Agilent PNA Series Network Analyzer

Printed Version of PNA Help User's and Programming Guide

Supports Firmware A.08.00

March 12, 2008

Agilent Technologies

Warranty Statement

DFARS/Restricted Rights Notice

Certification

Agilent Technologies, Inc. certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies, Inc. further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

Contacting Agilent

Assistance with test and measurements needs and information on finding a local Agilent office are available on the Web at: http://www.agilent.com/find/assist
If you do not have access to the Internet, please contact your Agilent field engineer.
In any correspondence or telephone conversation, refer to the Agilent product by its model number and full serial number. With this information, the Agilent representative can determine whether your product is still within its warranty period.

TABLE OF CONTENTS

What's New in PNA Code Version A.08.00

- Noise Figure Application (Opt 029)
- Gain Compression Application (Opt 086)
- 'Sweep' Trigger Mode
- Custom Cal Window settings (remote only)
- New Equation Editor Functions
- Minimum Number of Points = 1

See New 8.0 Programming Commands

To check your PNA code version, click **Help**, then **About Network Analyzer**

What's New in PNA Code Version A.07.50

- USB / LAN power sensor support
- Increased Number of Points to 20,001
- 'Extra' Security Setting
- Wideband Pulsed Application (PNA-X)
- Expanded right-click mouse capabilities (PNA-X)
- IF Path Configuration for all receivers (PNA-X)
- External Source Control
    - Consistency improvements
    - Generic (Non-Agilent) sources are NOT supported in this release. This could result in errors in remote programs.
- Copy Source Power Cal Macro

Note: This firmware revision can be installed on ALL PNA models that use Windows XP.

Highlighted text on this page (until 6.04) describes features that are **NEW** for most PNA models. These features have already been released for PNA-X models.

See New 7.50 Programming Commands

What's New in PNA Code Version 7.22

- Enhanced Response Calibration
- PNA-X Support for Millimeter-wave (Please read **CAUTION**)
- External Source Control for ALL measurement types
- Embedded LO Measurements
- ADC Receiver Measurements

What's New in PNA Code Version 7.21

- Wider IF Bandwidths (PNA-X Only)
- Produce receiver power calibration of PNA reference receiver
- Isolation Cal (SCPI and COM only)

What's New in PNA Code Version 7.20

New PNA-X models includes the following features:

- Internal Second Source (some models)
- Improved Front-Panel User Interface
  - 10.4 inch Hi resolution LCD Touchscreen
  - Fully functional Hardkey / Softkey layout
  - Trace Zoom
  - Trace Max - isolates a single trace
  - Marker Drag with mouse or touchscreen
  - Expanded Right-click mouse capabilities
  - Custom Trace Titles
  - Memory Normalize
- Increased Rear-Panel Capabilities
  - Auxiliary Triggering

    - Pulse I/O
    - Power I/O
    - IF Path Configuration
- RF Path Configurator
- Measurement Classes
- Source and Receiver Attenuation Offset
- Updated Pulsed Application
- True Mode Stimulus Application (Webpage)

New PNA Preferences Help Topic

See New 7.20 Programming Commands

What's New in PNA Code Version 7.1

- New PNA-L 4-port models
- FOM and Power dialog support for 2 Internal Sources

See New 7.1 Programming Commands

What's New in PNA Code Version 6.2

- Option 551 Multiport Test Set Control
- QSOLT Calibration Method
- Calibration Preferences
- Unlimited number of windows
- Source Power Cal using a PNA receiver only
- Choose ports for saving sNp files
- Channel Trigger State added to Status Bar
- FCA and Cal Set viewer data can be saved to *.prn files
- Cal Channel created for performing calibrations

New in PNA Help:

- Improved FOM Setup Examples

See New 6.2 Programming Commands

What's New in PNA Code Version 6.04

- Updated Print and Page Setup dialog
- Selectable Power Sweep retrace level
- Turn power OFF during a retrace in single band sweep.
- Inverse Smith and Unwrapped Phase added to PNA display formats.
- Opt. 082 SMC Measurements
- Equation Editor
- Remote SCPI over LAN from non-windows PC using Sockets/Telnet
- Citifiles recalled to channel 32 and below.
- ECal User-Characterization allowed beyond ECal module frequency range

New in PNA Help:

- FCA Measurement Examples (VMC and SMC)
- Comparing the PNA Delay Functions
- PNA Online Web Help

See New 6.04 Programming Commands

What's New in PNA Code Version 6.0

- Calibrate using an External Trigger Source
  (This could affect your remote programs.)
- Calibrate with an Offset Load Standard
  (Cal Kits that you use may now include this standard.)
- Corrected Measurement visible in Cal Window
- External Testset Control
- New FCA capabilities

- Characterize Adaptor Macro creates S2P files from two 1-port Cal Sets.
- 1.1 GHz CPU and related capabilities
- Error-checking and Disk Defragmenter recommendation
- Agilent VEE Runtime Installed
- *.csa file type is default for Save As and Auto Save
- Bandwidth Markers search for "Valley" response
- SimCal SCPI Preference
- Application Code (software) Revision number now contains 6 digits instead of 4.
  (This could affect your remote SCPI and COM programs.)
- Rev 6.0 is NOT supported on PNA models using Windows 2000. For more information, see the PNA support website.
- Rev 6.0 is NOT supported on PNA models N3381A, N3382A, N3383A.

Last modified:

9/28/06	Cross-browser

PNA User Accounts and Passwords

When the PNA power is switched on, it automatically logs into Windows using the default user name and password. This gives anyone full access to the analyzer. The following steps can be taken to increase security of your PNA.

- Require users to logon when the PNA computer is turned ON - Learn how to enable this feature
- Setup individual accounts on the PNA with varying level of access - Learn how to Add or Change User Accounts and Passwords

Please read about Anti-virus protection for your PNA

Existing User Accounts

The following user accounts already exist on new PNAs:

- **Default User Account**
  Beginning in April 2004, PNAs were shipped from the factory with the default user name is **PNA-Admin** and the password is **agilent.**
  For PNAs shipped before that, the default user name is **Administrator** and the password is either **tsunami** or left blank.
  These accounts are created by Windows and cannot be deleted.
  We recommend you change the password and, if desired, the user name.
  DO NOT FORGET YOUR NEW PASSWORD. You will not be able to start your PNA without it.
- **Agilent Account** This Administrator account is created by Agilent for service purposes. Each PNA has a unique password for this account. Although allowed by Windows, please do not delete this account.
- **Guest Account** This account allows anyone to type in any name, without password, and gain limited access to the PNA files. This account is created by Windows and cannot be deleted. It can be renamed. This account is turned OFF when the PNA is shipped.

Notes

- Although allowed by Windows, do NOT setup an Administrator account without a password. Internet viruses look for, and exploit, this condition.
- You can create as many user accounts as you like.
- The user name is not case sensitive. The password IS case sensitive.
- The PNA local policies are set so that, if logon is required, you must retype the user name (and password) every time. Do not change the local policies on the PNA.

How to Require Users to Logon when the PNA Computer is turned ON.

How do I know which Operating System I have?

Windows 2000	Windows XP
On the Windows taskbar, click **Start**, then **Settings**, then **Control Panel**	On the Windows taskbar, click **Start**, then **Run**
Double click **Users and Passwords**	Type **control userpasswords2** then click **OK**
Check **Users must enter a user name and password to use this computer.**	Check **Users must enter a user name and password to use this computer.**

To turn this function OFF, perform the same procedure, but clear the checkbox. The account that is selected when the checkbox is cleared is the account that is automatically logged on when the PNA is turned ON.

Add or Change User Accounts and Passwords

If the analyzer is in a secure environment, you can setup PNA users by name and grant various levels of access. This is particularly important when the PNA is remotely controlled or accessed over LAN.

You can designate a person as the administrator and then configure the PNA to allow others to use it with reduced permissions. That is, other people can be signed on to use the analyzer but they will not have the ability to perform all of the administrative functions that you can as the administrator.

How to add or change a user account and password

[How do I know which Operating System I have?]

Windows 2000	Windows XP
In the analyzer **System** menu, point to **Configure**, and click **Control Panel**.	Click Start, then point to Settings, then click Control Panel
In the **Control Panel** window, scroll down and select the **Users and Passwords** application.	Click **User Accounts**
On the **Users** tab, if the **Add** button appears dimmed, select the **Users must enter a user name and password to use this computer** check box near the top of the window.	Follow the prompts to: • Change an account • Create a new account • Change the way users log on or off.
Click **Add** to enter the information for yourself or for another user.	**CAUTION:** Although allowed by Windows, do NOT allow an Administrator account without a password. Internet viruses look for, and exploit, this condition.
In the **User name** box, enter a user name for the user. In the **Full name** box, enter the full name of the user.	

In the **Description** box, enter a description for the user. Then, click **Next.**	
In the **Password** box, have the user type a password. Have the user retype the password in the **Confirm password** box. Then, click **Next**.	
Select the level of access that you wish to grant this user. **Note**: Standard users and restricted users are **NOT** able to switch GPIB modes and install firmware. There are several other levels of security that you may grant in the **Other** list. A description of each of these other levels is displayed beneath the **Other** box when it is selected. Then, click **Finish.**	**Note**: Standard users and restricted users **ARE** ABLE to switch GPIB modes and install firmware.
In the **Users for this computer** box, validate the user name and security level group of the user.	
If you want this user to be able to use the network analyzer without entering their password each use, clear the **Users must enter a user name and password to use this computer** check box. Click **OK**.	
When the **Automatically Log On** window is displayed, have the new user type their password in the **Password** box and have them retype the password in the **Confirm Password** box.	
Click **OK** to complete this user addition.	
In the **File** menu, click **Close** to close the Control Panel.	

PNA Computer Properties

The PNA uses a personal computer and a Windows operating system. The following are common tasks that you may need to perform on the PNA computer.

- View or change Full Computer Name
- Check IP Address
- Check the amount of RAM
- Check CPU Speed
- Set Time and Date
- Turn OFF Speaker

Other Administrative Task Topics

View or change Full Computer Name

Your PNA has a unique computer name that identifies it on a network. To view or change the computer name, you must first minimize the PNA application.

How do I know which Operating System I have?

Windows 2000	Windows XP
On the desktop, right-click **My Computer**	On the desktop, right-click **My computer** Icon
Click **Properties**	Click **Properties**
Click the **Network Identification** tab at the top of the dialog box	Click the **Computer Name** tab at the top of the dialog box
Click **Properties**	Click **Change** next to "**..rename this computer..**" message
Type your new **Computer Name**	Type your new **Computer Name**

Note: To add your computer to a domain, or to set up the networking configuration, contact your company's I.T. department. This setup is custom for each company.

To restore the PNA application, click **PNA Analyzer** in the task bar at the bottom of the screen.

Check IP Address

If your PNA is connected to a LAN, you can view the IP address and other networking information.

1. Minimize the PNA application
2. Click **Start**, then **Run**
3. Type **cmd**, then click **OK**
4. At a DOS prompt, type **ipconfig /all**

Check the amount of RAM

Random Access Memory (RAM) is the amount of working memory in your computer. The PNA application can require up to 512 MB of RAM depending on the settings you use. If your PNA is operating slowly when you have more than four windows open or if you routinely use more than 1601 data points, you may need to upgrade to 512 MB.

To view the amount of PNA RAM, you must first minimize the PNA application.

How do I know which Operating System I have?

Windows 2000	Windows XP
On the desktop, right-click **My Computer**	On the desktop, right-click **My computer** Icon
Click **Properties**	Click **Properties**
Click the **General** tab at the top of the dialog box	Click the **General** tab at the top of the dialog box
The amount of RAM appears at the bottom of the window.	The amount of RAM appears at the bottom of the window.

To restore the PNA application, click **PNA Analyzer** in the task bar at the bottom of the screen.

Check CPU Speed

The speed of the PNA processor (CPU) is a factor in determining how quickly the PNA processes data. See PNA configurations to learn if you can upgrade your PNA CPU. To check your PNA CPU speed, you must first minimize the PNA application.

How do I know which Operating System I have?

Windows 2000	Windows XP
On the desktop, right-click **My Computer**	On the desktop, right-click **My computer** Icon
Click **Manage**	Click **Properties**
Open **System Tools** folder, then click **System Information.**	Click the **General** tab at the top of the dialog box
Click **System Summary**.	The CPU speed appears near the bottom of the window
After refreshing, the CPU speed appears at the end of the **Processor** entry.	

To restore the PNA application, click **PNA Analyzer** in the task bar at the bottom of the screen.

Set Time and Date

Both Windows 2000 and XP

To set the time and date on your PNA, you must first minimize the PNA application.

1. Move the cursor to the lower corner of the screen
2. When the taskbar appears, double-click on the displayed time. This opens the **Date/Time Properties** dialog box.
3. Change the date, time, and time zone as appropriate.

To restore the PNA application, click **PNA Analyzer** in the task bar at the bottom of the screen.

Turn OFF | ON Speaker

When the PNA is generating errors, you may want to turn the speakers off to quiet the beeping. Learn more about errors.

1. To turn ON or OFF the PNA speaker, you must first minimize the PNA application.
2. Then click **Start, Control Panel,** then **Sounds and Audio Devices.**
3. Under **Device Volume**, check **Mute**.

Last Modified:

20-Sep-2007 Added speaker OFF

Run Error Check and Disk Defragmenter

When the PNA is shutdown unexpectedly or power is removed without first shutting down, large amounts of Hard Disk Drive space is rendered unusable. If shutdown in this manner enough times, the PNA could become unstable and no longer work.

This Hard Disk Drive space can be recovered by first running Windows **Error-checking** to find and correct errors on the disk, and then the **Disk Defragmenter** to recover Hard Disk Drive space.. These programs should be run routinely, about every 1 to 4 weeks, depending on how often the PNA is unexpectedly shutdown.

To learn more about Disk Defragmenter, see the Windows Help file.

Follow this procedure to run these programs:

Windows 2000	**Windows XP**
On the desktop, double-click **My Computer**	On the desktop, double-click **My Computer**
Select **Local Disk (C:)**	Select **System OS**
Click **File**, then **Properties**	Click **File**, then **Properties**
Click the **Tools** tab	Click the **Tools** tab

Error-checking

- Click **Check Now.**
- Check **Automatically fix file system errors.**
- Click **Start.**
- Click **Yes** to run disk check on next restart.
- Manually restart the PNA. The disk check will run before Windows restarts.

Approximately every six months, check the second box in addition to the first box. The error-checking process takes much longer, but performs a more complete check.

Defragmentation

- Click **Defragment Now...**
- Click **Defragment** to begin the defragment process.
- Click **Close** when defragmentation is complete.

Recovering from PNA Hard Drive Problems

The leading cause of PNA failures is problems with the PNA Hard Disk Drive (HDD). These problems are usually preventable (see Preventing PNA HDD Problems), and in many cases, recoverable. The following could save you weeks of downtime and the cost of replacing your PNA HDD.

This document is now on the Agilent PNA Support Website: http://na.tm.agilent.com/pna/. When at this webpage, click the **Hard Drive Recovery** link.

If your PNA does experience a Hard Disk Drive Problem, you will not be able to access this Help file, but you may be able to access the Internet from another computer.

Microsoft Windows® XP / 2000 Considerations

In this topic:

Microsoft Windows on the PNA

- Beginning in April 2004, the PNA is shipped from the factory with a modified version of Microsoft Windows XP operating system. Previously, the PNA was shipped with Windows 2000. The PNA application performs identically using these two operating systems.
- Beginning in Dec. 2005 with PNA Rev 6.0, firmware cannot be upgraded on PNA models that use Microsoft Windows 2000. For more information, see the PNA support website.

To determine which Operating System is installed on your PNA:

1. Minimize the PNA application
2. On the PNA desktop, click **Start**.
3. Along the side of the Start menu appears one of the following:
   - **Windows 2000 Professional**
   - **Windows XP Professional**

VERY IMPORTANT Protect your hard drive!

The leading cause of PNA failures is problems with the PNA Hard Disk Drive (HDD). These problems are usually preventable, and in many cases, recoverable. Learn more about protecting your PNA.

Using USB

The PNA has at least two USB ports for connecting devices: one on the front panel and at least one on the rear panel. The main advantages of USB are “hot” connects and disconnects and fast data transfer speeds. Electronic Calibration modules are now available with USB connections.

The first time you plug a device into a USB port there is some wait time. Windows reports it is identifying the hardware, then searching for the correct driver, then installing the driver (if it was found).

Connecting that same device back into that same port later is quick and easy, but if you move the device to a different USB port, you will have to wait through the hardware ID and driver search again.

Learn about USB limitations.

Note: Certain USB devices (such as ECAL modules) require you be logged on with Administrator privileges the first time you plug them into the PNA. This must be done for each serial number. Click **Next** to choose the default settings when installing new USB devices.

Plug & Play Stability and Security

Plug & Play capabilities is similar to Win 95 and 98. It provides both a stable and secure operating environment. You may notice also that it greatly reduces the number of required reboots.

LAN Connections

Windows supports DHCP and fixed IP addressing. Also, “Hot” connect and disconnect of the LAN cable, as well as a visual indicator of LAN status in system tray area, makes LAN connections more intuitive. In addition, the Hardware Wizard helps users with system hardware configuration.

Single and Double Click option

By default, Windows allows a single-click method of launching icons. To revert to double-clicking, click **Start**, then **Settings**, then **Control Panel,** then click **Mouse**. In the Mouse Properties dialog, select **Double-click to open an item**. Then click **OK**.

Windows XP Theme

The PNA application is designed for, and best viewed in, **Windows Classic** theme. To change the theme from Windows XP to Windows Classic,

1. Minimize the PNA application.
2. Right-click on the Desktop, then click **Properties**.
3. On the Theme tab, under **Theme** select **Windows Classic**.

Printing

Adding a printer should be done outside of the PNA application. Learn more.

Gain Compression Application GCA (Opt 086)

- Features, Requirements, and Limitations
- Gain Compression Concepts
- Understanding the GCA Displayed Traces
- Gain Compression Parameters
- Compression Methods
- Acquisition Modes
- Using Gain Compression App
- GCA Measurement Tips

See Also

- GCA Calibration
- **App Note** Amplifier Linear and Gain Compression Measurements

Other PNA Applications

Features, Requirements, and Limitations

Features

- Fast, easy, and complete Gain Compression measurements for amplifiers.
- Many compression parameters to choose from, including gain, input power at compression, output power at compression, input match, and compression level.
- Several compression methods to choose from, including deviation from linear gain, deviation from max gain, back-off, and X/Y.
- Three acquisition methods to choose from: Power per Freq, Freq per Power, and SMART Sweep
- SMARTCal Calibration Wizard to guide you through Full 2-Port or Enhanced Response calibration, plus Source Power calibration.
- Supports Frequency domain Wideband Pulse measurements. However, Time domain measurements are NOT supported.

Requirements

- PNA-X with Opt 086 (software option only) must be enabled.
- When performing an optional calibration:
    - ECal module or Calibration Kit
    - Power meter and power sensor

Limitations with GCA

- Number of points limited to 20,001 for two-dimensional acquisitions, 10,000 points for SMART Sweep.
- Standard CW power sweep is NOT supported in a Gain Compression channel.
- No Independent IFBW, Independent power levels in segment table.
- Stepped sweep mode only.
- Linear, Log, and Segment frequency sweep modes only.
- 2-port DUTs ONLY.

The following PNA Features are **NOT** Available in a Gain Compression channel:

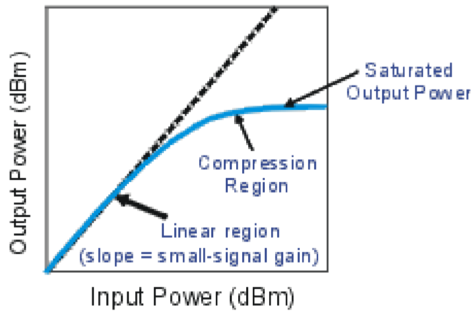
- Unratioed receiver measurements (A, B, R)
- ECal User Characterization
- Fixture Deembedding
- FOM or FCA
- External Test Set Control (Option 551)
- Interface Control
- Copy Channel
- IF Path Configuration
- Time Domain
- Equation Editor - Equation traces are not allowed in the GCA channel, but GCA traces can be referenced in an equation trace that resides in a standard channel. Learn more.
- Port extensions
- Balanced measurements
- Point and Sweep trigger
- Save Formatted Citifile data.

- Time Domain Pulse measurements in the Wideband Pulse App are NOT supported.

Gain Compression Application Concepts

What is Gain Compression

An amplifier has a region of linear gain, where the gain is independent of the input power level. This gain is commonly referred to as small signal gain. As the input power is increased to a level that causes the amplifier to approach saturation, the gain will decrease. The 1 dB gain compression is defined as the input power level that causes amplifier gain to drop 1 dB relative to the linear gain.



Terms used in GCA

Linear Power Level The specified input power that yields linear gain (also known as 'small-signal gain') in the amplifier.

Reference gain The measured gain that is used as a reference for determining compression level. The Compression Method that is used could cause this value to be different.

Compression level The specified amount of gain reduction from the reference gain.

Target gain The gain at the specified compression level. Although this term does not appear in GCA, it is important to understand when discussing the various compression parameters.

For example, when using Compression from Linear Gain method with the following settings:

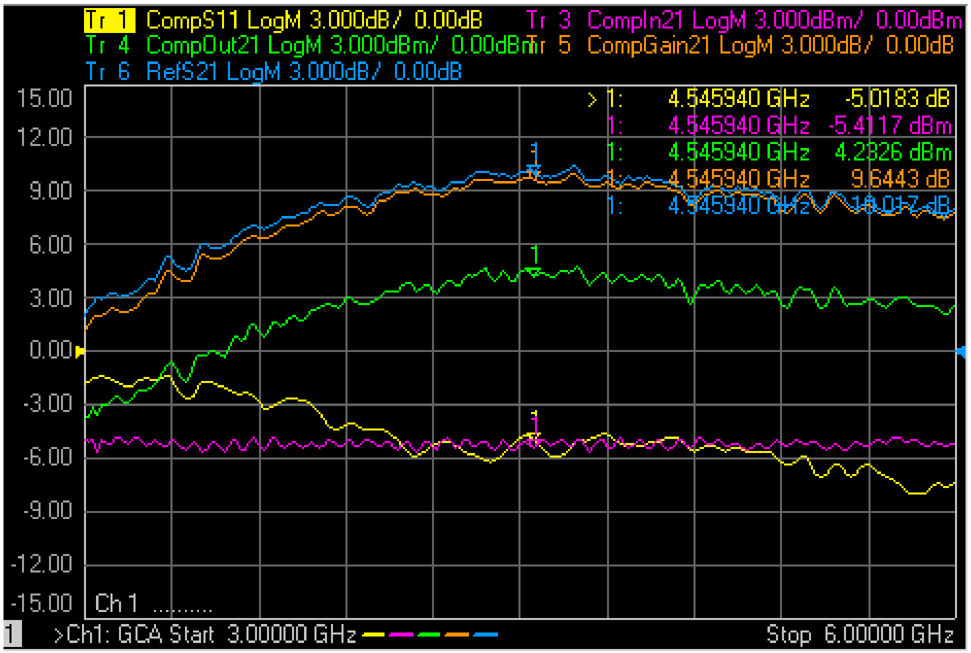
- Linear gain (measured at Linear Input power) = 10.2 dB
- Compression level (specified) = 1 dB
- Target gain = 9.2 dB

This is called 'Target' gain because GCA will search for the closest measured gain to 9.2000 dB. It may not measure this gain exactly.

Compression point The operating point at which the measured gain is closest to the Target Gain. All compression parameters report data for this operating point.

Understanding the GCA Displayed Traces

One of the most important concepts to remember with GCA is that, each frequency data point represents many measurements using different input power levels.



Some things to notice about how GCA displays **compression** data:

1. The X-axis values are ALWAYS frequency. Imagine behind each frequency data point, a traditional power sweep curve with corresponding measurements and calculations to find the specified compression point.
2. The Y-axis values are always reported at the compression point. The value that is displayed depends on the **compression** parameter that you choose. The S-parameters that are displayed in a GCA channel are always measured at the linear and reverse power level.

Example: Five of the six GCA compression parameters are displayed in the above image. The missing trace, DeltaGain21 is discussed below.

- Markers are placed at 4.549 GHz for all of the parameters.
- Tr 3 CompIn21 (Input power at the compression point) shows the marker value to be **-5.4117 dBm**. This is the power into the DUT that was required to achieve the compression point Notice that this is about the same input power required to achieve the specified compression at ALL frequencies.
- Tr 5 CompGain21 (Gain at the compression point) shows the marker value 9..6443 dB . This is the measured gain at the compression point.
- It is NOT possible to see the gain at a different input power at this frequency by viewing a GCA compression parameter. The compression parameters display values ONLY at the compression point. However, this data CAN be viewed by saving saving 2D data to a csv file, or displayed on the PNA by running a macro at that single frequency.

Gain Compression Parameters

There are several Gain Compression parameters, as well as standard S-parameters that can be measured in a GCA channel.

How to add or change GCA Parameters	
Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For PNA-X and 'C' models	Programming Commands
1. Press **MEAS** 2. then select a parameter	1. click **Response** 2. then **Measure** 3. then select a parameter

Linear S-Parameters

For convenience, the standard S-parameters are offered in a GCA channel. S11 and S21 are measured at the specified Linear Input level. S22 and S12 are measured at the specified Reverse power level.

Parameter	Description	When Measured
S11	Input Match	Always
S21	Gain	Always
S22	Output Match	See Reverse
S12	Reverse Isolation	See Reverse

Compression Parameters

Note: The following table assumes: DUT **Input** = PNA **port 1** and DUT **Output** = PNA **port 2**.

When the Port mapping is different, the parameters in GCA are updated accordingly. For example, with Input = port 2 and Output = port 1, then "CompIn12" would be displayed.

The raw data for these parameters are always measured.

Parameter	Description
CompIn21	Input power at the compression point.
CompOut21	Output power at the compression point.
CompGain21	Gain at the compression point.
CompS11	Input Match at the compression point.
RefS21	Linear Gain value used to calculate the compression level. This is calculated differently depending on the compression method.
DeltaGain21	CompGain21 MINUS Linear Gain (in Log Mag format). This trace can be used to learn a lot about the DUT compression point. Learn more.

Compression Methods

GCA offers the following methods to find the compression point of an amplifier using GCA:

Compression from Linear Gain

The Reference Gain is measured using the specified Linear (Input) Power Level. The Target Gain is calculated as the Linear Gain minus the specified Compression Level. For example 8.3 dB - 1 dB = 7.3 dB.

Compression from Max Gain

Available ONLY in **2D** Acquisition modes.

The linear region of an amplifier gain may not be perfectly linear. After all data is acquired at each frequency, the highest gain value is used as the Reference (S21) Gain. The Target Gain is found in the same way as Compression from Linear Gain.

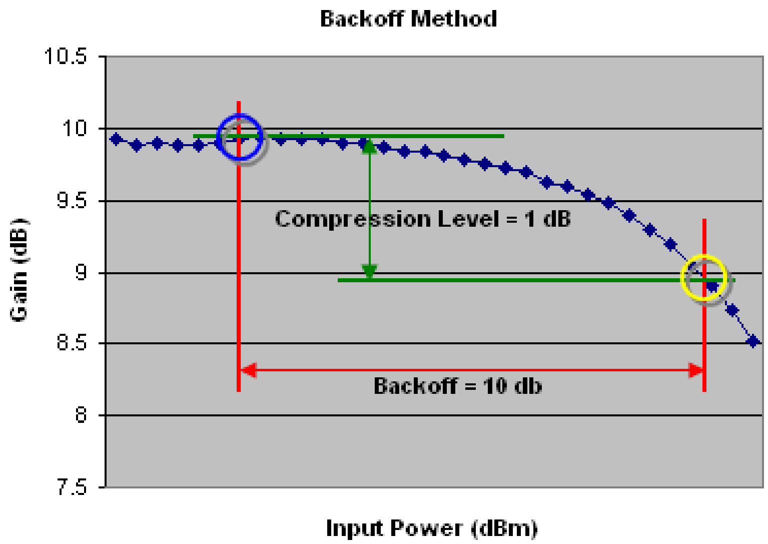
Backoff and X/Y method

These two compression methods are very similar.

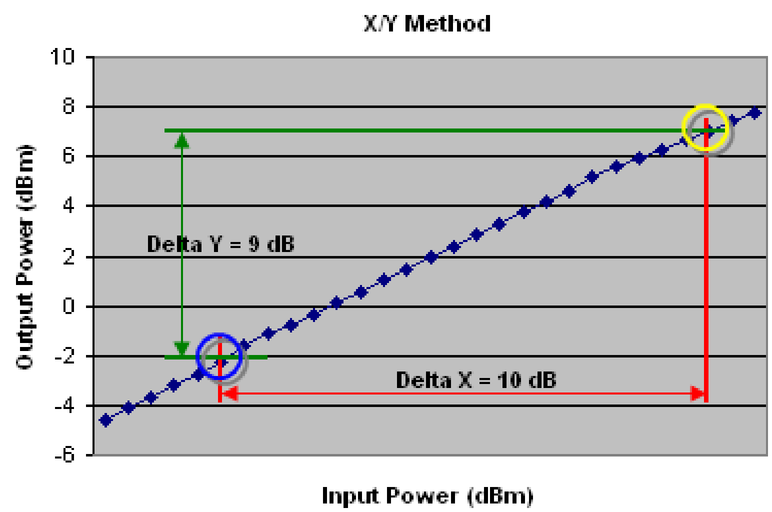
- Both methods specify a difference in input power (X axis) between the linear region and compression point.
- For the Y-axis difference:
  - **Backoff method** specifies Compression Level which is a difference in **Gain**.
  - **X/Y method** specifies Delta Y which is a difference in **Output Power**.

GCA searches for these points differently for 2D sweeps and SMART sweep.

The following images show how Backoff and X/Y method is calculated at ONE frequency.



The compression point (**yellow** circle) is where 10 dB more input power yields 1 dB less gain than at the reference point (circle).



The compression point (**yellow** circle) is where 10 dB more input power yields only 9 dB more output power than at the reference point (circle).

Acquisition Modes

The GCA offers three modes for data acquisition: Two 2D sweep modes, and SMART sweep.

Note: A traditional power sweep at a single frequency is NOT offered in the GCA channel. However, macros are provided to easily measure and view this data along with GCA data. Learn more.

2D (two-dimensional) Sweeps

This is the easiest method to understand, and the least efficient for finding the compression point. Both 2D sweep modes work as follows:

1. All GCA measurements begin by measuring S-parameters at the specified Linear Power level. Reverse parameters are measured ONLY if Full 2-port calibration is applied or if a reverse parameter is displayed. Learn more about Cal choices.
2. Gain measurements are then made at ALL of the specified frequency and power values. Although these are conceptually 2-Dimensional sweeps, a single sweep is constructed in firmware. See Data Points Limit.
3. After data has been measured, a search is performed to find the compression point. You can choose to interpolate between the two measured points closest to the target gain. Learn more.

As each sweep is performed, dots are plotted next to the **Ch** indicator in the lower left corner of the display to indicate progress for the current sweep.

Note: For Backoff and X/Y compression method, GCA does not verify that the specified Start - Stop power range is at least the size of the specified Backoff or X value. The closest compression point is always reported.

2D Sweep Modes

- **2D Sweep Power per Frequency -** Input power is stepped from Start to Stop at each specified frequency. From the following example you can see that the device is exposed to the highest power level (p3) at the first frequency (f1). This could heat the device early in the measurement and affect compression results.

The following examples show (**f**requency, **p**ower) values for three frequency points and three power points, resulting in a total of 9 measurements:

1	2	3	4	5	6	7	8	9
f1,p1	f1,p2	f1,p3	f2,p1	f2,p2	f2,p3	f3,p1	f3,p2	f3,p3

- **2D Sweep Frequency per Power -** Frequency is swept from start to stop at each specified power level as follows:

1	2	3	4	5	6	7	8	9
f1,p1	f2,p1	f3,p1	f1,p2	f2,p2	f3,p2	f1,p3	f2,p3	f3,p3

Viewing and Saving 2D Data

It is NOT possible to plot ALL of the 2D measurement data on the PNA display. However, it can be saved to a .csv file and then read into an Excel spreadsheet. The initial S-parameter measurement data is not saved to this file.

To save 2D data:

- With a 2D measurement active, click **File**, then **Save As**, then select **File Type** .csv file.

- The last complete 2D sweep data is saved. See Save Data Types.

You can also view on the PNA all power sweep information at a selected frequency using a macro. Learn more.

SMART Sweep

SMART Sweep is usually the fastest and most accurate method to measure Gain Compression. Unlike the 2D acquisition modes which measure all of the specified frequency / power points, SMART Sweep performs a series of power search iterations. At each frequency, an 'intelligent guess' of input power is made to find the compression level that is within tolerance. This guess is further refined with each successive power search iteration sweep.

SMART Sweep continues to iterate until one of the following conditions occur:

1. ALL data points are within tolerance. When the compression level for a data point achieves the specified tolerance, it continues to be measured and input power changed to improve the measurement within tolerance.

2. The specified compression level can NOT be achieved for the remaining frequencies that are not in tolerance. Either the Start power is too high or the Stop power is too low.

3. Maximum iterations have been achieved. If a measured gain is not within the specified tolerance before the specified **Max** number of **Iterations** has been reached, then the **last** power reading is used as the compression point.

The Iteration Counter, Dots, and Bangs

Next to the Ch indicator, in the lower left corner of a GCA window, the following annotation appears:

- An **iteration counter** is incremented each time input power is adjusted.
- A **dot** appears when another 10% of the frequency points are within tolerance.
- **!** (bangs) are displayed after the last iteration. Each bang represents 10% of the data points that are NOT within tolerance.

SMART Sweep and Compression Method

The intelligent guess process works differently depending on the compression method. This is important because Backoff and X/Y compression methods subject the DUT to significant changes in input power during an iteration sweep. This can affect the DUT and the measurement results.

Learn all about Backoff and X/Y compression methods.

ALL GCA measurements begin by measuring S-parameters at the specified Linear Power level. Reverse parameters are measured ONLY if Full 2-port calibration is applied or if a reverse parameter is displayed. Learn more about Cal choices.

- **Backoff and XY** Because both compression methods specify the separation between the 'linear" region and the "compressed" region, each iteration requires **two sweeps** at different power levels over the same frequency range. The first sweep measures the DUT at the **Backoff** or **X** power level. The second sweep measures the DUT at the compressed power level, specified by the Start and Stop power range. At the beginning of the second sweep, the power level rises by the **Backoff** or **X** value. The specified Settling Time is applied at this point to allow the DUT time to react to this significant change in power level. Also Safe Sweep can be used to minimize this change in input power.

- **Compression From Linear Gain** After the reference gain is measured at the linear input power, the next iteration measures the DUT at a power level half way between the linear power level and the stop power. The next sweep, depending upon the compression level of the DUT, either increments or decrements the power by ¼ of the difference between stop power and start power. The third iteration sweep then uses a curve-fit algorithm to precisely find the compression point.

  Note: The DUT can be subject to significant changes in power from one iteration sweep to the next. This can be minimized by the use of SAFE Sweep and careful selection of the corresponding settings.

- **Compression from Max Gain** NOT offered with SMART Sweep.

Using the Gain Compression Application

The following is a general procedure for performing a GCA measurement. The challenge with GCA is configuring a measurement that yields the true compression performance of YOUR DUT. This requires knowledge of the Gain Compression settings and knowledge of the DUT.

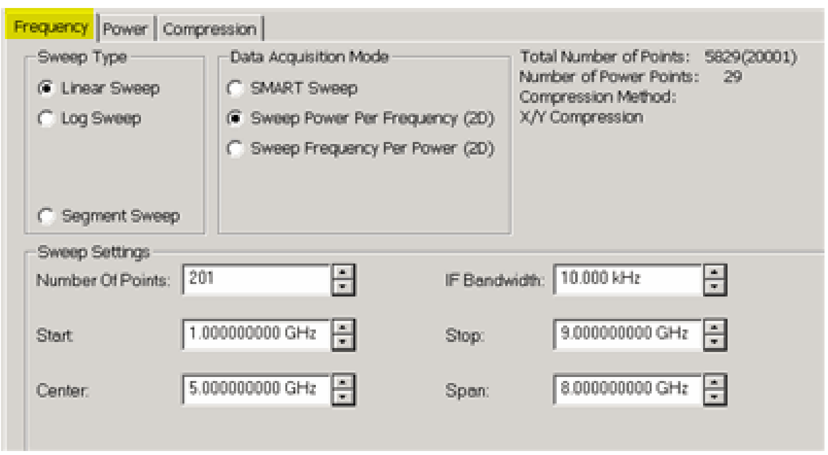
See specific dialog boxes below.

1. Disconnect the DUT if preset or default power levels may damage the PNA or DUT.
2. Preset the PNA, or configure a suitable User Preset that will be safe in case the DUT is connected.
3. Create a GCA channel. Learn how. The default trace is S21.
4. Start GCA Setup dialog and configure the measurement settings based on the DUT, adapters, attenuators, booster amplifiers, and fixtures to be used in the measurement.
5. Save the instrument state (optional).
6. Connect DUT and apply bias and RF power as appropriate. The default measurement for a GCA channel is S21 (amplifier gain). Inspect the gain measurement to ensure the DUT is operating as expected.
7. Add GCA compression parameter traces. Learn how.
8. Adjust the measurement settings to yield satisfactory compression parameters. See GCA Measurement Tips.
9. Start and complete the GCA Calibration wizard.

How to start the Gain Compression Setup dialog

To provide quicker access, use the Setup softkey. Learn how.

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For PNA-X and 'C' models	Programming Commands
1. Press **FREQ** 2. then **[Gain Compression Setup]**	1. Click **Stimulus** 2. then **Frequency** 3. then **Gain Compression Setup**



Frequency tab - Gain Compression -dialog box help

Configures the frequency settings over which Gain compression is to be measured, as well as the measurement method.

Sweep Type

Choose a method in which to sweep frequency: Linear, Log, and Segment Sweeps. This setting applies to all data acquisition modes.

Segment Sweep

> **Note:** The segment table shown on the dialog is **'READ-ONLY'**.
>
> Learn how to Create and edit the Segment Sweep table.
>
> **Independent IFBW** and **Power** are NOT available.

CW sweep is NOT available. A traditional gain compression measurement using power sweep at a single CW frequency can be performed in a standard S-parameter channel. See the Single frequency macro.

Data Acquisition Mode

Specifies HOW the gain compression data is collected.

SMART Sweep

- At each frequency, input power is 'intelligently' adjusted to find a measured gain equal to the target gain.
- Faster and more accurate than 2D sweeps to measure Gain Compression point at a number of frequencies.
- Learn ALL about SMART Sweep

2D (two-dimensional) Sweeps

- **Sweep Power per Frequency** Performs a series of power sweeps at each successive frequency.
- **Sweep Frequency per Power** Performs a series of frequency sweeps at each successive power level.
- Learn ALL about 2D sweeps

Sweep Settings

Click each to learn more about these settings.

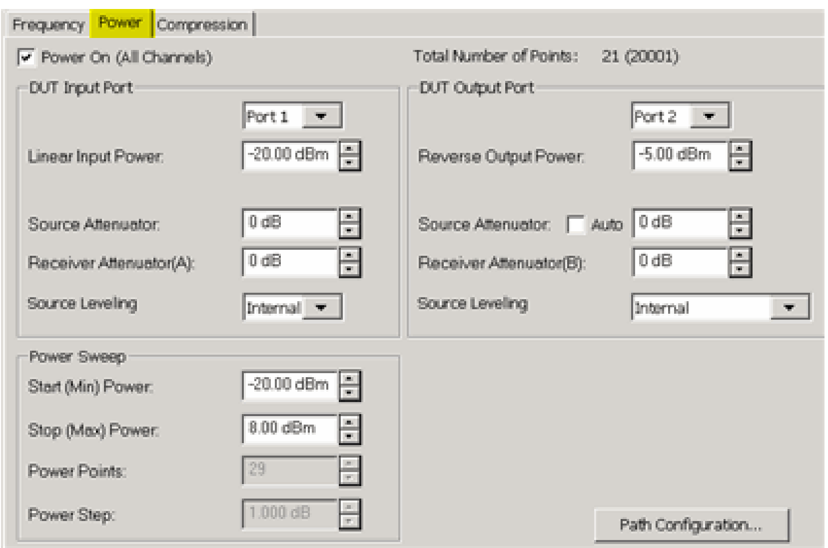
- **Number of points** Number of frequency points to measure. The Frequency points may be limited due to the number of specified Power points. See Data Points Limit.
- **IF Bandwidth** Set this value to yield acceptable trace noise when measuring gain at the linear power level. This level of noise contributes directly to the accuracy of compression point. A lower value (narrower IFBW) allows for more accurate, but slower, measurements. See GCA Measurement Tips to see how to best set IFBW.
- **Start / Stop**, **Center / Span** frequencies. Set the frequency range over which to measure Gain compression.

Data Points Limit

The maximum number of measurement data points depends on Acquisition method and Compression method as follows:

	SMART sweep	2D sweep
Compression method	Number of **frequency points** is reduced to ensure the total number of data points does not exceed the specified limit.	Number of **power points** is reduced to ensure the total number of data points does not exceed the specified limit.
• Compression from linear gain	Data points = **freq points** Max = 20,001	Data points = (**freq. points) * (power points)** Max power points = **2,001** Max data points = **20,000**
• Compression from max gain	NOT supported	
• X/Y and Backoff	Data points = **2 * freq points** Max = 20,001	

Note: Although the dialog box will allow you to enter any number of frequency or power points, the values are checked when **OK** or **Apply** is pressed. If a limit is exceeded, the relevant data points are reduced to the maximum allowable number **without warning**.



Power tab - Gain Compression dialog box help

Configures RF power and Power Sweep settings for Gain Compression measurement.

Power ON (All channels) Check to turn RF Power ON or clear to turn power OFF for all channels.

Input Port

Select the PNA port that is connected to the DUT Input.

Linear Power Level The input power that yields the linear gain of the DUT. The linear gain is used as the reference gain when calculating the **Compression from Linear Gain.** Input match is also measured at this power level.

Source Attenuator Specifies the attenuator setting associated with the port connected to the input of the DUT. This attenuator will affect the range of available power into the DUT Learn more about Source Attenuation.

All PNA channels in continuous sweep must have the same attenuation value. Learn more.

Receiver Attenuator Specifies the attenuator setting for the receiver associated with the input of the DUT. When the power into the receiver test port is around +10 dBm, the PNA receiver may be in compression. However, with receiver attenuation, lower input power levels may become too noisy to make accurate power measurements. In this case, lower IFBW to reduce noise. Learn more about Receiver Attenuation.

Source Leveling Specifies the leveling mode. Choose Internal. Open Loop should only be used when doing Wide Band Pulse measurements.

Output Port

Select the PNA port that is connected to the DUT Output.

Reverse Output Power Sets power level into the output of the DUT for reverse sweeps. Port power is automatically uncoupled.

Reverse power is applied to the DUT ONLY under the following conditions. Otherwise, this setting is ignored.

- When Linear Output Match or Linear Reverse Isolation parameters are requested.
- When Full 2-port correction is used. You can perform a full 2-port cal and downgrade to an Enhanced Response Cal to prevent reverse power from being applied to the DUT. Learn more.

Source Attenuator Specifies the attenuator setting for the port connected to the DUT output. This setting will affect the range of available power at the DUT output port.

Receiver Attenuator Specifies the attenuator setting for the receiver associated with the DUT output port.

Source Leveling Specifies the leveling mode. Choose from: Internal (normal operation) or Open (use ONLY for WB Pulse measurements).

Power Sweep

Power Points Number of power points to measure for 2D acquisition modes. The Power Points may be limited due to the number of frequency data points. See Data Points Limit. This setting is NOT available in SMART Sweep, which uses only enough power points to find the specified compression level.

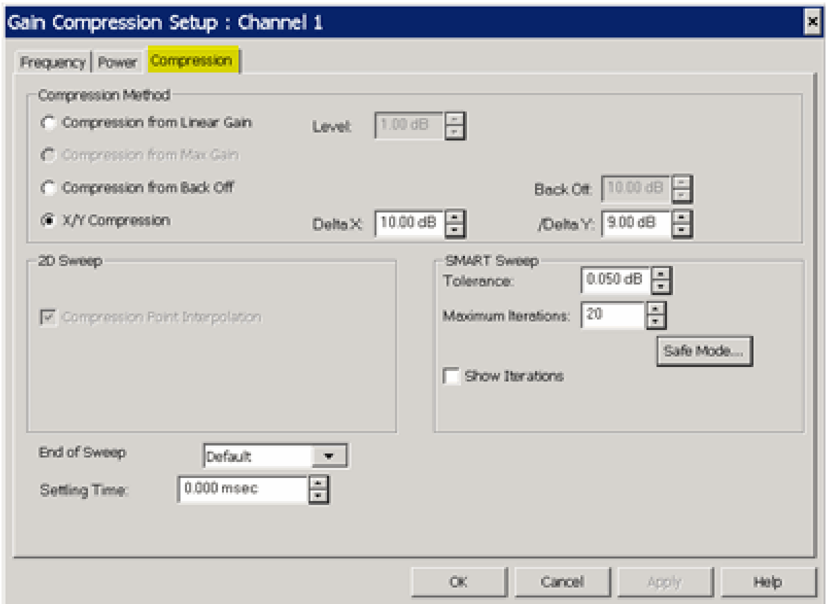
Start and **Stop Power**

- **2D sweep** In Backoff, X/Y, and Compression from Max Gain methods, sets the range of power levels that are applied to the DUT to find BOTH the Reference Gain and Compression point. Make sure this range is wide enough to include both. For example, if the Backoff level is 10 dB, then the power range must be greater than 10dB. Otherwise, GCA will report a compression value using the closest reference gain and compression point, which may be inaccurate. In Compression from Linear Gain, the reference gain is measured at the Linear Power Level, so the Start and Stop power levels are used to find the compression point.
- **SMART sweep** Sets the range of power over which GCA will search for the compression point. The reference gain is found using the Linear Power Level, Backoff, and X values, depending on the Compression Method. To reduce the number of iterations that are required to find the compression point, limit the Start / Stop power range to the input levels that will achieve compression. Do not include the linear region.

Note: If your DUT requires more input power to achieve compression below 3.2 GHz, use the PNA-X **Hi-power mode,** available from the RF Path Configuration dialog. The disadvantage to this is higher harmonic content.

Power Step (Size) Calculated value from current Start, Stop, and Points settings. This setting can NOT be changed directly.

Path Configuration click to launch the RF Path Configuration dialog.



Compression tab - Gain Compression dialog box help

Compression Method

Learn ALL about these Compression Methods

- **Compression from Linear Gain** The specified compression level is measured from the linear gain. The linear gain is measured using the **Linear Power Level** that is specified on the Power tab.
- **Compression from Max Gain** The specified compression level is measured from the maximum gain level. Not available in SMART sweep.
- **Compression from Back Off** This compression method uses the Compression Level and Back Off values for finding the compression point.
- **X/Y Compression** This compression method uses the specified parameters (X and Y) as the criterion for finding the compression point.

2D Sweep - Compression Point Interpolation

Check the box to calculate and display interpolated compression traces.

The Target gain is calculated using a complex linear ratio between the two closest measured values. All compression parameters are then interpolated using this same ratio.

Clear the box to display compression parameters for the closest compression point, either high or low, to the level specified in the Compression Method setting.

SMART Sweep

Learn ALL about Smart Sweep.

Tolerance Specifies an acceptable range for measuring the compression level. Reducing this value can significantly increase the number of iterations that are required to find the compression point.

Maximum Iterations Specifies the maximum number of power search iterations SMART Sweep is allowed. Reducing this value can cause SMART sweep to terminate before all compression levels are found to within the specified tolerance.

Show Iterations When checked, the compression parameter traces are updated at the completion of each power search iteration. When cleared, compression parameter traces are updated when SMART Sweep completes the power search iteration process.

End of Sweep Specifies the power level applied to the DUT at the completion of a GCA measurement.

GCA performs numerous power and frequency sweeps on the DUT during the overall measurement process. This setting has no affect on these intermediate sweeps. This setting only applies at the end of the very last sweep in the GCA channel.

In addition, this setting applies ONLY to the GCA channel. All other channels operate independently of this setting. Therefore, the power applied to the DUT after all channels have been measured may be different from this setting.

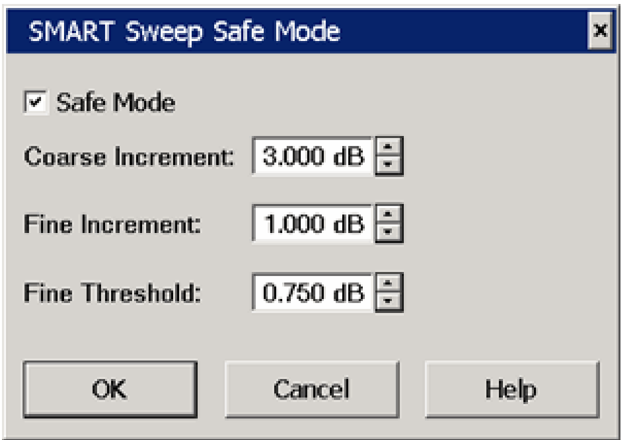
Choose from:

- **Default** Use the default PNA method. Learn more.
- **RF OFF** RF power is turned off when GCA completes a measurement cycle.
- **Start Power** RF power is set to the start power level.
- **Stop Power** RF power stays at the stop power level.

Settling Time

Used ONLY in SMART Sweep when Back Off or X/Y compression algorithms are selected.

This setting allows additional dwell time when the input power changes from the back-off level to the compression level. Learn more.



Safe Sweep Mode dialog box help

For use with SMART Sweep ONLY.

When enabled, Safe Sweep increases the input power to the DUT by the specified amounts, allowing the compression point to be achieved gradually. While this will increase the number of iterations required to achieve compression, it also minimizes the possibility of driving the DUT too far into compression.

Safe Mode (Enable) Check to enable Safe Sweep.

Coarse Increment Sets the maximum change in input power, up or down, which will be applied to the DUT from one iteration to the next. Default = 3.0 dB.

Without Safe Sweep, the maximum change in input power can be the entire Backoff or X value when using these compression methods.

Fine Increment Once the Fine Threshold has been achieved, this becomes the maximum change in input power, up or down, which will be applied to the DUT. Default = 1.00 dB

Fine Threshold Specifies the compression level in which Safe Sweep changes from the COARSE to the FINE increment. Default = .75 dB. This means that, by default, the PNA uses the Fine Power Adjustment when compression reaches 0.75 dB.

GCA Measurement Tips

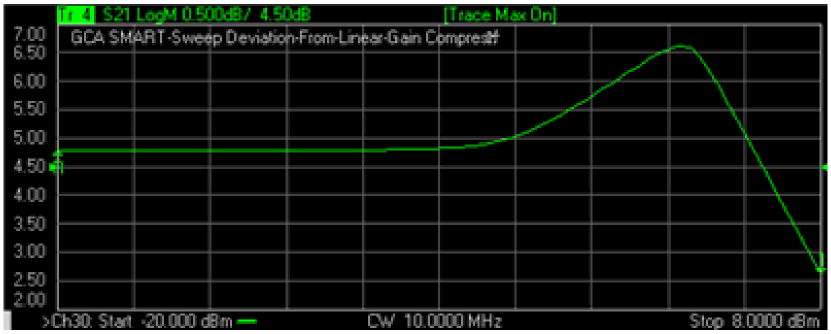
There are many settings in the Gain Compression Application. Here are a few tips when using GCA to learn as much as possible about the compression characteristics of your DUT in the most efficient manner.

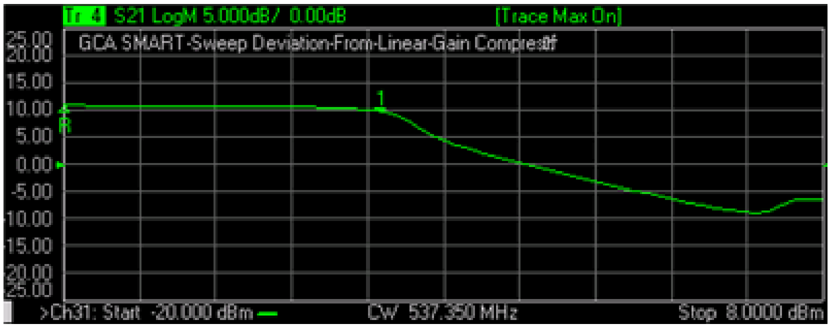
DUT Compression Characteristics and GCA

Although GCA provides excellent results with a wide variety of amplifiers, it works best with amplifiers which have a monotonic compression curve. In some cases where the compression curve is not monotonic, for example if the amplifier gain expands before it compresses, the correct compression level may not be found.

To help a SMART sweep find the correct compression point, limit the Start and Stop power levels around the anticipated compression point. Learn more.

The following two power-sweep traces are examples of non-monotonic gain:





DeltaGain

A DeltaGain trace is the best way to see how closely GCA is actually measuring to the desired compression level. In addition, you can view the phase of DeltaGain to see the phase deviation between the compressed gain and the reference gain. DeltaGain is calculated as:

- DeltaGain = Measured Gain (watts) / Ref Gain (watts)
- In LogMag format: DeltaGain = (Measured Gain) - (Ref Gain)

With SMART Sweep, DeltaGain (in LogMag format) shows how soon certain frequencies achieve the specified tolerance. Learn more.

Some other settings which may be helpful:

- Trigger source: Manual allows you to analyze data and make adjustments while allowing the device to cool.
- Construct Limit Lines around the compression point at the tolerance level.
- Use this macro as a starting point. When edited or run from an external computer (either with remote desktop or a mapped drive) you can make setting changes in the macro and quickly rerun the measurement.

The following image shows a DeltaGain21 trace using SMART Sweep. The Limit Lines were added manually.

In the above image:

Relevant Settings	Method = Compression From Linear Gain Compression level = 1 Iteration Tolerance = 0.05 dB. Maximum Iterations = 10
Displayed Results	A data point on -1.00 indicates that, at that frequency, the exact compression level (1 dB) was measured. Several frequencies did not achieve the specified tolerance (0.05 dB) before the Max Iterations (10) was reached. • FAIL and red data points outside the limit lines. • Nine dots (....) indicate that 90% of the data points achieved the specified compression level. • one **!** indicates that 10% of the data points did not achieve compression. • Learn more about the Iteration Counter and annotation.

SMART Sweep Tips

- Compression from Linear Gain is the easiest compression method to understand and control in SMART Sweep. Learn more.
- If SMART Sweep requires more than twenty iterations, this is an indication that something is wrong. Try changing the Tolerance setting, Frequency Range, Start / Stop power range, IF bandwidth, or Dwell Time.
- If the number of iterations required to achieve the desired compression level changes significantly from one set of measurements to the next, this could be due to other effects, such as heating. Try increasing the dwell time or using a wide-band pulse measurement configuration.
- If the DUT should not be significantly overdriven into compression, or the changes in the input power should be limited, use Safe Sweep mode with Deviation from Linear Gain compression method.

Single Frequency Macro

Because GCA displays only the compression point for each frequency, and not the entire power sweep, it can be difficult to see some of the more subtle aspects of a measurement. However, it is easy to see a traditional power sweep at a single frequency using one or both macros that are provided with GCA.

With a 2D sweep (NOT SMART Sweep) a script that is stored on the PNA hard drive automatically creates a traditional power sweep measurement in a standard channel using the same stimulus setting as the GCA channel. Use a marker in the GCA channel to specify the frequency for the measurement.

The script has two modes of operation:

- View Mode displays all of the previous 2D sweep data at that frequency.
- Measure Mode performs a new measurement at that frequency.

Both modes create a new S-Parameter channel using the same stimulus settings as the GCA channel, including port power, attenuator, IF Bandwidth, and dwell settings. The new channel does not support calibration or pulse characteristics.

- To see noise on a measurement, or use the Measure macro in continuous sweep. Adjust the IFBW and averaging until the noise versus sweep speed meets your needs.
- To see other effects of your DUT at a specific frequency, use the View macro and the Measure macro with 2D sweep mode. Both macros present data using a standard channel. The View macro shows 2D data at a specific frequency, while the Measure macro shows freshly measured data at the same frequency. Ideally, the data from these two would be identical. However, changes in your DUT behavior due to heating or other effects can cause these to be different. If significant differences exist, try:
    - Using the 2D Frequency per Power setting rather than Power per Frequency
    - Adjusting the dwell time
    - Adjusting IFBW
    - Use a wide-band pulse configuration

How to setup the Macros

Each macro must be setup separately.

1. Press **Macro**, then **Macro Setup.**
2. Select a blank line, then click **Edit.**
3. In **Macro Title**, type a short description such as Meas GCA or View GCA.
4. Click **Browse**, then navigate to C:\Program Files\Agilent\Network Analyzer\Applications\GCA**GCA.vbs**
5. In Macro run string parameters:
    1. Type **M** for the Measure macro or **V** for View macro.
    2. **Optional:** Supply the following additional parameters in any order:

- To run the program from a remote computer, specify the full computer name of the PNA .
- Channel in which to create the measurement. **I**f not specified, **M**easure is created in **Ch30** and **V**iew is created in **Ch31**.
- **Example:** Run string parameters for the Measure macro run from a remote computer in Channel 5.---- **M MyPNA 5.**

6. Click **OK**.

How to run the Macros

On a GCA channel:

1. **Create a 2D sweep.** Either Power per Freq or Freq per Power. Both macros always create a power sweep at the frequency of interest.
2. Create a **CompIn** trace.
3. On the CompIn trace, right-click and select **Add Marker**. Drag the marker to the frequency of interest.
4. Press **Macro**, then select either by the short description your provided in Step 3.

Last Modified:

23-Aug-2007	New topic

Noise Figure Application (Opt 029)

The Noise Figure Application makes fast, easy, and accurate noise figure measurements using the PNA-X.

- **Features, Requirements, and Limitations**
- **Noise Concepts**
- **How the Noise Figure Application Works**
- **Noise Parameters**
- **Using Noise Figure App**
- **Noise Figure Measurement Tips**

See Also

Noise Figure Calibration

Agilent Noise Figure App Note 57-1

Noise Figure Application Features

- Cold Noise Source method includes match correction for highly accurate noise measurements.
- Operates from 10 MHz to 26.5 GHz.
- Measures noise figure values ranging from 0 to 30 dB.
- Measures amplifiers with gain ranging from -20 to +40 dB.
- ENR values are interpolated for frequencies between the supplied data points.

Requirements

- PNA-X with option 029
- Agilent 346C Noise Source: Covers the same frequency range as the PNA-X.
- An adapter may be necessary to connect the Noise Source to the PNA port 2 reference plane during calibration.
- Noise Tuner (N4691B ECal module -m-f recommended) Opt 029 provides an additional cable and adapter to connect the ECal module to the front-panel connectors. Learn more.
- Cal Kit (or second ECal module) with same connector type and gender as DUT connectors.

- Recommended: An accurate thermometer. Learn more.

Limitations with Noise Figure

All PNA functions are supported except the following:

- Does NOT work with FCA (opt 083) or Frequency Offset (opt 080).
- All frequency sweeps are STEPPED. Analog sweep is NOT available.
- No External Test Set Control (Opt 550 or 551)
- No Receiver calibration.
- No Enhanced Response Cal
- No ECal User Characterization.
- No Fixture Deembedding.
- No Pulsed Measurements
- No Copy Channels
- No saving Formatted Citifile data.

Noise Concepts

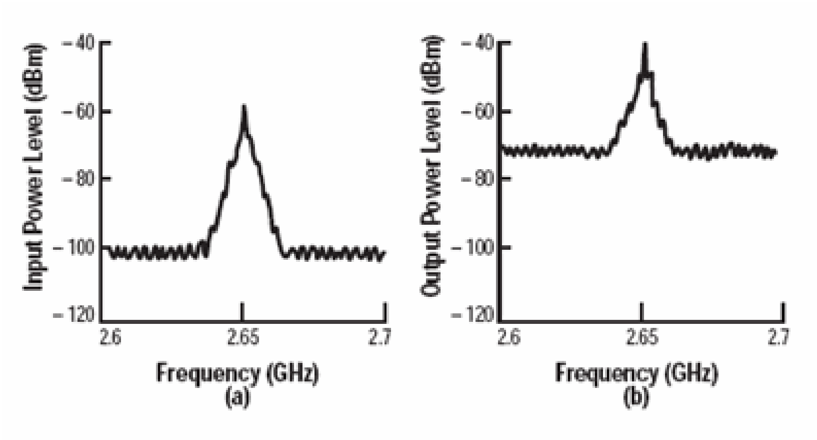
The following conceptual information is a short summary taken from the Agilent Noise Figure App Note 57-1.

All electronic circuits have some degree of random noise. The most common form is thermal noise, which increases as the temperature of the circuit increases.

The signal-to-noise (S/N) ratio of components in a communications system is a very important parameter. To improve the S/N ratio, it is usually easier and more cost-effective to reduce noise than to increase signal power. In order to reduce noise, an accurate method to measure noise is required.

Noise Figure

Noise figure is the degradation in the signal-to-noise ratio as a signal passes through a device. For example, in the following images:



(a) At the INPUT of an amplifier:	**(b)** At the OUTPUT of the same amplifier:
The noise floor is -100 dBm, the signal is at -60 dBm, **40 dB** above the noise floor.	The gain has boosted the signal AND the noise floor by 20 dB. The amplifier then added 10 dB of its own noise. The output signal is now only **30 dB** above the noise floor. Since the degradation in signal-to-noise ratio is 10 dB, the amplifier has a **10 dB noise figure**.

For consistency, noise measurements are calculated as if using a 1 Hz bandwidth, although measurements are almost always made at higher bandwidths.

The following formula shows the lowest possible noise power in dBm at 290° K (room temperature). The only way to measure noise lower than this is to make the measurement at a lower temperature.

- P = 10LOG(4.0 x 10 -21 watts/.001 watt)
- P = -174 dBm / Hz

How the Noise Figure Application Works

The noise figure application includes two noise receivers which measure the noise coming out of the DUT. The noise receivers are calibrated using a characterized noise source. Learn more about the noise calibration process.

A major source of noise measurement error is caused by a poor impedance match at the DUT input. Therefore, during every measurement, the Noise Figure Application uses an ECal module to present at least four different impedances at the input of the DUT. This "Noise Tuner" is connected to the PNA port 1 front-panel loops which is in the PNA internal source path. From the measurements at various impedance states, the PNA calculates the noise out of the DUT as though the PNA were exactly 50 ohms. No assumptions are made regarding the input impedance of the DUT.

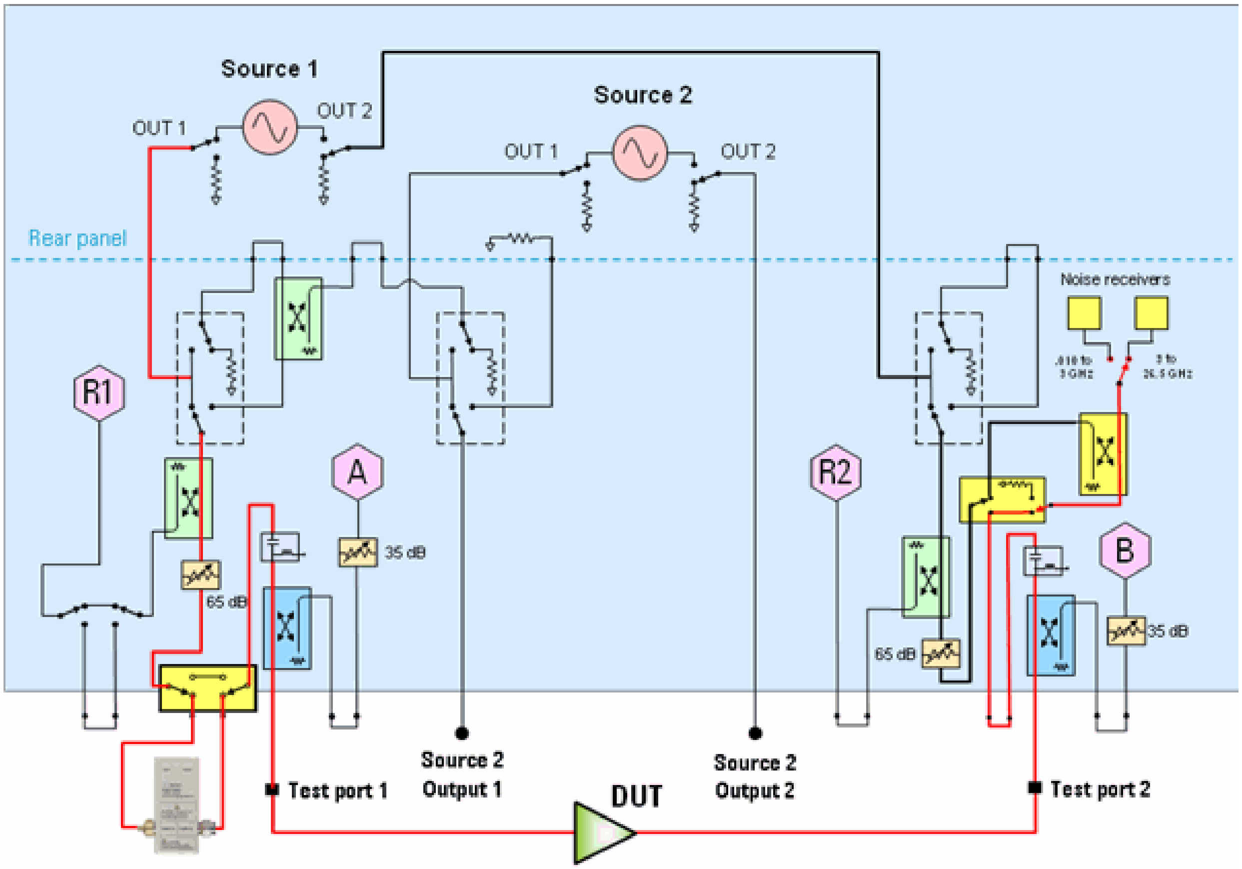
Here is how a noise figure measurement is made:

- The DUT input is always connected to the PNA source at port 1.
- The DUT output is always connected to the PNA receivers at port 2.

The sweep numbers are annotated on the PNA display as they occur.

1. With the noise tuner in the THRU state, S-parameter measurements are made to accurately characterize the gain of the DUT. This requires sweeps in both forward and reverse directions. (sweep #1 and #2).
2. The noise measurements are performed next. PNA source power is turned OFF and the noise tuner is switched to the first impedance state.
3. At each frequency, the noise receiver samples a large number of readings in order to attain **one** valid measurement. If Noise Averaging is selected, the specified number of measurements are made and averaged together to obtain one noise measurement. This continues for all frequencies (sweep #3).
4. The next noise tuner impedance state is switched IN and the noise measurements in step 3 are repeated. This occurs until measurements are made at all impedance states. At least four impedance states must be used. (sweeps #4, #5, #6+)
5. Calibration error terms are applied and calculations made to simulate the measurement with a perfect 50 ohm input impedance. The sweep result is plotted on the PNA display.
6. The PNA begins sweeping again with step 1.

PNA-X Block Diagram with Noise Figure components



Noise Figure Components are shaded yellow

- At test port 1 front-panel loops, a **DPDT switch** connects the noise tuner (ECal module) in series with Source1 providing several different input impedances. Learn more.
- At test port 2, **DPDT switch** and **coupler** to route RF from the DUT output to **two noise receivers**. The appropriate receiver is automatically switched as required for frequency being measured.

Making S-parameter measurements and the Noise Tuner Switch

The default setting for the port 1 DPDT switch is EXTERNAL, as shown in the above diagram. This setting always provides incident power through the front panel loop. When an ECal module is connected, it may NOT be in the THRU state, which is necessary for accurate S-parameter measurements. This can be changed in any of the following ways:

- Set the switch to INTERNAL for the S-parameter channel using the path configuration dialog.
- Set the switch to INTERNAL for the S-parameter channel using the following commands
  - **SCPI** - SENS:PATH:CONF:ELEM:STAT “Port1NoiseTuner”, “Internal”
  - **COM** - PathConfiguration.Element(“Port1NoiseTuner”).Value = “Internal”
- Change the preferred default setting to INTERNAL using SCPI or COM.

- Set the Noise Tuner (ECal module) to the THRU state using CONT:ECAL:MOD:PATH:STATE.

Noise Figure App vs Noise Figure Analyzer

In comparing the PNA Noise Figure App measurements with the NFA Series Noise Figure Analyzer measurements, you may obtain different results. This is because the Noise Figure Analyzer assumes that the DUT has a perfect 50 ohm input. The PNA Noise Figure App measures the source match and calculates the noise figure as though it were a perfect 50 ohm match. In addition, the PNA measures the amplifier gain with vector error correction applied to reduce measurement uncertainty.

Noise Parameters

Several noise parameters, as well as standard parameters, can be measured in a GCA channel.

How to add or change Noise Figure Parameters	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For PNA-X	Programming Commands
1. Press **MEAS** 2. then select a parameter	1. Click **Response** 2. then **Measure** 3. then select a parameter

Noise Parameters that are offered

- **Noise Figure** - Explained above in Noise concepts).
- **T-Effective** - The effective temperature, in Kelvin, of the measured noise level. For example 290° K = -174 dBm/Hz.
- **DUT Noise Power Density** - The total noise generated by the DUT, without system noise.
- **DUT Relative Noise Power** - DUT Noise Power Density MINUS 290° K, expressed in K and normalized to room temperature.
- **System Noise Power Density** - The total noise measured at the noise receivers. This includes noise generated by the DUT **plus** the noise generated by the PNA noise receivers and other system components.
- **System Relative Noise Power** - System Noise Power Density MINUS 290° K, expressed in K and normalized to room temperature.

Standard Parameters that are offered

- **S-parameters**: S11, S21, S22, S12

- **Unratioed parameters** using the following notation: (Receiver, source port). These parameters REPLACE the active GCA measurement. To do this (from front-panel ONLY), press **MEAS**, then **[More]**, then **[Receivers]**.

    - (R1,1), (R2,2), (A,1), (A,2), (B,1), (B,2)

Using the Noise Figure Application

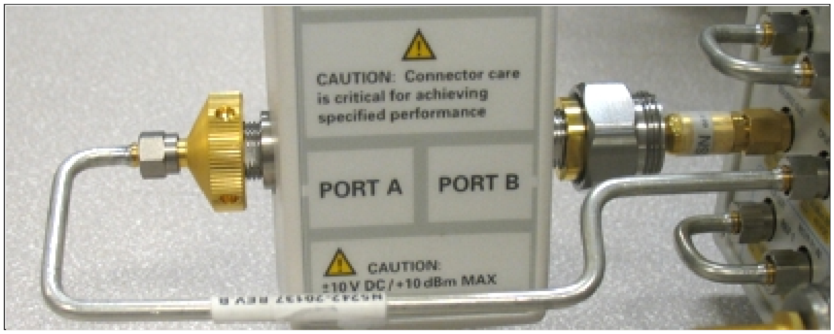
Use the following general procedure to make measurement with the Noise Figure App:

1. Connect Tuner and Noise Source.
2. Create a Noise Figure Measurement.
3. Make Noise Figure Settings.
4. Perform Calibration First copy your Noise source ENR file to the PNA.
5. Connect the DUT:
    - DUT Input to PNA port 1.
    - DUT Output to PNA port 2. For highest Noise Figure accuracy, there should be the least amount of electrical loss possible between the DUT output and the PNA Port 2.
6. Measure Noise Figure.
7. **Optional** Click File, then Save to save Noise Figure data in the following formats: (available ONLY when NF correction is ON.)
    - ***.CTI** Citifile
    - ***.PRN**
    - ***.nco** Noise Correlation Matrix data in S2P format. Learn more about this data.

See Also: Measurement Tips

Connect Noise Tuner and Noise Source

1. Connect the **noise source** to the 28V connector on the PNA-X rear panel. The Noise Source is turned ON and OFF automatically as needed during a calibration. Connect the noise tuner to Port 2 reference place when prompted during calibration.
2. Connect the **noise tuner** (ECal module)   On the PNA front panel, remove the **Port 1** jumper cable SOURCE OUT / CPLR THRU. Connect tuner using the cable (N5242-20137) and adapter (85082-60013) supplied with Opt 029.



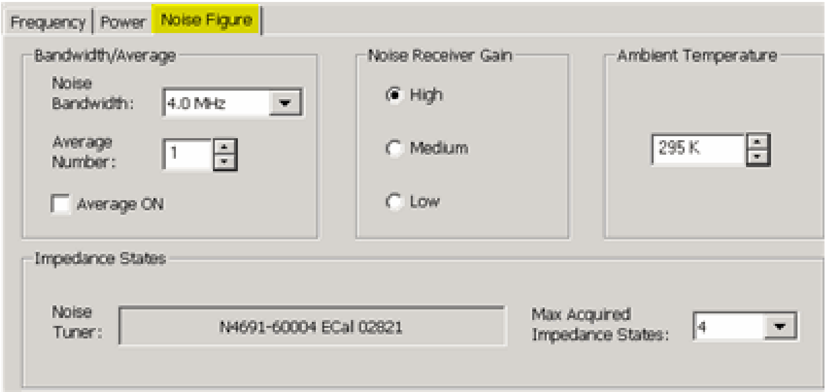
Create a Noise Figure Measurement

1. On the PNA-X front panel, press **Meas,** then **[Measurement Class]**
2. Select **Noise Figure Cold Source,** then either:
   - **OK** delete the existing measurement, or
   - **New Channel** to create the measurement in a new channel.
3. A Noise Figure measurement is displayed. To select additional parameters to display, click **Response**, then **Measure**, then select a parameter from the list.

How to start the Noise Figure Setup dialog

To provide quicker access, use the Setup softkey. Learn how.

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For PNA-X and 'C' models	Programming Commands
1. Press **FREQ** 2. then **[Noise Figure Setup]**	1. Click **Response** 2. then **Measure** 3. then **Noise Setup**



Noise Figure Setup dialog box help

Note: In this topic, the term **Jitter** is used to describe the trace-to-trace fluctuations in a measurement. In other topics, this is called 'trace noise'.

Bandwidth/Average

The following two settings work together to achieve the optimum balance of measurement accuracy versus speed. Both settings can be changed after calibration to make faster measurements with minimal effect on calibration accuracy.

Noise Bandwidth Increase the bandwidth to make faster measurements. However, a wider setting reduces the frequency resolution of the measurement. More frequencies are essentially smoothed together to produce a flatter response, which could hide the actual noise performance of the DUT.

Noise Averaging Factor Increase the number of averages to reduce jitter. This also increases measurement speed. For maximum accuracy, increase the averaging factor for the noise calibration. It can then be reduced to improve measurement speed.

Noise Receiver Gain

With knowledge of your DUT gain, set the appropriate amount of receiver gain in order to optimize the power level at the noise receiver.

The following values reflect the SUM of the DUT gain (dB) **PLUS** NF (dB). For example: DUT gain = 20 dB; NF = 10 dB; SUM = 30 dB.

- Select **High** if the SUM is relatively low (<30 dB).
- Select **Medium** if the SUM is about average (20 dB to 45 dB).
- Select **Low** if the SUM is relatively high (>35 dB).

There is considerable overlap in these settings. Because all three gain settings are calibrated with each Noise Calibration, this setting can be changed after calibration to achieve the least amount of jitter without overpowering the noise receiver.

When too much power is detected at the noise receiver, a warning message appears, and the next lower gain setting is automatically selected.

Only ONE gain setting can be used for the entire frequency range of your noise measurement. Therefore, it may be necessary to use two noise channels with different frequency ranges and gain settings to achieve the very highest noise figure accuracy.

Ambient Temperature

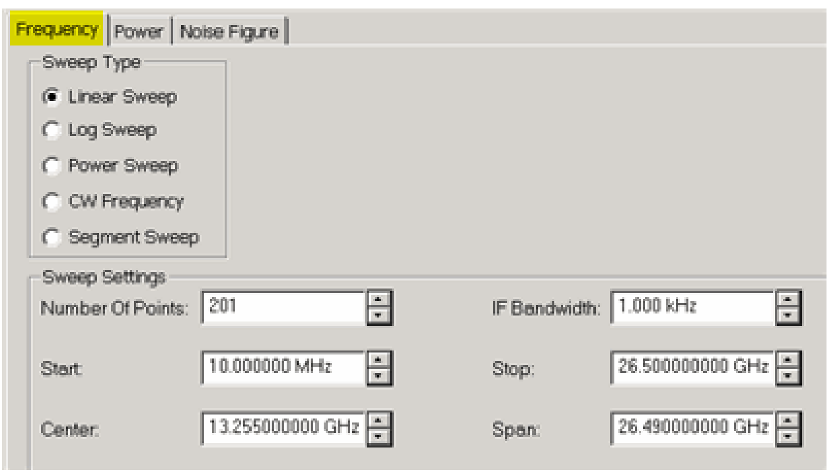
Enter the room temperature at the time of the measurement, in Kelvin. For best results, use a thermometer to read the temperature at the PNA test port 1 or the DUT input cable.

This ambient temperature number has an inverse relationship to the noise figure. When using the effective noise temperature (Te) format, a 3 degree increase in the ambient temperature will make the overall measurement result drop 3 degrees.

Impedance States

Noise Tuner Displays the ECal module to be used as a noise tuner. Select the Noise Tuner during calibration on the Select Cal Method dialog.

Max Acquired Impedance States Select the number of impedance states in which to make noise measurements. At least FOUR impedance states are required. Learn more



Frequency Tab - Noise Figure dialog box help

These settings can also be made from the normal PNA setting locations. Click links below to learn how.

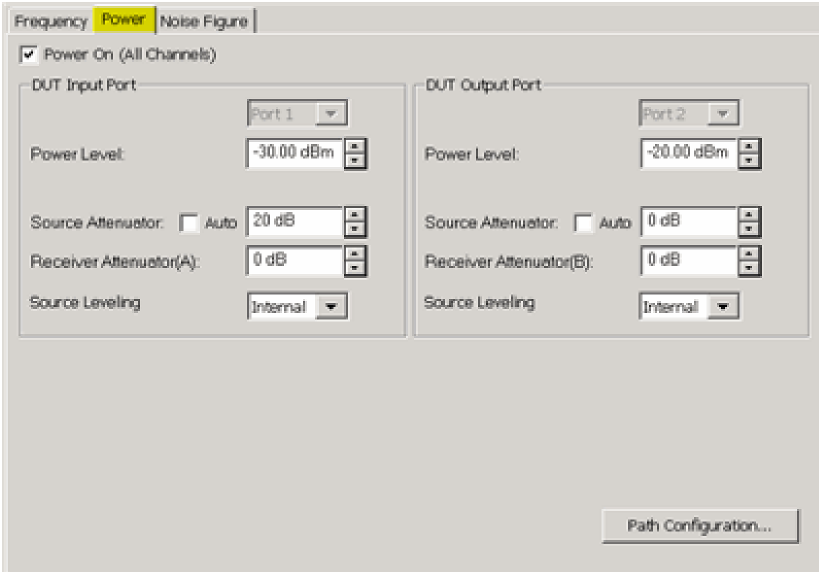
Sweep Type

Choose a sweep type. Learn more.

Sweep Settings

Click each to learn more about these settings.

- **Number of points**
- **IF Bandwidth** For standard PNA receiver measurements. This setting is important for improving noise measurement accuracy. Learn more.
- **Start / Stop**, **Center / Span** frequencies.



Power Tab - Noise Figure dialog box help

Note: S-parameter power settings are critical for accurate Noise Figure measurements. See Noise Figure Measurement Tips.

Configures RF power settings for the S-parameter measurements that occur before noise measurements. Input power to the DUT is turned OFF during noise measurements.

These settings can also be made from the normal Power setting locations.

Power ON (All channels) Check to turn RF Power ON for all channels.

DUT Input Port

PNA Port 1 is connected to the DUT Input. This can NOT be changed.

Note: Input power levels are critical for accurate Noise Figure measurements. Learn more.

Power Level The input power to the DUT during S-parameter measurements.

Source Attenuator Auto Check to automatically select the correct attenuation to achieve the specified input power. Clear, then select attenuator setting that is used achieve the specified Power Level. Learn more about Source Attenuation.

All PNA channels in continuous sweep must have the same attenuation value. Learn more.

Receiver Attenuator Specifies the receiver attenuator setting for port 1.

Source Leveling Specifies the leveling mode. Choose Internal. Open Loop should only be used when doing Wide Band Pulse measurements (not available with Noise figure measurements).

DUT Output Port

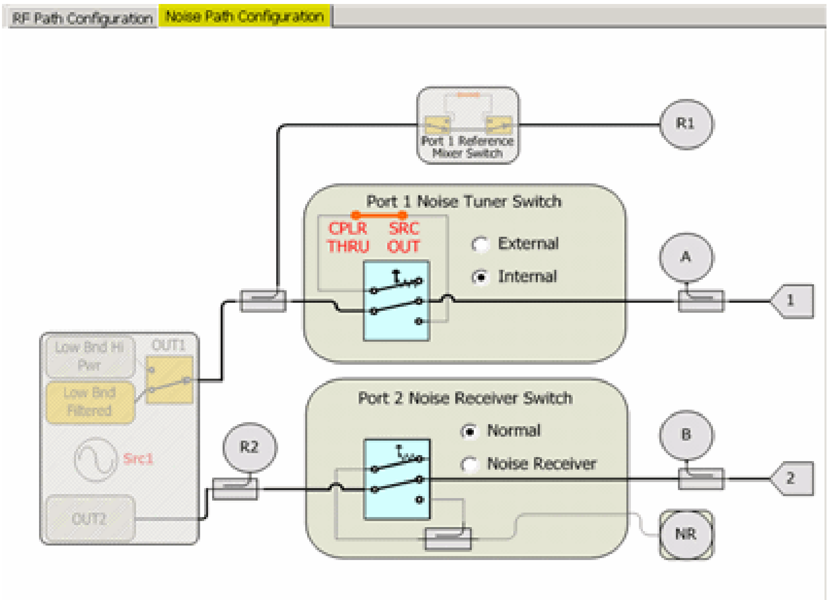
PNA Port 2 is connected to the DUT Output. This can NOT be changed.

Output Power Sets power level in to port 2 for reverse sweeps. Port power is automatically uncoupled. Reverse sweeps are always applied to the DUT when Full 2-port correction is applied. Enhanced Response Cal is NOT available for Noise Figure measurements.

Source Attenuator Specifies the source attenuator setting for reverse power.

Receiver Attenuator Specifies the receiver attenuator setting for port 2. Learn more about Receiver Attenuation.

Source Leveling Specifies the leveling mode. Choose Internal.



Noise Path Configurator dialog box help

Port 1 Noise Tuner Switch The orange line between CPLR THRU and SRC OUT represents the Noise Tuner. The **External** setting switches IN the Noise Tuner when making noise measurements.

Port 2 Noise Receiver Switch allows you to make Noise Receiver measurements.

To prevent premature wear on the above two Noise switches, the PNA does not allow these switches to be thrown when sweeping a Noise channel and non-Noise channel. To make Noise Figure measurements and non-Noise Figure measurements in different channels and continuously trigger both, set these switches to the same state as the Noise channel:

- With the **non-Noise Figure channel** active, go to Noise Path Configurator.
- Set Noise Tuner switch to **External.** This routes source power to the front-panel loops, and to the Noise Tuner when connected. Use CONT:ECAL:MOD:PATH:STATE to set the internal state of the Noise Tuner to THRU, which creates a small amount of additional loss in the source path.
- Set Noise Receiver Switch to **Noise Receiver**.

Noise Figure Measurement Tips

Note: In this topic, the term **Jitter** is used to describe the trace-to-trace fluctuations in a measurement. In other topics, this is called 'trace noise'.

Noise Figure measurements are extremely sensitive and vulnerable to small changes in temperature and the surrounding environment. Cell phone usage and other wireless devices can affect measurement results.

For highest Noise Figure measurement accuracy and stability, there should be the least amount of electrical loss possible between the DUT output and PNA Port 2.

S-Parameters

S-parameters are used to measure the gain of the DUT before each series of noise measurements. Jitter in the S-parameter measurements corresponds directly to jitter in the noise measurements.

In general, for best measurement accuracy, the power level at the B receiver (port 2) should be close to +10 dBm. Much below this level, measurements have more jitter. Above this level, the B receiver starts to compress, although there is no warning or annotation that shows this condition is occurring.

The best way to monitor power at the B receiver is to display a B,1 measurement. With your DUT in place and powered ON, change the input power to the device and note the power at the B receiver.

- For low-gain amplifiers, use 5 dB of source attenuation to improve the uncorrected match of port 1.
- For high-gain amplifiers, source and receiver attenuation may be required. Use the lowest possible attenuation values.

S-parameter Calibration

During a noise calibration, it is also important that the power level at the B receiver (port 2) be close to +10 dBm. However, this can be challenging since calibration is performed without the DUT in place. Because of this, it is often necessary to set source power higher during the calibration than during the measurement. This will cause the 'CΔ' annotation on the status bar. However, measurement results are accurate as long as the step attenuators and other configuration switches are in the same position and all receivers remain in their linear range (below +10 dBm).

It is best to find the optimum power and attenuation settings for both the calibration and subsequent noise measurements **before** performing a calibration.

IF Bandwidth

Jitter is further reduced by narrowing the IF bandwidth. If the calibration needs to be performed at a low source power, or with receiver attenuation due to high DUT gain, the IF bandwidth should be reduced during the calibration to reduce jitter. The IF bandwidth can then be increased to improve measurement speed. The CΔ annotation can be ignored when changing IFBW after calibration.

Noise Settings

See Noise Figure dialog box help for a complete description of these important settings.

Temperature

Noise Figure measurements are extremely sensitive to temperature. As such, there are two settings that require an accurate temperature measurement: At the DUT input, and at the Noise Source connector.

Radio-Frequency Electromagnetic Field Immunity

When a 3Vm-1 radio-frequency electromagnetic field is applied to an N5242A with Opt 029 according to IEC 61000-4-3:1995, degradation of performance may be observed. When the frequency of the incident field matches the frequency of a measured noise figure or gain, the values displayed will deviate from those expected. This phenomenon will only affect that specific frequency, and the analyzer will continue to perform to the specification at all other frequency sample points.

The N5242A with Opt 029 may be unable to calibrate a chosen frequency sample point if the frequency matches that of an incident electromagnetic field.

Last Modified:

29-Jun-2007 MX New topic

Narrowband Pulsed Application

The Narrowband Pulsed Application is a Visual Basic program that provides a user interface for making pulsed measurements.

Learn about the **New** Wideband Pulsed Application.

The following enhancements were made In PNA Rev. 7.2:

- Enhanced Pulse Measurement Capabilities
- Support for Internal Pulse Generators / Modulators (PNA-X only)

For more conceptual information see our Pulsed Measurement App Notes.

See **PNA-X** Block Diagram of IF Path / Pulse Generators / Source Modulation

Other IF Access Topics

Required Options and Equipment

The PNA H08 option provides the Narrowband Pulsed Application. The following options are also required. If your PNA does not have the required options, a message is displayed on the screen. For more information, see Pulsed-RF Measurements Configuration Guide

- E836x models: Opt 014 (front panel access) and Opt 080 (frequency offset). To use the internal receiver gating feature of the Narrowband Pulsed Application, your PNA must have the H11 hardware option.
- PNA-X models: None; however Opts 021. 022. and 025 greatly enhance speed, performance, and convenience.
- PNA-L models: HO8 NOT available

- Agilent 81104A or 81110A Pulse Generator with ONLY the 81105A or 81111A output modules. The 81112A module does NOT have selectable 50 ohm/1K ohm output impedance/load compensation to drive the 1K ohm PNA IF gates. For more information, see the 81100 Family of Pulse Pattern Generators Technical Specifications at: http://cp.literature.agilent.com/litweb/pdf/5980-1215E.pdf

Physical Connections

Each 81110A Pulse Generator has two output modules. Each output can drive a PNA IF Receiver or Source Modulation (Z5623A H81).

Connect the Pulse Generators as follows:

81110A front panel connectors

- Connect GPIB cables to the 81110As and PNA.
- Connect the PNA 10 MHz Ref Out to the 81110A 10 MHz IN.
- If using two 81110As for a total of 4 outputs, then connect the TRIGGER OUT of one to the EXT INPUT of the other 81110A.
- Connect the 81110A OUTPUTs to the PNA rear panel IF inputs to be gated. The outputs are mapped in the Pulsed Generator Configuration dialog box.

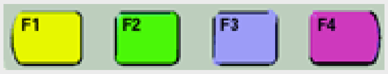
Connect the Z5623A H81Pulse Test Set (optional) to the PNA front-panel port 1 loops as follows:

PNA	H81
Src Out	Source IN
CPLR THRU	CPLR THRU
RCVR R1 IN	RCVR R1 Out

See Also

- PNA Front-panel loops
- PNA-X rear-panel
- PNA IF connectors
- 81110A Documentation
- Z5623A H81 Documentation

Using the Narrowband Pulsed Application

How to start the Narrowband Pulsed Application	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For PNA-L and E836x models	Programming Commands
1. Press  until **Pulse** is visible 2. then 	1. Click **System** 2. then **Macro** 3. then **Pulse**
For PNA-X	Programming Commands
1. Press **SYSTEM** 2. then **[Macro]** 3. then **[Pulse]**	1. Click **Utility** 2. then **System** 3. then **Macro** 4. then **Pulse**

See Also

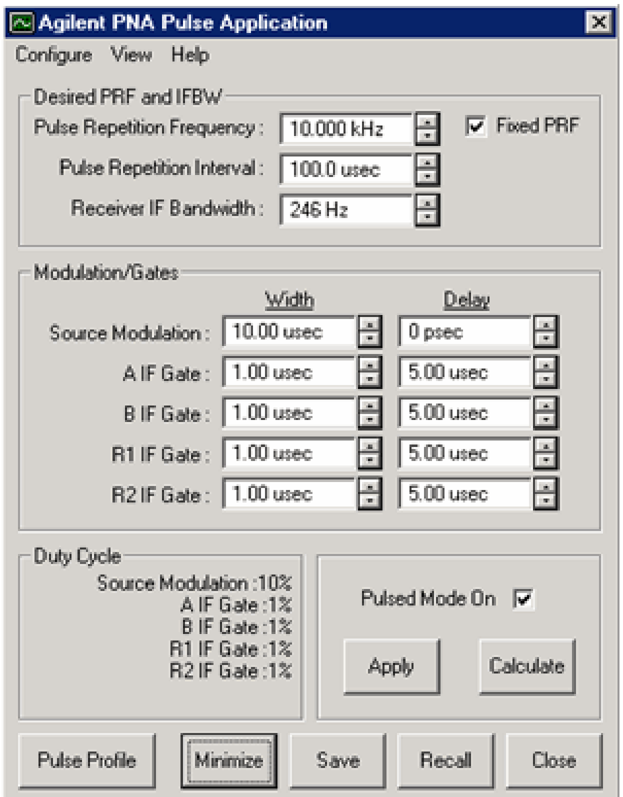
See programming commands to launch the Macro remotely.

See how to write your own custom Narrowband Pulsed Application.

Keypad Data Entry

The PNA front-panel Numeric Entry and Navigation keys can be used for dialog box input. Also, a keyboard can be used to enter values, including alpha characters for prefixes (for example, **u** for usec.) . After typing values, first press **Enter**, then press **Tab** to go to the next field.

The following is an image of the main dialog box:



Pulsed Application Main dialog box help

Note: An **error message** may appear on the PNA stating that the response frequency has exceeded the maximum allowed frequency.

The Narrowband Pulsed Application may set the offset frequency (option 080) of the PNA to some value other than zero (the default value). If the stop frequency is set to the maximum of the PNA model, then the error message will appear.

To fix this, set the stop frequency to a value that is at least 2 KHz less than the maximum allowed. For example, if you have a 20 GHz PNA, and the stop frequency is set to 20 GHz, and the error message appears, then set the stop frequency to 19.999998 GHz

See Block Diagram of IF Path / Pulse Generators / Source Modulation

Configure

You can configure more than one channel to make pulsed measurements, but the channels must use the same pulse generator settings.

Only the Agilent 81110A Pulse Generator is supported with the Narrowband Pulsed Application. Refer to the 81110A documentation for pulse repetition frequency and duty cycle capabilities.

See also:

Configure Receivers

Converter Measurements

Edit / Undo Pulse Application settings revert to those when Apply was last pressed.

Desired PRF and IFBW Enter the DESIRED values. When **Calculate** is pressed, one or both of these values may change.

Pulse Repetition Frequency (PRF): Frequency of the pulses from the Pulse Generator.

Pulse Repetition Interval: 1/ PRF Changes to either PRF or this setting changes both.

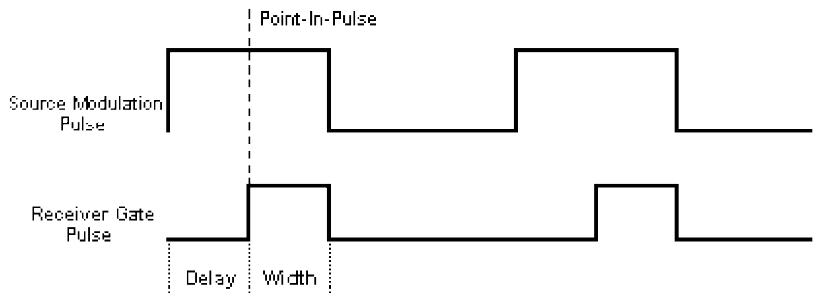
Receiver IF Bandwidth: IF Bandwidth of the PNA. Choose a setting from 1 Hz to 10 KHz.

Fixed PRF When checked, (default setting) the **Calculate** algorithm will NOT adjust the PRF, but only change the IF Bandwidth.

Modulation/Gates The Source Modulation and four PNA receiver gates can each have their own, or share, Pulse Generator outputs. Shared outputs have identical Width and Delay values. To configure and enable outputs, click **Configure**, then **Pulse Generators** to launch the Pulsed Generator Configuration dialog box.

Width Pulse Width.

Delay The delay that occurs before the pulse.



Duty Cycle Calculated Duty Cycle of the source and each of the selected receivers. Updated when **Calculate** is pressed.

Pulse Mode On When this box is checked, the PNA is enabled for Pulsed measurements. The PNA Status Bar annotation indicates the following:

- **G** Internal IF gates enabled.
- **F** Filtering for Pulsed Measurements enabled.

Apply All selections are sent to the pulse generator and the active channel of the PNA.

Calculate All selections are calculated and valid PRF and IFBW values are entered in their fields. If these settings are not acceptable, try changing the values you previously entered and click Calculate again. When acceptable values are attained, click **Apply** to send these values to the pulse generator and PNA.

Pulse Profile Launches the Pulse Profile dialog box. Same as clicking **View / Pulse Profile.** If not available, check **Pulse Mode ON**, click **Calculate**, then **Apply**.

Minimize Click to minimize the dialog box to make changes in the PNA application. To see the dialog again, select **Macro, Pulse**, or turn the Status Bar ON.

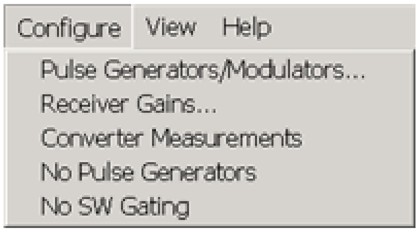
Save All settings from the Narrowband Pulsed Application are saved in a *.ppf file. These settings are NOT saved with PNA instrument state.

Recall Restore settings from the specified *.ppf file that were previously saved.

Close Closes the dialog box without saving changes.

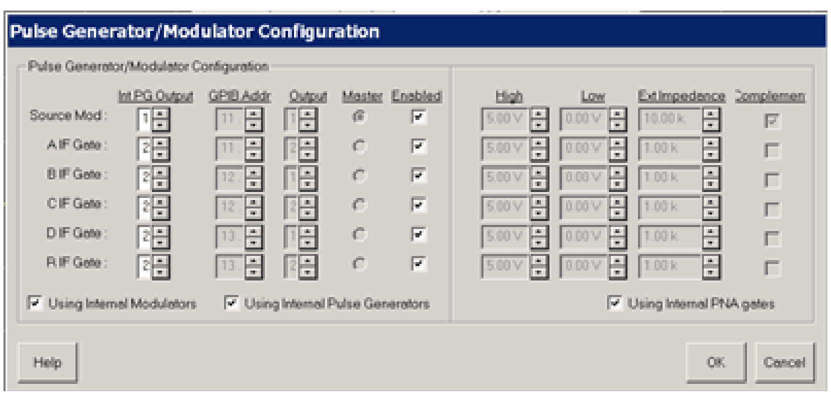
How to configure Pulse Generators / Modulators and Receivers

From the Pulse App main dialog box



Learn about...

- Configure Receiver Gain
- Converter Measurements
- **No Pulse Generators** When checked, the Narrowband Pulsed Application does NOT attempt to communicate with internal or external pulse generators. This setting is used for troubleshooting purposes.
- **No SW Gating** When checked, the improved SW gating sensitivity is turned OFF. This setting is used for troubleshooting purposes.



Pulsed Generator Configuration dialog box help

See Block Diagram of IF Path / Pulse Generators / Source Modulation

This dialog may look different depending on the PNA model and number of receivers available.

Configures either the internal pulse generators (PNA-X models with relevant options), or Agilent 81110A Pulse Generator outputs. You can configure each 81110A Pulse Generator with either one or two 81111A output modules.

The Source Mod and four PNA receiver gates can each have their own, or shared, pulsed generators allowing identical **Width** and **Delay** values which are selected on the Main dialog.

To share an external generator output between one or more PNA inputs, use the same GPIB address and output module for each PNA input.

Internal Pulse Gen Output (available ONLY on the PNA-X opt 025)

Specify the Pulse Gen (1 through 4) to use to modulate each of the PNA receiver IF gates or Sources.

External Pulse Generator settings

GPIB Addr: The GPIB address of the 81110A.

Output: The output module of the 81110A.

Master: The 81110A that uses the 10 MHz reference signal from the PNA.

Enabled: Turns the pulse output ON.

External Gate/Modulator settings

High: Specify a 'TTL-High' voltage level

Low: Specify a 'TTL-Low' voltage level

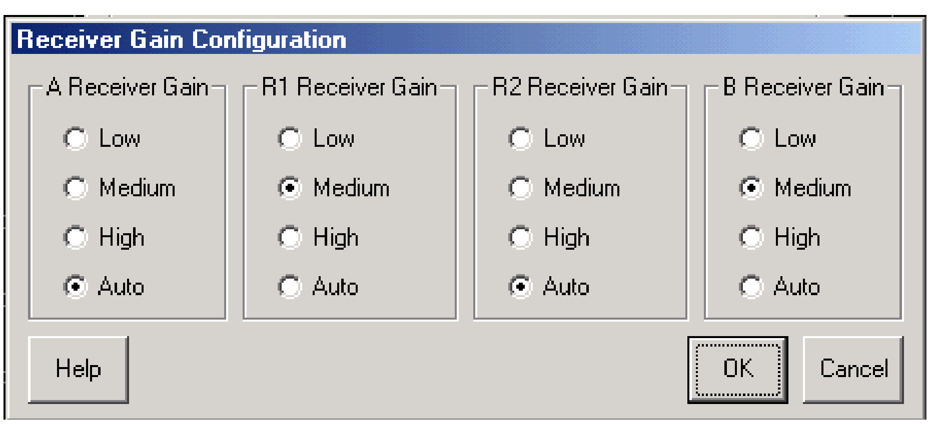
Ext Impedance: Impedance of the modulator used to create the pulse.

Complement: When this box is cleared, TTL HIGH is the pulse. When checked, TTL LOW is the pulse.

Using Internal Modulators When this box is checked, the voltage, impedance, and complement values are forced to settings that prevent damage to the internal modulator.

Using Internal Pulse Generators Makes the appropriate settings on this dialog available.

Using Internal PNA gates When this box is checked, the voltage, impedance, and complement values are forced to settings that prevent damage to the internal gates.



Receiver Gain Configuration dialog box help
See Block Diagram of IF Path / Pulse Generators / Source Modulation This dialog may look different depending on the PNA model and number of receivers available. Sets the gain of each PNA receiver manually or automatically. **Auto** - The PNA selects the best gain level to make pulsed measurements. Use the following to manually set the gain for each receiver. **Low -** about 0 dB of gain **Medium -** about 17 dB of gain **High** - about 24 dB of gain The **PNA-X** has the following attenuation settings: **Low** - 30 dB of attenuation **Medium** - 15 dB of attenuation **Hi** - 0 dB of attenuation

Calibration in Pulse Mode

To perform a calibration in pulse mode (option H08), first configure and apply the pulse parameters (PRF, Pulse Width, Delays, IF gating, and so forth) **before** calibrating the system. This will ensure the PNA is configured properly during the calibration and measurement.

When performing Unknown Thru or TRL calibrations, ALL receivers must be gated. Otherwise, the error terms will not be correct after the calibration has completed. This can be accomplished by either having a separate pulse generator output for each of the IF gates, or by connecting pairs of the IF gates together with BNC-T's. For example, if the pulse generator does not have enough outputs, then connect the R1 and R2 IF gates to the same pulse generator output. Also, connect the A and B IF gates to either separate outputs (recommended) or one output (reduces flexibility). The error terms will then be valid after the calibration is complete.

Pulse Profiling

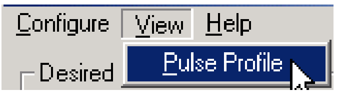
Pulse profiling provides a time domain view of the pulse envelope. Profiling is performed using a measurement technique that "walks" a narrow receiver "snapshot" across the width of the pulse. This is analogous to using a camera to take many small snapshots of a wide image, then piecing them together to form a single, panoramic view.

- Pulse Profiling can be performed using ratioed or unratioed measurements.
- Pulse Profiling is performed at a single CW frequency.

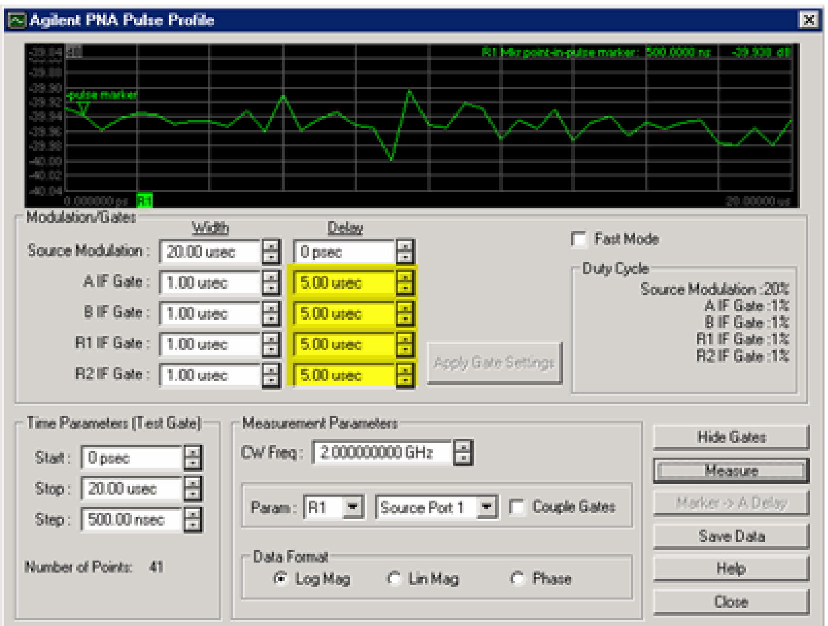
How to perform Pulse Profiling

From the Pulse App main dialog box,

Click the **Pulse Profile** button. or:



If this setting is unavailable, check **Pulse Mode ON**, click **Calculate**, then **Apply**.



Pulse Profile dialog box help

Learn about Pulse Profiling (scroll up)

See Block Diagram of IF Path / Pulse Generators / Source Modulation

Modulation / Gates

These setting duplicate those found on the main Pulse App dialog box.

In Pulse Profile, the Gate Delay settings (highlighted in yellow) are significant only with certain **Measurement Parameter** and **Couple Gates** settings.

Time Parameters

Start, Stop These two combine to make the window of the assembled pulse profile. To view the entire pulse, the start and stop values must be at least as wide as the Source Modulation **Width** plus **Delay** value.

Step Each consecutive snapshot is incremented by this value until the stop value is reached. Therefore, the number of points for the pulse profile measurement can be calculated as: (Stop - Start) / Step. The higher the number of points, the longer it takes to make the measurement.

Measurement Parameter

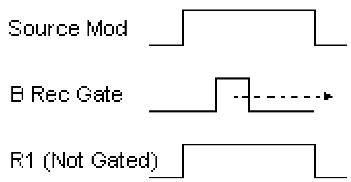
CW Freq. Frequency of the PNA source.

Source Port The PNA port supplying the source power. Only required for single receiver (unratioed) measurements.

Param(eter) Only those receiver gates (and relevant measurements) that are configured in Pulsed Generator Configuration are available.

Note: When a single receiver (unratioed) is selected, **Gate Delay** Settings (highlighted in yellow on above dialog image) are ignored.

If the reference receiver gate is NOT configured, the average of the Source Modulation pulse is used as the reference. **For example:** With **S21** Selected, but ONLY **B** receiver gate is configured, then...



B Gate is walked across the Source Modulation pulse.

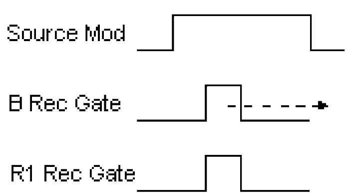
Source Modulation pulse average is used as reference (not gated).

Coupled Gates Used when the appropriate receiver gates are configured for your **S-parameter** measurement ONLY. This setting is ignored when a single receiver (**Param)** is selected.

- **Uncoupled** (box cleared) The reference gate is FIXED at the delay setting as the test gate is walked across the Source Modulation pulse as dictated by the **Time Parameter** settings.

  For example:

  S21 Selected, **B** and **R1** receiver gates configured, Gates **Uncoupled**

  B Gate is walked across the Source Modulation pulse.

  R1 gate is fixed at pulse width and delay setting.

- **Coupled** (box checked) The reference gate is walked synchronously with the test gate as dictated by the **Time Parameter** settings. Only the **difference** between the test and reference gate delay values is significant; NOT the absolute values.

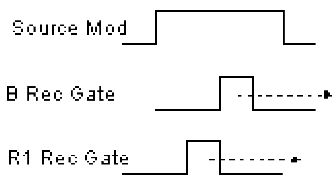
For example:

S21 Selected, **B** and **R1** receiver gates configured, Gates **Coupled**

B gate delay = 3 microseconds,

R1 gate delay = 2 microseconds

Difference = 1 microsecond



B Gate is walked across the Source Modulation pulse.

R1 gate is fixed at pulse width and delay setting.

B gate leads R1 gate by 1 microsecond.

Data Format Log Magnitude, Linear Magnitude, or Phase (only available if S-parameter selected).

Buttons

Show Gates Allows you do change the receiver gating width and delay while looking at the results.

Apply Gate Settings Click after making changes to gate settings.

Continuous Sweep Check, then click **Measure**, to continuously measure pulse profiling.

Measure Click to start the pulse profile measurement. Becomes **Stop** when continuously sweeping.

Marker to Delay After making a measurement, you can drag the display maker to any point along the trace. Click this button and the marker time is entered into the Receiver **Delay** field on the main dialog box.

Save Data Saves time domain data to the PNA hard drive in any of the following formats:

- Touchstone (*.s1p)
- Comma delimited (*.prn)
- Citifile (*.cti)

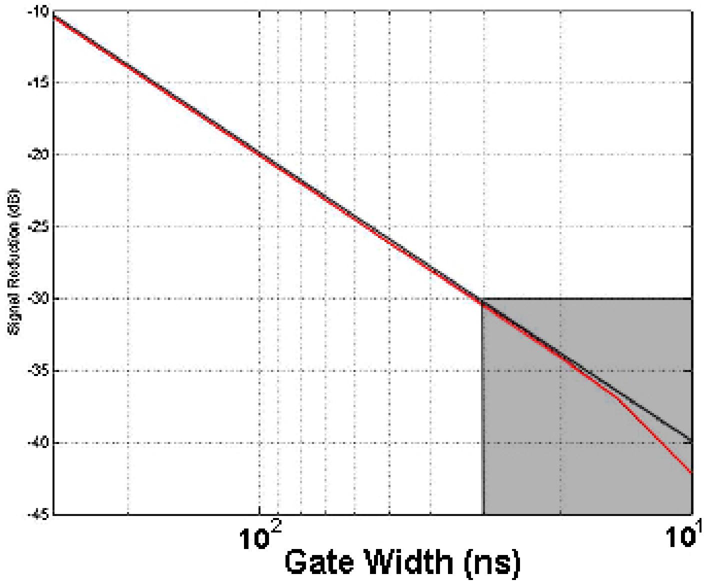
Learn more about these data formats

Signal Reduction versus Gate Width

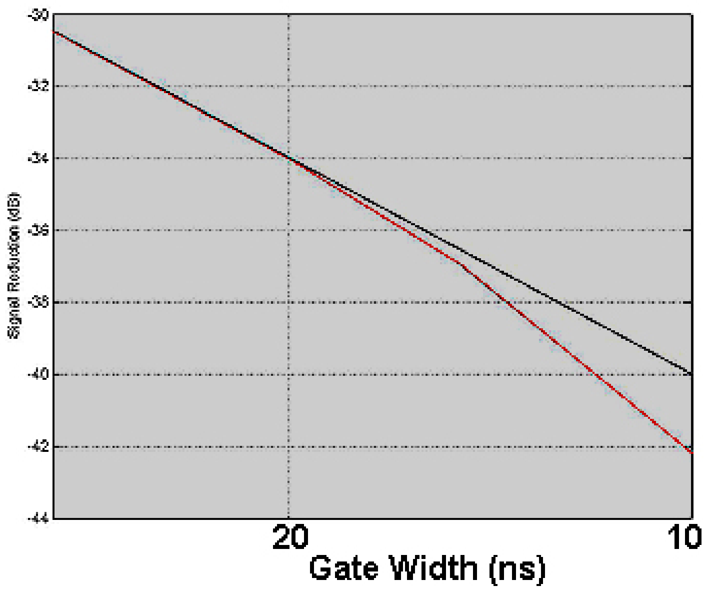
Signal Reduction versus Gate Width

PRF = 1 MHz

The following two figures show the performance of the internal IF gates as the width is narrowed.



The following is a zoomed image of the shaded area (above).



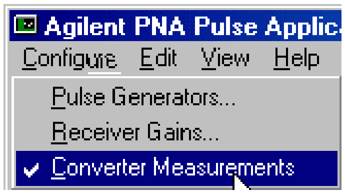
- The straight line shows the theoretical loss in dynamic range due to duty cycle effects when using narrowband detection.
- The curved (red) line shows the actual measured performance of the gates.
- The minimum gate width for <1dB deviation from theoretical is approximately 20ns.

See the specifications for the option H11 and option H08.

Pulsed Frequency Converter Measurements

The Narrowband Pulsed Application works with both FCA (option 083) and standard Frequency Offset (opt 080) measurements. On the **Configure** menu, check **Converter Measurements**. When checked, this setting prevents the Narrowband Pulsed Application from overwriting frequency offset values. This may limit the number of **PRF** and **IFBW** solutions that are returned when **Calculate** is pressed on the main Pulsed Application dialog box.

Note: Pulse Profiling can NOT be performed with frequency converter measurements.



Writing your own Narrowband Pulsed Application

You can use the Narrowband Pulsed Application or use an example program as a template for making your own Narrowband Pulsed Application.

The Narrowband Pulsed Application uses a custom .dll to perform the calculations that are necessary to make pulsed measurements. Use the COM Method below to send and return values to **agilentpnapulsed.dll.** Then use SCPI or COM commands to control the PNA.

	E836x	PNA-X
Example Program	E836x Create	PNA-X Create
COM Methods	ConfigNarrowBand3	ConfigEnhancedNB2 ConfigEnhancedNBIFAtten
SCPI commands	SCPI	SCPI
COM commands	COM	COM

Install and Register the Pulsed .dll on your PC

To create your own Narrowband Pulsed Application, or run the Narrowband Pulsed Application from a remote PC, you must do the following:

1. Copy the following files from the PNA C:\program files\agilent\network analyzer\ to a directory on your PC.
    - **agilentpnapulsed.dll**
    - **OffsetList.txt**
    - **prfbw.txt**
    - **prfbwmixer.txt**
2. To register the ActiveX DLL in Microsoft Windows Operating System:

- From a command prompt on your PC, navigate to the directory where you copied the DLL.
- Type: **regsvr32 agilentpnapulsed.dll** and press **Enter**

For Operating Systems other than Windows, see their associated help files to learn how to register DLL files.

Last Modified:

20-Feb-2008	Added physical connections
6-Nov-2007	Edited Ext Impedance
22-Jun-2007	converted to NB pulsed
122-Jun-2007	Updated for MX

Wideband Pulsed Application

The Wideband Pulsed Application configures the PNA-X internal pulse generators and modulators for measuring pulsed S-parameters using the wideband mode detection technique.

The Wideband Pulse Application is designed to be used with the PNA-X with Opts 021, 022, and 025.

Note: Wideband Pulse application is NOT supported on the E836x and PNA-L models.

See Also

- To learn more about wideband detection, see Application Note 1408-12.
- See a Visual Basic example: Create a Wideband Pulsed Measurement using the PNA-X
- Learn about the Narrowband Pulsed Application.

Download and Install the Wideband Pulsed Application

This application is installed and run as a macro on the PNA-X. Learn more about macros.

1. Go to http://na.tm.agilent.com/pna/apps/applications.htm
2. Click the download link
3. Save the downloaded file to the PNA hard drive
4. Double-click the downloaded file to install the Wideband Pulsed Application on the PNA.
5. Configure the macro. Learn how. The application is installed at C:\Program Files\Agilent\Network Analyzer\Applications\WB Pulse\Wideband_pulse.exe

To learn more about Wideband pulsed application, click Help in the application.

Last Modified:

22-Jun-2007 MX New topic

Frequency Offset Mode

Frequency Offset Mode (FOM) provides the capability to have the PNA Sources tune to frequencies that are different (offset) from the PNA Receivers.

PNA Option 080 provides you with the hardware and basic software capability to make Frequency Offset Measurements. This topic discusses the PNA settings that are relevant to making these types of measurements. See Frequency Converting Device Measurements for more information on making specific device measurements.

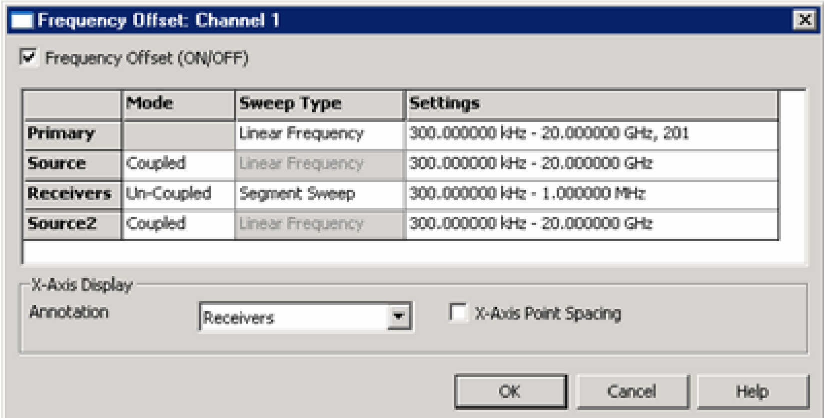
Note: The Frequency Converter Application Option 083 simplifies the task of making extremely accurate frequency offset measurements on MOST frequency converting devices.

- **Frequency Offset Dialog Box**
- **Setup Examples**
- **Test Set (Reference Switch) Dialog Box**

Other Frequency Offset topics

How to make Frequency Offset settings

Using front-panel HARDKEY **[softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Channel** 2. then **Frequency Offset**
For PNA-X and 'C' models	Programming Commands
1. Press **STIMULUS** 2. then **[Frequency Offset]**	1. Click Stimulus 2. then **Frequency** 3. then **Frequency Offset**



Frequency Offset dialog box help

The following are major changes to FOM:

- Stimulus and Response are now called Sources and Receivers.
- Sources and Receivers settings can be made in two ways:

    1. By **Coupling** to the Primary (Channel) settings. This is the only method used in previous releases.
    2. By **Uncoupling** and setting Sources and Receivers values independently. This is the new, simplified method.

- External sources can be controlled form this dialog. Learn more.

Note: Source2 supplies power for ports 3 and 4. **Turn Source2 power ON** using the Power and Attenuators dialog. This (Frequency Offset) is the only dialog for controlling the frequency of Source 2. Learn more about Source2.

Frequency Offset (ON/OFF) Enables Frequency Offset Mode on ALL measurements that are present in the active channel.

When FOM is NOT enabled, all frequencies are the same as the active channel.

Tip: First make other settings on this dialog box, then click **Frequency Offset** ON.

Primary The current Active Channel settings. When a Source or Receiver is coupled to the Primary settings, its Sweep Type is the same as that of the Primary. The frequency settings of the coupled range are mathematically derived from the Primary settings using the Multiplier, Divisor, and Offset values. With this approach, only the Primary settings need to be changed in order to affect change in the coupled Sources and Receivers. Changes to the Primary channel settings occur when Frequency Offset is checked ON. See example using Primary and Coupled setting.

Tip: Primary settings are ONLY used when Sources and Receivers are Coupled. It is often easier to Uncouple, then set Sources and Receivers independently.

Source and Source2 if available. Learn more about Internal Second Source.

Receivers All receivers that are used in the channel, including Reference receivers, are tuned to the specified frequency settings.

Mode

Coupled Source and Receiver settings are mathematically derived from the Primary settings using Multiplier, Divisor, and Offset values. Learn more.

Uncoupled Source and Receiver settings are entered independently, without reference to Primary settings. When Uncoupled, Source and Receiver Ranges can use separate sweep types.

Sweep Type Click to change the type of sweep for each range. Only available for Primary and Uncoupled Sources and Receivers.

Unsupported Sweep Type combinations

- Power Sweep and Segment Sweep can NOT be used together.
- Uncoupled Log Sweep yields **invalid data** whenever the sources are offset from the receivers.
- Coupled Log Sweep is allowed only for the following two conditions:

    1. The offset = 0, the multiplier = 1, and the divisor = 1.
    2. The multiplier = 0

Settings To change settings, click **IN** the appropriate Settings cell, then click **Edit**.

- If coupled, invokes the Coupled dialog.
- If uncoupled or Primary invokes the Uncoupled settings dialog.

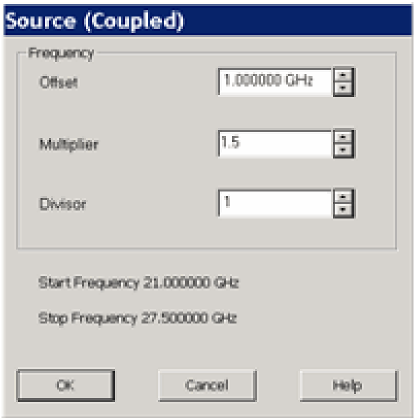
X-Axis Select the settings to be displayed on the X-Axis.

X-Axis Point Spacing Only available when a Segment Sweep Type is selected as the X-Axis display. Learn more.

Note: When Frequency Offset is enabled, ALL receivers on the channel, including the reference receivers, tune to the new offset frequencies, Therefore the source and reference receiver will be at different frequencies. Therefore, FOM measurements that include a reference receiver, which includes all S-parameters, display invalid data.

To measure and display measurements at both the source and receiver frequencies, you must use two channels. Use Equation Editor to calculate the conversion loss. See a calibrated FOM conversion loss example.

Learn how to calibrate frequency offset measurements.



Coupled settings dialog box help

Coupled Formulas:

Range Start = [Primary Start x (Multiplier / Divisor)] + Offset

Range Stop = [Primary Stop x (Multiplier / Divisor)] + Offset

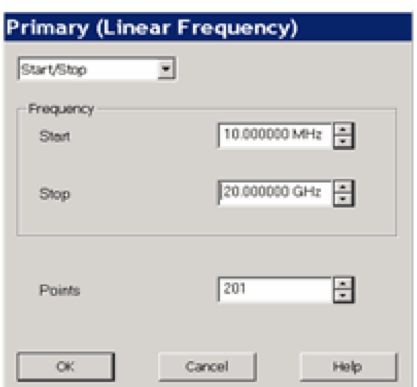
Where:

Offset Specifies an absolute offset frequency in Hz. For mixer measurements, this would be the LO frequency. Range is +/- 1000 GHz. Offsets can be positive or negative.

Multiplier Specifies (along with the divisor) the value to multiply by the stimulus. Range is +/- 1000.

- Negative multipliers cause the stimulus to sweep in decreasing direction. For downconverter mixer measurements, this would be for setups requiring the Input frequency to be less than LO frequency. See an example.
- 0 (zero) as the multiplier nulls the Primary setting. Then the Offset value adds to zero.

Divisor Specifies (along with the multiplier) the value to multiply the stimulus. Range is 1 to 1000.



Primary and Uncoupled settings dialog box help

This dialog will vary depending on the sweep type:

Linear and Log frequency

Uncoupled Log sweep yields **invalid data** whenever the sources are offset from the receivers.

Select Start/Stop or Center/Span

Frequency Enter values

Points (Primary only) Enter number of data points for the sweep.

Power

CW Freq Enter frequency in Hz.

Points (Primary only) Enter number of data points for the power sweep.

CW Time

CW Freq Enter frequency in Hz.

Sweep Time Enter time to complete one sweep. Enter 0 for the fastest sweep.

Segment Sweep Edits are made exactly like the standard segment table.

For Advanced Users: Uncoupled Segment Sweep offers great flexibility in configuring measurements. In segment sweep mode:

- The **OK** button is NOT available until the total number of data points for all segments matches the number of Primary data points.
- Independent IF Bandwidth and Independent Sweep Time are available ONLY on the Primary (channel) and the Uncoupled **Receivers** - NOT Sources.
- Independent Power is available ONLY on the Primary (channel) and the Uncoupled **Sources** - NOT Receivers.

Setup Examples

Although the Frequency Offset settings can be used with many types of devices, these examples include mixer terminology.

See a Mixer Compression and Phase (AM-PM) Measurement using FOM.

See a calibrated FOM conversion loss example.

1. Fixed LO - Upconverter

- **Swept Stimulus (Mixer Input):** 1000 MHz - 1200 MHz
- **Fixed LO**: 1500

- **Swept Response (Mixer Output):** 2500 MHz to 2700 MHz

Make the following settings on the FOM dialog

Source: Uncoupled

Sweep Type: Linear

Click Settings, then Edit. In the Source dialog:

Start Frequency = 1000 MHz

Stop Frequency = 1200 MHz

Receiver: Uncoupled

Sweep Type: Linear

Click Settings, then Edit. In the Receiver dialog:

Start Frequency = 2500 MHz

Stop Frequency = 2700 MHz

LO Settings

Set external source to CW - 1500 MHz.

Source2: Uncoupled (Only with Second PNA Internal Source)

Sweep Type: CW Time

Click Settings, then Edit. In the Source2 dialog:

CW Frequency = 1500 MHz

---

2. Fixed LO - Downconverter (Input < LO)

- **Swept DECREASING Stimulus (Mixer Input):** 1100 MHz to 1000 MHz
- **Fixed LO**: 2500 MHz
- **Swept INCREASING Response (Mixer Output)** 1400 MHz to 1500 MHz

Make the following settings on the FOM dialog

Primary: Not used

Source (Input): Uncoupled

Sweep Type: Linear

Click Settings, then Edit. In the Source dialog:

Start Frequency = 1100 MHz

Stop Frequency = 1000 MHz

Receiver (Output)**:** Uncoupled

Sweep Type: Linear

Click Settings, then Edit. In the Receiver dialog:

Start Frequency = 1400 MHz

Stop Frequency = 1500 MHz

LO Settings

Set external source to CW - 2500 MHz.

Source2: Uncoupled (Only with Second PNA Internal Source)

Sweep Type: CW Time

Click Settings, then Edit. In the Source2 dialog:

CW Frequency = 2500 MHz

---

3. Swept LO - Fixed Output - Upconverter

Swept External LO measurements in Frequency Offset Mode can be very difficult. The external LO source must be synchronized with the swept output or input (as in this case). See Synchronizing and External Source Control to see how this is done. The Frequency Converter Application Opt 083 performs makes these measurements easily.

- **Swept Stimulus (Mixer Input):** 1000 MHz to 1100 MHz
- **Swept LO**: 1500 MHz to 1400 MHz
- **Fixed Response (Mixer Output):** 2500 MHz

Make the following settings on the FOM dialog

Source: Uncoupled

Sweep Type: Linear

Click Settings, then Edit. In the Source dialog:

Start Frequency = 1000 MHz

Stop Frequency = 1100 MHz

Receiver: Uncoupled

Sweep Type: CW Time

Click Settings, then Edit. In the Receiver dialog:

CW Frequency = 2500 MHz

LO Settings

- If using external source, set to sweep from 1500 - 1400 MHz.
- If using **Source2** (Second Internal Source):set to Uncoupled, then:

Sweep Type: Linear

Click Settings, then Edit. In the Source2 dialog:

Start Frequency = 1500 MHz

Stop Frequency = 1400 MHz

---

4. **Power Sweep for Mixers**

To measure the gain compression of a mixer, the input power to the mixer is swept. The input and output frequencies are fixed but offset from one another.

This is a good use of Coupled settings because the same compression test can be performed at several different frequencies. With coupled Source and Receiver ranges, the Primary (channel) frequency can be easily changed from the front panel. The coupled source and receiver frequencies will update accordingly.

- **Swept Input Power:** -10 dBm to 0 dBm
- **Fixed Input Frequency:** 1500 MHz
- **Fixed LO**: 500 MHz
- **Fixed Output:** 2000 MHz

Make the following settings on the FOM dialog

Primary:

Sweep Type: Power Sweep

Click Settings, then Edit. In the Primary dialog:

CW Frequency = 1500 MHz

Source: Coupled

Default settings make CW Frequency: 1500 MHz (same as Primary)

Receiver: Coupled

Default settings make Sweep Type: CW Time

Click Settings, then Edit. In the Receiver dialog:

Offset = 500 MHz

LO Settings

- If using external source, set to CW: 500 MHz.
- If using **Source2** (Internal Second Source)**,**:set to Coupled, then:

Sweep Type: Power Sweep

Click Settings, then Edit. In the Source2 dialog:

CW Frequency = 500 MHz

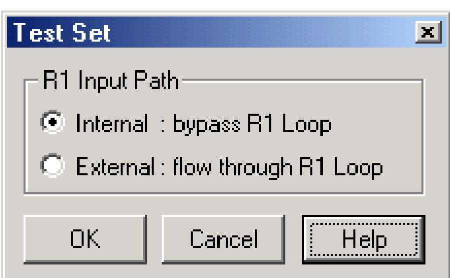
Test Set Reference Switch

PNA models with option 081 have a switch in the test set that allows you to bypass the port 1 reference receiver through the front panel Reference 1 connectors. This switch lets you easily switch between standard S-Parameter measurements and measurements using a reference mixer. You could use this feature to make standard S11 measurements and converter transmission measurements relative to a reference ("golden") mixer.

Note: The Frequency Converter Application Option 083 simplifies the task of making extremely accurate phase measurements on MOST frequency converting devices.

How to access the Test Set dialog box

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For [N5230A](#) and [E836xA/B](#) models	Programming Commands
1. [Navigate using MENU/DIALOG](#)	1. Click **Channel** 2. then **Test Set**
For [PNA-X](#) and ['C' models](#)	Programming Commands
1. Press TRACE/CHAN 2. then **[Channel]** 3. then **[More]** 4. then **[Path Config]** 5. **select**	1. Click **Trace/Chan** 2. then **Channel** 3. then **More** 4. then **Path Config** 5. **Select**



Test Set dialog box help

Note: This feature is only available on PNA models with [Option 081](#) - external reference switch.

R1 Input Path

Internal: bypass R1 Loop Connects the port 1 source directly to the R1 receiver.

External: flow through R1 Loop Allows direct access to the R1 receiver through the Reference 1 front-panel connectors.

See [block diagram of reference switch](#).

Last modified:

25-Feb-2008	Added link to AM-PM procedure
16-Oct-2007	Minor edits
11/21/06	MQQ Modified for new dialog

Frequency Converting Device Measurements

Many frequency offset measurements can be made using the PNA with option 080. The following is a list of some of those measurements and how they are made.

- **Conversion Loss**
- **Conversion Compression**
- **Return Loss and VSWR**
- **Isolation**
- **Harmonic Distortion**

See Also: Frequency Offset Measurement Accuracy

Frequency Offset Measurement Accuracy

This topic discuss methods that can be used to make accurate frequency offset measurements.

- [Calibrations]
- [Mismatch Errors]
- [Accurate and Stable LO]

See other Mixer Measurement topics

Calibrations

With Frequency Offset measurements, the stimulus and response frequencies are different. Standard calibration error terms are calculated using reference measurements. Therefore, traditional calibration methods such as full 2-port SOLT cannot be used with frequency offset.

Source and Receiver Power calibrations can be used to calibrate your Frequency Offset measurements.

Frequency Converter Application (option 083) offers fully calibrated scalar and vector frequency offset measurements.

Source Power calibration:

- Sets accurate power level at stimulus frequencies regardless of the receiver that will be used in the measurement.
- Can be copied to other channels with copy channels feature.
- Can be interpolated.

Receiver Power Cal:

- Requires a source cal to have already been performed and applied.
- Cannot be copied to other channels.

Therefore:

- Start by performing a source power cal over the combined stimulus and response frequencies.
- Copy the channel to other needed channels and the source power cal is copied.
- Change the frequency range of the copied channel to response frequencies.
- Perform a receiver cal at the response frequencies on individual channels.

- Change the frequency range to stimulus frequency and switch frequency offset ON.
- On Status Bar, ensure that source and receiver cals are ON (source cal will be interpolated).

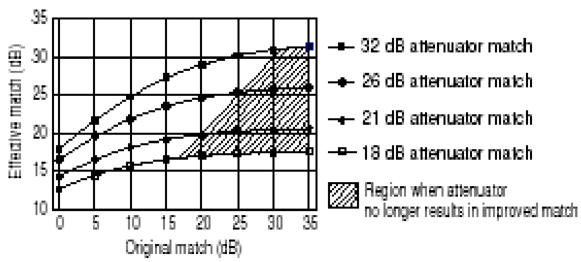
See Frequency Offset Conversion Loss Measurements to see a step-by-step example.

Mismatch Errors

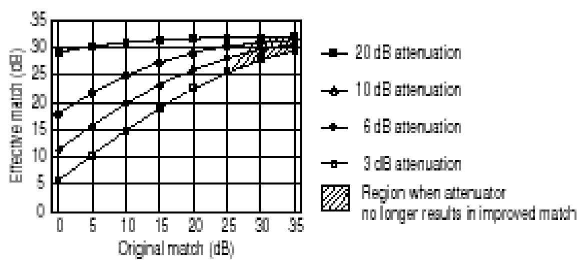
Mismatch errors result when there is a connection between two ports that have different impedances. With S-parameter measurements, these mismatches are measured and mathematically removed during a full 2-port calibration. This is much more difficult with frequency offset measurements. A much easier solution is to use high-quality attenuators on the input and output of the mixer.

By adding a high-quality attenuator to a port, the effective port match can be improved by up to twice the value of the attenuation. For example, a 10-dB attenuator, with a port match of 32 dB, can transform an original port match of 10 dB into an effective match of 25 dB. However, as the match of the attenuator approaches the match of the original source, the improvement diminishes.

Note: The Frequency Converter Application (option 083) uses calibration techniques that correct for mismatch errors.



The larger the attenuation, the more nearly the resulting match approaches that of the attenuator, as shown in the following graphic. However, excessive attenuation is not desired because that will decrease the dynamic range of the measurement system.



Accurate and Stable LO

When using frequency offset mode, if the LO signal is not accurate and stable, the output signal will not be at the expected response frequency. As a result, the output signal can fall on the skirts of the PNA receiver IF filter, or fall completely outside of the receiver filter passband.

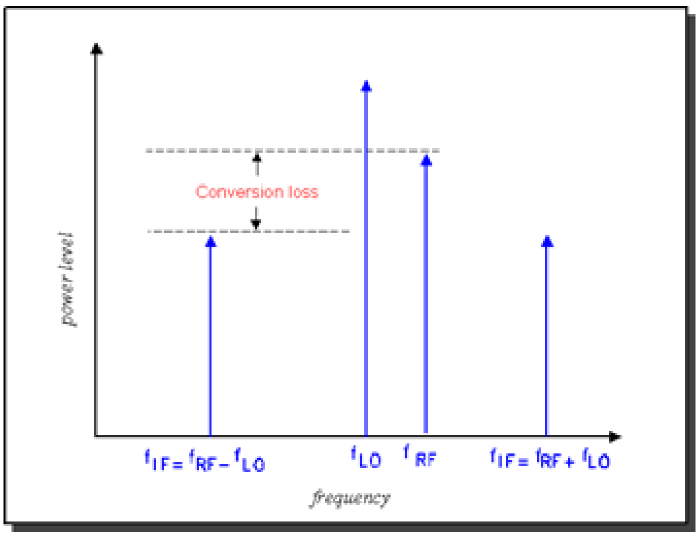
Also, the LO power level is critical in mixer measurements. Be sure to monitor these power levels closely.

Conversion Loss (or Gain)

See other Frequency Converting Device Measurements

What is Conversion Loss?

Conversion loss is defined as the ratio of the power at the output frequency to the power at the input frequency with a given LO (local oscillator) power. This is illustrated in the graphic below. A specified LO power is necessary because conversion loss varies with the level of the LO, as the impedance of the mixer diode changes.



Why Measure Conversion Loss?

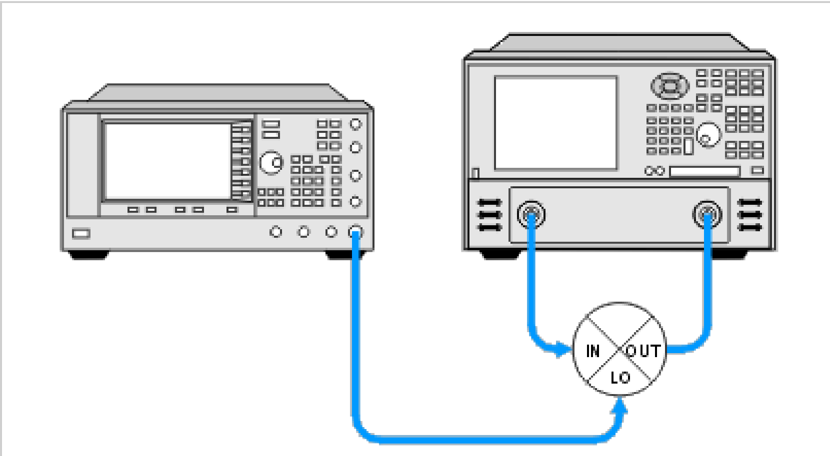
Conversion loss (or gain in the case of many converters and tuners) is a measure of how efficiently a mixer converts energy from the input frequency to the output frequency. If the conversion loss response of a mixer or converter is not flat over the frequency span of intended operation, valuable information may be lost from the resulting output signal.

How to Measure Conversion Loss

Conversion loss is a transmission measurement. It is measured by applying an input signal (stimulus) and an LO signal at specific known power levels, and measuring the resulting output signal level. Because the output frequency is different from the input frequency, frequency offset mode (option 080) must be used for this measurement.

Note: This measurement is made much easier if your PNA has the Frequency Converter Application

Equipment Setup



Example: A calibrated Conversion Loss (Down-converter) measurement

Swept Input with Fixed LO = Swept Output

- RF Input: 3.1 - 3.3 GHz
- LO: 2.2 GHz
- IF Output: 900 - 1100 MHz

PNA setup and calibrate on channel 1

1. On channel 1 create an unratioed R measurement over the ENTIRE input and output frequency span (.9 - 3.3 GHz). This will be the base source power cal that will be copied to the R and B channel measurements.
2. Perform a source calibration using a power meter. This makes the power level at the input of the mixer very accurate.

Setup Reference measurement on channel 2

1. Copy channel 1 to channel 2 which will display the reference input to the mixer. The channel 1 source power cal is copied with the other channel settings.
2. Change measurement to R1 unratioed.
3. Change RF Input frequency to 3.1 - 3.3 GHz. The source power cal becomes interpolated.
4. Perform receiver power cal. Do not need to make physical connections. The PNA source is internally connected to the R1 receiver. Makes the R receiver read the source power level.

Setup B measurement on channel 3

1. Copy channel 1 to channel 3. This channel will display the output of the mixer. The channel 1 source power cal is copied with the other channel settings.
2. Change measurement to B unratioed.
3. Change IF Output frequency to .9 - 1.1 GHz. This causes the source power cal becomes interpolated.
4. Connect thru line from port 1 to port 2.
5. Perform receiver power cal. This makes the B receiver read the source power at the IF Output frequencies.
6. Turn OFF receiver power cal. This prevents an error when changing to input frequencies (next step).
7. Change RF Input frequency to 3.1 - 3.3 GHz. This changes the channel back to the mixer RF Input frequencies.
8. Enable Frequency Offset.
9. Change Offset to (-2.2 GHz). This tunes the B receiver to the IF Output frequencies .9 to 1.1 GHz. **Note:** The minus sign indicates a down-converter measurement.
10. Turn ON receiver power cal.

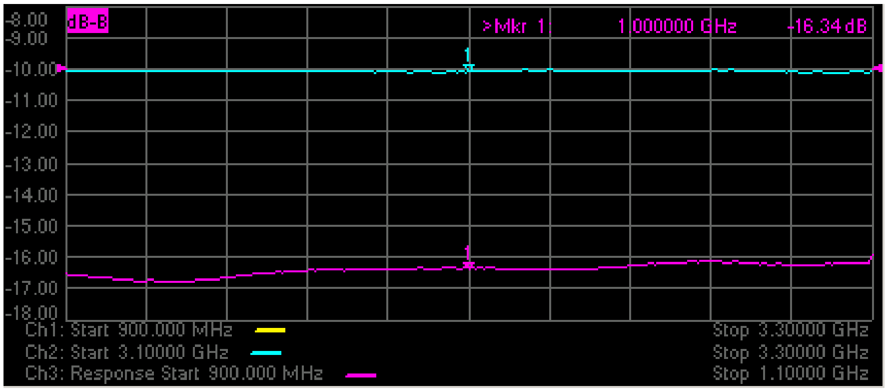
Measure the Mixer

1. Connect the mixer.
2. Adjust scaling to suit your needs.
3. Enable markers to read power levels for each trace.

The display below shows:

- Ch3 B receiver (bottom trace) absolute output power.
- Ch2 R1 receiver measurement (top trace) absolute input power to the mixer.

With this method, the conversion loss math (B/R1) can be performed with Equation Editor (not shown). The B/R1 ratio measurement is not supported with receiver power Cal turned on. However, conversion loss (C21) measurements can be made directly and are much easier using the Frequency Converter Application, FCA (Opt 083).


dB-B
>Mkr 1
1.000000 GHz
-16.34 dB
-8.00
-9.00
-10.00
-11.00
-12.00
-13.00
-14.00
-15.00
-16.00
-17.00
-18.00
Ch1: Start 900.000 MHz
Stop 3.30000 GHz
Ch2: Start 3.10000 GHz
Stop 3.30000 GHz
Ch3: Response Start 900.000 MHz
Stop 1.10000 GHz

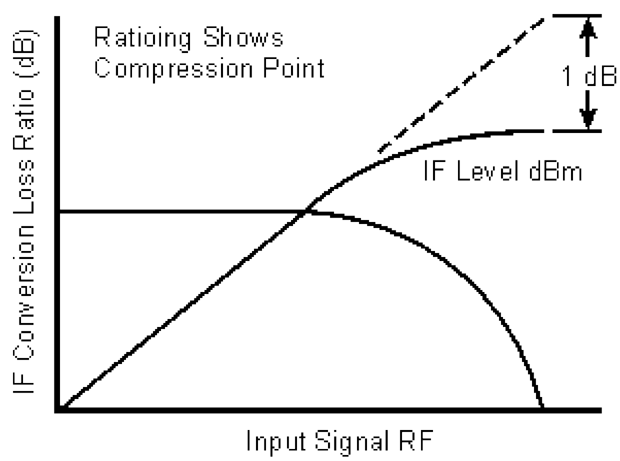
Conversion Compression

See other Frequency Converting Device Measurements

What is Conversion Compression?

Conversion compression is a measure of the maximum input signal level for which a mixer will produce linear operation. It is very similar to the gain compression experienced in amplifiers.

To understand conversion compression, you must first understand conversion loss. This is the ratio of the mixer output level to the mixer input level. This value remains constant over a specified input power range. When the input power level exceeds a certain maximum level, the constant ratio between input and output power levels begins to change. The point at which the ratio has decreased 1 dB is called the 1-dB compression point. This is illustrated in the graphic below.



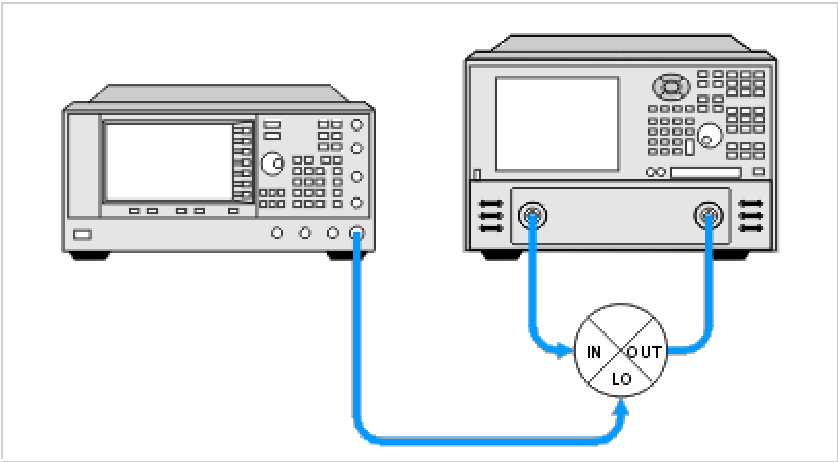
Why Measure Conversion Compression?

Conversion compression is an indicator of the dynamic range of a device. Dynamic range is generally defined as the difference between the noise floor and the 1-dB compression point.

How to Measure Conversion Compression

The equipment and setup used to measure conversion compression are essentially the same as for measuring conversion loss and is illustrated in the following graphic.

The PNA performs a power sweep using frequency-offset mode and the resulting display shows the mixer's output power as a function of its input power. The 1-dB compression point (or others such as 3-dB) can be determined using markers.



Measurement Accuracy Considerations

Equipment Setup Considerations

- The couplers in the PNA have very good directivity. If the return loss of the DUT is bad, the reflected signal gets sampled by the PNA and can result in errors. This relates to error in DUT gain. To increase the accuracy, an attenuator can be added between the PNA's source port and the DUT's input port. Normally a 6- to 10-dB attenuator is sufficient. Addition of this attenuator, however, decreases the available drive to the DUT.
- With high drive levels the PNA can be driven into compression resulting in measurement error. With excessive drive levels, the PNA can be damaged. Add an attenuator between the output of the DUT and the receiver input of the PNA to avoid these problems.

Calibration Considerations

- Source power calibration can be used to provide a high level of accuracy for this measurement.
- If your PNA has the Frequency Converter Application (option 083), you can perform a Scalar Mixer Calibration to obtain a more accurate measurement.

Isolation Measurements of Frequency Converting Devices

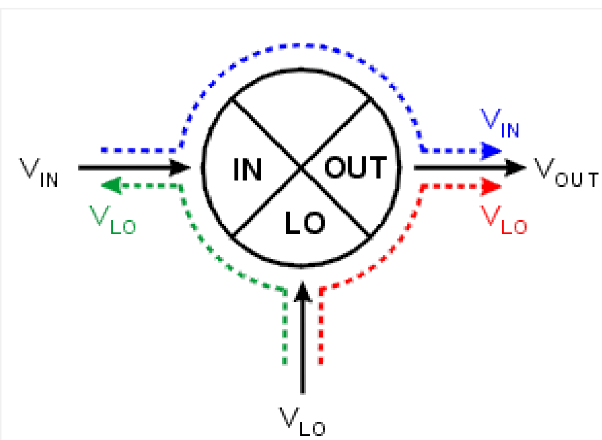
See other Frequency Converting Device Measurements

What is Isolation?

Isolation is a measure of the leakage, or feedthrough, from one port to another. The more isolation a mixer provides, the lower the amount of feedthrough. Isolation is measured at the same frequency as the stimulus, not the converted or shifted frequency. Therefore, Frequency Offset capability is not necessary for these measurements.

Three main isolation terms are of interest for mixer measurements:

- LO-to-OUT isolation (**V_{LO}**)
- LO-to-IN isolation (**V_{LO}**)
- IN-to-OUT feedthrough (**V_{IN}**)



Why Measure Isolation?

Any unwanted signal "leaking" through the device will mix with the desired output signal creating intermodulation products, adding to intermodulation distortion. These unwanted signals may be difficult to filter out.

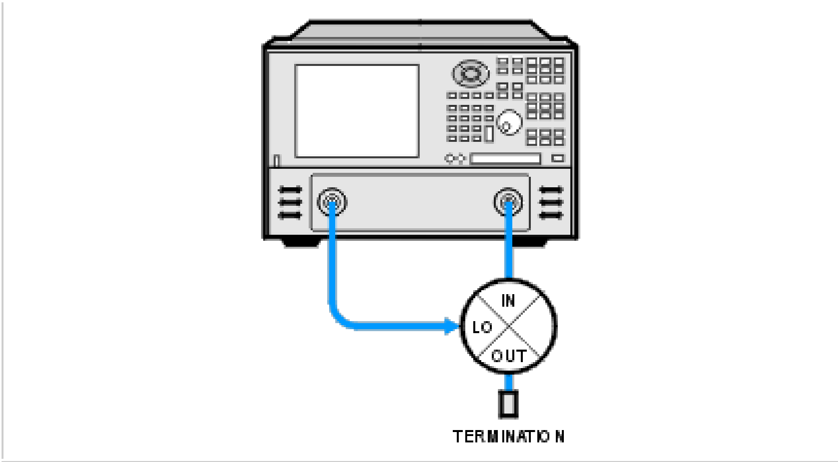
How to Measure Isolation

Use the following setups to measure the isolation of a mixer:

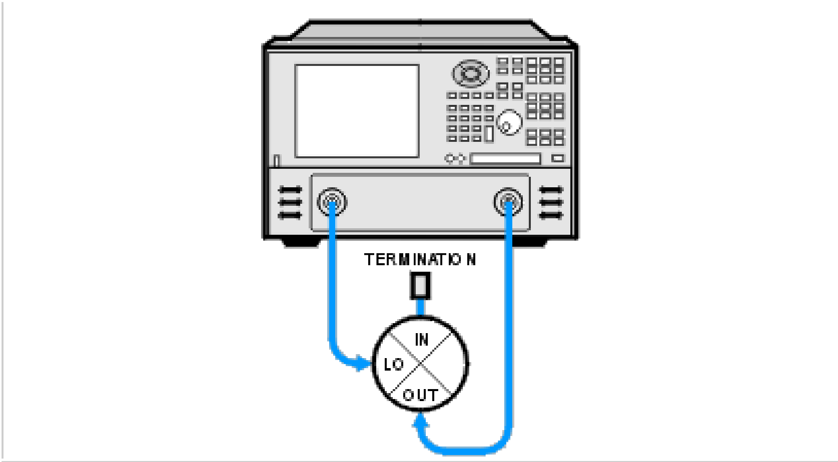
Note the following:

- The Input to Output isolation is very dependent on the LO power level. Isolation should be measured with the LO power at its normal operating level.
- Each of the ports not being tested should be terminated with an impedance typical of actual operation. This may not always be the characteristic impedance, Z0 (usually 50 or 75 ohms). For example, if the OUT port of a mixer is intended to be directly connected to a filter, then this filter should be used when measuring the LO-to-IN feedthrough.

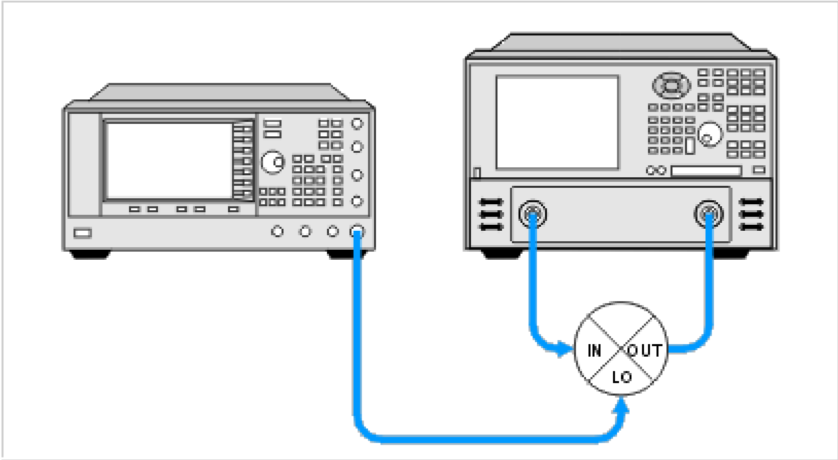
LO-TO-IN ISOLATION



LO-TO-OUT ISOLATION



IN-TO-OUT ISOLATION



Measuring Converters vs. Mixers

Measuring IN-to-OUT feedthrough of a converter is identical to that of a mixer. The IN-to-OUT feedthrough is generally very small for a converter due to the inclusion of an IF filter in the device. Because of this, the measurement may require the PNA to have increased dynamic range.

Measuring LO leakage (LO-to-OUT and LO-to-IN) of a converter requires a different technique because the LO port is typically not accessible:

- The PNA can be tuned to the frequency of the LO signal and either the OUT or IN port connected to the PNA receiver port. The PNA source port is not connected.
- A spectrum analyzer can be connected to either the OUT or IN port and tuned to the frequency of the LO signal.

Harmonic Distortion

See other Frequency Converting Device Measurements

What is Harmonic Distortion?

Harmonics are multiples of any signal appearing at the mixer input and also multiples of the LO input. The distortion of the mixer's output characteristics caused by these harmonics is referred to as harmonic distortion. Harmonic distortion is caused by non-linearities in the device.

Harmonics are NOT signals created by two or more signals interacting (mixing); these signals are known as intermodulation products, which result in intermodulation distortion.

Why Measure Harmonic Distortion?

- It can degrade the performance of devices connected to the output of the mixer.
- The harmonics can also mix with other signals present in the mixer, adding to the intermodulation distortion of the mixer.

How to measure Harmonic Distortion

The harmonics can be measured using the PNA with Frequency Offset (option 80). The frequency of the LO to the mixer is set to zero and multiplier of the RF input is used to set the IF frequency (the harmonic). The equipment setup is shown below.

Since harmonics are specified in dBc, the fundamental RF and both the second and third harmonics are measured and the differences calculated. Multiple channels can be used to do this.

1. Connect the equipment.
2. Setup the measurement for calibration. See also Measurement and Accuracy Considerations.

   Use three channels and frequency offset mode:

   Channel 1 = F1 to F2

   Channel 2 = F1 to 2F2 (frequency offset mode, multiplier = 1)

   Channel 3 = F1 to 3F2 (frequency offset mode, multiplier = 1)

- Perform a source power calibration and receiver power calibration over the entire frequency range. See [Measurement and Accuracy Considerations](#).

- Reduce the frequency span and increase the frequency offset multiplier on Channels 2 and 3:

  Channel 2 = F1 to F2 (frequency offset mode, multiplier = 2)

  Channel 3 = F1 to F2 (frequency offset mode, multiplier = 3)

  Note: Because the frequency span has been changed from that used for calibration, the source and receiver calibrations will be interpolated.

- Connect the DUT, make the measurement, and calculate the harmonic response:

  Set up markers on Channels 1, 2 and 3, and determine the difference between the marker values to get the dBc value of each harmonic.

  Channel 1 - Channel 2 = 2nd harmonic (dBc)

  Channel 1 - Channel 3 = 3rd harmonic (dBc)

  Note: Be sure to set the markers to the appropriate stimulus. Channel 2 markers should be set to twice the frequency of Channel 1 markers. Channel 3 markers should be set to three times the frequency of Channel 1 markers.

Measurement and Accuracy Considerations

Equipment Setup Considerations

- A filter must be used at the input of the mixer to remove the PNA source harmonics.

Calibrations

- If your PNA has the Frequency Converter Application (FCA), you can perform a Scalar Mixer Calibration to obtain a more accurate measurement.

Return Loss and VSWR

- What are Return Loss and VSWR?
- Why Measure Return Loss and VSWR?
- How to Measure Return Loss and VSWR

See other Frequency Converting Device Measurements

What is Return Loss and VSWR?

Return loss and VSWR are both linear reflection measurements, even when testing frequency conversion devices, because the reflected frequency is not converted. These measurements are essentially the same as for filters and amplifiers. Learn more about Reflection Measurements.

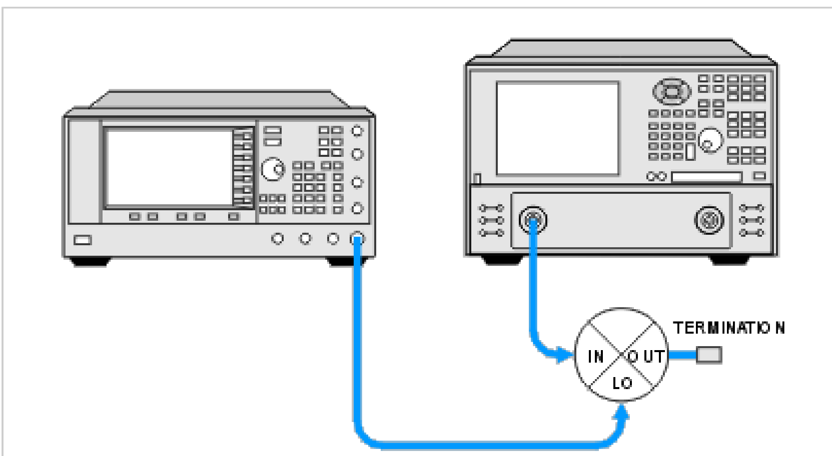
Why Measure Return Loss and VSWR?

Devices which have poor return loss and VSWR result in loss of signal power or degradation of signal information.

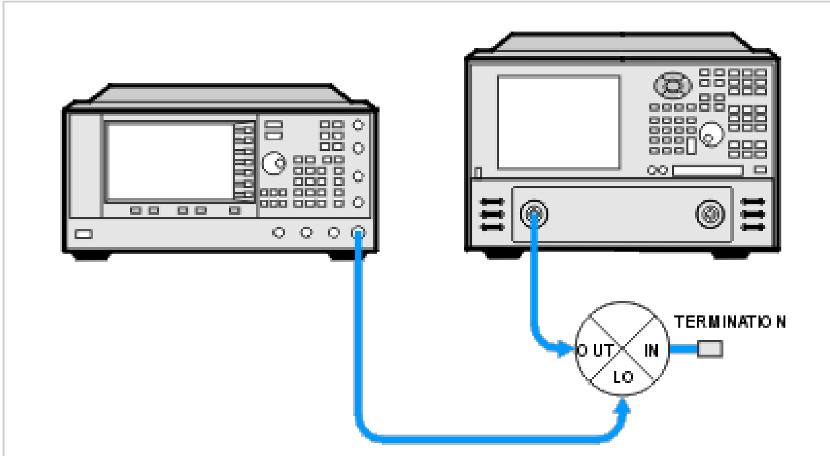
How to Measure Return Loss and VSWR

Setup the PNA measure return loss and VSWR as you would any two-port device. Connect your frequency converting device as shown in the following diagrams:

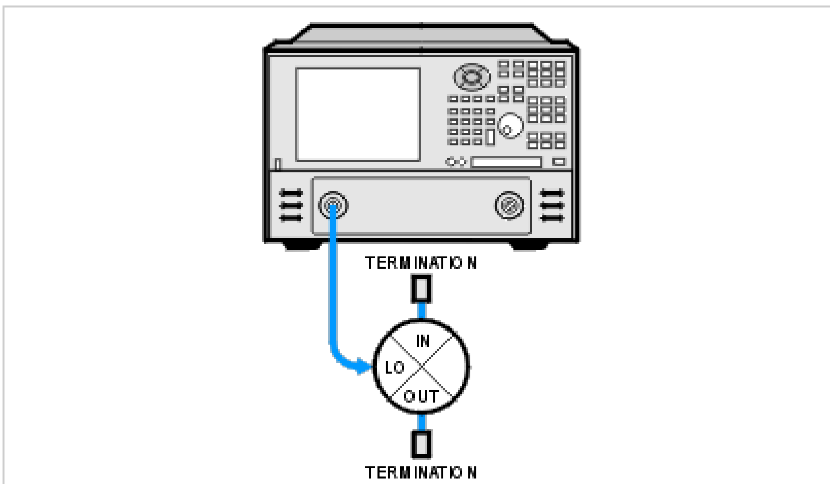
RETURN LOSS AND VSWR OF MIXER INPUT PORT



RETURN LOSS AND VSWR OF MIXER OUTPUT PORT



RETURN LOSS AND VSWR OF MIXER LO PORT



Frequency Converter Application Known Issues

To see the current list of known FCA issues, please visit http://na.tm.agilent.com/fca/ and click the known FCA issues link.

Frequency Converter Application

The Frequency Converter Application (Option 083) simplifies testing of frequency converting devices.

Note: Option 082 allows you to make only SMC calibrations and measurements.

- Advanced calibration techniques that provide exceptional amplitude and phase accuracy.
- Simple setup using PNA models with Internal Second Source.
- Control of external signal sources for use as local oscillators.
- A graphical set-up dialog box that lets you:
  - quickly set up the PNA for single or dual conversion devices.
  - calculate and choose where mixing and image products will fall.

For more information, see the following topics:

- **Using FCA**
- **Configure Your Mixer**
- **FCA Calibrations**
- **Configure an External LO Source**
- **SMC with a Booster Amp**
- **CharacterizeAdaptor Macro**
- **Measure a DUT with an Embedded LO**

Examples

- **How to make a VMC Measurement**
- **How to make an SMC Measurement**

Notes:

- For a detailed understanding of FCA, see our Mixer Measurements App Notes.
- Please submit FCA issues that you find, as well as enhancement requests, to fca_support@agilent.com. See Known Issues with the FCA
- FCA is **NOT** supported on PNA-L Models. However, Opt 082 (SMC only) IS supported on PNA-L Models.
- FCA is **NOT** supported when using external Millimeter Modules.
- Copy Channels does NOT work with FCA.

Last modified:

13-Feb-2008	Added note about Copy Channels
Nov 28, 2006	Added clarification to PNA-L note

Using the Frequency Converter Application (Option 083)

- [What's New in FCA]
- [Overview]
- [How to Create a Measurement]
- [FCA Measurements Offered]
- [FCA Measurement Settings]
  - [Change a Measurement]
  - [Speed Up Swept LO SMC Measurements]
  - [Use Nominal Incident Power]
  - [Select X-axis Display]
  - [Save Trace Data]
  - [Avoid Spurs]

Examples (not in this topic)

- [How to make a VMC Measurement]
- [How to make an SMC Measurement]

Note: Please submit FCA issues that you find, as well as enhancement requests, to fca_support@agilent.com (See Known FCA Issues.)

Not sure if your analyzer is equipped with Option 083? Here's how to identify your analyzer.

Other Frequency Converter Application topics

What's new in FCA with Rev 7.2

- Support for PNA-X and Internal Second Source as LO

What's new in FCA with Rev 6.2

- Option 082 allows you to make SMC calibrations and measurements. (VMC is NOT available.)

What's new in Rev 6.0:

- Calibrated **Swept LO** measurements.
- Create any of the Mixer measurements that are offered. For example, in the past if you wanted an SC12 measurement, you first had to create an SC21 measurement, and then change it to SC12. You can also create more than one mixer measurement at the same time.
- FCA calibrations are streamlined for consistency and ease of use.
- Added SMC Power meter and offset settings.
- Embed/De-embed networks for Waveguide, in-fixture, or on-wafer measurements.
- Characterize Adaptor Macro creates S2P files from two 1-port cal Sets.
- **SMC-Forward** and **SMC-Reverse** measurements can now be performed in the same channel. Therefore, we no longer refer to them as separate measurement types.
- Previous Instrument State files that include an FCA measurement can **NOT** be recalled by Revision 6.0.
- FCA is **NOT** supported when using External Test Set Control.

Overview

The following is an overview of how to make an FCA measurement:

1. DECIDE to make either a Scalar measurement or Vector measurement. The calibration method is unique to each of these. See a comparison of these two measurement types.
2. CREATE one or more FCA Mixer measurements.
3. Setup and CALIBRATE your Scalar or Vector measurement.

How to Create an FCA Measurement

Note: An FCA measurement and a non-FCA measurement can NOT reside on the same channel.

- **PNA-X:** First assign a VMC or SMC measurement class to a channel. Learn how.
- **E836x and PNA-L:** From the New Trace dialog. click **Application**

Then change the default measurement to one you choose by doing the following:

How to Change an FCA Measurement

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press Measure 2. then S11 SC21 S22 Incident Power	1. Click **Trace** 2. then **Measure**
For PNA-X and 'C' models	Programming Commands
1. Press MEAS 2. then select parameters	1. Click **Trace/Chan** 2. then **Measure** 3. then select parameters

New FCA Measurement dialog box help

Select one or more Scalar Mixer or Vector Mixer measurements.

- SMC and VMC measurements MUST be made on separate channels.
- After you create a mixer measurement, you can configure the FCA measurement and make other FCA settings.

FCA Measurements Offered

Learn how to change the FCA measurement.

Important Note: Connecting your DUT to the PNA using FCA:

RF and **IF** terminology is NOT used in the FCA because the PNA does not know how the DUT is labeled or how it will be used. Instead, the general terms INPUT and OUTPUT are used.

- **INPUT** - The DUT port connected to PNA Port 1.
- **OUTPUT** - The DUT port connected to PNA Port 2.

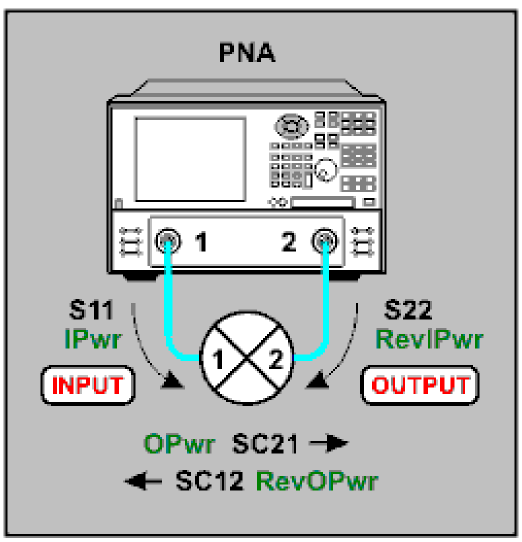
INPUT and OUTPUT Frequencies are specified using the Configure Mixer dialog box.

Vector Mixer/Converter Measurements

- **VC21 Conversion Loss/Gain (default) -** stimulus at Input, response at Output
- **S11 -** stimulus and response at Input
- **S22 -** stimulus and response at Output
- **R1** - stimulus at Input, measures absolute power at the R1 receiver (uncorrected)
- **B** - stimulus at Input, measures absolute power at the B receiver (uncorrected)
- VC12 (reverse conversion loss) is NOT offered because of the reference mixer.

See Also: Measure a DUT with an Embedded LO

Scalar Mixer/Converter Measurements



Ratioed

- **SC21 Conversion Loss/Gain -** stimulus at Input, response at Output
- **SC12 Conversion Loss/Gain -** stimulus at Output, response at Input

- **S11** stimulus and response at Input
- **S22** stimulus and response at Output

Unratioed These measurement do NOT use a reference receiver.

- **IPwr** (Incident Power) **-** stimulus and response at Input
- **RevIPwr** (Reverse Incident Power) **-** stimulus and response at Output
- **OPwr** (Output Power) **-** stimulus at Input, response at Output
- **RevOPwr** (Reverse Output Power) **-** stimulus at Output, response at Input

See Also: SMC with a Booster Amp

Channel / Window Selections

Channel Number Select the channel for the new traces.

Create in New Window

- Check to create new traces in a new window.
- Clear to create new traces in the active window. When the PNA traces per window limitation has been reached, no more traces are added.

Auto-Create Windows Check to create new traces in as many windows as necessary. See PNA number of windows limitation.

FCA Measurement Settings

Most of the FCA measurement settings in the remainder of this topic are made using the following menu selection. The choices will be slightly different depending on the active FCA measurement.

How to select several FCA measurement settings

1. First create an FCA measurement, then...

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Trace** 2. then **Measure** 3. select setting
For PNA-X and 'C' models	Programming Commands
1. Press MEAS 2. then select setting	1. Click **Response** 2. then **Measure** 3. then select setting

Speeding Up Swept LO SMC Measurements

Swept LO measurements require that an external LO source step in frequency. This can be extremely slow depending on your measurement setup. The following features together will significantly speed up your **SMC** (NOT VMC) swept LO measurement:

- BNC External LO trigger method
- Use Nominal Incident Power
- Apply Cal Set or Cal Type

Use Nominal Incident Power

Each data sweep of a fully corrected SC21 measurement actually requires FOUR data sweeps. Three of the sweeps are not displayed. When you select Use Nominal Incident Power, the reference receiver (R1 or R2) does not measure incident power. Instead, the incident power is assumed to be at the level that was set with the Source Power Calibration that is done as part of every SMC measurement. The degradation in accuracy is very negligible if the input or output of your test device is well-matched. This selection eliminates sweeps ONLY when either:

- Output Power is measured OR
- **SMCRsp** is applied.

This selection applies to all SMC measurements. This selection never eliminates VMC sweeps.

See how to select **Use Nominal Incident Power**.

Select X-axis Display for FCA Measurements

FCA measurements typically have more than one swept parameter. You can choose to view the response (output) of the measurement on the Y-axis while displaying any of the swept parameters (Input, LO1, LO2, Output) on the X-axis of the PNA display.

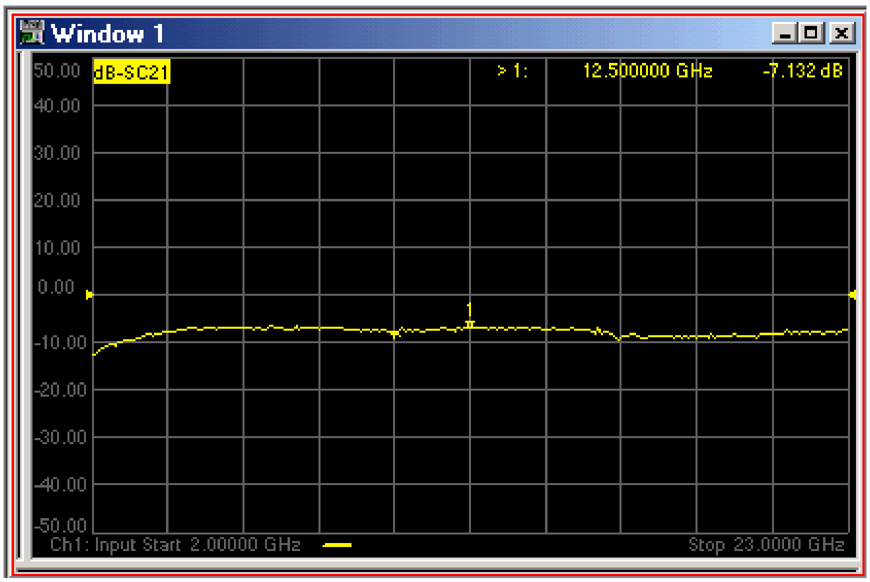
For example, the following image shows an SMC Fixed Output response versus the swept Input.

Output: 100 MHz (data trace)

Input: 2 GHz to 23 GHz (X-axis)

LO: 1.9 GHz to 22.9 GHz (not shown)

Marker annotation shows Output power at Input frequency.



See How to Select X-axis Display

Save Trace Data

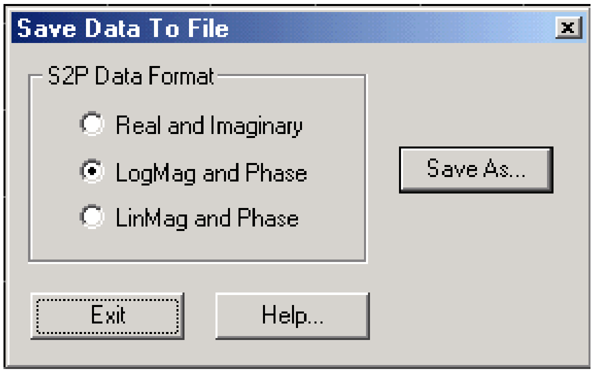
You can save your Frequency Converter measurement data in S2P format to disk.

Note: This is the only method to save Frequency Converter .S2P files from the front panel. Do NOT click **File, Save As**... to save these S2P data files.

Programming Commands

Beginning with PNA release 6.03, save FCA .S2P files remotely using the standard Save SNP programming commands.

See How to Save Trace Data



Save Data to File dialog box help

Allows you to save Frequency Converter measurement data to an S2P file. The data is saved in S2P format much like standard PNA data. Learn more about .S2P files.

Note: This is the only method to save Frequency Converter .S2P files. Do NOT click **File, Save As**... to save these S2P data files.

S2P Data Format Select the data format. This selection is independent of the PNA display.

Save As Click to specify a file name and location for the saved data.

Exit Closes the dialog box without saving the data. To save the data, you must click on the Save As button before clicking the Exit button.

Notes:

Each record contains 1 stimulus value and 4 parameters (total of 9 values) as follows:

Stim Real(p1) Imag(p1) Real(p2) Imag(p2) Real(p3) Imag(p3) Real(p4) Imag(p4)

where **pX** is the parameter depending on measurement type:

Measurement Type	p1	p2	p3	p4
Scalar	S11	SC21 (FWD)	SC12 (REV)	S22
Vector	S11	VC21	VC12	S22
Mixer Characterization	Directivity	Source Match	Reflection Tracking	M21

- If correction is OFF, data is only saved for the active parameter. Zeros are saved for all other parameters.
- If correction is ON, data is saved for all of the parameters.

All files contain the following Header Information: Brackets [ ] contain parameters.

```
!Agilent [Instrument Model Number]: [version]
!Mixer S2P File: [Mixer Measurement Type]
!Parameters: [Parameter List]
!Calibration State: [On/Off]
```

```
!# Begin Mixer Setup
![Mixer Setup parameters listed here]
![Mixer Parameter 1]
.
.
![Mixer Parameter n]
!# End Mixer Setup

# [S2P data here]
```

Avoid Spurs

The Avoid Spurs feature of the Frequency Converter Application attempts to prevent unwanted mixing products from appearing on the PNA screen. The Avoid Spurs feature does not significantly impact measurement speed.

Note: The Avoid Spurs feature is OFF by default for FCA calibrations. For highest accuracy, make measurements with the Avoid Spurs feature at the same state (ON or OFF) as was used when calibrating.

- To enable Avoid Spurs, check **Avoid Spurs** on the Mixer Setup dialog box.

Description

A spur, or spurious signal, is a term used to describe the unwanted product of two signals mixing together. When you configure the mixer setup dialog box for a desired Output, the PNA computes the frequencies of potential unwanted signals. By manipulating internal PNA hardware, these signals are avoided and do not appear on the PNA display. This means you do not need to use external filters to prevent spurious signals from appearing on the PNA display.

The time required for the PNA to compute the frequencies of unwanted spurious signals MAY be noticeable depending on the number of data points in your measurement. However, once computed, the time required for the PNA to avoid the spurs is usually insignificant.

Limitations

The Avoid Spurs utility cannot avoid every spur. However, when there is a choice of spurs to avoid, it will avoid the largest spur.

The Computation of Avoided Spurs

The Avoid Spur computer avoids the following spurs:

- LO, and its interaction with internal PNA components, and 16 of its harmonics.
- Input frequencies and 16 of its harmonics.
- Undesired Image frequencies (Sum or Difference) and 16 of its harmonics.

Last modified:

5-Oct-2007	Added link to embedded LO

Frequency Converter Application (Option 083) Calibrations

Frequency Converter Application (Option 083) offers two advanced calibration choices for mixer or converter measurements that provide exceptional amplitude and phase accuracy.

Note: Option 082 allows you to make only SMC calibrations and measurements.

Examples (not in this topic)

Not sure if your analyzer is equipped with Option 083? Here's how to identify your analyzer.

To learn more about the FCA capability and improving FCA measurement accuracy, see FCA App notes.

Please submit FCA issues that you find, as well as enhancement requests, to fca_support@agilent.com (See Known FCA Issues.)

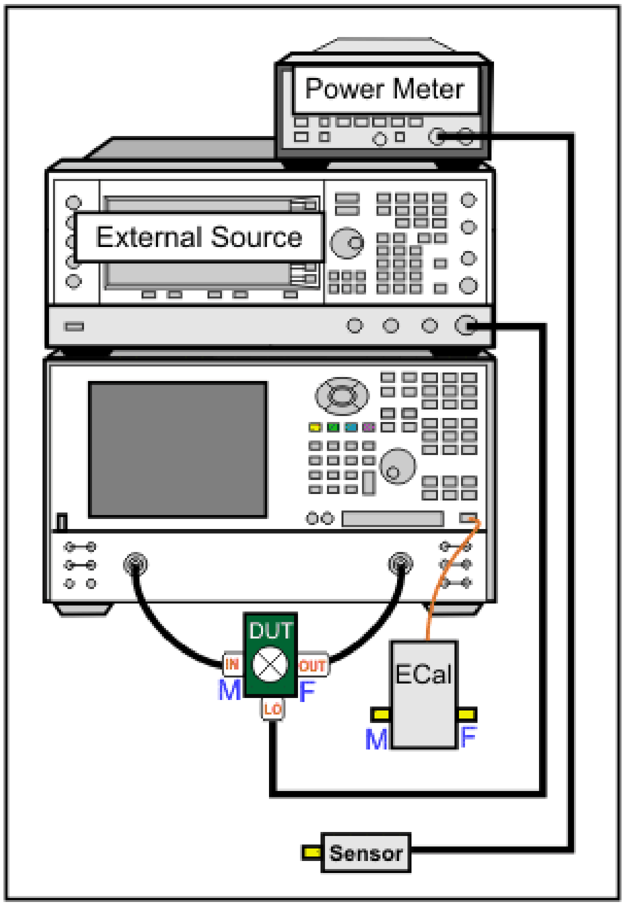
Other Frequency Converter Application topics

Comparison of Scalar and Vector Mixer Cals

<table>
<tr><th></th><th>Scalar Mixer Calibration</th><th>Vector Mixer Calibration</th></tr>
<tr><td>Overview</td><td>Provides highest Scalar (amplitude only) accuracy for measurements of conversion loss/gain.
Combines SOLT and power-meter calibration.
Simpler setup than Vector Mixer Calibration.</td><td>Provides unparalleled accuracy for measurements of relative phase and absolute group delay.
Uses combination of SOLT standards and a reciprocal mixer/filter pair during calibration.
More complicated setup and calibration procedure than Scalar Mixer Calibration.
After calibration, both reciprocal and non-reciprocal mixers and converters can easily be measured.</td></tr>
<tr><td>Types of Transmission Measurements</td><td>Both forward (SC_{21}) and reverse (SC_{12}) directions.</td><td>Amplitude response VC_{21}
Phase response
Group delay</td></tr>
<tr><td rowspan="2">Equipment Required</td><td>Power meter and sensor</td><td>Calibration mixer/filter combination (must be reciprocal $S_{21} = S_{12}$.)
Reference mixer
External source</td></tr>
<tr><td colspan="2">Common equipment for both SMC and VMC
• Mechanical cal kit or ECal module
• PNAs with one GPIB port require the Agilent 82357A USB/GPIB Interface (Contact component_test@agilent.com for this product. The 82357B is not a direct replacement.)</td></tr>
</table>

See Comparison of Mixer Characterization using New Vector Characterization Techniques.

SMC Calibration Setup and Overview



Note: When using a PNA-L or PNA-X with Internal Second Source, the external source is NOT necessary. Learn which PNA ports can be used for the LO.

Connect **External Source** and **Power Meter** to the PNA GPIB using any of the following methods:

- For PNAs with two GPIB ports, connect these devices to the Controller port.
- For PNAs with one GPIB port:
  - The Agilent 82357A USB/GPIB Interface - **highly recommended -** allows for the use of a remote PC to control the PNA.
  - The standard GPIB Interface - with the following limitations:
    - The PNA cannot be controlled remotely as talker / listener over GPIB. First put the PNA in System Controller mode. Learn how.
    - Available only on PNA releases 4.2 and later.

Learn how to Configure an External LO Source

Overview of the Scalar Mixer Calibration.

The Calibration Wizard guides you through this process.

1. Connect a power meter / sensor to PNA Port 1. At each step of the input and output frequency, the PNA measures:

    - input match of the power sensor
    - source power of the PNA

2. Perform two 2-port SOLT calibrations: one over the INPUT frequencies and one over the OUTPUT frequencies of the DUT. (If your DUT is a linear device, the calibration uses only the INPUT frequency range.) Use either a mechanical calibration kit or an ECal module.

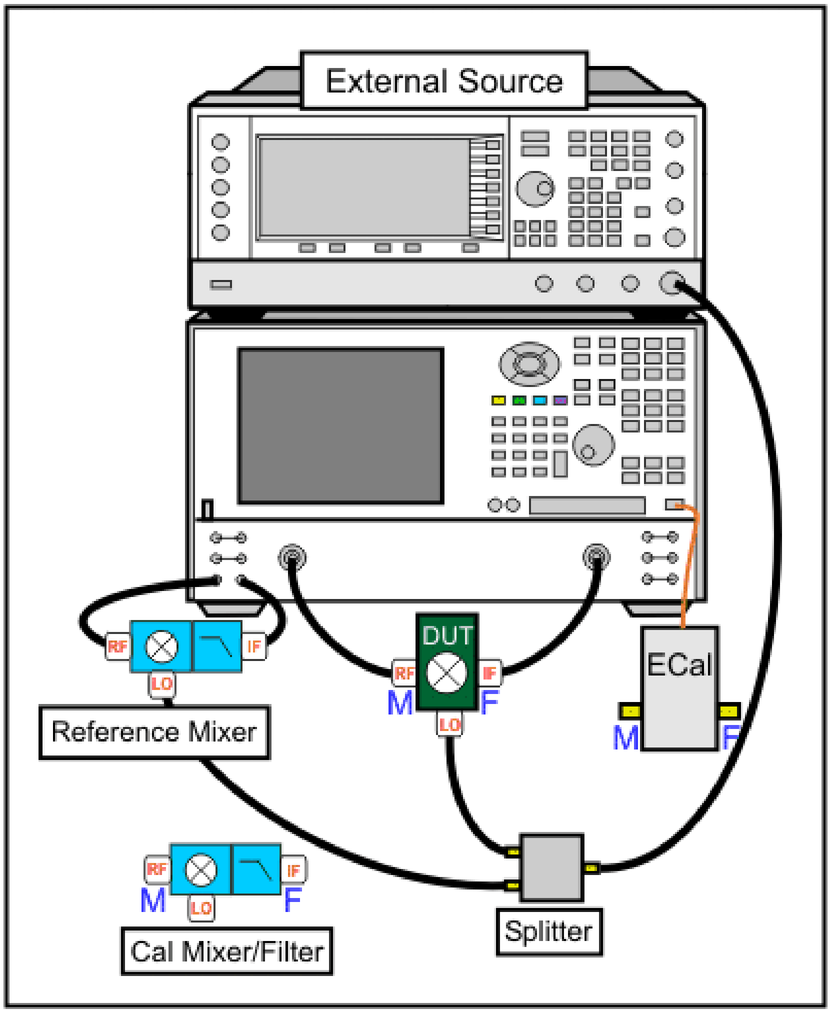
How to configure two power sensors to cover the SMC measurement frequency range.

Using a dual channel power meter, with both sensors connected:

1. At the SMC Select DUT Connectors dialog, click **View / Modify Source Cal Settings**
2. At Source Calibration Settings dialog, click **Power Meter Config**
3. At Power Meter Settings dialog, click **Sensors**
4. At Power Sensor Settings dialog, clear the **"Use this sensor only..."** checkbox for both sensors.
5. Then enter the **MIn** and **Max Frequencies** for both sensors.

During the SMC Cal, you will be prompted to connect each sensor at the appropriate time.

VMC Calibration Setup and Overview



1

Note: When using a PNA-X with Internal Second Source, the external source is NOT necessary.

- See note regarding LO power out both second source ports
- Learn which PNA ports can be used for the LO.
- Measure a DUT with an Embedded LO

Reference mixer provides a phase reference for the measurements. The reference mixer is connected in the reference receiver path of the network analyzer, between the source out and receiver R1 in ports, as shown below.

The reference mixer is considered part of the test system setup like the test cables. It remains in place during the entire calibration and measurement process. The reference mixer is switched in and out of the measurement path by the PNA as needed. See how to manually switch the reference mixer.

The reference mixer does not need to be reciprocal and does not have to match the calibration mixer or the mixer-under-test in performance. The only requirement of the reference mixer is that it cover the same frequency range as the mixer under-test. In general, it is valuable to select a reference mixer that can be used with a variety of different setups. For example, a broadband mixer can be used in place of several narrow-band alternatives.

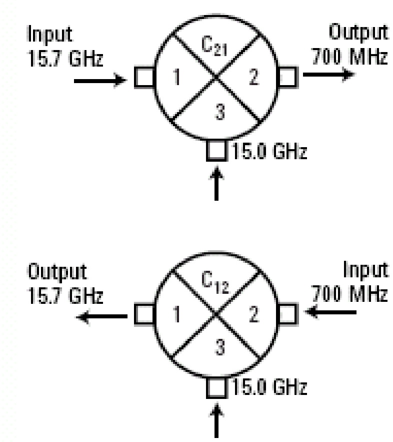
A low pass filter on the output of the reference mixer can be used to suppress the LO leakage signal that comes out of the reference mixer output. It is not strictly needed, but ensures that the PNA will not have any source unlock or unlevel errors due to the LO leakage.

- Connect the Reference Mixer INPUT to PNA **Ref 1 Source out**
- Connect the Reference Mixer OUTPUT to PNA **Rcvr R1 In**

2

Calibration mixer/filter is characterized either before or during a VMC calibration. It is used during the VMC calibration as the THRU standard. The calibration mixer/filter combination must meet the following requirements:

- The mixer must be reciprocal over the frequency range of the mixer under test. This means that it has the same magnitude and phase response in the up-converting and down-converting directions (C21 = C12) as shown in the following diagram.



- If the Input and Output frequency ranges are overlapping, the mixer must have Input to Output Isolation greater than 10 dB more than the conversion loss in the overlapping range.
- The filter must reject the undesired mixing product, and pass the desired mixing product, at the output of the cal mixer. This requirement can be made easier by characterizing the mixer/filter as a downconverter. Learn more.

3	**Power splitter**
4	**LO Source(s)**

Note: When using a PNA-X with Internal Second Source, the external source is NOT necessary.

- See note regarding LO power out both second source ports
- Learn which PNA ports can be used for the LO.

Connect external sources to the PNA GPIB using any of the following:

For PNAs with two GPIB ports,

connect to the GPIB Controller port.

For PNAs with one GPIB ports:

- The Agilent 82357A USB/GPIB Interface - **highly recommended -** allows for the use of a remote PC to control the PNA.
- The standard GPIB Interface - with the following limitations:
  - The PNA cannot be controlled remotely as talker / listener over GPIB. First put the PNA in System Controller mode. Learn how.
  - Available only on PNA releases 4.2 and later.

Learn how to Configure an External LO Source

Overview of the Vector Mixer Calibration

The Calibration Wizard guides you through this process. The first three steps characterize the calibration mixer that is used as the THRU standard during the calibration process.

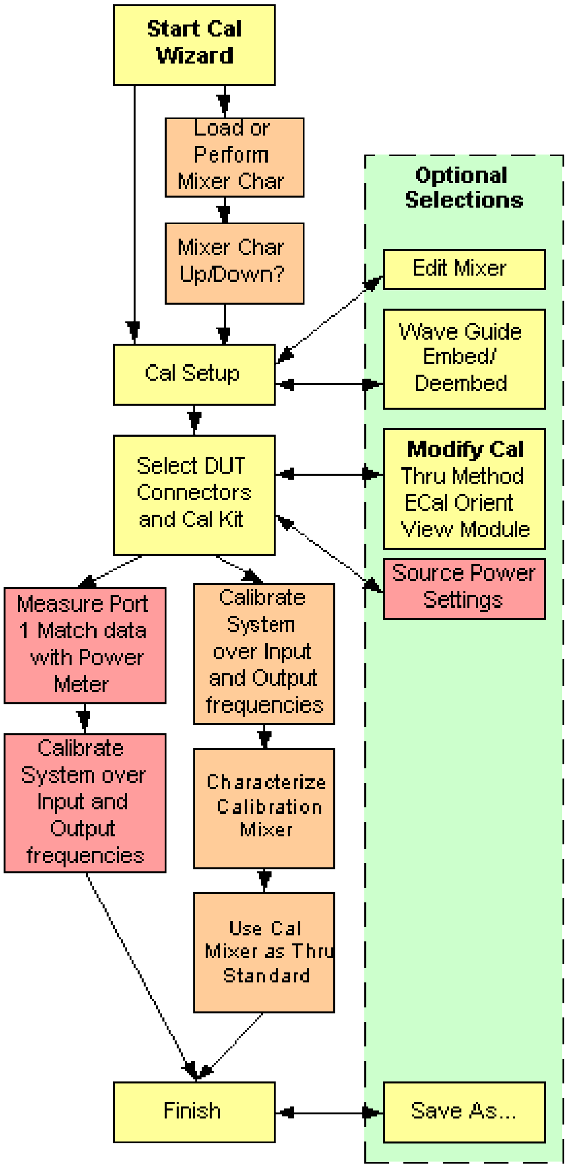
1. Perform a 2-port SOLT calibration over the INPUT frequency range of the DUT, and another 2-port SOLT calibration over the OUTPUT frequency range. Use either a mechanical calibration kit or an ECal module.
2. Characterize the input and output match of the calibration mixer/filter combination with the external LO connected and the output terminated with an open, short, and load. Learn how to connect the calibration mixer/filter. Once characterized, an S2P file is saved and can be recalled for use in subsequent VMC calibrations using the same stimulus settings.
3. Connect the reference mixer between the Source Out and Rcvr R1 front-panel connectors. Connect the output port of the calibration mixer/filter combination to PNA Port 2 (or at the end of the cable attached to the port).
4. Measure the calibration mixer/filter combination as the THRU calibration standard.
5. The PNA calculates the error terms necessary to make corrected phase measurements of your mixer/converter under test.

To learn more about VMC capability and improving measurement accuracy, see www.Agilent.com and search for App notes (AN 1408-1) and (AN1408-3).

The FCA Calibration Wizard

The following dialog boxes are presented during SMC, VMC, and Mixer Characterization (used in VMC).

Click a box to learn about that step.



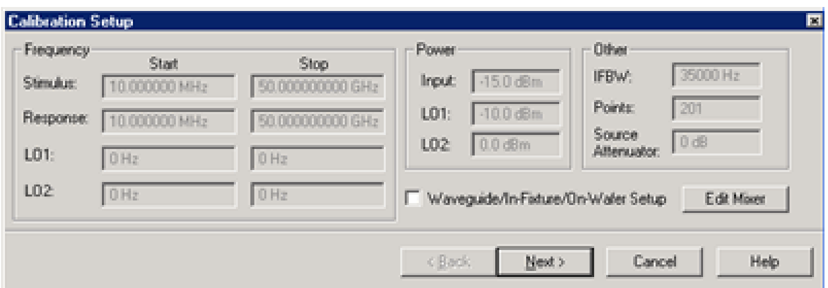
Note: In the above diagram and following procedure:

- **yellow** - steps that are common to both calibration methods.
- **tan** - VMC only steps.
- **red** - SMC only steps

How to Perform an SMC, VMC, or Mixer Characterization Calibration

1. Create an FCA measurement, then...

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Calibration Wizard** or **Mixer Characterization**
For PNA-X and 'C' models	Programming Commands
1. Press RESPONSE 2. then **[Cal Wizard]**	1. Click **Response** 2. then **Cal Wizard**

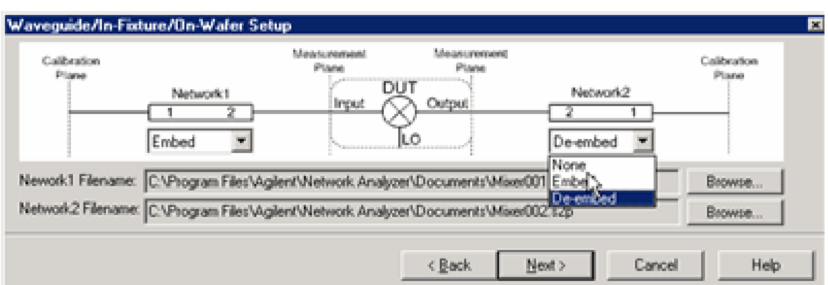


Calibration Setup dialog box help

Allows you to review and change the settings for your FCA calibration.

Waveguide/In-fixture/On-Wafer Setup Invokes the following **Setup** dialog box.

Edit Mixer Click to display the Configure Mixer dialog box.



Waveguide/In-fixture/On-Wafer Setup dialog box help

This dialog box appears ONLY if you checked the **Waveguide/In-fixture/On-Wafer Setup** box in the previous Cal Setup dialog.

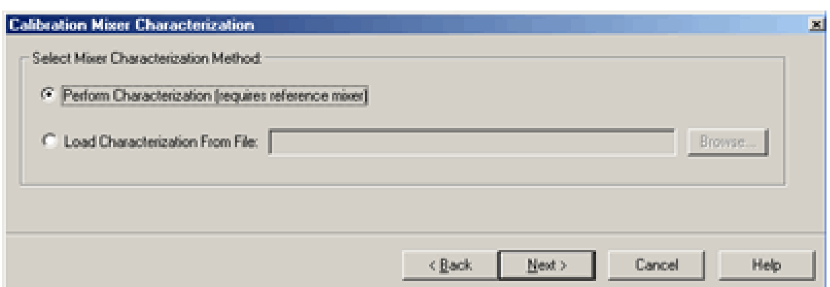
Allows you to embed (add) or de-embed (remove) circuit networks on the input and output of your mixer measurement.

For Network1 (Input) and Network2 (Output) select **Embed**, **De-embed**, or **None**.

Browse Click to navigate to the .S2P file that models the network to embed or de-embed.

Notes

- See To **Embed or De-embed?** and the associated procedures
- Characterize Adaptor Macro can be used to create the S2P file.
- The S2P file for Network1 (on the input of the mixer), must cover the Input frequency range. The S2P file for Network2 (on the output of the mixer), must cover the Output frequency range.
- The frequency range of the S2P file must be the same, or larger than, the frequency range of the FCA measurement. If more frequencies are included in the file, and the data points do not exactly match those of the measurement, interpolation will be performed.
- In all cases:
    - Port 1 of each network is assumed to be connected to the PNA.
    - Port 2 of each network is assumed to be connected to the DUT.



Calibration Mixer Characterization dialog box help

VMC and Mixer Characterization ONLY

What is Calibration Mixer Characterization? For a brief explanation, see Calibration Mixer.

Select Mixer Characterization Method

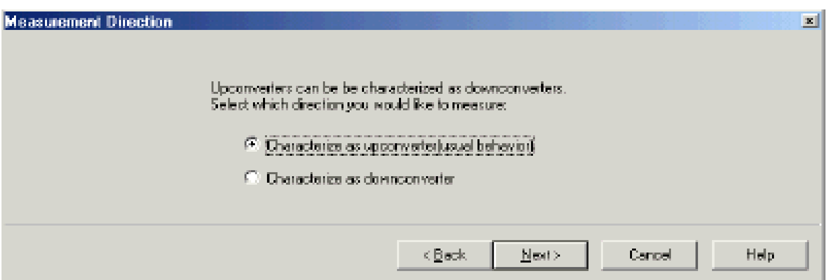
Perform Characterization (requires a reference mixer) Performs a Mixer characterization in addition to the VMC calibration. The mixer characterization file will be saved at the end for use in subsequent VMC calibrations. Choose this selection if you do NOT already have a mixer characterization file to load.

Load characterization from file Loads an S2P calibration mixer characterization file. Click **Browse** to locate the file.

- The frequency range of the S2P file MUST be the same, or larger than, the frequency range of the FCA measurement. If the S2P file frequency range is larger, or the data points do not exactly match those of the measurement, interpolation will be performed.
- The VMC calibration requires that the calibration mixer be connected in the same orientation as that in which it was characterized. The direction in which it was characterized is not part of the file that is recalled. You have to remember and connect it appropriately.

"Invalid Mixer Characterization File" is displayed if the frequency range of the S2P file is smaller that those of the measurement.

Note: A Mixer Characterization Cal can be performed separately. Learn how.



Measurement Direction dialog box help

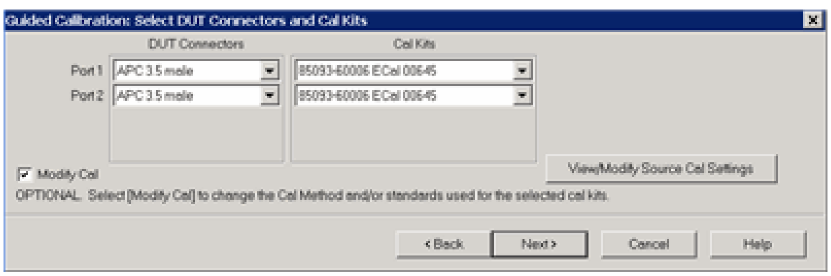
VMC and Mixer Characterization ONLY

This dialog box appears ONLY if your settings in the Mixer Setup dialog box indicate that your DUT is being tested as an upconverter (input < output). It allows you to characterize the Calibration Mixer / Filter as a downconverter (input > output) or an upconverter.

The following example shows why you would choose to characterize the calibration mixer as a downconverter. Consider a DUT being used as an upconverter. The input frequency is 70 MHz, the LO is 20 GHz, and the selected (+) output frequency is 20.07 GHz. If we chose **(-)** in the mixer setup dialog, the output frequency would be 19.93 GHz.

- **Characterize as upconverter** A very sharp cutoff filter is required to reject the undesired output of 19.93 GHz and pass the desired 20.07 GHz.
- **Characterize as downconverter** The input frequency is 20.07 GHz; the LO is 20 GHz. The sum (+) output is 40.07 GHz and the diff (-) output is 70 MHz. These are very easy to separate with a low-pass filter. The original frequencies are always used in the downconversion process, so be sure to choose a filter that will pass 70 MHz and reject 40.07 GHz.

See connection diagrams.



Select DUT Connectors and Cal Kits dialog box help

Allows you to specify the connector type of each DUT port.

The DUT port that is connected to PNA Logical Port 1.

DUT Port 1 Specify the Mixer **Input** connector type and the Cal Kit to use.

DUT Port 2 Specify the Mixer **Output** connector type and the Cal Kit to use.

Mixer Out Port (**VMC and Mixer Characterization ONLY**) Output port of the image filter that is connected to the calibration mixer. Specify the Cal Kit / standards to use for the measurement of the calibration mixer / filter combination.

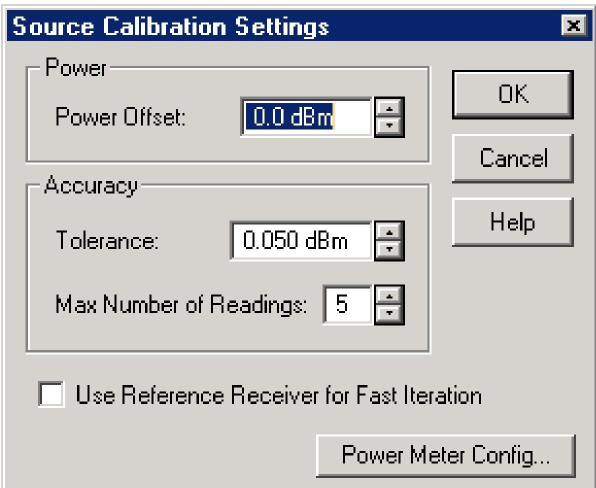
View / Modify Source Cal Settings (**SMC ONLY**) These settings allow you change ALL SMC Source Cal and Power Meter settings. Click to invoke the Source Cal Settings dialog. See how to configure two power sensors.

Note: If your DUT connectors are:

- **Waveguide** Change the system impedance to 1 ohm before performing a calibration. See Setting System Impedance.

- **Not listed** (male and female)   Select **Type A** as the connector type. Type A requires a calibration kit file containing the electrical properties of the standards used for calibration (see Calibration kits).
- **Unspecified** (like a packaged device) Select **Type B** as the connector type. Type B requires a calibration kit file containing the electrical properties of the standards used for calibration (see Calibration kits).

Modify Cal Check to invoke the Modify Cal dialog. If performing a Mixer Characterization Cal at the same time as VMC Cal, two Modify Cal dialogs will be presented, one after the other.



Source Calibration Settings dialog box help

SMC ONLY Allows you to modify the settings that are used during the Source Calibration portion of an SMC cal. These settings allow you to specify the accuracy of the Input power to the device.

Note: Be sure that the frequency range of your power sensor covers the frequency range of your measurement. This does NOT occur automatically.

Power

Power Offset Allows you to specify a gain or loss (in dB) to account for components you connect between the source and the reference plane of your measurement. For example, specify 10 dB to account for a 10 dB amplifier in the path to your DUT. Offset power is added to, or subtracted from, the power level that is set in the mixer configuration dialog box.

For information about how and when to use this setting, see SMC with a Booster Amp.

Accuracy

At each data point, power is measured using the specified Power Meter **Settling** Tolerance and adjusted, until the reading is within this Accuracy **Tolerance** or the **Max Number of Readings** has been met. The **last** power reading is plotted on the screen against the Tolerance limit lines.

Tolerance Sets the maximum desired deviation from the specified **Cal Power** level.

Max Number of Readings Sets the maximum number of readings to take at each data point for iterating the source power.

Use Reference Receiver for Fast Iteration

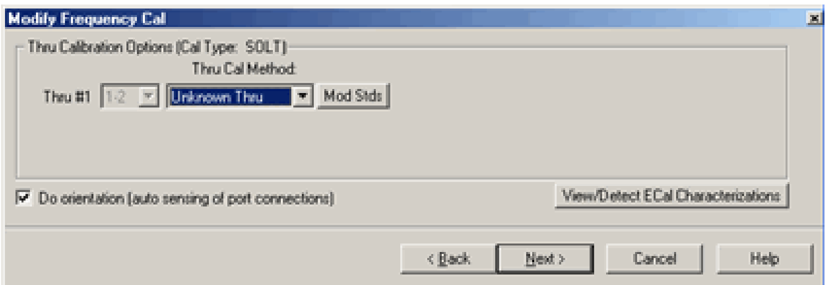
When checked, the first reading at each data point is used to calibrate the reference receiver. Subsequent readings, if necessary to meet your accuracy requirement, are measured using the reference receiver. This technique is much faster than using the power meter with almost no degradation in accuracy.

NOTE:Do NOT use the **Reference Receiver for Fast Iteration** feature if there is a component before the power sensor that exhibits non-linear behavior, such as a power amplifier in compression.

Power Meter Config Invokes the Power Meter Settings dialog box. See how to configure two power sensors.

OK Applies settings and closes dialog.

Cancel Cancels changes and closes dialog.



Modify Frequency Cal dialog box help

For SMC and VMC calibrations - NOT for Mixer Characterization.

Thru Calibration Options

Thru Cal Method For each Thru connection, choose the Thru method. Learn more about these choices.

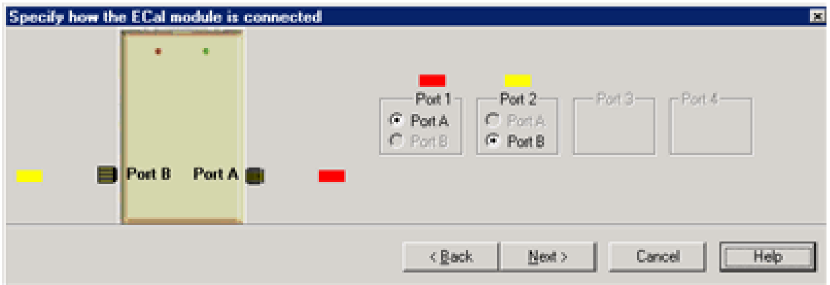
Mod Stds Click to invoke the Modify Calibration Selections dialog box.

The following selections are available ONLY if using an ECal module.

Do orientation When this box is checked (default) the PNA senses the ECal model and direction in which the ECal module port is connected to the PNA ports. If power to the ECal module is too low, it will appear as if there is no ECal module connected. If you use low power and are having this problem, clear this check box to provide the orientation manually.

Orientation occurs first at the middle of the frequency range that you are calibrating. If a signal is not detected, it tries again at the lowest frequency in the range. If you have an **E8361A** or **E836xB** PNA and do an ECal completely within 10 - 20 MHz OR 60 - 67 GHz, you may need to do orientation manually. There may not be sufficient power to orient the ECal module at those frequencies.

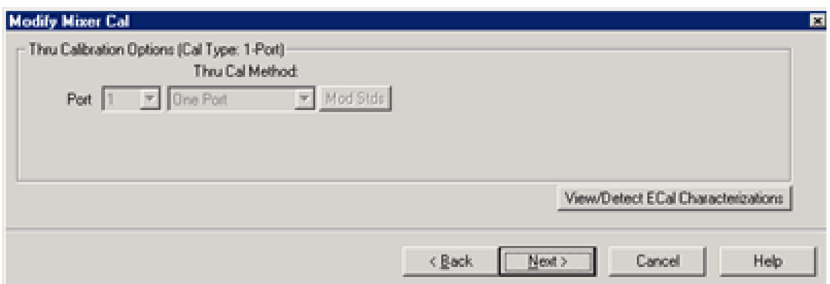
View/Detect ECal Characterizations Appears only if an ECal module is selected for use. Click to invoke the View ECal Modules and Characterizations dialog box. Displays a list of ECal modules that are connected to the PNA.



Specify how the ECal module is connected dialog box help

This dialog box appears when the **Do orientation** checkbox in the previous **Modify Frequency** dialog box is cleared.

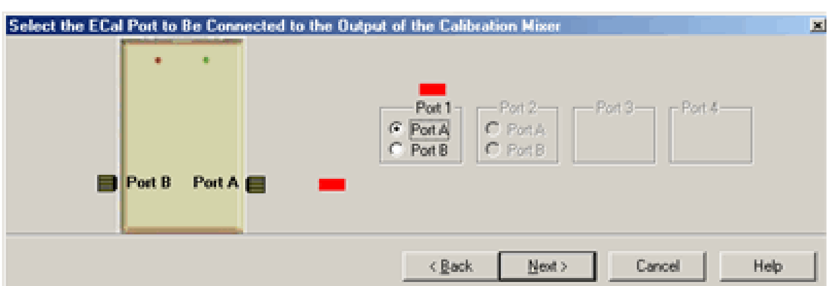
Click the ECal Port that is connected to each PNA port.



Modify Mixer Cal dialog box help

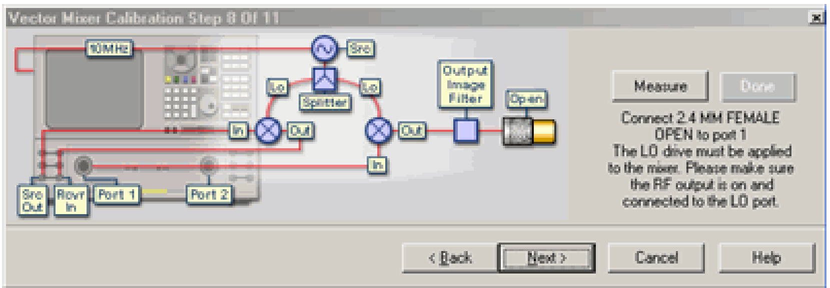
Mixer Characterization ONLY. The Thru standard is not measured. Therefore, the Thru Cal Method choices are not available.

View / Detect ECal Characterizations Available ONLY if using an ECal module. Invokes the Select ECal Module and Characterization dialog box.



Select the ECal Port to be connected to the Output of the Calibration Mixer dialog box help

Select the ECal Port to be connected to the output of the image filter of the Calibration Mixer / Filter combination. See connection diagram of Calibration Mixer / Filter combination.



Vector Mixer Cal dialog box help

VMC and Mixer Characterization

Connect the Open, Short, and Load standards to the image filter output, then click **Measure.'**

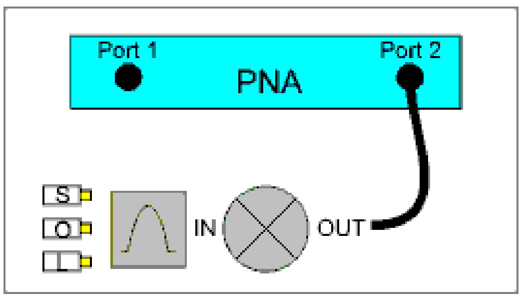
This portion of the calibration characterizes the calibration mixer.

The connection is different depending on if the calibration mixer is an upconverter being characterized as a down converter.

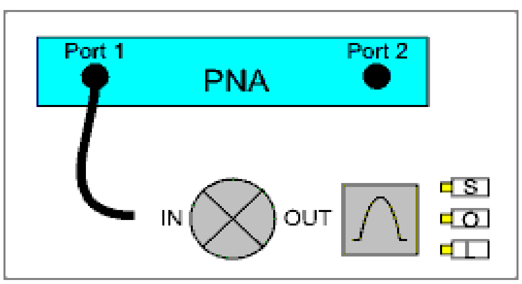
Note:

The following are **simplified** connection diagrams - the reference mixer and LO signals must also be connected.

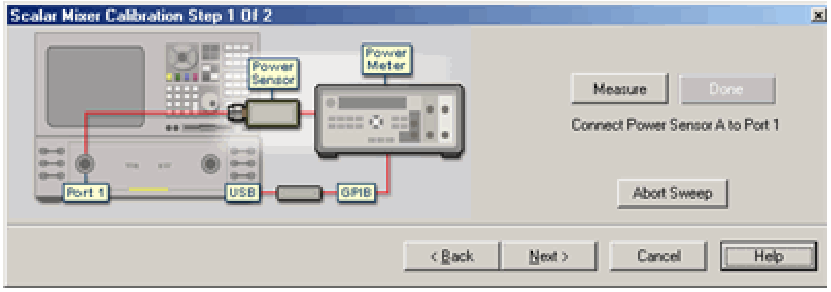
As a **Downconverter.** (The PNA automatically switches to make the S22 measurement on the device.)



As an **Upconverter**



Done Click to proceed to the Calibration Complete dialog. Available only after all measurements for the calibration are complete.



Scalar Mixer Calibration - Power Cal dialog box help.

SMC ONLY Perform the power-meter portion of the calibration.

Connect your power sensor to port 1 as shown in the diagram. Then click **Measure**.

Measure Begins the power meter measurements and then continues to the next step.

Done Click to proceed to the Calibration Complete dialog. Available only after all measurements for the calibration are complete.

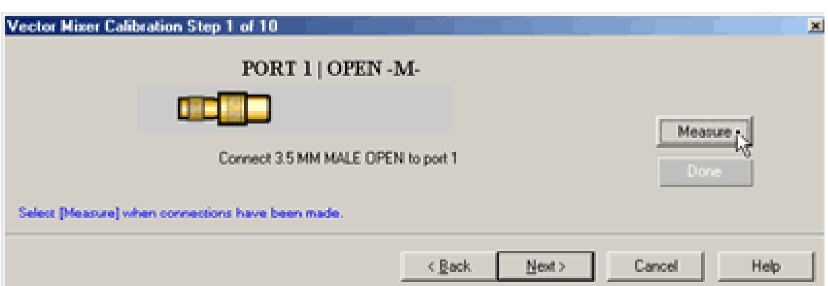
Abort Sweep Stops the power meter measurement.

Back Returns to the previous dialog box.

Next Continues to the next calibration step. Does NOT make a measurement.

Notes

- Beginning with Rev 6.0, a power meter measurement is only necessary on port 1.
- SMC calibration performs 10 averages at the beginning and at the end of the power cal step to ratio the difference between normal and offset R1 measurements in the calibration band of frequencies. The averaging is done to remove a reasonable amount of noise from the ratio measurement.
- From Source Calibration dialog you can use the Power Loss Compensation Table to compensate for an adapter used to connect the power meter sensor.
- See how to configure two power sensors.



Measure Calibration Standards dialog box help

Prompts for standards to be measured. Connect the standard, then click **Measure**.

Measure Measures the mechanical standard and continue to the next calibration step.

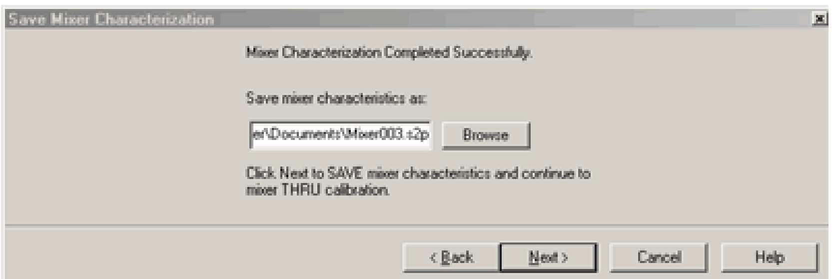
[ReMeasure] Replaces Measure after standard has been measured. Allows you to remeasure a standard.

Done Click to proceed to the Calibration Complete dialog. Available only after all measurements for the calibration are complete.

Back Returns to the previous dialog box.

Next Does NOT make a measurement. Proceeds to the next required step.

Cancel Exits the Calibration Wizard.



Save Mixer Characterization dialog box help

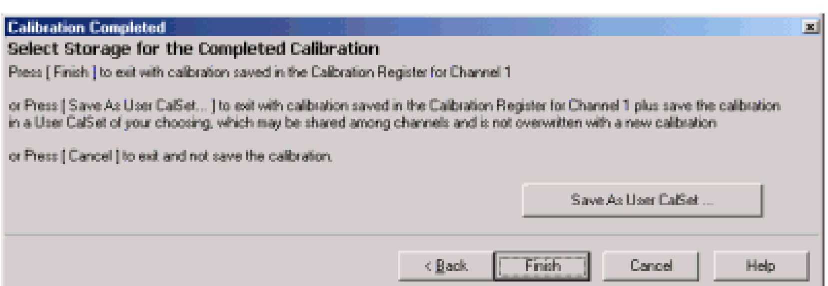
VMC ONLY

Allows you to save the characterization data of your calibration mixer. When performing another VMC calibration using the same calibration mixer, this S2P file can then be recalled.

Browse Navigate to the location where you want to save the characterization data of your calibration mixer. Either use the default file name or enter a custom file name.

Next Saves the mixer characterization file and continues with the next step in the full system calibration routine.

Finish Replaces **Next** if you are only characterizing the calibration mixer instead of performing a full system calibration. Saves the mixer characterization file and exits the mixer characterization routine.



Calibration Completed dialog box help
Finish Save to the channel's calibration register. **Save As User Cal Set** Invokes the Save as User Cal Set dialog box AND save to the channel's calibration register. **Cancel** Calibration is NOT applied or saved. Learn about Calibration Registers. Learn about User Cal Sets

Create and Apply an FCA Cal Set or SMC Cal Type

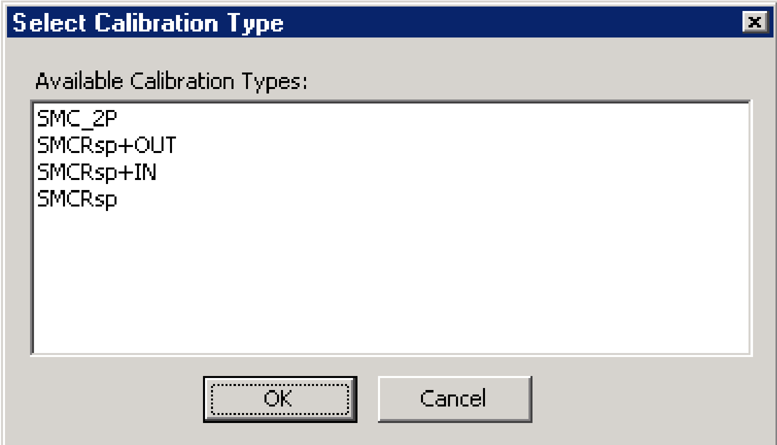
You can create an FCA measurement and apply an existing Cal Set as you can with any PNA measurement. Learn about Cal Sets. In addition, from a Cal Set, you can apply a specific SMC Cal Type to an existing SMC measurement.

Although the Cal Type selection is available for VMC, there is only one VMC Cal Type.

How to apply an SMC Cal Type

1. Create an SMC measurement
2. Calibrate or apply an existing SMC Cal Set, then...

Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Cal Type**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[Manage Cals]** 3. then **[Cal Type]**	1. Click Response 2. then **Calibration** 3. then **Manage Cals** 4. then **Cal Type**



Select Calibration Type dialog box help

Each SMC measurement requires FOUR sweeps. Three of these are hidden. If the input and output of your mixer is well-matched to the PNA, you can apply **SMCRsp** Cal Type to speed up your SMC measurements. This is most noticeable when making fixed input or fixed output measurements, which requires an external LO to sweep with the PNA.

SMC_2P: (Response + Input + Output) All four sweeps required. Most accurate.

SMCRsp: No Input or Output match. Saves two sweeps.

SMCRsp+In: No Output match. All four sweeps required.

SMCRsp+Out: No Input match. All four sweeps required.

Last modified:

6-Mar-2008	Added procedure for two sensors
30-Aug-2007	Modified 82357A text
01-Jan-2007	MX Added PNA-X UI

Configure a Mixer

- How to Start the Mixer Setup dialog box
- Learning the Mixer Setup Dialog Box
- Rules for Configuring a Mixer
- Using Power Sweep for Testing Mixers
- Input > LO Example
- Configure Swept LO Measurements
- Fractional Multiplier Examples

See Also

- How to make a VMC Measurement example
- How to make an SMC Measurement example
- Measure a DUT with an Embedded LO

Note: Please submit FCA issues that you find, as well as enhancement requests, to fca_support@agilent.com (See Known FCA Issues.)

Other Frequency Converter Application topics

How to start the Mixer Setup dialog box

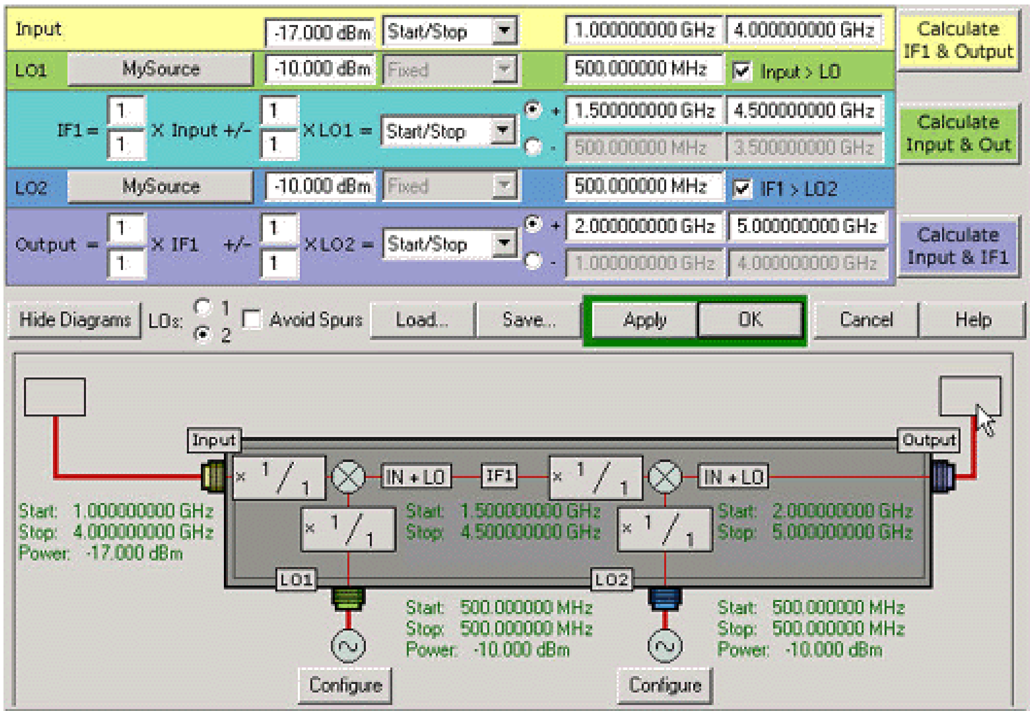
1. Create an FCA measurement. Then...

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. 	1. Click **Trace** 2. then **Measure** 3. then **Configure Mixer**

For PNA-X and 'C' models	Programming Commands
1. Press FREQ 2. then [Input, LO, or Output]	1. Click **Response** 2. then **Measure** 3. then **Configure Mixer**

Learning the Mixer Setup dialog box

Click on sections of the image to learn about a setting.



Note: This image shows two LOs.

Important Note: Connecting your DUT to the PNA using FCA:

RF and **IF** terminology is NOT used in the FCA because the PNA does not know how the DUT is labeled or how it will be used. Instead, the general terms INPUT and OUTPUT are used to describe the following PNA behavior:

- INPUT - the stimulus frequencies, BEFORE conversion by your DUT.
- OUTPUT - the response frequencies, AFTER conversion (either UP or DOWN) by your DUT. Specify UP or DOWN conversion using the + or - symbol for each output.

See Fractional Multiplier Examples (below)

Mixer Setup dialog box help

Throughout the dialog box, the Mixer / converter ports are color coded (Input, LO1, IF1, LO2, Output)

Rules for Configuring a Mixer

Red **Apply** and **OK** buttons indicate that one or more of the following settings are invalid.

1. The INPUT start frequency can NOT exceed the stop frequency.(The OUTPUT start frequency CAN exceed the stop frequency.)
2. INPUT or OUTPUT frequencies cannot be outside the range of the PNA.
3. Any combination of INPUT and LO which results in an OUTPUT that sweeps through zero Hz is NOT allowed.
4. The range for the numerator and denominator of a fractional multiplier is from +1 to +10. Negative values are NOT allowed.

Power Sets the power level of the input signal, and both LO signals.

Frequency Format Selects the format to specify the frequency information for each signal in your test setup. The Input, LO1, LO2, IF, and Output frequency information can be specified using start/stop or center/span formats. Only LO1, LO2, IF, and Output formats can be set to Fixed. When you select a swept LO, you can also select the information you want to display on the X-axis.

LO1 and LO2 Source Configuration Buttons Performs the same function as the **configuration** buttons on the lower diagram. The current source, or **Not Controlled** is displayed on the button label. Click to launch the **Select Source** dialog.

Resulting Frequencies Either sets or calculates the frequency values for each of the signals in your test setup. For example, if you enter the Input frequency range and press the Calculate button adjacent to the Input, the PNA will calculate and display the Output frequencies.

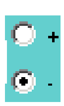
Go to the **Mixer Setup** image

Input > LO

These check boxes remove ambiguity when using the Calculate button to determine the INPUT frequency.

	Check if the **INPUT** is **GREATER THAN** the **LO** Clear if the **INPUT** is **LESS THAN** the **LO**
	Check if the **IF1** is **GREATER THAN** the **LO2** Clear if the **IF1** is **LESS THAN** the **LO2**

These boxes are only used when all 3 of the following conditions are TRUE:
(If ALL 3 are NOT true, the PNA does not read these boxes).

1. Difference (Low) sideband  is selected for the corresponding Calculate button AND
2. Output frequency is less than the LO frequency AND

3. The Green or Blue Calculate button is used to calculate the Input frequency.

To learn more, see this example.

Fractional Multiplier

The combination of (numerator / denominator) forms a fractional value that is multiplied by the input and LO frequency ranges (also the IF and LO2 frequency ranges for a test setup with two LOs). These values are used to Calculate the response frequency of the PNA receiver. Use the fractional multipliers to:

- replicate the action of harmonic mixers
- replicate the action of multipliers and dividers that may exist in your test setup
- tune the PNA receiver frequency to a harmonic of the mixer/converter

See Fractional Multiplier examples.

Go to the **Mixer Setup** image

Mixer-Product Selector Determines whether the receivers will tune to the Sum (+) or the Difference (-) of the Input and LO frequencies. Click the adjacent Calculate button after your selection.

Calculate buttons Calculates frequency information based on your other mixer settings. The mixer port settings next to the Calculate button you press remain fixed. For example, in a 1-LO scenario, specify the Input and LO frequencies, specify **+** (sum), then click the **Calculate** button next to the Input. The input remains fixed and the output frequency range is calculated for you.

Hide / Show Diagrams Hides and displays the test setup diagram. Your measurement trace is displayed when the diagram is hidden.

LOs Click **1** or **2** to select the number of LO sources in your test setup. When you select 2 LOs, the IF1 frequencies are set for you. You can also measure devices with an Embedded LO.

Avoid Spurs Check to invoke the Avoid Spurs feature.

Load Loads a previously-configured mixer attributes file (.mxr).

Note: A .mxr file includes an LO source name. However, It does NOT include the LO Source configuration. Therefore, when using a .mxr file that was created on a different PNA, the PNA will display an error if does not find the LO Source configuration using EXACTLY the same LO source name.

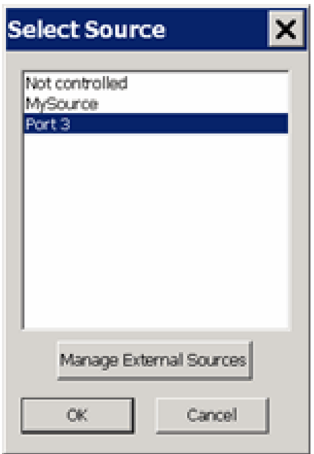
Save Saves the settings for your mixer/converter test setup to a mixer attributes file (.mxr).

Apply Applies the settings for your mixer/converter test setup to the measurement. The mixer setup dialog box remains OPEN. If shaded red, see rules.
OK Applies the settings for your mixer/converter test setup to the measurement. The mixer setup dialog box CLOSES. If shaded red, see rules.

Cancel Closes the mixer setup dialog box and does NOT apply the settings.

Frequency Diagram: Provides a display of the frequency information for the signals in the test setup.

Go to the **Mixer Setup** image



Select Source dialog box help

This dialog is launched when clicking the Mixer Setup **LO1 or LO2** button.

Click one of the following to select a source for LO control:

- An existing External Source setup. Calibrate the source using a standard Source Power Cal.
- A port number to use an internal second source
- **Not controlled** the PNA will not attempt communication to control a source for the LO.
- **Manage External Sources** button to launch the External Source Configuration dialog.

Note: VMC measurements using a PNA-X with Internal Second Source

Source 2 is automatically configured to supply power to BOTH available ports simultaneously. This setting can NOT be changed.

In addition, power can be uncoupled to provide different power levels at each port This feature allows power to be delivered to both the DUT LO and Reference Mixer LO without use of a splitter. See VMC setup.

Using Power Sweep for Testing Mixers

To measure the gain compression of a mixer, you need to sweep the input power to the mixer. The input and output frequencies are fixed but offset from one another. To set Power Sweep and the input and output frequencies of the mixer under test:

1. On the mixer dialog box, set the LO frequency, identical input start and stop frequencies, and identical output start and stop frequencies. These selections create fixed input and output frequencies.
2. On the PNA menu, click **Sweep**, then **Sweep Type**. Select **Power Sweep**. Do NOT change the CW

frequency on the Power Sweep dialog box. The mixer dialog box settings will not be automatically updated.

For more information, see Conversion Compression.

Input > LO Example

For the following single stage mixer:

- Output = 2 GHz
- LO = 3 GHz
- Diff (-) selected

Clicking **Calculate Input** could yield two Input frequencies:

Formula for **Diff**:

Input - LO = Output

Substitute our example values in the formula:

Input - 3GHz = 2 GHz

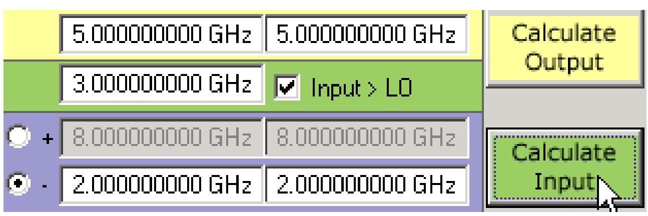
Solving the formula can yield either:

Input = 5 GHz

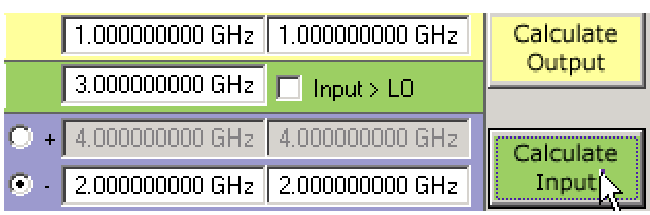
OR

Input = 1 GHz

(Although 1-3 = - 2 GHz, the analyzer displays the absolute value of the frequency.)



Check - use the Input frequency (5 GHz) that is greater than LO (3 GHz)



Clear - use the Input frequency (1 GHz) that is less than LO (3 GHz)

Configure Swept LO Measurements

Note: With a corrected VC21Swept LO measurement, the phase data is displayed relative to the phase of the calibration mixer that was used during the VMC calibration. In addition, Group delay display format is NOT valid.

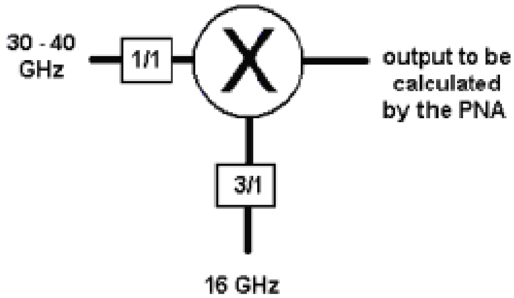
See Examples of Fixed Output Measurements

- SMC
- VMC

Fractional Multiplier Examples

Example 1

Use the LO fractional multiplier to replicate the action of the third-harmonic mixer so the PNA can accurately calculate the receiver frequency. The input and LO frequencies are known.



Enter these settings in the **Mixer Setup** dialog box:

- **Input Start Freq: 30 GHz**
- **Input Stop Freq: 40 GHz**
- **LO Fixed Freq: 16 GHz**
- Mixer-Product Selector: - (difference)
- LOs: 1
- LO fractional multiplier: 3/1
- INPUT fractional multiplier: 1/1

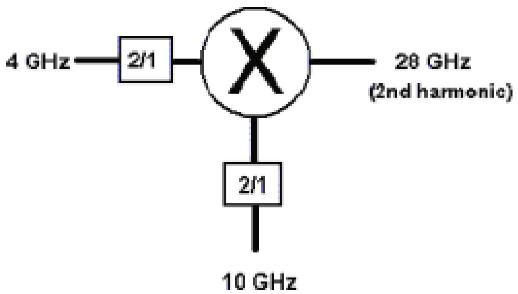
Click **Calculate Output**

Results:

- **Output Start Freq: 18 GHz**
- **Output Stop Freq: 8 GHz**

Example 2

Use the fractional multipliers to tune the PNA receiver frequency to the second harmonic of the mixer's 14 GHz fundamental output. The input, LO, and output frequencies are known.



Enter these settings in the **Mixer Setup** dialog box:

- **Input Start Freq: 4 GHz**
- **Input Stop Freq: 4 GHz**
- **LO Fixed Freq: 10 GHz**
- Mixer-Product Selector: + (Sum) of the input and LO signals
- LOs: 1
- INPUT fractional multiplier = 2/1
- LO fractional multiplier = 2/1

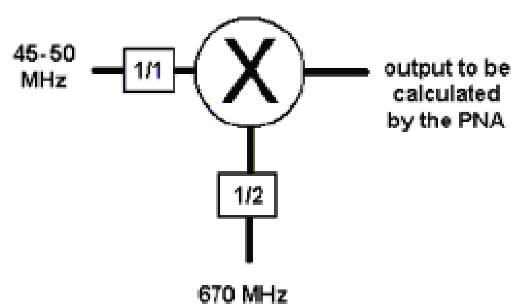
Click **Calculate Output**

Results:

- **Output Start Freq: 28 GHz**
- **Output Stop Freq: 28 GHz**

Example 3

Use the LO fractional multiplier to replicate the action of the divide-by-two mechanism inside the mixer package. Having done this, the PNA can accurately calculate the receiver frequency. The input and LO frequencies are known.



Enter these settings in the **Mixer Setup** dialog box:

- **Input Start Freq: 45 MHz**
- **Input Stop Freq: 50 MHz**
- **LO Fixed Freq: 670 MHz**
- Mixer-Product Selector: **+** (Sum) of the input and LO signals
- LOs: 1
- INPUT fractional multiplier = 1/1
- LO fractional multiplier = 1/2

Click **Calculate Output**

Results:

- **Output Start Freq: 380 MHz**
- **Output Stop Freq: 385 MHz**

Last Modified:

20-Apr-2007	MX Updated for internal second source

Configure an External Source

Beginning with PNA Rev. 7.22 , an external source can be configured and controlled by the PNA for all FOM (opt 080), FCA (opt 083), or Millimeter Wave (opt H11) measurements. Without one of these options you must control an external source manually.

Also, the External Source Control feature only supports List-sweep mode, which a PSG limits to 1601 points. Manual source control supports Step-sweep mode, in which a PSG allows up to 65,535 points.

See Synchronize an External Source for help with manual source control,

After a one-time Configuration of an External Source , it must be selected for each measurement using the Select Sources dialog .

In this topic:

- **How to Select an External Source**
- **How to Connect an External Source to the PNA**
- **How to Configure an External Source**
    - **Add New Source**

See Also the following examples:

- How to make a VMC Measurement
- How to make an SMC Measurement

Beginning with PNA Rev 7.5...

- Generic (Non-Agilent) sources are not supported with this release.
- With an external source selected, the PNA **WILL** now allow an S-parameter measurement to be made at the same time as an FCA measurement.
- All External Sources, including those used for FCA LO, are now calibrated by doing a standard Source Power Calibration .
- FCA external sources are now selected and managed using the standard dialogs shown in this topic.

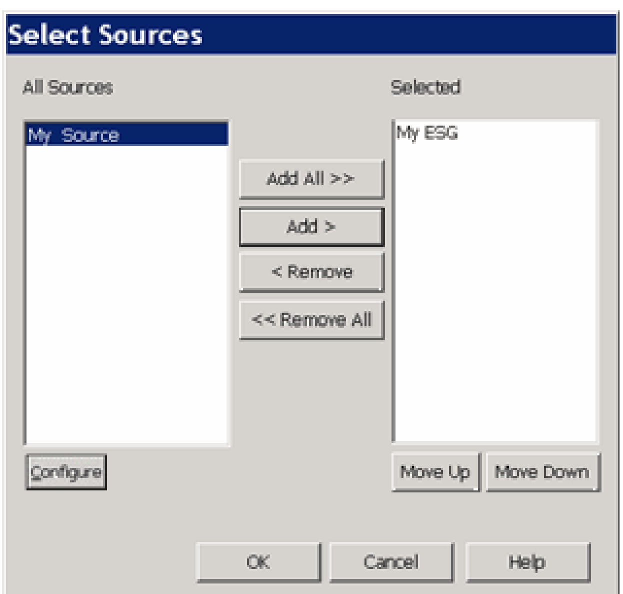
How to Select an External Source

For an FCA measurement

1. In the Configure Mixer dialog box, click the LO 'Control' button
2. In the Select Source dialog, click **Select External Sources** to launch the Select Sources dialog.

For all other FOM (opt 080) measurements, do the following:

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	See Remotely Specifying a Source Port
1. Navigate using **MENU/DIALOG**	1. Click **System** 2. then **Configure** 3. then **Select External Source**
For PNA-X and 'C' models	See Remotely Specifying a Source Port
1. Press **SYSTEM** 2. then **[Configure]** 3. then **[Select External Source]**	1. Click **Utility** 2. then **System** 3. then **Configure** 4. then **Select External Source**



Select Sources dialog box help

See What's new with External Source Control with PNA Rev. 7.5.

For FOM (Opt 080) measurements, once you select an external source from this dialog box, it becomes available from the following PNA dialog boxes as if it were an internal PNA source:

- FOM (turn **ON** and set freq, power)
- Power (set power level)
- Source Power Cal (Calibrate the external source)
- New / Change Trace (set source port for a measurement)

A ll Sources The sources that are currently configured appear in this list. There is no limit to the number of sources that can be selected.

- Click **Add All>>** to move all sources to the Selected list.
- Click a source name, then click **Add>** to add that source to the Selected list.

Configure Click to launch the Configure External Source dialog to add a source to the list.

Selected The sources that are currently selected.

- Click **<Remove All** to un-select all sources.
- Click a source name, then click **<Remove** to un-select that source.

Move Up and Down Changes the order of the sources in the list. The order indicates the order that the sources appear in the FOM, Power, Source Power Cal, and New / Change Trace dialog boxes.

Important Notes

- All newly selected or reordered sources are preset, with source power OFF. Source power must be turned ON in the Power dialog . Frequency Offset must be enabled in the FOM dialog .
- When reordering a list of sources using Move Up / Down, any existing PNA frequency and power settings for those sources will be preset and must be reentered.
- When daisy-chaining multiple sources in Hardware List triggering , the source to receive the Trigger signal from the PNA must be the first source listed in the **Selected** column of this dialog.
- The PNA controls the triggering of an external source. Therefore, PNA triggering must be set to Internal , not External.
- Your source selections remain until you recall an instrument state with different selections, or perform a factory preset.
- Communication with the selected sources is checked when **OK** is pressed. Make sure that the source is turned ON and the GPIB address in the configure dialog is accurate.

- If communication with a source is broken after the dialog box is closed, a message appears and channel triggering is put in Hold mode.
- The same source can NOT be used more than once in the same channel.

How to Connect an External Source to the PNA

1. GPIB or LAN, use one of the following methods:

   - The Agilent 82357A USB/GPIB Interface .
   - Dedicated Controller and Talker/Listener GPIB ports .
   - **USB** or **LAN using Visa Alias** . Both of these interfaces are configured using Agilent ACE (IO libraries) which is installed on the PNA.

     1. In ACE, click 

     2. Select **LAN (TCPIP0)** or **USB0** , then click **OK.**
     3. Click, then enter the **IP address** of the external source.
     4. Click **Test Connection** to verify communication.
     5. Click **OK** .
     6. In the list of connected instruments, right click the external source, then **Add VISA Alias** .
     7. Enter the same PNA source name that was, or will be, used in the **Add New Source** dialog.

   - The standard GPIB Interface (One GPIB port) - with the following limitations:

     - The PNA cannot be controlled remotely as talker / listener over GPIB. First put the PNA in System Controller mode. Learn how.
     - If this method does not work initially, first close, then restart the PNA application, then put the PNA in System Controller mode , then click **Controlled** on this dialog box. This should resolve any GPIB hang-up issues with the external source.

2. External sources should always share the same 10 MHz Reference signal as the PNA. Connect a BNC cable from the PNA 10 MHz Ref Output to the External Source Input.
3. See Hardware List Triggering Connections

How to Configure an External Source

For an FCA measurement :

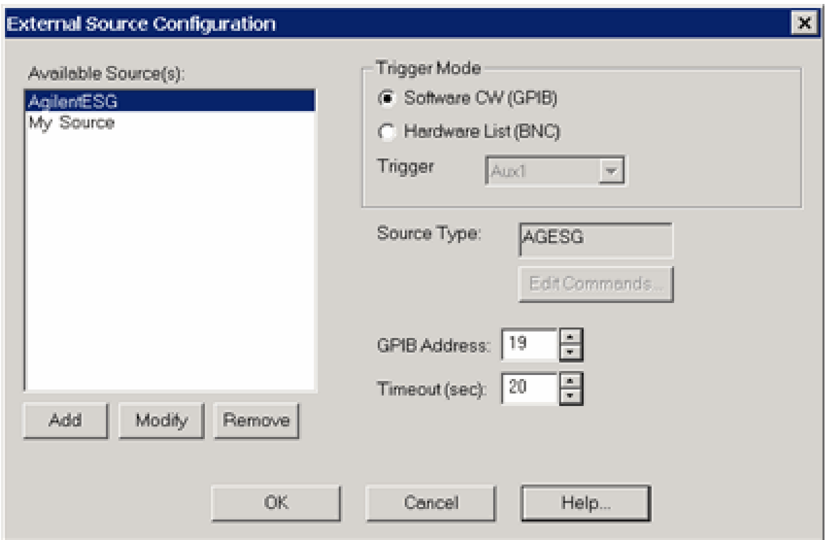
- In the Configure Mixer dialog box, click **LO Control** **OR**
- In the Select Source dialog, click **Manage External Sources**

For all other measurements:

- Click **Configure** from the Select Sources dialog **OR**
- As follows:

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	See Remotely Specifying a Source Port
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Configure** 3. then **External Source Config**
For PNA-X and 'C' models	See Remotely Specifying a Source Port
1. Press SYSTEM 2. then **[Configure]** 3. then **[External Source Config]**	1. Click **Trace/Chan** 2. then **Channel** 3. then **Hardware Setup** 4. then **External Source Config**

Note: If an **External Source Not Found** error occurs, the Agilent I/O Library may no longer be running. To check, look in the Windows task bar of the PNA for the **IO** icon. If not present, restart the IO library. Click Start, Programs, Agilent I/O Libraries, IO Control.



External Source Configuration dialog box help

This dialog box is used to perform a one-time configuration of an external source.

All External Sources, including those used for an FCA LO, are calibrated by doing a standard Source Power Calibration .

Available Sources

Lists the sources that have been previously configured.

Add Displays the Add New Source dialog box . Type a **unique** source name.

Modify Makes changes to the selected source. Launches Modify Source dialog, exactly like Add New Source .

Remove Removes an external source from your setup.

Trigger Mode ONLY used when the external source is stepped, as with FCA swept LO measurements.

Notes

- **MM Wave Test Heads:** The PNA trigger settings are automatically configured and must not be changed.
- The PNA automatically controls triggering of the external source. PNA triggering can be set to Internal, Manual, or External. When set to External, the trigger signal must come through a PNA rear panel connector that is not being used to trigger the external source.
- See SCPI and COM examples of an SMC fixed output measurement.
- For more information, see:
  - Speeding Up Fixed Output SMC Measurements
  - PNA Trigger model

Software CW (GPIB) Slowest method.

- The external source receives the CW frequency and trigger signal from the PNA over GPIB.
- Used with ALL sources, including generic (not listed), and Agilent 837X sources.

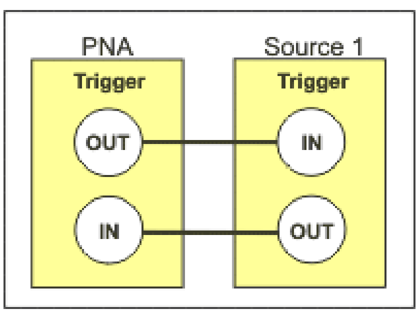
Hardware List (BNC) Fastest method.

Note: If the number of data points used in the measurement exceeds the capability of the external source, the PNA automatically switches to Software CW (GPIB) trigger mode. This will slow the measurement significantly.

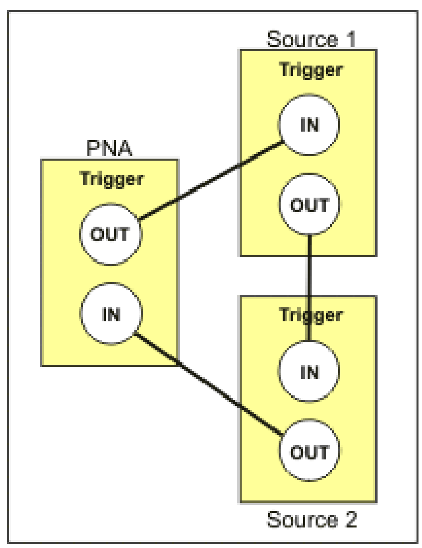
Trigger Select the PNA rear panel connector to be used for triggering.

- The external source receives a list of CW frequencies from the PNA, then receives BNC trigger signals as required from the PNA.
- Used with ALL except generic (not listed) sources.
- **MM Wave Test Heads:** Hardware List mode is ALWAYS used.
- The sources must be connected as follows:
  - **PNA-X models:** Connect multiple sources using the following daisy-chain, or directly using Aux1 or Aux2. See rear panel Aux connectors
  - **E836x and PNA-L models** - Use rear-panel BNC Trigger connectors as follows:

1 External Source



Daisy-chain 2 External Sources



Note: Source 1, which receives the trigger out of the PNA, must be listed first on the Select Sources dialog box.

Source Type

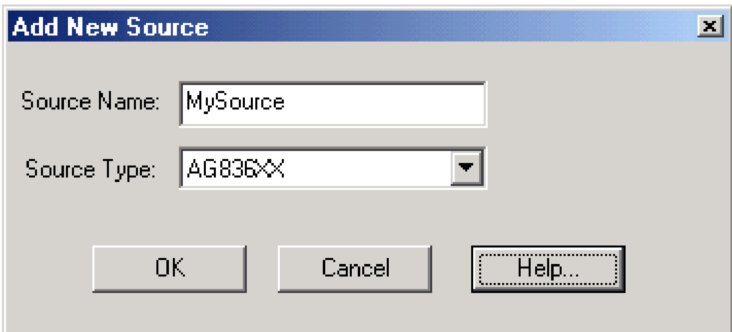
Shows the model number of the external source that is selected in the displayed list.

Edit Commands Only available with generic (non-Agilent) sources. Not available in the A.07.50 release.

GPIB Address Sets the GPIB address of the selected external source.

Timeout (sec) Sets a time limit for the source to make contact with the PNA. If this time limit is exceeded, the PNA stops the measurement procedure and displays a diagnostic-type error message. If this occurs, check the connections of your PNA and source.

Use the standard Source Power Calibration to calibrate the external source.



Add / Modify New Source dialog box help

Allows you to add or modify an external source. The new or modified source appears in the list of sources displayed in the External Source Configuration dialog box .

Source Name Enter a unique name for your source.

Note: If you enter a source name that existed since that last PNA Shutdown, the old Source Type will be remembered and displayed on the External Source dialog. Either use a new name, or delete the old name, then restart the PNA application before re-entering the name.

Source Type Select a source type from the scrolling list.

Generic (Non-Agilent) sources are not supported.

Last Modified:

11-Feb-2008	Added limitation note at top
23-Jan-2008	Added Selected ordering notes
5-Nov-2007	Added links for remote selection
18-Jul-2007	Edited for FCA LO Cal changes
30-Apr-2007	MX Modified for ALL external source config.

How to make a VMC Fixed Output Measurement

The following is a step-by-step example illustrating how to measure a mixer in swept LO mode using FCA Vector Mixer Calibration.

There are fewer components required for SMC as compared to VMC, and fewer measurement steps. Therefore, if you do NOT need to make relative phase measurements, SMC is an easier measurement. Also, ONLY SMC (not VMC) can measure the reverse conversion loss of the mixer.

This procedure can also be used for making **fixed** LO measurements, which is quite similar. Although the external source is still required, the physical triggering cables that connect the PNA and External Source are not required.

Required Equipment

- N5242A (PNA-X), E8362B, E8363B, E8364B or E8361A PNA series network analyzer
    - with option 083 (FCA)
    - with PNA Rev 6.03 or greater
- GPIB External Source (Agilent ESG or PSG works best) **
- Reference Mixer (see requirements)
- Calibration Mixer/Filter (see requirements)
- Power splitter **
- ECal module with connectors that match the Input and Output connectors of the DUT. You can use adapters to make the ECal module match the DUT connectors, but first perform an ECal user-characterization with the adapters attached. ECal makes the FCA calibration much easier.
- Cables and adapters
- **Optional** GPIB Power meter and sensor (for LO power calibration)

** Not necessary when using PNA-X with Internal Second source

The example mixer

The example device is a mixer with the following characteristics:

- LO and Input Frequency Range: 2 GHz to 4.2 GHz
- Output Frequency Range: DC to 1.3 GHz

We will measure:

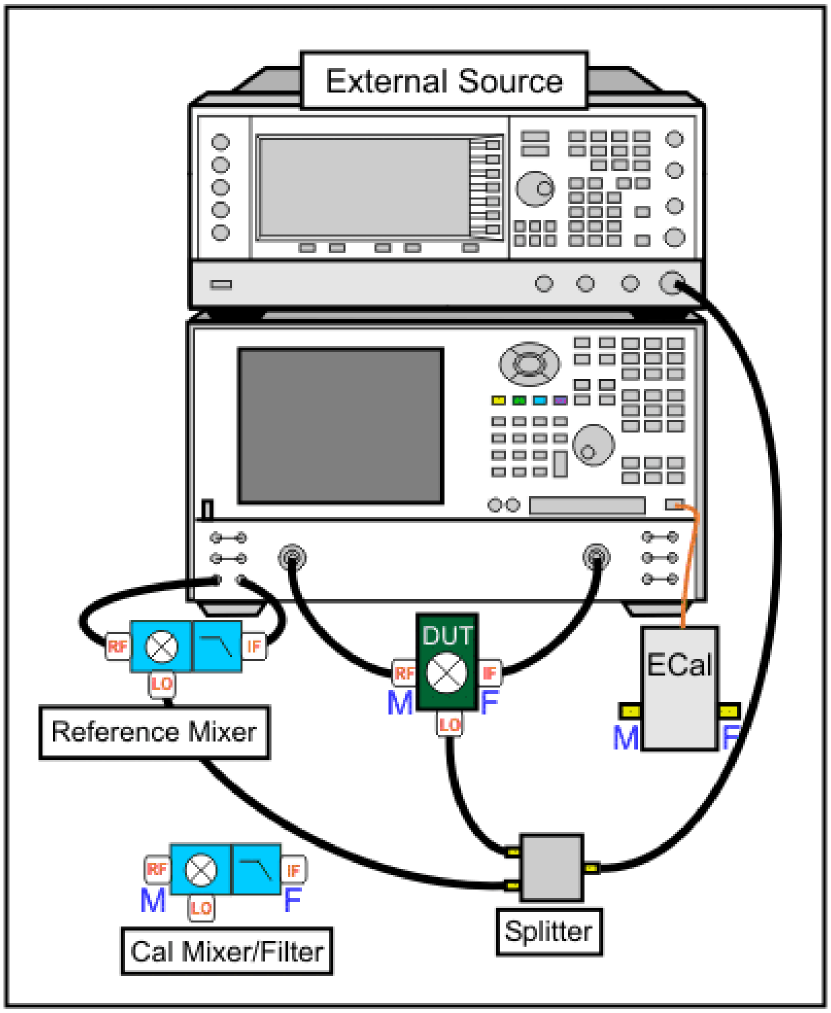
- Fwd Conversion Loss (VC21)
- Input match (S11)

- Output match (S22)
- Rev Conversion Loss is NOT possible because of the reference mixer.

VMC Setup

Connect the devices as shown in the following diagram:

Note: This setup can also be used for SMC measurements, allowing you to make VMC and SMC measurements simultaneously on separate channels. The Reference Mixer is automatically switched during SMC measurements. The Cal Mixer/Filter is not used.

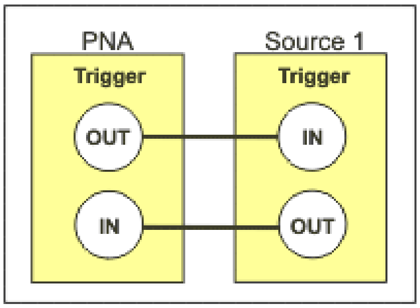


Notes:

- When using a PNA-X with Internal Second Source, the external source is NOT necessary.
  - See note regarding LO power out both second source ports
  - Learn which PNA ports can be used for the LO.
- The low-pass filter on the output of the Reference Mixer is recommended, but NOT required. Learn more.

Make Connections on the Instrument rear panels:

1. Connect the PNA and Source using two GPIB cables. A USB to GPIB adapter can also be used if you need to control the PNA from a remote PC.
2. Using a BNC cable, connect the Source **10 MHz Reference Output** to the PNA **10 MHz Reference Input**.
3. Using two BNC cables, connect the Source and PNA Trigger connectors as shown in the following image. This is not necessary when making fixed LO measurements.



Create the Measurement

For this document:

- Front-panel hardkeys are formatted as "Press ***Trace"***
- Menus are formatted as "Click **System"**

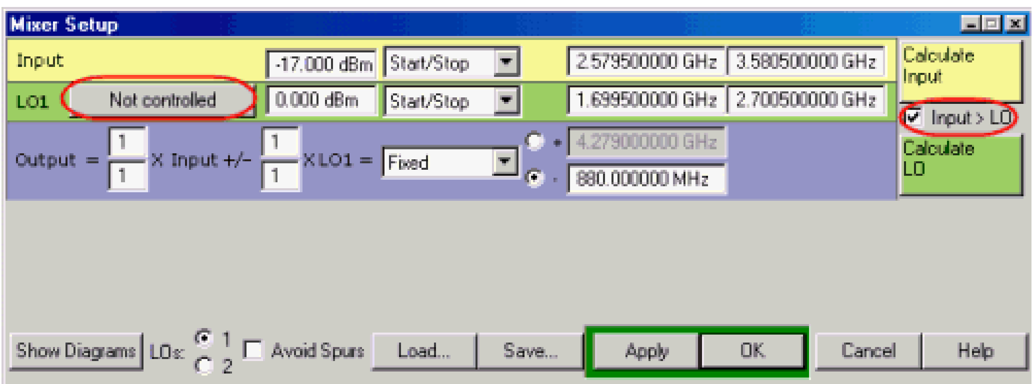
1. Connect the DUT.
2. On the PNA, click **System**, then point to **Configure**, then click **SICL/GPIB/SICL**. On the **SICL/GPIB/SICL** dialog, click **System Controller**. This allows the PNA to control the Source and Power Meter.
3. On the Source, note the GPIB address.
4. Press ***Preset*** to make sure you are starting with a known state.
5. Press ***Trace***, then ***Delete*** to delete the default trace.
6. Press ***Application*** to create a new FCA measurement.
7. Under **Choose an application**, select **Vector Mixer/Converter.**
8. Under **Select measurement parameter**, select **VC21**.
9. Click **OK.**

Configure the Mixer settings

1. Press ***Measure Setups***, then **Mixer**
2. Enter the Mixer setup values as shown in the image below.

   Notes:

   - Rather than enter ALL of the frequency settings, you can enter the Input and the Output frequencies, then click **Calculate LO**.
   - If **Input>LO** is NOT checked, the PNA assumes you want the Input < LO frequencies, and higher LO frequencies are calculated as a result.
   - The <Controlled> LO power level setting specifies the power out of the external source (not at the DUT) unless an LO power cal is performed.
   - The Avoid Spurs feature is useful for eliminating spurs in test setups with excessive LO leakage.
   - When the settings are valid, the background color around the **Apply** and **OK** buttons changes from Red to Green.

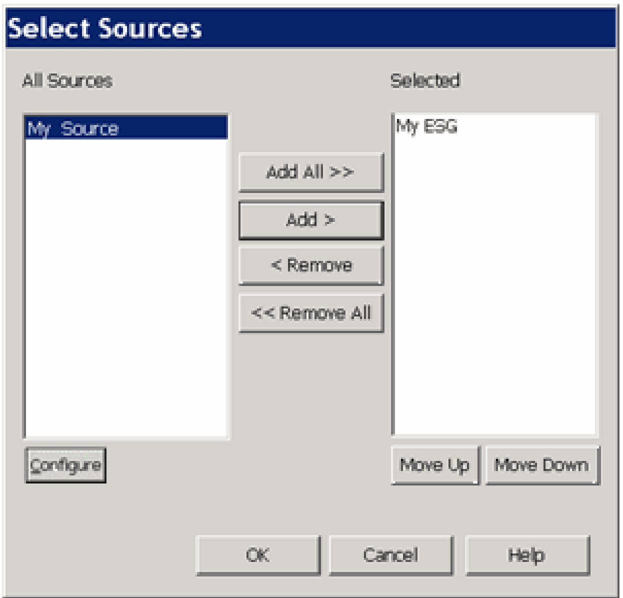


Configure the External LO Source

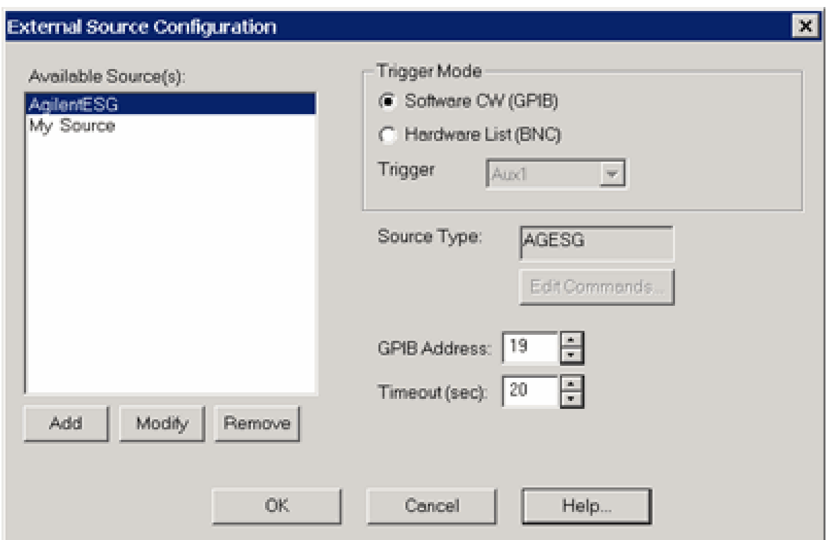
When using a PNA-X with Internal Second Source, the external source is NOT necessary.

- [See note regarding LO power out both second source ports]
- [Learn which PNA ports can be used for the LO.]

1. Click **Not Controlled** to set up the External LO source. The following dialog appears:

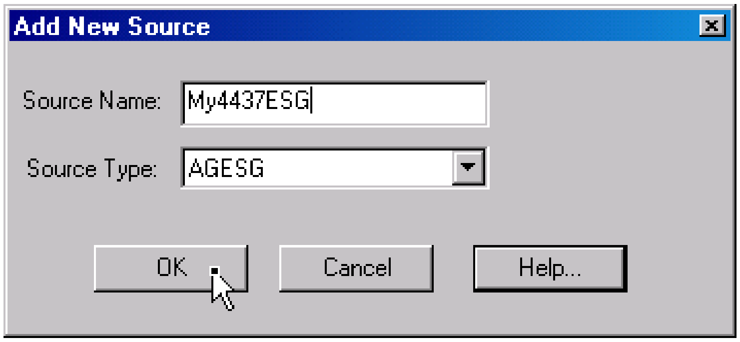


2. Select a configured source from the **All Sources** column and click **Add**. If no sources appear, then click **Configure**. The following dialog appears:

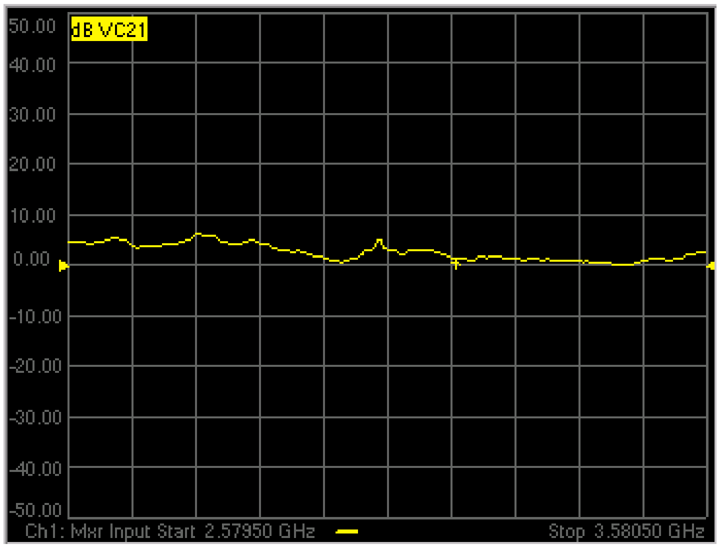


Depending on the model of your source, this is what it looks like AFTER entering the settings.

3. Click **Add**, to add a source.



4. In the Add New Source dialog, type an identifying Source Name, such as the model of your source. In Source Type, select the model of source you are using. Then click **OK**.
5. Back in the External Source Configuration dialog, click **Controlled**, to tell the PNA to assume control of the source.
6. Click **Hardware List (BNC)**, which is the fastest measurement method. This method requires the BNC Trigger cables that connect the PNA and source. If not available, **Software CW** can be used, but measurements are much slower.
7. If necessary, change the GPIB Address to match that of the source. This is NOT automatically detected.
8. Click **OK** to return to the Mixer Setup dialog. The Not Controlled should now read **Controlled.**
9. Save the mixer settings in a file so you can recall them easily. Click **Save…**, then type a descriptive filename, such as "FixedOutputMixer".
10. Click **OK** to close the Mixer Setup dialog. If there is a problem communicating with the source, the PNA will display an error here. See Problems?
11. The two traces should begin to sweep, as the external source steps in frequency. It should look something like this:



Because of the reference mixer, the uncorrected VMC measurement can look like it has gain.

Problems?

Not sweeping:

- On the PNA, press ***Sweep***, then ***Trigger***, then ***Continuous*** to start the PNA sweeping. Watch for error messages on the PNA and source.

Problems communicating with the source:

- Press ***Measure Setup***, then ***Mixer*** to start the Mixer setup dialog. Click **Software CW trigger**, then close the dialog. Perform the previous statement to start sweeping. If this works, then something is wrong with **Hardware (BNC)**. Check the trigger cables on the rear panel.
- As a last resort, try rebooting the PNA. First, save the entire setup to a .csa file. When the PNA preset measurement appears, recall the .csa file to resume at this step.

If the source is sweeping, and the PNA Input is sweeping, but there is still no output.

- Check power levels at the LO and Input.
- Check the DUT by making a fixed LO measurement - much easier.

Perform a VMC Calibration

Note: Optionally perform a Source Power Cal before the VMC Cal to specify the LO Power at the DUT. This requires a power meter be connected to the GPIB.

1. Disconnect the DUT.
2. Connect the ECal module to a PNA USB port.
3. Click **Calibration**, then **Calibration Wizard**. Because the VC21 measurement is active, the Cal Wizard automatically begins a VMC Calibration.
4. At the **Calibration Setup** dialog, click **Next**.
5. At the **Calibration Mixer Characterization** dialog, click **Next**. We will perform characterization of the Calibration mixer as part of the VMC cal. Later we will save the Calibration mixer characterization so that, in future VMC calibrations that use this same frequency range, we can recall the Calibration mixer characterization by clicking **Load Characterization from file**.
6. At the **Select DUT Connectors and Cal Kits** dialog, for **DUT Port 1** select the connector type and gender of your DUT INPUT. For **DUT Port 2** select the connector type and gender of your DUT **OUTPUT**. Then select ECal as the Cal Kit to use for each connector. Click **Next**.
7. At the **Select the ECal Port to be Connected** dialog, ensure that **Port A** is selected for **Port 1**, then click **Next**.
8. At the **Vector Mixer Calibration Step 1 of 3** dialog, connect the ECal module Port A to the Port 1 cable, and

Port B to the Port 2 cable. Then click **Measure**. This portion of the calibration gathers the linear (non-frequency-translating) error terms of the test setup at the input and output frequencies.

9. At the **Vector Mixer Calibration Step 2 of 3** dialog, connect the following, then click **Measure.** This portion of the calibration will connect reflection standards to characterize the S-parameters of the calibration mixer/filter.

   - Port 1 cable to the Input of the calibration mixer.
   - LO cable to the LO port of the calibration mixer.
   - ECal module to the Output of the calibration mixer/filter.

10. At the **Vector Mixer Calibration Step 3 of 3** dialog, disconnect the ECal module and connect the Port 2 cable to the output of the calibration mixer/filter, then click **Measure**. This step completes the calibration using the characterized mixer/filter as a Thru standard.
11. At the **Save Mixer Characterization** dialog, click **Browse**, then type a unique filename and click **OK**. Then click **Next**. This saves the Calibration Mixer characterization to an S2P file. This file can be recalled for subsequent VMC calibrations.
12. At the **Calibration completed** dialog, you can choose to save the VMC calibration as a User Cal Set. Otherwise, click **Finish** to complete the VMC calibration. Correction is turned ON and applied to the VMC trace that we set up earlier.

What is happening?

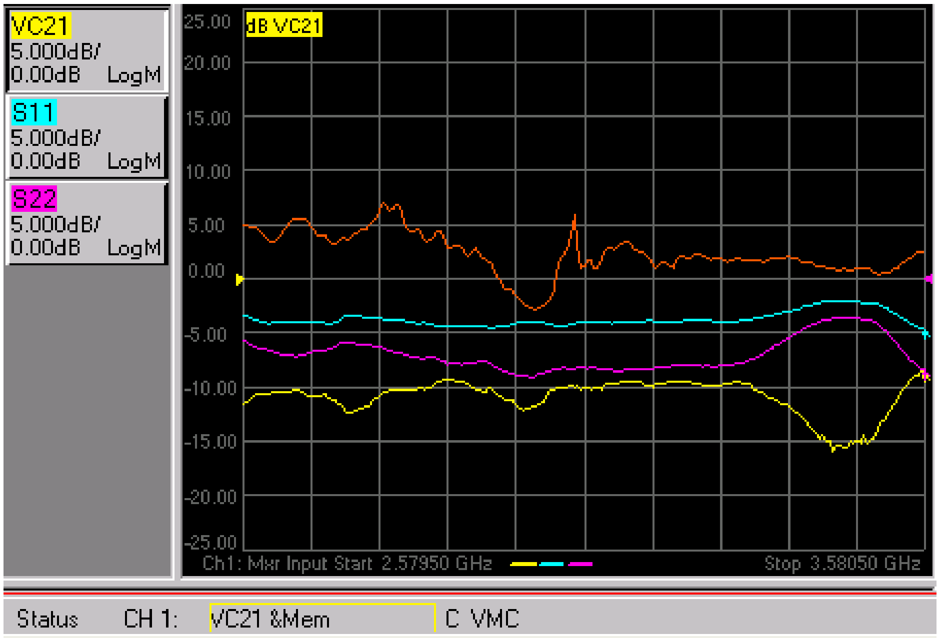
Because Fixed Output or Fixed Input FCA measurements require an external source to sweep, the measurements are much slower. When correction is ON, you will see that there are times when nothing is happening on the screen. This is because there are background measurements being made but not displayed.

This is exactly the same as when full 2-port correction is applied to an S-parameter. All four parameters are measured, then correction is applied, then all four measurements are updated. This occurs much faster when there is no external source. With a VMC measurement, there is no VC12 (reverse transmission measurement), so there are only three background measurements. With correction OFF, the traces are updated as the data is measured. You can see this taking place by creating the following measurements.

Create S11 Input and S22 Output Match

1. Press ***Trace***, then ***Application***. Click **S11** and **S22**, then click **OK** to add these measurements to the same channel.
2. While the source is sweeping, watch the source port indicator on the front of the PNA. First, the port 1 indicator will light for two sweeps, then the port 2 indicator will light for 1 sweep while all 3 traces update.
3. Turn correction OFF for ALL measurements. Notice that the relevant traces will update as the sweep is occurring.

The following image shows the corrected Conversion Loss (VC21), Input Match (S11), Output Match (S22) and the uncorrected Conversion Loss (VC21), which is a memory trace.


VC21
5.000dB/
0.00dB LogM
S11
5.000dB/
0.00dB LogM
S22
5.000dB/
0.00dB LogM
dB VC21
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
Ch1: Mxr Input Start 2.57950 GHz
Stop 3.58050 GHz
Status CH 1: VC21 &Mem C VMC

How to make an SMC Fixed Output Measurement

The following is a step-by-step example illustrating how to measure a mixer in swept LO mode using FCA Scalar Mixer Calibration.

There are fewer components required for SMC as compared to VMC, and fewer measurement steps. Therefore, if you don't need to make relative phase measurements, SMC is an easier measurement. Also, ONLY SMC (not VMC) can measure the reverse conversion loss of the mixer.

This procedure can also be used for making **fixed** LO measurements, which is quite similar. Although the external source is still required, the physical triggering cables that connect the PNA and External Source are not required.

Required Equipment

- E8362B, E8363B, E8364B or E8361A PNA series network analyzer
  - with option 083 (FCA)
  - with PNA Rev. 6.03 or greater
- GPIB External Source (Agilent ESG or PSG works best)
- ECal module with connectors that match the Input and Output connectors of the DUT. You can use adapters to make the ECal module match the DUT connectors, but first perform an ECal user-characterization with the adapters attached. ECal makes the FCA calibration much easier.
- GPIB Power meter and sensor
- Cables and adapters

The example mixer

The example device is a down-converter mixer with the following characteristics:

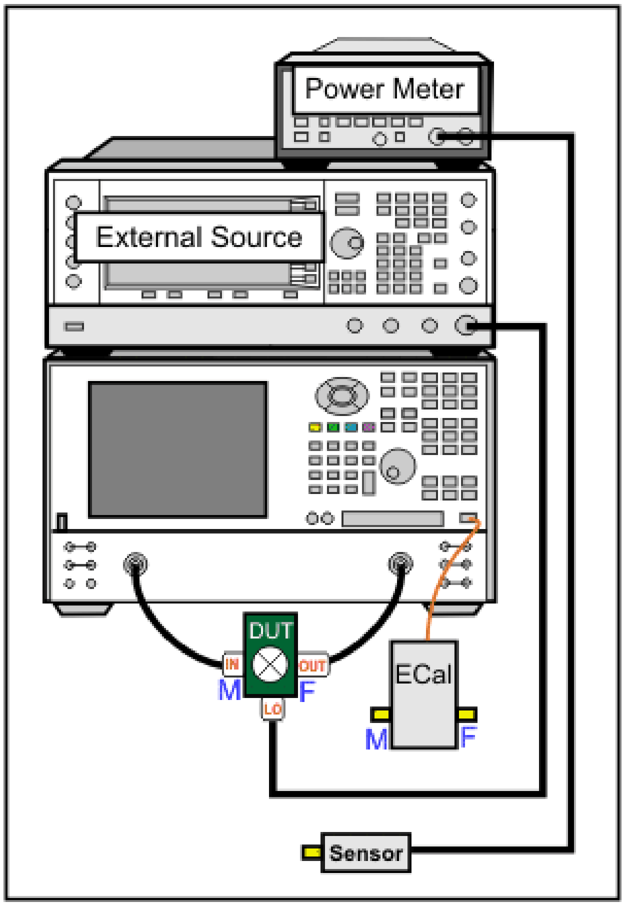
- LO and Input Frequency Range: 2 GHz to 4.2 GHz
- Output Frequency Range: DC to 1.3 GHz

We will measure:

- Fwd Conversion Loss (SC21)
- Input Match (S11)
- Output Match (S22)
- Reverse Conversion Loss (SC12)

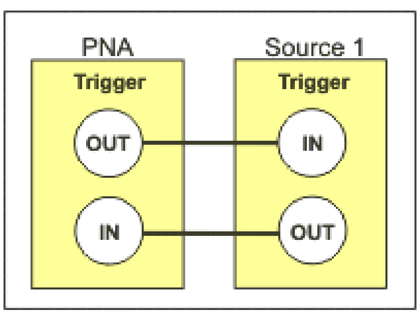
SMC Setup

Connect the devices as shown in the following diagram:



Make Connections on the Instrument rear panels:

1. Connect the PNA, Source, and Power Meter using two GPIB cables. A USB to GPIB adapter can also be used if you need to control the PNA from a remote PC.
2. Using a BNC cable, connect the Source **10 MHz Reference Output** to the PNA **10 MHz Reference Input**.
3. Using two BNC cables, connect the Source and PNA Trigger connectors as shown in the following image. This is not necessary when making fixed LO measurements.



Create the Measurement

For this document:

- Front-panel hardkeys are formatted as "Press ***Trace"***
- Menus are formatted as "Click **System"**

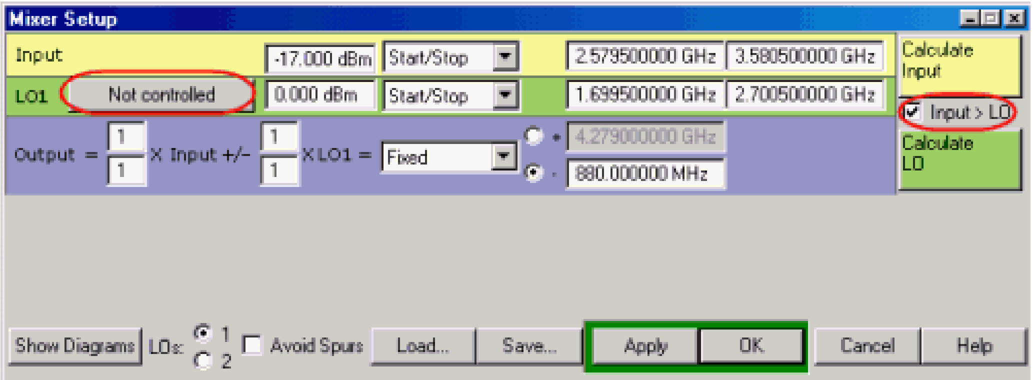
1. Connect the DUT.
2. On the PNA, click **System**, then point to **Configure**, then click **SICL/GPIB/SCPI**. On the SICL/GPIB/SCPI dialog, click **System Controller**. This allows the PNA to control the Source and Power Meter.
3. On the Source and Power Meter, record the GPIB addresses.
4. Press ***Preset*** to make sure you are starting with a known state.
5. Press ***Trace***, then ***Delete*** to delete the default trace.
6. Press ***Application*** to create a new FCA measurement.
7. Under **Choose an application**, select **Scalar Mixer/Converter.**
8. Under **Select measurement parameter**, select **SC21**.
9. Click **OK.**

Configure the Mixer settings

1. Press ***Measure Setups***, then **Mixer**
2. Enter the Mixer setup values as shown in the image below.

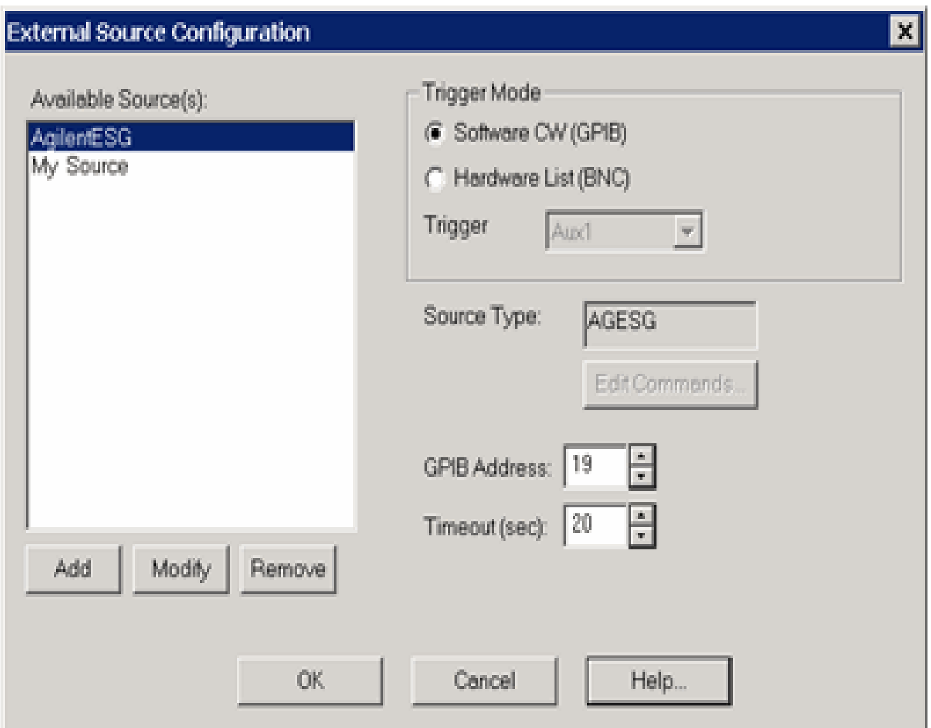
   Notes:

   - Rather then enter ALL of the frequency settings, you can enter the Input and the Output frequencies, then click **Calculate LO**.
   - If **Input>LO** is NOT checked, the PNA assumes you want the Input < LO frequencies, and higher LO frequencies are calculated as a result.
   - The LO power level setting specifies the power out of the external source; not at the DUT) unless an LO power cal is performed.
   - The Avoid Spurs feature is useful for eliminating spurs in test setups with excessive LO leakage.
   - When the settings are valid, the background color around the **Apply** and **OK** buttons changes from Red to Green.



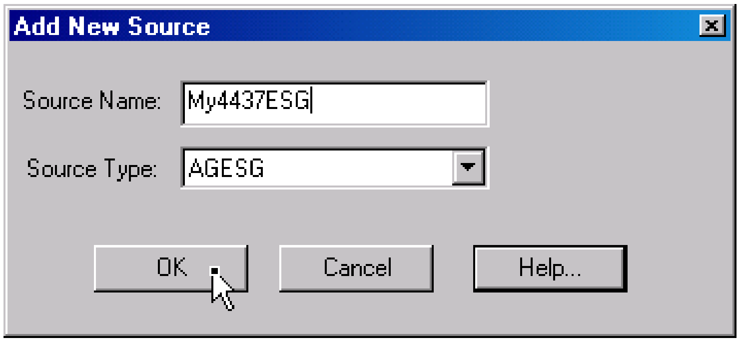
Configure the External LO Source

1. Click **Not Controlled** to set up the External LO source. The following dialog appears:



Depending on the model of your source, this is what it looks like AFTER entering the settings.

2. Click **Add**, to add a source.



3. In the Add New Source dialog, type an identifying Source Name, such as the model of your source. In Source Type, select the model of source you are using. Then click **OK**.

4. Back in the External Source Configuration dialog, click **Controlled**, to tell the PNA to assume control of the source.

5. Click **Hardware List (BNC)**, which is the fastest measurement method. This method requires the BNC Trigger cables that connect the PNA and source. If not available, **Software CW** can be used, but measurements are much slower.

6. If necessary, change the GPIB Address to match that of the source. This is NOT automatically detected.

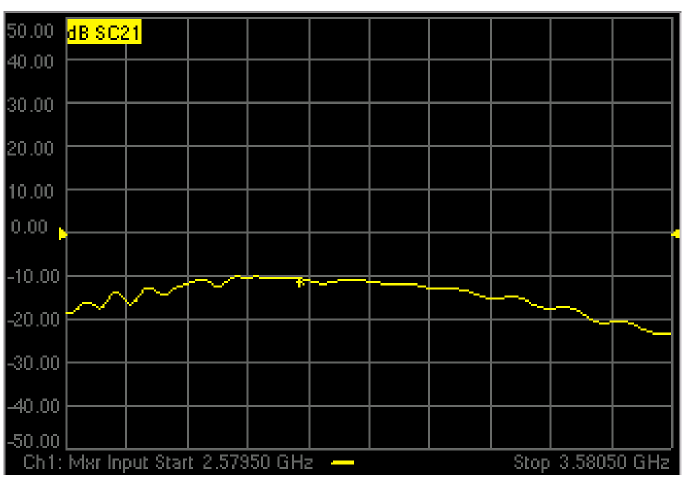
7. Optional: Click **LO Power Calibration** to calibrate the LO Power level at the DUT.

8. Click **OK** to return to the Mixer Setup dialog. The Not Controlled should now read **Controlled.**

9. Save the mixer settings in a file so you can recall them easily. Click **Save…**, then type a descriptive filename, such as “FixedOutputMixer”.

10. Click **OK** to close the Mixer Setup dialog. If there is a problem communicating with the source, the PNA will display an error here. See Problems?

11. The trace should begin to sweep as the external source steps in frequency. It should look something like this:



Problems?

Not sweeping:

- On the PNA, press ***Sweep***, then ***Trigger***, then ***Continuous*** to start the PNA sweeping. Watch for error messages on the PNA and source.

Problems communicating with the source:

- Press ***Measure Setup***, then ***Mixer*** to start the Mixer setup dialog. Click **Software CW trigger**, then close the dialog. Perform the previous statement to start sweeping. If this works, then something is wrong with **Hardware (BNC)**. Check the trigger cables on the rear panel.
- Can the PNA communicate with the power meter? If not, there is something wrong with the GPIB communication.
- As a last resort, try rebooting the PNA. First, save the entire setup to a .csa file. When the PNA preset measurement appears, recall this .csa file and continue at this step.

If the source is sweeping, and the PNA Input is sweeping, but there is still no output.

- Check power levels at the LO and Input.
- Check the DUT by making a fixed LO measurement - much easier.

Perform an SMC calibration

1. Disconnect the DUT.
2. Connect the ECal module to a PNA USB port.
3. Click **Calibration**, then **Calibration Wizard**. Because the SC21 measurement is active, the Cal Wizard automatically begins an SMC calibration.
4. At the **Calibration Setup** dialog, click **Next**.
5. At the **Select DUT Connectors and Cal Kits** dialog, for **DUT Port 1** select the connector type and gender of your DUT INPUT. For **DUT Port 2** select the connector type and gender of your DUT **OUTPUT**. Then select ECal as the Cal Kit to use for each connector. Click **Next**.
6. At the **Scalar Mixer Calibration Step 1 of 2** dialog, connect the power sensor to the Port 1 test cable, then click **Measure**. The data will be used to correct for input mismatch errors. Beginning with PNA Rev 6.0, power measurements are no longer required at port 2.
7. At the **Scalar Mixer Calibration Step 2 of 2** dialog, connect the ECal module Port A to the Port 1 cable, and Port B to the Port 2 cable. Then click **Measure**. This portion of the calibration gathers the linear (non-frequency-translating) error terms of the test setup at the input and output frequencies.

8. At the **Calibration completed** dialog, you can choose to save the SMC calibration as a User Cal Set. Otherwise, click **Finish** to complete the SMC calibration. Correction is turned ON and applied to the SMC trace.

What is happening?

Because Fixed Output or Fixed Input FCA measurements require an external source to sweep, the measurements are much slower. When correction is ON, you will see that there are times when nothing is happening on the screen. This is because there are background measurements being made but not displayed.

This is exactly the same as when full 2-port correction is applied to an S-parameter. All four parameters are measured, then correction is applied, then all four measurements are updated. This occurs much faster when there is no external source. With correction OFF, the traces are updated as the data is measured. You can see this taking place by creating the following measurements.

Create S12 Upconverter, S11 Input and S22 Output Match

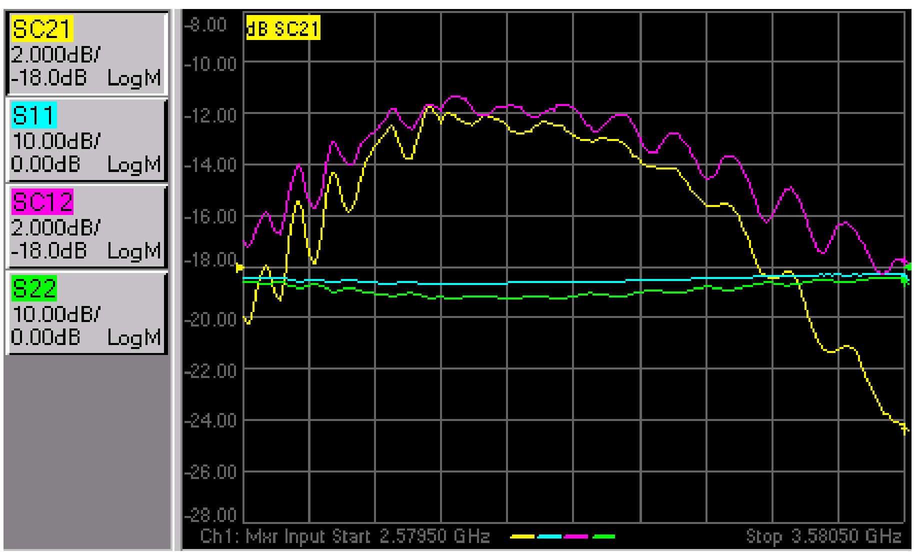
1. Press ***Trace***, then ***Application***. Click **S11, SC12,** and **S22**, then click **OK** to add these measurements to the same channel.

2. While the source is sweeping, watch the source port indicator on the front of the PNA. First, the port 1 indicator will light for two sweeps, then the port 2 indicator will light for 2 sweeps. During the last sweep, all 4 traces update.

3. Turn correction OFF for ALL measurements. Notice that the relevant traces update as the sweep is occurring.

With the SC12 measurement you can see the reciprocity of the mixer.

Note: With the recent improvements to FCA, this step is MUCH easier than before. SMC forward and reverse measurements can now reside in the same channel and are calibrated automatically at the same time.



Last Modified:

1-Jan-2007 MX New topic

Embedded LO Measurements

The Embedded LO feature allows you to make VMC measurements of mixers that have a FIXED LO inside the DUT. SMC (Scalar) measurements are not allowed because phase information is used in the LO measurement process.

Note: This feature is available as Opt 084, and must be enabled.

Measurements of these devices are challenging for a couple of reasons:

1. The VMC measurement process requires the use of a reference mixer that has the same LO frequency as the DUT. A separate internal or external source must be used for the reference mixer LO. This LO must be controlled by the PNA. A PNA with an internal second source is much faster.

2. The PNA receivers need to be tuned to the correct frequency to measure the mixer output, which is highly dependent on the exact LO frequency.

For both of these reasons, the PNA is required to accurately know the frequency of the Embedded LO.

How we measure the embedded LO

The nominal frequency of the embedded LO is input into the Mixer Setup dialog. The LO source for the reference mixer is tuned to this value.

Before each DUT measurement sweep, background sweeps are made to determine the frequency of the embedded LO to a configurable degree of accuracy.

Background sweeps...

- **Broadband** Sweep - rough measurement of the embedded LO frequency, made around a selectable data point over a selectable frequency span. The input signal to the DUT is tuned to a selectable CW frequency. The reference mixer is not used. The B receiver is swept across a selectable span around the anticipated output frequency. The difference between the frequency of the found signal and the desired output frequency is then applied as an adjustment to the Reference Mixer LO frequency.

- **Precise** Sweep The reference mixer LO is tuned to the result of the broadband measurement. VC21 is measured at the selectable data point. Measurements of phase versus time are made, from which the exact offset frequency is computed, until either the tolerance value or maximum iterations are met.

How to make a VMC measurement of a DUT with an Embedded LO

1. Create a standard VMC measurement.

2. In the mixer setup dialog, enter the nominal frequency of the embedded LO as the LO frequency.

3. Perform a VMC calibration.

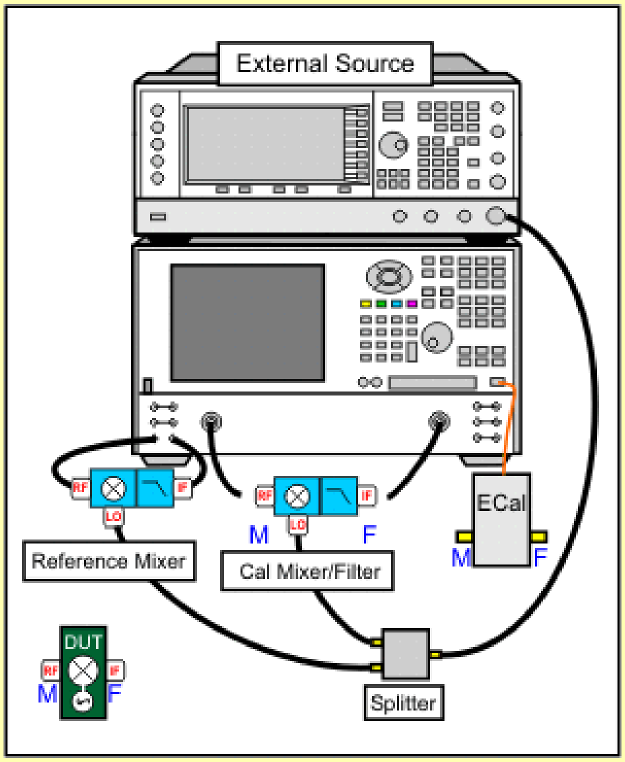
4. Launch and complete the Embedded LO Mode dialog box (below)

The LO source for the Reference Mixer can be either:

- An **Internal** source when using a PNA-X that has two sources.
- An **External** source:
  - Must be controlled by the PNA. Learn how.
  - Must be locked to the PNA using the 10 MHz reference.

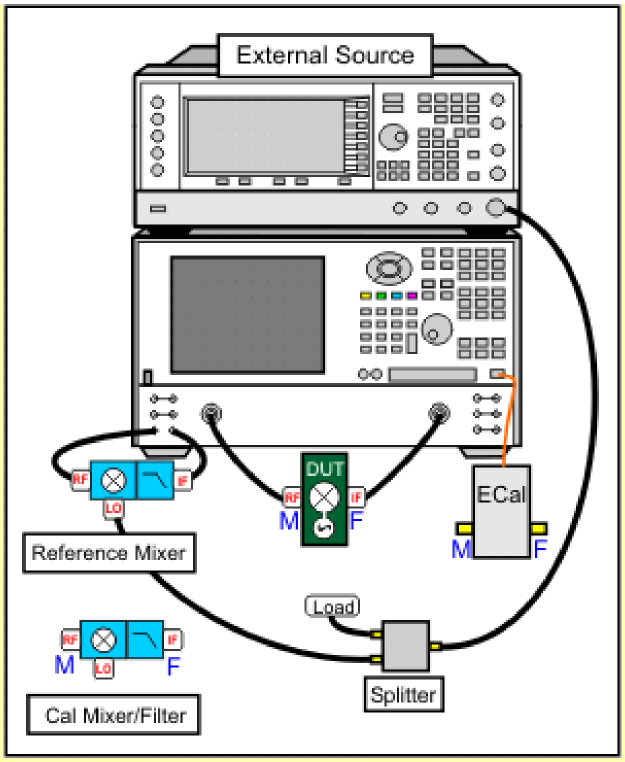
During Calibration

The LO source is shared between the Reference Mixer and the Calibration Mixer/Filter. This requires a splitter when using an external source, as shown in the following image.



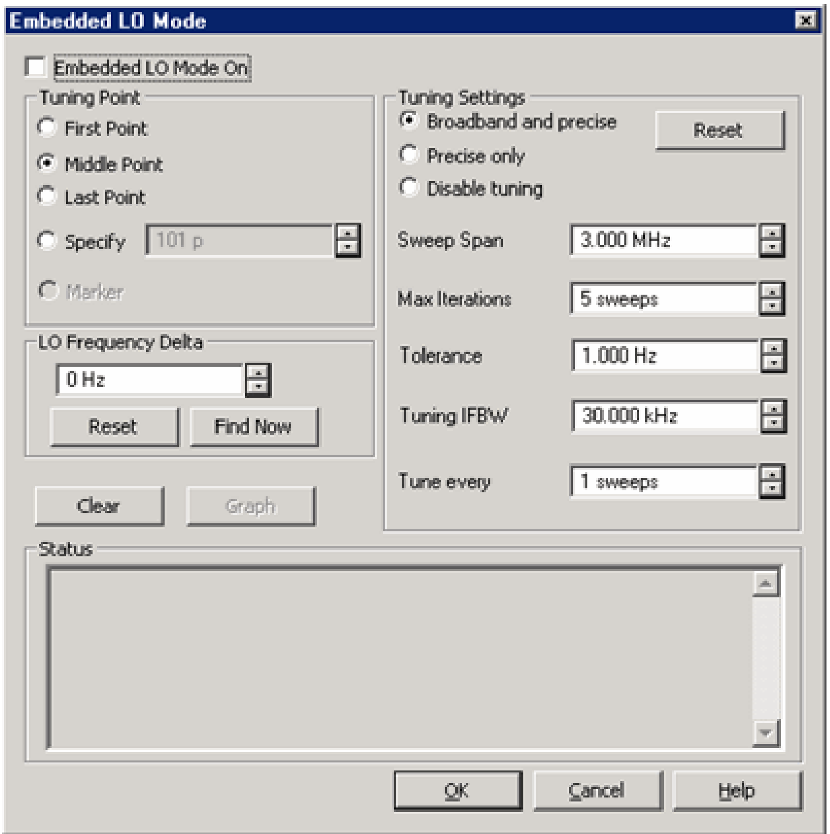
During the Measurement

Only the Reference Mixer uses the LO source. Terminate the LO source port that is no longer used by the Calibration Mixer/Filter to ensure that the match seen by the Reference Mixer LO port does not change after the calibration, as shown in the following image. This precaution is not necessary when using the internal second source (ports 3 and 4) of the PNA-X.



How to Launch the Embedded LO Mode dialog box

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Trace** 2. then **Measure** 3. then **Embedded LO**
For PNA-X and 'C' models	Programming Commands
1. Not Available	1. Click **Trace/Chan** 2. then **Measure** 3. then **Embedded LO**



Embedded LO dialog box help

The Tuning Settings balance LO measurement speed versus accuracy. You can tell that accuracy is becoming compromised when noise starts to appear on the VMC measurement trace.

Scroll up to learn more about the Embedded LO measurement process.

Embedded LO Mode On Check to enable measurement of the Embedded LO.

Tuning Point Select, or specify, the data point in the mixer sweep that will be used to find the embedded LO frequency. If a marker is enabled, that data point can be used. For broadband and Precise sweeps, choose a point in the mixer sweep where noise is least likely to be found. This is generally the center of a sweep or the center of a filter if used.

LO Frequency Delta The absolute difference between the measured embedded LO frequency and the LO setting that is entered in the Mixer Setup dialog. This value is updated each time the embedded LO frequency is measured. Entering a value is a way to change the LO frequency on the mixer setup without invalidating the calibration.

Reset Set the LO Frequency Delta back to 0 Hz

Find Now The PNA finds and measures the actual LO frequency using the current dialog settings. This data is displayed in the **Status** box.

Tuning Settings These settings determine the amount of time spent versus the degree of accuracy to which the LO Frequency is measured. You can tell that accuracy is becoming compromised when noise starts to appear on the VMC measurement trace.

Reset Set all Tuning Settings back to the defaults.

Broadband and Precise Do the entire tuning process for each background sweep.

Precise only Does NOT perform broadband tuning on each sweep. Use this setting when the embedded LO is stable.

Disable tuning Only the previously measured LO Frequency Delta is applied to the reference mixer LO and PNA receivers.

Sweep Span Narrowing the sweep span limits the number of data points that are measured in the broadband sweep and makes the measurement faster.

Max Iterations The maximum number of Precise sweeps to make. When this number is reached, the final measurement is used.

Tolerance When two consecutive Precise measurements are made within this value, the final measurement is used. If this is not achieved within the Max Iterations value, then the last measurement is used. This is the best of the 'Tunings settings' to change to improve accuracy.

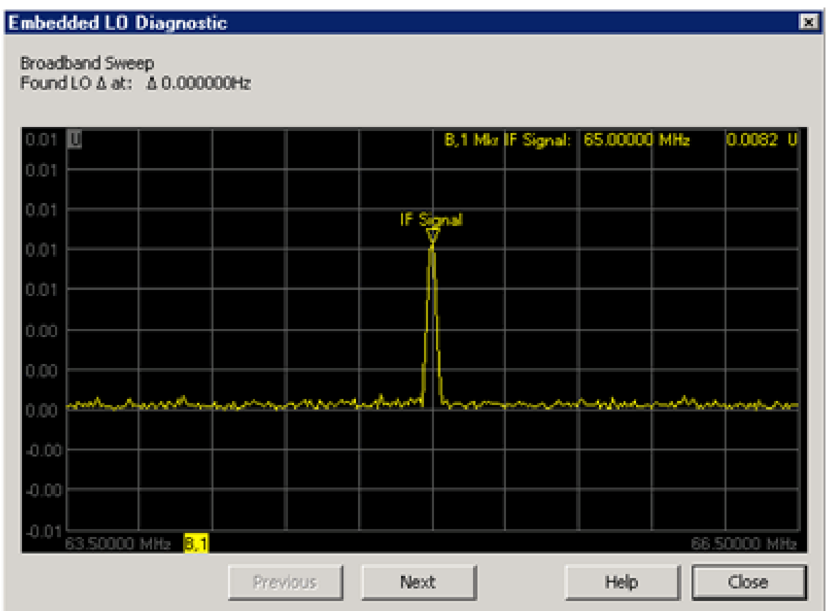
Tuning IFBW IF Bandwidth used for Broadband and Precise tuning sweeps. The larger the IFBW, the faster the sweep, but the signal may not be found.

Tune every Set the interval at which tuning is performed before a measurement sweep. 'Tune every 3 sweeps' means that every third measurement sweep is preceded by tuning sweeps. If the embedded LO drifts, or if regularly changing DUTs, use 'Tune every 1 sweep'.

Status Allows textual and graphical representation of the Embedded LO measurement sweeps.

Clear Removes the text information currently being displayed.

Graph Launches the following graphical (spectrum analyzer type) display sweeps of the latest embedded LO measurement.



Embedded LO Diagnostic dialog box help
Presents a graphical (spectrum analyzer type) display of the latest embedded LO measurement. Click **Previous** and **Next** to view available Broadband and Precise sweeps. The LO Frequency is displayed in the Marker annotation.

Last Modified:

5-Oct-2007	Added config image and text
5-Jul-2007	Update access point
6-Apr-2007	MX New topic

Characterize Adaptor Macro

This external Macro application creates an S2P file that models a device such as an adaptor, the input OR output side of a test fixture, or an on-wafer probe head. This is done by calculating the four S-parameters of the device from two 1-port calibrations; one on side A of the device and the other on side B of the device. Such S2P files can be used for embedding (adding) or de-embedding (removing) the device from subsequent S-parameter measurements and FCA calibrations.

This application, along with the FCA Embed/De-embed feature, can be especially useful when performing FCA calibrations.

- An SMC calibration requires a power meter measurement at the port 1 reference plane. This could be very difficult in on-wafer applications where the measurement reference plane is at the tip of a probe. This macro, in conjunction with the Embed/De-embed feature, enables you to model the probe and connect the power sensor at the coax connector where the probe connects.

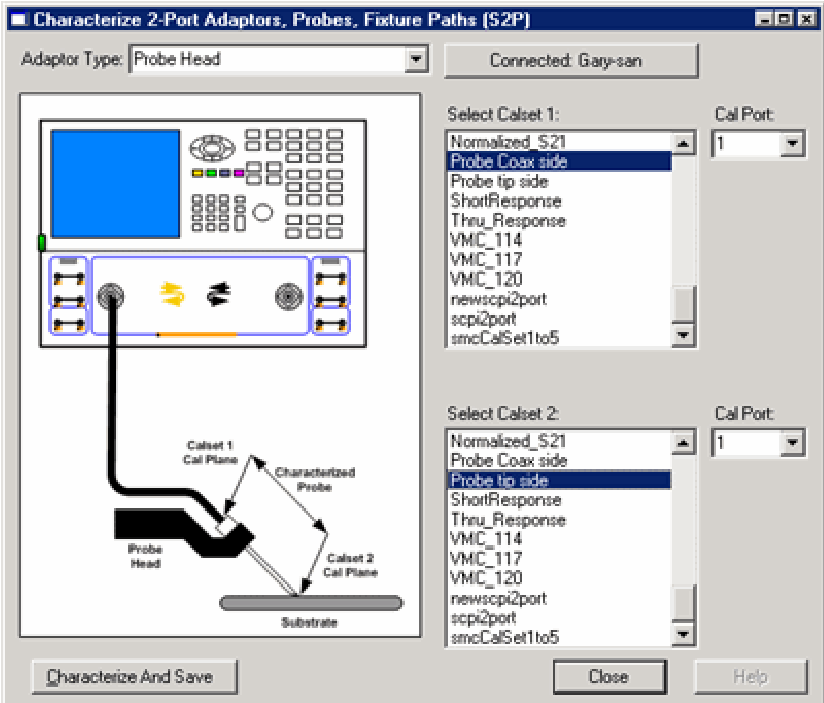
- Likewise, a VMC calibration requires that a calibration mixer be used for the Thru standard. Again, this can be very difficult in on-wafer applications where the measurement reference plane is at the tip of a probe. This macro, in conjunction with the Embed/De-embed feature, enables you to model the probe and connect the calibration mixer at the coax connectors where the probe connects.

Also in this topic:

To Embed or De-embed?

Procedures

How to start the Characterize Adaptor Macro	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Press  repeatedly 2. Press 	1. Click **System** 2. then **Macro** 3. then **AdaptorChar**
For PNA-X and 'C' models	Programming Commands
1. Press **SYSTEM** 2. then **[Macro]** 3. then **[AdaptorChar]**	1. Click **Utility** 2. then **Macro** 3. then **AdaptorChar**



Characterize 2-Port Adaptors, Probes, Fixture Paths (S2P) dialog box help

Important Notes

- The device to be characterized (probe, adapter...) MUST be reciprocal (S21 = S12).
- Two 1-port cals must be performed and saved to Cal Sets BEFORE using the Characterize Adaptor application.
- The frequencies and number of points of the two Cal Sets MUST be identical.
- **CRITICAL**: The calculations that are performed to create the S2P file require that **Calset 1** ALWAYS be from the side closest to the PNA and **Calset 2** ALWAYS be from the other side of the device.
- If your application that uses the resulting S2P file requires that the ports be reversed, it must be done on the S2P file using an external program such as Microsoft Excel.
- The majority of this topic describes the characterization of a 2-port device from two 1-port cal sets. However, you can also use the cal sets from two 2-port calibrations, or one 2-port and two 1-port calibrations. See procedures for both.

Learn more about the Characterize Adaptor Macro.(scroll up)

Connected <PNA host name> The two 1-port Cal Sets can reside in another PNA. Click to connect to another PNA that is DCOM configured. Learn how to configure DCOM.

Adaptor Type Select the type of device to be characterized.

Note: The image that appears in the macro does not influence the calculations. It only appears to help you visualize the measurement reference plane of the Cal Sets.

Select Calset 1 and Calset-2 Select a 1-port Cal Set from each list. Although all Cal sets are listed, only the Cal Sets that have error terms to satisfy a 1-port calibration may be used.

Cal Port Select the port within the selected Cal Set which represents the modeled device. The Cal Ports must be the same for both selected Cal Sets.

Characterize and Save Calculates four S-parameters, then invokes the Save As dialog with S2P file type. This button is not available until valid Cal Sets and Cal Ports are selected.

Close Closes the dialog box.

To Embed or De-embed?

To make an accurate measurement, the setup configuration during the DUT measurement MUST exactly match the setup configuration during Calibration. In other words, if you calibrate with an adapter, you must also measure the DUT with the same adapter.

However, the PNA provides some flexibility by allowing you to '**Virtually**' add (embed) or remove (de-embed) an adapter from either the measurement or an FCA calibration. Knowing how to do this can be confusing.

In the following, if you are NOT making an FCA measurement, then your only choice is A. Also, "adapter " can mean any type of 2-port device:

To perform a calibration WITHOUT the adapter, but make DUT measurements WITH the adapter, do either of the following:

A. Remove (de-embed) the adapter from the DUT measurement OR

B. Add (embed) the adapter during the FCA Calibration.

To perform a calibration WITH the adapter, but make DUT measurements WITHOUT the adapter, do either of the following:

A. Add (embed) the adapter during the DUT measurement, OR

B. Remove (de-embed) the adapter from the FCA Calibration.

Procedures

- Create an S2P file using Characterize Adaptor Macro
- De-embed the S2P file from DUT measurement
- Embed the S2P file in DUT measurement
- Embed or De-embed the S2P file with FCA Cal
- De-Embedding a Fixture that has a THRU Standard
- De-Embedding a Fixture with No THRU Standard

Create an S2P file using the Characterize Adaptor Macro

1. Configure your PNA measurement (frequency span, power level, IF bandwidth, and number of points).
2. Perform a 1-port SmartCal at the reference plane. Save the cal to a User Cal Set using a descriptive name (for example, **Ref Plane**).
3. Connect the adapter to be characterized at the reference plane.
4. Perform another 1-port SmartCal at the end of the adapter. Save it to a User Cal Set using a different descriptive name (for example, **Adapt End**).
5. Start the Characterize Adaptor Macro.
6. In the **Select Calset1** field of the dialog box, select the Cal Set for the reference plane (from step 2 above).
7. In the **Select Calset2** field of the dialog box, select the Cal Set for the end of the adapter (from step 4 above).
8. Click **Characterize and Save.** In the resulting dialog box, enter the .S2P file name and location.
9. Click **Close**.

To De-embed the adapter (S2P file) from subsequent S-parameter measurements:

Note: Subsequent measurements must have the same or smaller frequency range (within the Start / Stop frequencies) as that of the S2P file.

1. Perform a 2 port SOLT calibration **without** the adapter/fixture.
2. Select 2-port De-embedding:
    1. For PNA-X and E836xC: click **Response**, then **Cal**, then **More**, point to **Fixtures**, then click **2 port De-embedding**.
    2. For E836xA/B, click **Calibration**, point to **Fixtures**, then click **2 port De-embedding**.
3. Select the Port to add the adapter to, then select **User Defined (S2P file)**.
4. Click **Use S2P file** and select the S2P file created using the Characterize Adaptor macro.
5. Check **Enable De-embedding,** then click **Close.**
6. Enable Fixturing:
    1. For PNA-X and E836xC: click **Response**, then **Cal**, then **More**, point to **Fixtures**, then click **Fixturing on/OFF.**
    2. For E836xA/B, click **Calibration,** then **Fixturing on/OFF.**
7. **Sim** appears in the Status Bar to indicate that Fixture Simulation is ON.

To Embed the adapter (S2P file) into subsequent S-parameter measurements:

1. Perform a 2 port SOLT calibration **including** the adapter. Note the port number on which the adapter is calibrated.
2. Select Port Matching:
    1. For PNA-X and E836xC: click **Response**, then **Cal**, then **More**, point to **Fixtures**, then click **Port Matching**
    2. For E836xA/B, click **Calibration**, point to **Fixtures**, then click **Port Matching.**
3. Under Choose Circuit Model for Matching, select the Port that the adapter was on during calibration, then select **User Defined (S2P file)**.
4. Press **Use S2P File** and navigate to the S2P file created using the Characterize Adaptor macro.
5. Check **Enable Port Matching,** then click **Close.**
6. Enable Fixturing:
    1. For PNA-X and E836xC: click **Response**, then **Cal**, then **More**, point to **Fixtures**, then **Fixturing on/OFF.**
    2. For E836xA/B, click **Calibration,** then **Fixturing on/OFF.**
7. **Sim** appears in the Status Bar to indicate that Fixture Simulation is ON.

To Embed or De-embed the S2P file with FCA Cal:

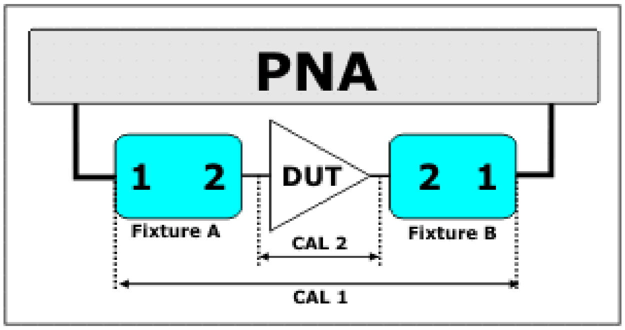
1. Configure the mixer SMC or VMC measurement (frequency span, power level, IF bandwidth, and number of points).
2. Click **Calibration**, then **Calibration Wizard**.
3. On the Calibration Setup dialog box, check Waveguide/In-fixture/On-Wafer Setup, then click **Next**.
4. On the Waveguide/In-fixture/On-Wafer Setup dialog box, click **Help** to learn how to Embed or De-embed the S2P file.

De-Embedding a Fixture that has a THRU Standard

A test fixture is generally regarded as a single 'bed' in which a DUT is placed. However, for modeling purposes such as this, it is separated into two circuits: Fixture A on the input of the DUT, and Fixture B on the output.

Use this procedure to perform calibrations WITHOUT the test fixture while making measurements WITH the test fixture. A calibration is performed once WITH the test fixture, and then again as it wears with use and electrical performance changes. The fixture is de-embedded from subsequent measurements to match the regular calibrations that are performed without the fixture.

If you have a THRU standard for your test fixture, you can perform a full 2-port calibration in the fixture, and from that create the required S2P files for de-embedding.



1. Perform a full 2-port **CAL 1** at the connections of the PNA to the fixture as shown above. Save to **MyCalSet1**.
2. Perform a full 2-port **CAL 2** where the DUT is inserted (reference plane). Save to **MyCalSet2**.

Follow the Create an S2P file procedure, beginning with step 6, using the following selections:

1. Create #1 S2P file:
    1. For CalSet1, choose **MyCalSet1** and select **CalPort=1**
    2. For CalSet2, choose **MyCalSet1** and select **CalPort=2**
    3. Save to **FixtureA.s2p**
2. Create #2 S2P file:
    1. For CalSet1, choose **MyCalSet2**and select **CalPort=1**
    2. For CalSet2, choose **MyCalSet2**and select **CalPort=2**
    3. Save to **FixtureB.s2p**

Follow steps in To De-embed the adapter...

Perform these steps TWICE; once for each of the following S2P files:

1. For PNA Port 1, select **FixtureA.s2p**
2. For PNA Port 2, select **FixtureB.s2p**

De-Embedding a Fixture with No THRU Standard

This procedure is a slight modification of the above. Cal 2 is performed from two 1-port cals when a THRU standard for the fixture is not readily available.

1. Perform a full 2-port **CAL 1** at the connections of the PNA to the fixture as shown above. Save to **MyCalSet1**.
2. **CAL 2** is performed using two 1 port cals

- **Cal2A** at the Fixture A / DUT plane. Save to **MyCalSet2A**
- **Cal2B** at the Fixture B / DUT plane. Save to **MyCalSet2B**

In the Create an S2P file...Step 6 above, except:

1. Create #1 S2P file:
    1. For CalSet1, choose **MyCalSet1** and select **CalPort=1**
    2. For CalSet2, choose **MyCalSet2A** and select **CalPort=2**
    3. Save to **FixtureA.s2p**
2. Create #2 S2P file:
    1. For CalSet1, choose **MyCalSet1**and select **CalPort=2**
    2. For CalSet2, choose **MyCalSet2B**and select **CalPort=2**
    3. Save to **FixtureB.s2p**

Follow steps in To De-embed the adapter above, except:

1. For PNA Port 1, select **FixtureA.s2p**
2. For PNA Port 2, select **FixtureB.s2p**

Last modified:

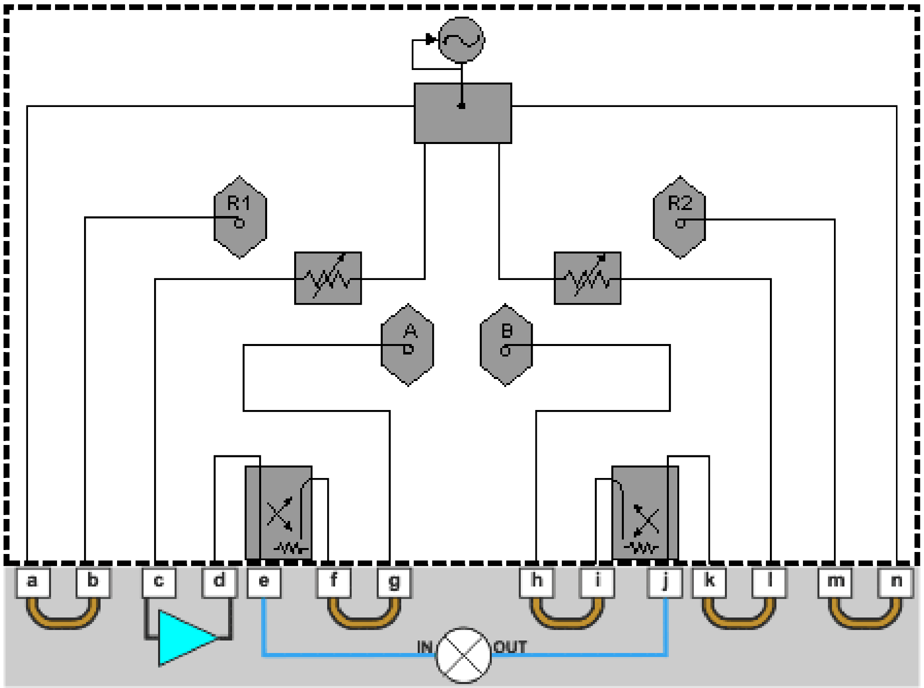
12-Feb-2008	New procedures
24-Jan-2008	Fixed error in procedures and added section
30-Nov-2007	Clarified and highlight order of calsets.
26-Feb-2007	Fixed " Note: Subsequent measurements...".
12-Sept-2006	Added link to programming commands

SMC with a Booster Amp

If your mixer measurement requires more source power on the input than the PNA can provide, a booster amplifier can be used to provide the additional power. This topic describes how to configure and make a calibrated SMC measurement using a booster amplifier.

Connect

Connect the booster amplifier between the Source-Out and Coupler-Thru connectors on the front-panel as shown in the following diagram.



Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

Measurement and Calibration Setup

In the following procedure:

- **Test Port power** is the power level out of the source.
- **Corrected power** is the power level you require at the mixer input and output.

This procedure assumes you will applying stimulus power to the mixer **input** to make SC11 and SC21 measurements, and to the **output** of the mixer to make SC22 and SC12 measurements.

1. Determine the gain of the booster amplifier. If the gain has significant slope across the **input and output range** of the mixer, see Booster Amp with a Gain Slope.
2. Determine the corrected power for both the input (port 1) and output (port 2) of the mixer.
3. Calculate the Test Port power for both ports by subtracting the gain of the amplifier from both the input and output corrected power levels.

   For example, the following values assume a 25 dB booster amp on port 1 as in the diagram above.

	Corrected Power	-	Amp Gain	=	Test Port Power
Port 1 (input)	0 dBm	-	25 dB	=	-25 dBm
Port 2 (output)	-20 dBm	-	25 dB	=	-45 dBm

4. On the PNA Power dialog, clear the **Port Power Coupled** checkbox, which allows different power levels for each port.
5. Enter the calculated **Test Port Power** values for each port.
6. During the SMC Cal Wizard **Select DUT Connectors and Cal Kits** dialog, click **View/Modify Source Cal Settings** to invoke the Source Calibration Settings dialog.
7. In **Power Offset**, enter the booster amplifier gain.

Booster Amp with a Gain Slope

SMC calibration takes place over the entire input and output range of the mixer. Therefore, the booster amplifier will also be subjected to the entire input and output frequency range of the mixer.

To compensate for a gain slope, you might have to experiment with the source attenuator setting, power-offset value, and initial power value to get a combination that will not cause the PNA source to go unleveled during or after the cal.

For example, assume the booster amp gain is 30 dB at the low end, and 20 dB at the high end. If you enter 30 dB for the power offset value, the PNA might run out of ALC range when the actual gain drops to 20 dB. The PNA will try to increase its source power to account for the 10 dB gain drop. Therefore, pick a power offset value that is in the middle of the amplifier gain band (25dB).

If possible, select a PNA attenuator setting that puts the ALC approximately in the middle of its range at the desired corrected power with the mid-band gain. This condition means the ALC can set the power higher and lower to account for the gain slope, without unleveling.

If the gain slope is too large, then there may not be a setting that prevents a source unlevel. In this case, a flatter booster amp must be used.

Time Domain

Time Domain allows you to view a device response as a function of time. The following are discussed in this topic:

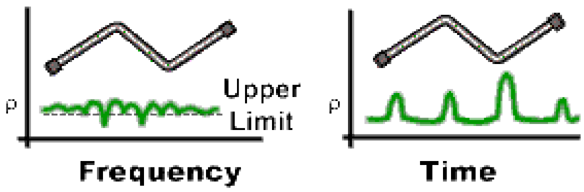
Note: Time Domain measurements are only available on PNAs with Option 010. See PNA Options

See the updated **App Note**: Time Domain Analysis Using a Network Analyzer.

Overview

In normal operation, the PNA measures the characteristics of a test device as a function of frequency. With Time Domain (opt 010), the frequency information is used to calculate the inverse Fourier transform and display measurements with time as the horizontal display axis. The response values appear separated in time, allowing a different perspective of the test device's performance and limitations.

The graphic below compares the same cable reflection measurement data in both the frequency and time domain. The cable has two bends. Each bend creates a mismatch or change in the line impedance.



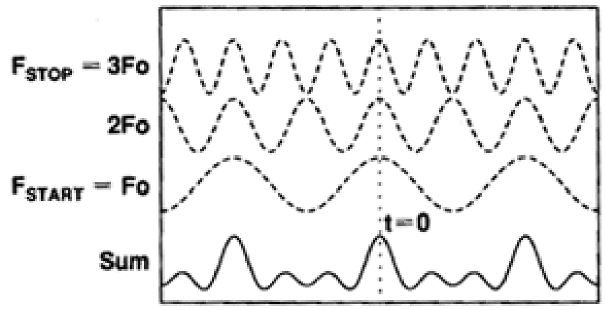
- The frequency domain S11 measurement shows reflections caused by mismatches in the cable. It is impossible to determine where the mismatches physically occur in the cable.
- The time domain response shows both the location and the magnitude of each mismatch. The responses indicate that the second cable bend is the location of a significant mismatch. This mismatch can be gated out, allowing you to view the frequency domain response as if the mismatch were not present. Distance Markers can be used to pinpoint the distance of the mismatch from the reference plane.

How the PNA Measures in the Time Domain

Time domain transform mode simulates traditional Time-Domain Reflectometry (TDR), which launches an impulse or step signal into the test device and displays the reflected energy on the TDR screen. By analyzing the magnitude, duration, and shape of the reflected waveform, you can determine the nature of the impedance variation in the test device.

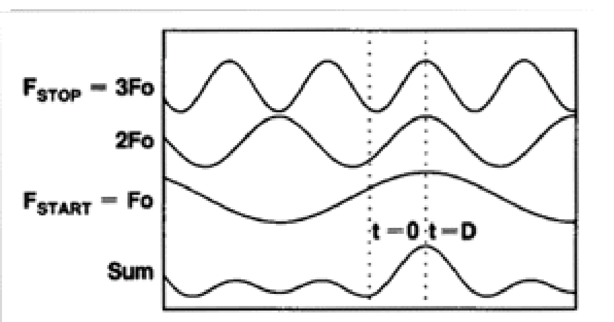
The PNA does not launch an actual incident impulse or step. Instead, a Fourier Transform algorithm is used to calculate time information from the frequency measurements. The following shows how this occurs.

A single frequency in the time domain appears as a sine wave. In the following graphic, as we add the fundamental frequency (F0), the first harmonic (2F0), and then the second harmonic (3F0), we can see a pulse taking shape in the Sum waveform. If we were to add more frequency components, the pulse would become sharper and narrower. When the PNA sends discrete frequencies to the test device, it is in effect, sending individual spectral pieces of a pulse separately to stimulate the test device.

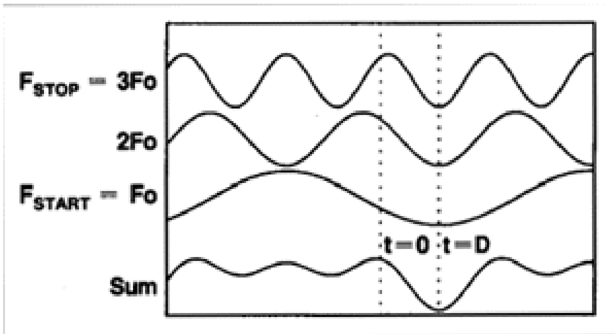


During an S11 reflection measurement, these incident signals reflect from the test device and are measured at the A receiver. This is when the time domain transform calculations are used to add the separate spectral pieces together.

For example, consider a short length of cable terminated with an open. All of the power in the incident signal is reflected, and the reflections are 'in-phase' with the incident signal. Each frequency component is added together, and we see the same pattern as the simulated incident would have looked (above). The magnitude of the reflection is related to the impedance mismatch and the delay is proportional to the distance to the mismatch. The x-axis (time) scale is changed from the above graphic to better show the delay.



Alternately, the same cable terminated with a short also reflects all of the incident power, but with a phase shift of 180 degrees. As the frequency components from the reflection are added together, the sum appears as a negative impulse delayed in time.



Calibration for Time Domain

For simplicity, we have discussed incident signals reflecting off discontinuities in the test device. By far the most common network analyzer measurement to transform to time domain is a ratioed S11 measurement. An S11 reflection measurement does not simply display the reflections measured at the A receiver - it displays the ratio (or difference) of the A receiver to the Reference receiver. In addition, the S11 measurement can also be calibrated to remove systematic errors from the ratioed measurement. This is critical in the time domain as the measurement plane, the point of calibration, becomes zero on the X-axis time scale. All time and distance data is presented in reference to this point. As a result, both magnitude and time data are calibrated and very accurate.

The following shows where the time domain transform occurs in the PNA data flow: (see Data Access Map)

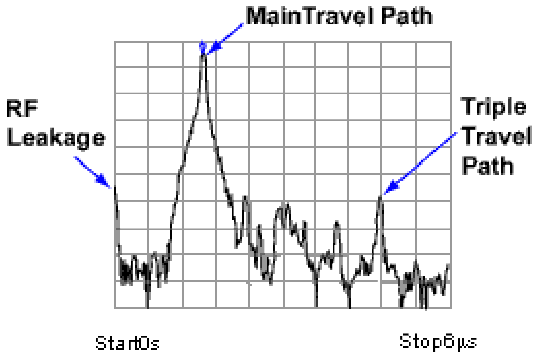
1. Acquire raw receiver (A and R1) data
2. Perform ratio (A/R1)
3. Apply calibration
4. Transform data to time domain
5. Display results

Therefore, although a time domain trace may be displayed, a calibration is always performed and applied to the frequency domain measurement which is not displayed.

Transmission Measurements

The most common type of measurement to transform is an S11 reflection measurement. However, useful information can be gained about a test device from a transformed S21 transmission measurement. The frequency components pass through the test device and are measured at the B receiver. If there is more than one path through the device, they would appear as various pulses separated in time.

For example, the following transmission measurement shows multiple paths of travel within a Surface Acoustic Wave (SAW) filter. The largest pulse (close to zero time) represents the propagation time of the shortest path through the device. It may not be the largest pulse or represent the desired path. Each subsequent pulse represents another possible path from input to output.



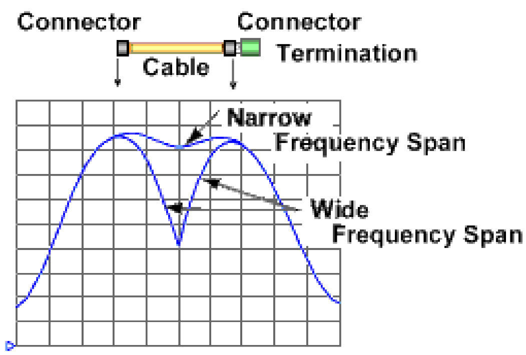
Triple travel is a term used to describe the reflected signal off the output, reflected again off the input, then finally reappearing at the output. This is best seen in a time domain S21 measurement.

Measurement Response Resolution

In the previous paragraphs, we have seen that using more frequency components causes the assembled waveform to show more detail. This is known as measurement response resolution, which is defined as the ability to distinguish between two closely spaced responses.

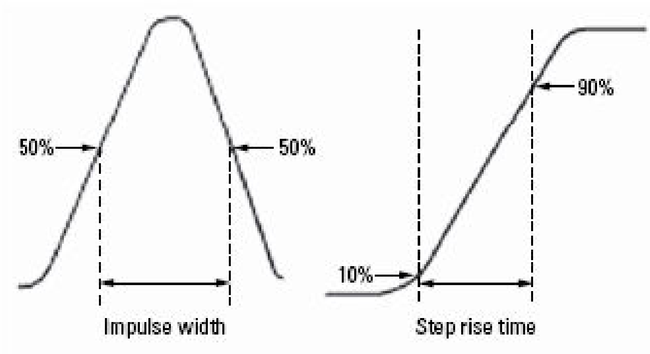
Note: Adjusting the transform time settings improves **display** resolution, but not measurement resolution.

The following graphic shows the effect of both a narrow and wide frequency span on the response resolution. The wider frequency span enables the analyzer to resolve the two connectors into separate, distinct responses.



Resolution Formula

For responses of equal amplitude, the response resolution is equal to the 50% (-6 dB) points of the impulse width, or the step rise time which is defined as the 10 to 90% points as shown in the following image.



The following table shows the **approximated** relationship between the frequency span and the window selection on response resolution for responses of equal amplitude.

Window	Low-pass step (10% to 90%)	Low-pass impulse (50%)	Bandpass impulse
Minimum	0.45 / f span	0.60 / f span	1.20 / f span
Normal	0.99 / f span	0.98 / f span	1.95 / f span
Maximum	1.48 / f span	1.39 / f span	2.77 / f span

For example, using a 10 GHz wide frequency span and a normal window in Bandpass impulse mode, response resolution (in time) equals:

- Time Res = 1.95 / frequency span
- Time Res = 1.95 / 10 GHz
- Time Res = 195 ps

To calculate the physical separation (in distance) of the responses which can be resolved, multiply this value times the speed of light (c) and the relative velocity (Vf) of propagation in the actual transmission medium. In this case, Vf = 0.66 for polyethylene dielectric.

- Distance Res = 195 ps x c x Vf
- Distance Res = 195 ps x (2.997925 E8 m/s) x .66
- Distance Res = 38 mm

For reflection measurements, because of the 2-way travel time involved, this means that the minimum resolvable separation between discontinuities is half of this value or 19 mm.

Although a wider frequency span causes better measurement resolution, the measurement range becomes limited. Also, increasing the frequency range can cause a measurement calibration to become invalid. Be sure to adjust the frequency span BEFORE performing a calibration.

Measurement Range and Alias Responses

Measurement range is the length in time in which true time domain responses can be seen. The measurement range should be large enough to see the entire test device response without encountering a repetition (alias) of the response. An alias response can hide a true time domain response.

To increase measurement range in both modes, change either of these settings:

- Increase the number of points
- Decrease the frequency span

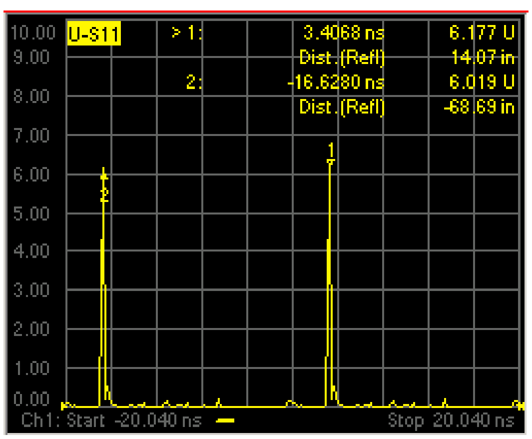
Notes:

- After making these settings, you may need to adjust the transform time settings to see the new measurement range.
- Decreasing the frequency span degrades measurement resolution.
- Make frequency span and number of points settings BEFORE calibrating.
- Maximum range also depends on loss through the test device. If the returning signal is too small to measure, the range is limited regardless of the frequency span.

Alias Responses

An alias response is not a true device response. An alias response repeats because each time domain waveform has many periods and repeats with time (see How the PNA Measures in the Time Domain). Alias responses occur at time intervals that are equal to 1/ frequency step size.

The PNA adjusts the transform time settings so that you should only see one alias free range on either side (positive and negative) of zero time. However, these settings are updated only when one of the toolbar settings are changed.



To determine if a response is true, put a marker on the response and change the frequency span. A true device response will not move in time. An alias response will move.

For example, in the above graphic, the marker 1 response occurs at 14.07 inches. When the frequency span is changed, this response remains at 14.07 inches. The marker 2 response moves.

Range Formula

You can calculate the alias-free measurement range (in meters) of the PNA using the following formula for **TDR** (reflection) measurements:

Range (meters) = (1/ f) x Vf x c

Where:

- f = frequency step size (frequency span/number of points-1)
- Vf = the velocity factor in the transmission line
- c = speed of light = 2.997925 E8 m/s

For example: For a measurement with 401 points and a span of 2.5 GHz, using a polyethylene cable (Vf = 0.66)

- Range = (1 / (2.5E9 / 400)) x 2.997925 E8 m/s x 0.66
- Range = 6.25E6 x 2.997925 E8 m/s x 0.66
- Range = 32 meters

In this example, the range is 32 meters in physical length. To prevent the time domain responses from overlapping or aliasing, the test device must be 32 meters or less in physical length for a transmission measurement.

To calculate the one-way distance for a reflection measurement rather than round-trip distance, simply divide the length by 2. In this case, the alias-free range would be 16 meters.

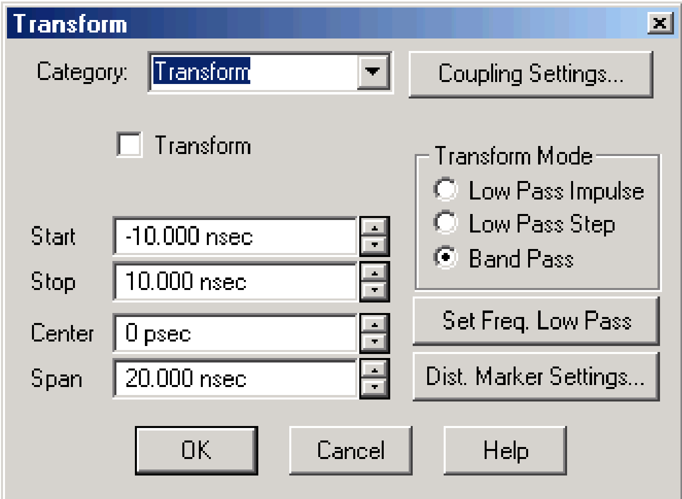
How to make Time Domain Settings

The following launches the Time Domain toolbar

On the toolbar, click **More...** to launch the Time Domain dialog box

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Trace** 2. then **Transform**
For PNA-X and 'C' models	Programming Commands
1. Press ANALYSIS 2. then **[Transform]** 3. **then [More]**	1. Click **Marker/Analysis** 2. then **Transform**

4. **then [Transform Tool]**



Transform dialog box help

Category Select Transform, Window, or Gating

Transform Turns time domain transform ON and OFF.

Coupling Settings Launches the Trace Coupling Settings dialog box.

Time Settings

The following settings adjust the **display resolution**, allowing you to zoom IN or OUT on a response. They do NOT adjust measurement range or measurement resolution.

These settings automatically update (when one of these values are updated) to limit the display to one alias-free response on either side of zero time.

Start Sets the transform start time that is displayed on the PNA screen.

Note: Zero (0) seconds is always the measurement reference plane. Negative values are useful if moving the reference plane.

Stop Sets the transform stop time that is displayed on the PNA screen.

Center Sets the transform center time that is displayed in the center of the PNA screen.

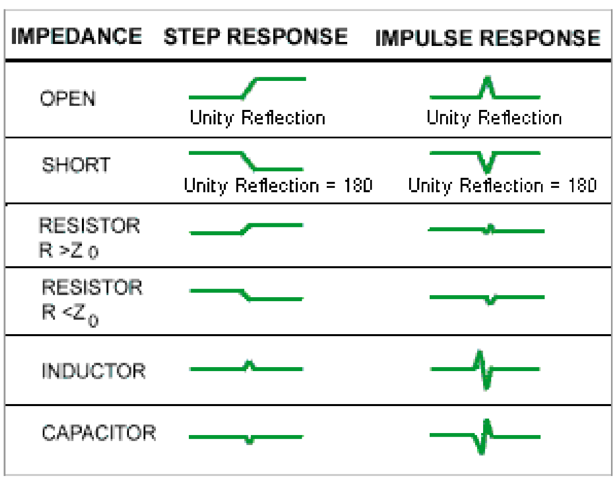
Span Sets the transform span time that is split on either side of the Center value.

Transform Mode

Transform modes are three variations on how the time domain transform algorithm is applied to the frequency domain measurement. Each method has a unique application.

Mode	Benefit - application	Limitation
Low pass Impulse	Highest resolution. Most useful for seeing small responses in devices that pass low frequencies, such as cables.	In both Low pass modes, frequencies down to DC and negative frequencies are extrapolated. Therefore, the Start frequency is adjusted when you click Set Freq.Low Pass Because this will affect calibration accuracy, be sure to calibrate AFTER completely setting up your time domain measurement.
Low pass Step	Easiest to identify inductive and capacitive discontinuities in devices that pass low frequencies, such as cables.	
Band pass Impulse	Easiest method - can be used with any frequency sweep. Most useful for measuring band limited devices such as filters and DC blocked cables.	Does NOT show capacitive and inductive reactance For the same frequency span and number of points, band pass mode has twice the impulse width, which hides closely spaced responses degrading the response resolution.

The following chart shows how to interpret results from various discontinuity impedances using Low pass Step and either Low pass or Band pass Impulse modes.



Effect on Measurement Range

Band pass mode - measurement range is inversely proportional to frequency step size.

Low pass mode - measurement range is inversely proportional to the fundamental (start) frequency AFTER clicking Set Freq. Low Pass.

Set Freq. Low Pass USE ONLY IN LOW PASS MODES

Recomputes the start frequency and step frequencies to be harmonics of the start frequency. Start frequency is computed by the following formula: **Low Pass Start Frequency = Stop Frequency / Number of points.**

The computed value must always be greater than or equal to the analyzer's minimum frequency.

Note: The number of points or stop frequency may be changed in order to compute this value.

Distance Marker Settings Launches the Distance Marker Settings dialog box.

Gating

Perhaps the most beneficial feature of time domain transform is the Gating function. When viewing the time domain response of a device, the gating function can be used to "virtually" remove undesired responses. You can then simultaneously view a frequency domain trace as if the undesired response did not exist.. This allows you to characterize devices without the effects of external devices such as connectors or adapters.

Note: When a discontinuity in a test device reflects energy, that energy will not reach subsequent discontinuities. This can "**MASK**", or hide, the true response which would have occurred if the previous discontinuity were not present. The PNA Gating feature does NOT compensate for this.

The following measurements images show a practical example how to use and perform gating. The test device is a 10inch cable, then a 6 dB attenuator, terminated with a short. The following four discontinuities are evident in window 2, from left to right:

1. A discontinuity in the test system cable which appeared after calibration. It is identified by marker 2 at -10.74 inches (behind the reference plane).
2. A discontinuity in the 10 inch device cable shortly after the reference plane.
3. The largest discontinuity is the attenuator and short shown by marker 1 at -12.67 dB (6 dB loss in both forward and reverse direction).
4. The last discontinuity is a re-reflection from the device cable.

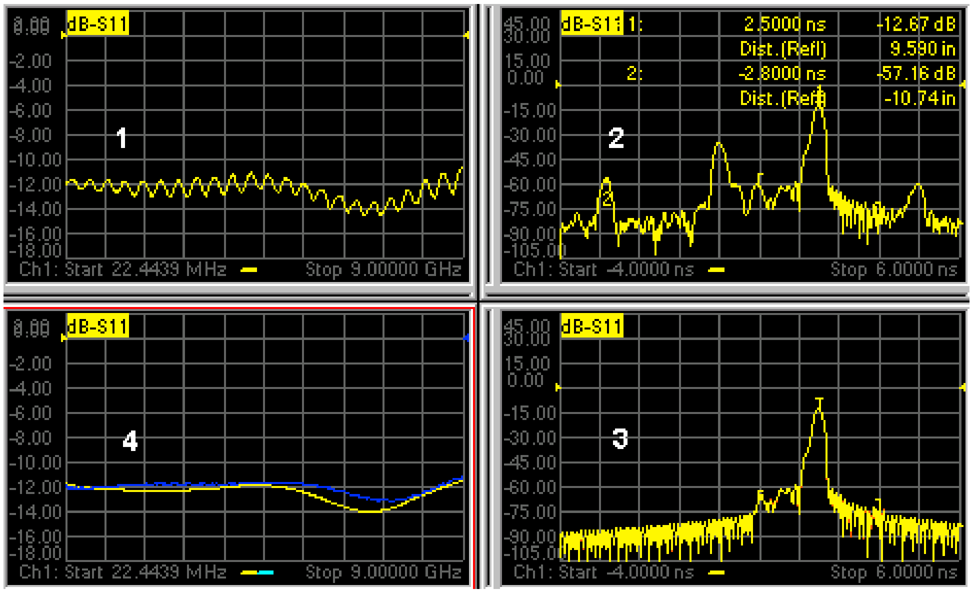
We will gate IN the attenuator response. All other responses will be gated OUT.

Window 1. Create original S11 frequency domain trace. Shows ripple from all of the reflections.

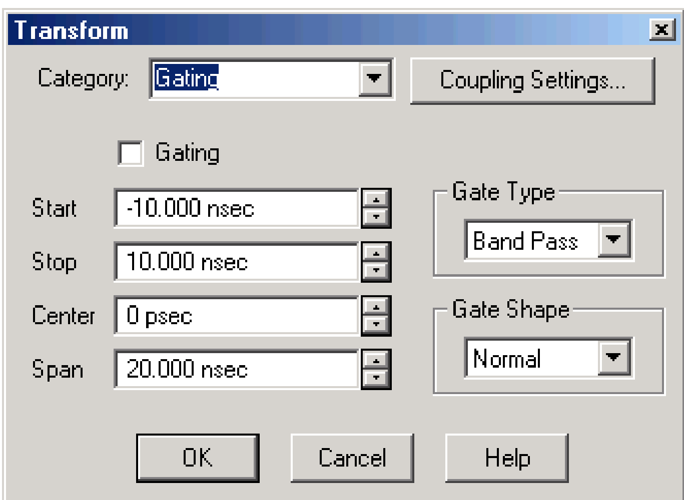
Window 2. Create a new S11 trace - same channel; new window. Turn Transform ON.

Window 3. On the transformed trace, turn gating ON. Center the gate on the large discontinuity (2.500ns). Adjust gate span to completely cover the discontinuity. Select Bandpass gating type.

Window 4. On the original frequency measurement, turn Gating ON (Transform remains OFF). View the measurement without the effects of the two unwanted discontinuities. The blue trace is a measurement of the 6 dB attenuator with the unwanted discontinuities PHYSICALLY removed. The difference between the two traces in window 4 is the effect of "masking".



[Learn how to launch the Transform dialog box]()



Transform Gating dialog box help

Programming Commands

Gating Turns Gating ON and OFF.

Coupling Settings Launches the [Setup Trace Coupling]() dialog box.

Start Specifies the start time for the gate.

Stop Specifies the stop time for the gate.

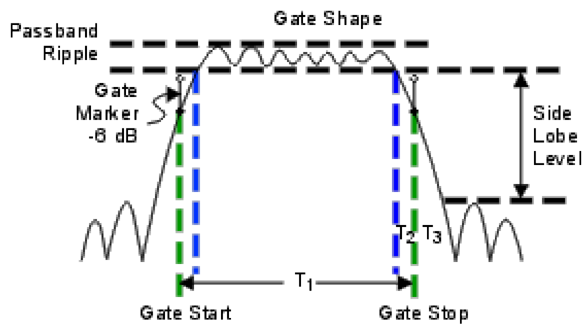
Center Specifies the value at the center of the area that is affected by the gating function. This value can be anywhere in the analyzer range.

Span Specifies the range to either side of the center value of area that is affected by the gating function.

Gate Type Defines the type of filtering that will be performed for the gating function. The gate start and stop flags on the display point toward the part of the trace you want to keep.

- **Bandpass -** KEEPS the responses within the gate span.
- **Notch -** REMOVES the responses with the gate span.

Gate Shape Defines the filter characteristics of the gate function. Choose from Minimum, Normal, Wide, Maximum



Gate Shape	Passband Ripple	Sidelobe Levels	Cutoff Time	Minimum Gate Span
Minimum	±0.1 dB	-48 dB	1.4/Freq Span	2.8/Freq Span
Normal	±0.1 dB	-68 dB	2.8/Freq Span	5.6/Freq Span
Wide	±0.1 dB	-57 dB	4.4/Freq Span	8.8/Freq Span
Maximum	±0.01 dB	-70 dB	12.7/Freq Span	25.4/Freq Span

Cutoff time -- is the time between the stop time (-6 dB on the filter skirt) and the peak of the first sidelobe. The diagram below shows the overall gate shape and lists the characteristics for each gate shape.

- T_1 is the gate span, which is equal to the stop time minus the start time.
- T_2 is the time between the edge of the passband and the 6 dB point, representing the cutoff rate of the filter.
- T_3 is the time between the 6 dB point and the edge of the gate stopband.
- For all filter shapes T_2 is equal to T_3, and the filter is the same on both sides of the center time.

Minimum gate span -- is twice the cutoff time. Each gate shape has a minimum recommended gate span for proper operation. This is a consequence of the finite cutoff rate of the gate. If you specify a gate span that is smaller that the minimum span, the response will show the following effects:

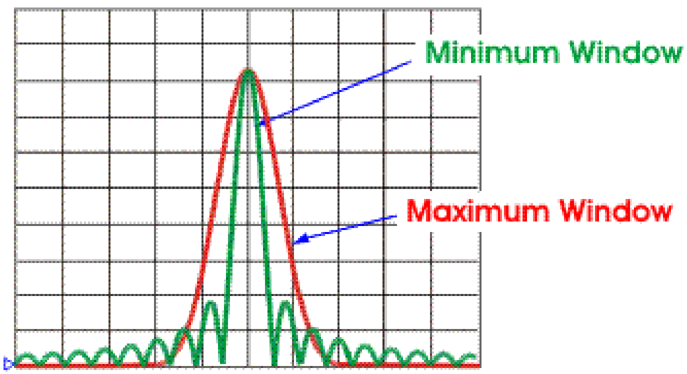
- distorted gate shape that has no passband
- distorted shape
- incorrect indications of start and stop times

- may have increased sidelobe levels

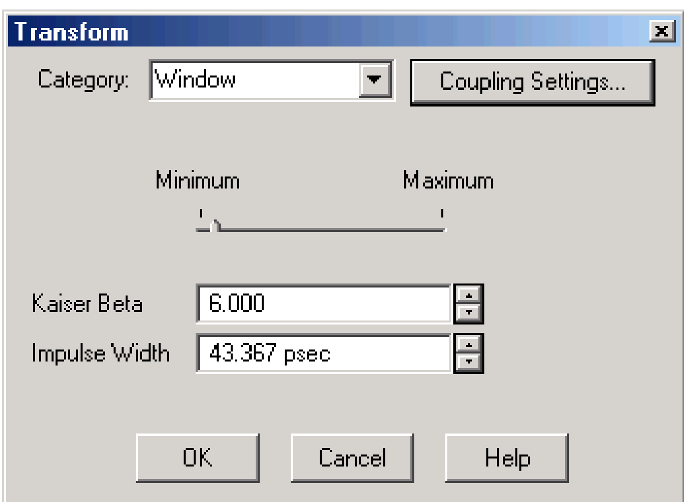
Window Settings

There are abrupt transitions in a frequency domain measurement at the start and stop frequencies, causing overshoot and ringing in a time domain response. The window feature is helpful in lessening the abruptness of the frequency domain transitions. This causes you to make a tradeoff in the time domain response. Choose between the following:

- **Minimum Window = Better Response Resolution** - the ability resolve between two closely spaced responses.
- **Maximum Window = Dynamic Range -** the ability to measure low-level responses.



[Learn how to launch the Transform dialog box]



Transform - Window dialog box help

Programming Commands

Coupling Settings Launches the Setup Trace Coupling dialog box.

The window settings balance response resolution versus dynamic range.

- Minimum Window = Best Response Resolution
- Maximum Window = Best Dynamic Range

The following three methods all the set window size. For best results, view the time domain response while making these settings.

- **Minimum - Maximum** Move the slider with a mouse to change the window size
- **Kaiser Beta** Changes window size using a Kaiser Beta value
- **Impulse Width** Changes window size using an Impulse Width value

Learn more about Windowing (top)

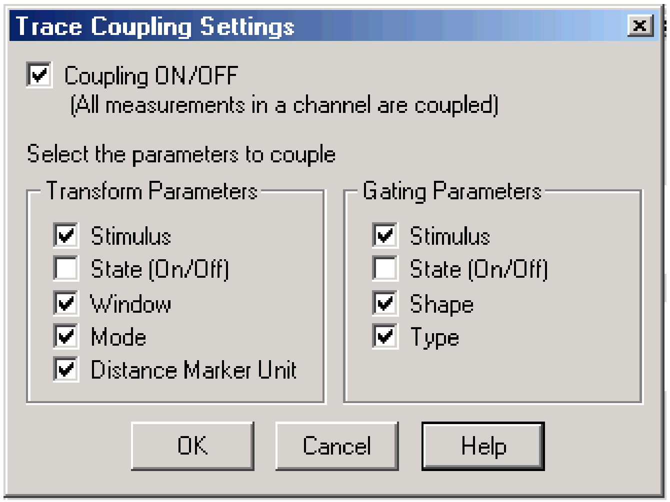
How to make Trace Coupling Settings

You can launch the **Trace Coupling Settings** dialog box from any of the following dialog boxes:

- Transform
- Gating
- Window

Programming Commands

Learn more about using the front panel interface



Trace Coupling Settings dialog box help

Trace coupling allows you to change time domain parameters on a measurement, and have the same changes occur for all other measurements in the channel.

For example:

If you are simultaneously viewing a frequency domain measurement and time domain measurement,

and **Coupling** is enabled in this dialog box,

and ALL **Gating Parameters** are checked in this dialog box,

and on the time domain measurement you change the **Gate Span** parameter,

Then the frequency domain measurement will automatically change to reflect the time domain gated span.

Coupling ON/OFF Check to enable coupling. All of the measurements in the active channel are coupled.

The following parameters are available for coupling:

Transform Parameters

Stimulus Start, Stop, Center, and Span TIME settings.

State (On/Off) Transform ON and OFF

Window Kaiser Beta / Impulse Width

Mode Low Pass Impulse, Low Pass Step, Band Pass

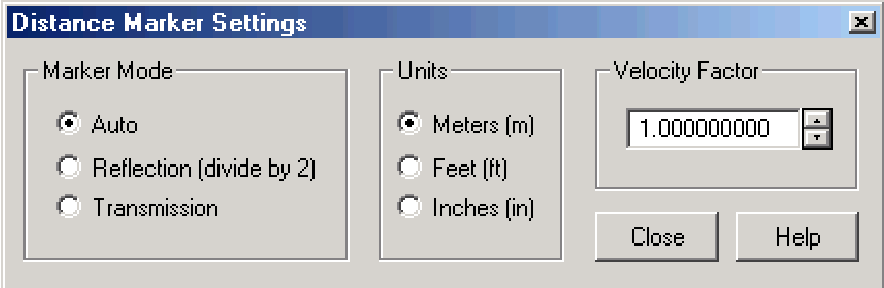
Gating Parameters

Stimulus Start, Stop, Center, and Span TIME settings.

State (On/Off) Gating ON and OFF

Shape Minimum, Normal, Wide, and Maximum

Type Bandpass and Notch



Distance Marker Settings dialog box help

Programming Commands

To launch this dialog box, click **Dist. Marker Settings** on the Transform dialog box.

When markers are present on a time domain measurement, distance is automatically displayed on the marker readout, marker table, and print copy. To learn how to create markers on your measurement see marker settings.

This dialog box allows you to customize the time domain distance marker readings.

These settings affect the display of ALL markers for only the ACTIVE measurement (unless **Distance Marker Unit** is coupled on the Trace Coupling dialog box.

Marker Mode Specifies the measurement type in order to determine the correct marker distance.

- Select **Auto** for S-Parameter measurements.
- Select **Reflection** or **Transmission** for arbitrary ratio or unratioed measurements.

Auto If the active measurement is an S-Parameter, automatically chooses reflection or transmission. If the active measurement is a non S-Parameter, reflection is chosen.

Reflection Displays the distance from the source to the receiver and back divided by two (to compensate for the return trip.)

Transmission Displays the distance from the source to the receiver.

Units Specifies the unit of measure for the display of marker distance values.

Velocity Factor Specifies the velocity factor that applies to the medium of the device that was inserted after the measurement calibration. The value for a polyethylene dielectric cable is 0.66 and 0.7 for Teflon dielectric. 1.0 corresponds to the speed of light in a vacuum. This is useful in Time Domain for accurate display of time and distance markers.

This setting can also be made from the Electrical Delay and Port Extensions dialog boxes.

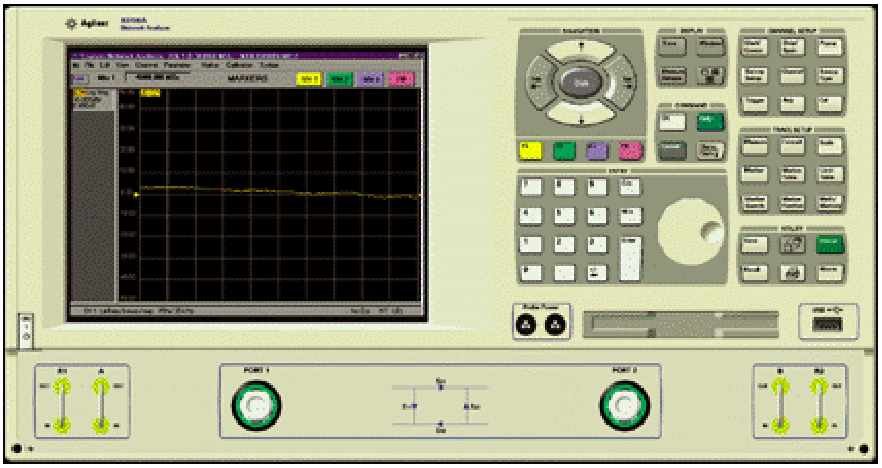
Last Modified:

11-Sep-2007 Edits to resolution and rage formulas

Front Panel Tour
PNA-L and Microwave Models

See the PNA-X Front Panel Tour

Click on the sections of the front panel for information.



Power Switch

Toggles the analyzer between the On and Hibernate conditions. This switch is not connected to the power supply. Learn more about powering the PNA ON and OFF.

Front-Panel Access Jumpers

Provides access to the measurement path. Learn more.

Test Ports

PNA test ports internally switch between source and receiver allowing measurement of your device in two directions. Two different lighting methods are used to indicate the source and receiver port:

For 9 GHz and below PNA models

- A green light indicates the source port.
- An orange light indicates the receiver port.

All other PNA models:

- An illuminated image next to the test port indicates the source.

See Input Damage Levels

USB

This Type A Universal Serial Bus (USB) connector allows you to connect a keyboard, mouse, ECAL module, or other USB device.

- Contact 1: Vcc; 4.75 to 5.25 VDC, 500 mA maximum.
- Protected with an automatically-resettable 1A fuse.
- Contact 2: –Data
- Contact 3: +Data
- Contact 4: Ground

See USB limitations.

3.5" Floppy Disk Drive

Installs files on the analyzer hard drive or stores data files from the analyzer. Access the disk drive by using Windows Explorer.

- Unformatted Data Capacity: 2MB
- Compatible with: High Density (2HD), and Normal Density (2DD)
- Transfer Rate: 500 kbits/second

Probe Power

The 3-pin (m) connectors supply power for active probes.

- Top Pin: Ground
- Left Pin: +15 VDC ±2%, 400 mA maximum; protected by PTC @0.5A
- Right Pin: –12.6 VDC ±5%, 300 mA maximum; protected by PTC @0.5A

(PTC=slow acting, automatically resettable fuse)

The PNA-X does NOT provide probe power.

Navigation Keys

These keys allow you to navigate through menus and dialog boxes and select choices from the active entry toolbar.

Left / Right	Moves left and right through menus Moves tab-left and tab-right within dialog boxes
Up / Down	Moves up and down through menus Behaves as follows in a dialog box: • Modifies a numeric value • Moves through items in a drop-down list • Moves through options buttons in a group of option buttons
Click	Makes a selection just like a mouse click
F1...F4 Keys	Selects choices from the active entry toolbar. The color of the key corresponds to the active entry toolbar choice. Learn more about Active Entry Keys.

Entry Keys

These keys allow you to enter values for measurement settings.

Numeric Keys	Selects values for measurement settings, then press Enter or G/n or M/u to complete the selection.
Units Keys	Completes the value selection, assigning a unit of measurement. Select either • G/n (Giga/Nano) E12 or E-12 • M/u (Mega/micro) E6 or E-6 Then press Enter to complete the value entry.
Decimal point	Enters a decimal point to designate fractions of a whole number.
Plus - Minus - Backspace Key	Toggles between a positive and negative value entry if it is the first key pressed in the entry. Backs up the cursor and deletes any previous selection.
Enter	Enters the values that you select for the measurement settings.
Knob	Rotate to increase or decrease the value of the active entry.

Display Keys

Controls window and trace configuration

Trace	First press brings up the Trace Active Toolbar. Subsequent presses allow you to cycle through the measurement traces in a window, making each trace active in turn. You can make modifications only to active functions. This key also allows you to create or delete traces, using the function keys.
Window	First press brings up the Window Active Toolbar, where you can create, select, and delete windows, using the function keys. Subsequent presses of this key cycle through the windows that are currently set up, making each window active in turn. You can make size modifications only to an active window. A window must also be active to cycle through the traces in the window.
Measure Setup	Allows you choose from four pre-configured measurement setups.
Arrange	Allows you to choose from four window arrangements: Overlay, Stack 2, Split 3, Quad 4. Learn More about Arranging the Display

Channel Setup Keys

Controls channel settings.

Start/Stop **Center/Span**	Sets the frequency range of the channel.
Power	Sets the source power level.
Sweep Setup	Defines several sweep settings.
Channel	Select an active channel, or delete the active channel. A channel must be active to modify any channel settings. Learn more about Channels.
Sweep Type	Sets the sweep type and associated settings.
Trigger	Sets how the start of the measurement sweep is initiated.
Avg	Applies measurement averages which reduces noise. The analyzer performs a complex exponential average of a number of sweeps that you specify. Learn more about Averaging
Cal	Initiates a measurement calibration. The Calibration Wizard appears if you press Menu/Dialog, Cal. Otherwise, pressing the Cal key makes the calibration active entry toolbar appear. Learn more about Calibration

Command Keys

OK Closes a dialog box and enters any values made in the dialog box.

Help Launches the analyzer Help file.

Cancel Closes a dialog box.

Menu/Dialog Allows you to browse the menus with the Navigation keys. Also allows you to display dialog boxes by pressing Menu/Dialog and then a key in the Channel, Trace, or Utility blocks. Learn more.

Trace Setup Keys

Performs many trace settings. Learn more about Traces.

Measure Allows you to select an S-parameter measurement. Through the dialog box you can also select an arbitrary ratio, or unratioed power measurement. Learn more.

Format Allows you to select the format the analyzer uses to display the measurement data. Learn more.

Scale Allows you to specify the value the analyzer uses to scale the displayed measurement response. You can also let the analyzer automatically set the Y axis scales to fit the entire measurement trace on the screen. Learn more.

Marker Allows you to activate a marker and set the value. Markers provide numerical readout of measured data. Learn more.

Marker Table Displays the table of values that allow you to view the data readout for all of the markers on the active trace. Learn more.

Limit Table Displays the table of values that allow you to create pass / fail testing based on these limit segments. Learn more.

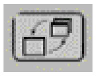
Marker Search Provides access to the marker search functions. If there is no marker displayed, this key will activate a marker. Learn more.

Marker Function Allows you to change measurement settings, based on the location of an active marker. If there is no marker displayed, this key will activate a marker. Learn more.

Math/Memory Allows you to select math and memory functions that the analyzer performs on the measurement data. Learn more.

Utility Keys

Save Allows you to save instrument states, calibration data, and measurement data to a file. Learn more.

 Changes the selected window to the full measurement screen size and then restores it to the previous window size. Restores the PNA application if minimized. Learn more.

Preset Presets the PNA. Learn more.

Recall Recalls a file from the hard drive. Learn more.

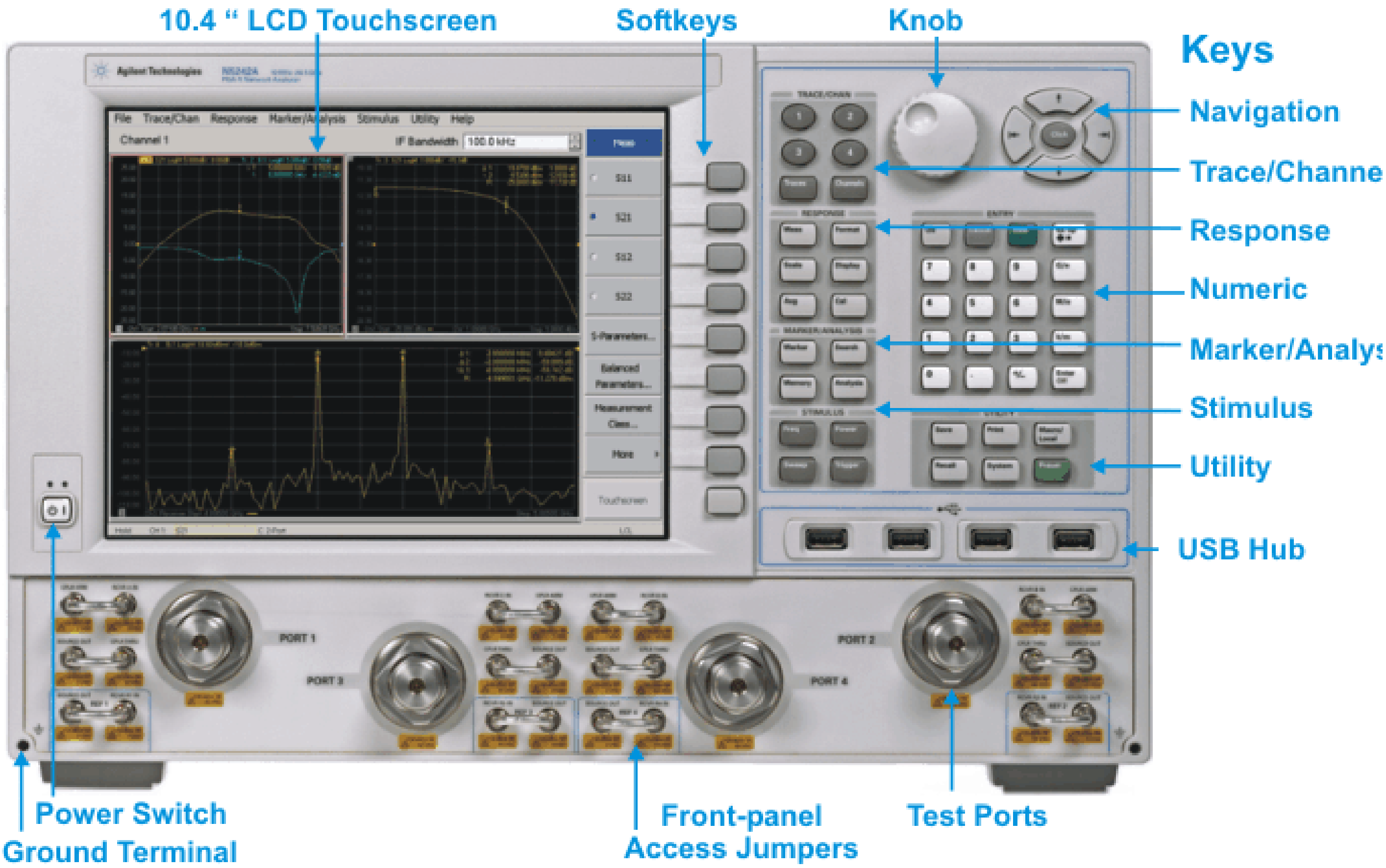
Print Prints a displayed measurement. Learn more.

Macro/Local When the analyzer is being controlled through automation, pressing this key allows the analyzer to respond to front panel key presses.

When the analyzer is in normal operation, pressing this key accesses a set of user macros that are in the form of executable files. You can title and store up to 12 macros. When you repeatedly press this key, the titles in the active entry toolbar rotate through three sets of four titles.

The executable files must already be on the hard drive and setup as a macro. Learn more.

PNA-X Front-Panel Tour



See Also

- The PNA-X Display area
- PNA-X Models / Options
- PNA-X Rear-Panel Tour

Familiar Hardkey layout, similar to Agilent 8720 and 8753 Network Analyzers

Back to the familiar layout, significantly different from legacy PNA models. Most measurement settings are made from the Stimulus Block and the Response Block.

Fully functional Hardkey/Softkey selections consistent with Menu (mouse) selections

Access ALL PNA settings from the front panel using hardkey/sofkeys or from the Menu using a mouse. Both methods are consistent; learn the menu structure once, and it applies to both methods of UI navigation.

Power Switch

Used for choosing between power-on (|) and standby (O) state.

Learn to power ON and OFF the PNA.

Test Ports

The PNA-X is available with 2 or 4 test ports.

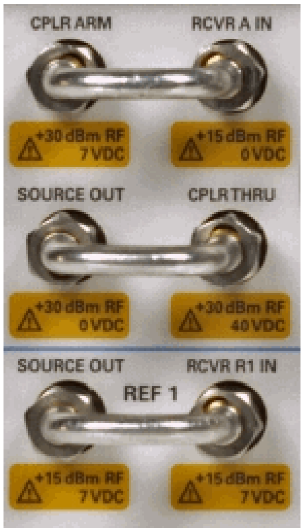
Learn about the Test port connectors .

Learn about the Input damage levels.

Front panel Access Jumpers

These connectors provide direct access to the PNA source and receivers. This allows you to make a wide variety of measurements and improve dynamic range. All PNA-X models have these same jumpers for each test port.

See the PNA-X front panel jumpers specifications



USB Hub

This USB hub contains four USB ports to power your PNA peripherals. There are also four USB ports on the rear panel.

Limitation: The total power consumption for all eight USB ports is limited to 4.0 amps. If this limit is exceeded, all USB ports are disabled until a device is removed and power consumption falls below the limit. When first connected, Agilent ECal modules 8509x and N4431 draw significantly more current than other modules.

Ground terminal

Connect a banana-type plug to this terminal for grounding to the PNA chassis.

No probe power

Probe power is NOT provided with the PNA-X.

Hardkeys

TRACE/CHAN Keys

Manages the Traces and Channels on the PNA display.

Hard Key	Invokes these Softkeys
1, 2, 3, 4	Makes the corresponding trace active.
Traces	Invokes the Traces softkey menu which allows you to **create** a new trace, **select** a trace, **delete** a trace, or **maximize** the trace.
Channels	Invokes the Channels softkey menu which allows you to manage channels.

RESPONSE Keys

Performs operations on measurement traces after data is measured - not including Data Analysis operations.

Hard Key	**Invokes these Softkeys -** Click to learn more
Meas	Measurement selections • S-Parameters • Balanced Parameters • Measurement Class More Meas • Receivers
Format	Format
Scale	Scale Electrical Delay Phase Offset More • Velocity Factor • Media -Waveguide/coax • Waveguide cutoff freq
Display	Display settings Arrangements (Overlay...) Windows (Managing) Measurement Setups Display Items

	- Title - Trace Status - Freq Stimulus - Marker Readout - Toolbars - Tables - Status Bar - Hide Sofkeys - Minimize App
Avg	Averaging Smoothing IF Bandwidth
Cal	Start Cal - Cal Wizard - Preferences - Global Delta Match Correction Power Cal - Source Cal - Receiver Cal Manage Cals - Cal Set - Cal Type - Cal Set Viewer Properties (must have a Cal ON) no idea what this is Port Ext Toolbar Interpolation Fixtures

	• ON |Off • Port matching • lots more Manage Cal Kit Manage ECal System Z0 Velocity Factor

MARKER/ANALYSIS Keys

Control all aspects of Data Analysis including Markers and Math functions..

Hard Key	Invokes these Softkeys - Click to learn more
Marker	Markers Properties • Delta Markers • Discrete • Type • Coupled Functions
Search	Marker Search
Memory	Data/ Memory Math 8510 Mode
Analysis	Limit Lines • Limit Test • Global Pass/Fail Trace Statistics Gating Transform • Windowing

	- Coupling - Distance Marker Equation Editor

STIMULUS Keys

Controls settings that determine **what** data (stimulus range), and **how** data (sweep type and triggering), is measured.

Hard Key	**Invokes these Softkeys -** Click to learn more
Freq	Frequency Range Frequency Offset Mode
Power	RF Power level Power Slope Power and Attenuator settings
Sweep	Sweep Time Number of Points Sweep Type Sweep Setup Segment Table settings
Trigger	Trigger settings

UTILITY Keys

Performs global PNA operations.

Hard Key	**Invokes these Softkeys -** Click to learn more
Save	File Save Manage Files Define Data Saves User Preset
Print	Print Print to file Page Setup
Macro/Local	Macro Setup Run Macros

Recall	File Recall
System	Security Configure • SICL / GPIB • Control Panel (Windows) • System Z0 • Power Meter Settings • Millimeter Module Service Help • Error Messages • About NA User Key Touchscreen
Preset	Preset User Preset

ENTRY Keys

Hard Key	Invokes these Softkeys
OK	Closes a dialog box and enters any values made in the dialog box.
Cancel	Closes a dialog box.
Help	Launches this Help file.
Bk Sp	Back Space. Backs up the cursor and deletes any previous selection.
1 to 9	Selects values for measurement settings, then press Enter or G/n - M/u - k/m to complete the selection.
G/n **M/u** **k/m**	Completes the value selection, assigning a unit of measurement. • G/n (Giga/Nano) E12 or E-12 • M/u (Mega/micro) E6 or E-6

	• k/m (kilo/milli) E3 or E-3
Enter **Off**	Enters the values that you select for the measurement settings.
Decimal point	Enters a decimal point to designate fractions of a whole number.
+/-	Plus - Minus Toggles between a positive and negative value entry if it is the first key pressed in the entry.

Knob

Rotate to increase or decrease the value of the active entry.

Navigation Keys

These keys allow you to navigate through menus and dialog boxes and select choices from the active entry toolbar.

Hard Key	Invokes these Softkeys
Left / Right	Moves left and right through menus. Moves tab-left and tab-right within dialog boxes.
Up / Down	Moves up and down through menus. Behaves as follows in a dialog box: • Modifies a numeric value • Moves through items in a drop-down list • Moves through options buttons in a group of option buttons
Click	Makes a selection just like a mouse click.

Last Modified:

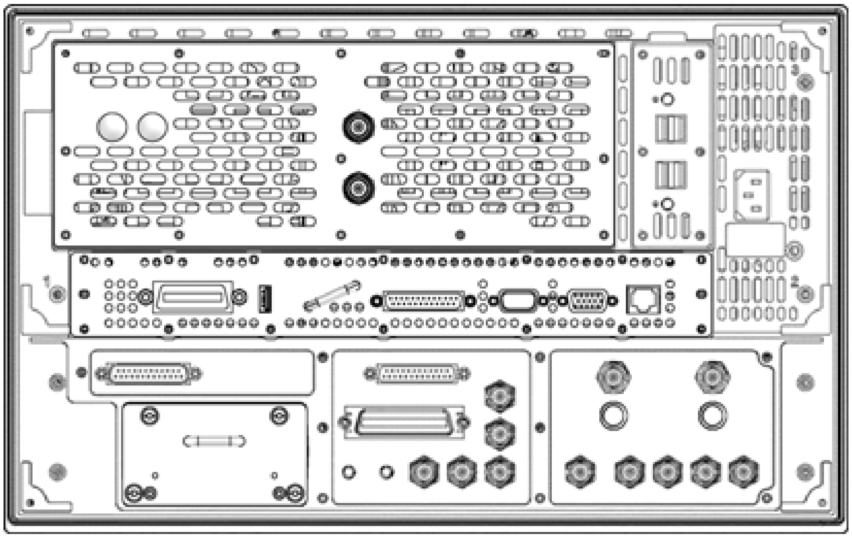
23-Aug-2007 Added front panel jumpers image

Rear Panel Tour

PNA-L and Microwave Models

[See the PNA-X Rear Panel Tour]

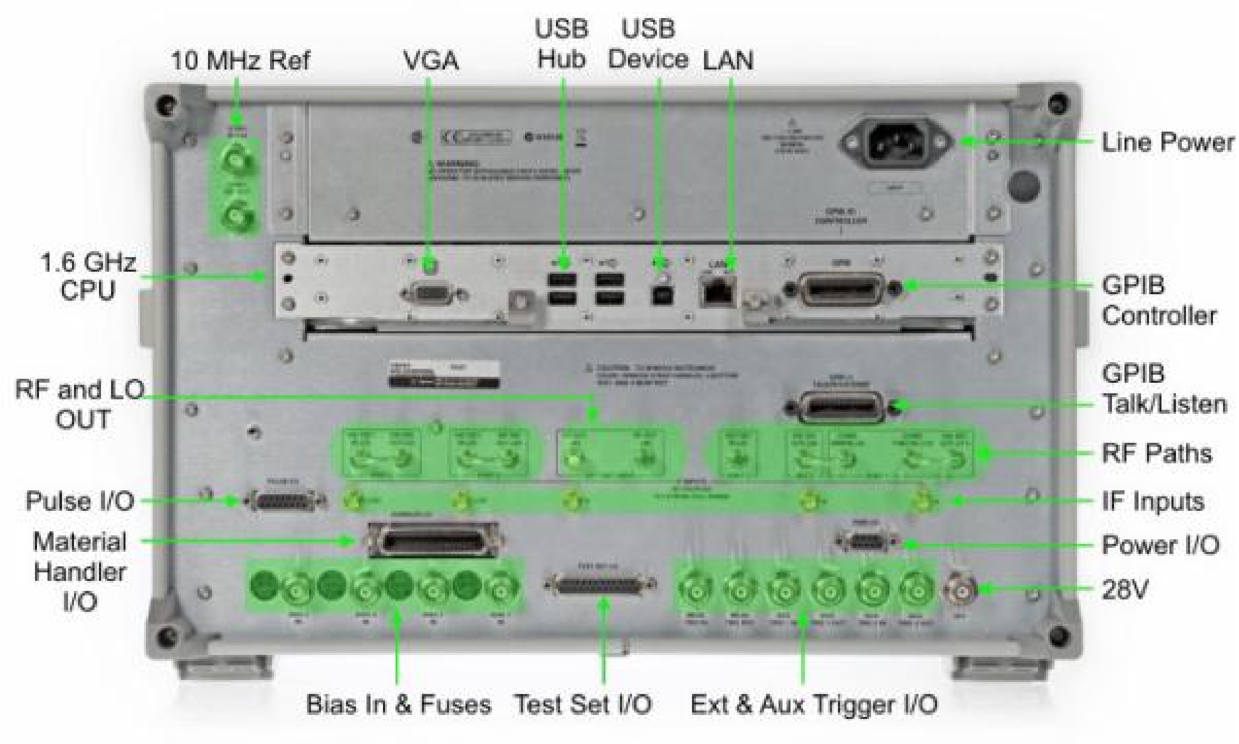
This image includes ALL rear-panel features.
Your PNA may not have this capability or look.
Click on a connector for detailed information.



See this rear-panel with a 1.1 GHz CPU Board.

PNA-X Rear Panel

Click image to learn more.



10 MHz Reference IN/OUT

10 MHz Reference Input When a 10 MHz external reference signal is detected at this port, it will be used as the instrument frequency reference instead of the internal frequency reference.

10 MHz Reference Output This BNC(f) connector outputs a frequency reference signal for use by other test equipment.

See specifications for these ports.

VGA Connector Learn more

USB Hub

This USB hub contains four USB ports to power your PNA peripherals. There are also four USB ports on the front panel.

Limitation: The total power consumption for all eight USB ports is limited to 4.0 amps. If this limit is exceeded, all USB ports are disabled until a device is removed and power consumption falls below the limit. When first connected, Agilent ECal modules 8509x and N4431 draw significantly more current than other modules. See specifications.

USB Device Learn more

LAN Connector

This 10/100BaseT Ethernet connection has a standard 8-pin configuration and auto selects between the two data rates.

Line Power

See specifications

GPIB Controller and Talker/Listener Ports

The PNA-X can be a GPIB Controller and Talker/Listener. Learn more.

RF Path Access

These connectors allow RF Path Configuration.

IF Path Inputs

Option 020 adds these connectors, which allow access to the PNA Receiver / IF paths.

These are labeled A, B, C/R1, D/R2, R.

- For 2-port PNA-X models, use A, B, R1, R2.
- For 4-port PNA-X models, use A, B, C, D, R.

See IF Path configuration block diagram.

Settings are made using SCPI and COM ONLY.

Power I/O

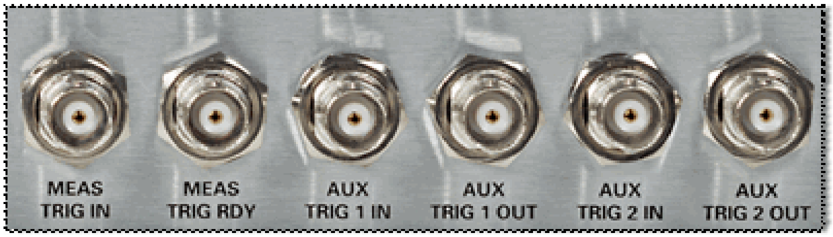
Has some of the AUX I/O connector functionality on the PNA-L and E836xB models.

See Details

28 V (BNC output)

Used to power a noise source for the Noise Figure App.

External and AUX Trigger I/O



MEAS TRIG IN - When enabled, PNA is triggered by signals on this connector. Learn more.

MEAS TRIG RDY When enabled, PNA ouputs a 'READY' signal on this connector to other devices. Learn more.

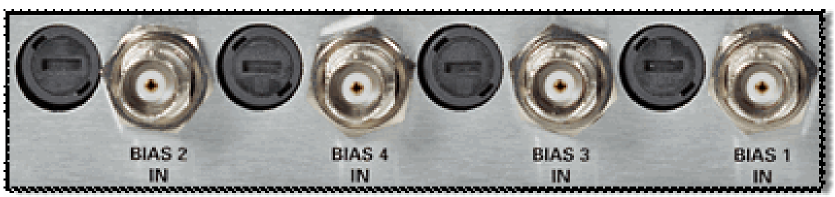
AUX TRIG 1&2 IN When enabled, PNA accepts signals on these connectors which indicates that the external devices is ready to be triggered. Learn more.

AUX TRIG 1&2 OUT When enabled, PNA outputs signals on these connectors either before or after a measurement. Learn more.

Test Set I/O

See Details

Bias IN and Fuses



Apply Bias to the PNA ports through these BNC connectors.

See specifications

Material Handler I/O

See details.

Pulse I/O

See Details

RF and LO OUT

Caution: LO OUT has more power than previous PNA models.

See Specifications

1.6 GHz CPU See CPU Speed / Performance

Last modified:

4-Sep-2007	Added 28V image
June 6, 2007	Added RF and IF connector images
January 11, 2007	MX New topic

Powering the PNA ON and OFF

The following is described in this topic:

- **How to...**
- **Hibernate**
- **ON**
- **Shutdown**
- **Turn OFF Autostart**

Notes

During boot up of Windows or of the Network Analyzer application program, do **NOT** press keys on the front panel, rotate the RPG knob, or connect a USB device. Doing so MAY lead to a front panel lockup state.

If the PNA front-panel keypad or USB ports are not responding, SHUTDOWN or RESTART the PNA; do NOT Hibernate. This causes the PNA drivers to awaken from hibernation in the same corrupt state.

How to Log off, Shut down, Restart, or Hibernate the PNA.

WITH a Mouse

1. On the PNA **System** menu, click **Windows Taskbar**
2. On the Windows Taskbar, click **Shutdown**
3. In the **What do you want the computer to do?** list, choose an action:
   - Log off (closes programs and disconnects from the network)
   - Shut down
   - Restart (shutdown and start)
   - Hibernate
4. Click **OK** to perform the action

WITHOUT a Mouse

- To Hibernate, BRIEFLY press the front-panel PNA power button.
- To Shutdown - ONLY if the PNA is locked and you cannot operate the mouse or keypad - Press and hold the power button for at least four seconds. **This practice should be avoided!** Repeated shutdowns in this manner WILL damage the hard drive. Learn more about damaging the PNA hard drive.
- **Recommended -** To SAFELY shutdown the PNA without a mouse, configure the PNA so you can choose

what to do when the power button is briefly pressed (as in Step 3 above). PNAs shipped after June 2005 are already configured this way:

1. From Windows Control Panel, select **Power Options**
2. Click **Advanced** Tab
3. Under **Power buttons**, select **Ask me what to do.**
4. Click **OK** to end configuration.

The next time the power button is pressed, a dialog box will ask **What do you want the computer to do?** Use the PNA front panel **Tab** and **Enter** keys to choose an action.

Tip: If it is not already running, press the **Preset** button (on the PNA front-panel) to start the PNA application.

Hibernate Mode

- In hibernate mode the current instrument state is automatically saved to the hard disk before the PNA is powered OFF.
- When the PNA is powered ON, this instrument state is loaded, thus saving time over a full system boot-up.
- A password is NOT required to resume PNA operation after Hibernate mode.
- The hibernation state is the normal OFF state. A small amount of standby power is supplied to the PNA when it is in the hibernation mode. This standby power only supplies the power switch circuits and the 10 MHz reference oscillator; no other CPU-related circuits are powered during hibernation. To guarantee that your measurements meet the PNA specified performance, allow the PNA to **warm-up for 90 minutes** after the power button light has changed from yellow back to green.

ON Mode

- To turn ON the PNA press the yellow power button.
- The power button will change to green when power is ON.

Turn OFF PNA Autostart

The PNA application (835x.exe) always starts automatically when power is turned ON. To cause the PNA to NOT Autostart, do the following:

1. Minimize the PNA application.
2. From Windows Explorer, navigate to and double-click the following file: C:/Program Files/Agilent/Network Analyzer/Service/Toggle_PNA_Autostart.

The script toggles the PNA Autostart mode ON and OFF.

Shutdown Mode

- In shut down mode the current instrument state is NOT automatically saved before the PNA is powered OFF.
- When the PNA is again powered ON, a full system boot-up is performed and the PNA powers-up in the preset settings.
- A password is required to resume PNA operation after being in Shutdown mode.
- To guarantee that your measurements meet the PNA specified performance, allow the PNA to **warm-up for 90 minutes** after the power button light has changed from yellow back to green.
- The PNA should only be shut down for service or to provide security via password protection.
- The power button will change to yellow when power is OFF.

Note: If the PNA is locked and you cannot operate the mouse or keypad, shut down the PNA by pressing and holding the power button for at least four seconds.
This practice should be avoided! Repeated shutdowns in this manner WILL damage the hard drive. Learn more about damaging the PNA hard drive.

Unplugging the PNA

- Remove the power cord from the PNA ONLY when the power button is yellow, in either Hibernate or Shutdown mode. If the power cord is removed while the power button is green (PNA ON), damage to the hard drive is **likely**.
- The button will remain yellow for several seconds after the power cord has been removed.
- When plugged back in and the power button is pressed to ON, the PNA starts in the mode it was in when the power cord was unplugged, either Hibernate or Shutdown.

Front Panel Interface

All PNA models except PNA-X

There are three ways to use the front panel keys:

- **Active Entry Toolbar** (quickest)
- **Launch Dialog Boxes**
- **Navigate Menus** (most comprehensive)

Other Quick Start topics

Active Entry Toolbar

Not all settings can be made this way. For making ALL settings use Menus.

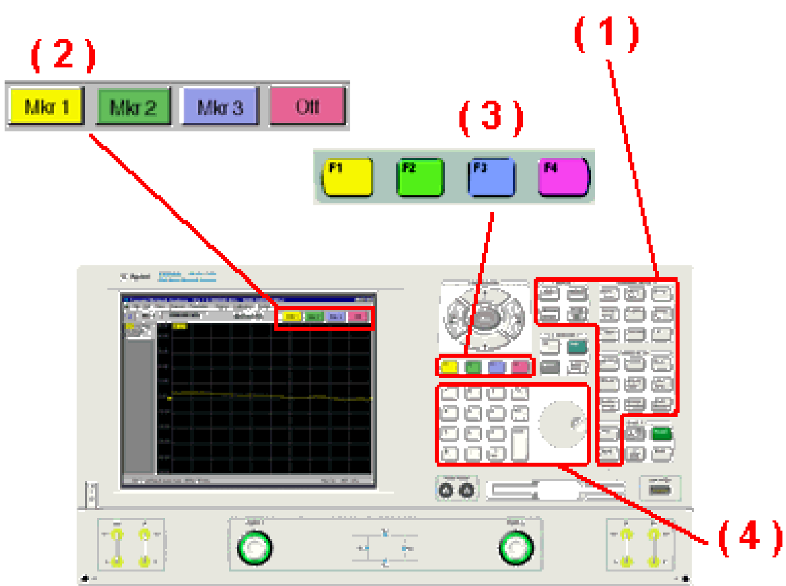
You can make settings quickly using this four step procedure.

(1) Press a key

(2) View active entry

(3) Select a function

(4) Enter a value (if necessary)

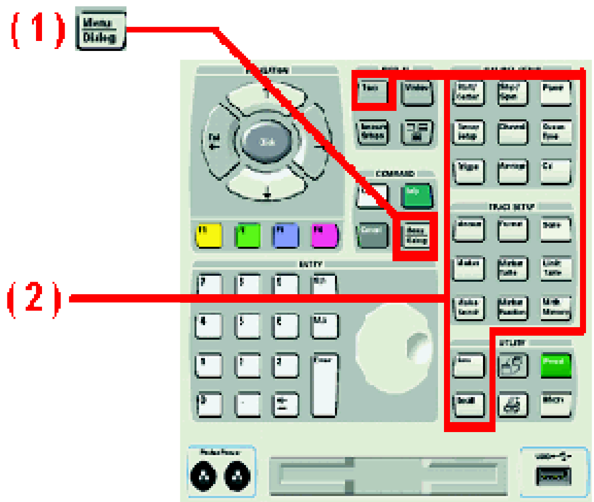


Launch Dialog Boxes,

To quickly launch MOST dialog boxes:

(1) Press the Menu/Dialog Key

(2) Select a function key



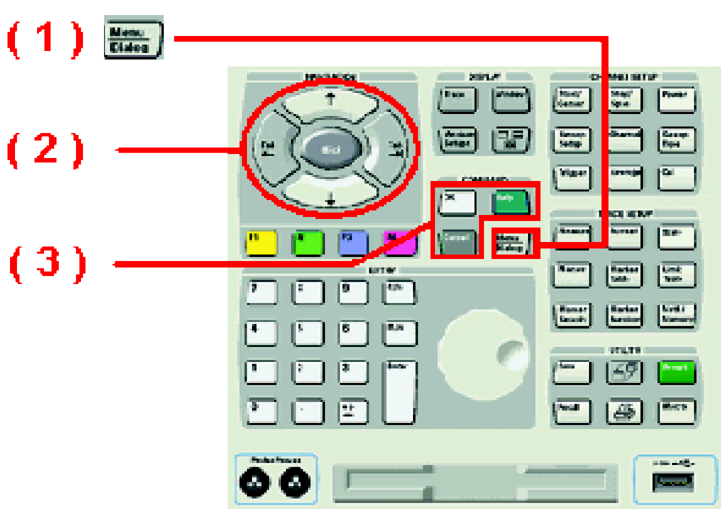
Navigate Menus

You can access ALL PNA functions using Menus:

(1) Press the Menu/Dialog Key

(2) Use the direction keys to navigate through the Menus. Use the "Click" key to make a selection.

(3) Other Command keys are available for cancelling or seeking Help (if necessary)



Traces, Channels, and Windows on the PNA

It is critical to understand the meaning of the following terms as they are used on the PNA.

- **Traces** - **Managing**
- **Channels** - **Managing**
- **Windows** - **Managing**

Note: You may experience a significant decrease in computer processing speed with combinations of the following: increased number of points, number of traces, and calibration error terms (full 2-port or 3-port). If this becomes a problem, you can increase the amount of RAM with PNA Option 022. To monitor the amount of PNA memory usage, press **Ctrl Alt Delete**, select **Task Manager**, then click on the **Performance** tab.

Other Quick Start topics

Traces are a series of measured data points. There is no theoretical limit to the number of traces. However, the practical limit is the maximum number of windows * the maximum number of traces per window (8).

In addition, one memory trace can be stored and displayed for every data trace. Learn more about Math / Memory traces.

Trace settings affect the presentation and mathematical operations of the measured data. The following are Trace settings.

- Parameter
- Format and Scale
- Smoothing
- Correction ON / OFF
- Electrical Delay
- Phase Offset
- Trace Math
- Markers
- Time Domain (Opt 010)

Managing Traces

- How to **Select** a trace
- How to **Delete** a trace

- How to **Move** a trace
- How to **Maximize** a trace
- How to **Create** a new trace
- How to **Change** the trace parameter.
- How to display a custom **trace title.**

How to Select a Trace

A trace must be selected (active) before its trace settings can be changed.

How to know which trace is Active?

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	Programming Commands
1. Press TRACE repeatedly	1. Click the Trace Status button.
For PNA-X models	Programming Commands
1. For Traces 1-4, press the corresponding Hard Key 2. For other trace numbers, press TRACES 3. then **[Select Traces]** 4. Select a trace number in the Entry toolbar.	1. Click the Trace Status label or trace.

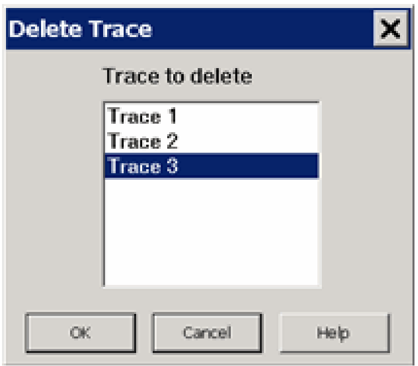
How to Delete a Trace

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	Programming Commands
1. Press TRACE	1. Right-click the Trace Status button, then click Delete.
For PNA-X models	Programming Commands
1. For Traces 1-4, press the corresponding Hard Key 2. For other trace numbers, press TRACES 3. then **[Select Traces]** 4. Select a trace number in the Entry toolbar.	1. Right-click the Trace Status label, then click Delete.

How to Move a trace to a different window

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	
1. Not available	1. Not available
For PNA-X models	
1. Select the trace to move. 2. Press TRACES 3. then **[Move Trace]** 4. Select a window number in the following dialog.	1. Right-click the Trace Status label, then click **Move Trace**.

PNA-X ONLY



This dialog is launched by clicking **Trace/Chan**, then **Delete Trace**

The Select Trace dialog is launched by clicking **Trace/Chan**, then **Select Trace**

Select, Delete, Move Traces dialog box help
Both the **Select Trace** and **Delete Trace** dialogs work the same. Select a trace, then click **OK.** Only ONE trace can be Selected or Deleted. **Note:** To EASILY select a trace, click the Trace Status label. To EASILY delete a trace, right-click the Trace Status label, then click **Delete**.

Trace Max - PNA-X ONLY

Makes the active trace the ONLY trace on the display. All other traces are hidden.

How to do Trace Max

- Select **Trace**, then **Trace Max**.
- With Trace Max ON, select a different trace from the **Traces** softkeys to make that trace visible.
- To make all traces visible again select **Trace Max OFF**

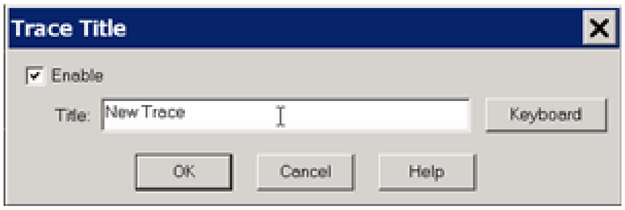
Trace Title

A Trace Title overwrites the Measurement Parameter in the Trace Status area, the Status Bar, and hardcopy prints.

- This title has priority over Equation Editor titles.
- The practical limit is about 70 characters if there is only one trace.
- Spaces are accepted but not displayed; use underscores.
- The title is annotated as follows:

How to enter a Trace Title

1. Click the Trace Status label to select a trace.
2. Click **Trace/Chan,** then **Trace,** then **Trace Title.**



3. Click **Enable**, then type the trace title. Click **Keyboard** to type with a mouse.
4. To remove the trace title, clear the **Enable** checkbox, or delete the text from the dialog entry.

Channels contain traces. The PNA can have up to **32 independent channels.**

Channel settings determine **how** the trace data is measured . All traces that are assigned to a channel share the same channel settings. A channel must be selected (**active**) to modify its settings. To select a channel, click the Trace Status button of a Trace in that channel. The following are channel settings:

- Frequency range
- Power level
- Calibration
- IF Bandwidth
- Number of Points
- Sweep Settings
- Average
- Trigger (some settings are global)

Managing Channels

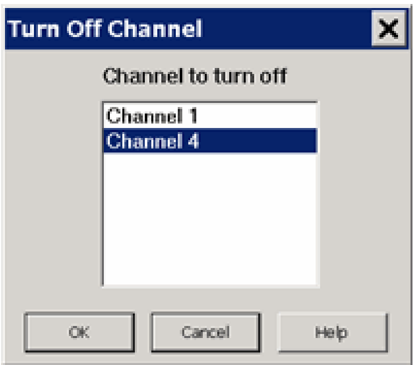
How to Select a Channel

A channel must be selected (active) before its settings can be changed.

To make a channel active, select a trace in that channel.

How to Turn ON or OFF a Channel

Click **Trace/Chan**, then **Channel,** then **Turn On / Off** Channel.

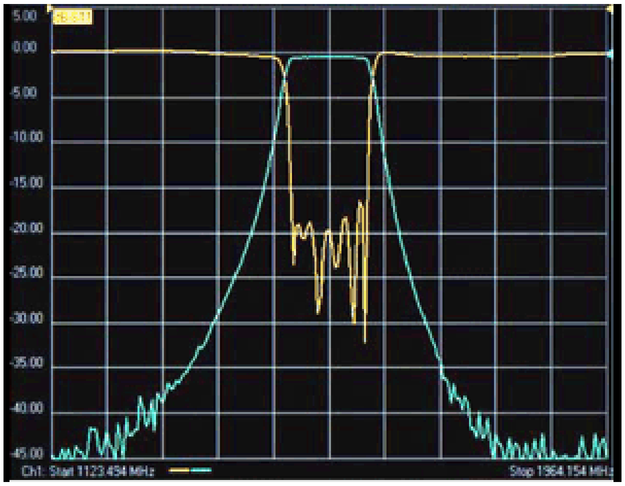


Turn ON | OFF Channel dialog box help
Both the Turn **ON** and Turn **OFF** dialogs work the same. Select a channel, then click **OK.** Only ONE channel can be selected When turning ON a channel, the new channel is always the Standard Measurement Class with an S11 trace. **Note:** To create more than one trace in a new channel, click Trace, then New Trace

Windows are used for viewing traces.

- The PNA can show an **UNLIMITED** number of windows on the screen (16 windows previous to PNA release 6.2) with the following limitations:
    - The COM property MaximumNumberOfWindows returns 1000 ('unlimited' is not a number).
    - The SCPI status register can only track the status of up to 576 traces.
- Each window can contain up to **8 traces** (4 traces previous to PNA release 5.2).
- Windows are completely independent of channels.
- Learn to create and manage windows.

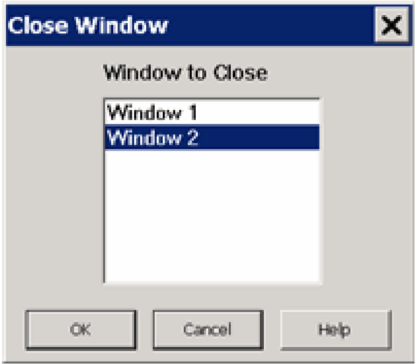
The following is a window containing two traces. Both traces use the same channel 1 settings as indicated by the annotation at the bottom of the window.



PNA-X shows the window number in the lower-left corner of the window. The following shows window **5.**

Managing Windows -

How to make various window settings New, Close, Tile, Cascade, Minimize, Maximize	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	
1. Press 	1. Click **Window**
For PNA-X models	
1. Press **RESPONSE** 2. then **[Display]** 3. then **[Windows]**	1. Click **Response** 2. then **Display** 3. then **Windows**



Close Window dialog box help
Select a window, then click **OK.** The remaining windows are tiled. Only ONE window can be selected. Traces contained in a closed window are deleted. **Note:** To EASILY close a window, click the X in the upper right corner of a window. The X is only visible when Title Bars are enabled. The remaining windows are NOT tiled. See Customize the PNA screen to learn how to make other window settings

Last modified:

15-Oct-2007	MX New settings
9/19/06	MQ Modified for unlimited number of windows

Basic Measurement Sequence

The following process can be used to setup all PNA measurements:

Step 1. Set Up Measurements
Reset the analyzer, create a measurement state, and adjust the display.

Step 2. Optimize Measurements
Improve measurement accuracy and throughput using techniques and functions.

Step 3. Perform a Measurement Calibration
Reduce the measurement errors by performing a calibration.

Step 4. Analyze Data
Analyze the measurement results using markers, math operations, and limit tests.

Step 5. Print, Save or Recall Data
Save or print the measurement data.

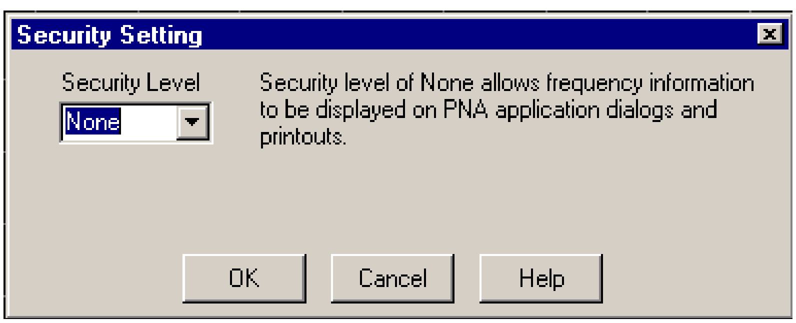
Frequency Blanking

Note: To learn how to erase memory before moving your PNA out of a secure area, see http://na.tm.agilent.com/pna/security.html.

For security reasons, you can prevent frequency information from appearing on the PNA screen and printouts.

How to set Frequency Blanking

Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Security**
For PNA-X and 'C' models	Programming Commands
1. Press **UTILITY** 2. then **[System]** 3. then **[Security]**	1. Click **Utility** 2. then **System** 3. then **Security**



Security Setting dialog box help

None   All frequency information is displayed on the screen and printouts.

Low security level

Frequency information is blanked from the following:

- Display annotation
- Calibration properties
- All tables
- All toolbars
- All printouts

To re-display frequency information, revisit this dialog box and select **None**.

High security level

Low security level settings PLUS:

- GPIB console is inactive

To re-display frequency information, perform an instrument preset, or recall an instrument state with security level of None.

Extra security level

High security level settings PLUS:

- All ASCII data saving capability (.snp, .prn, .cti) is DISABLED.

To re-display frequency information, perform an instrument preset, or recall an instrument state with security level of None.

For ALL security levels:

Frequency information is **NOT** blanked from the following:

- The Frequency Converter Application (opt 083) dialog box information or printouts.
- Service Adjustment Programs
- Your remote COM or SCPI programs.

Last Modified:

17-Jul-2007   Added Extra setting

Internal Second Source

The following PNA models include an internal second source.

Model (click to see block diagram)	Total # of Ports	Frequency
N5230A Opt 146	4	300 KHz - 13.5 GHz
N5230A Opt 246	4	300 KHz - 20 GHz
N5242A Opt 224	2*	10 MHz to 26.5 GHz
N5242A Opt 400	4	10 MHz to 26.5 GHz

How to use the second source

- Set frequency using the Frequency Offset Opt 080 dialog.
- Set power using the Advanced Power dialog.
- Source power calibration of the second source is performed as usual.
- Using FCA, click the LO button to set frequency and power.
- The specifications of the second source are the same as source 1.

Benefits / Uses of the second source

- Up to five times faster than stepping an external source.
- Measure Mixers with internal swept or fixed LO.
- Measure TOI or Intermodulation distortion.

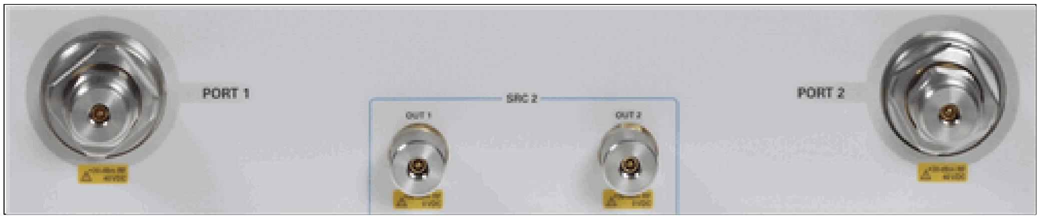
Internal Second Source Restrictions

Source 1 and Source 2 are available at specific ports as follows:

N5230A (PNA-L) models:

- Source 1 power available at Port 1 OR Port 2; NOT at both ports simultaneously.
- Source 2 power available at Port 3 OR Port 4; NOT at both ports simultaneously.

N5242A Opt 224 (PNA-X 2-port model):



- Source 1 power available at **Port 1** OR **Port 2**; NOT at both ports simultaneously.
- Source 2 (**SRC 2**) power available at **Out 1** AND **Out 2**; BOTH ports simultaneously.

N5242A Opt 400, 419, 423 (PNA-X 4-port models):

- Source 1 power available at Port 1 OR Port 2; NOT at both ports simultaneously.
- Source 2 power available at Port 3 AND Port 4; BOTH ports simultaneously.
- Opt 423 ONLY - Source 2 power is available at Port 4 AND either Port 3 OR Port 1 (through the combiner as "Port 1 Src2"). See block diagram for N5242A Opt 423

Remotely Accessing the Internal Second Source

See

Last modified:

23-Jul-2007	Added remote section
1123-Jul-2007	MX Added PNA-X models
10/02/06	MQQ New topic

Networking and Connecting the PNA

The PNA as a PC

- PNA User Accounts and Passwords
- Drive Mapping
- Connecting the PNA to a PC
- Easy versus Secure Configuration
- Changing Network Client
- Using VNC to Control the PNA User Interface

GPIB / COM Programming

- Configure for COM/DCOM Programming
- 82357A USB to GPIB Interface
- The PNA as GPIB System Controller
- How to Configure for GPIB, SCPI, and SICL

Controlling External Devices

- E5091 TestSet Control
- External Testset Control
- Interface Control Feature
- TestSetIO Connector
- Handler IO Connector
- AuxIO Connector

PNA Preferences

The following is a list of PNA preferences. Most of these are set using SCPI or COM commands. SCPI commands can be easily set from the PNA front panel. For more information, click the links below.

Calibration

Preference	UI Setting	SCPI	COM
Auto-save User Cal Set	None	SENS:CORR:PREF:CSET:SAVE	None
For Guided Cal, set external trigger.	None	SENS:CORR:PREF:TRIG:FREE	PreferInternalTriggerOnChannelSingle
For Unguided Cal, set external trigger.	None	SENS:CORR:PREF:TRIG:FREE	PreferInternalTriggerOnUnguidedCal
Sets behavior for simulated cal	None	SENS:CORR:PREF:SIMCal	None
Show or not, the first 'Method' Page of the Cal Wizard.	Cal Preferences	None	None
Set and order default Cal Types	Cal Preferences	None	None
Perform orientation of the ECal module during calibration?	ECal Wizard	SENS:CORR:PREF:ECAL:ORI	OrientECALModule
Specify ECal port mapping when orientation is OFF	ECal Wizard	SENS:CORR:PREF:ECAL:PMAP	ECALPortMapEx

File Save

Preference	UI Setting	SCPI	COM
Specifies the contents of subsequent citifile saves.	Data Define	MMEM:STOR:TRAC:CONT:CIT	CitiContents
Specifies the format of subsequent citifile saves.	Data Define	MMEM:STOR:TRAC:FORM:CIT	CitiFormat

Measurements

Preference	UI Setting	SCPI	COM
Mathematically offset for receiver attenuation.	None	SYST:PREF:ITEM:OFFS:RCV	OffsetReceiverAttenuator
Mathematically offset for source attenuation.	None	SYST:PREF:ITEM:OFFS:SRC	OffsetSourceAttenuator
Turn RF power ON or OFF during a frequency sweep retrace.	None	SYST:PREF:ITEM:RETR:POW	PowerOnDuringRetraceMode
For power sweep, maintain source power at the start or stop power level.	None	SYST:PREF:ITEM:PSRT	PowerSweepRetracePowerMode
Sets the External Trigger OUT behavior to have either Global or Channel scope.	None	TRIG:PREF:AIGL	AuxTriggerIsGlobal

Errors

Preference	UI Setting	SCPI	COM
Report source unleveled events as errors?	None	SYST:ERR:REP:SUNL	EnableSourceUnleveledEvents
Display Error Messages?	Error Preferences	None	None

Last Modified:

5-Feb-2007 MX New topic

Using VNC to Control the PNA User Interface

VNC (Virtual Network Computing) allows you to control the User Interface of a PNA from any PC. The PNA display appears on the connected PC display. Mouse and keyboard control can occur from both the PNA and PC, although not simultaneously.

Both the PNA and PC must be connected to the internet. The responsiveness of the PNA while using VNC is dependent of the speed of your internet connection.

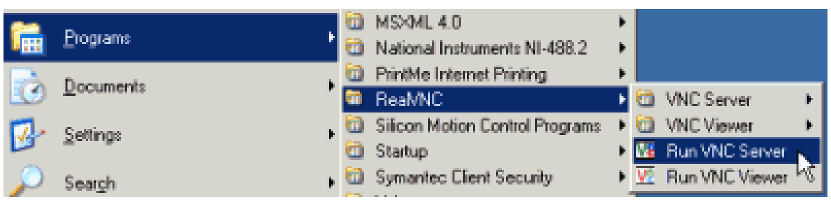
Every PNA is shipped with VNC installed. However, you must download and install the VNC software onto the PC from http://www.realvnc.com/.

Once installed, the following procedure will help you configure VNC to view and control the PNA application from your PC.

On the PNA, run VNC Server

To do this:

1. Click View, then Minimize Application.
2. Click **Start, Programs, RealVNC, Run VNC Server.**



- The first time you run VNC Server, you will set a password to control access from remote PCs.
- To automatically start VNC when the PNA computer boots, drag a **Run VNC Server** shortcut to your User "startup" folder. The following is the Administrator folder: C:\Documents and Settings\Administrator\Start Menu\Programs\Startup

On the PC, run VNC Viewer

To do this:

1. Download (http://www.realvnc.com/) and install VNC on the PC.
2. From the PC Desktop, click **Start, Programs, RealVNC, Run VNC Viewer**
3. When prompted for the Hostname, type the full computer name or IP address of the PNA.
4. When prompted for the password, type the password you set when configuring VNC on the PNA.

Using Help

Help Rev. 2008-03-10
PNA Rev. A.08.00

This topic discusses the following:

- PNA Documentation
- Printing Help
- Copying Help to your PC
- Launching Help
- Navigating Help
- Help Languages
- Glossary
- Dialog Boxes
- About Network Analyzer
- Documentation Warranty
- Suggestions Please

Other Quick Start Topics

PNA Documentation

This Help file, which is embedded in the PNA, is the **Users Guide and Programming Manual for the PNA**. The help file is automatically updated on the PNA when firmware is updated. Only the PNA Installation and Quick Start Guide is shipped with new PNA instruments.

Hardcopy manuals are no longer available for purchase with the PNA.

All PNA documentation, including the **latest online Web Help version** of this Help file, and a printable .PDF version of the Help file, are available at http://na.tm.agilent.com/pna/help/index.html.

Printing Help

Beginning with the PNA 5.2 release (March 2005), we once again offer a .pdf version of PNA Help. Download the .pdf file from http://na.tm.agilent.com/pna/help/index.html. You can still print individual PNA Help topics by clicking the Print icon at the top of the PNA Help window.

Copying Help to your PC

With the Help system on your PC, you can read about the PNA while away from it. You can also Copy and Paste programming code from this Help system directly into your programming environment.

The Help file is located on your PNA hard-drive at **C:\ Winnt\ Help\ PNAHelp.chm**. If both the PNA and PC are connected to LAN, you can map a drive and copy the file directly.

The Help file can also be downloaded from http://na.tm.agilent.com/pna/help/index.html.

Launching Help

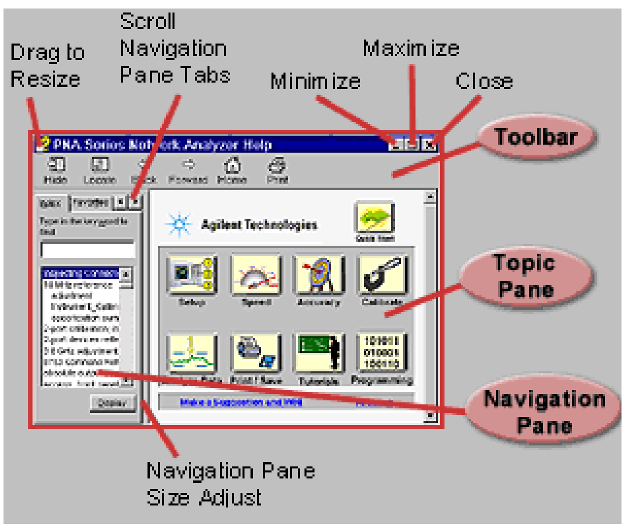
The Help system can be launched in three ways:

1. From the front panel Help button.
2. From the **Help** drop-down menu
3. From Dialog Box Help

Navigating Help

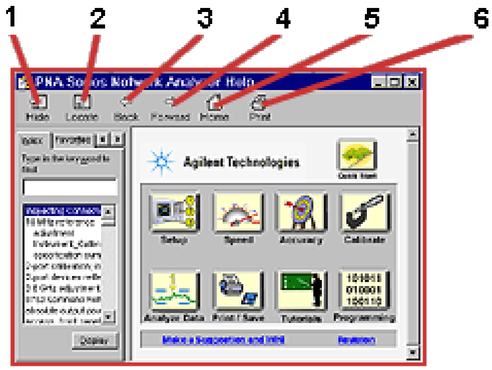
The Help Window contains 3 panes (regions):

1. Toolbar Pane
2. Topic Pane
3. Navigation Pane



Toolbar Pane

The Toolbar is at the top of all Help windows. It allows you to resize the window, browse and print the selected topic.



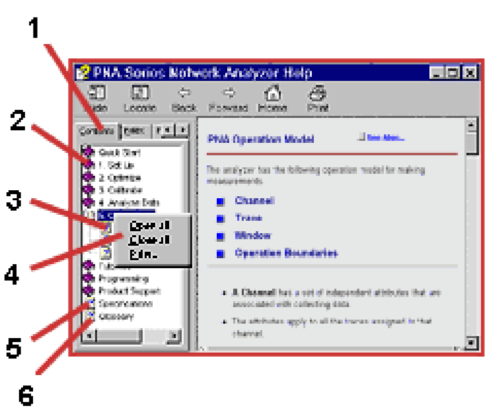
1. Hide or show the navigation pane
2. Locate the topic in the table of contents
3. Back to topic visited previously
4. Forward again if **Back** was clicked
5. Go to the Home page.
6. Print the topic pane.

Navigation Pane

Click the following tabs in the Navigation Pane to access information in the Help system:

- Table of Contents Tab
- Index Tab
- Search Tab
- Favorites Tab

(Table of)Contents Tab



1. Click tab to select Table of Contents.
2. Click a book to access related topics.
3. Click to display a topic.
4. Right click to access menu.
5. Click to display specifications
6. Click to display glossary

Index Tab

The index tab allows you to type a keyword and go to only the most applicable topics.

1. Click tab to select index.
2. Type keyword to find topics of interest.
3. View suggested topics. (Double-click to display topic.)
4. Click to display topic.

Search Tab

TIP: To Search any topic for a keyword, press **Ctrl** and **F**.

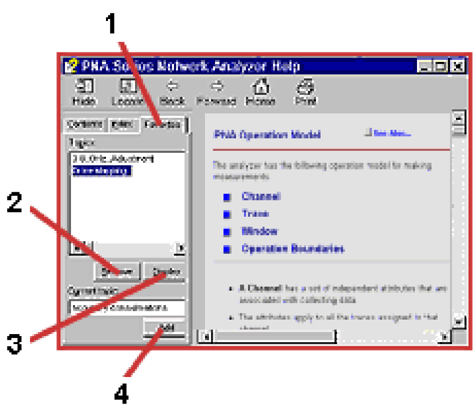
The following rules apply for using full-text search:

- Searches are not case-sensitive.
- You can search for any combination of letters (a-z) and numbers (0-9).
- Punctuation marks (period, colon, semicolon, comma, and hyphen) are ignored during a search.
- You can group the words of your search using double quotes or parentheses. Examples: "response calibration" or (response calibration). This requirement makes it impossible to search for quotation marks.
- Use Wildcard expressions:
  - To search for one undefined character use a question mark (?). For example, searching for **cal?** will find **calc** and **calf.**
  - To search for more than one undefined character use an asterisk (*). Searching for **Cal*** will find **calibration** and **calculate.**
- Use Boolean operators to define a relationship between two or more search words.

Search for	Example	Results will show topics containing:
Two words in the same topic	response AND calibration	Both the words "response" and "calibration".
Either of two words in a topic	response OR calibration	Either the word "response" or the word "calibration" or both.
The first word without the second word in a topic	response NOT calibration	The word "response" but not the word "calibration".
Both words in the same topic, close together.	response NEAR calibration	The word "response" within eight words of the word "callibration".

Favorites Tab

The favorites tab allows you to store (bookmark) the topics you refer to most often so that they can be recalled easily.



1. Click tab to view stored topics in Favorites.
2. Remove selected topic.
3. Display selected topic.
4. Add (store) current topic.

Topic Pane

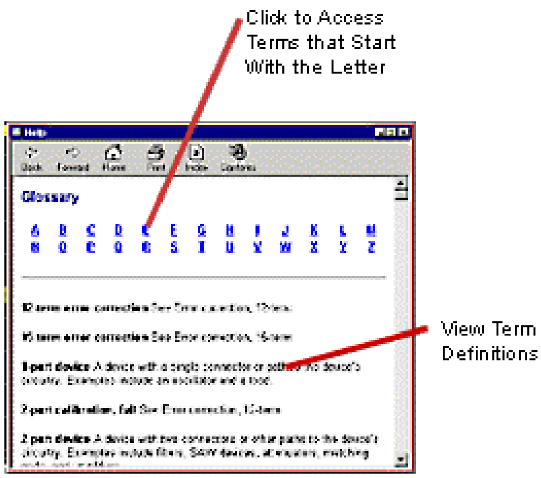
The Topic pane allows you to view the contents of the selected topic.

Help Languages

Beginning with PNA Rev A.08.00, PNA Help is offered in English ONLY.

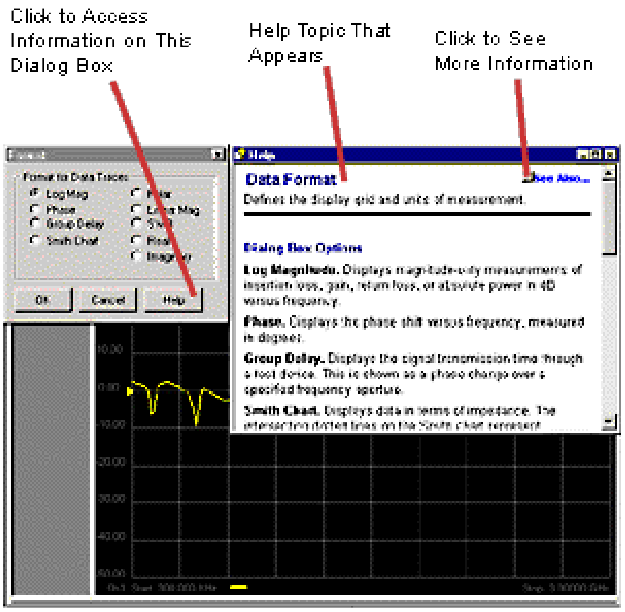
Glossary

The Glossary holds definitions of words, in alphabetical order.



Note: Click on a word in green text throughout Help to see the glossary definition.

Dialog Boxes



About Network Analyzer

To learn the following about the PNA, click **Help**, then **About Network Analyzer:**

- Model number (see list of PNA models)
- Frequency range
- Serial number
- Installed options
- Application Code (firmware) version
- Version of hard drive in the analyzer

Documentation Warranty

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED "AS IS," AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, AGILENT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. AGILENT SHALL NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR ANY INFORMATION CONTAINED HEREIN. SHOULD AGILENT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CONFLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT WILL CONTROL.

Suggestions Please!

Please let us know about your experience using PNA Help. Send your comments to: pna_help@am.exch.agilent.com. Comment about any aspect of the help system. Here are a few areas that you might consider:

- Does anything appear to be broken?
- Did you find what you were looking for?
- Was the information you found helpful?
- Any suggestions as to how we can improve the help system?

Your comments go directly to the help system authors. For help with technical questions, please refer to Technical Support.

Preset the PNA

When you Preset the PNA, it is set to known, or preset conditions. You can use the factory default preset conditions, or define your own User Preset conditions.

- Preset (Default) Conditions
- User Preset Conditions

See other 'Setup Measurements' topics

Preset Default Conditions

How to Preset the PNA

Tip: Press the **Preset** button to start the PNA application if it is not already running.

Using front-panel HARDKEY **[softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Press Preset	1. Click **System** 2. then **Preset**
For PNA-X and 'C' models	Programming Commands
1. Press Preset	1. Click **Utility** 2. then **Preset**

Click to view the **factory preset conditions**.

- Frequency Settings
- Power Settings
- Sweep Settings
- Segment Sweep Settings
- Trigger Settings
- Display Settings

- Response Settings
- Calibration Settings
- Marker Settings
- Limit Test Settings
- Time Domain Settings (Option 010)
- Global Display Settings

Frequency Settings:	
Measurement Parameter	S11
Start Frequency	Minimum frequency of the PNA
Stop Frequency	Maximum frequency of the PNA
CW Frequency	1 GHz

See the PNA configurations for the minimum and maximum frequency of your PNA

Power Settings:	
Test Port Power	0 dBm for E8356/7/8A 0 dBm for E8801/2/3A 0 dBm for N3381/2/3A -5 dBm for N5230A - 20 GHz -10 dBm for N5230 - 40 GHz -15 dBm for N5230 - 50 GHz -12 dBm for E8362/3/4 A or B, standard -15 dBm for E8361A -17 dBm for E8362/3/4 A or B with option UNL or 014
Power	On
Port Power Coupled	On
Auto Attenuation	On
Attenuator Value	0 dB
Power Slope	Off
Slope Value	0 dB/GHz

Sweep Settings:

Type	Linear Frequency
Mode	Continuous
Generation	Analog
Auto Sweep Time	On
Number of Points	201

Segment Sweep Settings:

Active Segments	1
Start Frequency	PNA start frequency
Stop Frequency	1 MHz for E8356/7/8A 1 MHz for E8801/2/3A 1 MHz for N3381/2/3A 1 GHz for E836xA/B
Number of Points	21
Power	PNA preset test port power
IF Bandwidth	50 KHz for N5230A 35 kHz for all other models
Reduce IF BW at Low Frequencies	ON
Dwell Time	0

Trigger Settings

Source	Internal
Mode	Sweep

Display Settings:

Format	Log Mag

These settings apply for formats when selected:

Format	Scale	Reference Position	Reference Value
Log Mag	10 dB/	5	0 dB
Phase	45 degrees/	5	0 degrees
Group Delay	10 nsec/	5	0 s
Linear Mag	100 munits/	0	0 units
SWR	1 unit/	0	1 unit
Real	2 units/	5	0 units
Imaginary	2 units/	5	0 units
Polar	1 unit/	n/a	1 unit
Smith Chart	1 unit/	n/a	1 unit

Response Settings:	
Channel Number	1
IF Bandwidth	50 KHz for N5230A 35 kHz for all other models
Averaging	Off
Averaging Factor	1
Smoothing	Off
Smoothing Factor	1% of span
Electrical Delay	0 s
Velocity Factor	1.0
Phase Offset	0 degrees
Math/Memory Trace View	Data

Calibration Settings:

Correction State	Off
Interpolation State	On
Calibration Type	None
Cal Kit Number	Current Cal Kit Number
System Z0	50 ohms
Port Extensions State	Off
Port Ext. Values Input A, B Port 1, 2	0

Marker Settings:

Initial Frequency	Current Center Frequency
Reference	None
Interpolation	On
Format	Trace Default
Type	Normal
Function	Max Value
Domain	Full Span
Table	Empty
Coupling	Always uncoupled

Limit Test Settings:

Limit Testing	Off
Line Display	ON
Sound on Fail	Off

Limit List Settings:	
Type (OFF, MAX, MIN)	OFF
Begin Stimulus	0
End Stimulus	0
Begin Response	0
End Response	0

Time Domain Settings:	
Transform State	Off
Transform Mode	Band Pass
Transform Start	-10 ns
Transform Stop	10 ns
Window	6.0 (Kaiser-Bessel factor)
Gating State	Off
Gating Start	-10 ns
Gating Stop	10 ns
Gate Type	Band Pass
Gate Shape	Normal

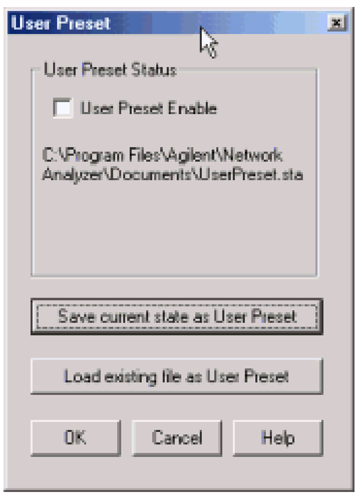
Global Display Settings:	
Trace Status	On
Frequency/ Stimulus	Off
Marker Readout	On (when a marker is activated)
Toolbars Shown	Active Entry
Status Bar State	ON

User Preset Conditions

The analyzer can be **preset** to either **factory default** conditions or **User Preset** conditions.

How to set User Preset

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **User Preset**
For PNA-X and 'C' models	Programming Commands
1. Press **SAVE** 2. then **[User Preset]**	1. Click **Utility** 2. then **User Preset**



User Preset dialog box help

With a User Preset saved and enabled, when the PNA is Preset, the User Preset settings are recalled instead of the factory default settings. Calibration data is NOT recalled with a User Preset. Learn more about instrument state settings.

User Preset Enable
Check - The PNA is preset to **User Preset** conditions when the Preset button is pressed.
Clear - The PNA is preset to **Default** conditions when the Preset button is pressed.

Save current state as User Preset Click to store the current instrument state as the User Preset conditions. File is stored as C:/ Program Files/ Agilent/ Network Analyzer/ Documents/ UserPreset.sta.

Load existing file as User Preset Click to retrieve an instrument state to be used as the User Preset conditions.

Last modified:

9/27/06	MX Added UI
9/12/06	Added link to programming commands

Measurement Parameters

This topic contains the following information:

- **S-Parameters** (pre-selected ratios)
- **Ratioed** (choose your own ratio)
- **Unratioed Power** (absolute power)
- **How to Select a Measurement Parameter**

Learn about Balanced Measurements

See other 'Setup Measurements' topics

S-Parameters

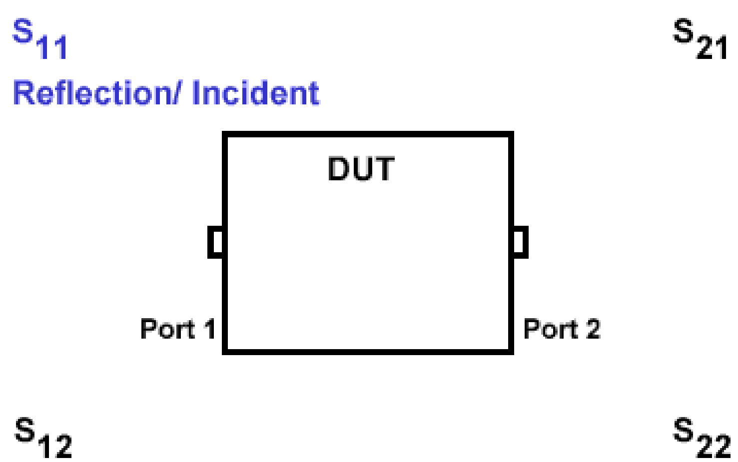
S-parameters (scattering parameters) are used to describe the way a device modifies a signal. For a 2-port device, there are **four S-Parameters.** The syntax for each parameter is described by the following:

S out - in

out = PNA port number where the device signal output is measured (receiver)

in = PNA port number where the signal is applied (incident) to the device (source)

Move the mouse over each S-parameter to see the signal flow:



For two-port devices:

- When the source goes into port 1, the measurement is said to be in the **forward** direction.

- When the source goes into port 2, the measurement is said to be in the **reverse** direction.

The analyzer automatically switches the source and receiver to make a forward or reverse measurement. Therefore, the analyzer can measure all four S-parameters for a two-port device with a single connection.

See the block diagram (including receivers) of your PNA.

Common Measurements with S-Parameters

Reflection Measurements (S11 and S22)

- Return loss
- Standing wave ratio (SWR)
- Reflection coefficient
- Impedance
- S_{11}, S_{22}

Transmission Measurements (S21 and S12)

- Insertion loss
- Transmission coefficient
- Gain/Loss
- Group delay
- Deviation from linear phase
- Electrical delay
- S_{21}, S_{12}

Receiver Measurements

A 2-port PNA typically has four receivers: A, B, R1, and R2.

Your PNA may not have 2 reference and 2 test port receivers. See the block diagram of your PNA.

- R1 and R2 are reference receivers. They measure the PNA source signal as it leaves the PNA and is incident on the DUT.
  - R1 measures the signal out of Port 1
  - R2 measures the signal out of Port 2.
- A and B are test port receivers. They measure the signal out (or reflecting off) of the DUT.
  - A measures the signal into PNA Port 1
  - B measures the signal into PNA Port 2

You can specify measurements using one or two of the available receivers.

Note: Beginning with PNA Rev. 7.22, you can use the internal ADC (Analog-Digital Converters) as measurement receivers. Learn more.

Ratioed Measurements

Ratioed measurements allow you to choose your own ratio of any two receivers that are available in your PNA. S-parameters are actually predefined ratio measurements. For example S11 is A/R1.

The following are common uses of ratioed measurements:

- Comparing the phase between two paths of a device. An example could be something simple like a power splitter or more complicated like a dual-channel receiver.
- Measurements that require a higher dynamic range than the analyzer provides with S-parameters.

Your PNA **MAY** have front-panel jumper cables that go directly to measurement receivers. Learn about the front-panel jumpers on your PNA.

Unratioed (Absolute Power) Measurements

The unratioed power parameter allows you to look at the absolute power going into any of the measurement receivers that are available on your PNA.

The reference receivers are internally configured to measure the source power for a specific PNA port. Performing an absolute power measurement of a reference receiver using a different source port will measure very little power unless the front panel jumpers are removed and signal is applied directly to the receiver. An example of this would be an R1 measurement using port 2 as the source.

- Measuring phase using a single receiver yields meaningless data. Phase measurements must be a comparison of two signals.
- Averaging for Unratioed parameters is computed differently from ratioed parameters.

How to create a NEW trace

PNA-X

The only measurements that can be created are those in the same measurement class as is currently assigned to the active channel. To create a measurement other than these, first assign the appropriate measurement class to a new or existing channel. Learn how.

After that is done...

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	Programming Commands
1. Press TRACE 2. then [Active Entry keys]	1. Click **Trace** 2. then **New Trace**
For PNA-X and 'C' models	Programming Commands
1. Press TRACE 1, 2, 3, OR 4	1. Click **Trace/Chan** 2. then **New Trace**

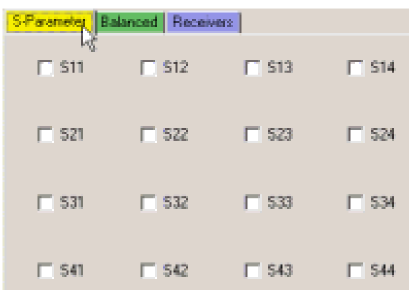
How to CHANGE the active trace

For N5230A and E836xA/B models	Programming Commands
1. Press **MEASURE** 2. then **[Active Entry keys]**	1. Click **Trace** 2. then **Measure**
For PNA-X and 'C' models	**Programming Commands**
1. Press **MEAS**	1. Click **Response** 2. then **Measure**

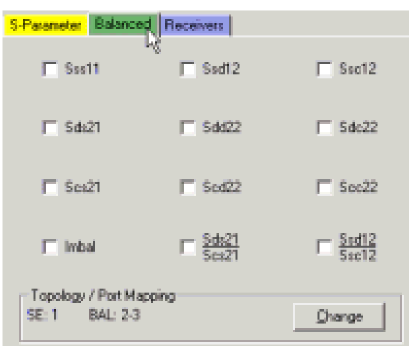
E836x and PNA-L models:

Click a tab to select the TYPE of measurement:

The tabs are populated ONLY with measurements and receivers that are available for your PNA configuration.



S-Parameters



Balanced

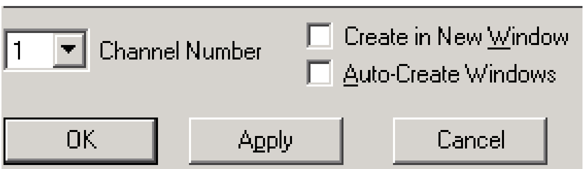
Different measurements are available depending on the selected topology.

Receivers

- Ratioed
- Unratioed

The internal ADCs (Analog-Digital Converters) can be used as measurement receivers. Learn more.

Learn about new logical receiver notation.



Gain Compression

Noise Figure

Channel / Window Selections

New / Change Measurement dialog box help

Note: The only measurements that are available are those in the measurement class currently assigned to the active channel. Other measurements are NOT compatible.

To create a measurement other than these, first assign the appropriate measurement class to a new or existing channel. Learn how.

Click a tab to create or change measurements.

- When creating NEW measurements, you can choose more than one.
- When changing an EXISTING measurement, you can choose ONLY one.

Tabs

S-Parameter Select a predefined ratioed measurements. Learn more about S-parameters.

Balanced Select a balanced measurement type. (Multiport PNAs ONLY)

Change Click to invoke the Balanced DUT Topology / Logical Port mappings dialog box. Learn more about Balanced Measurements.

Receivers Select receivers to make Ratioed and Unratioed (absolute power) measurements. Learn more about receiver measurements.

Logical Receiver Notation

With PNA Rev 6.2, Ratioed and Unratioed measurements can also use **logical receiver notation** to refer to receivers. This notation makes it easy to refer to receivers with an External Test Set connected to the PNA. You do not need to know which physical receiver is used for each test port.

- **a**N - Reference receiver for logical port N
- **b**N - Test port receiver for logical port N

For example:

- **Ratioed**: "b12/a1" refers to the logical test port 12 receiver / the logical port 1 reference receiver.
- **Unratioed**: "b10" refers to the logical test port 10 receiver.

The old style notation (A, B, R1 and so forth) can still be used to refer to the PNA **physical** receivers.

However, ratioed measurements MUST use the same notation to refer to both receivers; either the physical receiver notation (A, R1) or the logical receiver notation (aN, bN). For example, the following mixed notation is NOT allowed: A/b3 and a5/R2.

Programming

When entering receiver letters using programming commands, neither logical or physical receiver notation are case sensitive.

Ratioed Check **Activate** to create or change a measurement. Select a receiver for the Numerator, select another receiver for the Denominator, then select a source port for the measurement.

The **Source port** is ALWAYS interpreted as a logical port number.

For convenience, the table is populated with common choices.

- Learn about External Test Sets and Ratioed Measurements
- Learn more about Ratioed Measurements.

Unratioed Same as Ratioed, but select **1** as the Denominator.

- Learn More about Unratioed Measurements.
- See the block diagram of receivers in YOUR PNA.
- The internal ADCs (Analog-Digital Converters) can be used as measurement receivers. Learn more.

Channel / Window Selections

These selections are NOT AVAILABLE when changing an EXISTING measurement. Learn how to change a measurement.

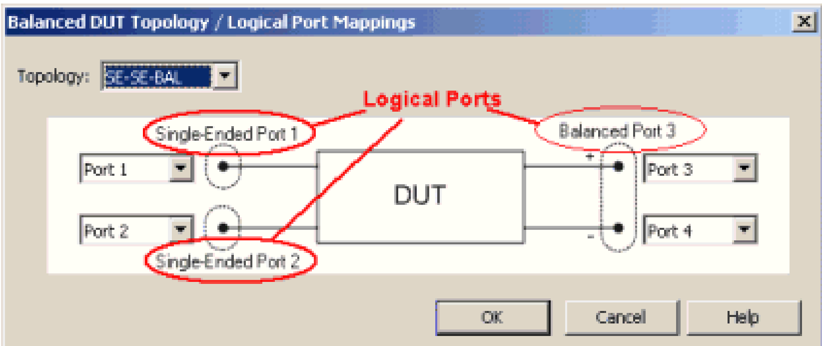
Channel Number Select the channel for the new traces.

Create in New Window

- Check to create new traces in a new window.
- Clear to create new traces in the active window. When the PNA traces per window limitation has been reached, no more traces are added.

Auto-Create Windows Check to create new traces in as many windows as necessary. See PNA number of windows limitation.

About Measurement Parameters (top of page)



Balanced DUT Topology / Logical Port mappings dialog box help

New Check out the **True Mode Stimulus Application** being offered at www.agilent.com/find/balanced.

Create or edit DUT Topology and Logical Port Mapping.

A Logical Port is a term used to describe a physical PNA test port that has been remapped to a new port number.

- Any **Two** physical PNA ports are mapped to **One Balanced** Logical port
- Any **One** PNA physical port is mapped to **One Single-Ended** Logical port

Note: These selections apply to ALL measurements in the channel. If the device topology is changed, any existing measurements in the channel that are incompatible with the new topology will be automatically changed to one that is compatible.

Topology: Describes your DUT as you would like it tested. The following device topologies can be measured by a multiport PNA.

- **Balanced / Balanced**
  (2 logical ports - <4 actual ports>)
- **Single-ended / Balanced**
  (2 logical ports - <3 actual ports>)

- **Single-ended - Single-ended / Balanced**
  (3 logical ports - <4 actual ports>)

These topologies can be used in the reverse (**<==**) direction to measure:

- **Balanced / Single-ended** topology
- **Balanced / Single-ended - Single-ended** topology

For example, to measure a **Balanced / Single-ended** topology, measure the S12 (reverse direction) of a **Single-ended / Balanced** topology.

Learn about Logical Port mapping when using an **External Test Set.**

Learn more about Balanced Measurements

Last modified:

10/11/06	Added new UI
9/19/06	MQ Added logical receiver notation and Multiport meas toolbar.
9/12/06	Added link to programming commands

Measurement Classes

Measurement Classes are categories of measurements that can coexist on a channel.

- What are Measurement Classes
- How to assign a Measurement Class to a Channel
- Measurement Class Dialog Box Help

See other 'Setup Measurements' topics

What are Measurement Classes

The following table shows the three Measurement Classes currently available for the PNA. Within each of these classes there are a number of measurements.

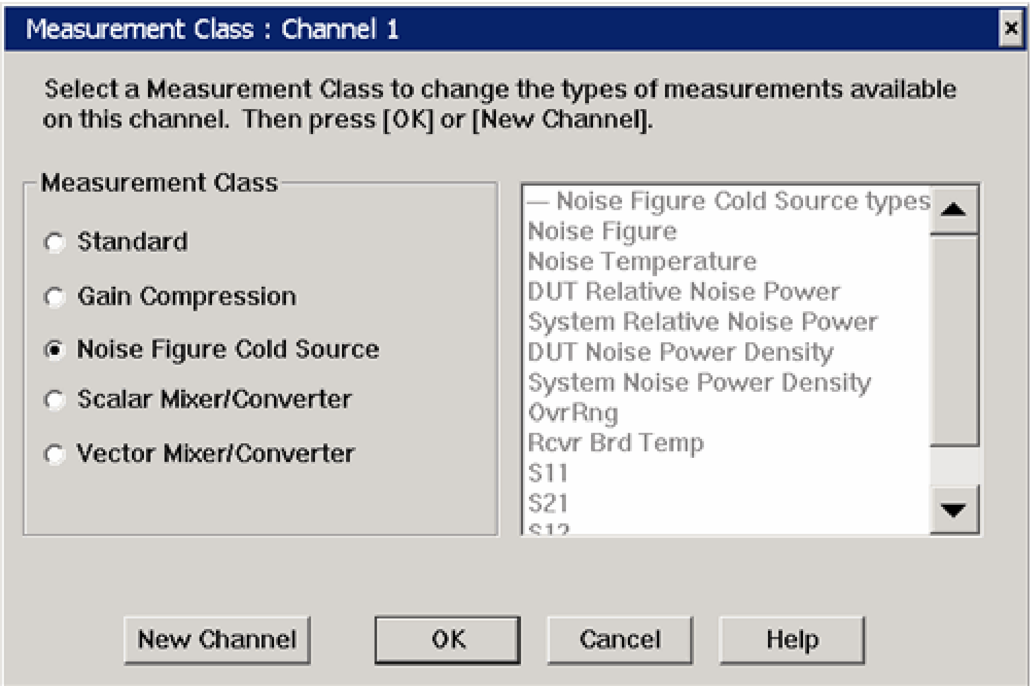
Measurement Class	Examples of Measurements
Standard S-Parameters	S11, S22, R, A/R1
Scalar Mixer Measurements	SC21, S11, RevOPwr
Vector Mixer Measurements	VC21, S11, B

Measurement Classes are categories of measurements that can coexist on a channel. A measurement from one class can NOT reside in a channel with a measurement from another class. For example, a VC21 measurement can NOT reside in a channel that is currently hosting Scalar Mixer Measurements.

The Measurement Class dialog is accessed in the following ways:

How to assign a Measurement Class to a Channel

Using front-panel HARDKEY [softkey] buttons	**PNA Menu using a mouse**
For N5230A and E836xA/B models	
1. Not Available	1. Not Available
For PNA-X and 'C' models	Programming Commands
1. Press **MEAS** 2. then **[Measurement Class]**	1. Click **Trace/Chan** 2. then **Measurement Class**



Measurement Class dialog box help

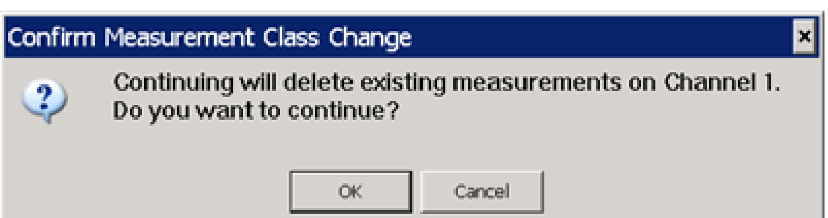
Measurements in a measurement class can NOT coexist in a channel with a measurement of a different measurement class. Select a measurement class for the active measurement channel.

Title Bar Indicates the active channel to which the measurement class will be assigned.

Measurement Class Choose the measurement class.

Note: The list of measurements is provided for display only. If you choose to create the measurement class in a new channel, a default measurement (usually S11) will be created. To change the measurement, click **Trace**, then select a new measurement.

Next Click to invoke the following dialog. NOT available when the selected measurement class is the same as the active channel.



Choose to do the following:

- **OK** - Delete the existing measurements in the active channel. Create the new measurement class, and default measurement, in that channel.
- **Cancel** - Do not create the new measurement class. Leave the old measurements (and class) in that channel and return to the Measurement Class dialog box.

Last Modified:

18-Jun-2007 MX New topic

Frequency Range

Frequency range is the span of frequencies you specify for making a device measurement.

- How to Set Frequency Range
- Zoom
- CW Frequencies
- Frequency Resolution
- Frequency Band Crossings

See other 'Setup Measurements' topics

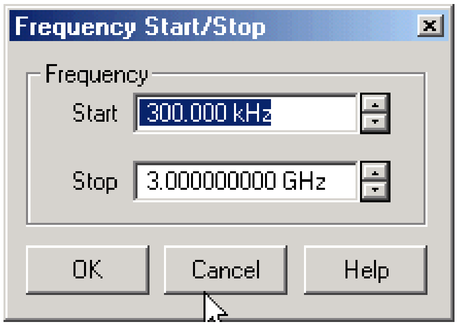
How to set Frequency Range

There are two ways to set the frequency range:

A. Specify the **Start** and **Stop** frequencies of the range.
B. Specify the **Center** frequency and desired **Span** of the range.

See the frequency ranges of all PNA models

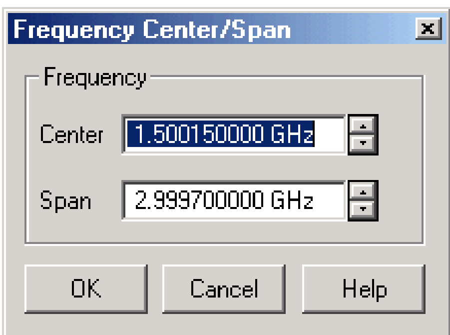
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Press **START/STOP** **or CENTER/SPAN**	1. Click **Channel** 2. then **Start/Stop** **or Center/Span**
For PNA-X and 'C' models	Programming Commands
1. Press **FREQUENCY**	1. Click **Stimulus** 2. then **Frequency**



Frequency Start/Stop dialog box help

Start Specifies the beginning frequency of the swept measurement range.

Stop Specifies the end frequency of the swept measurement range.



Frequency Center/Span dialog box help

Center Specifies the value at the center of the frequency sweep. This value can be anywhere in the analyzer range.

Span Specifies the span of frequency values measured to either side of the center frequency.

Zoom - PNA-X ONLY

Zoom allows you to easily change the start and stop frequencies or start and stop power levels in a power sweep.

Zoom operates on the Active Trace and all traces in the same channel as the active trace, regardless of the window in which they appear.

How to Zoom in a measurement window

1. Left-click the mouse or use a finger, then drag across a portion of a trace.
2. Release the mouse or lift the finger and the following menu appears:
3. Select from the following:

Zoom - changes the channel stimulus settings to the left and right border values of the Zoom selection

Zoom xy - changes the channel stimulus settings as above. In addition, the Y-axis scale of the active trace changes to the approximate scale of the Zoom selection.

Zoom Full Out - changes the channel stimulus settings to the full span of the current calibration. If no calibration is ON, then the stimulus settings are changed to the full span of the PNA model.

Notes

- The stimulus settings are changed for **ALL** traces in the active channel, regardless of the window in which they appear.
- If markers are in the selected area, they remain in place.
- If markers are in the unselected area, they are moved to the right or left edge of the new span. When Zoom Full Out is selected, the markers are moved back to their original location.

Zoom is NOT available for the following:

- Smith Chart or Polar display formats
- CW Time and Segment sweep type
- Frequency Offset Measurements
- FCA Opt 083 Measurements

CW Frequencies

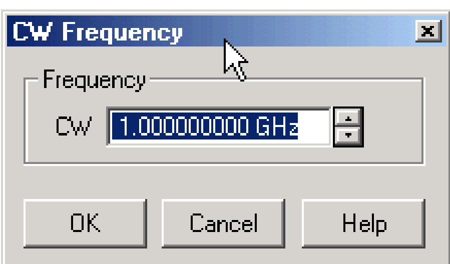
Measurements with a CW Time sweep or Power sweep are made at a single frequency rather than over a range of frequencies.

How to set CW Frequency

1. Set [Sweep Type](#) to **CW Time** or **Power**.

You can also set CW frequency from within the Sweep Type dialog box.

Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
2. Press **START/STOP** **or CENTER/SPAN**	1. Click **Channel** 2. then **CW Frequency**
For PNA-X and 'C' models	Programming Commands
2. Press **FREQ** 3. then **[CW]**	2. Click **Stimulus** 3. then **Frequency** 4. then **CW Frequency**



CW Frequency dialog box help

CW Type a value and the first letter of the suffix (k,m,or g) or use the up and down arrows to select any value within the range of the PNA.

Frequency Resolution

The resolution for setting frequency is 1 Hz.

Frequency Band Crossings

The frequency range of the PNA covers several internal frequency bands. The higher the frequency range of the

PNA, the larger the number of bands. The source power to your DUT turns off as the stimulus frequency is swept through these band crossings. To learn more, see Power ON and OFF during Sweep and Retrace.

The listed frequencies in the following tables are the stop frequency of the specified band, and the start frequency of the following band.

Frequency band crossings are different for the following models:

- 3 GHz, 6 GHz, and 9 GHz Models
- E8362A/B, E8363A/B, E8364A/B
- E8361A
- N5230A (2-port models)
- N5230A (4-port models)
- N5242A

For 3 GHz, 6 GHz, and 9 GHz (discontinued) PNA models:

Band	Frequency
1	10 MHz
2	748 MHz
3	1500 MHz
4	3000 MHz
5	4500 MHz
6	6500 MHz

For E8362 / 63 / 64 A/B
(A models do not have band 0)

Band	Freq (GHz)	Band	Freq (GHz)	Band	Freq (GHz)
0	.045				
1	0.748	9	7.60	17	25.60
2	1.500	10	10.00	18	30.00
3	3.00	11	12.00	19	32.00
4	3.80	12	12.8	20	36.00
5	4.50	13	15.20	21	38.40
6	4.80	14	16.00	22	40.00
7	6.00	15	20.00	23	45.60
8	6.40	16	22.80	24	48.00

For E8361A

Band	Freq (GHz)	Band	Freq (GHz)	Band	Freq (GHz)
0	.045	9	10.00	18	32.00
1	0.748	10	12.00	19	36.00
2	1.500	11	12.80	20	40.00
3	3.00	12	15.40	21	44.70
4	3.80	13	16.00	22	46.20
5	4.00	14	20.00	23	51.20
6	4.50	15	24.00	24	60.00
7	6.00	16	25.60	25	64.00
8	7.70	17	30.00		

For N5230A 2-port models

Band	Freq (GHz)	Band	Freq (GHz)	Band	Freq (GHz)
1	.045	**11**	10.500	**21**	28.600
2	.748	**12**	12.500	**22**	31.250
3	1.5	**13**	15.750	**23**	31.500
4	3.125	**14**	16.667	**24**	33.333
5	4.167	**15**	18.750	**25**	37.000
6	5.250	**16**	21.000	**26**	40.500
7	6.250	**17**	22.500	**27**	41.667
8	7.875	**18**	25.000	**28**	42.000
9	8.333	**19**	26.250	**29**	46.800
10	9.375	**20**	26.500	**30**	

For N5230A 4-port models

Band	Freq (GHz)	Band	Freq (GHz)
0	.00112	**9**	8.333
1	0.010	**10**	9.800
2	0.040	**11**	10.500
3	0.748	**12**	12.500
4	1.500	**13**	15.000
5	3.125	**14**	15.750
6	4.166	**15**	16.666
7	5.250	**16**	18.750
8	6.250	**17**	20.100

For N5242A

Band	Freq (GHz)	Band	Freq (GHz)	Band	Freq (GHz)
0	Reserved	**12**	.396	**24**	8.50
1	Reserved	**13**	.500	**25**	10.664
2	.014	**14**	.628	**26**	12.00
3	.019	**15**	1.00	**27**	12.80
4	.027	**16**	1.50	**28**	13.51
5	.038	**17**	2.00	**29**	15.40
6	.053	**18**	3.00	**30**	16.00
7	.075	**19**	3.20	**31**	18.00
8	.105	**20**	4.00	**32**	20.00
9	.146	**21**	5.32	**33**	21.328
10	.205	**22**	6.75	**34**	22.50
11	.250	**23**	8.00	**35**	24.00

Last modified:

10/23/06	MX Added new band crossings
10/16/06	Moved phase lock lost indicator
9/12/06	Added link to programming commands
9/27/06	MX Added UI

Power Level

Power level is the power of the PNA source at the test ports.

- **How to make Power Settings**
- **Power Dialog Help**
- **Power and Attenuation Dialog Help**
- **Source Unleveled**
- **Setting Independent Port Power**
- **Optimum Attenuation Value**
- **Receiver Attenuation**
- **Power ON and OFF during Sweep and Retrace**

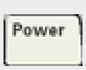
See other 'Setup Measurements' topics

Power Settings

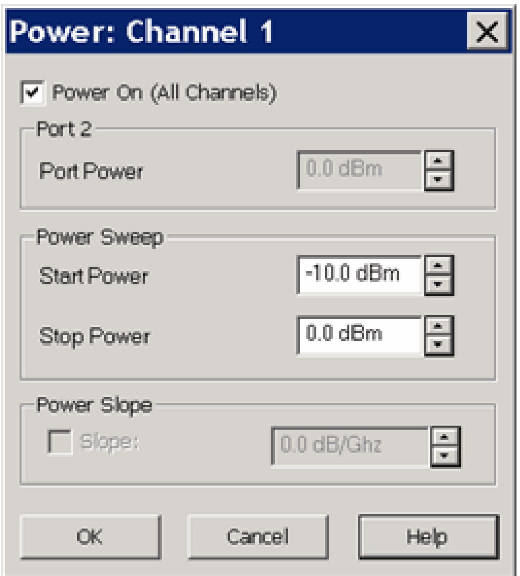
The test port output power is specified over frequency (See the Power Range and Frequency Range specifications for your PNA)

How to make Power settings

Use one of the following methods to set port power. Only the menu can be used to launch the Power and Attenuators dialog box.

Using front-panel **HARDKEY [softkey] buttons**	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1.  2. then 	1. Click **Channel** 2. then **Power**
For PNA-X and 'C' models	Programming Commands

1. Press **STIMULUS** 2. then **[Power] or [Power and Attenuators]**	1. Click **Stimulus** 2. then **Power or Power and Attenuators**



Power dialog box help

Defines and controls the PNA source power and attenuation.

Power On (All Channels) Check to enable source power for all channels. Only turns power ON if channel power setting is ON or Auto. See Advanced Power.

Note: Power ON/OFF setting and Instrument State Save and Recall.

If power is OFF when an instrument state is saved, the power will be OFF when the state is recalled.

If power is ON when an instrument state is saved, then when recalled, the power setting will be the SAME as the current power setting. To protect your DUT, power will NOT be turned ON by an instrument state recall if the current power setting is OFF.

User Preset follows this instrument state save/recall behavior.

Instrument Preset always includes Power ON.

Port 'n' Active source port for which power is being set.

Port Power Sets the power level for the specified port.

- To accurately set the power level at any point after the test port, perform a Source Power Calibration.
- See the specified power range of your PNA model.

Power Sweep

Start / Stop Power Set the start and stop power values of a power sweep. These settings are only available when Sweep Type is set to Power Sweep. Sweep power can also be set from the Advanced Power dialog box.

Zoom - allows you to easily change the start and stop power levels in a power sweep. [Learn how.](#)

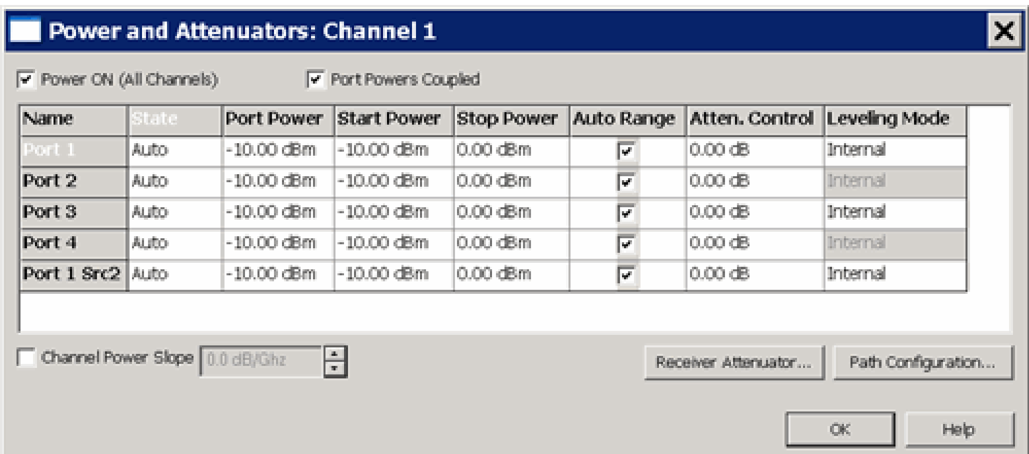
[Learn more about Power Sweep.](#)

Power Slope

Helps compensate for cable and test fixture power losses at increased frequency.

Slope Select to set the power slope. Clear to set power slope OFF.

- With power slope enabled, the port output power increases (or decreases) as the sweep frequency increases.
- The units of power slope are dB/GHz.
- Power slope can only be set to values of 0.5, 1, 1.5, or 2 (positive or negative).



Power and Attenuators dialog box help

Defines and controls the PNA source power and attenuation for the active channel.

Beginning with PNA Rev. 7.21, external sources can be controlled from this dialog. [Learn more](#).

Power On (All Channels) Check to enable source power for all channels. Only turns power ON if channel power setting is ON or Auto.

Port Powers Coupled

- **Coupled** (checked) The power levels are the same at each test port. Set power at any test port and all test ports change to the same power level.
- **Uncoupled** (cleared) The power levels are set independently for each test port. Uncouple power, for example, if you want to measure the gain and reverse-isolation of a high-gain amplifier. The power required for the input port of the amplifier is much lower than the power required for the output port. Learn more about [Setting Independent Port Power](#)

Name Lists the PNA test ports.

State ON and OFF are valid ONLY on PNA models with an [internal second source.](#)

- **Auto** Source power is turned ON at the specified test port when required by the measurement. This is the most common (default) setting.
- **ON** Source power is ALWAYS ON, regardless of measurements that are in process. Use this setting to supply source power to a DUT port that always requires power, such as an LO port. This could turn OFF power at another test port. Learn about internal second source restrictions.
- **OFF** Source power is never ON, regardless of the measurement requirements. Use this setting to prevent damage to a sensitive DUT test port.

Port Power Sets the power level at the output of the source.

- To accurately set the power level at any point after the test port, perform a Source Power Calibration.
- See the specified power range of your PNA model.

Start / Stop Power Available ONLY when sweep type is set to Power Sweep. Set the start and stop power values of a power sweep. Learn more about Power Sweep.

In PNA release 6.04 you can specify whether to maintain source power at either the start power or stop power level at the end of a power sweep. To do this, send SYST:PREF:ITEM:PSRT from the GPIB Command Processor Console.

Auto Range Check to allow the PNA to select the optimum attenuation value to achieve the specified test port power.

Clear to manually set the attenuation for each port. Type or select the attenuation value in the adjacent Attenuator Control box.

Attenuator Control When Port Powers are Uncoupled, manual attenuator control allows you to set a wide range of power levels by setting the attenuation. See Setting Independent Port Power. Also use manual attenuation control when a measurement requires a very good impedance match with the source, such as with oscillators or conditionally unstable amplifiers. Choose an attenuation level of 10 dB or more to ensure the best source match.

When Port Powers are Coupled, changing one port Attenuation Control value changes all port values.

Attenuation is in between the Source and the test port. Power to the reference receiver is not attenuated and is therefore higher than at the test port by the amount of attenuation. This will make an uncalibrated measurement using a reference receiver appear as though there is added attenuation at the test device. See the PNA Block diagram.

Note: With PNA release 7.2, a preference can be set to mathematically offset (or NOT) the power at the reference receiver by the amount of source attenuation. Because the reference receiver is not in the attenuation path, there is more power at the reference receiver than at the test port by the amount of source attenuation.

By default, ALL PNA models currently offset the reference receivers. See Block diagram.

See the SCPI and COM commands used to set the preference.

Leveling Mode

Internal Standard ALC leveling. Power level within an attenuator setting is limited to the ALC Range. See Source Unleveled.

Open Loop (Used during pulse conditions with the internal source modulators). No leveling is used in setting the source power. The lowest settable power, without attenuation, is limited to -30dBm. The source power level accuracy is very compromised. Use a source power calibration to make the source power somewhat more accurate.

Source Unleveled

When the power level that is required at a test port is **higher** than the PNA can supply, a Source Unleveled error message appears on the screen and the letters LVL appear on the status bar.

To perform a power sweep, the range of power is usually limited to the range of the Automatic Leveling Control (ALC) loop. (The PNA-X allows a very wide power range using **Open Loop**).

PNA specifications guarantee the ALC power range over which the PNA can supply power without an unleveled indication. However, the actual achievable power range on your PNA is probably greater than the specified range.

How to calculate the specified achievable power range

From the specifications for the N5230A Opt 245 for the frequency span from 15 GHz to 20 GHz:

- Max Leveled Power = **-8 dBm**
- Power Sweep Range (ALC) = **-17 dB**

For this frequency range the specified power range is calculated as:

- Max = **-8 dBm**
- Min = (-8)-(17) = **-25 dBm**

When using Source Attenuators:

- with 10dB of attenuation, this becomes **-18 dBm** to **-35 dBm**
- with 20dB of attenuation, this becomes **-28 dBm** to **-45 dBm**, and so forth.

See the output power specs for your PNA.

To resolve an unleveled condition, change either the Test Port Power or Attenuator setting. If an Unleveled condition exists within the specified power range, contact Technical Support.

Setting Independent Port Power

The PNA allows you to uncouple port power and specify different power levels at each test port. There are a few things to consider when setting independent port powers.

- Does your required high and low power levels fall within the specified Min and Max power range of the PNA? See Unleveled Indicator. If they do not, you may need to use the internal Source Attenuators.
- Does the PNA have source attenuators? If so, how many source attenuators? Some PNA models have one attenuator for each port. In most multiport PNA systems, the attenuators are shared by at least two test ports. See PNA Options to see the availability and range of source attenuation on your PNA.

Note: To prevent premature wear on source and receiver attenuators, the PNA does not allow attenuators (or other mechanical switches) to switch between settings when continuously triggering. Attenuator values are set for the entire channel.

When different channels are used and settings require an attenuator to switch value, only one channel is allowed to sweep continuously. All other channels are automatically put in Trigger Hold.

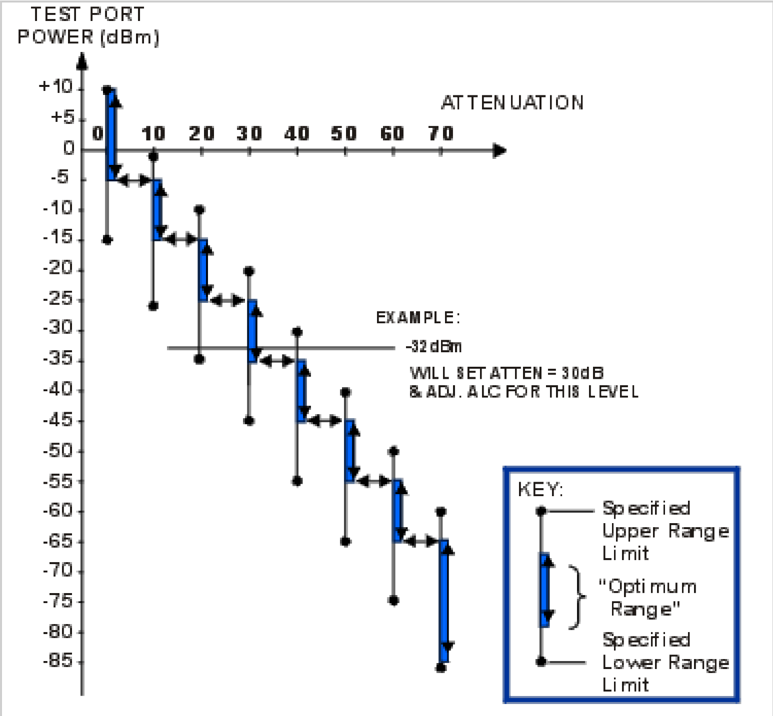
To override this condition, change the 'Hold' channel to Single trigger or Group trigger, which allows up to 2 million triggers. The attenuator will then be allowed to switch settings for each channel.

Optimum Attenuation Value

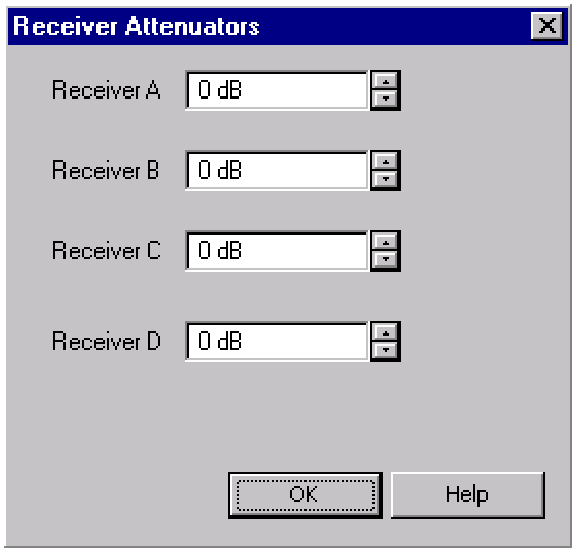
The attenuator has different positions, allowing a wide range of power levels. The number of power ranges available is determined by the source attenuation installed in your PNA. See PNA Options to see the availability and range of source attenuation on your PNA.

- Each range has a total specified span (25 dB in the following Attenuation Values graphic).
- The optimum setting is the middle of the range. This range provides the best accuracy and performance of the source leveling system. The optimum ranges are the blue regions in the following graphic.
- An attenuator setting can be selected manually or automatically. If automatic is selected, the blue optimum ranges (shown in the following graphic) are used.

(Attenuator ranges vary, this particular range is 70 dB)



Note: Error correction is fully accurate only for the power level at which a measurement calibration was performed. However, when changing power within the same attenuator range at which the measurement calibration was performed, ratioed measurements can be made with nearly full accuracy (non-ratioed measurements with less accuracy).



Receiver Attenuators dialog box help

Type or select independent attenuation values for each receiver.

Receiver Attenuation, available as option 016 on some PNA models, is used to attenuate the output signal from the device under test to avoid damaging the PNA receivers. The PNA receivers typically start to compress at around +10 dBm. This causes the power level at the receiver to be less than the power at the test port by the specified amount of attenuation.

Note: With PNA release 7.2, a preference can be set to mathematically offset (or NOT) the displayed trace by the amount of receiver attenuation. This causes the display to show the power at the test port.

By default:

- PNA-L and E836xB do **NOT** offset the display.
- The PNA-X **DOES** offset the display.

See the SCPI and COM commands used to set the preference.

When an external test set is connected, Receiver Attenuation control is only available for the physical receivers in the PNA. Switching receiver attenuation using logical receiver notation is NOT allowed.

CAUTION! You can damage the analyzer receivers if the power levels exceed the maximum values. See your analyzer's Technical Specifications for the maximum input power to a receiver.

The receiver attenuator characteristics are:

- Range:
  - 0 to 50 dB (E8361A only)

- 0 to 35 dB (all other applicable PNA models)

- Resolution:
  - 10 dB (E8361A only)
  - 5 dB (all other applicable PNA models)

Power ON and OFF during Sweep and Retrace

The frequency range of the PNA covers several internal frequency bands. The higher the frequency range of the PNA, the larger the number of bands. For example, a 9 GHz PNA has 6 frequency bands, a 50 GHz PNA has 25 frequency bands. See the frequency band crossings.

Power to the DUT is turned OFF during band changes to avoid causing power spikes to the DUT.

Retrace occurs when the source gets to the end of your selected frequency span and moves back to the start frequency. Power to the DUT is again turned OFF when **retracing** across frequency bands.

Therefore, the following occurs for various stimulus settings:

1. **Single band sweep** - The power to the DUT is always ON, even during retrace.
   In PNA release 6.04, a preference setting can turn power OFF during a retrace. Only available in single band frequency and segment sweeps.
2. **Multi-band sweep** - The power to the DUT is turned OFF while sweeping across a band crossing. It is turned OFF again during retrace.
3. **Power sweep** - Because power sweep is always done at a single frequency, the frequency is always within a single band and the source power is always ON. At the end of a power sweep, power is immediately set to the start power.
   In PNA release 6.04, this behavior can be changed with a preference setting.
4. **Single sweep**:
   - Manual trigger mode - At the end of a multiband sweep, power is turned OFF during retrace, and then power is turned back ON before arming for the next trigger.
   - Hold mode - Power can be ON or OFF depending on when and how Hold mode is entered. However, power can be immediately turned OFF manually or remotely.

Caution: Avoid expensive repairs to your PNA. Read Electrostatic Discharge Protection.

Last modified:

26-Mar-2007	Clarified retrace power OFF
11/16/06	Added new retrace features
10/23/06	Modified for new power diag
10/17/06	Clarified leveling
9/12/06	Added link to programming commands

Sweep Settings

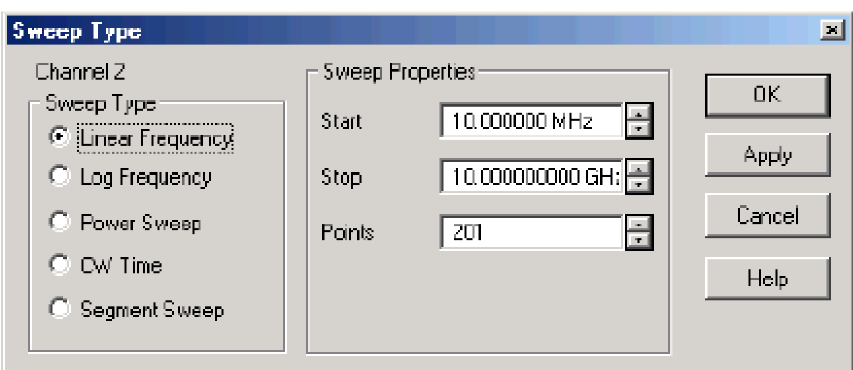
A sweep is a series of consecutive data point measurements taken over a specified sequence of stimulus values. You can make the following sweep settings:

- Sweep Type
- Sweep Time
- Sweep Setup

See Triggering and other 'Setup Measurements' topics

How to set Sweep Type

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	Programming Commands
1. Press **SWEEP TYPE** 2. then [Active Entry keys]	1. Click **Sweep Type**
For PNA-X and 'C' models	Programming Commands
1. Press **SWEEP** 2. then **[Sweep Type]**	1. Click **Stimulus** 2. then **Sweep** 3. then **Sweep Type**



Sweep Type dialog box help

Note: Sweep Settings are not applied until either **OK** or **Apply** is pressed.

Channel The active channel when Sweep Type was selected. Sweep settings will be applied to this channel.

Sweep Type

Linear Frequency Sets a linear frequency sweep that is displayed on a standard grid with ten equal horizontal divisions.

- **Start** Sets the beginning value of the frequency sweep.
- **Stop** Sets the end value of the frequency sweep.
- **Points** Sets the number of data points that the PNA measures during a sweep. Range: 2 to 20001.(Default is 201).

Log Frequency The source is stepped in logarithmic increments and the data is displayed on a logarithmic x-axis. This is usually slower than a continuous sweep with the same number of points.

- **Start** Sets the beginning value of the frequency sweep.
- **Stop** Sets the end value of the frequency sweep.
- **Points** Sets the number of data points that the PNA measures during a sweep. Range: 2 to 20001. (Default is 201).

Power Sweep Activates a power sweep at a single frequency that you specify. Learn about power sweep

- **Start** Sets the beginning value of the power sweep.
- **Stop** Sets the end value of the power sweep.
- **CW Frequency** Sets the single frequency where the PNA remains during the measurement sweep.

CW Time Sets the PNA to a single frequency, and the data is displayed versus time.

- **CW Frequency** Sets the frequency where the PNA remains during the measurement.
- **Sweep Time** Sets the duration of the measurement, which is displayed on the X-axis.
- **Points** Sets the number of data points that the PNA measures during a sweep. Range: 2 to 20001.(Default is 201).

Segment Sweep Sets the PNA to sweep through user-defined sweep segments. Learn how to make these settings.

- **Independent Power Levels** Check to set the source power level for each segment. Test port uncoupling is also allowed.
- **Independent IF Bandwidth** Check to set the IF bandwidth for each segment.

- **Independent Sweep Time** Check to set the duration of the measurement for each segment.
- **X-Axis Point Spacing** Check to scale the X-Axis to include only the segments. Learn more.
- **Allow Arbitrary Segments** Check to allow arbitrary frequencies (overlapped or reverse sweeps). Learn more
- **Show Table** Shows the table that allows you to create and edit segments.
- **Hide Table** Hides the segment table from the screen.

OK Applies setting changes and closes the dialog box.

Apply Applies setting changes and leaves the dialog box open to make more setting changes.

Cancel Closes the dialog. Setting changes that have been made since the last Apply button click are NOT applied.

Power Sweep

A power sweep either increases or decreases source power in discrete steps. Power sweep is used to characterize power-sensitive circuits, with measurements such as gain compression or AGC (automatic gain control) slope.

In the Sweep Type dialog, specify Start power, Stop power, and CW Frequency. Power can be swept over any attainable range within the PNA ALC range.

Note: If the PNA has source attenuators, and the attenuation must be changed in order to achieve the requested start and stop power, click **Channel**, then **Power** to set the power and attenuation.

The PNA does NOT allow a single power sweep over a range that requires attenuator switching. However, two power sweeps can be performed in different channels. The attenuators will not be allowed to switch continuously, but triggering can be performed using single or group triggering. Learn more.

The remaining power settings apply in power sweep mode:

- Port Power is always coupled.
- Test Port Power setting is ignored.
- Attenuator Control is always Manual.
- Power Slope (dB/GHz) is ignored. The output frequency is CW.

Click **Sweep**, then Number of Points to change the step size of the power sweep.

Beginning with PNA release 6.04 you can specify whether to maintain source power at either the start power or stop power level at the end of a power sweep. To do this, send SYST:PREF:ITEM:PSRT from the GPIB Command Processor Console.

Segment Sweep

Segment Sweep activates a sweep which consists of frequency sub-sweeps, called segments. For each segment you can define independent power levels, IF bandwidth, and sweep time.

Once a measurement calibration is performed on the entire sweep or across all segments, you can make calibrated measurements for one or more segments.

In segment sweep type, the analyzer does the following:

- Sorts all the defined segments in order of increasing frequency
- Measures each point
- Displays a single trace that is a composite of all data taken

Restrictions for segment sweep:

- The frequency range of a segment is not allowed to overlap the frequency range of any other segment.
- The number of segments is limited only by the combined number of data points for all segments in a sweep.
- The combined number of data points for all segments in a sweep cannot exceed 20001.
- All segments are FORCED to have power levels within the same attenuator range to avoid premature wear of the mechanical step attenuator. See Power Level.

How to make segment sweep settings	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Press **SWEEP TYPE** 2. then [Active Entry keys]	1. Click **Sweep** 2. then **Segment Table**
For PNA-X and 'C' models	Programming Commands
1. Press **SWEEP** 2. then **[Sweep Type]**	1. Click **Stimulus** 2. then **Sweep** 3. then **Sweep Type**

Insert Segment - adds a sweep segment before the selected segment. You can also click the "down" arrow on your keyboard to quickly add many segments.

Delete Segment - removes the selected segment.

Delete All Segments - removes all segments.

Note: At least ONE segment must be ON or Sweep Type is automatically set to **Linear**.

To Modify an Existing Segment

To make the following menu settings available, you must first show the segment table.

Click **View**, point to **Tables**, then click **Segment Table.**

	STATE	START	STOP	POI	IFBW	P1 PWR	P2 PWR	TIME
1	ON	20.000000 MHz	1.000000 GHz	21	10.0 kHz	17.00 dBm	0.00 dBm	2.474 msec
2	ON	1.000000 GHz	4.000000 GHz	21	35.0 kHz	17.00 dBm	0.00 dBm	630.000 µsec

The above graphic shows the Segment table with all independent settings selected, including source power uncoupled (two power settings).

STATE Click the box on the segment to be modified. Then use the up / down arrow to turn the segment ON or OFF.

START Sets start frequency for the segment. Click the box and type a value and the first letter of a suffix (**K**Hz, **M**hz, **G**Hz). Or double-click the box to select a value.

STOP Sets stop frequency for the segment. Click the box and type a value and the first letter of a suffix (**K**Hz, **M**hz, **G**Hz). Or double-click the box to select a value.

POINTS Sets number of data points for this segment. Type a value or double-click the box to select a value.

To set IFBW, Power, and Sweep Time independently for each segment:

1. On the **Sweep** menu, click **Sweep Type**, then **Segment Sweep**.
2. Check the appropriate **Sweep Properties** boxes
3. Then click the box and type a value or double-click the box and select a value.

Note: If the following are NOT set, the entire sweep uses the channel IFBW, Power, and Time settings.

IFBW Sets the IF Bandwidth for the segment.

POWER Sets the Power level for the segment. You can also UNCOUPLE the test port power. See Power Coupling.

TIME Sets the Sweep time for the segment.

X-Axis Point Spacing - Segment Sweep ONLY

This feature affects how a segment trace is drawn on the screen.

How to select X-Axis Point Spacing

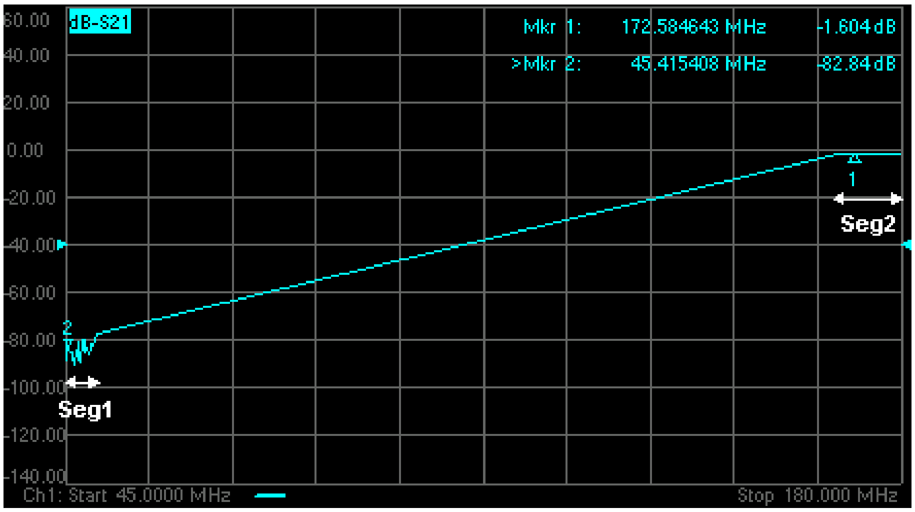
On the Sweep Type dialog box, click **Segment Sweep**

Then check **X-Axis Point Spacing**

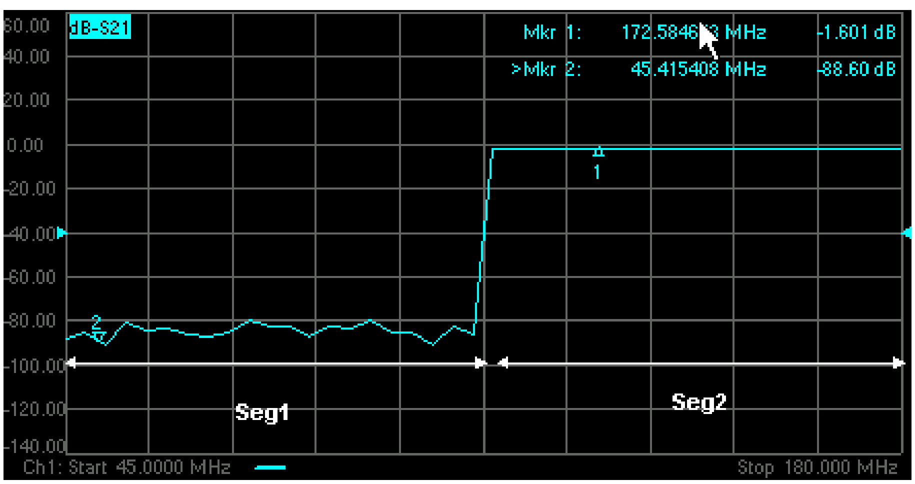
- **Without X-axis point spacing**, a multi-segment sweep trace can sometimes result in squeezing many measurement points into a narrow portion of the x-axis.
- **With X-axis point spacing**, the x-axis position of each point is chosen so that all measurement points are evenly spaced along the x-axis.

For example, given the following two segments:

	STATE	START	STOP	POINTS
1	ON	45.000000 MHz	50.000000 MHz	21
2	ON	170.000000 MHz	180.000000 MHz	21



Without X-Axis Point Spacing



With X-Axis Point Spacing

Arbitrary Segment Sweep

This feature allows arbitrary frequencies to be entered into the segment sweep table. With this capability, segments can have:

- overlapping frequencies.

- the stop frequency less than the start frequency (reverse sweep).

How to enable Arbitrary Segment Sweep
1. On the Sweep Type dialog box, click **Segment Sweep** 2. Check **Allow Arbitrary Segment Sweep**

Notes:

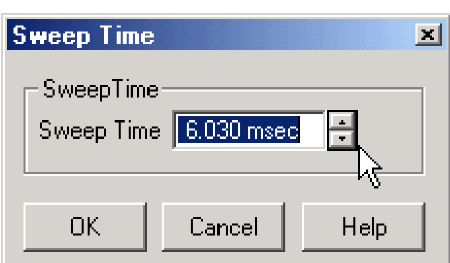
- Unusual results may occur when using arbitrary sweep segments with markers, display settings, limit lines, formatting, and some calibration features.
- When Allow Arbitrary Segment is checked, X-axis point spacing is automatically turned ON.

Sweep Time

The PNA automatically maintains the fastest sweep time possible with the selected measurement settings. However, you can increase the sweep time to perform a slower sweep.

How to set Sweep Time

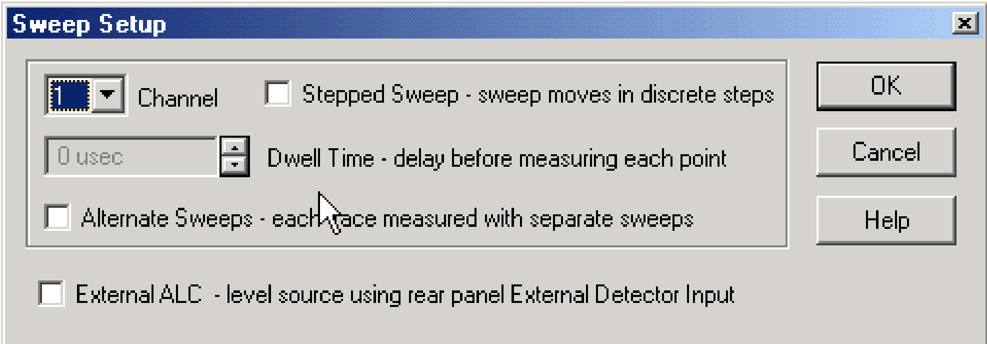
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Press **SWEEP SETUP** 2. then [Active Entry keys]	1. Click **Sweep** 2. then **SweepTime**
For PNA-X and 'C' models	Programming Commands
1. Press **STIMULUS** 2. then **[Sweep]** 3. then **[Sweep Time]**	1. Click **Stimulus** 2. then **Sweep** 3. then **Sweep Time**



Sweep Time dialog box help
Specifies the time the PNA takes to acquire data for a sweep. The maximum sweep time of the PNA is 86400 seconds or 1 day. Learn about other settings that affect sweep speed. **Note:** If sweep time accuracy is critical, use ONLY the up and down arrows next to the sweep time entry box to select a value that has been calculated by the PNA. Do NOT type a sweep time value as it will probably be rounded up to the closest calculated value. This rounded value will not be updated in the dialog box. • The actual sweep time includes this acquisition time plus some "overhead" time. • The PNA automatically maintains the fastest sweep time possible with the selected measurement settings. However, you can increase the sweep time using this setting. • Enter **0** seconds to return the analyzer to the fastest possible sweep time. • The Sweep Time setting is applied to the active channel. • The sweep time is per sweep. A full 2-port cal requires two sweeps, both using the specified sweep time. Learn more. • A **Sweep Indicator** appears on the data trace when the Sweep Time is 0.3 seconds or greater, or if trigger is set to Point Sweep Mode. The indicator is located on the last data point that was measured by the receiver. If the indicator is stopped (point sweep mode) the source has already stepped to the next data point.

Sweep Setup

How to make Sweep Setup settings	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Press **SWEEP SETUP**	1. Click **Sweep** 2. then **Sweep Setup**
For PNA-X and 'C' models	Programming Commands
1. Press **STIMULUS** 2. then **[Sweep]** 3. then **[Sweep Setup]**	1. Click **Stimulus** 2. then **Sweep** 3. then **Sweep Setup**



Sweep Setup dialog box help

Channel Specifies the channel that the settings apply to.

Stepped Sweep When checked (Stepped Sweep) the PNA source is tuned, then waits the specified Dwell time, then takes response data, then tunes the source to the next frequency point. This is slower than Analog Sweep, but is more accurate when testing electrically-long devices.

When cleared (Analog Sweep) the PNA takes response data AS the source is sweeping. The sweep time is faster than Stepped, but could cause measurement errors when testing electrically-long devices.

When the dialog checkbox is cleared, the PNA could be in either Analog or Step mode. There is no display indication of whether the PNA is in Analog or Stepped Sweep. Step mode is automatically selected for a number of reasons. Here are some of the reasons.

- IF Bandwidth is at, or below, 1 kHz.
- Source Power Correction is ON unless doing CW measurement.
- When more than one source is turned ON (multisource PNA models).
- When step mode is a faster way to take the data.
- For all FOM and FCA measurements.
- For all ADC measurements.
- For all MMwave measurements.

Dwell Time Specifies the time the source stays at each measurement point before the analyzer takes the data. Only applies to stepped sweep. The maximum dwell time is 100 seconds. See also Electrically Long Devices.

Alternate Sweeps When checked, the PNA measures only one receiver per sweep.

When cleared, the PNA measures both the A and B receivers (if used) each sweep. See also Crosstalk.

External ALC Available ONLY on 3 GHz, 6 GHz, and 9 GHz PNA models (now discontinued).

When checked, the analyzer is enabled to receive an external signal that you provide for leveling the source output. The external ALC signal input connector is the External Detector Input on the rear panel.

Last modified:

21-Jun-2007	Increased max data points
3-May-2007	Updated Step mode conditions
9/27/06	MX Added UI
9/12/06	Added link to programming commands

Trigger

A trigger is a signal that causes the PNA to make a measurement sweep. The PNA offers great flexibility in configuring the trigger function.

View the interactive Trigger Model animation to see how triggering works in the PNA.

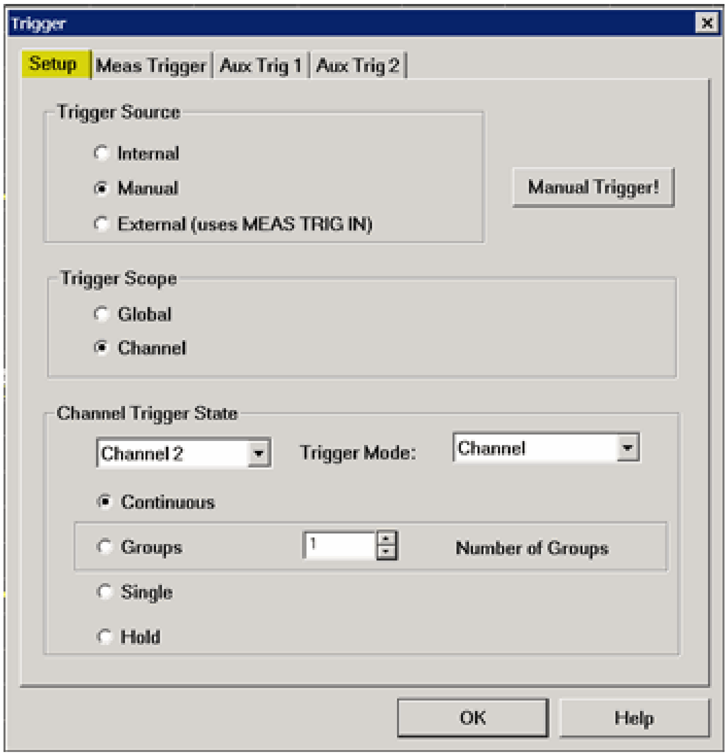
- How to Set Trigger
- Source
- Scope
- Channel Settings
- Restart
- External and Auxiliary Triggering **(separate topic)**

See other 'Setup Measurements' topics

How to set Triggering

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	Programming Commands
1. Press **TRIGGER**	1. Click **Sweep** 2. then **Trigger** 3. then **Trigger**
For PNA-X and 'C' models	Programming Commands
1. Press **TRIGGER** 2. then **[Trigger...]**	1. Click **Stimulus** 2. then **Trigger** 3. then **Trigger**

Note: The **Continuous**, **Single**, and **Hold** settings apply ONLY to the active channel. These settings are available from the Trigger menu, Active Entry keys, and softkeys



Trigger Setup dialog box help

View the interactive Trigger Model animation to see how triggering works in the PNA.

Trigger Source

These settings determine **where** the trigger signals originate for all existing channels. A valid trigger signal can be generated only when the PNA is not sweeping.

Internal Continuous trigger signals are sent by the PNA as soon as the previous measurement is complete.

Manual One trigger signal is sent when invoked by the Trigger button, the active toolbar, or a programming command.

External Trigger signals sent out or received from various connectors on the rear panel. Learn more about External and AUX Triggering.

Manual Trigger! - Manually sends one trigger signal to the PNA. Available ONLY when Manual trigger is selected.

Trigger Scope

These settings determine **what** is triggered.

Global All channels not in Hold receive the trigger signal [Default setting]

Channel Only the next channel that is not in Hold receives the trigger signal. This is not obvious or useful unless Trigger Source is set to Manual. This setting enables Point Sweep mode.

Channel Trigger State

These settings determine **how many** trigger signals the channel will accept.

Continuous The channel accepts an infinite number of trigger signals.

Groups The channel accepts only the number of trigger signals that is specified in the Number of Groups text box, then goes into Hold. Before selecting groups you must first increment the Number of Groups text box to greater than one.

Number of Groups Specify the number of triggers the channel accepts before going into Hold. If in Point Sweep, an entire sweep is considered one group.

First increment to desired number, then select 'Groups'.

Single The channel accepts ONE trigger signal, then goes into Hold.

Another way to trigger a single measurement is to set Trigger Source to Manual, then send a **Manual trigger**. However, ALL channels are single triggered.

Hold The channel accepts NO trigger signals.

Trigger Mode

These settings determine what EACH signal will trigger.

Sweep and **Point** modes are available ONLY when both Trigger Source = MANUAL or EXTERNAL **AND** Trigger Scope = CHANNEL.

Channel Each trigger signal causes **ALL traces** in that channel to be swept in the order specified below.

Sweep Each Manual or External trigger signal causes **ALL traces that share a source port** to be swept in the order specified below. When in Groups or Single trigger, the count is decremented by one after ALL traces in ALL directions are swept.

When correction is ON which requires sweeps in more than one direction, traces on the screen will not update until all of the relevant directions have been swept. For example, with all four 2-port S-Parameters displayed:

- When correction is OFF, trigger 1 causes S11 and S21 to update; trigger 2 causes S22 and S12 to update.
- When Full 2-port correction is ON, trigger 1 causes NO traces to update; trigger 2 causes ALL S-Parameters to update. Learn more about sweeps with correction ON.

Point Each Manual or External trigger signal causes one data point to be measured. Subsequent triggers go to the same trace until it is complete, then other traces in the same channel are swept in the order specified below. When in Groups or Single trigger, the count is decremented by one after ALL data points on ALL traces in the channel are measured. See Also, the (point) Sweep Indicator and SCPI Triggering example for use with External.

Trace Sweep Order

For ALL Trigger Modes, traces within each channel are always swept in the following order. Trigger signals continue in the same channel until all traces in that channel are complete. Triggering then continues to the next channel that is not in HOLD.

- Traces are swept sequentially in source-port order. For example, in a channel with all four 2-port S-parameters, first the source port 1 traces (S11 and S21) are swept simultaneously. Then the source port 2 traces (S22 and S12) are swept simultaneously.
- In addition, when Alternate sweep is selected, traces are swept sequentially in source-port / receiver-port order. In the above example, first the S11 trace is swept, then S21, then S12, then S22.

Restart (Available only from the Trigger menu) Channels in Hold are set to single trigger (the channel accepts a single trigger signal). All other settings are unaffected, including decrementing trigger Groups.

See Also

- External and AUX Triggering.
- Interactive Trigger Model animation

Last modified:

26-Oct-2007	Added Trigger Mode
15-Dec-2006	Added MX capability
9/12/06	Added link to programming commands

External and Auxiliary Triggering

External and Auxiliary triggering are both used to synchronize the triggering of the PNA with other equipment or events.

- **Overview**
- **Capability Summary for each PNA Model**
- **Dialogs**
  - **Auxiliary Triggering (PNA-X only)**
  - **External Trig (IN) Dialog (All models)**
  - **I/O2 Trig Out Dialog (PNA-L and E836x)**

See Also

- Controlling a Handler
- Synchronizing an External Source
- PNA Triggering

Overview

The manner in which External Triggering is performed has evolved throughout the PNA history, with each new model becoming more comprehensive and flexible. Unfortunately, our ability to update the older models is limited as a large part of external triggering is dependent on the PNA hardware. Where possible, we have updated the capability of the older models with software.

Ready Signals versus Trigger Signals

A 'Ready for Trigger' signal is different from a Trigger signal. The ready signal indicates that the instrument sending the signal is ready for measurement. The instrument receiving the ready signal would then send a trigger signal, indicating that the measurement will be made, or has been made. Usually the slower instrument sends the trigger signal. The following two scenarios illustrate when the PNA is faster, and slower than the external device:

- A material handler is very mechanical and takes a relatively long time to load and discharge parts. Therefore, the PNA sends a 'Ready' signal when it is setup to measure, and the handler sends a trigger signal to the PNA when it is ready for a measurement. Additional signals are available on the PNA Handler I/O to indicate that the PNA sweep has ended, and that the handler can setup for the next measurement. See a procedure.
- Alternatively, an external source usually sets up for the next measurement much faster than the PNA. This is because the PNA acquires data, and moves both source and receivers for the next measurement. In this case, the external source sends a 'Ready' signal. The PNA then begins the measurement and sends a trigger signal AFTER the measurement has been made. This indicates that the measurement is complete

and that the source should setup for the next measurement. See a procedure. Beginning with A.07.22, the PNA can control an external source from within the firmware. Learn more.

Capability Summary for each PNA Model

The following describes the capabilities and recommended method of triggering for each PNA model.

PNA-X

The PNA-X has the most comprehensive, flexible, and easy to understand of all models in the PNA family. The following are two reciprocal pairs that can be used to accomplish efficient triggering.

Signal Pair	Rear-Panel Connectors	Control Settings (click to learn more)
PNA Ready for Trigger (OUT)	MEAS TRIG RDY and Handler I/O p21	Meas Trigger TAB
Trigger IN to PNA	MEAS TRIG IN and Handler I/O p18	Meas Trigger TAB
Trigger OUT of PNA	AUX TRIG OUT (1&2)	AUX Trig TAB
Ext Device Ready (IN to PNA)	AUX TRIG IN (1&2)	AUX Trig TAB

PNA-L models

The **I/O (TRIG IN)** and **I/O TRIG OUT)** signal pair is the recommended signal pair to synchronize the PNA-L and external devices. Both signals result in triggering the other instrument; neither of these signals indicate a 'Ready' condition.

Recommended Signal Pair	Rear-Panel Connectors	Control Settings
Trigger IN to PNA	BNC IN	External TAB
Trigger OUT of PNA	BNC OUT	I/O Trig TAB
Other Signals	**Rear-Panel Connectors**	**Control Settings**
PNA Ready for Trigger (OUT)	AUX I/O p18	SCPI and COM Only
	Handler I/O p21 (some PNA-L models)	SCPI and COM Only
Trigger IN to PNA	AUX I/O p19	SCPI and COM Only
	Handler I/O p18 (some PNA-L models)	SCPI and COM Only

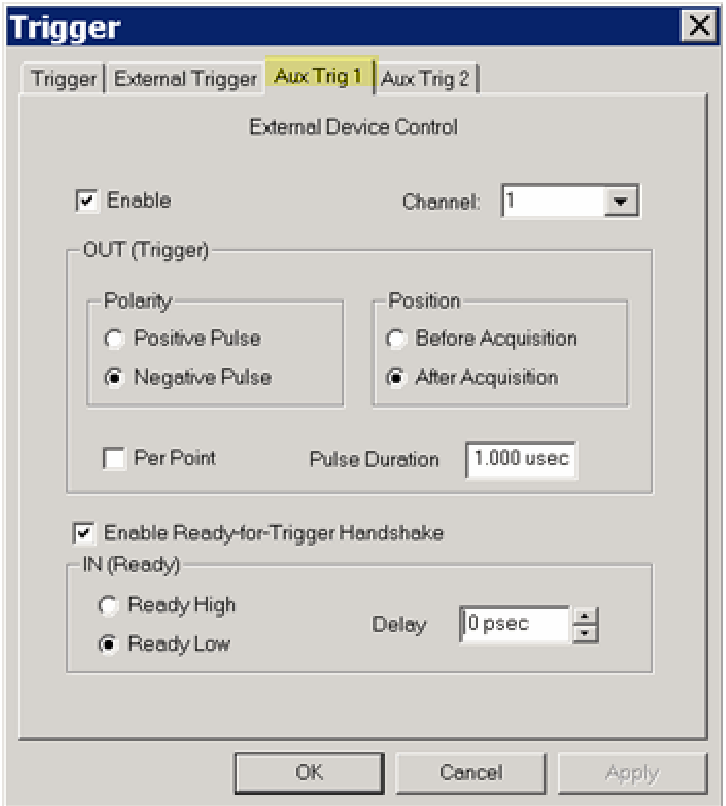
Ext Device Ready (IN to PNA)	None	N/A

E836xA/B/C

The **I/O (TRIG IN)** and **I/O TRIG OUT)** signal pair is the recommended signal pair to synchronize the E836x and external devices. Both signals result in triggering the other instrument; neither of these signals indicate a 'Ready' condition.

Recommended Signal Pair	Rear-Panel Connectors	Control Settings
Trigger IN to PNA	BNC IN	External TAB
Trigger OUT of PNA	BNC OUT	I/O Trig Out TAB
Other Signals	**Rear-Panel Connectors**	**Control Settings**
PNA Ready for Trigger (OUT)	AUX I/O p18	SCPI and COM Only
Trigger IN to PNA	AUX I/O p19	SCPI and COM Only
Ext Device Ready (IN to PNA)	None	N/A

See how to access the Trigger Dialog



Aux Trig 1 - Aux Trig 2 dialog box help

This reciprocal pair of signals on **PNA-X models ONLY,** offers high flexibility, and robust synchronization with external devices.

- When enabled, the PNA-X waits indefinitely for a 'Ready IN' signal on the AUX IN connector from an external device.
- When received, the PNA is triggered from the usual trigger sources (Internal, External, or Manual).
- The trigger output signal on the AUX OUT connector can be sent BEFORE or AFTER data acquisition.
- Each channel can be configured differently.
- Two pair of AUX TRIG connectors allow two external devices to be controlled simultaneously.

See Also

- See how to use these connectors to synchronize with External Sources.
- To use the opposite reciprocal pair, see Meas Trig IN and Ready OUT pair.

Dialog Settings

Note: The Aux Trig 1 and Aux Trig 2 tabs are identical.

Enable Check to use the Aux1 or Aux2 connectors to output signals to an external device.

Channel All settings on this dialog affect the specified channel ONLY.

OUT (Trigger)

After receiving the Aux Trig IN 'Ready' signal, the trigger signal comes from any of the following Trigger Sources:

- **Internal** - trigger occurs immediately.
- **Manual** - trigger occurs when the Trigger button is pressed.
- **External -** trigger occurs when Meas Trig In signal is received. This must be configured independently.

The following settings control the properties of the signals sent out the rear panel AUX TRIG OUT (1&2) connectors:

Polarity

Positive Pulse Outgoing pulse is positive.

Negative Pulse Outgoing pulse is negative.

Position

Before Acquisition Pulse is sent immediately **before** data acquisition begins.

After Acquisition Pulse is sent immediately **after** data acquisition is complete.

Per Point Check to cause a trigger output to be sent for each data point. Clear to send a trigger output for each sweep. This setting controls the trigger **output** signal regardless of the channel Point trigger setting, which causes the PNA channel to trigger per point. For example, to trigger the PNA channel per point, and output a trigger signal per point, both this, and the channel setting must be checked ON.

Pulse Duration Specifies the duration of the positive or negative output trigger pulse.

Ready for Trigger Handshake

When checked, the PNA waits indefinitely for the input line at the rear panel AUX TRIG OUT (1&2) connectors to change to the specified level before acquiring data. This signal indicates that the external device is ready for PNA data acquisition. If the signal arrives before the PNA is ready to acquire data, it is latched (remembered).

When NOT checked, the PNA-X does not wait, but outputs trigger signals when the PNA-X is ready.

This signal does NOT trigger the PNA-X. The trigger signal is generated from any of the usual sources: Internal, Manual, or External.

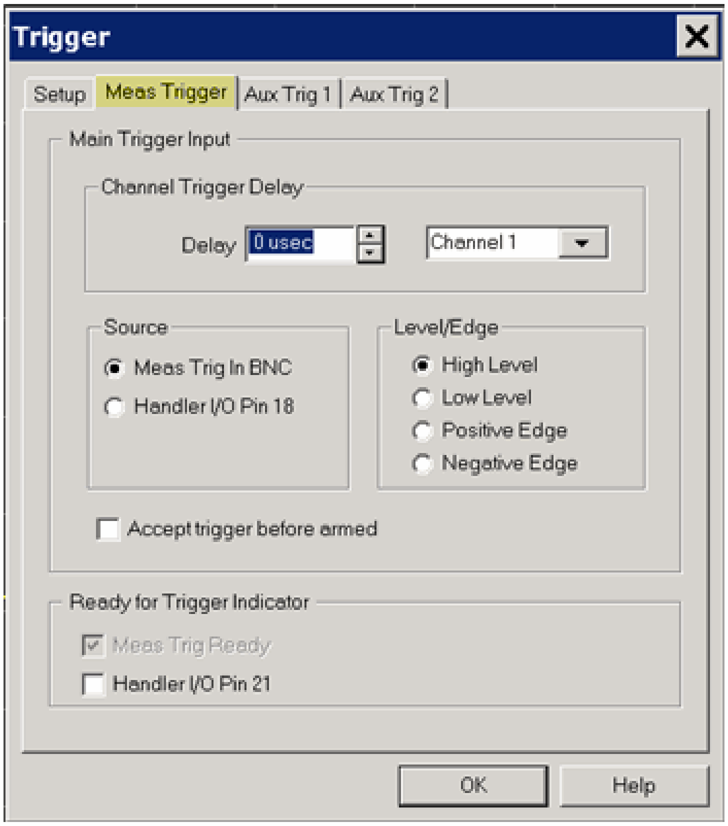
IN (READY)

Ready High PNA responds to the leading edge of a pulse on the Aux1 or Aux2 In connector.

Ready Low PNA responds to the trailing edge of a pulse on the Aux1 or Aux2 In connector.

Delay Time that the PNA waits after receiving the Handshake input before data acquisition.

See how to access the Trigger Dialog



Dialog box as it appears on a PNA-X. This tab is labeled **External** on PNA-L and E836x models

Meas (External) Trigger dialog box help

Learn how to External Trigger during Calibration

Main Trigger Input

Global / Channel Trigger Delay After an external trigger is received, the start of the sweep is held off for this specified amount of time plus any inherent latency.

When Trigger Scope = Channel, the delay value is applied to the specified channel.

When Trigger Scope = Global, the same delay value is applied to ALL channels.

Source The PNA accepts Trigger IN signals through the following rear-panel connectors:

- Meas Trig IN BNC (PNA-X ONLY)
- Handler I/O Pin 18 (PNA-L and PNA-X ONLY)
- I/O 1 (TRIG IN) BNC (PNA-L and E836x ONLY)
- Aux I/O - pin 19 (PNA-L and E836x ONLY)

Level / Edge

High Level The PNA is triggered when it is armed (ready for trigger) and the TTL signal at the select input is HIGH.

Low Level The PNA is triggered when it is armed (ready for trigger) and the TTL signal at the select input is LOW.

Positive Edge After the PNA arms, it will trigger on the next positive edge. If Accept Trigger Before Armed is set, PNA will trigger as soon as it arms if a positive edge was received since the last data was taken.

Negative Edge After the PNA arms, it will trigger on the next negative edge. If Accept Trigger Before Armed is set, PNA will trigger as soon as it arms if a negative edge was received since the last data was taken.

Note: Edge triggering is NOT available on the following PNA models: E835xA, E880xA, N338xA, E8362A, E8363A, E8364A.

Accept Trigger Before Armed When checked, as the PNA becomes armed (ready to be triggered), the PNA will immediately trigger if any triggers were received since the last taking of data. The PNA remembers only one trigger signal. All others are ignored.

- When this checkbox is cleared, any trigger signal received before PNA is armed is ignored.
- This feature is only available when positive or negative EDGE triggering is selected.
- Configure this setting remotely using CONTrol:SIGNal (SCPI) or ExternalTriggerConnectionBehavior (COM).

Ready for Trigger Indicator

Connector to send the PNA 'Ready' OUT signal.

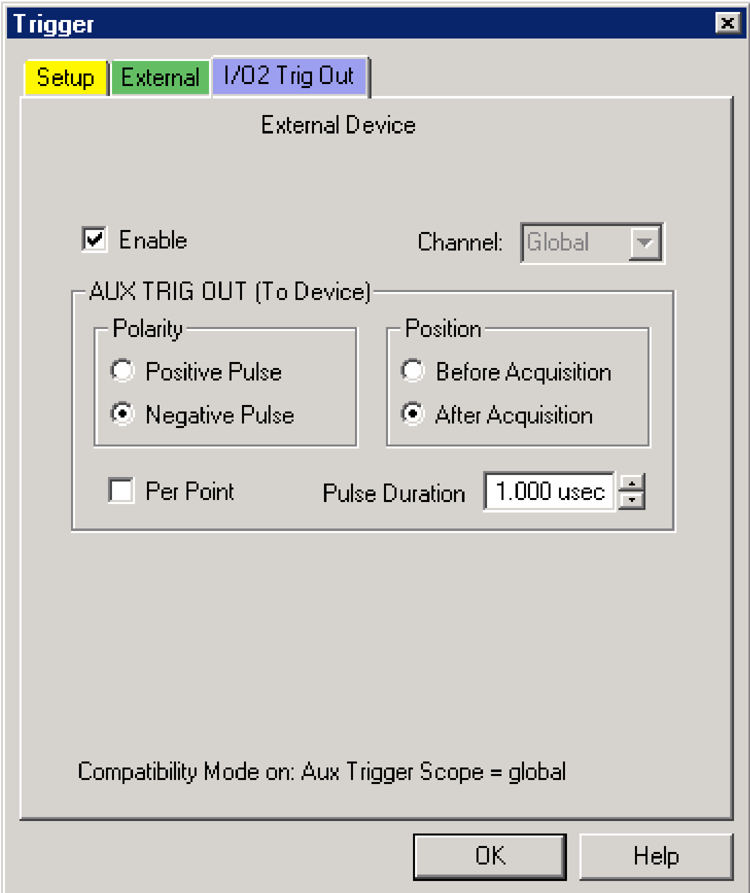
On the PNA-X, when Meas Trig IN is enabled, then Meas Trig Ready (OUT) is also enabled.

Choose from:

Handler I/O p21

AUX I/O p18

See how to access the Trigger Dialog



I/O2 Trig Out dialog box help

This TAB appears ONLY on E836X and PNA-L models with a Trig I/O rear-panel connector.

Enable When checked, the PNA sends synchronized trigger signals out the rear-panel I/O (TRIG OUT) BNC connector.

Channel

Global - Trigger output properties apply for ALL channels. This is the default setting and is consistent with pre-7.2 release behavior. In this mode, the Per Point setting (below) is not allowed, but is coupled to the channel Point trigger property. In other words, when a channel is in point sweep mode, the trigger output will be sent per point.

Channel Trigger output properties are channel dependent. To output trigger signals for each point, check Per Point (see below).

Note: This Channel / Global setting can be changed ONLY by using the following Preference commands:

- SCPI Trig:Pref:AIGLobal
- COM - AuxTriggerIsGlobal Property

The current setting is annotated at the bottom of the dialog as:

Compatibility Mode on: Aux Trigger Scope = global

AUX (I/O) TRIG OUT (To Device)

Polarity The trigger pulse output from the PNA is either in the Positive or Negative direction.

Position The trigger pulse output is sent either BEFORE or AFTER data is acquired.

Per Point (Channel mode only) Check to cause a trigger output to be sent for each data point. Clear to send a trigger output for each sweep. This setting controls the trigger **output** signal regardless of the channel Point trigger setting, which causes the PNA channel to trigger per point. For example, to trigger the PNA channel per point, and output a trigger signal per point, both this, and the channel setting must be checked ON.

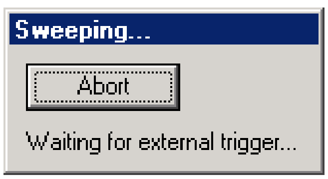
Pulse Duration Specifies the duration of the positive or negative output trigger pulse.

Learn how to calibrate while in External Trigger

Note: Beginning with PNA Rev 6.0, Guided and Unguided Calibration CAN be performed in External Trigger mode. With this optional behavior, while Trigger Source is set to External, trigger signals must be sent for Calibration sweeps. This behavior does not apply to FCA calibrations.

To revert to pre-6.0 behavior, (the PNA calibrates using Internal trigger signals while Trigger Source is set to External), send these SCPI or COM commands. You can send SCPI commands using the GPIB console.

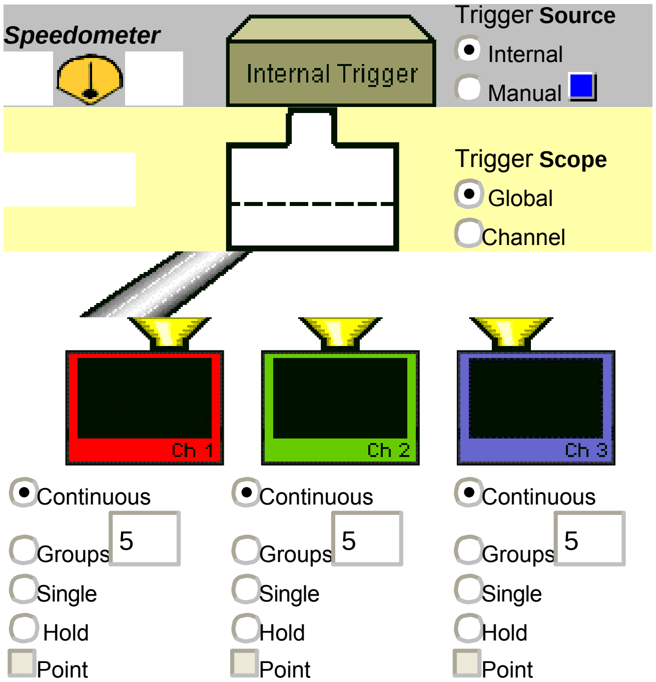
The following dialog box appears on the PNA screen while the PNA is waiting for an External trigger signal.



Click **Abort** to cancel the wait for a trigger signal.

Last Modified:

3-Mar-2008	Many edits
25-Jan-2007	MX New topic



About the trigger model

Read Text description of triggering behaviors.

This model does not include the new Sweep trigger mode.

Data Format and Scale

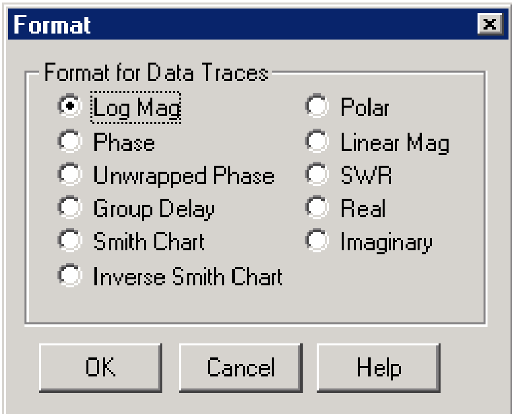
A data format is the way the PNA presents measurement data graphically. Pick a data format appropriate to the information you want to learn about the test device.

- How to set Format
- Rectangular (Cartesian) Display Formats
- Polar
- Smith Chart
- Scale, Reference Level and Position
- Magnitude Offset

See other 'Setup Measurements' topics

How to set the Display Format

Using front-panel HARDKEY **[softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Press FORMAT 2. then Active Entry keys	1. Click **Trace** 2. then **Format**
For PNA-X and 'C' models	Programming Commands
1. Press FORMAT	1. Click **Response** 2. then **Format**



Format dialog box help

- Log Mag
- Phase / Unwrapped Phase
- Group Delay
- Smith / Inverse Smith Chart
- Polar
- Linear Mag
- SWR
- Real
- Imaginary

Rectangular Display Formats

Seven of the nine available data formats use a rectangular display to present measurement data. This display is also known as Cartesian, X/Y, or rectilinear. The rectangular display is especially useful for clearly displaying frequency response information of your test device.

- Stimulus data (frequency, power, or time) appears on the X-axis, scaled linearly
- Measured data appears on the Y-Axis.

Log Mag (Logarithmic Magnitude) Format

- Displays Magnitude (no phase)
- Y-axis: dB
- Typical measurements:
  - Return Loss

- Insertion Loss or Gain

Phase Format

- Displays Phase (no magnitude)
- Y-axis: Phase (degrees)
- The trace 'wraps' every 180 degrees for easier scaling.
- Typical Measurements:
  - Deviation from Linear Phase

Unwrapped Phase

- Same as Phase, but without 180 degree wrapping.

Group Delay Format

- Displays signal transmission (propagation) time through a device
- Y-axis: Time (seconds)
- Typical Measurements:
  - Group Delay

  See also:

  Comparing the PNA Delay Functions.

  Phase Measurement Accuracy

Linear Magnitude Format

- Displays positive values only
- Y-axis: Unitless (**U**) for ratioed measurements
  Watts (**W**) for unratioed measurements.
- Typical Measurements:
  - reflection and transmission coefficients (magnitude)
  - time domain transfer

SWR Format

- Displays reflection measurement data calculated from the formula $(1+\rho)/(1-\rho)$ where ρ is reflection coefficient.
- Valid only for reflection measurements.
- Y axis: Unitless

- Typical Measurements:
    - SWR

Real Format

- Displays only the real (resistive) portion of the measured complex data.
- Can show both positive and negative values.
- Y axis: Unitless
- Typical Measurements:
    - time domain
    - auxiliary input voltage signal for service purposes

Imaginary Format

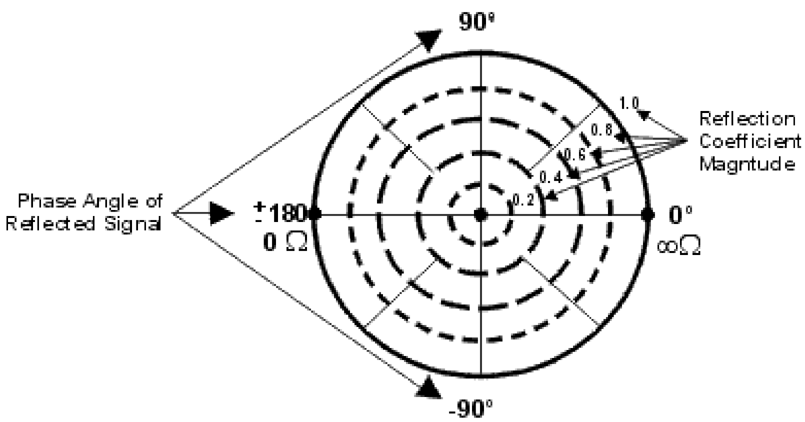
- Displays only the imaginary (reactive) portion of the measured data.
- Y - axis: Unitless
- Typical Measurements:
    - impedance for designing matching network

Polar Format

Polar format is used to view the magnitude and phase of the reflection coefficient (Γ) from your S_{11} or S_{22} measurement.

You can use Markers to display the following:

- Linear magnitude (in units) or log magnitude (in dB)
- Phase (in degrees)



- The dashed circles represent reflection coefficient. The outermost circle represents a reflection coefficient (Γ) of 1, or total reflected signal. The center of the circle represents a reflection coefficient (Γ) of 0, or no reflected signal.

- The radial lines show the phase angle of reflected signal. The right-most position corresponds to zero phase angle, (that is, the reflected signal is at the same phase as the incident signal). Phase differences of 90°, ±180°, and -90° correspond to the top, left-most, and bottom positions on the polar display, respectively.

Smith Chart Format

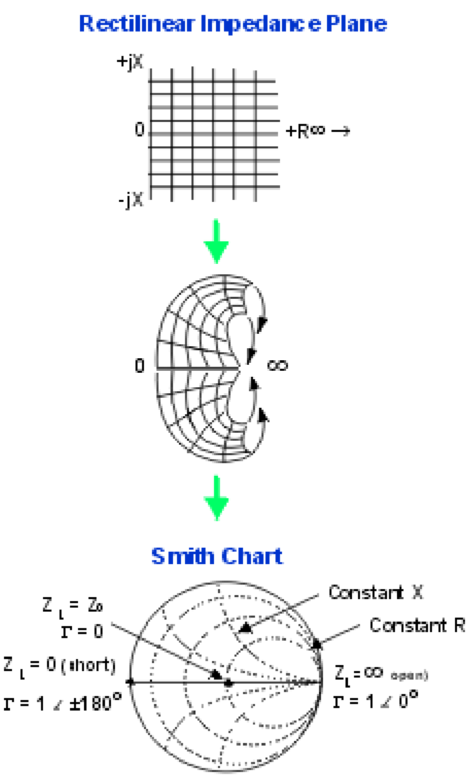
The Smith chart is a tool that maps the complex reflection coefficient (Γ) to the test device's impedance.

In a Smith chart, the rectilinear impedance plane is reshaped to form a circular grid, from which the series resistance and reactance can be read (R + jX).

You can use Markers to display the following:

- Resistance (in units of ohms)

- Reactance as an equivalent capacitance (in units of farads) or inductance (in units of henrys)



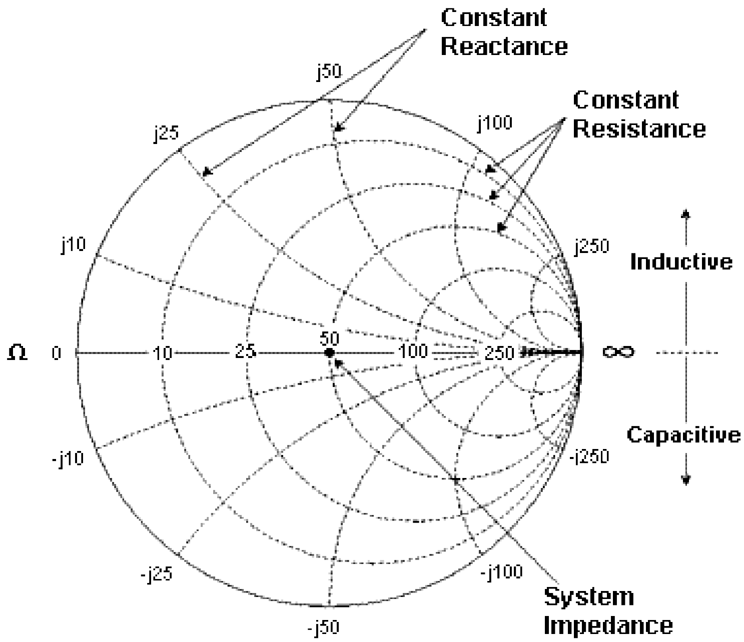
Inverse Smith Chart (also known as **Admittance)**

Same as standard Smith Chart , except:

- The plot graticule is reversed right-to-left.

- Admittance (in units of siemens) instead of resistance.

Interpreting the Smith Chart



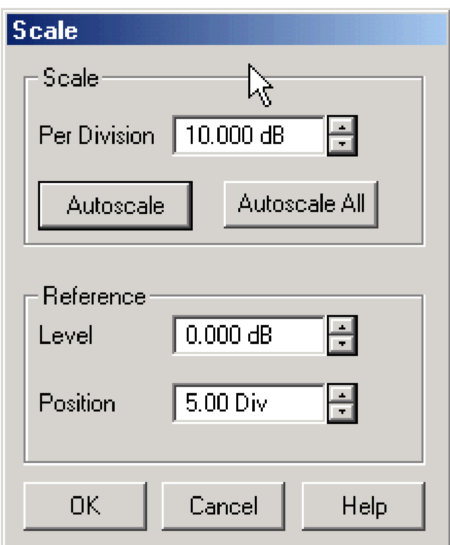
- Every point on the Smith Chart represents a complex impedance made up of a real resistance (r) and an imaginary reactance (r+-jX)
- The horizontal axis (the solid line) is the real portion of the impedance - the resistance. The center of the horizontal axis always represents the system impedance. To the far right, the value is infinite ohms (open). To the far left, the value is zero ohms (short)
- The dashed circles that intersect the horizontal axis represent constant resistance.
- The dashed arcs that are tangent to the horizontal axis represent constant reactance.
- The upper half of the Smith chart is the area where the reactive component is positive and therefore inductive.
- The lower half is the area where the reactive component is negative and therefore capacitive.

Scale, Reference Level and Position

The Scale, Reference Level and Reference Position settings (along with format) determine how the data trace appears on the PNA screen.

How to set Scale, Reference Level, and Position

Using front-panel HARDKEY **[softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Press SCALE 2. then Active Entry keys	1. Click **Scale** 2. then **Scale**
For PNA-X and 'C' models	Programming Commands
1. Press SCALE	1. Click **Response** 2. then **Scale** 3. then **Scale**



Scale dialog box help

Scale

Per Division Sets the value of the vertical divisions of a rectangular display format. In Polar and Smith Chart formats, scale sets the value of the outer circumference. Range: 0.001dB/div to 500 dB/div

Autoscale - Automatically sets value of the vertical divisions and reference value to fit the ACTIVE data trace within the grid area of the screen. The stimulus values and reference position are not affected.

The analyzer determines the smallest possible scale factor that will allow all the displayed data to fit onto 80 percent of the vertical grid.

The reference value is chosen to center the trace on the screen.

Autoscale All Automatically scales ALL data traces in the ACTIVE WINDOW to fit vertically within the grid area of the screen.

Reference

Level In rectangular formats, sets the value of the reference line, denoted by 

on the PNA screen. Range: -500 dB to 500 dB.

In Polar and Smith chart formats, reference level is not applicable.

Position In rectangular formats, sets the position of the reference line. Zero is the bottom line of the screen and ten is the top line. Default position is five (middle).

In Polar and Smith chart formats, reference position is not applicable.

Magnitude Offset

Magnitude Offset allows you to offset the magnitude (not phase) data by a fixed and / or sloped value in dB. If the display format is Linear Magnitude or Real (unitless), the conversion from dB is performed and the correct amount of offset is implemented.

How to set Magnitude Offset	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	
1. Navigate using MENU/DIALOG	1. Click **Scale** 2. then **Magnitude Offset**
For PNA-X and 'C' models	

1. Press SCALE
2. then **[More]**
3. then **[Magnitude Offset]**

1. Click **Response**
2. then **Scale**
3. then **Magnitude Offset**

Magnitude Offset dialog box help
The Magnitude offset setting affects only the active trace.
Offset Offsets the entire data trace by the specified value.
Slope Offsets the data trace by a value that changes with frequency. The offset slope begins at 0 Hz.
For your convenience, the offset value at the start frequency is calculated and displayed.
See where this operation is performed in the data processing chain.

Last modified:

9/12/06	Added link to programming commands
9/27/06	MX Added UI

Pre-configured Measurement Setups

- Pre-configured setups for NEW measurements
- Pre-configured arrangements for EXISTING measurements

Before reading this topic, it is important to understand Traces, Channels, and Windows in the PNA.

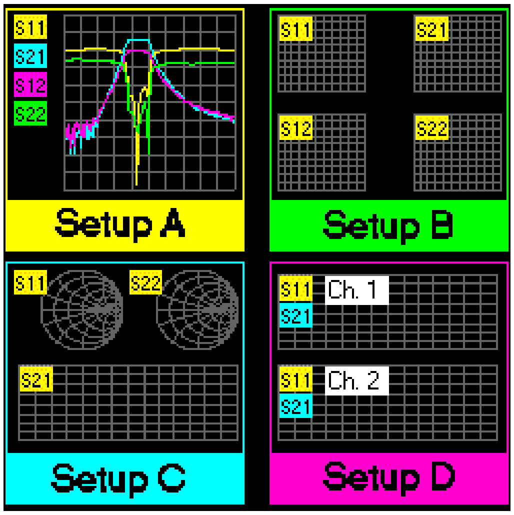
See other 'Setup Measurements' topics

Pre-configured Setups for NEW Measurements

Each of the following setups **creates new traces**. Existing traces and their settings will be lost, unless you first save them.

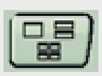
How to select a pre-configured measurement setup	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	No programming commands
1. Press **MEASURE SETUPS** 2. then Active Entry keys	1. Click **Window** 2. then **Meas Setups**
For PNA-X and 'C' models	No programming commands
1. Press **RESPONSE** 2. then **[Display]** 3. then **[Meas Setups]**	1. Click **Response** 2. then **Display** 3. then **Meas Setups**

The following are the four pre-configured measurement setups:



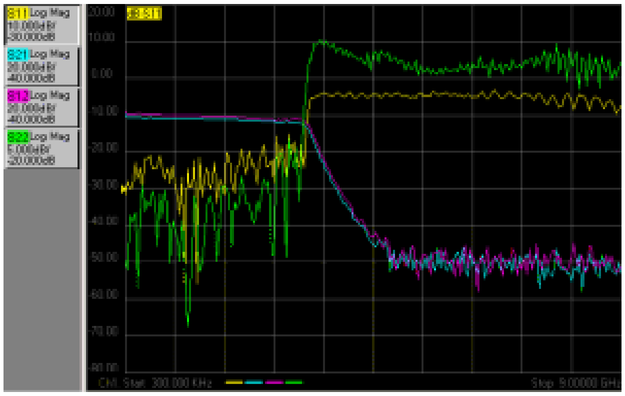
Arranging Existing Measurements

The following arrangements place EXISTING measurements into pre-configured Window arrangements using a sort algorithm.

How to select an Existing measurement arrangement	
Using front-panel HARDKEY **[softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Press  2. then Active Entry keys	1. Click **Window** 2. then **Arrange**
For PNA-X and 'C' models	Programming Commands
1. **Press DISPLAY**	1. Click **Response** 2. then **Display**

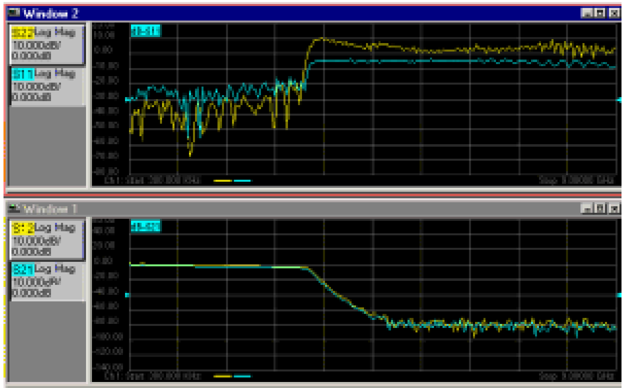
Overlay Arrangement

This configuration places all existing traces in a single window, all overlaid on each other.



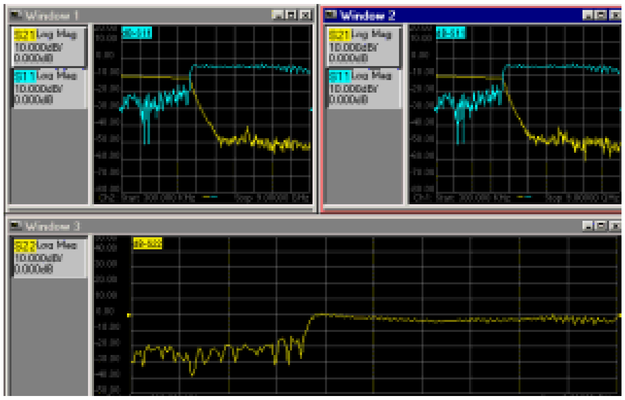
Stack 2 Arrangement

This configuration places all existing traces in two "stacked" windows.



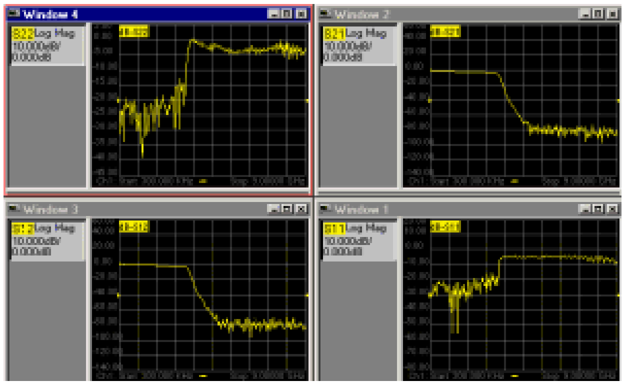
Split 3 Arrangement

This configuration places all existing traces in three windows, two on top and one below.



Quad 4 Arrangement

This configuration places all existing traces in four windows, one window in each screen quadrant.



Sort Algorithm

The sort algorithm for the Arrange Windows feature is designed to:

- Divide traces among windows based on their properties
- Group traces with common properties

The algorithm sorting is based on the following trace properties, in order of priority:

1. Format: circular (polar or Smith) versus rectilinear (log mag, lin mag, group delay, etc.)
2. Channel number
3. Transmission versus reflection

Note: The PNA traces per window limitation overrides this algorithm. An error occurs if the arrange selection cannot be completed with the current number of traces on the screen.

Last modified:

9/27/06	MX Added UI
9/12/06	Added link to programming commands

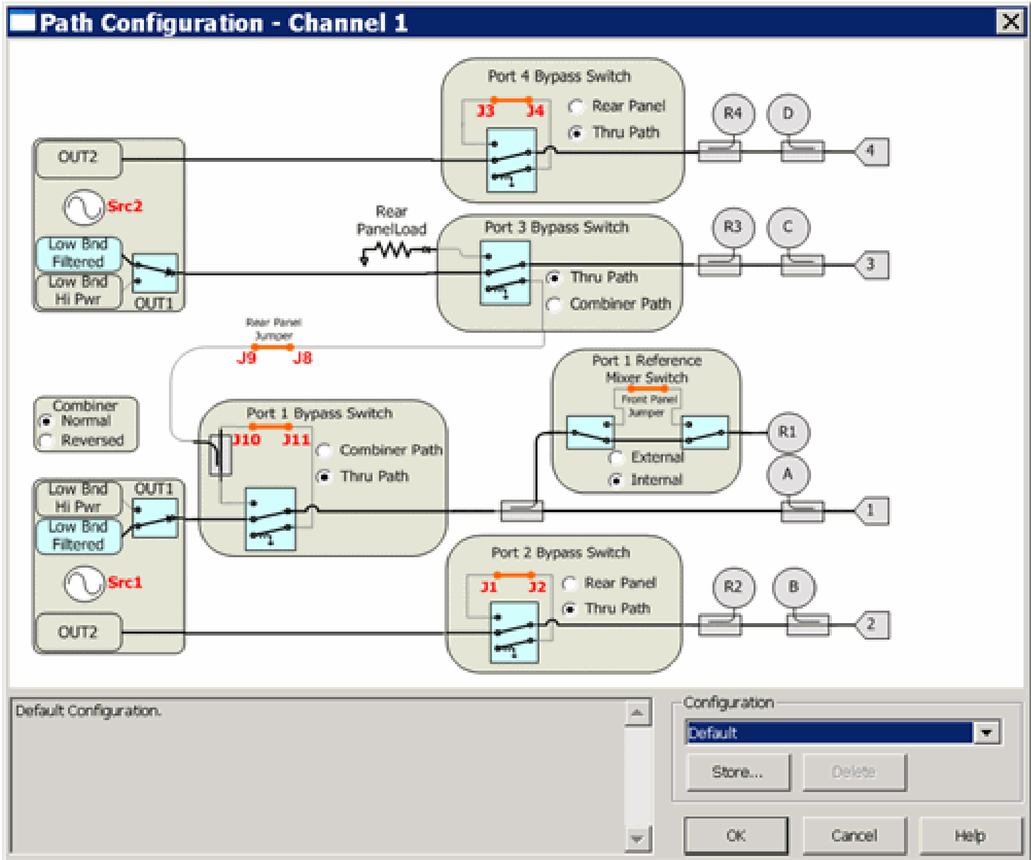
Path Configurator

Allows you to configure hardware components that are available with selected PNA-X options.

How to access Path Configurator	
Using HARDKEY [softkey] buttons:	**PNA Menu using a mouse:**
For N5230A and E836xA/B models	
1. Not Available	1. Not Available
For PNA-X and 'C' models	Programming Commands
1. Press TRACE/CHAN 2. then **[Channel]** 3. then **[More]** 4. then **[Hardware Setup]** 5. then **[Path Config...]**	1. Click **Trace/Chan** 2. then **Channel** 3. then **Hardware Setup** 4. then **Path Config...**

The following image shows configuration with PNA-X Opt 423 (4-port, internal 2nd source, combiner, and mechanical switches). Your PNA-X may not include these options.

See other RF path configuration diagrams.



Path Configuration dialog box help

Different paths can be configured for each channel.

See Noise Figure tab help of the Path Configuration.

Configuration

Select, store, and delete factory configurations or user-defined configurations. Configurations are stored on the PNA hard drive.

Any configuration can be saved, and later recalled, from this dialog. Click **Store**, type a configuration name, then click **OK**.

Text area Displays text describing the physical connections required to complete the configuration. The text for factory configurations can NOT be edited. Text is saved as part of the configuration.

Cancel Closes the dialog and returns the configuration settings to the state they were in when the dialog was opened. Cancel does NOT undo **Store** and **Delete** actions that were performed while the dialog was open.

Notes

- Click or touch anywhere within a box to actually cycle through the available settings.
- Some switch settings alter graphics in areas other that where the switch is thrown.
- If you don't hear switches clicking, this could be why:

- Electronic switches are **orange** on the path configuration dialog. These switches do not make noise when being thrown. Mechanical switches are **blue.**
- The channel is in hold and not sweeping.
- PNA switch wear prevention logic does NOT allow mechanical switching with continuous triggering. To override the logic use group or single triggering. Learn more.

- Orange lines are jumpers on the front or rear panel.
- Notice on the block diagrams:
  - Extra filtering is available to optimize harmonics below 3.2 GHz on OUT1 of both sources. These filters are not used in the Hi Pwr setting. See specifications.
  - Each source optionally has pulse modulation capability.
- Copy channel feature copies path configuration settings.
- Saved and recalled as part of an instrument state.

Last modified:

January 5, 2007	MX- New topic

Customize the PNA Screen

You can customize your PNA screen by showing or hiding the following display elements. All of these selections are made from the PNA **View** menu.

- **Status Bar**
- **Toolbars**
- **Tables**
- **Measurement Display**
- **Data and Memory Trace**
- **Title Bars**
- **Minimize Application**

Learn about using pre-configured measurements and windows arrangements

Learn about Traces, Channels, and Windows on the PNA

See other 'Setup Measurements' topics

Status Bar

When enabled, the status bar is displayed along the bottom of the PNA screen. The primary status bar shows the following:

- Channel Trigger State (Cont, Groups, Single, Hold)
- Active channel
- Measurement parameter for the active trace
- Trace Math
- Error correction for the active trace
- Averaging Factor for the active channel
- Smoothing Percentage
- Transform (On)
- Gating (On)
- IF Gating Enabled for Pulsed App: (G)
- Manual IF Filtering for Pulsed App: (F)

- Delay if invoked using Phase Offset, Electrical Delay, or Port Extensions.
- Loss if invoked using Magnitude Offset or Port Extensions.
- GPIB status: Local (LCL), Remote Talker Listener (RMT), or System Controller (CTL).
- Error Status: (LVL, LCK, etc)

Note: A second level status bar appears when using External Test Set Control or Interface control.

The status bar state (ON or OFF) will not change when the PNA is Preset.

How to display the Status Bar	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **View** 2. then **Status Bar**
For PNA-X and 'C' models	Programming Commands
1. Press **DISPLAY** 2. then **[More]** 3. then **[Status Bar]**	1. Click **Response** 2. then **Display** 3. then **Status Bar**

Toolbars

You can display up to five different toolbars to allow you to easily set up and modify measurements.

How to display toolbars	
Using front-panel HARDKEY [softkey] buttons	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **View** 2. then **Toolbar** 3. then the toolbar to turn ON/OFF
For PNA-X and 'C' models	Programming Commands
1. Press **DISPLAY** 2. then **[More]** 3. then **[Toolbars]**	1. Click **Response** 2. then **Display** 3. then **More** 4. then **Toolbars**

List of toolbars:

- Active Entry
- Markers
- Measurement
- Sweep Control
- Stimulus
- Time Domain
- Port Extension
- All Off

Note: There is also a Cal Set toolbar available for Monitoring Error Terms.

Active Entry Toolbar (For N5230A and E836xA/B models)

The active entry toolbar is displayed at the top of the screen, below the menu bar. It allows you to make selections from the active function using the mouse or by pressing the front panel key with the corresponding color.

Learn more about using the front panel interface

Entry Toolbar (For PNA-X and 'C' models)

When used with softkeys, this area allows numeric values to be entered for PNA-X settings. From the keyboard, enter G for Giga, M for Mega or milli, K for kilo, and so forth.

Markers Toolbar

The markers toolbar allows you to set up and modify markers. It shows:

- Marker number
- Stimulation value
- Marker functions:
  - Delta
  - Start/Stop
  - Center/Span

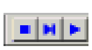
Tip: To use the Front Panel Knob to change marker position, first click the **Stimulus** field of the marker toolbar. Then turn the knob.

Learn more about Markers

Measurement Toolbar

The measurement toolbar allows you to **create a new trace** for a desired S-parameter measurement in a current window or new window.

Sweep Control Toolbar

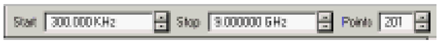


In left to right order, the buttons on this toolbar set the active channel to:

- **Hold** mode
- **Single** sweep, then Hold mode
- **Continuous** sweep

Learn more about Channel Trigger State.

Stimulus Toolbar



The stimulus toolbar allows you to view, set up, and modify the sweep stimulus. It shows the:

- **Start** value
- **Stop** value
- Number of **points**

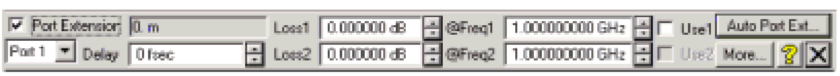
Time Domain

The Time Domain toolbar allows you to do the following:

- Turn Transform and Gating ON / OFF
- Change the Start / Stop times for both Transform and Gating
- **More...**launches the Time Domain Transform dialog box
- **X** Closes the toolbar

The front panel Tab key steps through all of the settings on all of the toolbars on the display. If Tab does not work, press one of the Active Toolbar (color) keys.

Port Extension



The Port Extension toolbar allows you to set Port Extensions while viewing the measurement trace. Learn more about Port Extensions.

All Off

This allows you to **hide all toolbars** with a single selection.

Tables

Tables are displayed at the bottom of the selected window. Only one table may be displayed at a time for a window.

How to display tables	
Using front-panel HARDKEY **[softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **View** 2. then **Tables** 3. **then the table to turn ON/OFF**
For PNA-X and 'C' models	Programming Commands
1. Press **DISPLAY** 2. then **[More]** 3. then **[Tables]**	1. Click **Response** 2. then **Display** 3. then **More** 4. then **Tables**

List of tables:

- Marker Table
- Limit Line Table
- Segment Table

Marker Table

You can display a table of marker settings. These settings include the:

- Marker number
- Marker reference (for delta measurements)
- Frequency
- Time and Distance (for Time Domain measurements)
- Response

Learn more about Markers

Limit Line Table

You can display, set up, and modify a table of limit test settings. These include:

- Type (MIN, MAX, or OFF)
- Beginning and ending stimulus values
- Beginning and ending response values

Learn more about Limit Lines

Segment Sweep Table

You can display, set up, and modify a table of segment sweep settings. These include:

- State (On/Off)
- Start and Stop frequencies
- Number of Points
- IF Bandwidth (if independent levels)
- Power Level (if independent levels)
- Sweep Time (if independent levels)

Learn more about Segment sweep

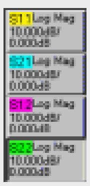
Measurement Display Items

How to show and hide Measurement Display items	
Using front-panel HARDKEY [softkey] buttons	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **View** 2. then **Meas Display** 3. then the display item to show/hide
For PNA-X and 'C' models	Programming Commands
1. Press **DISPLAY** 2. then **[Display Items]**	1. Click **Response** 2. then **Display** 3. then **Display Items**

Measurement Display items:

- Trace Status
- Frequency Stimulus
- Marker Readout
- Limit Test Results
- Limit Lines
- Title

Trace Status

	**For N5230A and E836xA/B models** Trace status buttons are displayed to the left of each window. The depressed button indicates the Active Trace. Click to select a trace.
	**For PNA-X and 'C' models** Trace status is annotated at the top of each window. The highlighted trace number indicates the Active Trace. Click to select a trace.

Trace Status shows the following:

- Trace number (Tr x). This is the trace number of the channel; NOT the window trace number which is used in many programming commands.
- Measurement parameter. This can be replaced with a custom Trace Title.
- Format
- Scaling factor
- Reference level

How to show/hide Trace Status

Frequency/Stimulus

Frequency/stimulus information is displayed at the bottom of each window on the screen. It shows:

- Channel number

- Start value
- Stop value

How to show/hide Frequency/Stimulus information

Marker / Bandwidth / Trace Statistics Readout

How to show/hide Readout settings

The Marker / Bandwidth / Trace Statistics Readout area, in the upper-right corner of each window, can contain up to **20** total readout lines. However, all readout lines may not be visible depending on the window size and whether Large Marker Readout is enabled.

The image shows 3 readout lines.

- Markers use one readout line per marker.
- Marker Bandwidth and Trace Statistics use three readout lines per trace.

Marker Readout

- Checked - Shows readout information.
- Cleared - Shows **no** readout information.

One Readout Per Trace

- Checked - Shows the readout of only the **active marker** for each trace.
- Cleared - Shows up to 20 total readouts lines.

Large Marker Readout

This setting also controls Trace Statistics readout.

- Checked - Shows the marker readout in **large font size for easy reading**.
- Cleared - Shows the marker readout in **normal font size**.

Learn more about Markers

Limit Line Test Results

Limit line test results, **Pass** or **Fail,** are displayed on the right side of the designated window.

Limit Lines

Limit lines are displayed for the active trace in the designated window. Their position depends on:

- Limit levels
- Format
- Scaling
- Reference level

Learn more about Limit Lines

How to show/hide Limit Lines and Results

Title

You can create and display a title for each **window** using the keyboard. You can also use the following Title Entry dialog box.

The title is displayed in the upper-left corner of the selected window.

To clear a title, delete the title from the dialog box entry area and click OK.

See also Trace Titles

How to show/hide a Title

Data Trace and Memory Trace

You can view or hide the active data or memory trace.

- Make a trace active by clicking the trace status button
- To view a memory trace you must first store a trace in memory. Click **Trace**, then **Math / Memory**, then **Data => Memory.**

Learn more about Math operations

Title Bars

The Title bar shows the window number and Minimize / Maximize icons.

- Checked - Title bars for all PNA windows are shown.
- Cleared - Title bars for all PNA windows are hidden. This allows more room to display measurement results.

How to show/hide the Title Bars	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **View** 2. then **Title Bars**
For PNA-X and 'C' models	Programming Commands
1. Press **DISPLAY** 2. then **[More]** 3. then **[Title Bars]**	1. Click **Response** 2. then **Display** 3. then **More** 4. then **Title Bars**

Minimize Application

The Network Analyzer application can be minimized to show the desktop and Windows taskbar.

How to minimize the Network Analyzer Application	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **View** 2. then **Title Bars**
For PNA-X and 'C' models	Programming Commands
1. Press **DISPLAY**	1. Click **File**

2. then **[Windows]** 3. then **[More]** 4. then **[Minimize]**	2. then **Minimize Application**

To restore the PNA application, click the PNA application on the Windows taskbar.

Last modified:

27-Aug-2007	Edited readout section
9/12/06	Added link to programming commands
9/27/06	MX Added UI

Copy Channels

You can copy the channel settings from an existing channel to a new or another existing channel.

- Why Copy Channels
- How to Copy Channels
- List of Channel Settings

Other Setup Measurements Topics

Why Copy Channels

Copy channel settings if you need to create several channels that have slightly different settings.

For example, if you have an amplifier that you want to characterize over a frequency span with several different input power levels.

Follow these steps:

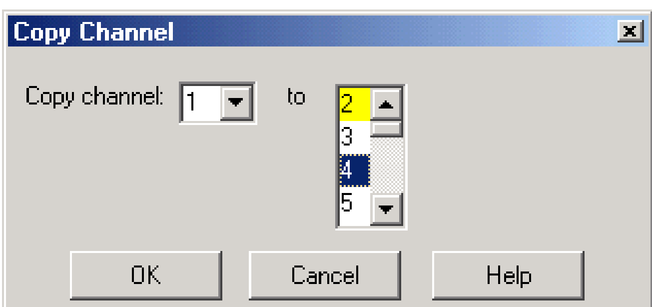
1. Create one measurement with your optimized channel settings.
2. Copy that channel to new channels.
3. Change the power level on the new channels.

The alternative to using Copy Channels is to create new default measurements on new channels. Then change every channel setting to your new requirement. This is very time consuming and thus shows the benefit of the Copy Channels feature.

Note: Copy Channels does NOT work with any of the PNA Applications, such as FCA, Gain Compression, or Noise Figure.

How to Copy Channels

Using front-panel HARDKEY [softkey] buttons	PNA Menu using a mouse
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Channel** 2. then **Copy Channel**
For PNA-X and 'C' models	Programming Commands
1. Press TRACE/CHAN 2. then **[Channel]** 3. then **[More]** 4. then **[Copy Channel[**	1. Click **Trace/Chan** 2. then **Channel** 3. then **Copy Channel**



Copy Channel dialog box help

Copies an existing channel's settings to another channel.

Copy channel: Select a channel to copy.

to: Scroll to select a channel to copy settings to. Channel numbers that are currently being used are highlighted. They can be selected and overwritten.

Notes:

- You can copy channel settings to ONLY one new or existing channel. Repeat this operation to copy to more than one channel.
- The new channel is ALWAYS copied to the Active window. If you want the new channel in its own window, first create a new measurement in a new window. Then make sure it is the Active window before you copy the channel into it.
- The measurement in the new channel becomes the active measurement.
- Only the channel settings are copied. The measurement trace is NOT copied to the new channel.
    - If measurements already exist on a channel being copied to, the measurements on that channel will not change, but they will assume the new channel settings.
    - If a NEW channel is copied TO, an S11 measurement is created in order to view the channel settings.

For example:

1. **Existing** channel 1: S21 measurement
2. **Copy** channel 1 to NEW channel 2
3. **Result**: channel 2: S11 measurement with channel 1 copied settings. Both measurements are in the same window. The S11 measurement is the active measurement.

For more information see Traces, Channels, and Windows on the PNA

List of Channel Settings

- Frequency Span
- Power
- Cal Set usage
- Source Power Cal data
- IF Bandwidth

- Number of Points
- Sweep Settings
- Average
- Trigger (some settings)

Last modified:

13-Feb-2008	Added note about Apps
9/12/06	Added link to programming commands

ADC Measurements

The PNA is equipped with one or more ADC (Analog to Digital Converter) inputs. These ADC inputs can be used as measurement receivers and display measurements on the PNA screen.

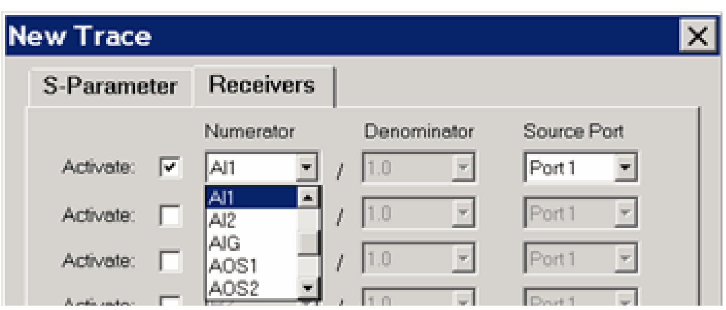
- Analog Inputs can be used for measuring from -10V to +10V. These inputs can be considered auxiliary receivers and used in a similar way as S-Parameter receivers.
- Analog Output Sense inputs (AOS1 and AOS2) can be used to measure the corresponding DAC outputs.
- Analog Ground input (AG1) can be used to measure the instruments analog ground (PNA-X only).

Supported Hardware

PNA-X: Power I/O connector

Other models: Aux I/O connector

How to create ADC receiver measurements	
For PNA-X and 'C' models	Programming Commands The New and Edit Measurement commands are extended to include ADC receiver measurements.
1. Press **TRACES** 2. then **[New Trace]**	1. Click **Trace/Chan** 2. then **New Trace**



New Trace (ADC) dialog box help

Note: Sweep speed slows dramatically when measuring more than two ADC receivers.

On the New Trace dialog, click the **Receivers** tab.

Activate - check any empty line to create a trace.

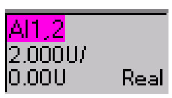
Numerator - select from the following:

- **AI1 -** Input 1 (PNA-X only)
- **AI2** - Input 2
- **AOS1, AOS2** - Output sense 1 or 2
- **AIG** - Analog ground (PNA-X only)

Denominator - NOT available (ONLY unratioed measurements)

Source Port - The ADC receiver is measured when the specified source port is sweeping.

ADC receiver traces are labeled as shown in the following images:



- The ADC1 input is being measured, with 2 as the source port.
- The Y axis is U (unitless).
- The default trace format is Real (linear).

ADC Traces and other useful PNA functions

Although most PNA functions work with ADC traces, the following may be especially useful.

- Equation Editor can be used with the trace data. Although the PNA-X ADC is measuring voltage (-10V to +10V range in 14 bits), by using a trace formula, this voltage can represent other types of measurement parameters (such as current, temperature, or a scaled voltage). See PAE example.
- Trace averaging and Trace Smoothing can be used to remove trace noise.
- Dwell time can be used to allow for settling.

PNA Functions Not Supported

- Calibration for ADC receivers is NOT supported.
- Use with FCA is NOT supported.

- While the PNA is sweeping an ADC measurement, do NOT use the rear-panel Analog I/O SCPI commands.

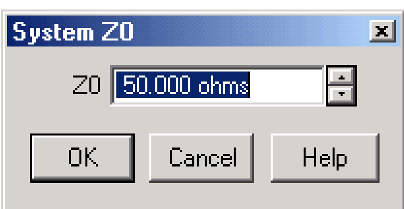
Last Modified:

19-Apr-2007 MX New topic

Setting System Impedance

The system impedance can be changed for measuring devices with an impedance other than 50 ohms, such as waveguide devices. The PNA mathematically transforms and displays the measurement data as though the PNA ports were the specified impedance value. Physically, the test ports are always about 50 ohms.

How to change the System Impedance	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Configure** 3. then **System Z0**
For PNA-X and 'C' models	Programming Commands
1. Press **SYSTEM** 2. then **[Configure]** 3. then **[System Z0**	1. Click **Utility** 2. then **System** 3. then **Configure** 4. then **System Z0**



System Z0 dialog box help

Allows you to change the system impedance (default setting is 50 ohms).

Z0 Displays the current system impedance.

For 75 ohm devices:

1. Change the system Z0 to 75 ohms.
2. Connect minimum loss pads (75 ohm impedance) between the analyzer and the DUT to minimize the physical mismatch.
3. Perform a calibration with 75 ohm calibration standards.

For waveguide devices:

1. Change the system Z0 to 1 ohm.
2. Perform a calibration with the appropriate waveguide standards.

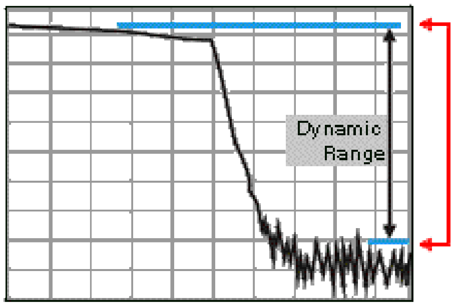
Last modified:

9/27/06	MX Added UI
9/12/06	Added link to programming commands

Dynamic Range

Dynamic range is the difference between the analyzer receiver's maximum input power and the minimum measurable power (noise floor). For a measurement to be valid, input signals must be within these boundaries.

Increasing dynamic range is important if you need to measure very large variations in signal amplitude, such as filter bandpass and rejection. The dynamic range is shown below for an example measurement.



To help reduce measurement uncertainty, the analyzer dynamic range should be greater than the response that the DUT exhibits. For example, measurement accuracy is increased when the DUT response is at least 10 dB above the noise floor. The following methods can help you increase the dynamic range.

- **Increase the Device Input Power**
- **Reduce the Receiver Noise Floor**
- **Use the Front-Panel Jumpers (if your PNA has a configurable test set)**

Other topics about Optimizing Measurements

Increase Device Input Power

Increase the DUT input power so that the analyzer can more accurately detect and measure the DUT output power. However, use caution - too much power can damage the analyzer receiver or cause compression distortion.

Caution! Receiver input damage level: +15 dBm.

See how to increase input power to the device

Tip: You can further increase dynamic range by using an external booster amplifier to increase the input power to the DUT. See High Power Amplifier Measurements.

Reduce the Receiver Noise Floor

You can use the following techniques to lower the noise floor and increase the analyzer's dynamic range.

- Reduce crosstalk between the PNA receivers when measuring signals close to the noise floor. See Receiver Crosstalk.)
- Use **Sweep Averaging** - learn more about Sweep Average

- Reduce the **IF Bandwidth** - learn more about IF Bandwidth.
- In Segment sweep mode each segment can have its own IF bandwidth. For example, when measuring a filter:
  - In the passband, the IF bandwidth can be set wider for a fast sweep rate, as long as high-level trace noise is kept sufficiently small.
  - In the reject band, where noise floor contributes significantly to measurement error, the IF bandwidth can be set low enough to achieve the desired reduction in average noise level.

Use the Front-Panel Jumpers (if your PNA has the configurable test set)

If your PNA has FOUR front-panel jumpers, you can bypass the test-port couplers and apply signals directly into the receivers. See Dynamic Range - 4 Jumpers. Using this configuration, you can achieve up to 143 dB dynamic range with **Response Calibration** using segment sweep mode.

If your PNA has MORE THAN FOUR front-panel jumpers (Configurable Test Set), you can use the front-panel jumpers to reverse a test-port coupler. See Dynamic Range - Configurable Test Set Option. Using this configuration, you can achieve up to 143 dB dynamic range with **Full 2-port Calibration** using segment sweep mode.

Note: Bypassing a port's directional coupler increases the port mismatch by approximately 15 dB (the coupling factor of the directional coupler).

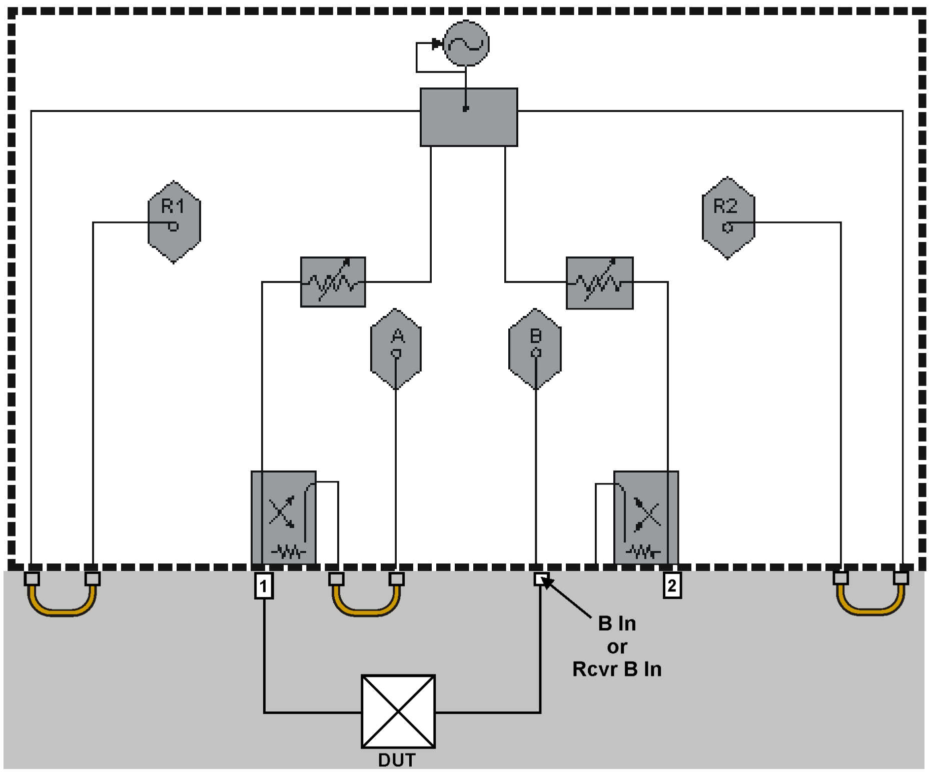
- For information about upgrading your PNA to include front-panel jumpers, see PNA Options.
- Discover the measurement possibilities using front-panel jumpers.

Improving Dynamic Range with FOUR front-panel jumpers

To improve dynamic range you can bypass the test-port coupler and apply the signal directly into the receiver. As shown in the following graphic, the signal is applied to the front-panel connector for the B In or Rcvr B In front-panel jumper rather than Port 2. Using this configuration, you can achieve up to 143 dB dynamic range with response calibration using segment sweep mode.

Explore the graphic with your mouse.

Note: Your PNA may not be equipped with front-panel jumpers or all of the components shown in this block diagram.

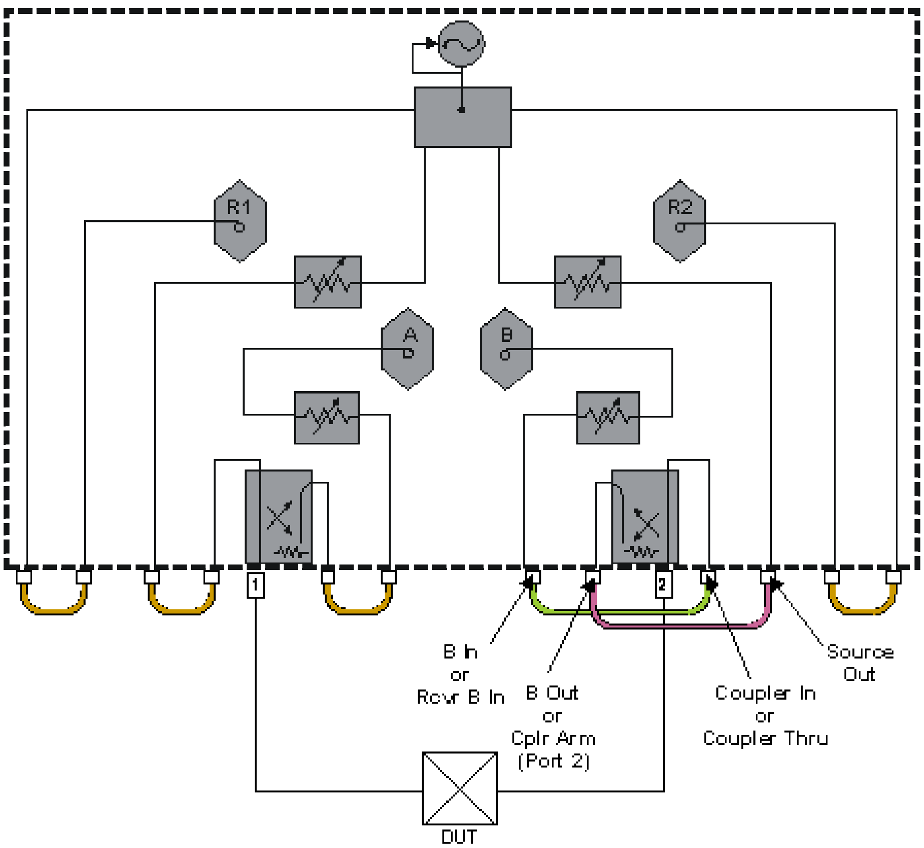


Improving Dynamic Range with Configurable Test Set Option

To improve dynamic range you can reverse the signal path in the test-port coupler and bypass the loss typically associated with the coupled arm. As shown in the following graphic, the signal is applied to Port 2. The signal bypasses the coupled arm via the jumper cable connected to the Coupler Thru (or Coupler In) and the Receiver B In (or B In) ports. Using this configuration, you can increase the forward measurement dynamic range up to 143 dB with full 2-port calibration using segment sweep mode. When making full 2-port error corrected measurements, the reverse measurement is degraded by 15 dB, with up to 113 dB of dynamic range available.

Explore the graphic with your mouse.

Note: Your analyzer's block diagram may contain different components than shown below.



Number of Points

A data point is a sample of data representing a measurement at a single stimulus value. You can specify the number of data points that the PNA measures across a sweep. (A "sweep" is a series of consecutive data point measurements, taken over a sequence of stimulus values.)

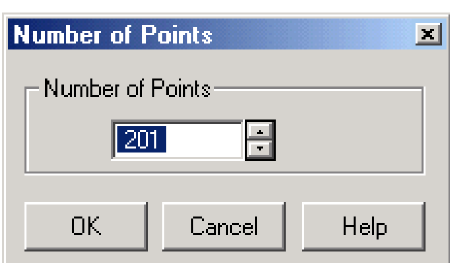
The PNA sweep time changes proportionally with the number of points. However, the overall measurement cycle time does not. See Technical Specifications for more information on how the number of points, and other settings, affect the sweep time.

Note: You may experience a significant decrease in computer processing speed with increased number of points, number of traces, and calibration error terms (full 2-port or 3-port). If this becomes a problem, you can increase the amount of RAM with PNA Option 022.

How to change the number of data points

Select a number or click Custom to invoke a dialog box

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For PNA-L and E836x models	
1. Press **SWEEP SETUP** 2. then 	1. Click **Sweep** 2. then **Number of Points**
For PNA-X and 'C' models	
1. Press **SWEEP** 2. then **[Number of Points]**	1. Click **Stimulus** 2. then **Sweep** 3. then **Number of Points**



Number of Points dialog box help

Specifies the number of data points that the analyzer gathers during a measurement sweep. You can specify any number from **1** to **20,001**. The default value is 201.

Two data points are required for Time Domain.

Tips:

- To achieve the greatest trace resolution, use the maximum number of data points.
- For faster throughput use the smallest number of data points that will give you acceptable resolution.
- To find an optimized number of points, look for a value where there is not a significant difference in the measurement when you increase the number of points.
- To ensure an accurate measurement calibration, perform the calibration with the same number of points that will be used for the measurement.

Last modified:

14-Dec-2007	Decreased min to 1
21-Jun-2007	MX Increased maximum
9/12/06	Added link to programming commands

Phase Measurement Accuracy

You can increase the accuracy of phase measurements by using the following PNA features.

- Electrical Delay
- Phase Offset
- Spacing Between Frequency Points (Aliasing)

See Also

Port Extensions

Comparing the PNA Delay Functions.

Learn more about Phase measurements

Electrical Delay

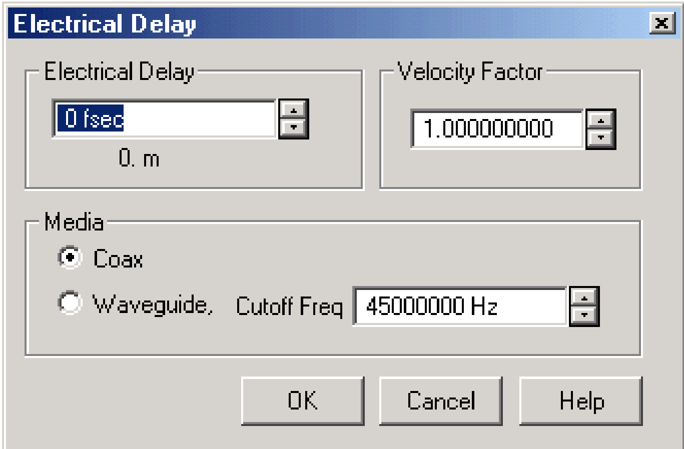
Electrical delay is a mathematical function that simulates a variable length of lossless transmission line.

Use the electrical delay feature to compensate for the linear phase shift through a device. This feature allows you to look at only the deviation from linear phase of the device.

You can set the electrical delay independently for each measurement trace.

How to set Electrical Delay

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Scale** 2. then **Electrical Delay**
For PNA-X and 'C' models	Programming Commands
1. Press **SCALE** 2. then **[Electrical Delay]**	1. Click **Response** 2. then **Scale** 3. then **Electrical Delay**



Electrical Delay dialog box help

Electrical Delay Specifies the value of delay added or removed, in units of time. This compensates for the linear phase shift through a device. You can set the electrical delay independently for each measurement trace.

Velocity Factor Specifies the velocity factor that applies to the medium of the device that was inserted after the measurement calibration. The value for a polyethylene dielectric cable is 0.66 and 0.7 for Teflon dielectric. 1.0 corresponds to the speed of light in a vacuum.

Velocity factor can also be set from the Port Extensions toolbar / More settings and Time Domain Distance Marker Settings.

Media

Coax select if the added length is coax. Also specify the velocity factor of the coax.

Waveguide Select if the added length is waveguide. Also specify the low frequency cutoff of the waveguide.

Cutoff Freq Low frequency cutoff of the waveguide.

Learn about Electrical Delay (scroll up)

Phase Offset

Phase offset mathematically adjusts the phase measurement by a specified amount, up to 360°. Use this feature in the following ways:

- **Improve the display of a phase measurement.** This is similar to the way you would change the reference level in an amplitude measurement. Change the phase response to center or align the response on the screen.
- **Emulate a projected phase shift in your measurement.** For example, if you know that you need to add a cable and that the length of that cable will add a certain phase shift to your measurement, you can use phase offset to add that amount and simulate the complete device measurement.

How to set Phase Offset	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Scale** 2. then **Phase Offset**
For PNA-X and 'C' models	Programming Commands
1. Press SCALE 2. then **[Phase Offset]**	1. Click **Response** 2. then **Scale** 3. then **Phase Offset**

Phase Offset dialog box help
Phase Offset Type a value or use the up and down arrows to select any value up to 360 degrees. Learn about Phase Offset (scroll up)

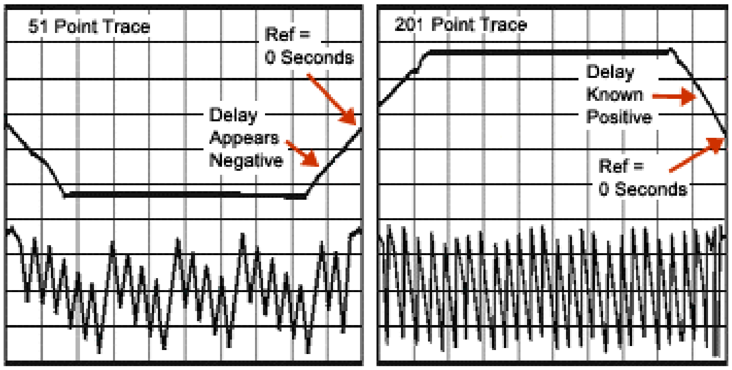
Spacing Between Frequency Points (Aliasing)

The analyzer samples data at discrete frequency points, then connects the points, creating a trace on the screen.

If the phase shift through a device is >180° between adjacent frequency points, the display can look like the phase slope is reversed. This is because the data is undersampled and aliasing is occurring.

If you are measuring group delay and the slope of the phase is reversed, then the group delay will change sign. For example, the following graphic shows a measurement of a SAW bandpass filter.

- The left measurement has 51 points and indicates the group delay is negative, which is a physical impossibility. That is, the response is below 0 seconds reference line.
- The right measurement shows an increase to 201 points which indicates the group delay is positive. That is, the response is above the 0 seconds reference line.



Tip: To check if aliasing might be occurring in a measurement, either increase the number of points or reduce the frequency span.

Last modified:

March 10, 2008	MX Added UI
Sept.12, 2006	Added link to programming commands

Electrically-Long Device Measurements

A signal coming out of a device under test may not be exactly the same frequency as the signal going in to a device at a given instant in time. This can sometimes lead to inaccurate measurement results. You can choose between two techniques to eliminate this situation and increase measurement accuracy.

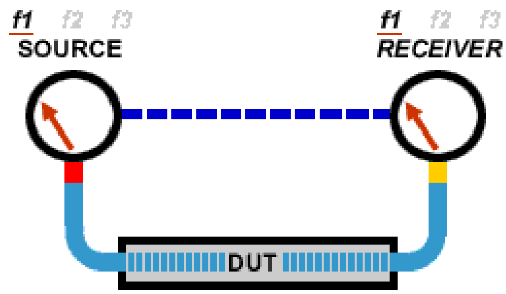
- **Why Device Delay May Create Inaccurate Results**
- **Solutions to Increase Measurement Accuracy**
  - **Slow the Sweep Speed**
  - **Add Electrical Length to the R Channel**

Other topics about Optimizing Measurements

Why Device Delay May Create Inaccurate Results

The following graphic shows an example of this situation:

- In the network analyzer, the source and receiver are phase locked together and sweep simultaneously through a span of frequencies.
- The signal flow through the Device Under Test (DUT) is shown as different colors for different frequencies.
- You can see as a stimulus frequency travels through the DUT, the analyzer tunes to a new frequency **just before** the signal arrives at the receiver. This causes inaccurate measurement results.



If the analyzer is measuring a long cable, the signal frequency at the end of the cable will lag behind the network analyzer source frequency. If the frequency shift is appreciable compared to the network analyzer's IF detection bandwidth (typically a few kHz), then the measured result will be in error by the rolloff of the IF filter.

Note: There is no fixed electrical length of a device where this becomes an issue. This is because there are many variables that lead to measurement speed. When high measurement accuracy is critical, lower the sweep speed until measurement results no longer change.

Solutions to Increase Measurement Accuracy

Choose from the following methods to compensate for the time delay of an electrically long device.

- Slow the Sweep Speed
- Add Electrical Length to the R Channel

Slow the Sweep Speed

The following methods will slow the sweep speed.

- Increase the Sweep Time
- Increase the Number of Points
- Use Stepped Sweep
- Set Dwell Time

Add Electrical Length to the R Channel

Note: This method applies to PNA models with front panel loops.

Instead of slowing the sweep, you can compensate for the electrical length of a cable or fixture.

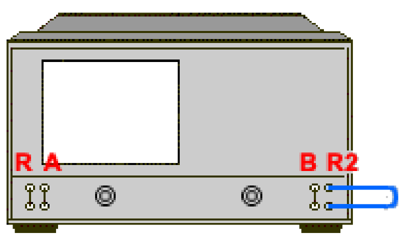
a. Remove the R-channel jumper on the front panel of the analyzer.

b. Replace the jumper with a cable of about the same length as the device under test.

   1. Add the cable on the R1 channel for S_{11} and S_{21} measurements.
   2. Add the cable on the R2 channels for S_{22} and S_{12} measurements.

c. Set the analyzer for a fast sweep.

Configuration for S_{22} and S_{12} Measurements



This method balances the delays in the reference and test paths, so that the network analyzer's ratioed transmission measurement does not have a frequency-shift error.

Note: This method works well if the delay is in a cable or fixture. For devices with long delays, this method is only suitable for uncalibrated measurements.

Reflection Accuracy on Low-Loss 2-Port Devices

To make accurate reflection measurements that have a 1-port calibration, you should terminate the unmeasured port.

Other topics about Optimizing Measurements

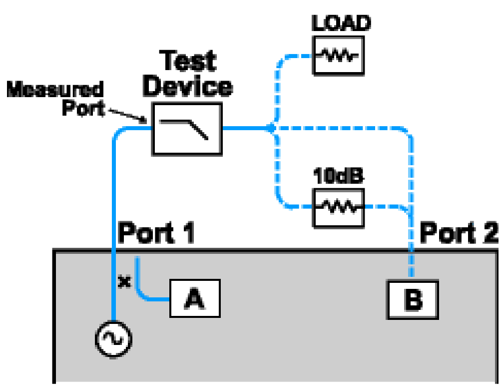
Why Terminate the Unmeasured Port

A 2-port calibration corrects for all 12 twelve error terms. A 1-port calibration corrects for directivity, source match and frequency response, but not load match. Therefore, for highest accuracy, you must make the load match error as small as possible. This especially applies for low-loss, bi-directional devices such as filter passbands and cables. You do not need to be concerned with load match when you are measuring a device with high reverse isolation, such as an amplifier.

How to Terminate the Unmeasured Port

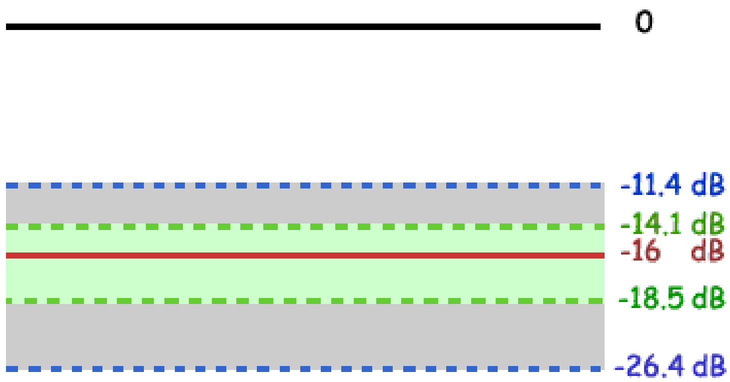
Use one of the following methods:

- Connect a high-quality termination load (from a calibration kit, for example) to the unmeasured port of your device. This technique yields measurement accuracy close to that of a Full SOLT 2-port calibration.
- Connect the unmeasured port of your device directly to the analyzer, inserting a 10 dB precision attenuator between the device output and the analyzer. This improves the effective load match of the analyzer by approximately twice the value of the attenuator, or 20 dB.



Resulting Measurement Uncertainty

The following graph illustrates the measurement uncertainty that results from terminating **with** and **without** a precision 10 dB attenuator on the output of the test device.



Legend

Filter Reflection

Uncertainty **with** attenuator

Uncertainty **without** attenuator

The calculations below show how adding a high-quality 10 dB attenuator improves the load match of the analyzer.

Note: The corresponding linear value is shown in parentheses.

Network Analyzer:

Load match (NA_{LM}) = 18 dB (.126)

Directivity (NA_{D}) = 40 db (.010)

Filter:

Insertion loss (F_{IL}) = 1dB (.891)

Return loss (F_{RL}) = 16 dB (.158)

Attenuator:

Insertion loss (A_{IL}) = 10 dB (.316)

SWR (A_{SWR}) = 1.05 (.024)
32.26 dB Return Loss

Calculations:

	Without Attenuator	With Attenuator
r**NA**	$= (F_{IL})*(NA_{LM})*(F_{IL})$ $= (.891)*(.126)*(.891)$ $=.100$	$= (F_{IL})*(A_{IL})*(NA_{LM})*(A_{IL})*(F_{IL})$ $= (.891)*(.316)*(.126)*(.316)*(.891)$ $= .010$
r**Attenuator**	NA	$= (F_{IL})*(A_{SWR})*(F_{IL})$ $= (.891)*(.126)*(.891)$ $= .019$
Worst Case Error (E_{WC})	$= \rho NA$ $=.1$	$= \rho NA + \rho Attn.$ $=.01+.019$ $=.029$
Uncertainty Adds	$= -20\log(F_{RL})+(E_{WC})+(NA_D)$ $= -20\log(.158)+(.100)+(.010)$ = **11.4 dB**	$= -20\log(F_{RL})+(E_{WC})+(NA_D)$ $= -20\log(.158)+(.029)+(.010)$ = **14.1 dB**
Uncertainty Subtracts	$= -20\log(F_{RL})-(E_{WC})-(NA_D)$ $=-20\log(.158)-(.100)-(.010)$ = **26.4 dB**	$= -20\log(F_{RL})-(E_{WC})-(NA_D)$ $= -20\log(.158)-(.029)-(.010)$ = **18.5 dB**

Measurement Stability

There are several situations that can cause unstable measurements. To ensure that you are making repeatable measurements, you can use various methods to create a stable measurement environment.

- **Frequency Drift**
- **Temperature Drift**
- **Inaccurate Measurement Calibrations**
- **Device Connections**

Other topics about Optimizing Measurements

Frequency Drift

The analyzer frequency accuracy is based on an internal 10 MHz frequency oscillator. See Technical Specifications for stability and aging specifications.

If your measurement application requires better frequency accuracy and stability, you can override the internal frequency standard and provide your own high-stability external frequency source through the 10 MHz Reference Input connector on the rear panel.

Temperature Drift

Thermal expansion and contraction changes the electrical characteristics of the following components:

- Devices within the analyzer
- Calibration kit standards
- Test devices
- Cables
- Adapters

To reduce the effects of temperature drift on your measurements, do the following.

- Switch on the analyzer 1/2 hour before performing a measurement calibration or making a device measurement.
- One hour before you perform a measurement calibration, open the case of the calibration kit and take the standards out of the protective foam.
- Use a temperature-controlled environment. All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated).
- Ensure the temperature stability of the calibration kit devices.

- Avoid handling the calibration kit devices unnecessarily during the calibration procedure.
- Ensure the ambient temperature is ±1°C of the measurement calibration temperature.

Inaccurate Measurement Calibrations

If a measurement calibration is inaccurate, you will not measure the true response of a device under test. To ensure that your calibration is accurate, you should consider the following practices:

- Perform a measurement calibration at the points where you connect the device under test, that is, the reference plane.
- If you insert any additional accessory (cable, adapter, attenuator) to the test setup after you have performed a measurement calibration, use the port extensions function to compensate for the added electrical length and delay.
- Use calibration standards that match the definitions used in the calibration process.
- Inspect, clean, and gage connectors. See Connector Care.

See Accurate Measurement Calibrations for more detailed information.

Device Connections

Good connections are necessary for repeatable measurements. To help make good connections, do the following:

- Inspect and clean the connectors for all of the components in the measurement setup.
- Use proper connection techniques.
- Avoid moving the cables during a measurement.

Noise Reduction Techniques

Random electrical noise which shows up in the analyzer receiver chain can reduce measurement accuracy. The following PNA functions help reduce trace noise and the noise floor which can lead to better dynamic range and more accurate measurements.

Note: The trace noise in microwave PNAs becomes worse below 748 MHz and is especially obvious between 10 MHz and 45 MHz. See Reduce IFBW.

- **Sweep Average**
- **IF Bandwidth**
- **Trace Smoothing**

See Also

Increase Dynamic Range

PNA data processing map.

Other topics about Optimizing Measurements

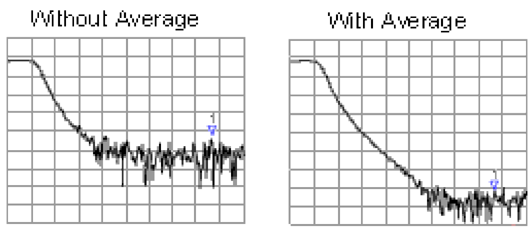
Sweep Average

Sweep average is a feature that reduces the effects of random noise on a measurement. The PNA computes each data point based on the average of the same data point over several consecutive sweeps. You determine the number of consecutive sweeps by setting the Average factor. The higher the average factor, the greater the amount of noise reduction.

- An **Average Counter** appears on the screen when Averaging is ON, displaying the number of sweeps that has been averaged. The effect on the signal trace can be viewed as the Average Factor increases. This can assist in the selection of the optimum number of sweep averages.
- **Channel** wide - Averaging is applied to all measurements in a channel. The Average counter is displayed for each channel.
- **Unratioed** measurements - Although you can average unratioed (single receiver) measurements, you may get unexpected results:
    - Phase results may tend toward 0. This is because phase measurements are relative by nature. Measuring absolute phase with a single receiver appears random. Averaging random positive and negative numbers will tend toward 0.
    - The noise floor does not drop when averaging unratioed measurements as on ratioed measurements.
- **Average vs IF Bandwidth** - Both can be used for the same benefit of general noise reduction. For minimizing very low noise, using Average is more effective than reducing system bandwidth. Generally, Averaging takes slightly longer than IF bandwidth reduction to lower noise, especially if many averages are required. Also, changing the IF bandwidth after calibration results in uncertain accuracy.

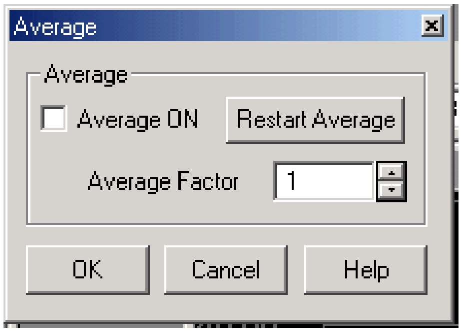
- **Calibration** - Because averaging is a mathematical process that occurs after the raw measurement is made, averaging can be turned ON before, or after, calibration without invalidating the error correction terms. If averaging is ON before calibration, the measurement of calibration standards are averaged measurements. More sweeps are needed to perform the calibration, but there will be less noise in the resulting error correction terms. Subsequent corrected measurements will also have less noise error. In addition, noise is further reduced by turning Averaging ON after calibration. See the PNA data processing map.
- **Point-averaging** - The PNA does NOT have a "point-averaging" feature like the Agilent 8510 network analyzer. That feature measures and averages each data point BEFORE moving to the next data point. Therefore, all data points are averaged in a single, slower sweep. To accomplish similar results with the PNA, try lowering the IFBW.

Effects of Sweep Average



How to Set Averaging

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Channel** 2. then **Average**
For PNA-X and 'C' models	Programming Commands
1. Press **AVG** 2. then **[Averaging]**	1. Click **Response** 2. then **Avg** 3. then **Average**



Average dialog box help
Average ON Checked - Averaging is applied Cleared - Averaging is NOT applied **Average Factor** Specifies the number of sweeps that is averaged. Range of 1 to 65536 (2^16). **Restart** Begins a new set of measurements that are used for the average. This set of measurements is equal to the average factor. Learn about Averaging (scroll up)

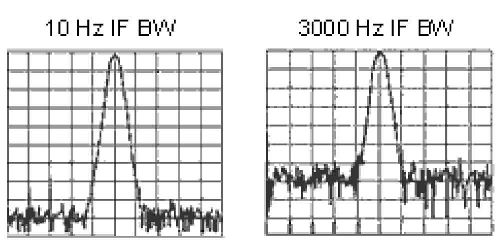
IF Bandwidth

The PNA converts the received signal from its source to a lower intermediate frequency (IF). The bandwidth of the IF bandpass filter is adjustable from 40 kHz (for most PNA models) down to a minimum of 1 Hz.

Reducing the IF receiver bandwidth reduces the effect of random noise on a measurement. Each tenfold reduction in IF bandwidth lowers the noise floor by 10 dB. However, narrower IF bandwidths cause longer sweep times.

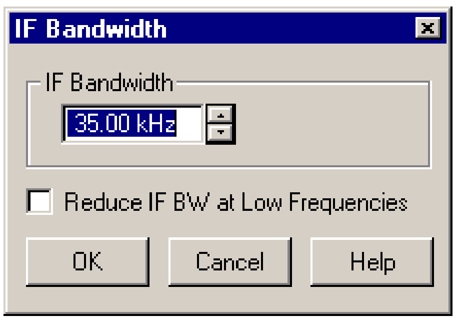
- **Channel** wide - IF bandwidth can be set independently for each channel
- **Segment sweep** - IF bandwidth can be set independently for each segment of segment sweep.
- **Calibration** - Changing the IF bandwidth after calibration will cause a 'C-delta' correction level, which means that calibration accuracy is uncertain.

Effect of Reducing IF Bandwidth



How to set IF Bandwidth

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Sweep** 2. then **IF Bandwidth**
For PNA-X and 'C' models	Programming Commands
1. Press **AVG** 2. then **[IF Bandwidth]**	1. Click **Response** 2. then **Avg** 3. then **IF Bandwidth**



IF Bandwidth dialog box help

IF Bandwidth Specifies the IF (receiver) bandwidth. The value of IF bandwidth is selected by scrolling through the values available in the IF bandwidth text box. The IF BW is set independently for each channel.

The list of selectable IF Bandwidths is different depending on PNA model.

The following values are common to all models:

- **1 | 2 | 3 | 5 | 7 | 10 | 15 | 20 | 30 | 50 | 70 | 100 | 150 | 200 | 300 | 500 | 700 | 1k | 1.5k | 2k | 3k | 5k | 7k | 10k | 15k | 20k | 30k**

In addition, the following values are PNA Model specific:

5230A Opts 020, 025, 120, 125, 140, 145, 146, 240, 245, 146

- **50k | 70k | 100k | 150k| 200k | 280k | 360k | 600k**

N5230A Opts 220, 225, 420, 425, 520, 525:

- **50k | 70k | 100k | 150k| 200k | 250k**

E836x models:

- **35k | 40k**

N5242A (PNA-X):

- **50k | 70k | 100k | 150k| 200k | 280k | 360k | 600k | 1M | 1.5M | 2M | 3M | 5M**
- The following limitations apply for the highlighted IFBW settings (1 MHz and above).
  Note: These wider IFBWs do NOT provide faster sweep speeds. They are used to make wideband pulsed measurements
  - Dwell time is not allowed.
  - Sweep times that are slower than the default value are not allowed.
  - Step sweep mode only - NOT available in Analog sweep.
  - External Trigger Delay is not allowed.
  - Number of points for CW sweep is limited to 1001.
  - A slight shift (.1dB) in Log Mag traces may be seen when switching in and out of these bandwidths.

Reduce IF BW at Low Frequencies

On PNA models with a maximum frequency of 20 GHz and higher, the trace noise becomes worse below 748 MHz. This is especially obvious between 10 MHz and 45 MHz and also when Time Domain is ON. See PNA models / maximum frequencies.

When this box is checked, the PNA uses a smaller IF Bandwidth than the selected value at frequencies below 748 MHz.

This setting:

- can be made for each channel.
- is ON (checked) by default.
- also applies to segment sweep.
- is NOT available on 4-port PNA-L (model N5230A Opt 240 and 245).

Use the following calculations to determine the actual IF Bandwidth value that is used below 748 MHz.

If the result is NOT a selectable IF BW value, the next higher selectable value is used.

	10 MHz to 44.999999 MHz	45 MHz to 748 MHz
Less than 20 GHz models:	Not applicable	Not applicable
ALL 2-port 20 GHz PNA models :	Actual IF BW = (selected IF BW) x **(.05)**	Actual IF BW = selected IF BW **(No reduction)**
ALL 40 GHz and higher models:	Actual IF BW = (selected IF BW) x **(.025)**	Actual IF BW = (selected IF BW) x **(.5)**

PNA-X Models

Start Freq	Stop Freq	Actual IF BW = (selected IF BW) x n
10MHz	19 MHz	n = .05
19MHz**+**	53 MHz	n = .1
53 MHz**+**	75 MHz	n = .5
75 MHz**+**	26.5 GHz	n = 1

+ indicates plus 1 Hz

Example:

On a 67 GHz PNA, the selected IF BW is 30 KHz.

With **Reduce IF BW at Low Frequencies** checked, the actual IF Bandwidths used are:

- From **10 MHz to 44.999999 MHz**: 30,000Hz * **.025** = 750 Hz (PNA uses next higher selectable value: **1000 Hz**.)
- From **45 MHz to 748 MHz**: 30,000Hz * **.5** = **15 KHz**
- From **748 MHz** to stop sweep: **30 KHz**

OK Selects the value of IF bandwidth shown in the text box.

Learn about IF Bandwidth (scroll up)

Trace Smoothing

Trace smoothing averages a number of **adjacent** data points to smooth the displayed trace. The number of adjacent data points that get averaged together is also known as the smoothing aperture. You can specify aperture as either the number of data points or the percentage of the x-axis span.

Trace Smoothing reduces the peak-to-peak noise values on broadband measured data. It smooths trace noise and does not increase measurement time significantly.

Because Trace Smoothing follows Format in the PNA data processing map, the formatted data is smoothed.

Smoothing is automatically turned off if the format is Polar or Smith Chart.

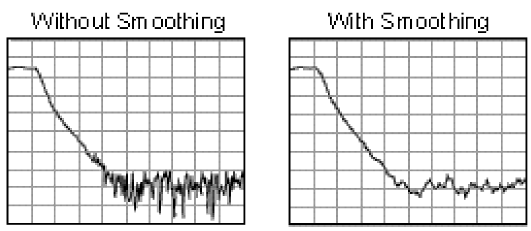
Learn more about Data Format Types.

See the PNA data processing map.

Tips:

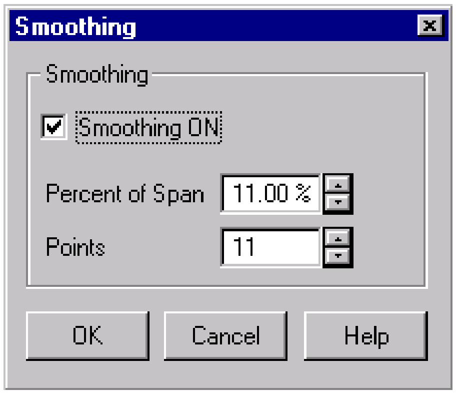
- Start with a high number of display points and reduce until you are confident that the trace is not giving misleading results.
- Do not use smoothing for high-resonance devices, or devices with wide trace variations. It may introduce misleading information.
- Smoothing is set independently for each trace.

Effects of Smoothing on a Trace



How to set Trace Smoothing

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Trace** 2. then **Smoothing**
For PNA-X and 'C' models	Programming Commands
1. Press **AVG** 2. then **[Smoothing**	1. Click **Response** 2. then **Avg** 3. then **Smoothing**



Smoothing dialog box help

Smoothing ON When checked, applies smoothing to the displayed trace.

Percent of Span Specify percent of the swept stimulus span to average. For example, for a trace that contains 100 data points, and specify a percent of span = 11%, then the number of data points that are averaged is 11.

Points Specify the number of adjacent data points to average.

Learn about Trace Smoothing (scroll up)

Last modified:

Sept.12, 2006 Added link to programming commands

Crosstalk

Crosstalk is energy leakage between analyzer signal paths. This can be a problem with high-loss transmission measurements. Although the crosstalk specification of the PNA is exceptional, you can reduce the effects of crosstalk by doing the following:

- **Set the Sweep to Alternate**
- **Perform an Isolation Calibration**

Other topics about Optimizing Measurements

Set the Sweep to Alternate

Alternate sweep measures only one receiver per sweep. When one receiver is measured, the analyzer switches off the other receiver. This helps reduce receiver crosstalk.

Learn how to set Alternate Sweep.

Notes

- Alternate sweep mode is set independently for each measurement channel. Therefore, if multiple measurement channels are in use, you may want to set Alternate sweep for each channel.
- When more than one receiver is being used to make measurements, the **Alternate Sweep** setting doubles the sweep cycle time.
- The PNA noise floor has to be lowered substantially before crosstalk is visible. You may need to use averaging or narrow the IF bandwidth.

Perform an Isolation Calibration

For transmission measurements, a response and isolation measurement calibration helps reduce crosstalk because the analyzer measures and then subtracts the leakage signal during the measurement calibration. The calibration improves isolation so that it is limited only by the noise floor.

Note: Isolation is never performed on a Smart (Guided) Calibration. Learn more.

Generally, the isolation error falls below the noise floor. So when you are performing an isolation calibration you should use a noise reduction technique such as sweep averages or reducing the IF bandwidth.

Effects of Accessories

Accessories in a configuration may affect the results of a device measurement. You can choose between two analyzer features that reduce the effects of accessories.

- **Power Slope to Compensate for Cable Loss**
- **Gating to Selectively Remove Responses**

Other topics about Optimizing Measurements

Power Slope to Compensate for Cable Loss

If you have a long cable or other accessory in a measurement configuration where a power loss occurs over frequency, apply the power slope function. This function increases the analyzer source power by a rate that you define (dB/GHz).

1. In the **Channel** menu, click **Power**.
2. If the slope function is not already switched on, click the **Slope** check box.
3. In the **dB/GHz** box, enter the rate that you want the source power to increase over the frequency sweep. Click **OK**.

Gating to Selectively Remove Responses

Gating is a feature in the time domain (option 010) that allows the analyzer to mathematically remove responses. You can set the gate for either a reflection or transmission response, but you will see different results.

- **Gating a reflection response** isolates a desired response (such as a filter's return loss), from unwanted responses (such as adapter reflections or connector mismatches).
- **Gating a transmission response** isolates a specific path in a multipath device that has long electrical lengths.

See Time Domain Gating for more information.

Achieve Fastest Sweep

You can achieve the fastest measurement sweep by adjusting the following:

- **Sweep Settings**
- **Noise Reduction Settings**
- **Measurement Calibration Choice**
- **Unnecessary Functions**

Other topics about Optimizing Measurements

Sweep Settings

Consider changing each of the following settings as suggested.

- **Frequency Span** - Measure only the frequencies that are necessary for your device.
- **Segment Sweep** - Use segments to focus test data only where you need it.
- **Switch Off Stepped Sweep** - Use linear swept mode to minimize sweep time when possible.
- **Auto Sweep Time** - Use this default to sweep as quickly as possible for the current settings.
- **Number of Points** - Use the minimum number of points required for the measurement.

For more information on how number of points and other settings affect sweep cycle time, see Technical Specifications.

Noise Reduction Settings

Using a combination of these settings, you can decrease the sweep time while still achieving an acceptable measurement.

- **IF Bandwidth.** Use the widest IF bandwidth that will produce acceptable trace noise and dynamic range.
- **Average.** Reduce the average factor, or switch Average off.

Measurement Calibration Choice

Choose the appropriate type of calibration for the required level of accuracy.

When full 2-port error correction is applied, the PNA takes both forward and reverse sweeps to gather all 12 error correction terms. This occurs even with a single S11 measurement displayed. All displayed measurements are updated as the second sweep is performed. Both sweeps are performed using the specified sweep time.

When calibrating greater than 2 ports, the following formula is used to determine the number of sweeps required:

- **N * (N-1)** where N = the number of ports.

When full 3-port calibration is applied, 6 sweeps are required; forward and reverse for each port pair. With full 4-port correction, 12 sweeps are required, and so forth.

To limit the measurement time, perform ONLY the level of calibration that your measurements require. For example, if making only an S11 measurement, perform a 1-port calibration on that port.

Sweep speed is about the same for uncorrected measurements and measurements done using a response calibration, or one-port calibration. For more information see Select a Calibration.

Unnecessary Functions

The analyzer must update information for all active functions. To achieve an additional increase in sweep speed, switch off all of the analyzer functions that are not necessary for your measurement application.

- Delete Unwanted Traces
- Switch Off Unwanted Markers
- Switch Off Smoothing
- Switch Off Limit Testing
- Switch Off Math Functions

Analyzer sweep speed is dependent on various measurement settings. Experiment with the settings to get the fastest sweep and the measurement results that you need.

Switch Between Multiple Measurements

If you need to make multiple measurements to characterize a device, you can use various methods to increase throughput. Experiment with these methods to find what is best for your measurement application needs.

- Set Up Measurements for Increased Throughput
  - Arrange Measurements in Sets
  - Use Segment Sweep
  - Trigger Measurements Selectively
- Automate Changes Between Measurements
- Recall Measurements Quickly

Other topics about Optimizing Measurements

Set Up Measurements for Increased Throughput

To achieve optimum throughput of devices that require multiple measurements, it is helpful to know the operation of the PNA. This knowledge allows you to set up the measurement scenarios that are best for your applications.

Learn more about Traces, Channels, and Windows on the PNA

Arrange Measurements in Sets

If you arrange measurements to keep the complete set of device measurements in one instrument state, you can save them so that you can later recall a number of measurements with one recall function.

See Pre-configured Measurement Setups for more information.

Use Segment Sweep

Segment sweep is helpful if you need to change the following settings to characterize a device under test.

- Frequency Range
- Power Level
- IF Bandwidth
- Number of Points

The segment sweep allows you to define a set of frequency ranges that have independent attributes. This allows you to use one measurement sweep to measure a device that has varying characteristics.

See Segment Sweep for more information.

Trigger Measurements Selectively

You can use the measurement trigger to make measurements as follows:

- Continuously update only the measurements that have rapidly changing data.
- Occasionally update measurements that have infrequently changing data.

For example, if you had four channels set up as follows:

- Two channels measuring the data that is used to tune a filter
- Two channels measuring the data for the out-of-band responses of the filter

You would want to constantly monitor only the measurement data that you use for tuning the filter. If you continuously update all of the channels, this could slow the response of the analyzer so that you would not be able to tune the filter as effectively.

Note: You must either trigger the infrequent measurement manually or with remote interface commands.

To trigger measurements selectively:

This procedure shows you how to set up two different measurements with the following behavior:

- Channel 1 measurement will continuously update the data.
- Channel 2 measurement will occasionally update the data.

1. In the **Windows** menu, click **Meas Setups**, **Setup D**.

Set Up a Measurement Trigger for Continuous Updates

2. In the **Sweep** menu, click **Trigger**, **Trigger...**.
3. Under **Trigger Source**, click **Internal**.
4. Under **Channel Trigger State**, select **Channel 1**, and click **Continuous**.

Set Up a Measurement Trigger for Occasional Updates

5. Under **Channel Trigger State**, select **Channel 2**, and click **Single**, **OK**.
    - If you want the analyzer to trigger more than a single sweep, click the **Enable Groups** check box and enter the number of sweeps.
6. In the **System** menu, click **Keys, Trigger**.

Update the Measurement

7. Click on the lower window to make Channel 2 the active channel.

8. On the active entry toolbar, click the type of trigger you set up.

   - Click **Single** if you set up the analyzer for a single sweep per trigger.
   - Click **Groups** if you set up the multiple sweeps per trigger.

Note: A trace must be active for you to initiate a trigger for that measurement.

Automate Changes Between Measurements

If there are slight differences between the various measurements that you need to characterize a device, you may find that it is faster to change the measurement settings using programming.

Recall Measurements Quickly

The most efficient way to recall measurements is to recall them as a set of measurements (instrument state).

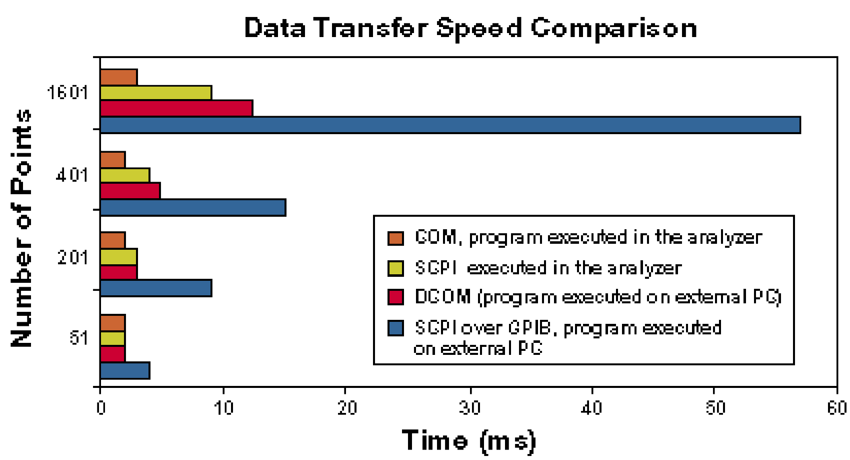
- It only takes a short time longer to recall an instrument state that includes multiple measurements, than it does to recall an instrument state with only one measurement.
- Each recall function has time associated with it. You can eliminate that time by setting up the measurements as a set so you can recall them as a set.

See Save and Recall Files for more information.

Data Transfer Speed

When testing devices remotely using COM or SCPI, the following techniques can be used to transfer data quickly between the PNA and remote computer, helping you achieve the best measurement throughput.

- **Use single sweep (trigger) mode** to ensure that a measurement is complete before starting a data transfer.
- **Transfer the minimum amount of data** needed. For example, a trace with a few points, using segment sweep rather than a full trace with many linearly spaced points. Also, use markers instead of trace transfers.
- **Choose the REAL data format** to provide the fastest transfer speed when using SCPI programs for automated applications.
- **Use SCPI over LAN** for applications that are automated with SCPI programs.
- **Use COM programs** to provide the fastest transfer speed when using an automated application. See Data Transfer Time specifications.



Other topics about Optimizing Measurements

Using Macros

Macros are executable programs that you write, load into the analyzer, and then run from the analyzer. You can have up to 12 macros set up to run on the analyzer.

- How to Setup Macros
- How to Run Macros
- Macro Example

How to Setup Macros

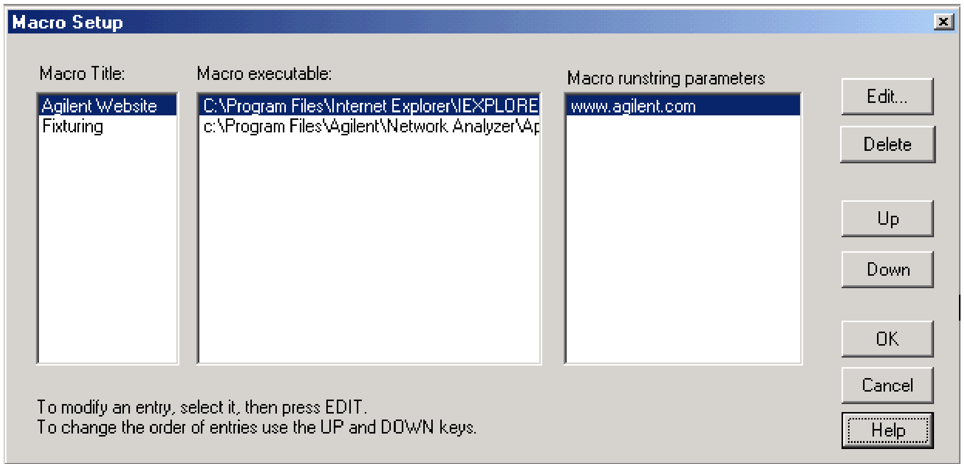
Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	
1. Press  +  2. Press	1. Click **System** 2. then **Macro** 3. then **Macro Setup**
For PNA-X and 'C' models	
1. Press MACRO 2. then **[Macro Setup]**	1. Click **Utility** 2. then **Macro** 3. then **Macro Setup**

In the Macro Setup dialog box:

1. Click on a blank line below the last entry. (There may be NO entry.)
2. Click **Edit**
3. In the **Macro Title** box**,** type a descriptive title for your macro.
4. Click **Browse.**
5. Change **Files of Type**
6. Find and click your macro file

7. Click **OK**

8. Click **OK** on the Macro Setup dialog box.



Macro Setup dialog box help

Allows you to create a set of 12 macros so that you can launch other programs from within the PNA application.

Note: To add a Macro, select a blank line then click **Edit**

Macro Title Shows the titles that appear in the active entry toolbar when you press the Macro key. These titles are associated with the executable files and should be descriptive so you can easily identify them. For example, if you wanted to launch the Agilent Home Page, you could title the executable "Agilent Home."

Macro Executable Lists the complete path to the executable file. To follow the example of launching the Agilent PNA Series Home Page, the path to the executable could be "C:\Program Files\Internet Explorer\iexplore.exe.

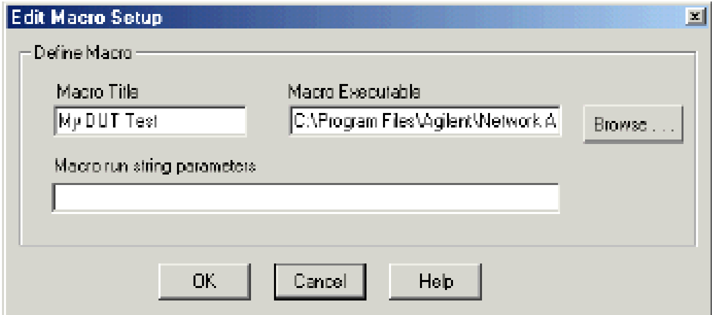
Macro Runstring Parameters Lists the parameters that get passed to the program that is referenced in the executable file. Again following the example of launching the PNA Series Home Page, you could assign the runstring parameters "http://www.agilent.com/find/pna".

Edit Invokes the Macro Edit dialog box.

Delete Deletes the selected macro.

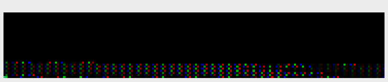
Up Allows you to reorder the macros, moving the selected macro up one line. For the 12 possible macros there are 12 lines, indicating the order that they appear in the active entry toolbar when you press the Macro key. Since there are four titles that can be shown at one time in the toolbar, when you repeatedly press the Macro key, the toolbar changes the macro titles to the next set of four macro titles.

Down Moves the selection down one line in the list of macros.



Macro Edit dialog box help
Macro Title Allows you to modify the title that appears in the active entry toolbar. **Macro Executable** Allows you to modify the complete path to the macro executable file. **Browse** Allows you to look through drives and directories, to locate the macro executable file and establish the complete path to the file. **Macro run string parameters** Allows you to modify the parameters that are passed to the program referenced in the executable file. See Macro Setup dialog box

How to Run Macros

Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	
1. Press  until your macro is visible 2. then 	1. Click **System** 2. then **Macro** 3. then select the macro to run
For PNA-X and 'C' models	
1. Press MACRO 2. then select the macro to run	1. Click **Utility** 2. then **Macro** 3. then select the macro to run

Macro Example

The following is an example Visual Basic Scripting (vbs) program that you can copy, install, and run on your PNA

Note: Print these instructions if viewing in the analyzer. This topic will be covered by the Macro Setup dialog box.

1. Copy the following code into a Notepad file.
2. Save the file on the analyzer hard drive in the **C:\Documents** folder. Name the file **FilterTest.vbs**
3. Close Notepad
4. Setup the macro in the PNA
5. Run the macro

```
'Start copying here
'This program creates a S21 measurement, with Bandwidth
'markers for testing a 175MHz Bandpass filter
'It is written in VBscript using COM commands

Set PNA = CreateObject("AgilentPNA835x.Application")
PNA.Preset
Set chan=PNA.activechannel
Set meas=PNA.activemeasurement
Set limts = meas.LimitTest
Set trce = PNA.ActiveNAWindow.ActiveTrace

meas.ChangeParameter "S21",1
chan.StartFrequency = 45e6
chan.StopFrequency = 500e6
trce.ReferencePosition = 8
PNA.TriggerSignal = 3

'Do Test
for t=1 to 5
call measure
call compare
next
msgbox("Done Testing")

sub measure
msgbox("Connect Device " & t & " and press OK")
PNA.ManualTrigger True
meas.SearchFilterBandwidth
end sub

sub compare
BW = meas.FilterBW
if bw>6.5e7 then msgbox("Failed BW: " & BW)
Loss = meas.FilterLoss
if loss>5 then msgbox("Failed Loss: " & Loss)
end sub
'End copying here
```

Calibration Overview

The following is discussed in this topic:

- **What Is Measurement Calibration?**
- **Why Is Calibration Necessary?**
- **Conditions Where Calibration Is Suggested**
- **What Is ECal?**

See other Calibration Topics

What Is Measurement Calibration?

Calibration removes one or more of the systematic errors using an equation called an error model. Measurement of high quality standards (for example, a short, open, load, and thru) allows the analyzer to solve for the error terms in the error model. See Measurement Errors.

You can choose from different calibration types, depending on the measurement you are making and the level of accuracy you need for the measurement. See Select a Calibration Type.

The accuracy of the calibrated measurements is dependent on the quality of the standards in the calibration kit and how accurately the standards are modeled (defined) in the calibration kit definition file. The calibration-kit definition file is stored in the analyzer. In order to make accurate measurements, the calibration-kit definition must match the actual calibration kit used. To learn more, see Accurate Calibrations.

Calibration Wizard provides the different calibration methods used in the PNA. See Calibration Wizard.

There are quick checks you can do to ensure your measurement calibration is accurate. To learn more see Validity of a Measurement Calibration

If you make your own custom-built calibration standards (for example, during in-fixture measurements), then you must characterize the calibration standards and enter the definitions into a user modified calibration-kit file. For more information on modifying calibration kit files, see Calibration Standards.

Note: Instrument Calibration is ensuring the analyzer hardware is performing as specified. This is not the same as measurement calibration.

Why Is Calibration Necessary?

It is impossible to make perfect hardware that would not need any form of error correction. Even making the hardware good enough to eliminate the need for error correction for most devices would be extremely expensive.

The accuracy of network analysis is greatly influenced by factors external to the network analyzer. Components of the measurement setup, such as interconnecting cables and adapters, introduce variations in magnitude and phase that can mask the actual response of the device under test.

The best balance is to make the hardware as good as practically possible, balancing performance and cost. Calibration is then a very useful tool to improve measurement accuracy.

Conditions Where Calibration Is Suggested

Generally, you should calibrate for making a measurement under the following circumstances:

- You want the best accuracy possible.
- You are adapting to a different connector type or impedance.
- You are connecting a cable between the test device and an analyzer test port.
- You are measuring across a wide frequency span or an electrically long device.
- You are connecting an attenuator or other such device on the input or output of the test device.

If your test setup meets any of the conditions above, the following system characteristics may be affected:

- Amplitude at device input
- Frequency response accuracy
- Directivity
- Crosstalk (isolation)
- Source match
- Load match

What Is ECAL

ECal is a complete solid-state calibration solution. It makes one port (Reflection), full two and three-port calibrations fast and easy. See Using ECal.

- It is less prone to operator error.
- The various standards (located inside the calibration module) never wear out because they are switched with PIN-diode or FET switches.
- The calibration modules are characterized using a TRL-calibrated network analyzer.
- ECal is not as accurate as a good TRL calibration.

For information about ordering ECal modules, see Analyzer Accessories or contact your Agilent Support Representative

Calibration Standards

This following section explains the general principles and terms regarding calibration kit files. To learn **how** to modify calibration kit files, See Modify Calibration Kits.

See other Calibration Topics

About Calibration Kits

A calibration kit is a set of physical devices called standards. Each standard has a precisely known or predictable magnitude and phase response as a function of frequency.

In order to calibrate the analyzer using the standards in a calibration kit, the response of each standard must be mathematically defined and then organized into standard classes that correspond to the error models used by the analyzer.

To be able to use a particular calibration kit, the known characteristics from each standard in the kit must be stored into analyzer memory. This is done for you with the PNA. All Agilent Cal Kits containing standard definitions are stored in the PNA. For a list of Agilent calibration kits, see Analyzer Accessories.

Calibration Standards

Calibration standards provide the reference for error-corrected measurements in the network analyzer. Each standard has a precisely known definition that includes electrical delay, impedance, and loss. The analyzer stores these definitions and uses them to calculate error correction terms.

During measurement calibration, the analyzer measures standards and mathematically compares the results with "ideal models" of those standards. The differences are separated into error terms that are later removed from device measurements during error correction. See Systematic Errors.

Standard Type

A standard type is one of five basic types that define the form or structure of the model to be used with that standard. The standard types are shown below:

Standard	Terminal Impedance
SHORT	zero ohms
OPEN	infinite ohms
LOAD	system impedance, Z0
THRU/LINE	no terminal impedance
ARBITRARY	user-defined

Standard Definitions

Standard definitions describe the electrical characteristics of the standards and the frequencies they will be used. Standard definitions can be viewed from the Advanced Modify Cal Kit menu selection. Standard definitions include:

- **Minimum Frequency** Specifies the minimum frequency the standard is used for calibration.
- **Maximum Frequency** Specifies the maximum frequency the standard is used for calibration.
- **Z0** Specifies the characteristic impedance of the standard (not the system characteristic impedance or the terminal impedance of the standard).
- **Delay** Specifies a uniform length of transmission line between the standard being defined and the actual calibration plane.
- **Type** Specifies type of standard (SHORT, OPEN, THRU/LINE, LOAD, ARBITRARY).
- **Loss** Specifies energy loss, due to skin effect, along a one-way length of coaxial cable.

Loss model equation:

- The value of loss is entered as ohms/second at 1 GHz.
- To compute the loss of the standard, measure the delay in seconds and the loss in dB at 1 GHz. Then use the following formula:

$$\text{Loss}\left(\frac{\Omega}{s}\right) = \frac{\text{loss (dB)} \times Z_0(\Omega)}{4.3429(\text{dB}) \times \text{delay(s)}}$$

Capacitance model equation:

C0, C1, C2, C3. Specifies the fringing capacitance for the open standard.

- $C = (C0) + (C1 \times F) + (C2 \times F^2) + (C3 \times F^3)$
- (F is the measurement frequency).
- The terms in the equation are defined when specifying the open as follows:

- C0 term is the constant term of the third-order polynomial and is expressed in Farads.
- C1 term is expressed in F/Hz (Farads/Hz).
- C2 term is expressed in F/Hz^2.
- C3 term is expressed in F/Hz^3.

Inductance model equation:

L0, L1, L2, L3. Specifies the residual inductance for the short standard.

- $L = (L0) + (L1 \times F) + (L2 \times F^2) + (L3 \times F^3)$
- (F is the measurement frequency).
- The terms in the equation are defined when specifying the short as follows:
  - L0 term is the constant term of the third-order polynomial and is expressed in Henries.
  - L1 term is expressed in H/Hz (Henries/Hz)
  - L2 term is expressed in H/Hz^2.
  - L3 term is expressed in H/Hz^3.

Class Assignments

Once a standard is characterized, it must be assigned to a standard "class". A standard class is a group of standards that are organized according to the calibration of the PNA error model.

The number of classes needed for a particular calibration type is equal to the number of error terms being corrected.

A class often consists of a single standard, but may be composed of multiple standards. These may be required for accuracy or to cover a wide frequency range.

Example: A response calibration requires only one class, and the standards for that class may include an OPEN, or SHORT, or THRU. A 1-port calibration requires three classes. A 2-port calibration requires 10 classes, not including two for isolation.

The number of standards assigned to a given class may vary from one to seven for unguided calibrations. Guided calibrations allow as many standards as needed.

Calibration Classes are assigned in the Advanced Modify Cal Kit menu selection.

The different classes used in the PNA:

S11A, S11B, S11C (S22A, S22B, S22C and so forth)

These are the three classes for port 1-reflection calibrations (three classes also for S22 and S33). They are used in the one-port calibrations and the full two-port calibration. They are required in removing the directivity, source match, and reflection tracking errors. Typically, these classes might consist of an open, a short and a load standard for each port.

Transmission and Match (forward and reverse)

These classes are used to perform a full two-port calibration. The transmission class relates primarily to the transmission tracking, while the match class refers to load match. For both of these classes, the typical standard is a thru or delay.

Isolation

The isolation classes are used to perform a full two-port and the TRL two-port calibrations. The isolation classes apply to the forward and reverse crosstalk terms in the PNA error model.

TRL THRU

These are used to perform a TRL two-port calibration. The TRL thru class should contain a thru standard or a short line. If it contains a non-zero length thru standard, then the calibration type is called LRL or LRM.

TRL REFLECT

This class is used to perform a TRL two-port calibration. The TRL reflect class should contain a standard with a high reflection coefficient, typically an open or short. The actual reflection coefficient need not be known, but its phase angle should be specified approximately correctly (± 90 deg). The exact same reflection standard must be used on both ports in the TRL calibration process.

TRL LINE or MATCH

These are used to perform a TRL two-port calibration. The TRL line or match class should contain line standards, load standards, or both. If a line standard is used, its phase shift must differ from that of the TRL THRU standard by 20° to 160°. This limits the useable frequency range to about 8 to 1. Two or more line standards of different lengths may be specified to get broader frequency coverage. It is also common to include a load standard for covering low frequencies, where the line's length would be impractically long. When a load is used, the calibration type is called TRM or LRM.

Note: For more information, read application note 8510-5A, "*Specifying Calibration Standards for the Agilent 8510 Network Analyzer*". Although the application note is written for the Agilent 8510 series of network analyzers, it applies to the PNA as well. The part number for the publication is 5956-4352.

Calibration Wizard

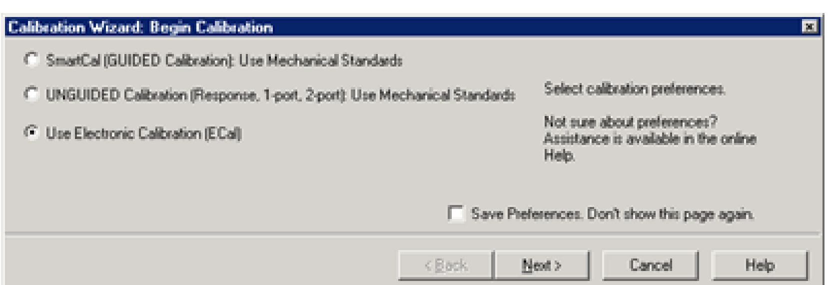
The Calibration Wizard allows you to choose a Calibration method and then perform the calibration.

- How to Start Calibration Wizard
- Guided Calibration: Mechanical Standards
- Unguided Calibration
- Saving a Calibration

Other Cal Topics

How to start Calibration Wizard

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press CAL 2. then Active Entry keys	1. Click **Calibration** 2. then **Cal Wizard**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[Start Cal]** 3. then **[Cal Wizard]**	1. Click **Response** 2. then **Cal Wizard**



Calibration Wizard Begin dialog box help

Select the calibration method:

SmartCal (Guided Calibration

This method provides a step-by-step "wizard" interface. You describe the connectors on your DUT and the cal kits you will use; it walks you through the most accurate calibration possible.

Note: SmartCal DOES allow you to measure calibration standards in any order. However, you must click **Next** and **Back** without measuring standards until you get to the standard you want to measure.

- Supports ALL Cals **EXCEPT** simple open, short, and thru response Cals . See Also TRL Calibration
- Use a different Cal Kit (**including ECal**) for each port.

Unguided Calibration

This method provides a familiar calibration interface, but with limited capability. You choose the type of cal to perform; it allows you the flexibility to measure the standards in any order.

- Supports all Cals **EXCEPT** full 3-port, full 4-port.
- TRL is NOT supported on multiport PNAs.
- Only one Cal Kit can be used.

Use Electronic Calibration

- This method provides fast, software-controlled calibrations.
- Only one ECal module can be used. Use SmartCal when more than one ECal module is needed.

Save Preferences

- When cleared, you will continue to see this page on subsequent calibrations.
- When checked, saves your calibration method choice and the dialog no longer appears.
- To make this dialog re-appear, click **Calibration**, then **Preferences.**
- Learn more about Calibration Preferences.

The Calibration Window / Channel

During a Guided Calibration, a 'Cal Window' is created for you to view the connection of calibration standards before standards are measured. This Cal Window uses a new Cal channel that is created and duplicates the settings in the channel being calibrated. Correction is ALWAYS OFF for the displayed calibration channel. At the completion of the calibration, the calibration channel and window are deleted.

With PNA Rev. 8.0, the measurement of calibration standards can be performed while viewing **any** PNA window configuration you choose. The Cal Window is appended to your Custom Cal Window setting, and all windows are visible and sweeping below the Cal Wizard before the **Measure** (cal standard) button is pressed. The windows to be viewed and channels to be swept during the cal process are specified using SCPI commands. See an example.

The new Cal Window settings do not work in a FCA channel.

SmartCal (Guided Calibration)

Guided Calibration automatically determines the calibration type and suggests a calibration kit that matches your DUT connectors.

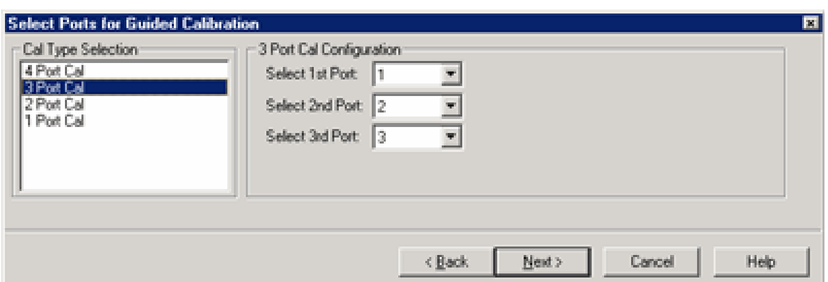
Guided Calibration can perform the following Cal Types:

- ALL Cals **EXCEPT Open, Short**, and **Thru Response** Cals.
- ECal on one or more ports, beginning with PNA firmware revision 5.24.
- TRL - Learn how to do TRL cals

Programming Commands

Note: SmartCal DOES allow you to measure calibration standards in any order. However, you must click **Next** and **Back** without measuring standards until you get to the standard you want to measure.

The PNA displays the following dialog boxes when performing a Guided calibration.



Select Ports for Guided Calibration dialog box help

Allows you to select ports to calibrate.

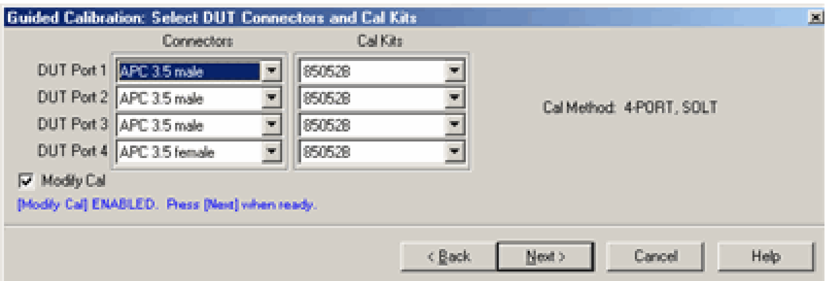
Cal Type Selection Select the number of ports to calibrate.

***N* Port Cal Configuration** If not calibrating all PNA ports, specify which ports to calibrate.

Show Advanced Settings (Orientation & Thru Cal Section) Available only for ECal.

Back Return to Cal Wizard Begin dialog. If you did not see the 'Cal Wizard Begin' dialog but want to, click **Back**, then clear the Save Preferences checkbox.

For greater than 4-port cals, see External Test Set calibration - Select Cal Type.



Select DUT Connectors and Cal Kits dialog box help

Allows you to select the connector type and Cal Kit for each DUT port to be calibrated.

Connectors To change selection, click the connector field for each DUT port.

If your DUT connectors are:

- **Waveguide** Change the system impedance to 1 ohm before performing a calibration. See Setting System Impedance.
- **Not listed** You can create your own connector type and calibration kit file. The PNA includes the following example cal kits that can be used as a template. See Calibration kits for more information.
  - If using a gendered (male and female) connector type, select **Type A** as the connector type.
  - If using a connectorless device such as on-wafer probes., select **Type B** as the connector type.

Cal Kits Select the Cal Kit to be used to calibrate each test port. The list for each DUT Port displays kits having the same connector type as the DUT.

Identical ECal models connected? ECal modules can be distinguished by serial number. This can have implications on your remote SCPI programs.

85056K

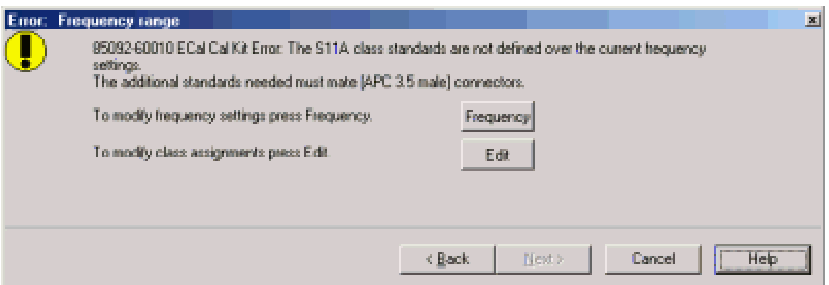
- To calibrate 2.4 mm connectors using the 85056K cal kit, select 85056D as the cal kit. The 85056K definitions in the PNA are for 2.92mm standards (2.4mm plus 2.92 adapters). The 85056D kit contains exactly the same standards WITHOUT the adapters.

TRL

- To perform a TRL Cal, assign a TRL Cal Kit to the lowest port number of each port pair.
- When selecting a TRL Cal Kit on a 4-port PNA, and a Global Delta Match Cal is not available, the Cal type will be set to SOLT and a "Could not find a Global Delta Match Cal." message is displayed on the dialog box. If the selected Cal Kit will not support SOLT, the **Next** button will not be available. Then you must select a different Cal Kit to proceed or **Cancel** and perform a Global Delta Match Cal.

Modify Cal Check, then click Next, to Modify Cal (Standards AND Thru Method).

For greater than 4-port cals, see External Test Set calibration - Select DUT Connectors.



Error: Frequency Range dialog box help

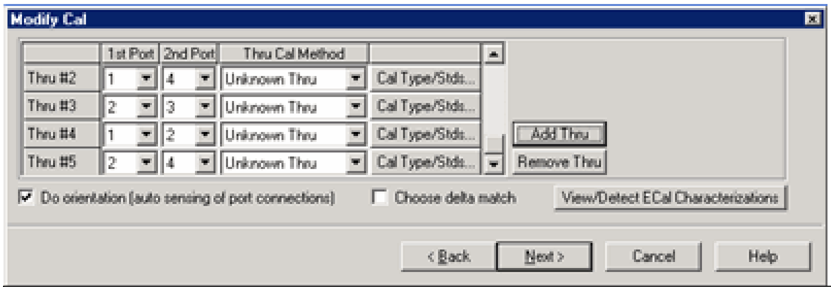
The current cal kit does not cover the current frequency range of the measurement. Do one of the following to correct the problem:

Frequency Change the frequency range of the active channel.

Edit Modify the class assignments so that a different standard is selected.

Back Select a different Cal Kit that covers the required frequency range.

Cancel Exit the Cal Wizard



Modify Cal dialog box help

Thru #n

Lists the proposed Thru connections to be made during the calibration process. You can change these Thru connections to better suit your test setup.

- The proposed Thru connections are listed automatically.
- Additional Thru connections can be selected for higher accuracy. Learn more.

Add Thru

Click to add a Thru connection. Learn more

Remove Thru

Select a Thru by clicking the "Thru #N" field or the "1st Port / 2nd Port" field. Then click "Remove Thru". This selection is NOT available if the selected Thru is required for the calibration.

1st Port / 2nd Port

Click to select the two ports to be included in the Thru connection. The order of the port numbers is not critical.

Thru Cal Method

Lists the available Thru Cal methods for the specified port pairs.

Learn about the Thru Cal Method choices.

Cal Type/ Stds

Click to invoke the View / Modify Properties of Cal dialog box

Do orientation - Appears ONLY if an ECal module is selected for use.

When this box is checked (default) the PNA automatically senses the model and direction in which an ECal module port is connected to the PNA ports. If power to the ECal module is too low, it will appear as if there is no ECal module connected. If you use low power and are having this problem, clear this check box to provide the orientation manually.

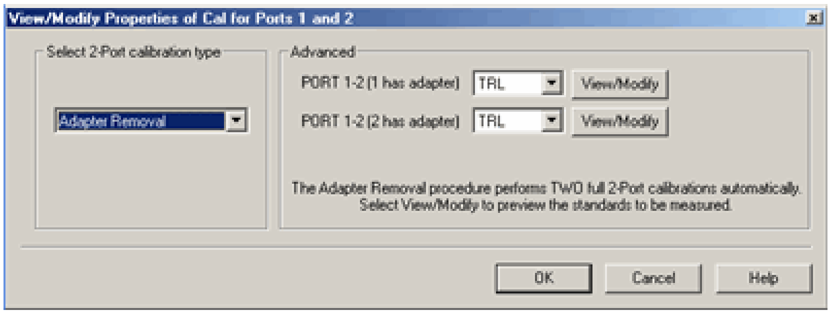
Orientation occurs first at the middle of the frequency range that you are calibrating. If a signal is not detected, it tries again at the lowest frequency in the range. If you have an **E8361A** or **E836xB** PNA and do an ECal completely within 10 - 20 MHz OR 60 - 67 GHz, you may need to do orientation manually. There may not be sufficient power to orient the ECal module at those frequencies.

Choose delta match - Available when a Delta Match Cal is required.

- Check, then click **Next** to invoke the Select Cal Set for Delta Match dialog box.
- Clear - The Cal Wizard uses the Global Delta Match Cal if available.

View/Detect ECal Characterizations - Appears ONLY if an ECal module is selected for use.

Click to invoke the View ECal Modules and Characterizations dialog box. Displays a list of ECal modules that are connected to the PNA.



View/Modify Properties of Cal for Ports... dialog box help

Select calibration type

Another chance to change the Thru method.

Learn about the Thru Cal Method choices.

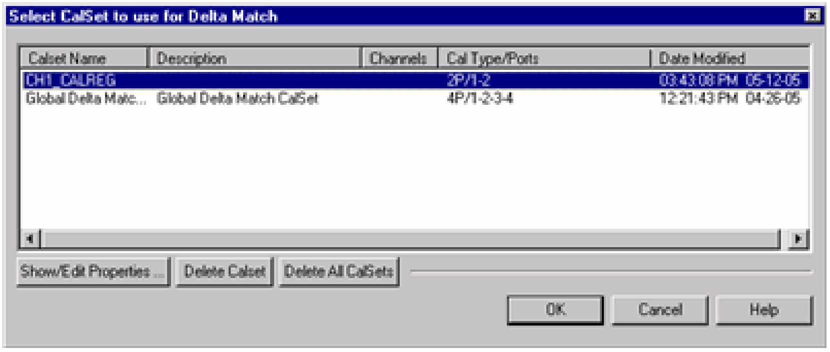
Advanced

Select the cal method for each connector of the Thru pair.

- **TRL** is only available if a TRL cal kit was selected for the lowest port number of the port pair.
- **QSOLT** Only available when "Defined Thru" or "Flush Thru" is selected. **"QSOLT 2 <= 1"** refers to the receive port 2 and source port 1(where reflection standards are connected).
- **Enhanced Response** Only available when "Defined Thru" or "Flush Thru" is selected.**"EnhResp 2 <= 1"** refers to the receive port 2 and source port 1.

View Modify Click to invoke the Preview and Modify Calibration Selections dialog box.

Note: Changes made to the Cal Kit through this dialog are **temporary** that last only for this calibration. To make permanent changes to the Cal Kit, perform Advanced Modify Cal Kits.



Select Cal Set for Delta Match dialog box help

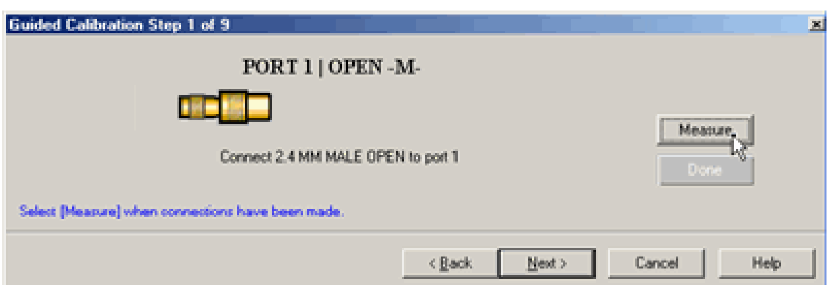
This dialog box appears when a Delta Match Cal is required and **Choose delta match** was selected. Learn more.

Displays the Cal Sets that meet the requirements of the Delta Match Cal.

Select either a User Cal Set or Global Delta Match Cal.

If there is no suitable choice for a Delta Match Cal:

1. Click **Cancel**, then **Cancel** again to quit the Cal Wizard.
2. Perform either a Global Delta Match Cal or a SOLT cal and save the result in a User Cal Set.
3. Start the Cal Wizard to re-initiate this calibration.
4. Select the Global Delta Match Cal or User Cal Set.



Calibration Steps dialog box help

Note: Beginning in PNA Rev. 6.0, calibration can be performed with External triggers. Learn more.

As each new cal step prompt appears, the traces are setup for the next standard measurement. Also, sweeps are triggered continuously until the Measure button is pressed. This way you can view the integrity of the standard connection.

Prompts for standards to be measured.

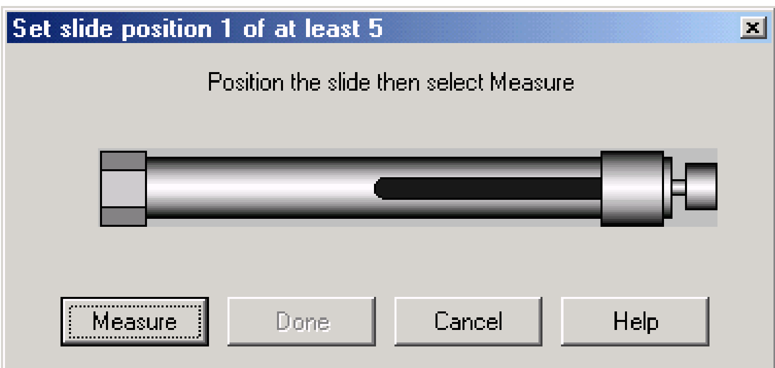
Measure Click to measure the standard.

Done Click **after** a standard is re-measured and all measurements for the calibration are complete.

Next Click to continue to the next calibration step. Does **NOT** measure the standard.

If a standard is NOT measured, a warning appears and **Done** will not be available after the last Cal step.

Note: SmartCal DOES allow you to measure calibration standards in any order. However, you must click **Next** and **Back** without measuring standards until you get to the standard you want to measure.



Sliding Load Measurement dialog box help

Allows you to measure the sliding load standard. Learn more about the Sliding Load standard.

To ensure an accurate calibration, carefully follow the instructions that were provided with your siding load.

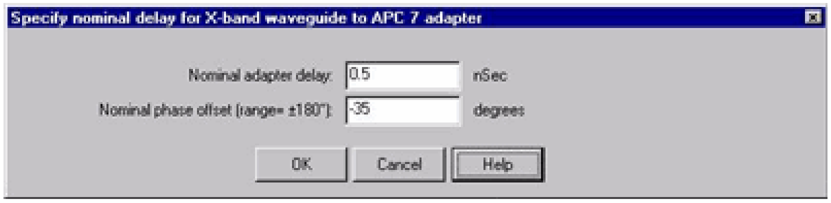
To Measure a Sliding Load:

1. Connect the sliding load to the measurement port.
2. Position the sliding element, then click **Measure**. Do not move the sliding element until measurement is complete.
3. Measure the sliding load for at least **five** and up to **seven** positions for best accuracy.

   Note: The positions of the sliding element should cover the full length of the slide, but be unequally spaced to reduce the possibility of overlapping data points. Most sliding loads have marks for each slide position.

4. Click **Done** after the final measurement.

5. Remove sliding load from the measurement port.
6. Measure the remaining standards.



Specify nominal delay dialog box help

This dialog appears ONLY when Adapter Removal or Unknown Thru calibrations are performed.

The following values were estimated from the measurement. Most of the time, they are adequate. However, for CW sweep or frequency sweep with large step sizes, the accuracy of the values may be improved.

Nominal adapter delay To improve this value, measure and record the delay of the adapter with a dense step size. Enter that value here.

Nominal phase offset (Waveguide ONLY). To improve this value, measure and record the phase offset of the Waveguide adapter with dense step size. Enter that value here.

When one connector is coax and the other connector is waveguide, the phase offset has an ambiguity of 180 degrees. For consistency, the estimate provided here is always between 0 and 180 degrees. You can change this estimate to any value between -180 degrees and +180 degrees.

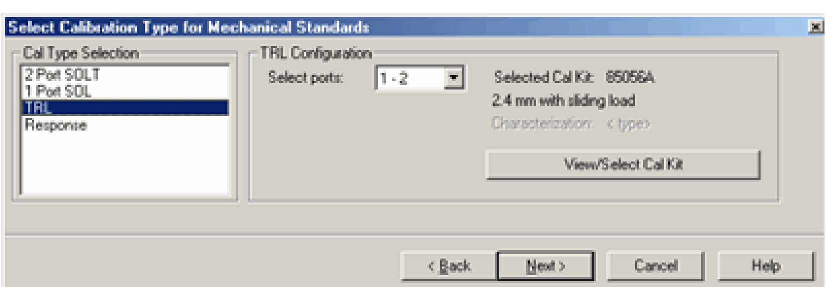
For FCA calibrations, this dialog box appears twice: once for the input frequencies and once for the output frequencies. The values can be slightly different.

The Calibration Complete dialog box appears after all standards are measured.

Unguided Calibration

Programming Commands

The PNA displays the following dialog boxes when performing an Unguided calibration:



Select Calibration Type for Mechanical Standards dialog box help

Unguided calibration does **NOT** support cals greater than 2 ports or **ECal** calibrations.

TRL Cal should be performed using Guided Calibration.

Calibration Type Selection

- **2-Port SOLT**
- **1-Port SOL**
- **TRL** - NOT available on PNA models with more than 2 ports.
- **Response -** Reflection and Thru (if the active measurement is transmission)

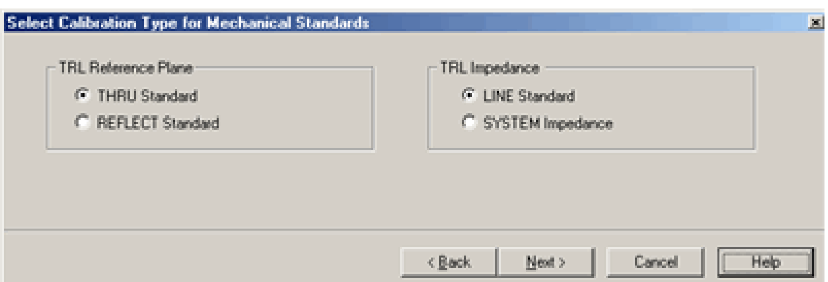
Cal Configuration If not calibrating all PNA ports, specify which ports to calibrate.

Back Return to Cal Wizard Begin dialog. If checked, you can clear the Save Preferences checkbox to see the Begin page when the Cal Wizard begins.

View/Select Cal Kit Click to invoke the Select Cal Kit dialog box.

Next Click to continue to Measure Mechanical Standards dialog box.

Note: If the DUT connector type has an impedance other than 50 ohms (waveguide = 1 ohm), change the system impedance before performing a calibration. See Setting System Impedance.



Select Cal Type dialog box help

This dialog box only appears if the selected Cal Type is TRL in the previous dialog box.

TRL Reference Plane Select which standard to use to establish the position of the measurement reference plane.

THRU Standard Select if the THRU standard is zero-length or very short.

REFLECT Standard Select if the THRU standard is not appropriate AND the delay of the REFLECT standard is well defined.

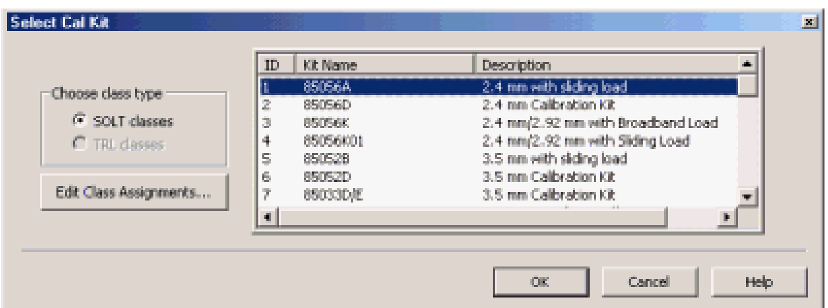
TRL Impedance

LINE Standard Specifies that the characteristic impedance of the LINE standard should be used as the system impedance. This ignores any difference between Offset Z0, Offset Loss, and System Z0.

SYSTEM Impedance Transforms the LINE standard impedance and loss to that of the system impedance for use with the calibration error terms. The TRL calibration will first compute the error terms assuming the LINE standard impedance is the system's characteristic impedance (same as previous LINE selection), then modify the error terms to include the impedance transformation. This should only be used with coax since the skin effect model used is a coaxial model.

Learn how to change System Z0.

To learn to substitute other calibration kits, see Advanced Modify Cal Kits



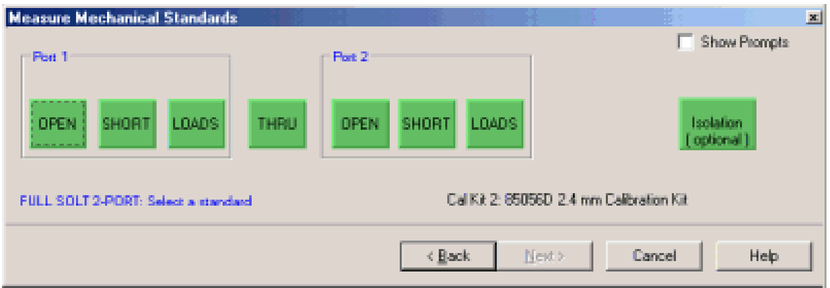
Select Cal Kit dialog box help

Displays the calibration kit files available for Unguided calibration. Select the desired calibration kit file and click **OK.**

Choose class type Unguided TRL calibration is NOT available on the 4-port PNA.

Edit Class Assignments Allows modification of the selected Cal Kit class assignments.

To learn to substitute other calibration kits, see Advanced Modify Cal Kits



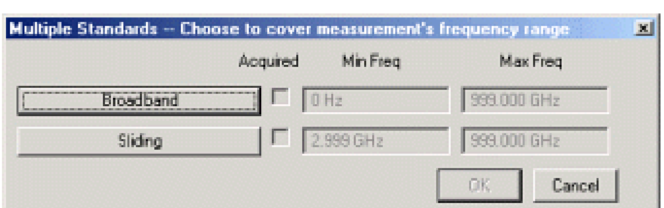
Measure Mechanical Standards dialog box help

Note: Beginning in PNA Rev. 6.0, calibration can be performed with External triggers. Learn more.

Displays the calibration kit file and standards required for the calibration.

- Standards may be connected and measured in any order.
- Connect the standard to the measurement port and click its associated green button. A check mark indicates the standard has been measured.
- If a standard type contains multiple standards, the Multiple Standards dialog box opens to display the multiple standards included in the calibration kit file.
- If a sliding load is included in the calibration kit file, the Sliding Load dialog box opens to perform the measurement with the standard.
- **Reflection Response** Select EITHER Open or Short standard, then click **Next**.
- **Isolation** Requires one load for each test port of the PNA. Learn more about Isolation. Use when your measurement requires maximum dynamic range (> 90 dB). See also Isolation Portion of 2-Port Calibration.
- **Normalize** Available when performing a response cal for any measurement. After Normalize is pressed and the Cal is complete, the data trace is flat when the same physical connections are present on the port. This is similar to Data/Memory, except that the response cal is saved with Cal data and can be applied to other like measurements. Data/Memory is still available after using Normalize. You would usually connect a THRU standard when calibrating a transmission measurement, and a SHORT standard when calibrating a reflection measurement.

Show Prompts Check to provide a reminder for the required connection when you click on the standard.



Multiple Standards dialog box help

Select the standards to be measured.

Note: You may see both male and female standards. The Unguided cal has no knowledge of the gender of your connector types. **Choose the gender of your DUT connector**; NOT the test port. Then click OK.

To modify this calibration class to show only one standard, on the Calibration menu, click **Advanced Modify Cal Kits**. Select the Cal kit and click **Edit Kit.** In **Class Assignment**, click **Edit**. Learn more about Modify Calibration Class Assignments.

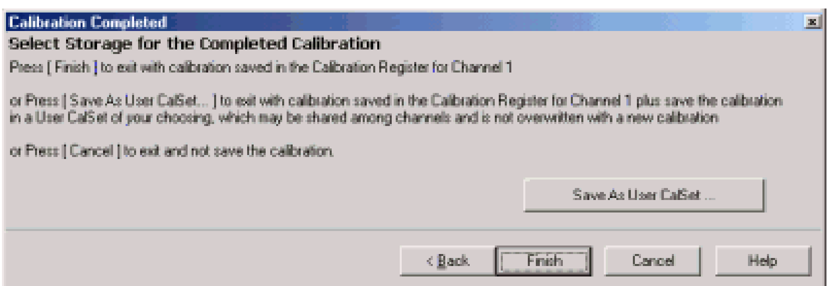
- Connect the standard to the measurement port and click its associated button. A check mark in the **Acquired** box indicates the standard has been measured.

- To cover the entire frequency range, you may need to measure more than one standard. The order in which the standards are measured is important. The last standard that is measured will override the others in respect to the frequency range of the standard definition. **Example:** In the case of measuring both a broadband load and a sliding load, you would measure the sliding load last. This is because the frequency range of the sliding load is a subset of the broadband load.

Learn more about Modify Calibration Class Assignments

Saving a Calibration

SmartCal, ECal, and Unguided Calibrations end with the following dialog box:



Calibration Completed dialog box help

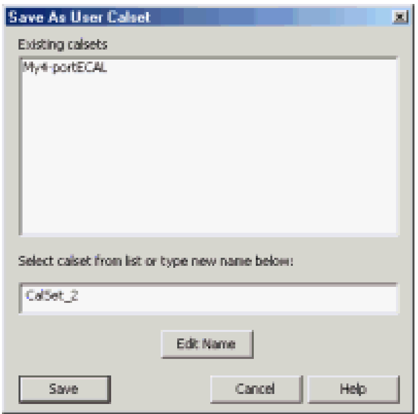
Finish Save to the channel's calibration register.

Save As User Cal Set Invokes the Save as User Cal Set dialog box AND save to the channel's calibration register.

Cancel Calibration is NOT applied or saved.

Learn about Calibration Registers.

Learn about User Cal Sets



Save as User Cal Set dialog box help

Existing Cal Sets - Lists the Cal Set names saved on the PNA.

Select Cal Set from list or type new name below Specify a name for the new Cal Set. Either accept the suggested new name, type a new name, or select a name from the list to overwrite an existing name.

Edit Name If there is no keyboard, click to start the PNA typing tool that can be used from the PNA front panel.

Save Saves the Cal Set to the new Cal Set name.

Learn about User Cal Sets

Last modified:

21-Sep-2007	Added note about no TRL on 4-port PNAs
January 20, 2007	Added note about any order for SmartCal.
January 20, 2007	MX Added UI
Sept 18, 2006	MQ Major modifications for multiport

Select a Calibration Type

The following calibration types are available in the PNA.

Cal Type	Interface	Accuracy	Thru Methods allowed
TRL Family	SmartCal	Very High	NOT unknown or adapter removal
SOLT	Both	High	All
Enhanced Response	SmartCal	High	Defined Thru or Flush Thru
QSOLT (Quick SOLT)	SmartCal	Medium	Defined Thru or Flush Thru
1-Port Reflection	Both	High	Not Applicable
Open/Short Response	Unguided	Low	Not Applicable
Thru Response	Unguided	Low	Known Thru or Flush Thru

Learn how to select a default Cal Type.

Other Cal Types (Separate Topic)

- Source and Receiver Power Cals
- FCA Scalar and Vector Mixer Cals

See other Calibration Topics

TRL Family

Application: Used to accurately calibrate any pair of ports when calibration standards are not readily available.

Note: A Delta Match Cal is required to cal test ports that do not have a dedicated reference receiver.

- Learn more about TRL family cal
- For more information on modifying standards, see Calibration Standards.

Calibration Method: SmartCal

General Accuracy: Very High

Standards Required: THRU, REFLECT, LINE or similar combination

Systematic Errors Corrected:

- Directivity
- Source match
- Isolation

- Load match
- Frequency response transmission tracking
- Frequency response reflection tracking

SOLT

Application: Used to accurately calibrate any number of ports.

General Accuracy: High

Calibration Method: SmartCal, Unguided Calibration, ECal

Standards Required: (SHORT, OPEN, LOAD, THRU) or ECal module

Systematic Errors Corrected (on all ports):

- Directivity
- Source match
- Isolation
- Load match
- Frequency response transmission tracking
- Frequency response reflection tracking

Enhanced Response

Application: Used to calibrate two ports when only measurements in one direction (forward OR reverse) are required. Measurements are faster because a second sweep is NOT required.

- Reflection Standards (OPEN, SHORT, LOAD) are connected to the source port to be calibrated.
- Defined THRU or Flush THRU standard is connected between port pairs.
- Much quicker than SOLT when using a mechanical cal kit. ECal can also be used.

To select Enhanced Response:

For a standard S-parameter Cal, select **SmartCal** in the Cal Wizard.

Then, for all cals:

1. At the 'Select DUT Connectors page', check Modify Cal, then click **Next**.
2. Under 'Cal Type', select **Enhanced Response**.

Enhanced Response cal also be selected as the default Cal Type using Cal Preferences.

General Accuracy: High

Calibration Method: SmartCal, ECal

Standards Required: (SHORT, OPEN, LOAD, Defined THRU or Flush THRU)

Systematic Errors Corrected:

- Directivity (source port)
- Source match (source port)
- Isolation

- Load match (receiver port)
- Frequency response transmission tracking (receiver port)
- Frequency response reflection tracking (source port)

QSOLT (Quick SOLT)

Application: Used to quickly calibrate any number of ports. Developed specifically for use with external multiport test sets.

Note: A Delta Match Cal is required to cal test ports that do not have a dedicated reference receiver.

- Reflection Standards (OPEN, SHORT, LOAD) are connected to only ONE of the ports to be calibrated. The lower port number of the ports to be calibrated is selected by default. This can be changed through the Modify Cal / Cal Type setting.
- Defined THRU or Flush THRU standards are connected from the reflection standard port to the remaining ports to be calibrated.
- Much quicker than SOLT when using a mechanical cal kit.
- Based on TRL math.

General Accuracy: Not as high as SOLT

Calibration Method: SmartCal, ECal

Standards Required: (SHORT, OPEN, LOAD, Defined THRU or Flush THRU)

Systematic Errors Corrected:
- Directivity
- Source match
- Isolation
- Load match
- Frequency response transmission tracking
- Frequency response reflection tracking

1-Port (Reflection)

Application: Used to accurately calibrate any single test port for reflection measurements only.

Calibration Method: SmartCal, Unguided Calibration, ECal

General Accuracy: High

Standards Required: (SHORT, OPEN, LOAD) or ECal module

Systematic Errors Corrected:
- Directivity
- Source match
- Frequency response reflection tracking

Open / Short Response

Application: Used to quickly calibrate any single test port for reflection measurements only.
Calibration Method: Unguided Calibration
General Accuracy: Low
Standards Required: OPEN or SHORT
Systematic Errors Corrected: Frequency response reflection tracking

Thru Response (Isolation Optional)

Application: Used to quickly calibrate any pair of test ports for transmission measurements only. Isolation is not usually recommended. Learn more about Isolation
Calibration Method: Unguided Calibration
General Accuracy: Low
Standards Required: THRU Isolation: One LOAD for each PNA test port.
Systematic Errors Corrected: • Frequency response reflection tracking • Isolation

Last modified:

February 23, 2007	Added Enhanced Response
9/12/06	Added QSOLT

Using Calibration Sets

- What are PNA Cal Sets
- Cal Registers and User Cal Sets
- How to Manage and Apply Cal Sets
- Examples of Cal Set Usage
- Archiving Cal Sets using .cal files

See other Calibration Topics

What are PNA Cal Sets

At the completion of a calibration, all calibration data is stored to a Cal Set. The Cal Set can be applied later to any channel that has the same stimulus settings as the Cal Set, thereby saving the time it takes to perform another calibration. The following data is saved to a Cal Set:

- Name
- Cal Set Description
- Cal Set Attributes - stimulus settings, cal type, port association
- Standards data
- Error term data
- GUID (**G**lobally **U**nique **ID**entifier)

Cal Registers and User Cal Sets

There are two types of Cal Sets:

- **Cal Registers** (channel specific)
- **User Cal Sets**

Calibration data is automatically saved to a Cal Register at the end of every calibration. You can also choose to save the cal data to a User Cal Set.

Calibration Registers

New with PNA Release 5.0, Calibration Registers are designed to simplify calibrations for most users. When a calibration is complete, the data is automatically saved to the channel's Cal Register, overwriting (or appended to) the previous cal data stored in that register. This concept is similar to previous Agilent Vector Network Analyzers.

- Every channel has ONE dedicated Cal Register. They are named CH**n**_CALREG, where **n** is the channel number. The name cannot be changed.
- Cal Registers are more volatile because they are overwritten (or appended) each time a calibration is performed on that channel. The Cal data is always saved, but only temporarily.
- Cal Registers can be applied to other measurements, but ONLY on the same channel as the Cal Register.

User Cal Sets

At the end of a calibration, you can choose to also save cal data to an existing or new User Cal Set.

- User Cal Sets can be applied to any number of channels simultaneously.
- User Cal Sets are named by you for easy identification.
- You can have an unlimited number of User Cal Sets.
- At any time, you can copy Cal Register data to create a User Cal Set. See Cal Set Properties.

Appending Data in a Cal Set

At the end of a calibration, data is saved to the channel's Cal Register and, if you choose, to an existing User Cal Set. The PNA attempts to append new error terms to a non-empty Cal Set. The existing Cal Set data is completely overwritten UNLESS the new data can coexist with the existing data according to the following two rules:

- The stimulus settings of the new data must exactly match the existing data.
- The new cal must involve different ports from the existing cal.

For example:

Case 1 - An existing Cal Set contains a full 2-port cal between ports 1 and 2. Using the same stimulus settings, you perform a 1-port cal on port 3. At the end of the cal, you click Save As User Cal Set and select the existing full 2-port User Cal Set.

Result: The 1-port cal is appended to the 2-port User Cal Set. There is NO overlap between them.

Case 2 - Same situation as Case 1, except the 1-port cal is performed on port 1.

Result: The Cal Set will contain a 1 port cal on port1 and a 1 port cal on port 2. The overlapping tracking terms are removed rendering the original full 2 port cal invalid.

How to Manage and Apply Cal Sets and Cal Types

The PNA attempts to apply a Cal Set, and turn error correction ON, for ALL of the measurements on the active channel. This may not always be possible. For example, suppose a channel contains both S11 (reflection) and S21 (transmission) measurements. If a Cal Set that contains only an S11 **Cal Type** is applied to that channel, the Cal Set does not contain the error terms to correct the S21 measurement. Error correction is turned ON for the S11 measurement and NOT turned on for the S21 measurement.

There are two ways to apply an existing Cal Set (Cal Register or User Cal Set) to a measurement:

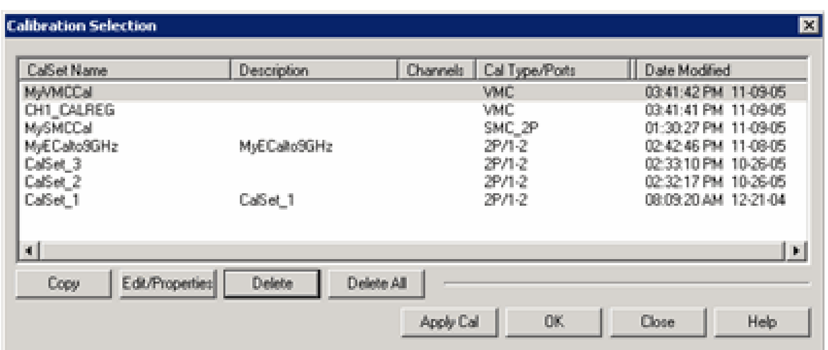
1. Recalling an Instrument State with Cal data (.cst file) - A .cst file contains an Instrument State with all measurement attributes AND a 'pointer' to the Cal Set that was used to calibrate the measurement. Before saving a .cst file, be sure that a User Cal Set (NOT a Cal Register) is being used for the measurement. Because Cal Registers are automatically overwritten when a new calibration is performed, it is likely that the Cal Register data will change before the .cst file is recalled.

2. Create a new measurement and select a Cal Set to apply to the active channel.

Note: NEVER copy or modify Cal Sets from Windows Explorer or other applications. Cal Sets should only be accessed through the PNA Application.

How to select and apply a Cal Set to the active channel

Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Cal Set**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[Manage Cals]** 3. then **[Cal Set]**	1. Click **Response** 2. then **Cal** 3. then **Manage Cals** 4. then **Cal Sets**



Calibration Selection dialog box help

This dialog box allows you to manage and apply Cal Sets.

Although the number of Cal Sets you can have is limited only by the amount of PNA memory, it is considered unusual to have more than about 10 existing Cal Sets, or one current Cal Set for every unique channel setup.

Old Cal Sets (with 'stale' data) should be deleted or overwritten.

The active channel's Cal Register always appears, even if empty. Cal Registers that belong to other channels appear in the list of Cal Sets only if the channel exists, and only if they contain data.

- Learn about Cal Registers.
- Learn how to View the Error Terms of a Cal Set.

To apply a Cal Set to the active channel, click a row to select that Cal Set, then click Apply Cal.

Note: A Cal Set must have been generated from the same measurement class as the active channel in order for it to Applied.

Columns click a heading to sort by that column

Cal Set Name Name to identify the Cal Set.

Description User-settable text to further identify the Cal Set.

Channels Channel numbers that are currently using this Cal Set. A blank entry means it is not currently in use.

CalType / Ports Type of Cal contained in the Cal Set. Learn about applying appropriate Cal Types.

Cal Type Abbreviations:

1P, 2P, 3P, 4P... - Full n-Port calibrations

R - Response (instead of ports, shows the measurement type that it corrects.)

ER/x-y Enhanced Response, where **x** is the receive port; **y** is the source port.

VMC Vector Mixer Cal

SMC Scalar Mixer Cal

Modified Date and time the Cal Set was last modified.

Buttons

Copy Invokes the Save as User Cal Set dialog box. Type a name for the copy of the selected Cal Set data.

Show / Edit Properties Invokes the Cal Set Properties dialog box. This allows you to view all of the Cal Set properties and create a **duplicate** User Cal Set from an existing User Cal Set or Cal Register.

Delete Permanently deletes the Cal Set after you choose OK to a warning prompt.

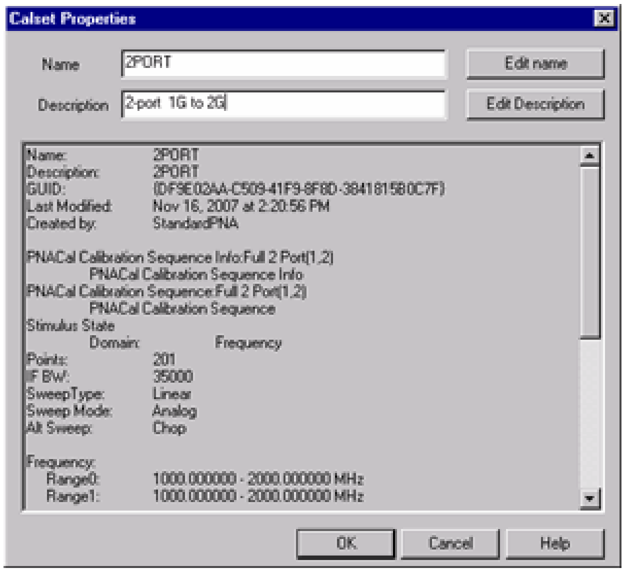
Delete All Permanently deletes ALL listed Cal Sets and Cal Registers after you choose OK to a warning prompt.

Apply Cal Applies the selected Cal Set to the active channel. If the stimulus settings of the Cal Set and channel are different, a choice must be made.

Unselect Available ONLY if the selected Cal Set is being used by the active channel. Click to 'Un-apply' the Cal Set, then click **Close** to exit with the Cal Set un-applied.

OK Always APPLIES THE SELECTED CAL SET to the active channel, then closes the dialog box.

Close Exit the dialog box. Performs no further action.



Cal Set Properties dialog box help

Allows you to view all of the Cal Set properties and create a **duplicate** User Cal Set from an existing User Cal Set or Cal Register.

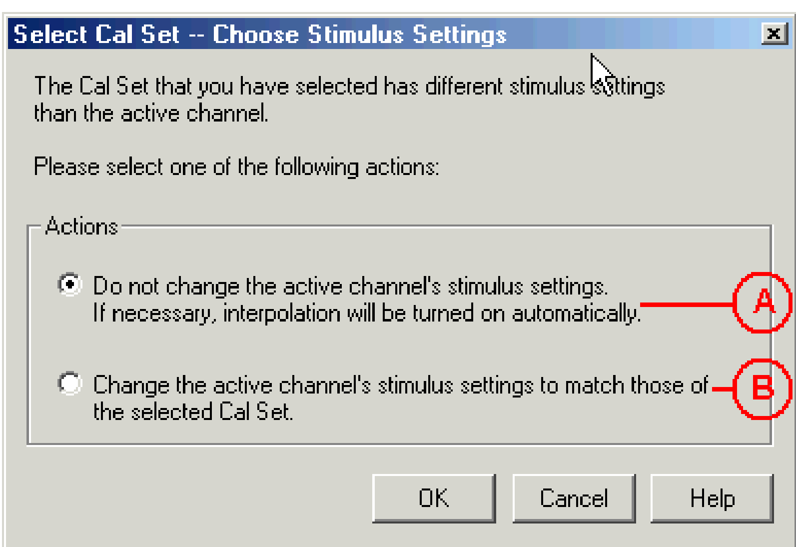
Name Edit name of the User Cal Set. You can NOT change the name of a Cal Register.

Description Descriptive text to further identify the Cal Set.

Cal Set Properties Lists descriptive information and stimulus conditions of the Cal Set.

Learn how to View the Error Terms of a Cal Set.

Stimulus Setting Different between Cal Set and Measurement



Select Cal Set -- Choose Stimulus Settings dialog box help

The Cal Set contains the channel stimulus settings that were in place when the Cal Set was saved. This dialog appears when the Cal Set channel settings are different than those of the channel to which the Cal Set is being applied. Choose between the following options.. (See above image).
• A. Keep the Active Channel Stimulus settings. Interpolate if possible.
  • If the Cal Set frequency range is greater the active channel, then Interpolation will be turned ON. Learn more about Interpolation Accuracy
  • If the Cal Set frequency range is less than the active channel, then this option is not available.
• B. Keep the Cal Set Stimulus settings. The Active Channel stimulus setting are changed.
OK Make the change.
Cancel Cal Set will NOT be applied.

Examples of Cal Set Usage

The following examples show how Cal Sets increase flexibility and speed in making analyzer measurements.

- **Using one User Cal Set with many Channels**
- **Using one Measurement with many Cal Sets**

Using one User Cal Set with many Channels

It is possible to do one calibration, then apply it to several channels.

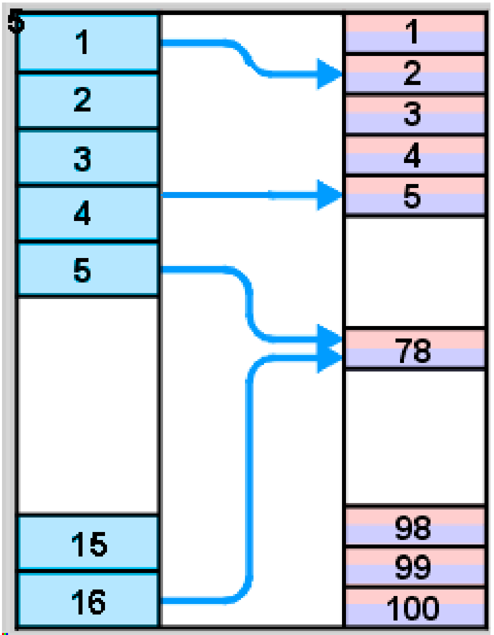
An example:

During a manufacturing process, you may have many calibrated channels. You may wish to continuously cycle through the measurements and examine them individually. Occasionally, you may wish to refresh the calibration without having to recreate all the measurement state files.

Here is how: Examine the stimulus settings for each channel. Then make the User Cal Set stimulus range a super-set of the whole group. Each channel can then use the same User Cal Set. Some calibrations will be interpolated. **Note:** Make sure that interpolation is turned on.

Notice in the following image, Cal Set 78 is used on more than one channel, in this case Channel 5 and 16 .

Channel **Cal Set**



Using one Measurement with many Cal Sets

The drawback with having one very large User Cal Set associated with many instrument states could be a loss of accuracy due to interpolation. In such cases, consider using one User Cal Set for each stimulus setting.. The stimulus conditions can then be changed for a channel by applying different User Cal Sets. Other settings (window setups, measurement definitions, scaling, limits, markers) will not change. This may result in faster state changes than if you saved and recalled *.cst files for each set of stimulus conditions.

Example #1: An amplifier needs to be measured at several input power levels. Calibrate at several power levels and save each calibration in a separate User Cal Set. Then, apply the User Cal Sets to the single measurement consecutively.

Example #2: Making an S21 Measurement, you need to measure both wide span and narrow span characteristics of the device. One Cal Set covers the wide span setup; another the narrow span setup.

Archiving Cal Sets using .cal or .csa files

Because User Cal Sets can easily be deleted, provide extra backup by also saving your calibration as a .cal or .csa file (see saving a .cal file).

Example:

One person performs a calibration, names and saves it as a User Cal Set. This Cal Set is available for any other person to use. A second user could accidentally delete or modify the User Cal Set requiring the originator to repeat the calibration.

Security can be provided for calibration data by saving the Cal Set to a **.cal** file or .csa file. At a later time, the file could be recalled and the original calibration restored.

Last modified:

9/12/06	Added link to programming commands

Error Correction and Interpolation

Error Correction and Interpolation settings work together to provide you with the highest level of calibration accuracy possible.

- **How to set Error Correction**
- **Error Correction**
- **Viewing Correction Levels**
- **How to set Interpolation**
- **Interpolation and Accuracy**

See other Calibration Topics

How to set Error Correction

Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Correction ON/off**
For PNA-X and 'C' models	Programming Commands
1. Press **CAL** 2. then **[Correction ON/off]**	1. Click **Cal** 2. then **Correction ON/off**

Error Correction

The Error Correction ON setting means that the calibration error terms are applied to the measurement. Error Correction is automatically turned ON when a calibration is performed or if a Cal Set is applied to a measurement. The PNA attempts to turn error correction ON for ALL of the measurements on the active channel. This may not always be possible when applying Cal Sets. For more information, see Applying Cal Sets.

When full 2-port error correction is ON, both forward and reverse sweeps are required to gather all 12 error terms, even if only one reflection measurement is displayed. This may result in a higher measurement speed than expected. Learn more.

You can always turn Error Correction OFF for the active measurement by clicking Correction OFF. The PNA will turn Error Correction OFF automatically when making stimulus changes under some conditions. To turn correction back ON, click **Correction ON**. Then:

- If Interpolation can NOT be performed, a dialog box will ask if you would like to change the stimulus settings to those of the applied calibration. Click OK or Cancel.
- If Interpolation can be performed, the stimulus setting will change and correction turned ON.

Viewing Correction Level

The correction level provides information about the accuracy of the active measurement. Correction level notation is displayed on the status bar for different calibration types like response, full 2-port, TRL, or power calibration.

To View Correction Levels:

In the **View** menu, click **Status Bar**. The status bar appears and displays the following items:

a. Active Channel

b. Measurement parameter

c. Correction Level (see description below)

d. Calibration type

Correction Level		Accuracy
C	Full	Highest
C*	Interpolated	Uncertain
C∆	Changed	Uncertain
No Cor	No Correction	Lowest

C Full Correction

Full Correction level is displayed immediately after a calibration is performed or when a valid Cal Set is applied. If you require optimum accuracy, avoid adjusting analyzer settings after calibration so your measurement remains at this level.

C* Interpolated Correction

"C star" appears in the status bar when a measurement is being interpolated. See Interpolation (above) and Interpolation Accuracy.

CD Changed Settings

"C-delta" appears in the status bar when one or more of the following stimulus settings change. The resulting measurement accuracy depends on which parameter has changed and how much it has changed. For optimum accuracy, recalibrate using the new settings.

- Sweep time
- IF Bandwidth
- Port power
- Stepped sweep enabled/disabled

No Corr   No Correction

The following will cause the PNA to turn Error Correction OFF for the channel:

- Decrease the start frequency
- Increase the stop frequency
- Change start frequency, stop frequency, or number of points with Interpolation OFF.
- Change sweep type

How to set Interpolation

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Interpolation ON/off**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[More]** 3. then **[Interplotion ON/off]**	1. Click **Cal** 2. then **More** 3. then **Interplotion ON/off**

Interpolation

Calibration interpolation adjusts calibration error terms to match changes to the following settings that you make AFTER a calibration is performed or a Cal Set applied.

The Interpolation **ON** setting means that interpolation is **enabled** for the active measurement. This does not necessarily mean that the measurement is interpolated. When enabled (ON), if interpolation becomes necessary because you change any of the following stimulus settings, **then** interpolation will be applied. When stimulus settings change while interpolation is OFF, interpolation is NOT applied but instead, error correction is turned OFF.

Interpolation occurs (if enabled) when you change any of the following settings:

- Start frequency increased
- Stop frequency decreased
- Number of points

Note: Decreasing the start frequency, or increasing the stop frequency will always turn correction **OFF**. (Exception: Power Calibration DOES extrapolate to the start and stop frequencies.)

Interpolation Accuracy

When a measurement is interpolated, the accuracy of the measurements cannot be predicted. It may be affected significantly or not at all. Identifying measurement errors in these cases must be determined on a case-by-case basis.

Significant measurement inaccuracy WILL occur when the phase shift between measurement points increases more that 180 degrees. The PNA will incorrectly interpolate the new phase data. For more information, see phase accuracy.

In general, the chances of significant inaccuracy increases when interpolating measurements under the following conditions:

- when increasing, rather than decreasing, the frequency span between measurement points.
- when frequency span between measurement points becomes much greater.
- when measurement frequencies are very high, especially above 10 GHz.

Last modified:

March 10, 2008	MX Added UI
Sept 12, 20/06	Added link to programming commands

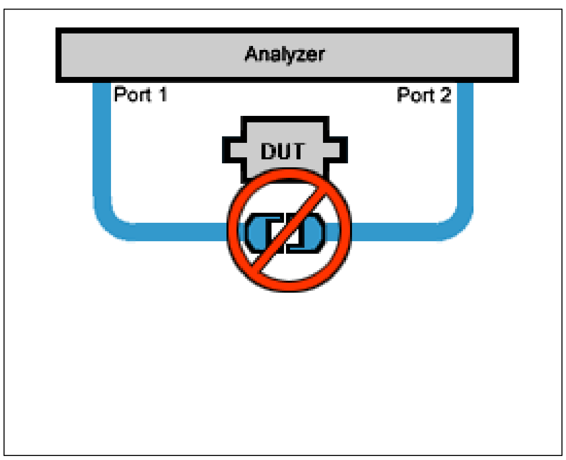
Calibration Thru Methods

Other Cal Topics

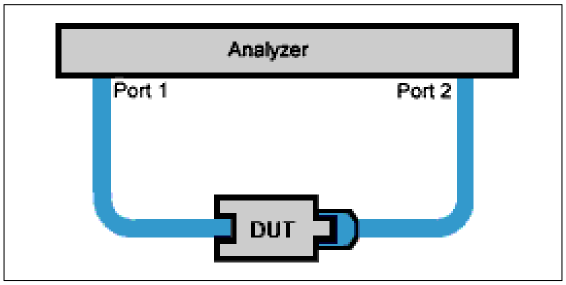
What is a Non-Insertable Device

To understand the Thru method choices, you must first understand what is meant by "Non-Insertable device". These definitions also apply to ECal modules. Substitute "ECal module" for "device". Then see ECal Thru Method Choices.

A **non-insertable device** is one whose connectors could NOT mate together. They either do not have the same type of connector or they have the same gender. This also means that the test port cables would not mate together, as in the following diagram.



An **insertable** device is one whose connectors could mate together. They have the same type of connector and opposite,or no, gender. This also means that the test port cables would mate together, as in the following diagram.



Choosing a Thru Method of Calibration

The Thru method is selected from the Cal Wizard. Select the **Modify** checkbox in the Select DUT Connectors and Cal Kits dialog box.

Notes:

For ECal, the following choices have different meanings. See THRU methods for ECal.

For 4-port calibration, see How can we measure only 3 THRU connections?

Choice for Insertable Devices: FLUSH Thru (also known as Zero-length Thru)

When calibrating for an insertable device, the test ports at your measurement reference plane connect directly together. This is called a zero-length THRU, or Flush THRU meaning that the THRU standard has zero-length: no delay, no loss, no capacitance, and no inductance. Your calibration kit may not have a physical THRU standard because it is assumed you have an insertable device and will be using a zero-length THRU.

Choices for Non-Insertable Devices

The following methods calibrate for a non-insertable device:

- Adapter Removal Accurate, but least convenient.
- Defined Thru
- Unknown Thru Cal **Preferred method.**
- Swap-Equal-Adapters Method is a valid choice, but NOT included in the PNA firmware.

Adapter Removal Calibration

This method is potentially very accurate. However, it requires many connections which increases the chances of inaccurate data.

Two full 2-port calibrations are performed: one with the adapter connected at port 1, and the other with the adapter connected to port 2. The result of the two calibrations is a single full 2-port calibration that includes accurate characterization and removal of the mismatch caused by the adapter.

Performing an Adapter Removal Cal requires:

- a THRU adapter with connectors that match those on the DUT.

- calibration standards for both DUT connectors.

To select Adapter Removal during a SmartCal, select the **Modify** checkbox in the Select DUT Connectors and Cal Kits dialog box. The Cal Wizard will guide you through the steps.

Learn how to perform an Adapter Removal Cal using ECal.

Defined Thru (also known as **Known Thru, Cal Kit Thru, ECal Thru, Characterized Thru**)

Defined Thru uses the THRU definition that is stored in the Cal Kit file or ECal module. The THRU standard may have worn over time, making it not as accurate as when it was new. Defined Thru is usually more accurate than Adapter Removal, but not as accurate as Unknown Thru method.

Notes

- If performing an ECal, this is the THRU standard in the ECal Module.
- If Defined Thru appears as a potential THRU method in the SmartCal Wizard, this means that there is a defined THRU standard in the selected Cal Kit. This could be a Zero-length Thru. The SmartCal Wizard will prompt you to connect the required standard when appropriate.

To define a THRU standard in a Cal Kit (not ECal module):

1. From the PNA Menu, click Calibration, Advanced Modify Cal Kits.
2. Select the Cal Kit
3. Click Edit Kit
4. Click Add
5. Select THRU
6. Complete the dialog box.

The next time you perform a Guided Cal, this Defined THRU standard will be available if the DUT connector types match the THRU standard.

Unknown Thru Cal

Unknown Thru Cal is the **preferred** THRU method of calibrating the PNA to measure a non-insertable device.

The Unknown Thru calibration is also known as **Short-Open-Load-Reciprocal Thru** (SOLR) calibration.

- Very easy to perform.
- Better accuracy than Defined Thru and usually better than Adapter Removal.
- Does not rely on existing standard definitions that may no longer be accurate.
- Causes minimal cable movement if the THRU standard has the same footprint as the DUT. In fact, the DUT can often BE the THRU standard.

About the Unknown Thru Process

SmartCal guides you through the process. Although the following process describes ports 1 and 2, Unknown Thru can be performed on any two ports when using a multiport PNA.

1. Perform 1-port cal on port 1.
2. Perform 1-port cal on port 2.
3. Connect Unknown Thru between ports 1 and 2.
4. Measure Unknown Thru.
5. Confirm Estimated Delay. This estimate may be wrong if there are too few frequency points over the given frequency span. You can measure the delay value independently and enter that value in the dialog box.

The Unknown Thru Standard

- Can have up to about 40 dB of loss and long electrical length.
- Must be reciprocal: S21=S12.
- Must know the phase response to within 1/4 wavelength (see step 5 above).
- Can be the DUT if it meets these conditions.

Unknown Thru Limitations

- Unknown Thru is NOT supported during a TRL calibration.
- Beginning with PNA code release 5.25, Unknown Thru CAN be performed using a 4-port PNA-L that does NOT have a reference receiver for each test port. However, a Delta Match Calibration is usually required before the Unknown Thru is measured.
- Unknown Thru is NOT supported on E8801A, E8802A, and E8803A.

ECal Thru Method Choices

When the ECal module connectors exactly match the DUT connectors, choose from the following THRU methods:

ECal Thru as Unknown Thru   Learn more about Unknown Thru.

- Measures the THRU state of the ECal module as an Unknown Thru.
- The default method when the ECal module connectors match the DUT.
- Very accurate and easy.
- May require a Delta Match Cal.

Flush Thru (zero-length Thru) Learn more about Flush Thru

- Requires an insertable ECal module / DUT.
- Remove the ECal module and connect the two reference planes directly together for a zero-length thru.
- Accurate, but not as easy as 'ECal Thru as Unknown Thru'.

ECal (Defined Thru)

- Measures the THRU state of the ECal module.
- Very easy, but not very accurate.

Unknown Thru

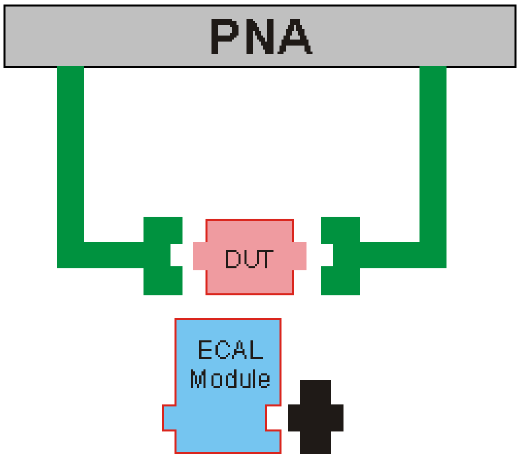
- Remove the ECal module.
- Then connect a Thru adapter to be measured as Unknown Thru.
- May require a Delta Match Cal.

When the ECal module connectors do NOT exactly match the DUT connectors, choose from the following two methods:

Adapter Removal

- Can be used with ECal when your DUT is NON-insertable. However, the ECal module MUST be insertable, and the adapter connectors must exactly match the connectors of the DUT as in the following diagram.

Note: With PNA release 4.8, adapter removal now performs 2-port measurements on both sides of the adapter. It previously performed 2-port measurements on one side and 1-port measurements on the other. This improves the accuracy of the adapter removal calibration.



ECal User Characterization

In cases when adapter removal cannot be performed, ECal User Characterization is ALWAYS possible if you have the right adapters. A User Characterization is performed once and stored in the ECal module. However, accuracy is compromised every time you remove, then reconnect, the adapter with the ECal module.

Last Modified:

20-Feb-2008	Added bullet for default ECal method

Accurate Measurement Calibrations

Calibration accuracy is affected by the type of calibration, quality of the calibration standards, and the care with which the calibration is performed. This section provides additional information about how to make accurate calibrations.

- **Measurement Reference Plane**
- **Effects of Using Wrong Calibration Standards**
- **Data-based versus Polynomial Calibration Kits**
- **Accuracy Level of Interpolated Measurement**
- **Effects of Power Level**
- **Using Port Extensions**
- **Isolation Portion of 2-Port Calibration**
- **Choosing a Thru Method**

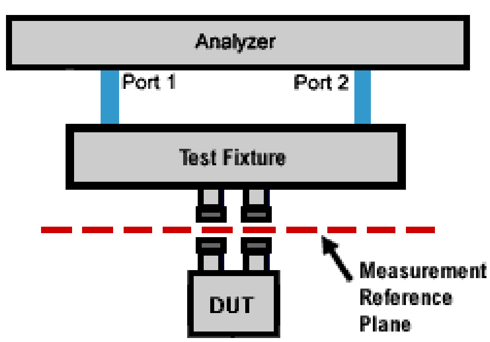
Learn how to determine the validity of your calibration.

See other Calibration Topics

Measurement Reference Plane

Most measurement setups will NOT allow you to connect a device under test (DUT) directly to the PNA front panel test ports. More likely, you would connect your device to test fixtures, adapters, or cables that are connected to the PNA.

A calibration takes place at the points where calibration standards are connected during the calibration process. This is called the measurement reference plane (see graphic). For the highest measurement accuracy, make the calibration reference plane the place where your DUT is connected. When this occurs, the errors associated with the test setup (cables, test fixtures, and adapters used between the analyzer ports and the reference plane) are measured and removed in the calibration process.



Effects of Using Wrong Calibration Standards

Normally, a calibration is performed using a calibration kit that contains standards with connectors of the same type and sex as your device under test.

However, your calibration kit may not always have the same connector type and gender as your device. For example, suppose your device has 3.5mm connectors, but you have a Type-N calibration kit. If you use an adapter to connect the Type-N standards to the 3.5mm test port, then the adapter becomes part of the calibration and NOT part of the test setup. This will result in significant errors in your reflection measurements.

Data-based versus Polynomial Calibration Kits

The Select DUT Connectors and Cal Kits dialog box offers a data-based model and a polynomial model for the newest high-frequency cal kits. See PNA Accessories. The data-based models provide higher accuracy for describing calibration standards than the polynomial models. It is RECOMMENDED that the data-based model be used if the most accurate results are desired.

	Data-Based Model	Polynomial Model
How accurate is the model?	Provides highest calibration accuracy. Eliminates the errors that can be the result of polynomial model approximations.	Provides high calibration accuracy.
How does the model define calibration standards?	Uses S-Parameter measurements.	Uses traditional four-term polynomial calibration standard modeling parameters.
How do I manually edit the definitions of the calibration standards when using the model?	Use the Advanced Modify Cal Kit function.	Use the Advanced Modify Cal Kit function.
How do I use the Calibration Wizard with the model?	Use only the SmartCal (Guided) Calibration method.	Use the SmartCal (Guided) or the Unguided Mechanical Calibration methods.

Learn about the "Expanded Math" feature.

Effects of Power Level

To attain the most accurate error correction, do NOT change the power level after a calibration is performed. However, when changing power within the same attenuator range at which the measurement calibration was performed, S-parameter measurements can be made with only a small degradation of accuracy. If a different attenuator range is selected, the accuracy of error correction is further degraded.

To check the accuracy of a calibration, see Validity of a Calibration.

Using Port Extensions

Use the port extensions feature after calibration to compensate for phase shift of an extended measurement reference plane due to additions such as cables, adapters, or fixtures.

Port extensions is the simplest method to compensate for phase shift, mismatch, and loss of the path between the calibration reference plane and the DUT.

Learn how to apply port extensions.

Learn about characterizing a test fixture.

Isolation Portion of 2-Port Calibration

The isolation portion of a calibration corrects for crosstalk, the signal leakage between test ports when no device is present. When performing an UNGUIDED 2-port calibration, you have the option of omitting the isolation portion of the calibration.

Note: Isolation is never performed on a Smart (Guided) Calibration.

The uncorrected isolation between the test ports of the PNA is exceptional (typically >100dB). Therefore, you should only perform the Isolation portion of a 2-port calibration when you require isolation that is better than 100dB. Perform an isolation calibration when you are testing a device with high insertion loss, such as some filter stopbands or a switch in the open position.

The isolation calibration can add noise to the error model when the measurement is very close to the noise floor of the analyzer. To improve measurement accuracy, set a narrow IF Bandwidth.

How to perform an isolation calibration

Isolation is measured when the Load standards are connected to the PNA test ports. For best accuracy, connect Load standards to BOTH test ports each time you are prompted to connect a load standard. If two Loads are not available, connect the untested PNA port to any device that will present a good match.

Choosing a Thru Method

When calibrating for a non-insertable device, you must choose a method to calibrate for the THRU error terms. This can have a significant effect on measurement accuracy. Learn more about choosing a thru method.

Validity of a Calibration

This section helps you determine if your calibration is valid and how the analyzer displays correction level information for your measurement.

- **Frequency Response of Calibration Standards**
- **Validating a Calibration**
- **Quick Check**
- **ECal Confidence Check**
- **Verification Kit**

See other Calibration Topics

Frequency Response of Calibration Standards

In order for the response of a calibration standard to show as a dot on the smith chart display format, it must have no phase delay with respect to frequency. The only standards that exhibit such "perfect" response are the following:

- 7-mm short (with no offset)
- Type-N male short (with no offset)

There are two reasons why other types of calibration standards show phase delay after calibration:

1. The reference plane of the standard is electrically offset from the mating plane of the test port. Such devices exhibit the properties of a small length of transmission line, including a certain amount of phase shift.
2. The standard is an open termination, which by definition exhibits a certain amount of fringe capacitance and therefore phase shift. Open terminations which are offset from the mating plane will exhibit a phase shift due to the offset in addition to the phase shift caused by the fringe capacitance.

The most important point to remember is that all standards are measured in order to remove systematic errors from subsequent device measurements. As a result, if calibration standards with delay and fringe capacitance are measured as a device after a calibration, they will NOT appear to be "perfect". This is an indication that your analyzer **is calibrated accurately and working properly.**

Validating a Calibration

At the completion of a calibration or selection of a stored Cal Set, validation can accomplish the following:

Improve Measurement Accuracy – Once a measurement calibration has been performed, its performance should be checked before making device measurements. There are several sources of error that can invalidate a calibration: bad cables, dirty or worn calibration standards that no longer behave like the modeled standards, and operator error.

Verify Accuracy of Interpolation – You should validate the calibration if you are testing a device and the measurements are uncertain because of interpolation**.** For more information see Interpolation Accuracy.

Verify Accuracy of Cal Standards – To check accuracy, a device with a known magnitude and phase response should be measured.

Quick Check

For this test, all you need are a few calibration standards. The device used should not be one of the calibration standards; a measurement of one of these standards is merely a measure of repeatability.

The following reflection and transmission Quick Check tests can be applied to all test ports.

To verify reflection measurements, perform the following steps:

1. Connect either an OPEN or SHORT standard to port 1. The magnitude of S11 should be close to 0 dB (within a few tenths of a dB).
2. Connect a load calibration standard to port 1. The magnitude of S11 should be less than the specified calibrated directivity of the analyzer (typically less than -30 dB).

To verify transmission measurements:

1. Connect a THRU cable (or known device representative of your measurement) from port 1 to port 2. Verify the loss characteristics are equivalent to the known performance of the cable or device.
2. To verify S21 isolation, connect two loads: one on port 1 and one on port 2. Measure the magnitude of S21 and verify that it is less than the specified isolation (typically less than -80 dB).

Note: To get a more accurate range of expected values for these measurements, consult the analyzer's specifications.

ECal Confidence Check

ECal Confidence Check is a method to check the accuracy of a calibration performed with mechanical standards or an ECal module. The confidence check allows you to measure an impedance state in the ECal module (called the confidence state), and compare it with factory measured data stored in the module.

In order for this test to be valid, the test ports of the ECal module must connect directly to the calibration reference plane (without adapters).

How to Perform ECal Confidence Check:

1. Connect ECal module to the analyzer with the USB cable. See Connect ECal Module to the PNA. **Note:** Terminate any unused ECAL ports with a 50 ohm load.

2. Allow the module to warm up for 15 minutes or until the module indicates **READY**.

3. Do one of the following to start ECal Confidence Check

Using front-panel HARDKEY **[softkey] buttons**	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **ECal Confidence Check**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[More]** 3. then **[ECal]** 4. then **[Confidence Check]**	1. Click **Response** 2. then **Cal** 3. then **More** 4. then **ECal** 5. then **Confidence Check**

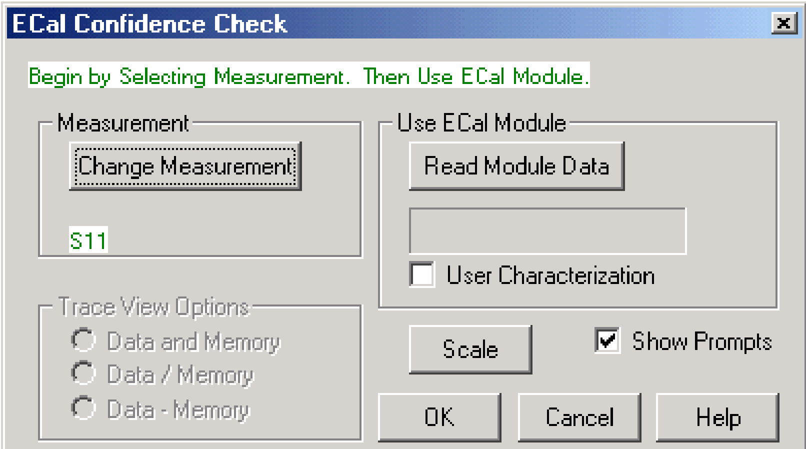
On the following ECal Confidence Check dialog box:

4. Click **Read Module Data**. The following occurs:
   - ECal module is set to "confidence state".
   - PNA reads and displays stored data.
   - PNA measures and displays "confidence state".
5. If you want to view a different parameter, select **Change Measurement** and select the check box for the desired parameter. (The default is the active channel parameter).
6. Select the viewing option in the Trace View Options block.
7. Compare the stored and measured data for each measurement parameter.

Notes:

- If the two traces show excessive difference, there may be a loose or dirty connection at the test ports or damage to the test cables. Carefully inspect the cables and connections. Then clean and gage each connector, and re-calibrate if needed.
- The User Characterization setting selects the user-characterization data instead of the factory

characterization data (available when a User-Characterization is stored in the ECal module).



ECal Confidence Check dialog box help

Compares the accuracy of corrected (calibrated) data with stored data in the ECal module. For the check to be valid, the module test ports must connect directly to the calibration reference plane (without an adapter). Learn more about ECal Confidence Check.

Measurement

Change Measurement Opens the Measure dialog box.

Use ECal Module

Read Module Data

- Copies stored data from the ECal module to Memory.
- Changes state of ECal module to confidence state.
- Measures and displays confidence state and Memory trace.

User Characterization Selects the user-characterization data (stored in the module) instead of the factory characterization data (available when a User-Characterization is stored in the ECal module).

Scale Opens the Scale dialog box.

Show Prompts Check to show a reminder for the connection (default).

Trace View Options

Data and Memory Trace Displays current measurement data and Memory trace.

Data / Memory Performs an operation where the current measurement data is divided by the data in memory.

Data + Memory Performs an operation where the current measurement data is added to the data in memory.

Verification Kit

Measuring known devices, other than calibration standards, is a straightforward way of verifying that the network analyzer system is operating properly. Verification kits use accurately known verification standards with well-defined magnitude and phase response. These kits include precision airlines, mismatch airlines, and precision fixed attenuators. Traceable measurement data is shipped with each kit on disk and verification kits may be re-certified by Agilent.

See Analyzer Accessories for a list of Agilent verification kits.

Last modified:

March 10, 2008	MX Added UI
9/12/06	Added link to programming commands

Using ECal

This topic discusses all aspects of performing an ECal:

- **ECal Overview**
- **Connect ECal Module to the PNA**
- **How to Perform a Calibration Using ECal**

See Also:

ECal User-Characterization

Restore ECal Module Memory

See other Calibration Topics

ECal Overview

ECal is a complete solid-state calibration solution. Every ECal module contains electronic standards that are automatically switched into position during a PNA measurement calibration. These electronic standards have been measured at the factory and the data stored within the memory of the ECal module. The PNA uses this stored data, along with the PNA-measured data, to calculate the error terms for a measurement calibration.

ECal modules are available in 2-port and 4-port models and a variety of connector types, covering many frequency ranges. See Analyzer Accessories for more about available ECal modules and ordering information.

You can perform the following calibrations with ECal:

- 1-Port Reflection calibration
- Full 2-Port calibration
- Full 3-Port calibration
- Full 4-Port calibration

Verify the validity of a mechanical or ECal calibration with ECal confidence check.

Care and Handling of ECal Modules

You can improve accuracy, repeatability, and avoid costly repair of equipment in the following ways.

- Practice proper connector care. See Connector Care.
- Protect equipment against ESD damage. Read Electrostatic Discharge Protection.
- Do not apply excess power to ports. Refer to specifications provided with your ECal module.

Connect ECal Module to the PNA

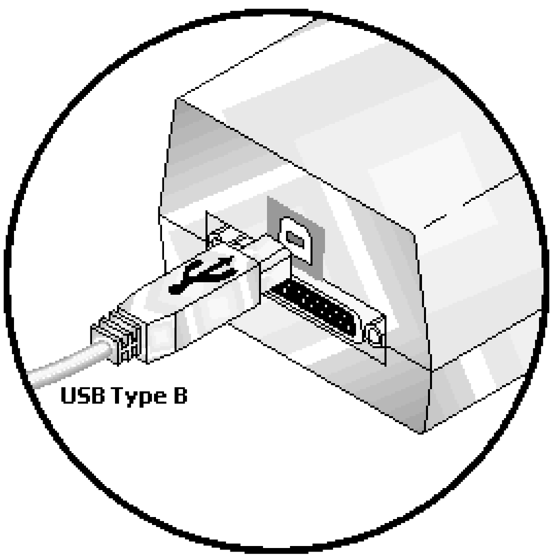
ECal modules are controlled and powered through a USB connection to the PNA. When you connect the module, the PNA automatically recognizes the type of module, frequency range, and connector type.

> **"First Time" Note**
>
> When you connect an ECal module that has a serial number never before seen by that PNA, the **Welcome to the Found New Hardware Wizard** will appear.
>
> Click **"No, not this time**", then click **Next** or **Finish** at the remaining dialog prompts.
>
> You must be logged on to the PNA with Administrator privileges to complete the first time registration process. This occurs automatically unless you change your default User Account.

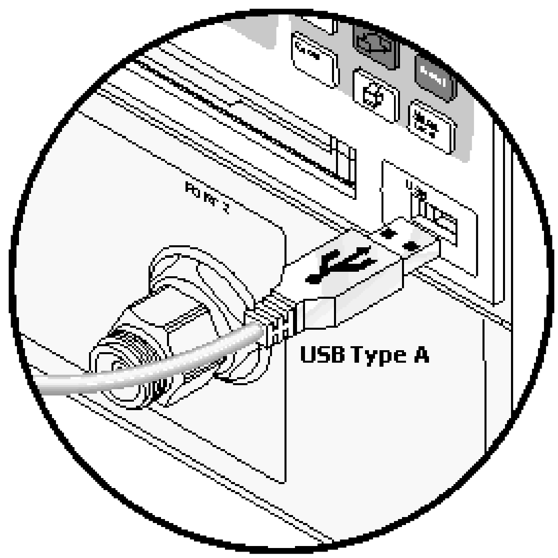
ECal modules connect to the USB port on the front or rear panel of the PNA.

1. Wear a grounded wrist strap when making connections.
2. Connect the USB cable **Type B** connector to the ECal module and the USB cable **Type A** connector to the front or rear panel USB connector of the analyzer, as shown in the following graphics.

ECal Module USB Port



Analyzer Front Panel USB Port



Notes:

- Unused ECal modules that have completed a calibration may remain connected to the USB port.
- You can connect and disconnect the ECal module while the analyzer is operating. However, DO NOT connect or disconnect the module while data transfer is in progress. This can result in damage or at least corrupted data.
- A USB hub may be used to connect more than one USB device to the analyzer. See Analyzer Accessories for more information about USB peripheral equipment.

How to Perform a Calibration Using ECal

Select an ECal module that has connectors of the same type and gender as the DUT. If such an ECal module is not available, a module with connectors different from the DUT can be used by using Advanced Settings or User Characterization.

Connect the ECal module ports to the PNA ports. During the calibration process the PNA can either automatically detect how the ECal module is connected, or the orientation can be performed manually.

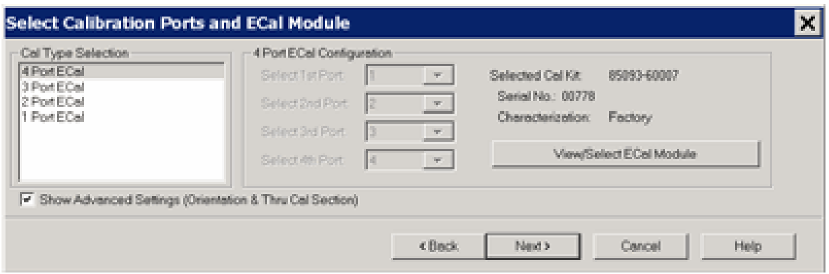
Note: Terminate any unused ECal ports with a 50 ohm load.

1. Connect the ECal module USB cable to the analyzer USB. See Connect ECal Module USB to PNA USB.
2. Allow the module to warm up until it indicates **READY**.
3. Enter the analyzer settings. See Set Up Measurements.
4. Do one of the following to start the Calibration Wizard

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Cal Wizard**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[Start Cal]** 3. then **[Cal Wizard]**	1. Click **Response** 2. then **Cal** 3. then **Cal Wizard**

5. In the Calibration Wizard Begin dialog box, click **Use Electronic Cal (ECal).**

Note: To calibrate with more than one ECal module, select **SmartCal**, then choose the ECal modules as your Cal Kits.



Select Calibration Ports and ECal Module dialog box help

Allows you to select calibration type and settings.

Cal Type Selection / Configuration Select the number of ports to calibrate. Then select the port number configuration.

4 Port ECal Available only if using a 4-port PNA. No additional configuration necessary.

3 Port ECal Available only if using a 4-port or 3-port PNA.

2 Port ECal

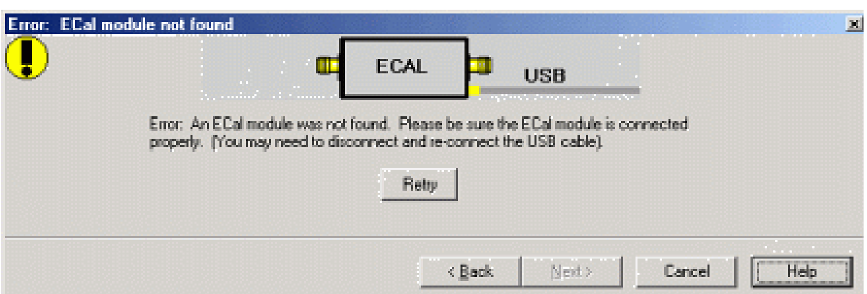
1 Port ECal- (Reflection) Advanced Settings are not available.

View/Select ECal Module Click to Select the ECal module if more than one ECal module is connected to the PNA. Also, Select the User Characterization within the module. Learn more about User Characterization.

Show Advanced Settings Check to display the Advanced Settings when **Next** is clicked.

Back Return to Cal Wizard Begin dialog. If checked, you can clear the Save Preferences checkbox to see the Begin page when the Cal Wizard begins.

Note: The PNA no longer allows ECal isolation to be performed. The inherent isolation of the PNA is better than that attained with correction using an ECal module.



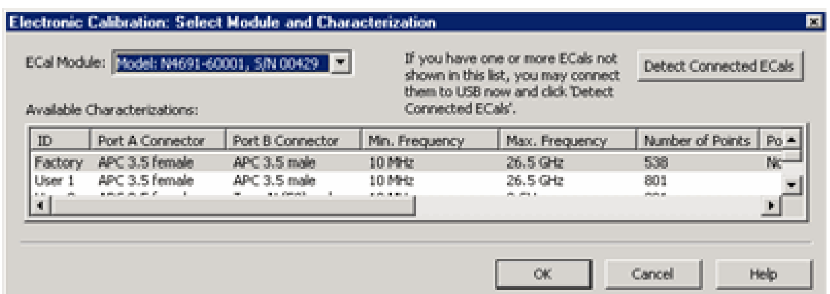
ECal module not found dialog box help

Displays an error message indicating the ECal module is not connected or has not been recognized by the network analyzer.

Retry Check the USB connections and click to continue.

Notes:

- If your ECal module is not detected, try to unplug, then reconnect the USB connector to the PNA.
- When the ECal module is connected to the network analyzer for the first time, it may take approximately 30 seconds for the analyzer to recognize the module and make it available for calibration.
- For best accuracy, allow the ECal module to warm-up until it indicates READY.
- Agilent 8509x and N4431 ECal modules, when first connected, draw significantly more current than other modules. This could cause the USB to stop working in certain situations. See USB limitations.
- See Connect ECal Module USB to PNA USB.

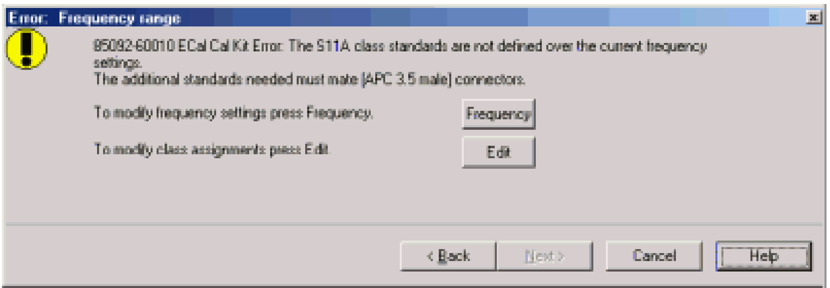


Select Module and Characterization dialog box help

ECal Module Select one of the ECal modules that are connected to the PNA.

Detect Connected ECals Click to rescan the USB for ECal modules.

Available Characterizations Select either the Factory Characterization of your ECal module or a User Characterization. Once selected, that characterization becomes the default selection until the PNA is turned OFF and restarted. When restarted, **Factory** again becomes the default selection.



Error: Frequency Range dialog box help

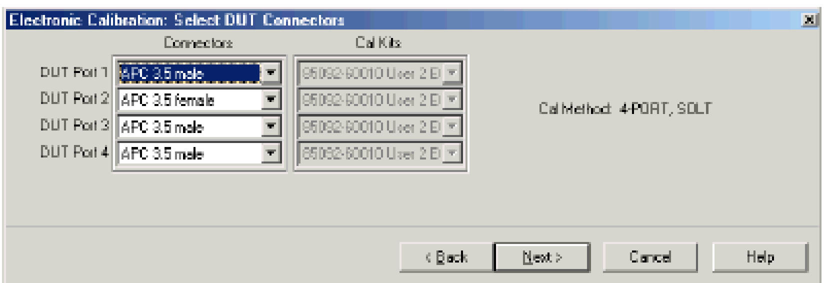
The current cal standards (or ECAL module) does not cover the current frequency range of the measurement. Do one of the following to correct the problem:

Frequency Change the frequency range of the active channel.

Edit This selection is not relevant to ECal modules.

Back Select a different characterization that covers the required frequency range.

Cancel Re-characterize the module with an increased frequency range.

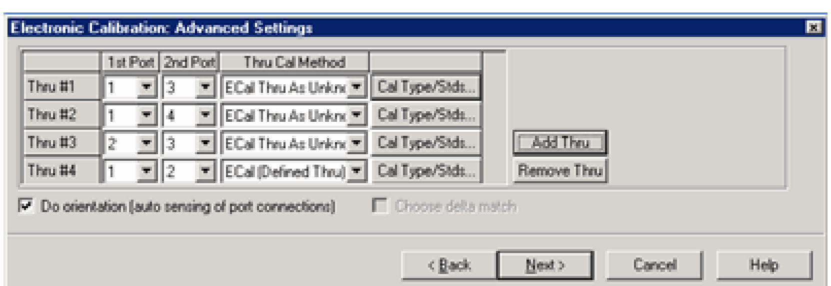


Select DUT Connectors and Cal Kits dialog box help

If the ECal module or selected User Characterization has more than one connector type, then the following dialog box is presented which allows you to describe the DUT connector type. Otherwise, click next to proceed to Advanced Settings (if checked) or ECal Steps.

Connectors

The available connectors are listed for each DUT port.



Advanced Settings dialog box help

Thru #n

Lists the proposed Thru connections to be made during the calibration process. You can change these Thru connections to better suit your test setup.

- The proposed Thru connections are listed automatically.
- Additional Thru connections can be selected for higher accuracy. Learn more.

Add Thru

Click to add a Thru connection. Learn more

Remove Thru

Select a Thru by clicking the "Thru #N" field or the "1st Port / 2nd Port" field. Then click "Remove Thru". This selection is NOT available if the selected Thru is required for the calibration.

1st Port / 2nd Port

Click to change the two ports to be included in the Thru connection. The order of the port numbers (1st or 2nd) is not critical.

Thru Cal Method

Lists the available Thru Cal methods for the specified port pairs.

Learn about ECal Thru Methods

Cal Type/ Stds

Click to invoke the View / Modify Properties of Cal dialog box

Do orientation

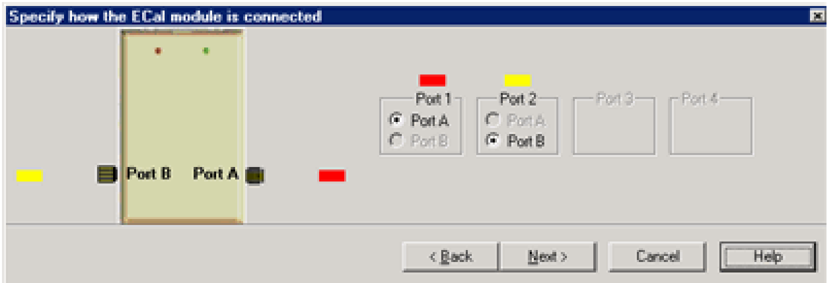
When this box is checked (default) the PNA automatically senses the model and direction in which an ECal module port is connected to the PNA ports. If power to the ECal module is too low, it will appear as if there is no ECal module connected. If you use low power and are having this problem, clear this check box to provide the orientation manually.

Orientation occurs first at the middle of the frequency range that you are calibrating. If a signal is not detected, it tries again at the lowest frequency in the range. If you have an **E8361A** or **E836xB** PNA and do an ECal completely within 10 - 20 MHz OR 60 - 67 GHz, you may need to do orientation manually. There may not be sufficient power to orient the ECal module at those frequencies.

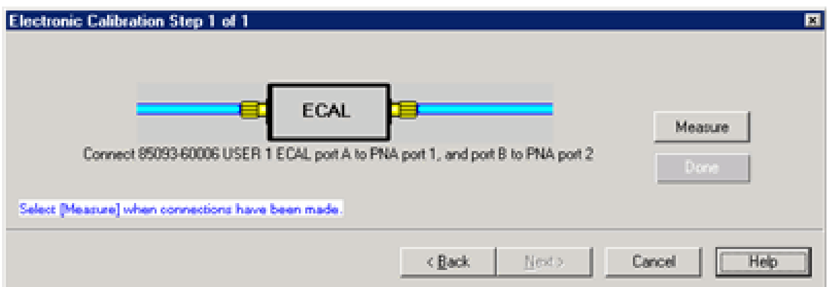
Choose delta match

Available only when a Delta Match Cal is required.

- Check, then click **Next** to invoke the Select Cal Set for Delta Match dialog box.
- Clear - The Cal Wizard uses the Global Delta Match Cal if available.



Specify how the ECal module is connected dialog box help
This dialog box appears when the **Do orientation** checkbox in the previous dialog box is cleared.
Click the ECal Port that is connected to each PNA port.



Electronic Calibration Steps dialog box help
Note: Beginning in PNA Rev. 6.0, ECal can be performed with External triggers. Learn more.
Displays the instructions for each measurement required for calibration.
Measure Measures the ECal standards.
Done Click when last standard has been measured.

Saving an ECal Calibration

When complete, you can save the new calibration. Learn how.

Last modified:

4-Sep-2007	Added First time note
14-Sep-2007	MX Added UI
Sept. 12, 2006	MQ Modified images for multiport

ECal User Characterization

- Overview
- How to Perform a User Characterization
- Restore ECal Module Memory

See also Using ECal

Other Calibration Topics

Overview

A user-characterized ECal module allows you to add adapters to the ECal module, re-measure the standards in the ECal module, INCLUDING the adapters, then add that data to ECal memory. This extends the reference plane from the module test ports to the adapters.

Why perform a user characterization?

- If you need to use adapters with your ECal module, you could characterize your ECal module with the adapters attached and perform subsequent ECals in a single step.
- If you have a 4-port ECal module, you could configure the module with adapters of different connector types, then perform a user characterization of the module. When you need to test a DUT with a pair of the connector types on your module, calibrate the PNA with a 1-step ECal using the same two connectors on the User-characterized module.
- If you test devices in a fixture, you could embed the characterization of the fixture in the characterization of the module. To do this, during the mechanical calibration portion of the user characterization, calibrate at the reference plane of the device as you would normally calibrate. Then remove the fixturing to be embedded and insert the ECal module to be characterized. When measuring the ECal module, the PNA removes the effects of the fixturing and stores the measurement results in the user characterized ECal module. Subsequent calibrations with that user characterized module will also remove the fixture effects.

Notes:

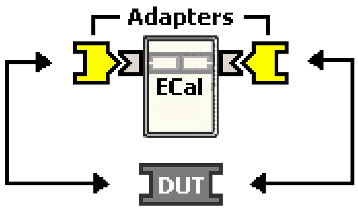
- User Characterization does not delete the factory characterization data. The factory data is saved in the ECal module in addition to the user characterization data.
- You can save up to five different user characterizations in a single ECal module. There are memory limitations; the PNA will determine if the contents of a user characterization will fit inside the module before it is performed. **Note:** This is a new feature with PNA Rev. 3.0. Previous versions of PNA will NOT recognize more than one user characterization.
- Both 2-port and 4-port ECal modules support user characterization.
- With PNA release 6.03, a user characterization can now be performed beyond the frequency range of the ECal module. Although this practice is allowed, calibration accuracy with the extended user characterization

is likely to be degraded. To determine the level of degradation, compare measurements of a variety of devices using a PNA with a mechanical cal kit calibration versus an ECal extended user characterization calibration.

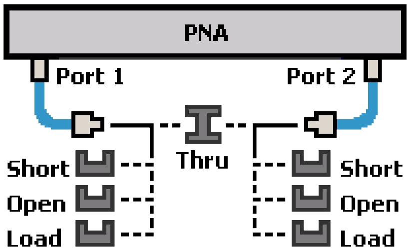
How to Perform a User Characterization

SUMMARY (A detailed procedure follows.)

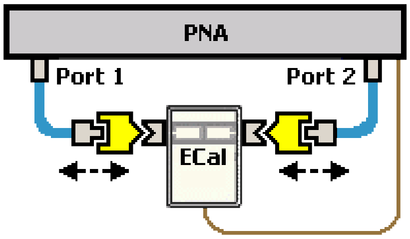
1. Select adapters for the module to match the connector configuration of the DUT.



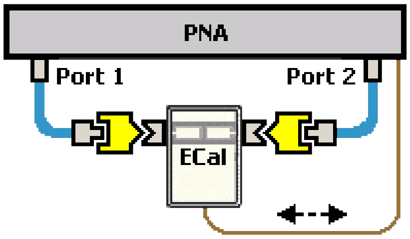
2. Either calibrate the PNA using mechanical standards or recall an existing Cal Set.



3. Measure the ECal module, including adapters, as though it were a DUT.



4. The measurement results are the characterization data that then gets stored inside the module.



Note

A 2-port PNA can be used to perform a User Characterization on a 4-port ECal module. However, a 4-port ECal module has SIX different port pairs. The PNA must be recalibrated for each port pair that uses unique connecter types or gender.

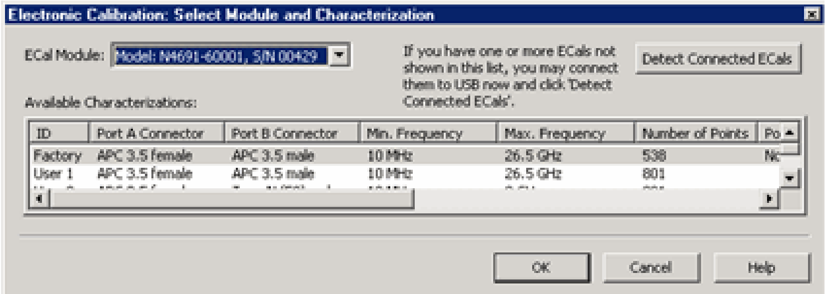
- If all 4 ECal module ports have the same connector type and gender, then only one PNA calibration is required to measure all six port pairs.
- If all 4 ECal module ports have different connector types or gender, then 6 calibrations are required.

When more than one PNA calibration is required during a User Characterization, then ALL calibrations must be performed using the standard Cal Wizard, saved to Cal Sets, and then recalled from Cal Sets DURING the User Characterization.

Detailed steps to Perform a User Characterization

1. Connect the ECal module to the network analyzer with the USB cable. See Connect ECal Module USB to PNA USB.
2. Allow the module to warm up until it indicates **READY**.
3. **Preset** the analyzer.
4. Set up the measurement. For best accuracy, the **IF bandwidth** should be set to **1 kHz** or less.
5. Start and complete the **Characterize ECal Module** Wizard:

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	No Programming commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Characterize ECal module**
For PNA-X and 'C' models	No Programming commands
1. Press CAL 2. then **[More]** 3. then **[ECal]** 4. then **[Characterize ECal module]**	1. Click **Response** 2. the **Cal** 3. then **More** 4. then **ECal** 5. then **Characterize ECal module**



Select Module and Characterization dialog box help

ECal Module Select one of the ECal modules that are connected to the PNA.

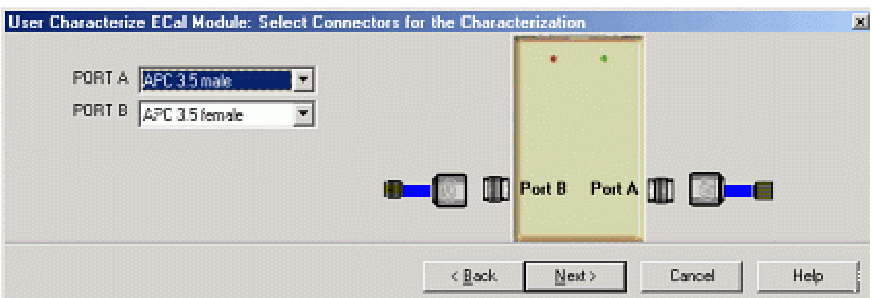
Detect Connected ECals Click to rescan the USB for ECal modules.

Available Characterizations Scroll to view all of the parameters of the stored characterizations. Select an empty location or select to overwrite an existing characterization.

Data can NOT be deleted from the ECal module.

Next Click to continue to the Select Connectors for the Characterization dialog box.

See note regarding extended frequency use.



Select Connectors for the Characterization dialog box help

Note: When performing an ECal User Characterization, do NOT use a custom connector **name** that you added to this list. If you need to use a custom-defined connector type, select "Type B", or one of the "Type A" variations from the list of connectors for each port.

Allows you to select the adapters for the ECal module test ports. Select **No adapter** if no adapter is used on a port.

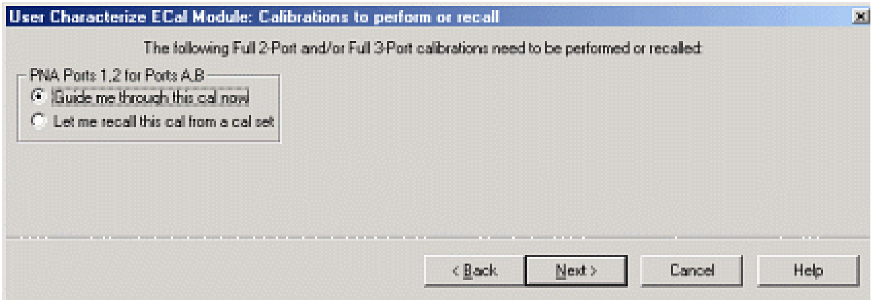
PORT A Lists the connector types available for Port A.

PORT B Lists the connector types available for Port B.

PORT C Lists the connector types available for Port C (available with a 4-port ECal module).

PORT D Lists the connector types available for Port D (available with a 4-port ECal module).

Next Click to continue to the Calibrations to perform or recall dialog box.



Calibrations to perform or recall dialog box help

The PNA must be calibrated before measuring the ECal module and necessary adapters. This dialog box displays the number and types of mechanical calibrations required for the characterization.

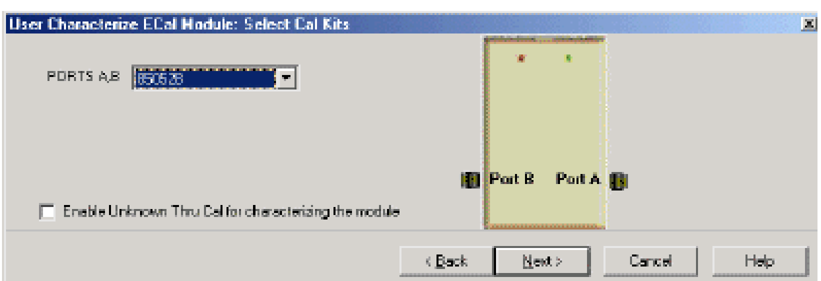
Guide me through this cal now Click to perform a Guided calibration. A calibration kit is required for each connector type.

Note: TRL calibrations can NOT be performed on a 4-port PNA during the calibration portion of a User Characterization. However, this type of Cal can be performed using the Cal Wizard, saved to a Cal Set, then recalled at this point in the User Characterization.

If more than one calibration is required, this selection is not available. See Note.

Let me recall this cal from a cal set Click to select an existing Cal Set. You cannot select a Cal Set that is currently in use. Learn more about Using Cal Sets.

Next Click to continue to either the Select Cal Kits or the Select Cal Set dialog box.



Select Cal Kits dialog box help

Provides a list of calibration kits to perform the calibration. Select the Cal Kit you will use for each port.

Enable Unknown Thru for characterizing the module Check to enable. This reduces the number of steps required to characterize the THRU standard. This setting is available only on PNA models with one reference receiver per test port.

Next Click to continue to the Select Cal Set dialog box.

Select Cal Set dialog box help

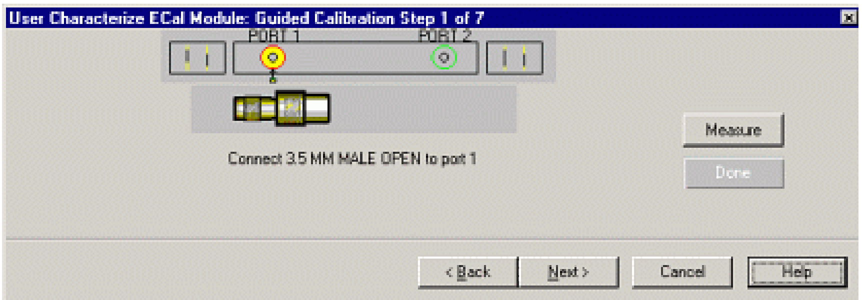
The calibration that you perform will be written to a Cal Set. This dialog box allows you to select a Cal Set to overwrite, or to write to a new Cal Set. The current choice is visible below the **Select Cal Set** button.

Select Cal Set Click to open the **Select A Cal Set** dialog box.

Create new Cal Set Check to create a new Cal Set to store the calibration. Clear to select and overwrite a stored Cal Set.

Next Click to continue to the Guided Calibration Steps dialog box.

Note: Remember the Cal Set name for future reference.



Guided Calibration Steps dialog box help

Instructs you to connect each calibration standard to the measurement port.

Measure Click to measure the standard.

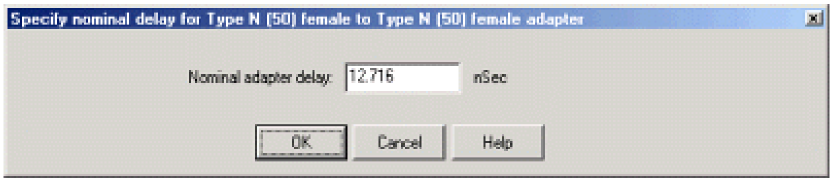
Back Click to repeat one or more calibration steps.

Done Click **after** a standard is re-measured and all measurements for the calibration are complete.

Next Click to continue to the next calibration step. (Does **not** measure the standard.)

Cancel Exits Calibration Wizard.

The **Specify nominal delay** or **Guided Calibration completed** dialog box appears when the steps are completed.



Specify nominal delay dialog box help

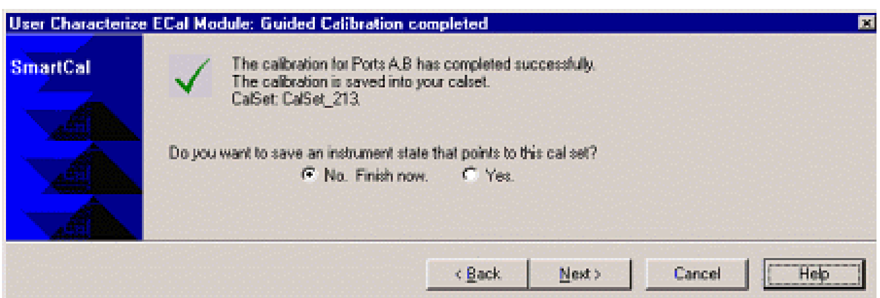
This dialog ONLY appears when Adapter Removal or Unknown Thru calibrations are performed.

The following values were estimated from the measurement. Most of the time, they are adequate. However, for CW sweep or frequency sweep with large step sizes, the accuracy of the values may be improved.

Nominal adapter delay To improve this value, measure and record the delay of the adapter with a dense step size. Enter that value here.

Nominal phase offset (Waveguide ONLY). To improve this value, measure and record the phase offset of the Waveguide adapter with dense step size. Enter that value here.

When one connector is coax and the other connector is waveguide, the phase offset has an ambiguity of 180 degrees. For consistency, the estimate provided here is always between 0 and 180 degrees. You can change this estimate to any value between -180 degrees and +180 degrees.



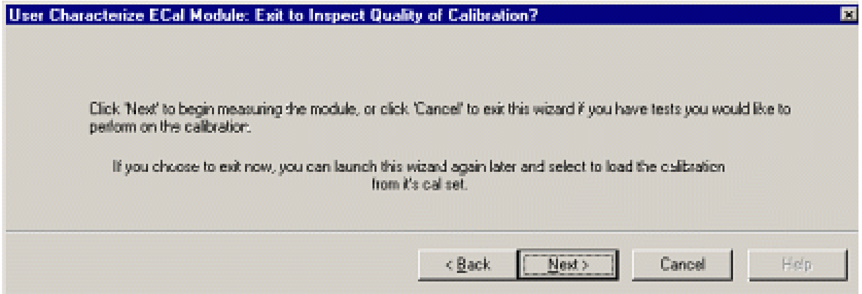
Guided Calibration completed dialog box help

Allows you to finish the calibration and continue to the next characterization steps.

No. Finish now Select to save Cal Set data.

Yes Allows selection of Save options.

Next Click to continue to the Exit to Inspect Quality of Calibration dialog box.



Exit to Inspect Quality of Calibration dialog box help

Allows you to exit User Characterization to validate the calibration before proceeding with the characterization.

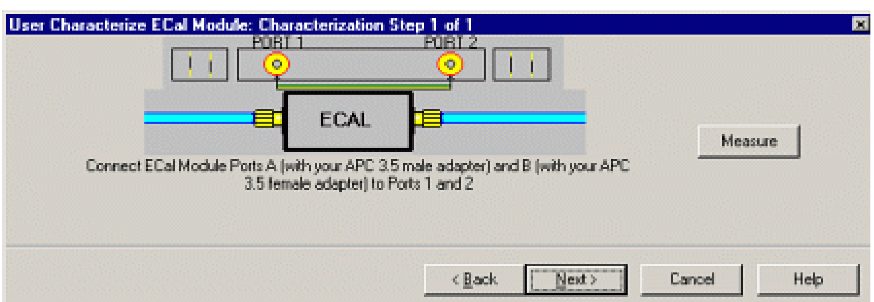
Back Allows you to repeat calibration.

Next Click to continue to the Characterization Steps dialog box.

Cancel Exits the Calibration.

To return to the current step:

1. Start User Characterization.
2. In the **Select user number for new characterization** dialog box, click **Next**.
3. In the **Select Connectors for Characterization** dialog box, click **Next**. (Previous entry is stored in memory.)
4. In the **Calibrations to perform or recall** dialog box, recall the Cal Set that you just performed.

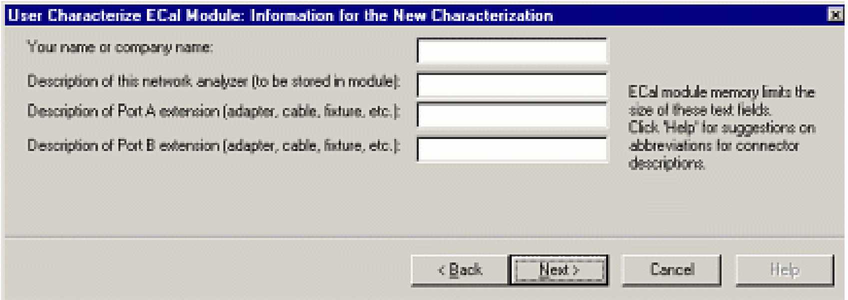


Characterization Steps dialog box help

Describes the instructions for each measurement required for characterization.

Measure Measures the ECal module.

Next Click to continue to the Information for the New Characterization dialog box when measurements are complete.



Information for the New Characterization dialog box help

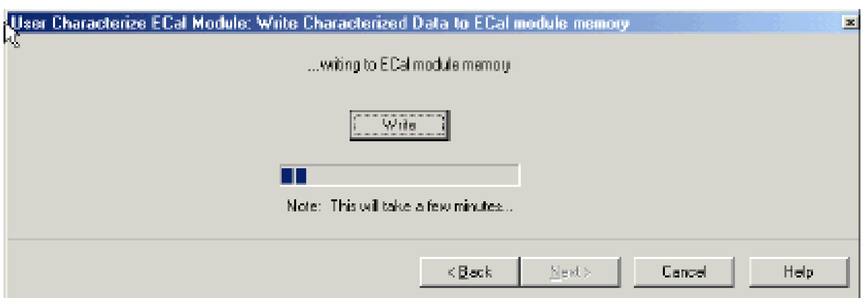
Allows you to describe the properties of the User Characterization.

Next Click to continue to the Write Characterized Data to the ECal module dialog box.

To minimize the number of characters, use the following 3-character codes to describe the connectors listed.

Connector Type	3-Character Code
1.0 mm female	10F
1.0 mm male	10M
1.85 mm female	18F
1.85 mm male	18M
2.4 mm female	24F
2.4 mm male	24M
2.92 mm female	29M
2.92 mm male	29F
3.5 mm female	35F
3.5 mm male	35M
7-16 female	16F
7-16 male	16M
Type F female	F7F
Type F male	F7M
N50 female	N5F
N50 male	N5M

N75 female	N7F
N75 male	N7M
APC 7	7MM
K-band waveguide	KBW
P-band waveguide	PBW
Q-band waveguide	QBW
R-band waveguide	RBW
U-band waveguide	UBW
V-band waveguide	VBW
W-band waveguide	WBW
X-band waveguide	XBW



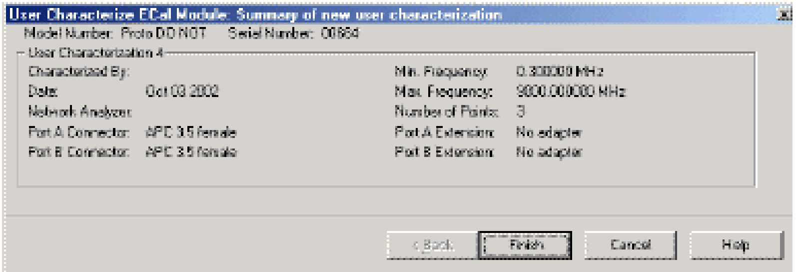
Write Characterized Data to the ECal module memory dialog box help

The PNA writes User Characterization and factory characterization data to the ECal module memory. For more information, see Restore ECal module memory.

Write Click to write data into the ECal module.

The **Summary of new user characterization** dialog box opens after data is saved to module.

Data can NOT be deleted from the ECal module.



Summary of new user characterization dialog box help
Verify the status of the ECal User Characterization. • ECal module model number • summary from user characterization **Cancel** Click to exit (characterization complete). **Finish** Click to exit (characterization complete).

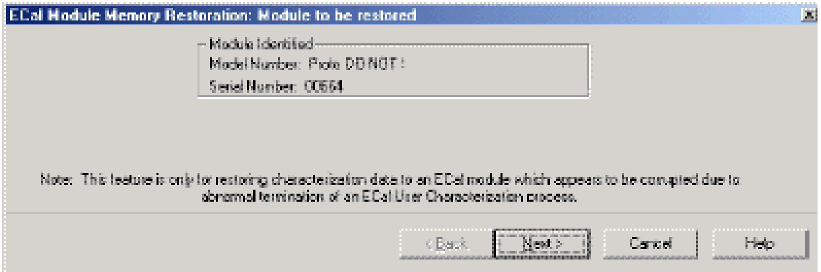
Restore ECal Module Memory

When user-characterized data is written to the ECal module, the entire contents of ECal memory is also written to the PNA hard drive. In the unlikely event that your ECal module memory is lost, you can restore the user-characterized data to ECal memory.

How to Restore ECal Module Memory

Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	No Programming commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Service** 3. then **Utilities** 4. then **Restore...**
For PNA-X and 'C' models	No Programming commands
1. Press SYSTEM 2. then **[Service]** 3. then **[Utilities]** 4. then **[Restore...]**	1. Click **Utility** 2. then **System** 3. then **Service** 4. then **Utilities**

	5. then **Restore...**



Module to be restored dialog box help
Verify the Serial number of the module to be restored. If two modules are connected to the PNA , choose the one to have data restored. **Next** Click to write data to the module.

Last modified:

April 25, 2007	Added note about can NOT delete data.
Sept. 20, 2006	MX Modified for cross-browser

TRL Calibration

TRL (Thru, Reflect, Line) represents a **family** of calibration techniques that measure two transmission standards and one reflection standard to determine the 2-port 12-term error coefficients. For example, **TRM** (Thru, Reflect, Match), **LRL** (Line, Reflect, Line), **LRM** (Line, Reflect, Match) are all included in this family.

The traditional SOLT calibration measures one transmission standard (T) and three reflection standards (SOL) to determine the same error coefficients.

See other Calibration Topics

Why Perform a TRL Cal?

TRL calibration is extremely accurate, in most cases more accurate than an SOLT cal. However, very few calibration kits contain TRL standards. TRL Cal is most often performed when you require a high level of accuracy and do not have calibration standards in the same connector type as your DUT. This is usually the case when using test fixtures, or making on-wafer measurements with probes. Therefore, in some cases you must construct and characterize standards in the same media type as your DUT configuration. It is easier to manufacture and characterize three TRL standards than the four SOLT standards.

Another advantage of TRL calibration is that the TRL standards need not be defined as completely and accurately as the SOLT standards. While SOLT standards are completely characterized and stored as the standard definition, TRL standards are modeled, and not completely characterized. However, TRL cal accuracy is directly proportional to the quality and repeatability of the TRL standards. Physical discontinuities, such as bends in the transmission lines and beads in coaxial structures, will degrade the TRL calibration. The connectors must be clean and allow repeatable connections.

To learn more about Cal Standard requirements, see Cal Standards Used in TRL.

The TRL Cal Process

Although TRL can be performed using the Cal Wizard Unguided Cal selection, the following process uses the easier SmartCal selection. Both selections require that you already have TRL calibration standards defined and included in a PNA cal kit.

1. Preset the PNA
2. Set up a S-parameter measurement and the desired stimulus settings.
3. Click **Calibration / Calibration Wizard**

4. Click **SmartCal** (**Guided Cal).**
5. Select the DUT connectors and Cal Kit for each port. The LOWEST port number of each port pair MUST include TRL standards. TRL appears as the Cal Method.
6. Check **Modify Cal, Next**, then **View/Modify** to change default TRL options if necessary.
7. Follow the prompts to complete the calibration.
8. Check the accuracy of the calibration

TRL Cal Kits

Agilent Technologies offers two cal kits that include the required standards to perform a TRL calibration: 85050C (APC 7mm) and 85052C (3.5mm). Both kits include the traditional Short, Open, and Load standards. (The Thru standard, not actually supplied, assumes a zero-length Thru). In addition, the kits include an airline which is used as the LINE standard. To use the airline, the kits include an airline body, center conductor, and insertion / extraction tools. The APC 7 kit includes an adapter to connect the airline to the APC connector.

Cal Standards Used in TRL

These standards must be defined in your TRL cal kit:

THRU

Note: All THRU calibration methods are supported in a TRL Cal **EXCEPT** Unknown Thru.

- The THRU standard can be either a zero-length or non-zero length. However, a zero-length THRU is more accurate because it has zero loss and no reflections, by definition.
- The THRU standard cannot be the same electrical length as the LINE standard.
- If the insertion phase and electrical length are well-defined, the THRU standard may be used to set the reference plane.
- Characteristic impedance of the THRU and LINE standards defines the reference impedance of the calibration.

REFLECT

- The REFLECT standard can be anything with a high reflection, as long as it is the same when connected to both PNA ports.
- The actual magnitude of the reflection need not be known.
- The phase of the reflection standard must be known within 1/4 wavelength.
- If the magnitude and phase of the reflection standard are well-defined, the standard may be used to set the reference plane.

LINE

The LINE and THRU standards establish the reference impedance for the measurement after the calibration is completed. TRL calibration is limited by the following restrictions of the LINE standard:

- Must be of the same impedance and propagation constant as the THRU standard.
- The electrical length need only be specified within 1/4 wavelength.
- Cannot be the same length as the THRU standard.
- A TRL cal with broad frequency coverage requires multiple LINE standards. For example, a span from 2 GHz to 26 GHz requires two line standards.
- Must be an appropriate electrical length for the frequency range: at each frequency, the phase difference between the THRU and the LINE should be greater than 20 degrees and less than 160 degrees. This means in practice that a single LINE standard is only usable over an 8:1 frequency range (Frequency Span / Start Frequency). Therefore, for broad frequency coverage, multiple lines are required.
- At low frequencies, the LINE standard can become too long for practical use. The optimal length of the LINE standard is 1/4 wavelength at the geometric mean of the frequency span (square root of f1 x f2).

MATCH

If the LINE standard of appropriate length or loss cannot be fabricated, a MATCH standard may be used instead of the LINE.

- The MATCH standard is a low-reflection termination connected to both Port 1 and Port 2.
- The MATCH standard may be defined as an infinite length transmission line OR as a 1-port low reflect termination, such as a load.
- When defined as an infinite length transmission line, both test ports must be terminated by a MATCH standard at the same time. When defined as a 1-port load standard, the loads are measured separately. The loads are assumed to have the same characteristics.
- The impedance of the MATCH standard becomes the reference impedance for the measurement. For best results, use the same load on both ports. The load may be defined using the data-based definition, the arbitrary impedance definition, or the fixed load definition.

See Modify Calibration Kits for detailed information about creating and modifying Calibration kit definitions.

Find more information about TRL standards at http://www.tm.agilent.com. Click "Technical Support". Use "Application Notes" to search for App Note 8510-5A (part number 5956-4352). Although the application note is written for the Agilent 8510 Series Network Analyzers, it also applies to the PNA.

TRL on a 4-port PNA and with an External Test Set

Beginning with the PNA code revision 5.25, TRL CAN be performed on a 4-port PNA and with an External Test Set enabled. Previously, a TRL calibration required a PNA with a reference receiver for each test port. With the new TRL method, a Delta Match Calibration is first performed and applied.

The accuracy of this TRL cal greatly depends on the accuracy of the Delta Match Calibration. With an accurate Delta Match Calibration, the difference in accuracy between a traditional TRL cal and this TRL cal is negligible.

How to Perform a TRL Cal on a multiport PNA

1. Click **Calibration, Cal Wizard.**
2. Select a TRL cal kit for the ports to be calibrated.
3. During the calibration, the Cal Wizard prompts you for a valid Delta Match Cal.

Last modified:

9/12/06 with Ext Test Set

Calibration Preferences Wizard

The following Cal Preferences are set from this Wizard:

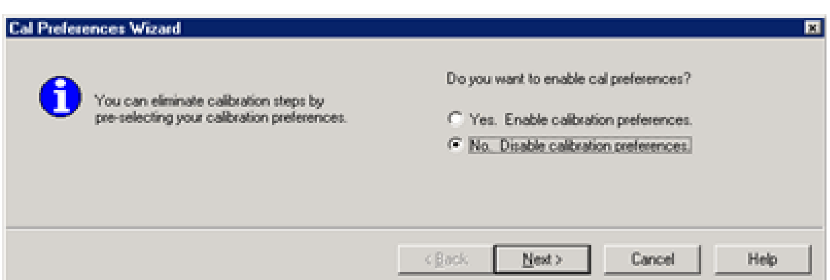
1. Whether or not to show the first 'Method' Page of the Cal Wizard
2. Select and order the Cal Types that are available during a SmartCal with Mechanical Standards
3.

To change either of these choices, you must select **Yes, Enable the calibration preferences** at the first Wizard page.

How to change Cal Preferences

Programming commands are NOT available for the preference settings discussed in this topic, although there are other Cal Preferences that can be set remotely.

Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Cal Preferences**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[Start Cal]** 3. then **[Preferences]**	1. Click **Response** 2. then **Cal** 3. then **Start Cal** 4. then **Preferences**

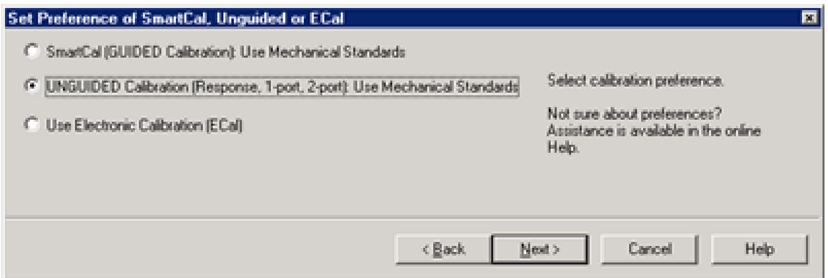


Cal Preferences Wizard dialog box help

Use this dialog to change either of the following preferences:

- Show or Hide the first page of the Cal Wizard
- Select order of calibrations that are offered.

To change either of these choices, you must select **Yes, Enable the calibration preferences**.



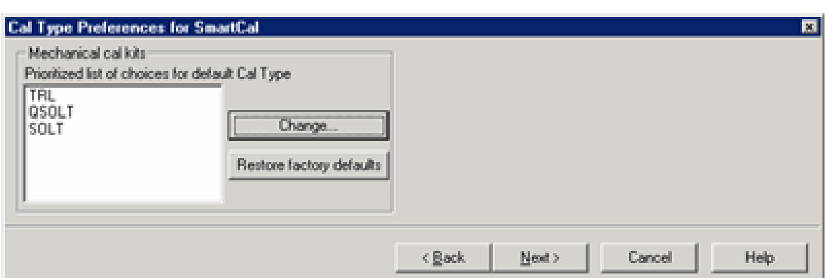
Cal Preferences of... dialog box help

Use this dialog to change which Cal method to perform.

After making this selection, the first page of the Cal Wizard will not be shown on subsequent calibrations.

If you ONLY want to change the order of Cal Types that are offered (next page of the Cal Preferences), you must do the following:

1. Select one of these choices and click **Next**.
2. Select and order the Cal Types, then click **Next**
3. Click **Finish**
4. Click **Cal**, then **Cal Wizard**.
5. On the first Cal Wizard page that shows, click **Back,** then clear the **Preferences** checkbox.



Cal Type Preferences dialog box help

This dialog is used to set which Cal Types are available, and the order in which they are selected as the default choice, during a SmartCal with Mechanical Standards. This setting is also used to set the default Cal Type for Guided calibrations using SCPI or COM.

The specified Cal Type order should allow you to make fewer changes to the Cal Type during a SmartCal with Mechanical Standards.

For example, in the above image, the first Cal Type on the list is TRL. When doing a SmartCal with Mechanical Standards:

- If a TRL Cal Kit is available for the specified DUT connectors, then TRL becomes the default Cal Type.
- If a TRL Cal Kit is NOT available, then the second Cal Type on the list (SOLT) is evaluated for compatibility with the available Cal Kits, and so forth with the Cal Types that remain on the list.
- If TRL is removed from the list, that Cal Type is NOT available for selection during a SmartCal with Mechanical Standards.

Learn more about Cal Types.

See where you choose Cal Type during a SmartCal

Prioritized list of choices for default Cal Type Shows the current list of Cal Types and the order in which they will be selected for Mechanical calibrations.

Change Click to invoke the Modify list of default Cal Types dialog.

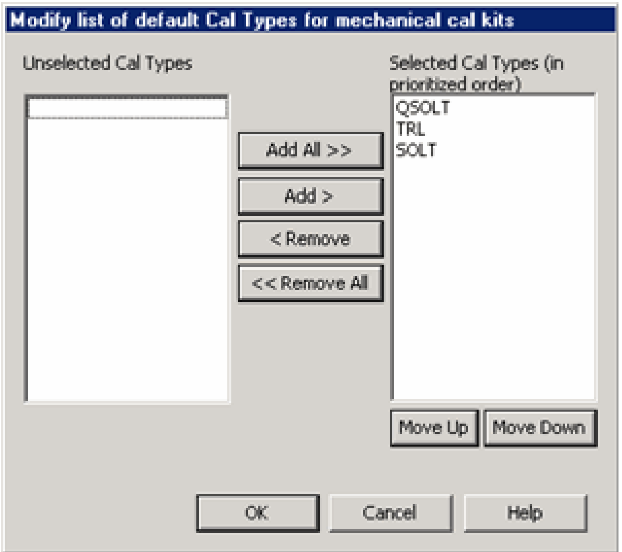
Restore factory defaults Returns the list to the original selections and order. The factory defaults are in order of accuracy from highest (TRL) to lowest (QSOLT).

Cancel Closes the dialog without making changes.

Notes:

- Your Cal Type settings are saved only until the PNA application is closed. When re-opened, the factory default settings are restored.

Learn more about QSOLT Calibration



Modify list of default Cal Types dialog box help

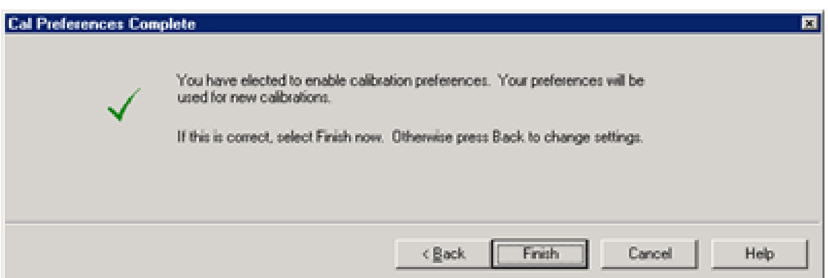
Use this dialog to Add, Remove, and re-order the available Cal Types. There must be at least ONE selected Cal Type to perform a SmartCal with Mechanical Standards.

Unselected Cal Types Cal Types in this list will not be presented as a choice during a Calibration.

Selected Cal Types Cal Types in this list will be presented, in order, as the default choice during a Calibration. Click a Cal Type to select it, then click the following buttons to perform that operation.

Add / Remove buttons Click to Add and Remove the selected Cal Types from the Selected Cal Types list.

Move Up / Down Click to re-order the Selected Cal Types list.



Cal Preferences Complete dialog box help

Either Enable or Disable Cal Preferences.

Do you want to select ONLY Cal Type Preferences and continue to show the first Cal Wizard page? Learn how.

Last Modified:

1-Jan-2007 MX added UI

Measurement Errors

You can improve accuracy by knowing how errors occur and how to correct for them. This topic discusses the sources of measurement error and how to monitor error terms.

See other Calibration Topics

Drift Errors

Drift errors are due to the instrument or test-system performance changing after a calibration has been done.

Drift errors are primarily caused by thermal expansion characteristics of interconnecting cables within the test set and conversion stability of the microwave frequency converter and can be removed by re-calibrating.

The time frame over which a calibration remains accurate is dependent on the rate of drift that the test system undergoes in your test environment.

Providing a stable ambient temperature usually minimizes drift. For more information, see Measurement Stability.

Random Errors

Random errors are not predictable and cannot be removed through error correction. However, there are things that can be done to minimize their impact on measurement accuracy. The following explains the three main sources of random errors.

Instrument Noise Errors

Noise is unwanted electrical disturbances generated in the components of the analyzer. These disturbances include:

- Low level noise due to the broadband noise floor of the receiver.
- High level noise or jitter of the trace data due to the noise floor and the phase noise of the LO source inside the test set.

You can reduce noise errors by doing one or more of the following:

- Increase the source power to the device being measured - ONLY reduces low-level noise.

- Narrow the IF bandwidth.
- Apply several measurement sweep averages.

Switch Repeatability Errors

Mechanical RF switches are used in the analyzer to switch the source attenuator settings.

Sometimes when mechanical RF switches are activated, the contacts close differently from when they were previously activated. When this occurs, it can adversely affect the accuracy of a measurement.

You can reduce the effects of switch repeatability errors by avoiding switching attenuator settings during a critical measurement.

Connector Repeatability Errors

Connector wear causes changes in electrical performance. You can reduce connector repeatability errors by practicing good connector care methods. See Connector Care.

Systematic Errors

Systematic errors are caused by imperfections in the analyzer and test setup.

- They are repeatable (and therefore predictable), and are assumed to be time invariant.
- They can be characterized during the calibration process and mathematically reduced during measurements.
- They are never completely removed. There are always some residual errors due to limitations in the calibration process. The residual (after measurement calibration) systematic errors result from:
  - imperfections in the calibration standards
  - connector interface
  - interconnecting cables
  - instrumentation

Reflection measurements generate the following three systematic errors:

- **Directivity**
- **Source Match**
- **Frequency Response Reflection Tracking**

Transmission measurements generate the following three systematic errors:

- **Isolation**
- **Load Match**
- **Frequency Response Transmission Tracking**

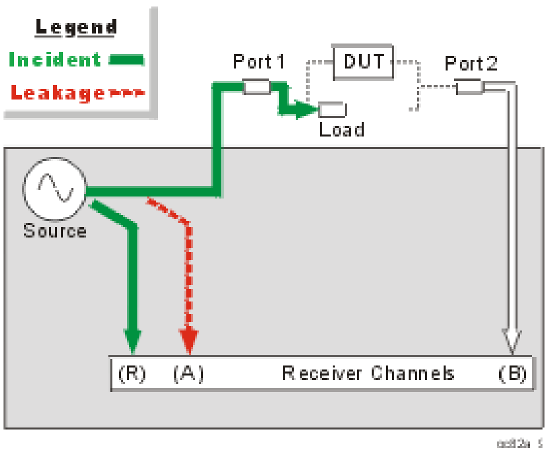
Notes about the following Systematic Error descriptions:

- The figures for the following six systematic errors show the relevant hardware configured for a forward measurement. For reverse measurements, internal switching in the analyzer makes Port 2 the source and Port 1 the receiver. 'A' becomes the transmitted receiver, 'B' becomes the reflected receiver, and 'R2' becomes the reference receiver. These six systematic errors, times two directions, results in 12 systematic errors for a two port device.
- For simplicity, it may be stated that ONE standard is used to determine each systematic error. In reality, ALL standards are used to determine ALL of the systematic errors.
- The following describes an SOLT calibration. This does not apply to TRL, or other types of calibration.

Directivity Error

All network analyzers make reflection measurements using directional couplers or bridges.

With an ideal coupler, only the reflected signal from the DUT appears at the 'A' receiver. In reality, a small amount of incident signal leaks through the forward path of the coupler and into the 'A' receiver. This leakage path, and any other path that allows energy to arrive at the 'A' receiver without reflecting off the DUT, contributes to directivity error.



How the Analyzer Measures and Reduces Directivity Error.

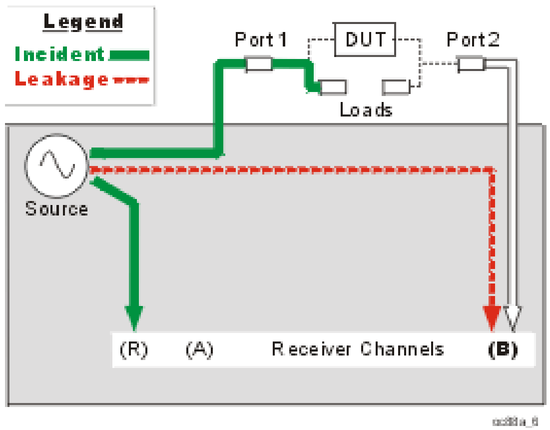
1. During calibration, a load standard is connected to Port 1. We assume no reflections from the load.
2. The signal measured at the 'A' receiver results from the incident signal leakage through the coupler and other paths.
3. Directivity error is mathematically removed from subsequent reflection measurements.

Isolation Error

Ideally, only signal transmitted through the DUT is measured at the 'B' receiver.

In reality, a small amount of signal leaks into the 'B' receiver through various paths in the analyzer.

The signal leakage, also known as crosstalk, is isolation error which can be characterized and reduced by the analyzer.



How the Analyzer Measures and Reduces Isolation Error

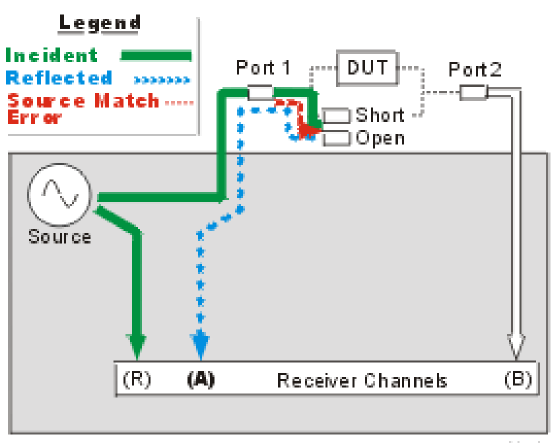
1. During calibration, load standards are connected to both Port 1 and Port 2.
2. The signal measured at the 'B' receiver is leakage through various paths in the analyzer.
3. This isolation error is mathematically removed from subsequent transmission measurements.

Source Match Error

Ideally in reflection measurements, all of the signal that is reflected off of the DUT is measured at the 'A' receiver.

In reality, some of the signal reflects off the DUT, and multiple internal reflections occur between the analyzer and the DUT. These reflections combine with the incident signal and are measured at the 'A' receiver, but not at the 'R' receiver.

This measurement error is called source match error which can be characterized and reduced by the analyzer.



How the Analyzer Measures and Reduces Source Match Error

1. During calibration, all reflection standards are connected to Port 1. Known reflections from the standards are measured at the 'A' receiver.
2. Complex math is used to calculate source match error.

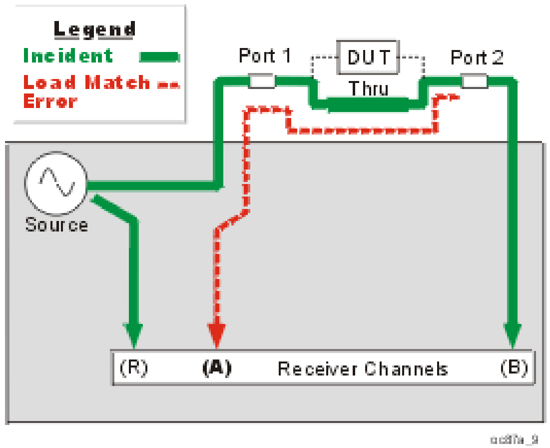
3. Source match error is mathematically removed from subsequent reflection and transmission measurements.

Load Match Error

Ideally in transmission measurements, an incident signal is transmitted through the DUT and is measured at the 'B' receiver.

In reality, some of the signal is reflected off of Port 2 and other components and is not measured at the 'B' receiver.

This measurement error is called load match error which can be characterized and reduced by the analyzer.



How the Analyzer Measures and Reduces Load Match Error

1. The Port 1 and Port 2 test connectors are mated together for a perfect zero-length thru connection. If this is not possible, a characterized thru adapter is inserted. This allows a known amount of incident signal at Port 2.
2. The signal measured at the 'A' receiver is reflection signal off of Port 2
3. The resulting load match error is mathematically removed from subsequent transmission and reflection measurements.

Frequency Response Reflection Tracking Error

Reflection measurements are made by comparing signal at the 'A' receiver to signal at the 'R1' receiver. This is called a ratio measurement or "A over R1" (A/R1).

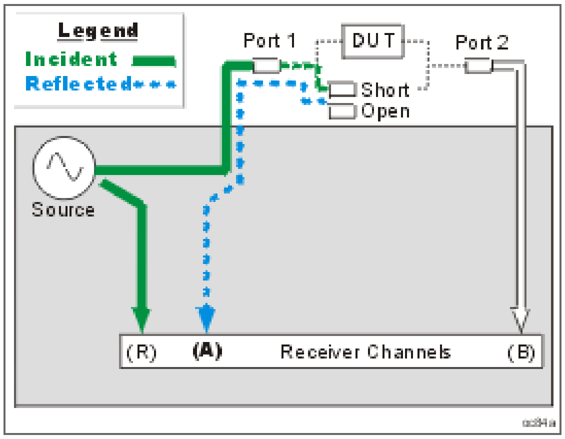
For ideal reflection measurements, the frequency response of the 'A' and 'R1' receivers would be identical.

In reality, they are not, causing a frequency response reflection tracking error. This is the vector sum of all test variations in which magnitude and phase change as a function of frequency. This includes variations contributed by:

- signal-separation devices
- test cables
- adapters

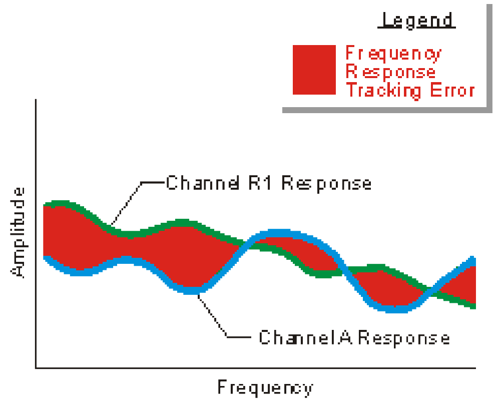
- variations between the reference and test signal paths

Frequency response reflection tracking error can be characterized and reduced by the analyzer.



How the Analyzer Measures and Reduces Frequency Response Reflection Tracking Error.

1. During calibration, all reflection standards are used to determine reflection tracking.
2. The average 'A' receiver response is compared with the 'R1' receiver response.
3. Complex math is used to calculate Frequency Response Reflection Tracking Error (see the following diagram). This frequency response reflection tracking error is mathematically removed from subsequent DUT measurements.



Note: In reflection response calibrations, only a single calibration standard is measured (open or short) and thus only its contribution to the error correction is used.

Frequency Response Transmission Tracking Error

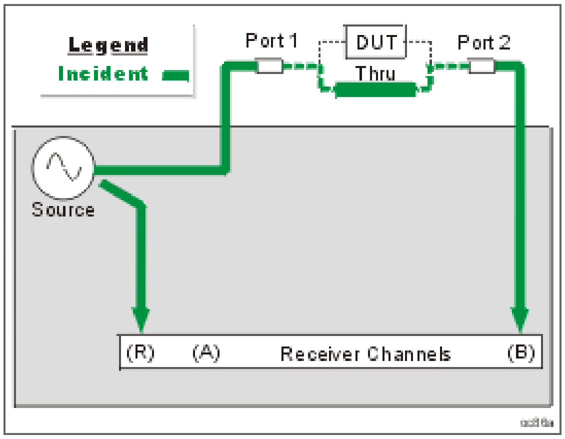
Transmission measurements are made by comparing signal at the 'B' receiver to signal at the 'R1' receiver. This is called a ratio measurement or "B over R1" (B/R1).

For ideal transmission measurements, the frequency response of the 'B' and 'R1' receivers would be identical.

In reality, they are not, causing a frequency response transmission tracking error. This is the vector sum of all test variations in which magnitude and phase change as a function of frequency. This includes variations contributed by:

- signal-separation devices
- test cables
- adapters
- variations between the reference and test signal paths

Frequency response transmission tracking error can be characterized and reduced by the analyzer.

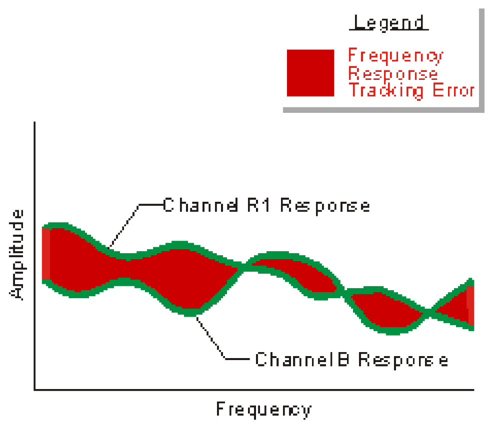


How the Analyzer Measures and Reduces Frequency Response Transmission Tracking Error.

1. During calibration, the Port 1 and Port 2 test connectors are mated together for a perfect zero-length thru connection. If this is not possible, a characterized thru adapter is inserted. This allows a known amount of incident signal to reach Port 2.

2. Measurements are made at the 'B' and 'R1' receivers.

3. Complex math is used to calculate Frequency Response Transmission Tracking Error (see the following diagram). This frequency response transmission tracking error is mathematically removed from subsequent DUT measurements.



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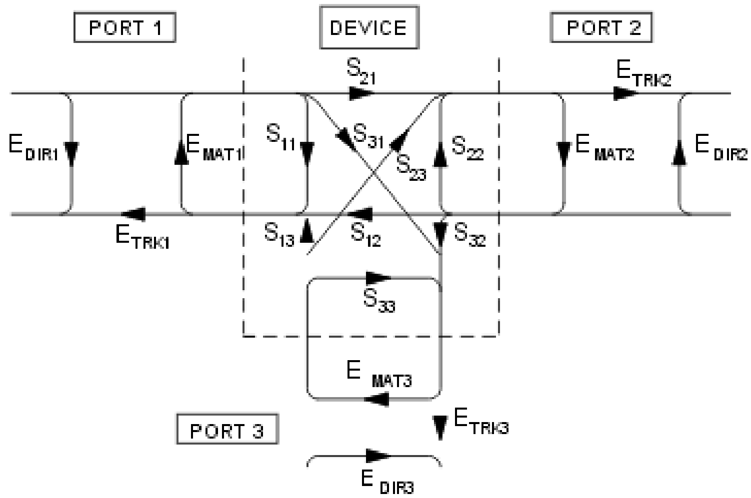
3-Port Error Terms

The following flow diagram displays the 3-port error term model:



where:

E = error term

DIR = Directivity

MAT = Forward Source Match and Reverse Load Match

TRK = Forward Reflection Tracking and Reverse Transmission Tracking

4-Port error terms

A full 4-port calibration requires the following terms:

Learn about the port numbering convention for error terms.

		Source Port			
		1	**2**	**3**	**4**
	1	DIR 1,1 RTRK 1,1 SRM 1,1	LDM 1,2 TTRK 1,2 XTLK 1,2	LDM 1,3 TTRK 1,3 XTLK 1,3	LDM 1,4 TTRK 1,4 XTLK 1,4
Rec	**2**	LDM 2,1 TTRK 2,1 XTLK 2,1	DIR 2,2 RTRK 2,2 SRM 2,2	LDM 2,3 TTRK 2,3 XTLK 2,3	LDM 2,4 TTRK 2,4 XTLK 2,4
P		LDM 3,1	LDM 3,2	DIR 3,3	LDM 3,4

o r t	**3**	TTRK 3,1 XTLK 3,1	TTRK 3,2 XTLK 3,2	RTRK 3,3 SRM 3,3	TTRK 3,4 XTLK 3,4
	4	LDM 4,1 TTRK 4,1 XTLK 4,1	LDM 4,2 TTRK 4,2 XTLK 4,2	LDM 4,3 TTRK 4,3 XTLK 4,3	DIR 4,4 RTRK 4,4 SRM 4,4

Reflection terms

- DIR: Directivity
- RTRK: Reflection Tracking
- SRM: Source Match

Transmission terms

- LDM:Load Match
- TTRK: Transmission Tracking
- XTLK: Cross Talk

How can we measure only 3 THRU connections?

On a 4-port PNA, a full 4-port cal can be performed while measuring only 3 THRU connections. Measuring more than 3 THRU connections will give higher accuracy.

By measuring all of the reflection terms, and 3 transmission THRU connections, there is adequate information available to calculate the remaining transmission terms. The following is a high level explanation of the concept. The actual calculations are much more complex.

To simplify, let's substitute letters (A,B,C,D) for port numbers from the diagram above so that they can be combined without confusion. Also for simplicity, let's assume that the source match and directivity errors are zero.

	A	**B**	**C**	**D**
A	AA	AB	AC	AD
B	BA	BB	BC	BD
C	CA	CB	CC	CD
D	DA	DB	DC	DD

- The reflection errors are all measured (AA, BB, CC, DD).
- Lets assume we measure a THRU between ports AB, AC, AD. The reverse direction for these THRUs are

also measured at the same time (BA, CA, DA).

- The terms left to calculate are BC, CB, BD, DB, CD, DC.

The following shows how the BC term is calculated from BA and AC:

$$\frac{BA * AC}{AA} = \frac{B * \cancel{AA} * C}{\cancel{AA}} = BC$$

Similarly:

- CB is calculated from CA and AB
- BD is calculated from BA and AD
- DB is calculated from AB and DA
- CD is calculated from CA and AD
- DC is calculated from DA and AC

Monitoring Error Terms using Cal Set Viewer

You can use **Cal Set Viewer** to monitor the measured data and the calculated error term. This will help to determine the health of your PNA and the accuracy of your measurements.

By printing or saving the error terms, you can periodically compare current error terms with previously recorded error terms that have been generated by the same PNA, measurement setup, and calibration kit. If previously generated values are not available, refer to Typical Error Term Data in Appendix A, "Error Terms", of the Service Guide.

Note: The service guide for your PNA is available at http://www.agilent.com/find/pna
It is also on the CDROM that was shipped with your PNA.

- A stable system should generate repeatable error terms over about six months.
- A sudden shift in error terms over the same frequency range, power, and receiver settings, may indicate the need for troubleshooting system components. For information on troubleshooting error terms, see Appendix A , "Error Terms", of the Service Guide.
- A subtle, long-term shift in error terms often reflects drift or connector and cable wear. The cure is often as simple as cleaning and gauging connectors or inspecting cables.

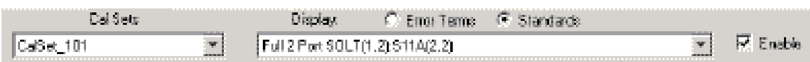
Viewing Cal Set Data

- Existing measurement traces are unaffected by the Cal Set Viewer.
- The Cal Set data trace is presented in the highest unused channel number (usually 32) in the active window.
- The Cal Set data trace is labeled as S11 in the status bar regardless of the type of error term or standard.
- Only one Cal Set error term or standard data can be viewed at a time. However, a data trace can be stored into memory and then compared to other data traces.

How to access Cal Set Viewer

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Cal Set Viewer**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[Manage Cals]** 3. then **[Cal Set Viewer]**	1. Click **Response** 2. then **Cal** 3. then **Manage Cals** 4. then **Cal Set Viewer**

How to use Cal Set Viewer



1. Use the down arrow to select a Cal Set. Then click either:
    - **Error Terms** - calculated data.
    - **Standards** - the raw measurement data of the Standard. **ONLY** available with Unguided Cal (not ECal or Guided Cal).
2. Use the down arrow to select an error term or standard to view.
3. Select the **Enable** check box to view the data on the PNA screen.

Port numbering convention for error terms is the same as for S-Parameters:
`E Term (Receiver, Source)` with the following exceptions:

- Load Match (2,1) - The match of port 2 which is measured by making an S11 measurement.
- Load Match (1,2) - The match of port 1 which is measured by making an S22 measurement.
- Transmission Tracking (2,1) - The port 2 receiver relative to the port 1 reference. (source=port 1).
- Transmission Tracking (1,2) - The port 1 receiver relative to the port 2 reference. (source=port 2).

- And so forth for multiport calibrations.

Last modified:

March 10, 2008	MX Updated UI

Modify Calibration Kits

You can create or modify calibration kit files using Advanced Modify Cal Kits.

- **About Modifying Calibration Kits**
- **Creating a New Cal Kit from an Existing Cal Kit**
- **Creating Custom Calibration Kits using a New Connector Family**
- **How to Modify Cal Kits**
- **Calibration Class Assignments**
- **Waveguide Cal Kits**

Note: For a detailed discussion of Cal Kits and standards, see App Note 1287-11.

See other Calibration Topics

About Modifying Calibration Kits

You can modify calibration kit files or create a custom one.

Note: You CAN modify Data-based Cal Kits. Learn how.

For most applications, the default calibration kit models provide sufficient accuracy for your calibration. However, several situations exist that may require you to create a custom calibration kit:

- Using a connector interface different from those used in the predefined calibration kit models.
- Using standards (or combinations of standards) that are different from the predefined calibration kits. For example, using three offset SHORTs instead of an OPEN, SHORT, and LOAD to perform a 1-port calibration.
- Improving the accuracy of the models for predefined kits. When the model describes the actual performance of the standard, the calibration is more accurate. (Example: A 7 mm LOAD is determined to be 50.4O instead of 50.0O.)
- Modifying the THRU definition when performing a calibration for a non-insertable device.
- Performing a TRL calibration.

Creating a New Cal Kit from an Existing Cal Kit

You can create a new custom Cal Kit using a copy of an existing Cal Kit as a starting point. Here is how:

1. From the Edit PNA Cal Kits dialog, click **Import Kit** to load the Cal Kit you want to use as a starting point. A "Duplicate Name..." message appears. Click **OK** to load a duplicate copy of the Cal kit into the last position of the Edit PNA Cal Kits dialog.

2. Select the imported kit.

3. Click **Edit Kit**, then change the Cal Kit Name and Description.

4. Click **Installed Kits - Save As** to save the new Cal Kit to a .ckt file.

5. Recommended: Also click **Edit PNA Cal Kits - Save As** to save the entire collection of Cal Kits to a .wks file.

6. If using a new or modified connector, click Change Family to change the connector family.

7. Click **Add or Edit** to change connector descriptions and parameters.

8. Make modifications to your new custom Cal Kit as required. Save your work by clicking **Installed Kits - Save As**

Note: Custom Cal Kits must be imported after a firmware upgrade. Learn more

Creating Custom Calibration Kits using a New Connector Family

To create a custom calibration kit that uses a new connector type, you must first define the connector family. The connector family is the name of the connector-type of the calibration kit, such as:

- APC7
- 2.4 mm
- Type-N (50O)

Although more than one connector family is allowed, it is best to limit each calibration kit to only one connector family.

If you are using a connector family that has male and female connectors, include definitions of both genders. If you are using a family with no gender, such as APC7, only one connector definition is required.

Use the following steps to create a custom calibration kit:

1. In the Edit PNA Cal Kits dialog box, click **Insert New** to add the new connector family.

2. In the Edit Kit dialog box:

   - Type the Kit Description for the custom cal kit.
   - Click **Add** in the Connectors section of the dialog box.

3. In the Add Connector dialog box:

   - Type a Connector Family name.
   - Type a Description of the connector.
   - Select the Gender of one of the connectors.
   - Type the minimum and maximum Frequency Range.

- Type the Impedance.
- Click the down-arrow to select the Media.
- Type the cut-off frequency.
- Click **Apply**.
- Click **OK**.

4. If you need to add another connector gender, in the Edit Kit dialog box :
   - Click **Add** in the Connectors section again for the next connector gender.
5. If you are adding another connector gender, repeat step 3.

Note: If you have male and female versions of the connector family, you probably do NOT also have a NO GENDER version.

6. Now that the connector family is added to the custom cal kit, you are ready to add new calibration standards. In the Edit Kit dialog box:
   - Under the list of standards, click **Add**.
7. In the Add Standard dialog box:
   - Select the type of standard (OPEN, SHORT, LOAD, or THRU).
   - Click **OK**.
8. In the Edit/Add Standards dialog box:
   - Complete the information in the dialog box for the standard you selected. Note that for banded standards, the start and stop frequency may be different than the frequency range of the specified connector. Edit the start and stop frequencies as needed.
   - Click **OK** when all the settings are correct.
9. Repeat steps 6 - 8, as necessary, to add all standards and definitions to the new custom cal kit.
10. Assign each of the standards to a calibration class. This is done through the Modify Calibration Class Assignment dialog box.
11. Click **File**, **PrintToFile**. PrintToFile will generate a .prn file (ascii file with comma delimiters) that can be imported into a spreadsheet.
12. Import the .prn file into an application such as Microsoft Excel, and print the results.

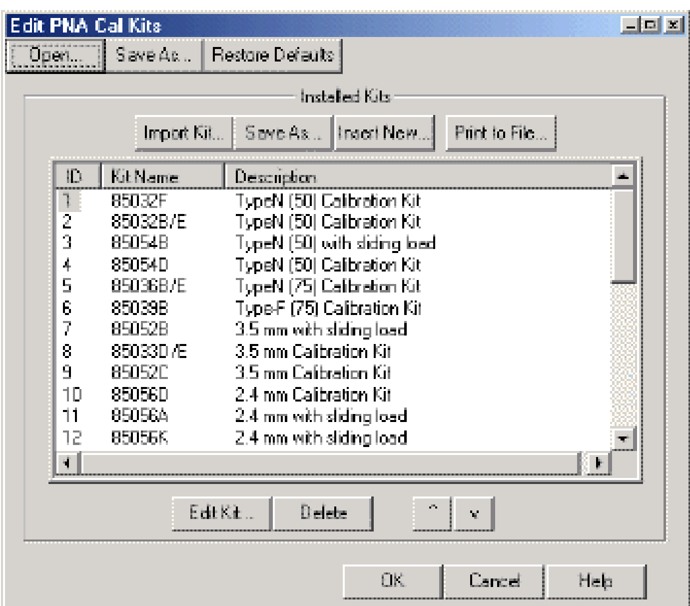
13. Use the spreadsheet to verify that each standard in the kit belongs to the same connector family and the gender of each standard is properly specified. It is important that the connectors and genders for your standards are correctly defined and verified in order for your SmartCal (guided calibrations) to work properly.

How to Modify Cal Kits

The series of dialog boxes that follow allow you to modify the standard definitions or class assignments of calibration kit files.

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Advanced Modify Cal Kit**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[More]** 3. then **[Cal Kit]**	1. Click **Response** 2. then **Cal** 3. then **More** 4. then **Cal Kit**

Edit PNA Cal Kits



Edit PNA Cal Kits dialog box help

Provides access to all Agilent cal kits and allows modification of their standard definitions.

PNA Cal Kits and Firmware Upgrades

- The default "factory" cal kits are overwritten when new firmware is installed. Your custom cal kits (files with custom filenames) are NOT overwritten. However, the custom cal kits must be imported (click **Import Kit**) into the new firmware.
- All PNA cal kits can only be imported by the current firmware revision and later. They can NOT be imported by PAST firmware revisions. Once a Cal Kit has been imported by a later firmware revision, it cannot be imported by the previous version of firmware from which it originated.
- When a firmware upgrade takes place, ALL cal kits, both factory and custom, that are present on the PNA are saved to a single *.wks file using a unique filename. These files are NOT Excel spreadsheet files. They are opened using the **Open** button (see below). They can be used as archives of cal kits from previous firmware versions.

Open Opens an archive of cal kits from past firmware upgrades and 'Save As' operations.

Save As Saves ALL cal kits in the PNA to a *.wks file.

Restore Defaults Re-installs the default factory contents of all Agilent cal kits from the PNA hard drive. The factory Agilent cal kits are stored on the PNA hard drive at C:/Program Files/Agilent/Network Analyzer/PnaCalKits/factory.

Installed Kits

Import Kit Invokes the Import Kit dialog box.

Save As Saves the selected calibration kit and definitions (using **.ckt** file type).

Insert New Invokes a blank Edit Kit dialog box to create new calibration kit definitions.

Print to File Prints the contents of the selected cal kit to a .prn file.

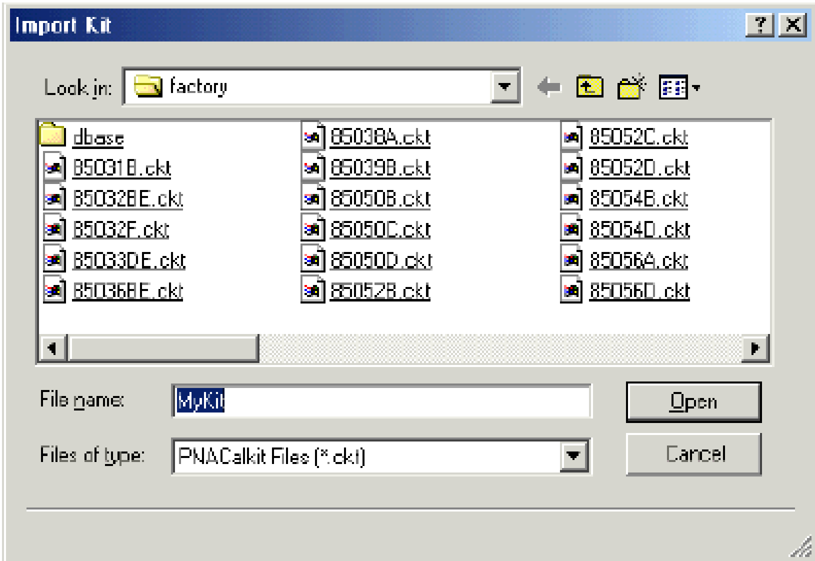
Edit Kit... Invokes the Edit Kit dialog box to modify selected calibration kit definitions.

Note: You CAN NOW modify Data-based Cal Kits. Learn more.

Delete Deletes selected calibration kit file.

^ Selects previous / next calibration kit in list.

For more information see Creating Custom Calibration Kits using a New Connector Family.



Import Kit dialog box help

Note: No more than 50 cal kits can be imported.

Imports calibration kit definitions from hard disk or other drive that are saved in the various formats. With PNA version 4.0 or later, four kit types can be imported.

Note: See PNA Cal Kits and Firmware Upgrades

Files of type Select the file type of your Cal Kit

Cal Kit Format	File Type
Current PNA Series Cal Kit	*.ckt
Old PNA Series Cal Kit (Version 1)	*.ck1
8510 Cal Kit	CK_*
8753, 8752, 8719, 8720, or 8722 Cal Kit	*.ck

File name Navigate and select your cal kit file.

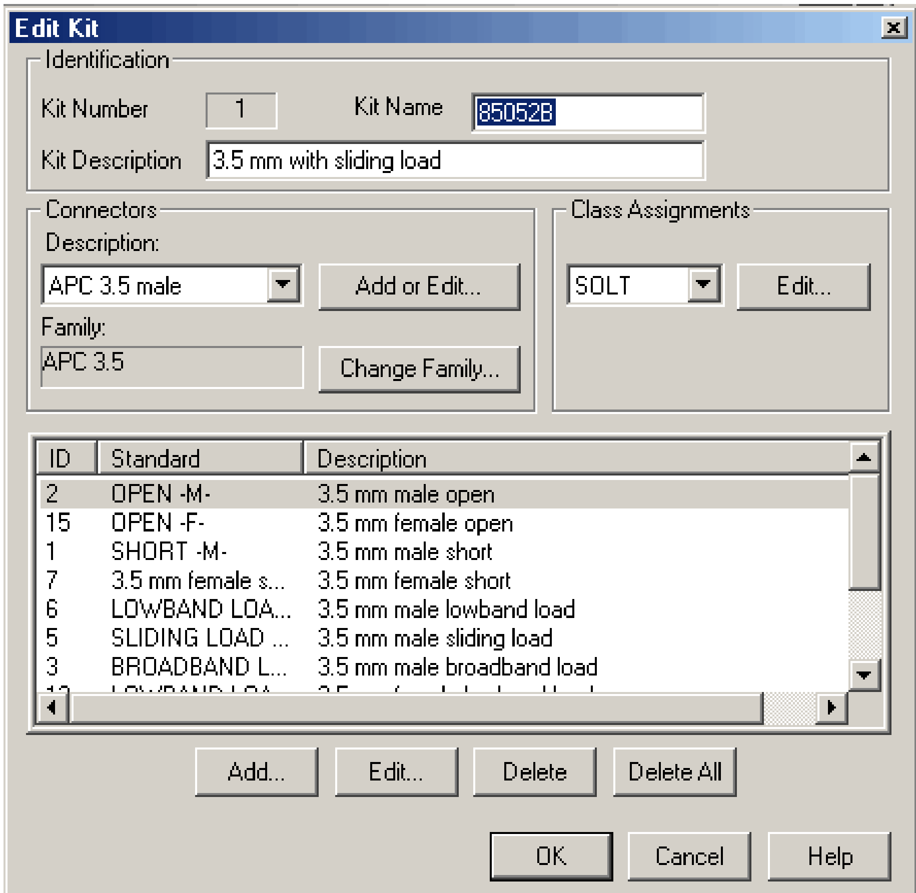
Open Imports the selected file. The kit is added at the end of the list of cal kits.

Importing Kits other than current PNA Series Kits

Cal kit files from Agilent "legacy" network analyzers (listed above) may not contain information that the PNA requires. Therefore, the PNA may modify the cal kit name and description, the cal standards, and the cal class assignments in a best effort manner. You may need to correct these modifications after importing your legacy cal kit to meet your specific requirements.

- "Legacy" cal kit files are based on the analyzer test port sex; PNA cal kits are based on the Device Under Test (DUT) connector sex. Therefore, when the kit is imported the standard's label and description are reversed and are noted as F- (female) and M- (male) .

- When a Coaxial standard is detected in the kit file, a pair of male/female connectors is typically created.
- Waveguide standards that are created as connector have no gender.



Edit Kit dialog box help

Identification

Kit Number Number of the selected calibration kit.

Kit Name Allows you to change the Name of the selected calibration kit.

Kit Description Allows you to change the description of the selected calibration kit.

Connectors

Note: You can NOT use a connector with a new or modified name to perform an ECal User Characterization.

Click the down arrow to change the connector type.

Add or Edit Invokes the Add or Edit Connector dialog box which allows you to add new connector type to the calibration kit or edit the connector properties.

Change Family Invokes the Change Connector Family dialog box which allows you to rename the entire connector family name.

Class Assignments

Click the down arrow to change the Class Assignment.

Edit Invokes the Modify Calibration Class Assignments dialog box.

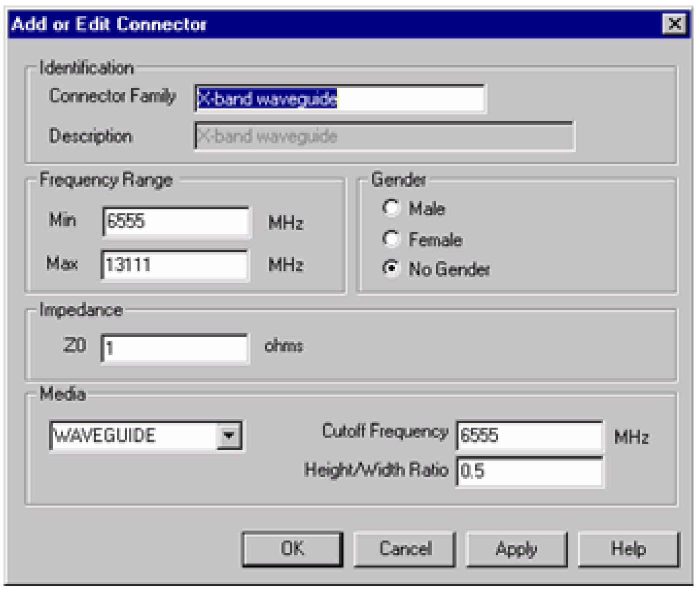
Standards in Kit

Lists the current standards and descriptions in the cal kit.

Add... Invokes the Add Standard dialog box that allows you to add definitions for a standard.

Edit... Invokes the Edit dialog box that allows you to modify standard definitions for the selected standard: either Open, Short, Load, or Thru.

Delete Deletes selected standard from calibration kit.



Add or Edit Connector dialog box help

Identification

Note: You can NOT use a connector with a new or modified name to perform an ECal User Characterization.

Connector Family Allows you to Add or Edit a specific connector name. If you change Connector Family to a unique name, the name and selected Gender is ADDED to the list of connectors in that kit.

Note: To change the Connector Family Name of all connectors in the Kit, click Change Family on the previous dialog box.

Description Displays connector type and gender.

Frequency Range

Min Allows you to define the lowest frequency at which the standard is used for calibration.

Max Allows you to define the highest frequency at which the standard is used for calibration.

Gender

Allows you to define the connector gender.

Impedance

Allows you to define the impedance of the standard.

Media

Allows you to define the medium (or 'geometry') of the connector: COAX or WAVEGUIDE.

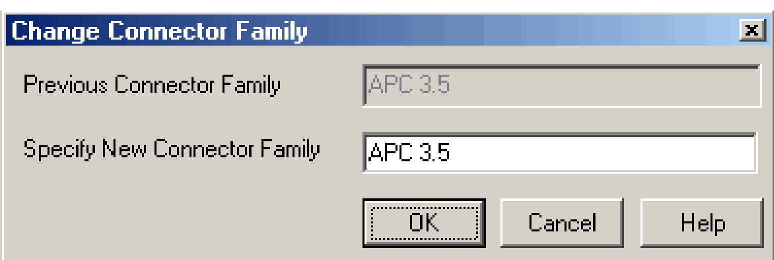
Waveguide Cal Kits

If modifying or creating a waveguide cal kit, be sure to make the following settings. You can create a custom waveguide cal kit using an existing factory waveguide Cal kit as a starting point. The factory cal kits already have these settings.

- Frequency Range: **Min. frequency** = **Cutoff frequency**.
- Gender: **No Gender**
- Impedance Z0: **1 ohm**
- Media: **Waveguide**
- **Cutoff Frequency** enter the low-end cutoff frequency.
- **Height/Width Ratio** Used to calculate waveguide loss. This value is usually on the data sheet for waveguide devices. For more information see App Note 1287-11.

Other waveguide settings

- If performing an Unguided Cal, change System Impedance to 1 ohm.
- For waveguide, choose TRL (Thru-Reflect-Line) calibration type . These calibration types are more accurate and take fewer steps than SOLT.



Change Connector Family dialog box help

Note: You can NOT use a connector with a new or modified name to perform an ECal User Characterization.

Performs a text "Search and Replace" function. Within the description field of each of the standards of the current Cal Kit, it searches for the Previous Connector Name and replaces it with the New Connector Name.

Specify New Connector Name Allows you to replace the primary connector-family name from the selected kit with the new connector-family name. The PNA allows multiple connector-families per kit.

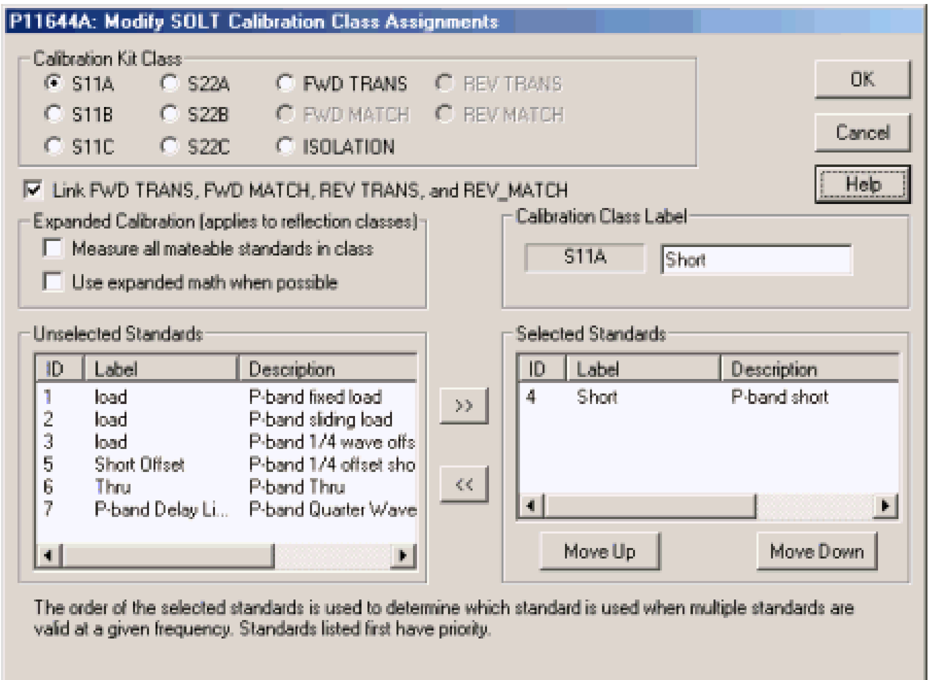
Previous Connector Name Displays the primary connector-family name. All occurrences of the previous connector name will be replaced throughout calibration dialog boxes. This includes calibration kit labels and description fields.

Notes:

- String replacement requires an exact match and is case sensitive. For example, "Type N" does not match "type N", and "apc 7" does not match "APC 7".
- Some calibration kits may include connector names that do not match strings within labels or description fields. You may reuse the Change Connector Name dialog to standardize the name within the kit, and then to replace the standard name with the new name.
  Example:
  Select the 85056A calibration kit. The default connector-family name is "APC 2.4". However, many standard description files are labeled "2.4 mm". You may want to replace the connector family name with a new name and update the standard descriptions to match the new name. For this kit, use a two step procedure.

  1. Use the Change Connector Name dialog to replace "APC 2.4" with "2.4 mm".
  2. Use the Change Connector Name dialog to replace "2.4 mm" with the new name, "PSC 2.4 mm".

See Also Creating a New Cal Kit from an existing Cal Kit



Modify Calibration Class Assignments dialog box help

Allows you to assign single or multiple standards to Calibration Classes.

There are two ways to get here:

1. Click **Calibration**
2. Click **Advanced Modify Cal Kit..**
3. Select the Cal Kit, then click **Edit Kit**
4. Under Class Assignments, select the Cal Method (SOLT, TRL), then click **Edit**

You can also get here during a SmartCal Calibration.

1. From the Select DUT Connectors and Cal Kits dialog, check **Modify Cal**, then click **Next.**
2. At the Modify Cal dialog, click a **Mod Stds** button.
3. At the View/Modify Properties Dialog, select the Cal Method (SOLT, TRL), then click **View/Modify**

To assign a standard to a calibration class:

1. Select the **Calibration Kit Class**
2. Select the standard from the **Unselected Standards** field
3. Click the right arrow to move the standard to the **Selected Standards** field.

Notes:

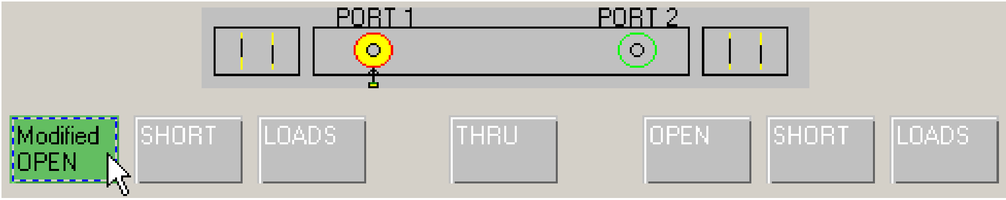
- During an Unguided Cal all of the **Selected Standards** are presented. You then choose which of these standards to measure.
- The MATCH standards must be assigned to the FWD MATCH, REV MATCH, and LINE classes. See TRL calibrations to learn more about TRL standards.
- Use MOVE UP and MOVE DOWN to change the **ORDER** of the standard. The order is used during a SmartCal to determine overlap priorities when:
  - **Multiple standards are valid for a frequency** - standards are presented in the order in which they appear.
  - **Using two sets of standards** - modify the order in which standards appear to reflect the configuration of your DUT. For example, for a DUT with a male connector on port 1 and a female connector on port 2, order the devices within the S11 classes (A, B, and C) such that the MALE standards are first in the list. Then order the S22 classes specifying the FEMALE standards as the first in the list.

To Add or Edit standards, click Calibration then, click Advanced Modify Cal Kit.

- See **TRL Class Assignments**
- Learn more about Calibration Classes.

Calibration Class Label

The label that appears on the Unguided Cal - Measure Mechanical Standards dialog box. For example, the Calibration Class Label **"Modified OPEN"** would yield the following prompt:



The following selections in this dialog box depend on your Class Assignment selection (**SOLT** or **TRL**) in the Edit Kit dialog box.

SOLT ONLY

Link FWD TRANS, FWD MATCH, REV TRANS, and REV MATCH Check to automatically assign the standard definition for FWD TRANS to FWD MATCH, REV MATCH, and REV TRANS. Clear to separately assign FWD MATCH, REV MATCH and REV TRANS classes (SOLT calibrations only).

Expanded Calibration

The following two check boxes **apply ONLY during Guided Calibrations**. For Unguided Calibration, these check boxes are ignored, including the case where the multiple standards dialog box is presented.

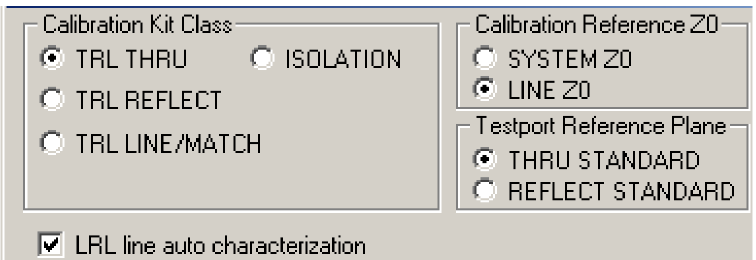
Measure all mateable standards in class Check this box to attain the very highest accuracy possible. For example, if a cal kit contains several load standards, during the calibration process you will be prompted to measure each of the standards. This could require a significant amount of calibration time. When checked, the "Use expanded math when possible" box is also checked automatically.

Use expanded math when possible Some kits contain multiple calibration standards of the same type that together cover a very wide frequency range. (For example: multiple shorts, or a lowband load and a sliding load.) If a calibration requires more than one standard to cover the calibration frequency range, there can be regions of overlapping measurements. When this checkbox is selected, the PNA automatically computes the most accurate measurement in the overlap regions using a "weighted least squares fit" algorithm. This function improves accuracy without slowing the calibration speed.

- Manually select this checkbox only when using a cal kit that contains multiple standards of the same type. (For example: multiple shorts, or a lowband load and a sliding load.)
- The checkbox is cleared by default when a polynomial model is selected from the cal kit menu.
- The checkbox is selected by default when the 85058B or 85058E data-based model is selected from the cal kit menu.

TRL ONLY

If TRL is selected as Class Assignment in the Edit Kit dialog box, the following changes appear in this dialog:



Calibration Kit Class

- Learn more about TRL standards.
- Isolation calibration is not usually necessary in the PNA.

LRL line auto characterization

Note: This setting ONLY applies if an LRL Cal Kit is being modified **AND** Testport Reference Plane is set to Thru Standard **AND** the TRL Thru class standard and the TRL Line/Match class standard both have the same values for Offset Z0 and Loss. Otherwise, this setting is ignored.

- Check the box to allow the PNA to automatically correct for line loss and dispersion characteristics.
- Clear the box if anomalies appear during a calibrated measurement which may indicate different loss and impedance values for the Line standards.

Calibration Reference Z0 (TRL only)

System Z0 The system impedance is used as the reference impedance. Choose when the desired test port impedance differs from the impedance of the LINE standard. Also, choose when skin effect impedance correction is desired for coax lines.

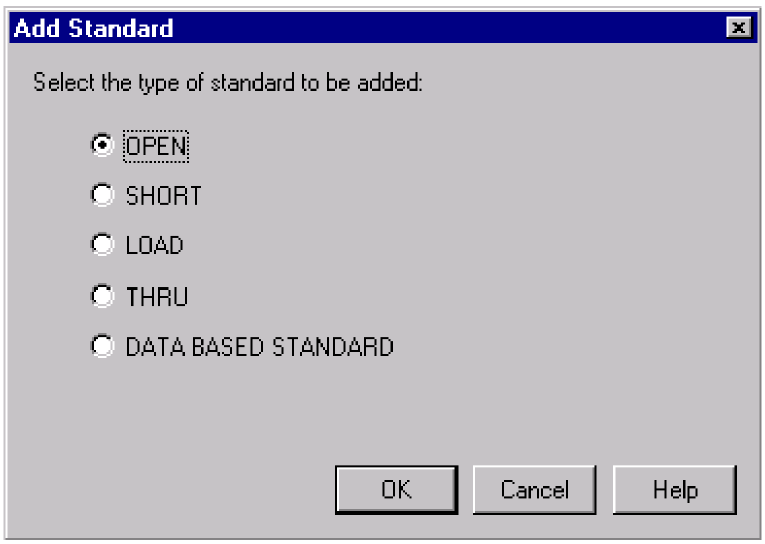
Line Z0 The impedance of the line standard is used as the reference impedance, or center of the Smith Chart. Any reflection from the line standard is assumed to be part of the directivity error.

Testport Reference Plane (TRL only)

Thru Standard The THRU standard definition is used to establish the measurement reference plane. Select if the THRU standard is zero-length or very short.

Reflect Standard The REFLECT standard definition is used to establish the position of the measurement reference plane. Select if the THRU standard is not appropriate AND the delay of the REFLECT standard is well defined.

Also, select If a flush short is used for the REFLECT standard because a flush short provides a more accurate phase reference than a Thru standard.



Add Standard dialog box help

Allows you to add standards to the calibration kit file.

OPEN Adds an open to the calibration kit file.

SHORT Adds a short to the calibration kit file.

LOAD Adds a load to the calibration kit file.

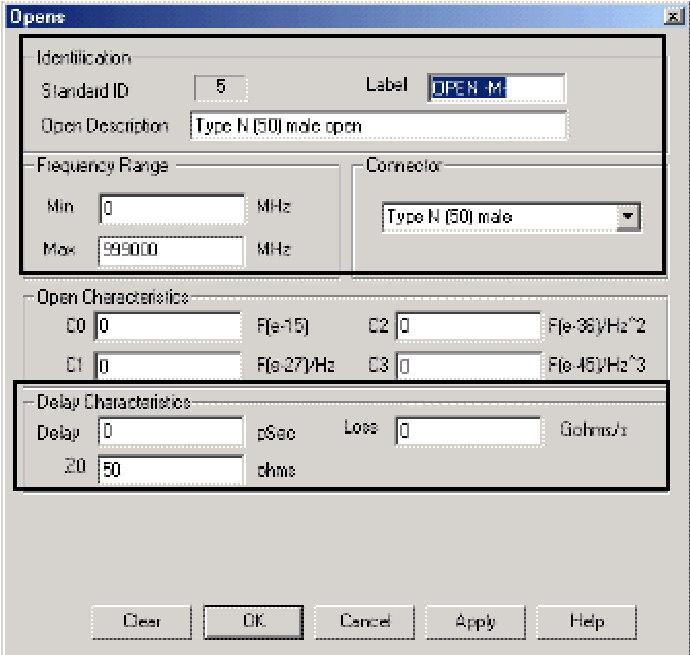
THRU Adds a thru to the calibration kit file.

DATA BASED STANDARD Adds a data-based standard to the calibration kit file.

OK Invokes a blank Edit Standards: Open, Short, Load, Thru, or Data-Based dialog box.

For more information see Creating Custom Calibration Kits using a New Connector Family.

Edit / Add Standards (Open, Short, Load, Thru, or Data-based)



Edit / Add Standards dialog box help

Note: For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

The boxed areas of the previous graphic applies to all standard types.

The other areas change depending on the type of standard selected.

Identification

Standard ID Number in list of standards

Label Type of standard.

Description Description of standard.

Frequency Range

Min Defines the lowest frequency at which the standard is used for calibration.

Max Defines the highest frequency at which the standard is used for calibration.

Connector

Indicates the type and gender (Male, Female, None) of the standard.

Delay Characteristics

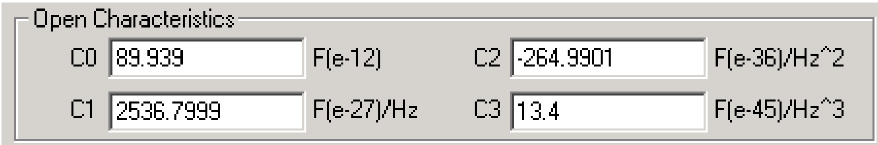
Delay Defines the one-way travel time from the calibration plane to the standard in seconds.

Z0 Defines the impedance of the standard.

Loss Defines energy loss in Gohms, due to skin effect, along a one-way length of coaxial cable.

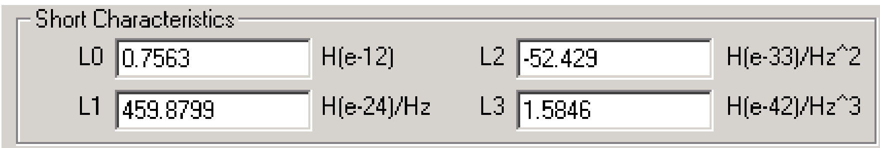
The following applies to standard types Open, Short, Load, Thru, and Data-based

Open Standard



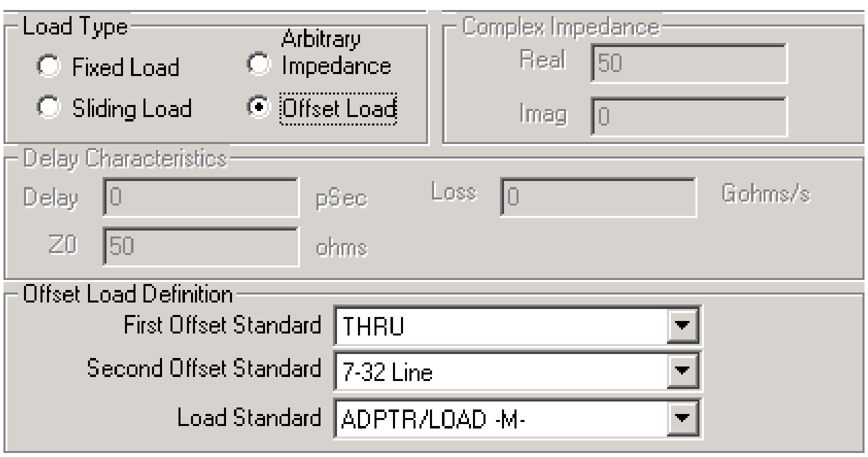
C0, C1, C2, C3 Specifies the fringing capacitance.

Short Standard



L0, L1, L2, L3 Specifies the residual inductance.

Load Standard



Allows you to select the type of load.

Load Type

Fixed Load Specifies the load type as Fixed. The fixed load is assumed to be a perfect termination without reflection.

Sliding Load A sliding load is defined by making multiple measurements of the device with the sliding load element positioned at various marked positions of a long transmission line. The transmission line is assumed to have zero reflections and the load element has a finite reflection that can be mathematically removed using a least squares circle fitting method.

A sliding load cal can be very accurate when performed perfectly. It can also be very inaccurate when not using proper technique. **For accurate results, closely follow the users manual instructions for the sliding load.**

Arbitrary Impedance Specifies the load type to be have an impedance value different from system Z0. An arbitrary impedance device is similar to a fixed load except that the load impedance is NOT perfect. Early firmware releases of the PNA series used a fixed resistance value. A complex terminating impedance has been added to allow for more accurate modeling of circuit board or on-wafer devices.

The following Complex Impedance settings are available ONLY when Arbitrary Impedance is selected.

- **Real** The real portion of the impedance value.
- **Imaginary** The imaginary portion of the impedance value.

Offset Load In Jan 2006, Offset Load definitions were added to TRL and Waveguide Cal Kit files. Using an Offset Load standard results in a more accurate calibration than with a Broadband Load. Therefore, when performing a calibration using one of the modified Cal Kit definitions, you may be prompted to connect more standards than before this change. To revert to using the Broadband Load Standard without offset, do the following:

1. Click **Calibration**, then **Advanced Modify Cal Kit**
2. Select the kit, then click **Edit Kit**
3. Under Class Assignments, click **Edit**
4. Select Calibration Kit Class **S11C** (Loads)
5. Under Selected Standards, select **Broadband Load**, then click **Move Up** until the standard is at the top of the list. This will ensure that the Broadband Load is used first.

About Offset Load

An offset load is a compound standard consisting of a load element and two known offset elements (transmission lines) of different length. The shorter offset element can be a zero-length (Flush-thru) offset. The load element is defined as a 1-port reflection standard. An offset load standard is used when the response of the offset elements are more precisely known than the response of the load element. This is the case with waveguide. Measurement of an offset load standard consists of two measurements, one with each of the two offset elements terminated by the load element. The frequency range of the offset load standard should be set so that there will be at least a 20 degree separation between the expected response of each measurement.

To specify more than two offset elements, define multiple offset load standards. In cases where more than two offsets are used, the frequency range may be extended as the internal algorithm at each frequency will search through all of the possible combinations of offsets to find the pair with the widest expected separation to use in determining the actual response of the load element.

The following Offset Load settings are available ONLY when Offset Load is selected.

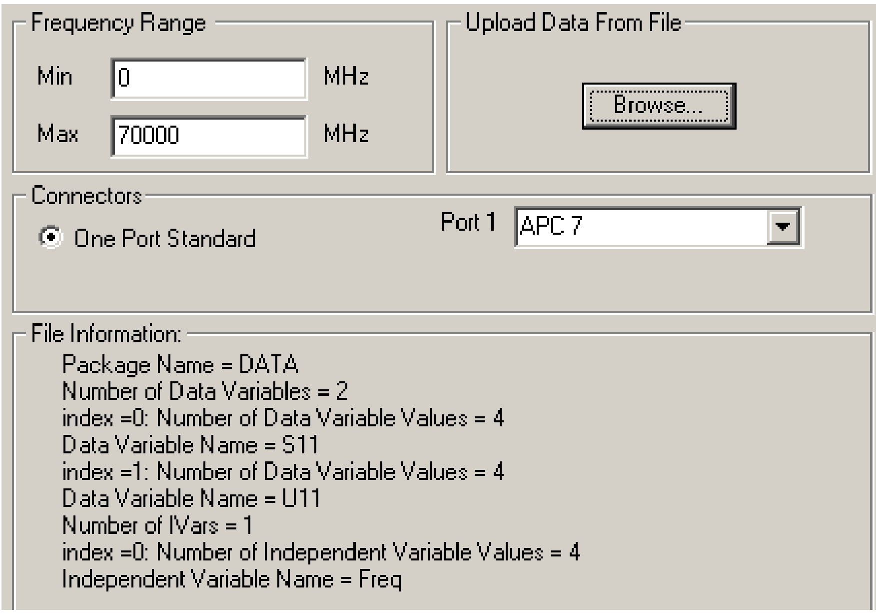
- First Offset Standard
- Second Offset Standard
- Load Standard

Thru Standard

Connectors

Defines connector type and gender at both ports.

Data-Based Standard



Note: To learn how to modify data-based standard files, visit http://na.tm.agilent.com/pna/dbcal.html

The modified file can then be uploaded into the PNA.

Upload Data From File

Click Browse to load data from a file.

Connectors

One Port Standard Currently only 1-port standards can be modified.

Port 1 Select the type of connector.

File Information Information about the standard that is read from the uploaded file.

Last modified:

4-Jan-2008	Added limit for imported kits
26-Oct-2007	Added Height/Width for Add connector. Moved waveguide settings.
2-Feb-2007	MX Added UI
9/12/06	Added link to programming commands

Power Calibration

Source and Receiver Power Calibrations work together to provide very accurate power levels from the source, and very accurate power measurements from the PNA receiver.

See other Calibration Topics

Source Power Calibration Overview

Perform Source Power Calibration when you need accurate power levels at some point in the measurement path between the PNA test ports. For example, you need to characterize the gain of an amplifier across a frequency range at a specified input power. You would perform a source power cal at the input of the amplifier to ensure the **exact** power level into the amplifier across the frequency range.

Using a Source Power Cal, you can expect the power at the point of calibration to be within the range of the uncertainty of the power meter and sensor that is used.

Note: You may not be allowed to perform a Source Power Cal unless you are logged on to the PNA with an Administrator user account.

Source Power Calibration:

- Is independent of measurement type. It corrects the PNA source regardless of which receivers are being used in a measurement. Therefore, it can be used with both ratio or non-ratio measurements.
- Applies ONLY to those measurements on the selected channel that use the test port that was specified as the Source for the calibration. For example, if you specify Channel 1 and Port 1 as the source to be calibrated, only those measurements on channel 1 that use port 1 as the source will be corrected.
- Can be used in conjunction with other measurement calibrations, such as a full 2-port calibration. For highest accuracy, perform the measurement calibration AFTER the source calibration.
- Can be used with Power Sweep type. Source Power Cal will correct the power at all power levels across the power sweep.

- Can be used with Port Power Uncoupled.
- Forces sweep mode to **Stepped** on measurements with source power correction turned ON.
- Beginning with PNA Rev. 7.50, an external source can be calibrated using Source Power Cal.

Overview of How it works:

Click to see the detailed procedure

1. Specify the measurement settings (frequency range, IFBW and so forth).
2. Start Source Power Calibration.

   Note: When using an Agilent 848X power sensor (sensors that do NOT have built-in calibration factors), enter the Cal Factors using the Power Sensor Settings dialog, because the PNA instructs the power meter to NOT use the Cal Factor tables internal to the power meter.

3. Connect a power meter sensor to the point at which you want a known power level. This may be at the input or output of your device, or some other point between the test ports.
4. The PNA source is stepped through the specified frequency range, and power is measured with the power meter. At each data point, the source power is adjusted until the measured power is within your specified accuracy level.
5. When complete, the power meter is preset. The source power calibration can be saved as part of the instrument state.
6. The power meter is removed and the measurement path reconnected.
7. The calibration is automatically applied to the channel. All measurements on that channel using that source port benefit from the source power cal.

Verify the source power calibration using the following procedure.

1. Connect the power meter as it was during the source power calibration.
2. Set the PNA to Point Trigger mode.
3. Trigger the PNA across the trace. Read about the behavior of the sweep indicator.
4. At each data point, the power meter should read the corrected power level within the specified tolerance.

Supported Power Meters and Sensors

Power Meters

The following power meters

All Agilent Power Meters are supported for use in a Source Power Calibration.

- See the current list of power meters at: www.agilent.com/find/powermeters
- See a list of compatible power meter / sensor combinations.
- The 82357A USB/GPIB Interface can be used to control the power meter.
- LAN connectivity can ONLY be used with the Agilent P-series power meters.

In addition, you can Create a Custom Power Meter Driver for use with other power meters.

Power Sensors

You can perform a Source Power Calibration with ALL power sensors that are supported by the above power meters. However, Source Power Calibration, operates slowly with the Agilent E930x and E932x power sensors, as the two calibrations are not optimized for use with those sensors.

Up to two sensors can be used to cover the frequency span of the measurement.

USB power sensors are supported beginning with PNA Rev 7.50.

Only one USB power sensor can be used to cover the entire frequency span.

To select a USB power sensor:

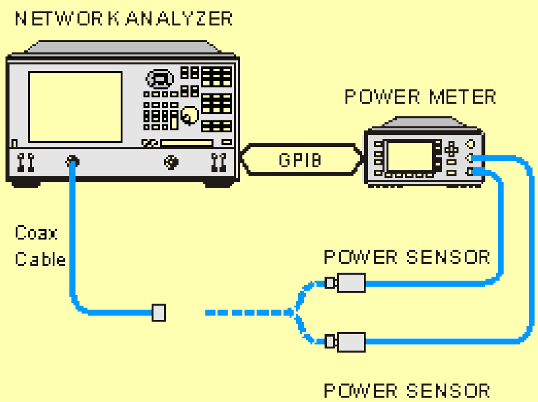
1. Connect the sensor directly to one of the PNA USB ports.
2. From the main Source Power Cal dialog, click **Power Meter Config**.
3. On the Power Meter Settings dialog, select **USB.**

See note about Zeroing USB Power Sensors.

How to perform Source Power Calibration

1. Setup your measurement (sweep type, frequency range, IFBW, and so forth). By default, a Source Power Cal is performed on the source port of the active measurement.
2. Connect coax cable, GPIB cable, and power sensors to the PNA as shown in graphic below.

This image does NOT apply to USB power sensors, which are connected directly to a PNA USB port.



3. Apply power to the power meter and allow 30 minutes warm-up time before beginning calibration.

4. Select **Source Power Cal** as follows:

Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands See programming examples in SCPI and COM
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Source Power Calibration**
For PNA-X and 'C' models	Programming Commands See programming examples in SCPI and COM
1. Press CAL 2. then **[Power Cal]** 3. then **[Source Cal]**	1. Click **Response** 2. then **Cal** 3. then **Power Cal** 4. then **Source Cal**

5. Complete the Source Power Cal dialog box (below), including Loss Compensation and Power Sensor Settings, as needed.

   Note: When using an Agilent 848X power sensor (sensors that do NOT have built-in calibration factors), enter the Cal Factors using the Power Sensor Settings dialog, because the PNA instructs the power meter to NOT use the Cal Factor tables internal to the power meter.

6. When complete, click **Take a Cal Sweep** in the Source Power Cal dialog box.

7. Follow the prompts to connect the sensors as required.

8. At this time you can change the Source Port setting and perform a Source Power Cal on a different port.

9. When calibration is finished, click **OK**. Correction is then applied and turned ON for the calibrated ports on the active channel.

10. Remove sensor.

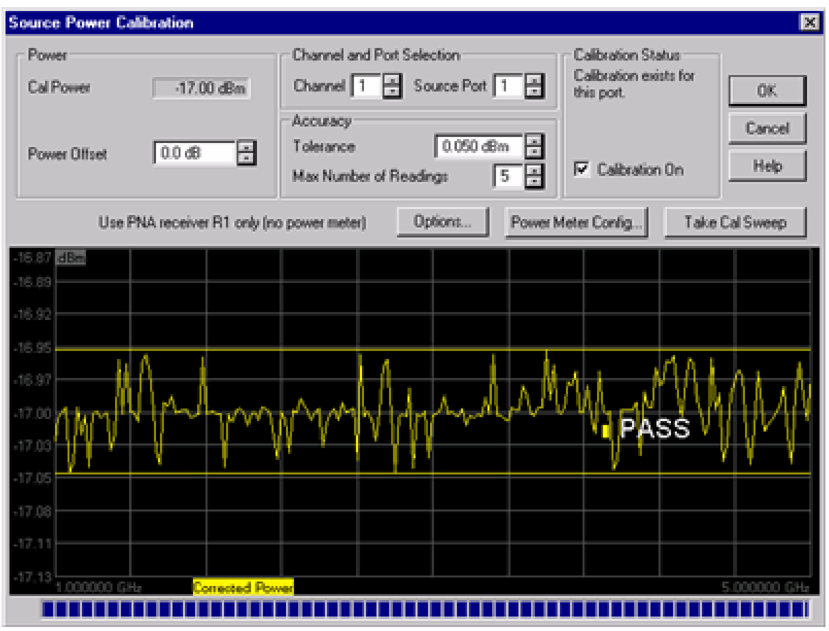
11. **SrcPwrCal** is displayed in the status bar when Source Power Correction is applied to the Active Measurement.

To turn Source Power Correction OFF:

- On the **Calibration** menu, point to **Power Calibration**, then click **Source Power Correction** on/**OFF**.
- ONLY correction for the source port of the ACTIVE MEASUREMENT is turned OFF (regardless of port power coupling setting.)

Interpolation

If the original stimulus settings are changed, Interpolation or EXTRAPOLATION is applied and **SrcPwrCal*** is displayed in the status bar. This is different from measurement calibration interpolation. For example, if the frequency span is increased, the PNA will extrapolate new correction values rather than turn correction off. This is to protect your test device from being overpowered by the source. If the original settings are restored, then source power calibration returns to full correction.



Source Power Cal dialog box help

Note: Be sure that the frequency range of your power sensor covers the frequency range of your measurement.

This does NOT occur automatically.

Power

Cal Power The calculated power (in dBm) at the calibration point. This value is the specified PNA source power plus the Power Offset value.

Power Offset Allows you to specify a gain or loss (in dB) to account for components you connect between the source and the reference plane of your measurement. For example, specify 10 dB to account for a 10 dB amplifier in the path to your DUT. Following the calibration, the PNA power readouts are adjusted to this value.

Channel and Port Selection

Channel Specifies the channel on which to perform the calibration. This setting defaults to the active channel.

Source Port Specifies the source port to be corrected. This setting defaults to the source port for the active measurement.

Beginning with PNA Rev. 7.22, external sources can be controlled from this dialog. Learn more.

Accuracy

At each data point, power is measured using the specified Power Meter **Settling** Tolerance and adjusted, until the reading is within this Accuracy **Tolerance** or the **Max Number of Readings** has been met. The **last** power reading is plotted on the screen against the Tolerance limit lines.

Tolerance Sets the maximum desired deviation from the specified **Cal Power** level.

Max Number of Readings Sets the maximum number of readings to take at each data point for iterating the source power.

Calibration Status

Allows you to turn Source Power Cal ON | OFF and view Cal data for each port, regardless of the active measurement. This feature allows the Internal Second Source to be calibrated and turned ON | OFF, even when being used as an incidental source in a measurement, such as an LO.

Calibration ON Check to turn Source Power Calibration ON for the specified source port.

The displayed text indicates when interpolation is applied for the calibration.

Buttons

Options Invokes the Source Power Cal Options dialog. Label to the left of the button displays the current 'Options' setting.

Power Meter Config Invokes the Power Meter Settings dialog box

Take Cal Sweep Begins source power calibration measurement.

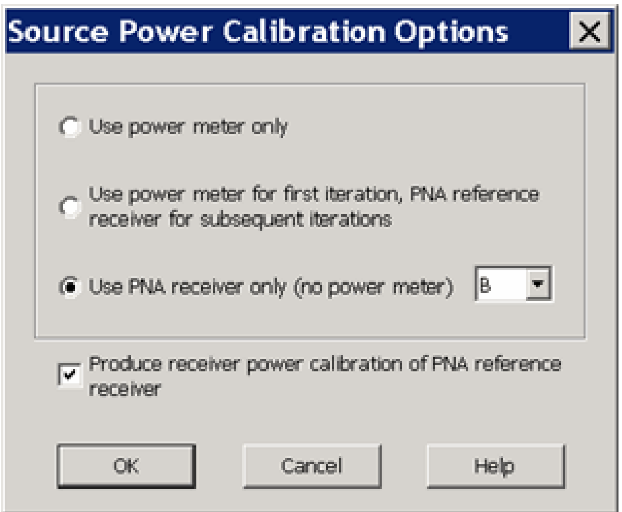
OK Applies calibration. This button is disabled until the Take Cal Sweep has been pressed.

Cancel If a sweep is in progress, cancels the sweep. Press again to close the dialog.

See Also

- Learn more about Source Power Cal

- Learn about External Testsets and Source Power Cal.



Source Power Calibration Options dialog box help

Provides options for measurement of the source power.

- **Use power meter only** Traditional source power calibration using only a power meter to measure the source power at each data point. Most accurate and slowest method.

Note: Because the following two settings use PNA receivers to make power measurements, they do NOT work correctly when a Frequency Offset value is being used.

- **Use power meter for first iteration**...When checked, the first reading at each data point uses a power meter to calibrate the reference receiver. Subsequent readings, if necessary to meet your accuracy requirement, are measured using the reference receiver. This technique is much faster than using the power meter with almost no degradation in accuracy.

  Note: Do NOT use the "first iteration" feature if there is a component before the power sensor that exhibits non-linear behavior, such as a power amplifier in compression.

- **Use PNA receiver only** This feature assumes that the receiver to be used has already been calibrated by a source power cal using a power meter, then a receiver cal. That receiver can then used to quickly calibrate other PNA source ports, or on another channel with different stimulus settings.

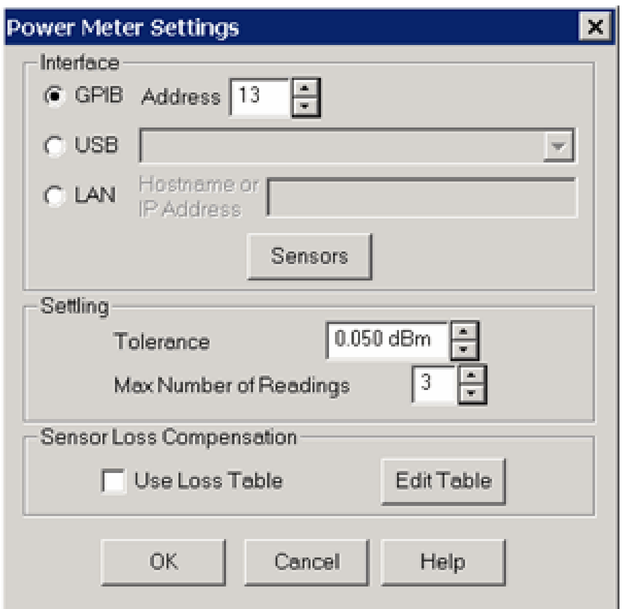
  This would be useful, for example, if the power level of the measurement was below the sensitivity of the power sensor. Calibrate the PNA receiver using a source power cal that is within the sensitivity of the sensor. Then, use the calibrated receiver to perform a second source power cal at the reduced power level.

- The receiver is specified using logical receiver notation.

  - It is best to use the reference receiver for the source port to be calibrated. For example, if calibrating source port 2, specify the "a2" receiver.

- To ensure an accurate source power cal, the frequency range over which the receiver was calibrated must be the same or larger than the "receiver only" source power calibration.
- All accuracy and settling tolerance and number of reading settings apply just as they do with a power meter reading.

Produce receiver power calibration of PNA reference receiver Check to calibrate the appropriate reference receiver to the power level that is measured at the calibration plane. Do this to make very accurate measurements using the calibrated reference receiver. This cal is done in addition to the standard source power cal using the any of the methods listed above. At the end of the source power cal measurement sweep, you can optionally save the reference receiver cal to a Cal Set to be recalled at a later time. The Cal is saved when the **OK** button is clicked to close the Source Power Cal dialog.



Power Meter Settings dialog box help

This dialog appears when you click the **Power Meter Config** button on the main Source Power Cal dialog.

Communication

- **GPIB / Address** Select GPIB power meter. Then select the address for the power meter. Default is 13. The PNA will search VISA interfaces that are configured in the Agilent IO Libraries on the PNA.
- **USB** PNA scans the USB for connected power sensors. Select a power sensor from the list. Only ONE USB power sensor can be configured to cover the entire frequency range of the calibration.
- **LAN** Specify the Hostname or IP address of the Power Meter. This setting can ONLY be used with the Agilent P-series power meters.

Sensors Invokes the power sensor settings dialog box.

Settling

These Settling settings do not apply when a PNA receiver is the power measurement device. Each power meter reading is "settled" when either:

- two consecutive meter readings are within this **Tolerance** value or
- when the **Max Number of Readings** has been met.

The readings that were taken are averaged together to become the "settled" reading. The settled reading is then compared to the Accuracy Tolerance requirements (tolerance and max readings) specified on the Source Power Cal dialog box.

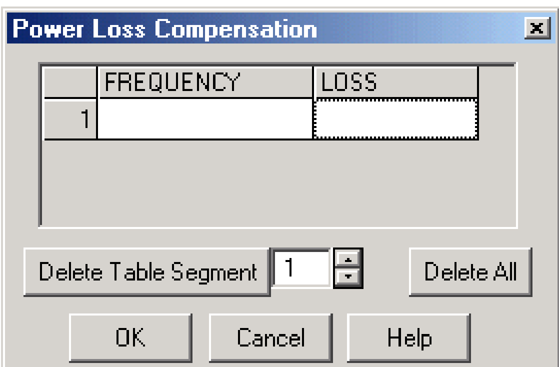
Tolerance When consecutive power meter readings are within this value of each other, then the reading is considered settled.

Max Number of Readings Sets the maximum number of readings the power meter will take to achieve settling.

Sensor Loss Compensation

Use Loss Table Select this checkbox to apply loss data to Source Power calibration correction (such as for an adapter on the power sensor).

Edit Table Invokes the Power Loss Compensation dialog box.



Power Loss Compensation dialog box help

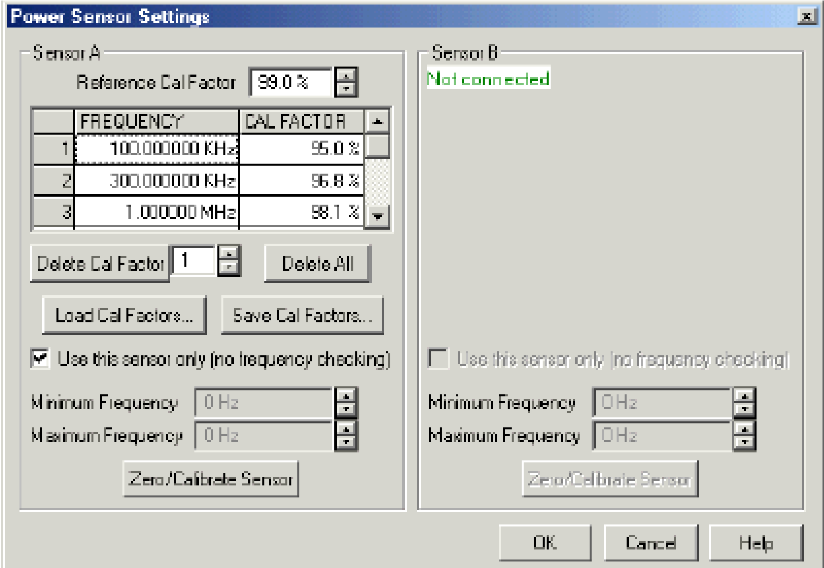
Compensates for losses that occur when using an adapter or coupler to connect the power sensor to the measurement port.

Delete Table Segment Deletes row indicated in the field.

Delete All Deletes all data in the table.

Note: To Add a Row to the table, click on a row in the table and press the down arrow on either the PNA front panel or keyboard.

- If you enter a single frequency/loss segment, the analyzer applies that value to the entire frequency range.
- You can enter up to 100 segments to achieve greater accuracy.



Power Sensor Settings dialog box help

This dialog appears when you click the **Sensors** button on the Power Meter Settings dialog.

Note: Be sure that the frequency range of your power sensor covers the frequency range of your measurement. This does NOT occur automatically.

Sensor A (B) Displays one of the following messages depending on type of sensor.

- **Not connected** The PNA is not detecting a power sensor.
- **Cal factors are contained within this sensor** The PNA detects an Agilent E-Series power sensor. Reference Cal Factor and Cal Factor data are loaded automatically.
- **Sensor Data** Allows entry for power sensor data:

Reference Cal Factor Specifies the sensor's Reference Cal Factor.

Cal Factor Table Specifies the frequency and corresponding Cal Factor for the sensor.

Delete Cal Factor Deletes the indicated row in the table.

Delete All Deletes all data in the table.

To Add a Row to the table, click on a row in the table and press the down arrow on either the PNA front panel or keyboard. A row is added to the bottom of the table. The table is automatically sorted by frequency when OK is pressed.

Use this sensor only Check this box to use this sensor over the entire frequency span of the measurement, even if two sensors are connected to power meter. Clear to allow entry of minimum and maximum frequencies for the sensor.

Minimum Frequency Specifies the minimum frequency range for the sensor when using dual sensors.

Maximum Frequency Specifies the maximum frequency range for the sensor when using dual sensors.

Perform Sensor Zeroing and Calibration Zero and calibrate the power sensor before taking data.

Note: There is no calibration needed in U2000 Series **USB power sensors**. Zeroing those sensors does NOT require disconnecting them from the source port or DUT except, for highest accuracy, when the power level is below -30 dBm. For more information, please read the USB power sensor documentation.

Copy a Source Power Calibration to other Channels

A macro application is now available that copies a Source Power Calibration to other channels. Once downloaded and installed on a PNA, the macro is automatically configured up. To learn more, click **Help** on the application main dialog. Get the application from http://na.tm.agilent.com/pna/apps/applications.htm.

Saving a Source Power Calibration

Because Source Power Cal calibrates source hardware, the calibration data is saved as part of the **Instrument State,** in either a .sta file or a .cst file. This correction is applied to all measurements on the channel that uses the calibrated source. See Save Instrument State.

Reducing Time to Complete a Source Power Calibration

The time required to perform a Source Power Calibration depends on source power, number of points, and number of readings taken. You can reduce this measurement time with the following methods:

- **Reduce number of points before calibration.** You can reduce the number of points before the measurement, then return the number of points to its original value after calibration is complete and correction is ON. The analyzer will perform a linear interpolation, although with some loss in accuracy.
- **Use an Agilent E-Series sensor.** You can obtain 40+ readings per second over GPIB with this type of sensor on the PNA.
- **Increase power to the sensor.** Lower power may have longer settling time with some sensors.
- **Check Use Reference Receiver for Iteration.**

Receiver Power Calibration

Receiver power calibration mathematically removes frequency response errors in the specified PNA receiver, and adjusts readings to the same, or a value offset from, the source power calibration level. It is the same as doing a **Response Cal** or **Data / Memory, (Normalization)** but with the data shifted to the Cal Power value.

Use Receiver Power Calibration to make very accurate absolute power (amplitude) measurements.

Receiver Power Calibration:

- Is ONLY allowed when making absolute power (unratioed) measurements.
- Is most accurate when a source power calibration was performed first.
- Applies to all unratioed measurements in the active channel using that receiver.
- Can be saved in a Cal Set and later reapplied to a like measurement.

Interpolation

Like other calibration types, if the original stimulus settings are narrowed, interpolation is applied and **C* Rcvr Pwr** is displayed in the status bar. If the original stimulus settings are made wider, the PNA will turn Receiver Power Correction **OFF.**

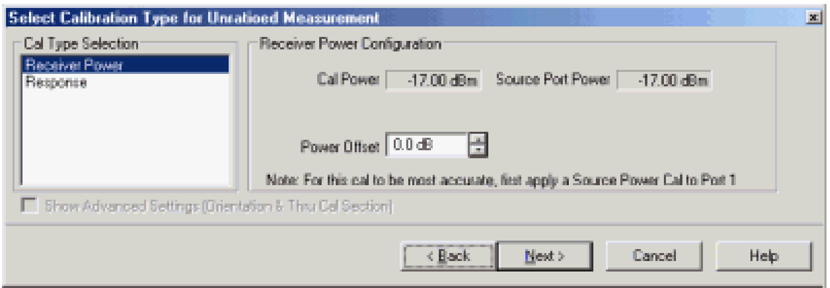
If the original settings are restored, then receiver power calibration returns to full correction.

How to perform a Receiver Power Calibration

1. Perform a Source Power Calibration.
2. Set the active measurement to unratioed. Learn How.
3. Connect a THRU line from the source port to the receiver port.
    - When performing a receiver power cal on a reference receiver, no connection is necessary as the receiver is internally connected to the source.
    - When the receiver port and the source port are the same (receiver A, source port 1), then connect an open or short to get maximum power to the receiver. This practice is not recommended. It is best to use different ports for the source and receiver.
4. Ensure correction for Source Power Calibration is ON as indicated by **Src Pwr Cal** or **Src Pwr Cal*** in the status bar.
5. Start the Calibration Wizard

Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Cal Set**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[Power Cal]** 3. then **[Receiver Cal]**	1. Click **Response** 2. then **Cal** 3. then **Power Cal** 4. then **Receiver Cal**

Complete the following dialog box, then click **Next**.



Select Calibration Type for Unratioed Measurement dialog box help

Cal Type Selection Select **Receiver Power**

Receiver Power Configuration

Cal Power Specifies the power level to be displayed on the measurement when complete. (Source Port Power + Power Offset).

Source Port Power Test port Power set for the measurement. Learn how to change Test Port Power

Power Offset Allows you to specify a gain or loss (in dB) to account for components you connect between the source and the reference plane of your measurement AFTER a source power cal has been performed. Following the calibration, the PNA power readouts are adjusted to the Cal Power value.

Next Click to continue the Calibration Wizard.

Notes:

- When Receiver Power Cal is finished, **C RcvrPwr** is displayed in the status bar and correction data is applied to subsequent sweeps.
- To turn correction **OFF**, click **Calibration,** point to **Power Calibration**, then set **Receiver Power Correction** to **OFF**.

Learn more about Receiver Power Cal (scroll up).

Saving a Receiver Power Calibration

Beginning with PNA Revision 5.0, Receiver Power Cal is saved to a Cal Register and optionally to a User Cal Set. It can be applied to measurements in the same way as other Cal Types. Previously, Receiver Power Cal data was saved as part of an Instrument State and was only applied to the measurement on which it was performed.

Learn more about Saving PNA files types.

Last modified:

21-Feb-2008	Added 848x note
4-Jan-2008	Added Cal note for USB sensors
30-Oct-2007	Added link to supported Power meters/ sensors
20-Jul-2007	Added USB / LAN support and Apply macro
21-January 21, 2007	MX Added UI
14 Sept-2006	MQ Added Receiver-only SPC.

Fixture Simulator

The following features allow you to mathematically add (embed) or remove (de-embed) circuits to, or from, your PNA measurements. The mathematical models are applied to specific ports for all measurements on the channel.

See Also

- "De-embedding and Embedding S-Parameter Networks Using a Vector Network Analyzer" App note. for more conceptual information on Fixture Simulation.
- Characterize Adaptor Macro can be used to create S2P files from Cal Sets.
- To **Embed or De-embed?** and the associated procedures

Order of Fixture Operations

- The fixturing operations are applied to the measurement results in the following order. **This order can NOT be changed.**
- In the PNA data processing chain, the Fixture Simulator functions occur at the same time as the **Apply Error Terms** block.

First, the following **Single-ended** measurement functions are processed in this order:

1. Port Extensions
2. 2-Port De-embedding
3. Port Z (Impedance) Conversion
4. Port Matching Circuit Embedding
5. 4-Port Network (single-ended) Embed/De-embed

Then, **Balanced** measurement functions are processed in this order:

6. Balanced Conversion
7. Differential / Common Mode Port Z Conversion
8. Differential Matching Circuit Embedding

Note: Port Impedance (Z) conversion uses values in the following prioritized order:

1. Balanced (Differential or Common Mode) - if enabled, these values are always used.
2. Single Port Impedance - if enabled, this value is used if Balanced is not enabled.
3. System Impedance - if neither balanced or single port is enabled, this value is used.

See an example of how these functions can be used to de-embed unwanted effects of a test fixture, and then mathematically embed the DUT in the circuit in which it is used.

How to select Fixturing Simulator

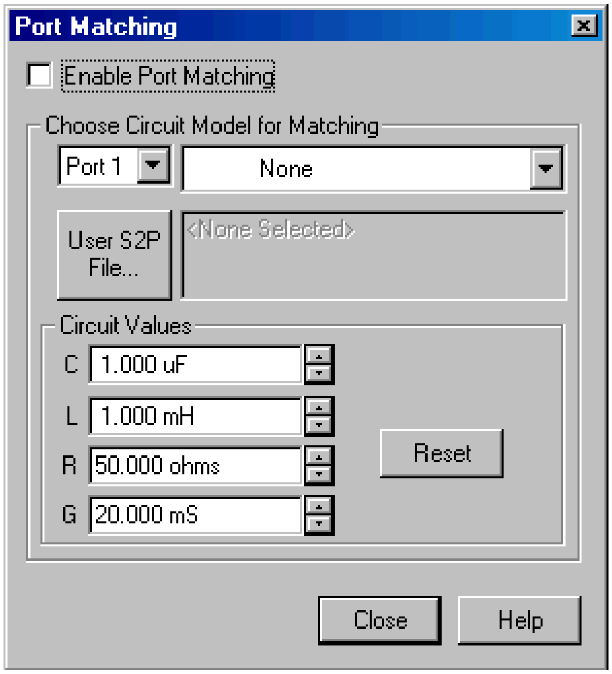
About Fixturing ON/off

BOTH of the following must occur to turn a fixturing selection **ON.**

EITHER ONE will turn a fixturing selection **OFF.**

1. Check **Fixturing ON/off**
   Port Extensions is NOT affected by Fixturing ON/off.
2. Check **Enable** on the individual fixturing selection dialog box.

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Fixturing Selections**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[More]** 3. then **[Fixtures]**	1. Click **Cal** 2. then **More** 3. then **Fixtures**



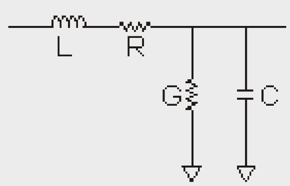
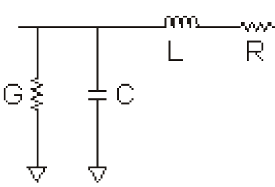
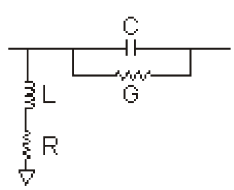
Port Matching dialog box help

This function specifies a circuit to embed (add) to the measurement results. See Order of Fixture Operations.

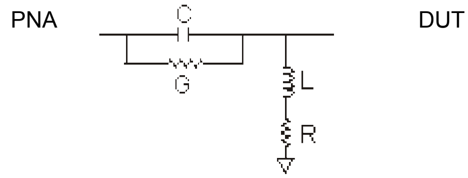
Enable Port Matching Check to apply the settings to the measurement results. Must also enable Fixturing ON/off.

Port - Select Port in which to apply simulation.

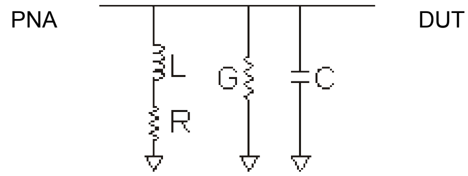
Circuit Model for Matching - Choose one of the following that best emulates your fixture at the selected PNA port:

Series L - Shunt C	PNA		DUT
Shunt C - Series L	PNA		DUT
Shunt L - Series C	PNA		DUT

Series C - Shunt L



Shunt L - Shunt C



User Defined (S2P File) Load a file that is specified with **User S2P File** button.

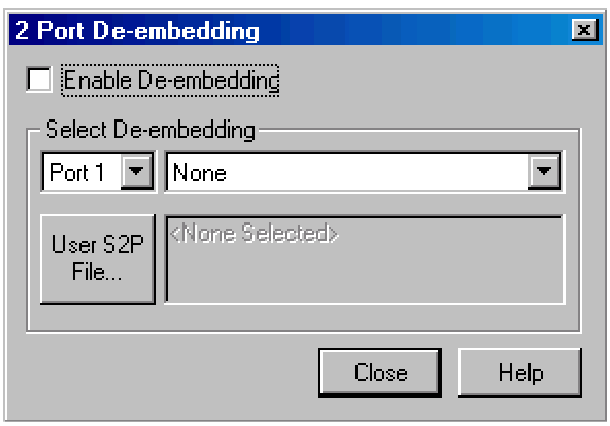
None Use no circuit model.

User S2P File Click to specify an S2P file of the circuit model to embed at the selected port. If the normalized impedance value in a recalled User .S2P file is different from the port reference impedance setting of the PNA, the PNA setting is used. Characterize Adaptor Macro can be used to create S2P files from Cal Sets.

Circuit Values

Capacitance (C), Inductance(L), Resistance(R), Conductance(G) Values for the specific components of the circuit type that models your fixture.

Reset Restores the default values.

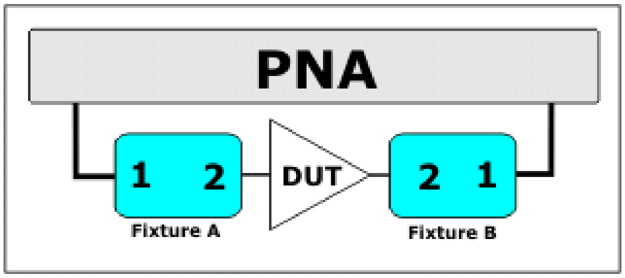


2 Port De-embedding dialog box help

This function **removes** the effects of a test fixture from the measurement results.

The de-embedding operation recalls an .s2p file (Touchstone format) for a 2-port test fixture. The file includes the electrical characteristics of a supplemental fixture or device. The file can be in any standard format (real-imaginary, magnitude-angle, dB-angle) and can represent any 2-port test fixture.

In the following image, the 2-port fixture would be either Fixture A **OR** Fixture B. To de-embed both, perform this operation twice.



Note: In all cases:

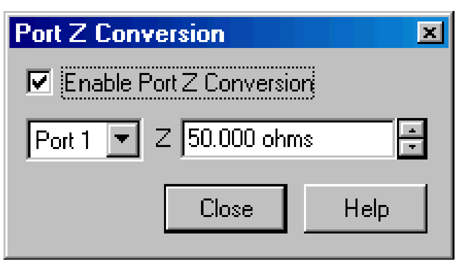
- Port 1 of the fixture is assumed to be connected to the PNA.
- Port 2 of the fixture is assumed to be connected to the DUT.

Enable De-embedding Check to apply the settings to the measurement results. Must also enable Fixturing ON/off.

Port - The **PNA** port to which the recalled de-embedding file is applied.

From the drop-down menu, select **User S2P**.

User S2P File Click to specify an existing .S2P file. If the normalized impedance value in a recalled User .S2P file is different from the port reference impedance setting of the PNA, the PNA setting is used. Characterize Adaptor Macro can be used to create S2P files from Cal Sets.



Port Z (Impedance) Conversion dialog box help

This function corrects the measurement and displays the results as if the measurement had been made into the specified impedance value. However, the physical port termination is still approximately 50 ohms.

The specified impedance value is applied to all of the measurements on ONLY the active channel.

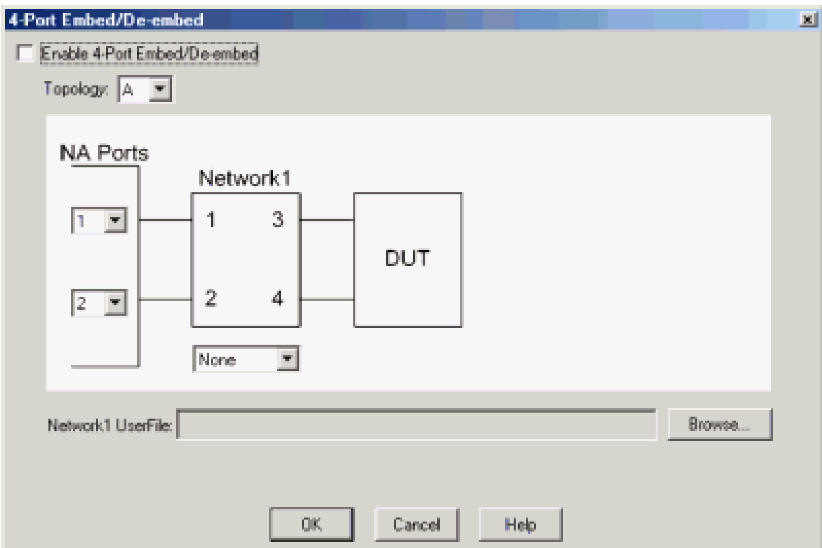
See Order of Fixture Operations.

Enable Port Z Conversion Check to apply the settings to the measurement results. Must also enable Fixturing ON/off.

Z Resistance part of the desired reference impedance for the specified port and channel.

Close Applies the entries and closes the dialog box

See note about Port Impedance priority.



4-Port Embed/De-embed dialog box help

This function specifies a single-ended 4-port circuit (*.S4P file) to embed (add) or de-embed (remove) from the measurement results. Computation takes place BEFORE Balanced conversion. See Order of Fixture Operations.

There is a single normalized impedance value for each port in the *.S4P file. This impedance value must match the impedance of the previous Port Z setting, or the PNA port impedance.

The PNA will interpolate if the number of data points that are read is different from the current PNA setting.

Enable 4-Port Embed/De-embed Check to apply the settings to the measurement results. Must also enable Fixturing ON/off.

Topology: Select a DUT topology.

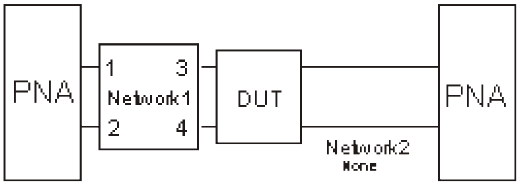
Refer to the images on 4-port embed/De-embed dialog box.

- **A -** 2 PNA/DUT Ports
- **B -** 3 PNA/DUT Ports

- **C -** 4 PNA/DUT Ports

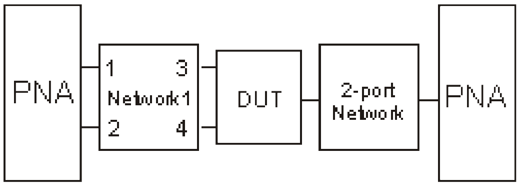
Topology configurations that are not addressed with standard images in dialog box:

1. If you have a 4-port DUT; 4-port network on one side; None on the other side.



- Specify **Topology C.**
- Use 4-port Network on one side.
- Use 4-port Network on the other side; set to **None.**

2. If you have a 3-port DUT and networks as follows:



- Specify **Topology B.**
- Use 4-port Network1 on one side.
- Use 2-port network on the other side.

NA Ports - Select the PNA Port that is connected to each circuit port.

Note: The *S4P file always assumes that:
Network ports 1 and 2 are connected to the PNA
Network ports 3 and 4 are connected to the DUT

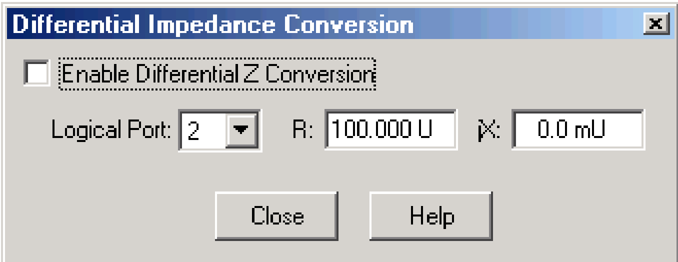
None, Embed, De-embed For Network1 and Network2, select:

- **None** - The same as disabling.
- **Embed** - Add the specified network circuit to the measurement results.
- **De-embed** - Remove the specified network circuit to the measurement results.

Browse For both Network1 and Network2, navigate to find the .*S4P file to embed or de-embed.

OK Applies the changes and closes the dialog box.

Cancel Does NOT apply the changes and closes the dialog box.



Differential Impedance Conversion dialog box help

This function sets the Differential impedance value for each balanced port.

The default value for **R:** is the SUM of the impedance values for both ports that make the logical port. If Port Z Conversion is not enabled, then System Z0 values for both ports are summed.

See Order of Fixture Operations.

Enable Differential Z Conversion Check to apply the settings to the measurement results. Must also enable Fixturing ON/off.

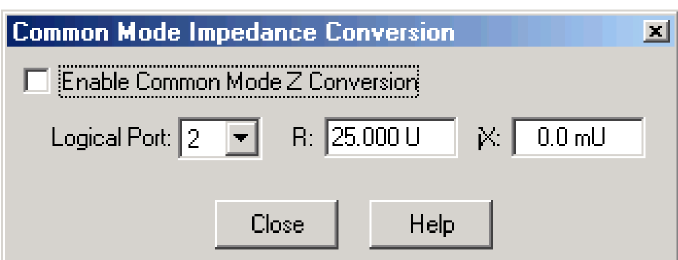
Logical Port Select the logical (balanced) port to receive impedance value. To see logical port numbers, see the measurement topology.

R Real part of the impedance value.

jX Imaginary part of the impedance value.

Close Closes the dialog box.

See note about Port Impedance priority.



Common Mode Impedance Conversion dialog box help

This function sets Common Mode Impedance value for each balanced port.

The default value for **R:** is calculated as follows.

(Z1 * Z2) / (Z1 + Z2)

Where ports 1 and 2 comprise the logical port:

Z1 = the Port Impedance values for port 1

Z2 = the Port Impedance values for port 2

If Port Z Conversion is not enabled, then System Z0 values for port 1 and 2 are used in the calculation.

See Order of Fixture Operations.

Enable Common Mode Z Conversion Check to apply the settings to the measurement results. Must also enable Fixturing ON/off.

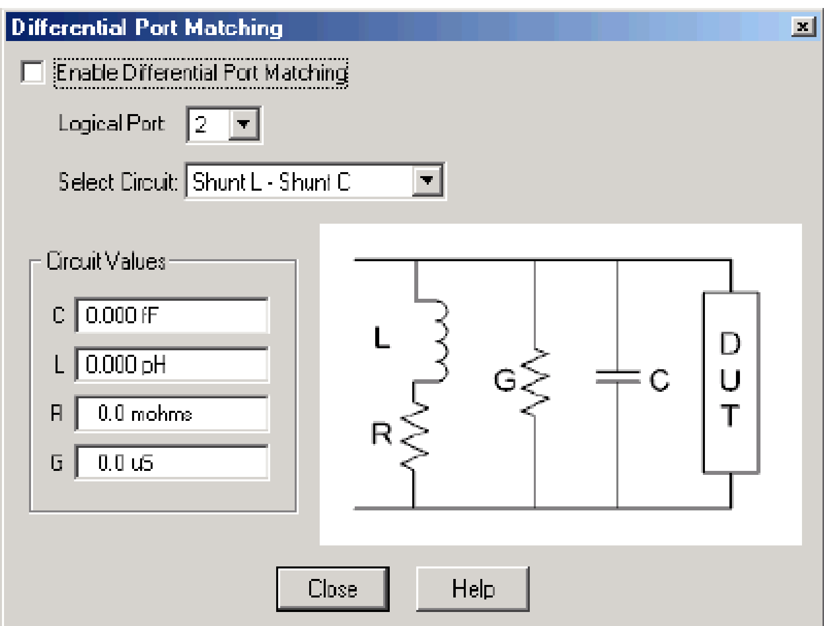
Logical Port Select the logical (balanced) port to receive impedance value. To see logical port numbers, see the measurement topology.

R Real part of the impedance value.

jX Imaginary part of the impedance value.

Close Closes the dialog box.

See note about Port Impedance priority.



Differential Port Matching dialog box help

This function allows the embedding of a differential matching circuit at a balanced port.

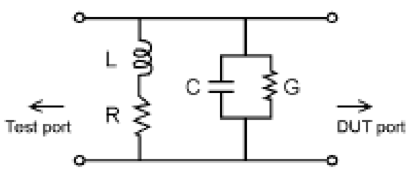
See Order of Fixture Operations.

Enable Differential Port Matching Check to embed the selected matching circuit to the measurement results. Must also enable Fixturing ON/off.

Logical Port Choose Logical DUT port to receive the selected matching circuit. To see logical port numbers, see the measurement topology.

Select Circuit Select a matching circuit. Choose from:

- **Shunt L - Shunt C** Predefined circuit.



Circuit Values Choose from:

- **C** Capacitance value
- **G** Conductance value
- **L** Inductance value
- **R** Resistance value

- **User defined** Select an *.S2P file that represents the matching circuit. Then click **Browse** to navigate to the *.S2P file.

Note: For the *.S2P file:
Port 1 of the circuit is assumed to be connected to the PNA
Port 2 of the circuit is assumed to be connected to the DUT.

- **None** No embedded circuit on selected port.

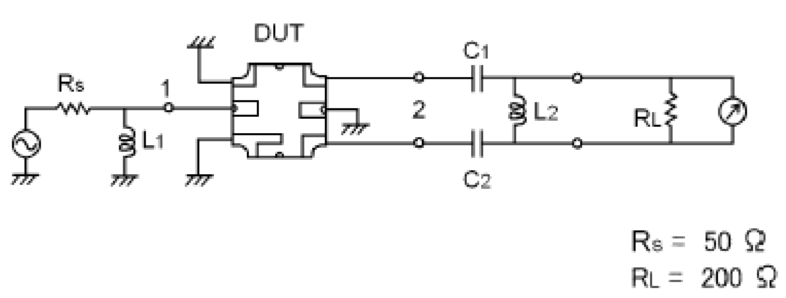
Close Closes the dialog box.

Fixture Simulator Example

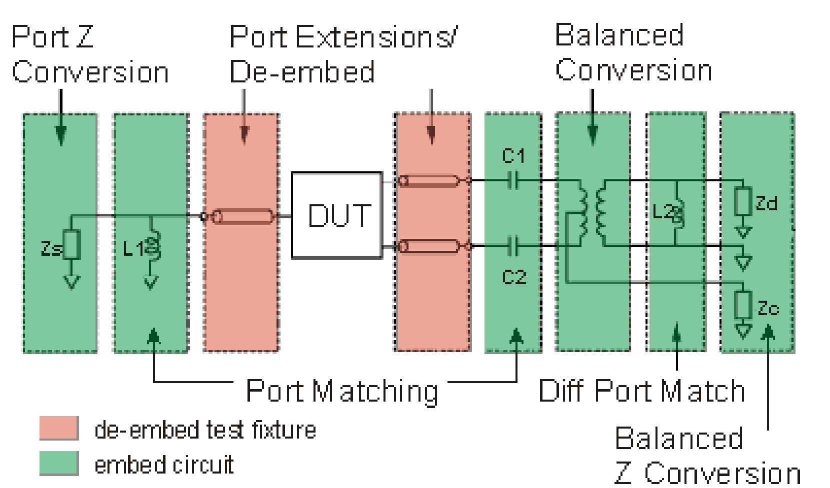
The following example shows a DUT and the matching circuit with which the DUT will be used in its intended application. When the DUT is tested in a high-volume manufacturing environment, multiple test fixtures are often required. The most accurate way to test the DUT and ensure measurement consistency between the different test fixtures is to use a simple, repeatable, test fixture without the actual matching elements.

To get the desired performance data, the parasitic effects of the fixture must first be removed (de-embedded) from the measured data. Then a perfect "virtual" matching circuit must be simulated and added mathematically (embedded) to the corrected, measured data. The result is an accurate display of the DUT as though it was actually tested with a physical matching circuit, but without the uncertainties of using real components.

Test Device and the circuit in which it will be used.



Circuit Simulation



This diagram does NOT refer to the order in which operations are performed.

See Order of Fixture Operations.

1. Create a balanced measurement using single-ended to balanced (SE-Bal) topology. Include all relevant measurement settings (IFBW, number of points, and so forth). Once the measurement is created and calibrated, the measurement parameter can be easily changed. For example, Sdd22 to Sds21.

2. Calibrate the measurement at the point where the simple test fixture is connected to the PNA. Use accurate calibration standards and definitions.

3. Remove the effects of the three uncalibrated transmission lines of the simple test fixture. This can be done in several different methods. The easiest is to use manual or automatic Port Extensions to move the calibration reference plane to the DUT. This removes the electrical length and loss of the fixture's transmission lines, but does not account for fixture mismatch. Another method is to de-embed previously-created *.S2p files of the 3

transmission lines. The files can be created using external ADS modeling software. Another alternative is to create the *.S2P files by independently measuring all 3 ports of the test fixture and saving the results of each to an S2P file.

4. With the test fixture connected to the PNA and a DUT inserted, the measurement results now appear as though calibration was performed at the connections to the DUT, and the device was measured in a 50-ohm single-ended test environment. The following steps will cause the results to reflect the performance of the device as though the device is embedded in the circuit in which it will be used.
5. Port 1 of the device is a single-ended port and sees a source impedance the same as the PNA system impedance, so no change is required. However, if Rs were a value other than 50 ohms, Port 1 Impedance Conversion would be used to simulate the different impedance.
6. Port Matching is used to simulate L1 inductance. Select any of the Shunt L circuits to embed (add) to the measurement results. Enter the value of L and R. The C and G values can be entered as 0 (zero).
7. Port Matching is used to simulate C1 and C2 capacitance. For both port 2 and port 3, select any of the **Series C** circuits to embed (add) to the measurement results. Enter the value of C and G. The L and R values can be entered as 0 (zero).
8. Balanced Conversion mathematically simulates the measurement in balanced mode.
9. Differential Port Matching is used to simulate L2 inductance. Select Shunt L- Shunt C and enter the inductance / resistance value. The C and G values can be entered as 0 (zero).
10. Finally, Differential Z Conversion is used to simulate a circuit termination of 200 ohms. If you are making Common Mode measurements, specify Common Mode Z Conversion.

Last modified:

March 10, 2008	MX Added UI
Sept 12, 2006	Added link to programming commands

Port Extensions

Port extensions allow you to electrically move the measurement reference plane after you have performed a calibration. The following two scenarios show how port extensions can be useful.

1. You have already performed a calibration, and then decide that you need to add a length of transmission line in the measurement configuration. Use port extensions to "tell" the analyzer you have added the length to a specific port.

2. You are unable to perform a calibration directly at your device because it is in a test fixture. Use port extensions to compensate for the time delay (phase shift), and optionally the loss, caused by the added transmission line of the fixture.

See Also

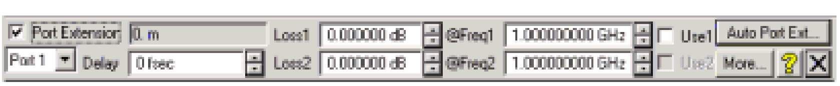
Fixture Compensation features

Phase Accuracy

Comparing the PNA Delay Functions

How to launch the Port Extensions toolbar

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Port Extension Toolbar**
For PNA-X and 'C' models	Programming Commands
1. Press CAL 2. then **[Port Ext Tool]**	1. Click **Response** 2. then **Cal** 3. then **Port Extension Tool**



Port Extensions toolbar help

Port extensions settings affect **all measurements on the active channel** that are associated with a particular port.

Learn about Port Extensions (scroll up)

- If you know the electrical length of additional transmission line, enter the value directly to the Delay setting.
- If you know the physical length of additional transmission line, increase the Delay setting until the physical length setting (directly above Delay) is achieved.
- If you do not know the electrical or physical length of additional transmission line, you must be able to connect an OPEN or SHORT to the new reference plane at the point of the DUT. In most cases, removing the DUT will leave a suitable OPEN at the new reference plane. Port Extensions can then be added manually (as follows), or by using Automatic Port Extensions.

Manual Port Extensions Procedure

1. Select a calibrated S11 measurement.
2. Select Phase format.
3. With an OPEN or SHORT at the calibration reference plane, verify that the phase across the frequency span is at or near zero.
4. Connect the added transmission line or fixture and attach an OPEN or SHORT in place of the DUT. In most cases, removing the DUT will leave a suitable OPEN at the new reference plane. On the Port Extension toolbar, increase **Delay** until the phase response is flat across the frequency span of interest.
5. If you know the loss of the additional transmission line, enter the Loss Compensation values using either one or two data points.

Note: Most OPEN and SHORT standards have delay. Therefore, adjusting delay with this method results in a delay equal to two times the delay of the OPEN or SHORT.

Port Extensions Settings

Port Extension Turns ON and OFF port extensions on all ports.

Port Select a PNA port for delay and loss values. Port Extensions settings affect ALL measurements on the active channel that are associated with a particular port.

Delay The amount of port extension delay in time. To compensate for delay in additional transmission line, enter a positive value.

Loss Compensation

The following settings, along with Loss at DC, allows the entire frequency span to be corrected for loss using a curved-fit algorithm.

To compensate for loss in additional transmission line, enter a positive value which causes the trace to shift in the positive (up) direction.

Loss1 Loss in dB at **Freq1**.

Use1 Check calculate and apply port extension Loss1 @Freq1 values. Also, check if using Loss at DC value.

Loss2 Loss in dB at **Freq2.**

Use2 ONLY available if Use1 is checked. Calculate and apply port extension Loss2 @Freq2 values.

Loss is calculated for each frequency data point (f) as follows.

If Use1 is checked and NOT Use2 then:

Loss(f) = Loss1 * (f/Freq1) ^ 0.5

If Use1 AND Use2 are checked, then:

Loss(f) = Loss1 * (f/Freq1) ^ n

Where:

n = $\log_{10}$ [abs(Loss1/Loss2)] / $\log_{10}$ (Freq1/Freq2)

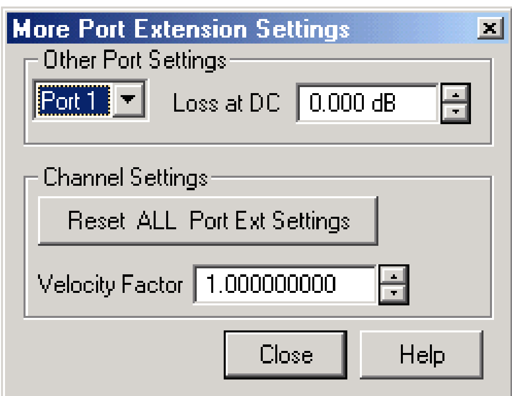
Note: abs = absolute value

More Invokes the More Port Extensions Settings dialog box.

Auto Ext. Invokes the Automatic Port Extensions dialog box

Note: Individual receiver port extensions (A,B, and so forth) can no longer be set. (Sept. 2004)

Learn about Port Extensions (scroll up)



More Port Extensions Settings dialog box help

Note: Port Extensions settings affect ALL measurements on the **active** channel that are associated with a particular port.

Other Port Settings

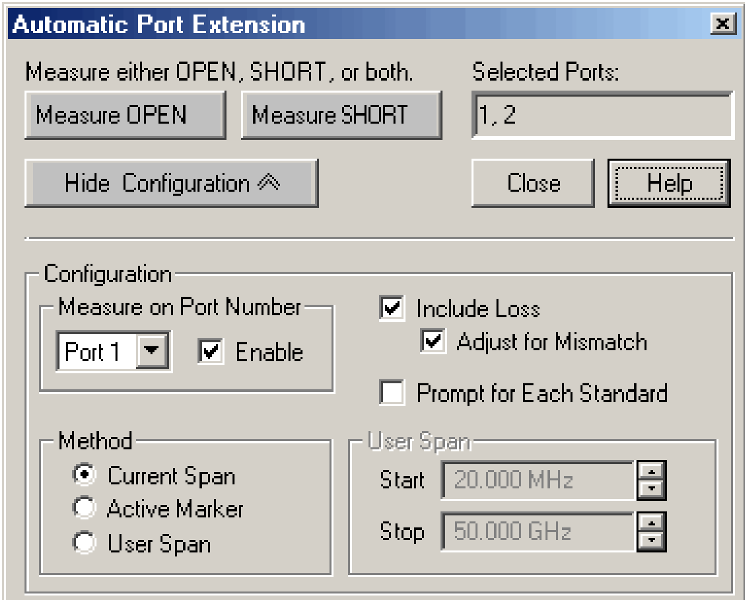
Port - Loss at DC Offsets the entire frequency span by this value. Use1 on the Port Extension toolbar must also be checked. To compensate for loss at DC, enter a positive value which causes the trace to shift in the positive (up) direction.

Channel Setting

Reset ALL Port Ext Settings All port extensions settings are changed to preset values. Port Extension state (ON / OFF) is unaffected.

Velocity Factor Specifies the velocity factor that applies to the medium of the device that was inserted after the measurement calibration. The value for a polyethylene dielectric cable is 0.66 and 0.7 for Teflon dielectric. 1.0 corresponds to the speed of light in a vacuum.

Learn about Port Extensions (scroll up)



Automatic Port Extension dialog box help

Automatic Port Extension AUTOMATICALLY performs the same operation as Manual Port Extension. By connecting a SHORT or OPEN, the reference plane is automatically moved to the point at which the standard is connected. In addition, Automatic Port Extension will optionally measure and compensate for the loss of the additional transmission line.

Auto Port Extensions Procedure

1. Connect the added transmission line or fixture. Attach an OPEN or SHORT to all affected ports at the new reference plane. In most cases, removing the DUT will leave a suitable OPEN at the new reference plane.
2. On the Port Extension toolbar, click **Auto Port Ext**. Click **Show Configuration** to make additional settings.
3. Click **Measure** to perform the port extension calculations. The resulting delay and loss settings are entered into the port extension toolbar. These settings are saved with Instrument Save or you can manually record the values and enter them again when required.

Settings

Measure either OPEN, SHORT, or both Press a button to make the measurement of the reflection standard.

Measure either OPEN or SHORT depending on which is most convenient. An ideal OPEN and SHORT, with zero loss and delay, is assumed. Therefore, accuracy is most affected by the quality of the standard. In most cases, removing the DUT will leave a suitable OPEN at the new reference plane. When measuring both OPEN and SHORT standards, the average of the two is used and will slightly improve accuracy.

Selected Ports Indicates the ports that currently have automatic port extension enabled. By default, ALL PNA ports are enabled. To disable a port, see **Measure on Port Number** below.

Note: Port Extensions settings affect ALL measurements on the active channel that are associated with a particular port.

Show/Hide Configuration Press to either show or hide the following configuration settings in the dialog box.

Measure on Port Number

Select port number to enable or disable automatic port extension.

Enable Check to enable the specified port. All enabled ports will have their reference plane automatically adjusted after performing Automatic Port Extension.

Include Loss Check to automatically measure the loss in the additional transmission line and apply compensation. To calculate loss compensation, frequencies at 1/4 and 3/4 through the frequency range are usually used as Freq1 and Freq2 values. Learn more about Loss Compensation.

Adjust for Mismatch Only available when **Include Loss** is checked. During the measurement of the OPEN or SHORT standard, mismatch could cause ripple in the magnitude (loss) response. The Loss compensation curved-fit algorithm allows half of the ripple to be positive and half negative. When measuring low-loss devices, it is possible that some magnitude responses could become slightly positive, indicating gain rather than loss.

Check - Offsets the trace to cause all of the data points to be at or below zero.

Clear - Most accurate application of the curve-fit calculation, but allows positive responses.

Prompt for Each Standard Check to invoke a prompt when the Measure OPEN or SHORT button is pressed. The prompt will indicate which standard to connect to which port.

Method

Select the span of data points which will be used to determine correction values for phase and loss (optional). If a portion of the current frequency span does not have flat or linear response, you can eliminate this portion from the calculations by using a reduced User Span.

To calculate loss compensation, Current Span and User Span methods usually use frequencies at 1/4 and 3/4 through the frequency range as Freq1 and Freq2 values. See Loss Compensation to learn more about how loss is calculated.

Current Span Use the entire frequency span to determine phase and loss values.

Active Marker Use only the frequency at the active marker, and one data point higher in frequency, to calculate phase and loss values. If a marker is not present, one will be created in the center of the frequency span.

User Span Use the following User Span settings to determine phase and loss values.

User Span

Start Enter start frequency of the user span.

Stop Enter stop frequency of the user span.

Learn about Port Extensions (scroll up).

See also Comparing the PNA Delay Functions

Last modified:

March 10, 2008	MX Added UI
9/12/06	Added link to programming commands

Delta Match Calibration

A TRL Cal, QSOLT, or Unknown Thru Cal requires a reference receiver for each test port. The 4-port PNA-L model does NOT have a reference receiver for each test port.

A Delta Match Calibration can be thought of as a software method which provides a reference receiver for each test port when not otherwise available in the hardware. The Delta Match Calibration measures the source match and load match of the PNA test ports, and then calculates the differences, or "delta", of the two match terms. The results are then used to correct subsequent TRL, QSOLT, or Unknown Thru calibrations.

There are several ways to acquire the Delta Match Calibration:

1. **From an existing User Cal Set** that meets the following Delta Match criteria: (Not allowed for use with external test sets.)
    - Must have been performed using ECal or as a guided mechanical Cal (not Unguided).
    - Must have the same start frequency, stop frequency, and number of points as the channel being calibrated.
    - Must calibrate the ports that require the delta match terms.
2. **From a Global** Delta Match Calibration.
3. **From a 'Self Delta Match'** when other portions of the calibration fully characterize all ports using SOLT with Defined Thru or Flush Thru. For example, when calibrating all four ports of a PNA-L, perform a SOLT between ports 1 and 2, and also between ports 3 and 4, then Unknown Thru could be used between any combination of the remaining ports. This is allowed with an external test set.

Which to use? A Self Delta Match Cal will always be used when possible. Otherwise, the Cal Wizard will use a Global Delta Match Cal when available unless you select Choose Delta Match.

Global Delta Match Cal

A Global Delta Match Cal is an "all-inclusive" calibration that can be applied whenever the delta match terms are required.

A Global Delta Match Cal differs from a standard SOLT Cal in the following ways:

- It is always performed using a Flush Thru, a Known Thru, or an insertable ECal module. You can NOT use an Unknown Thru in the calibration process.
- Only two Thru connections are required to characterize the delta match terms on a 4-port PNA. This is less than the minimum number of Thrus of a standard 4-port Cal.
- Upon completion, the Global Delta Match Cal is stored as a special type of Cal Set and should be used ONLY as a Delta Match Cal. It provides Delta Match error terms, but does NOT provide all of the standard error correction terms.
- To attain the highest accuracy, the following settings are automatically used to perform a Global Delta Match Cal. When applied, it will likely be interpolated.

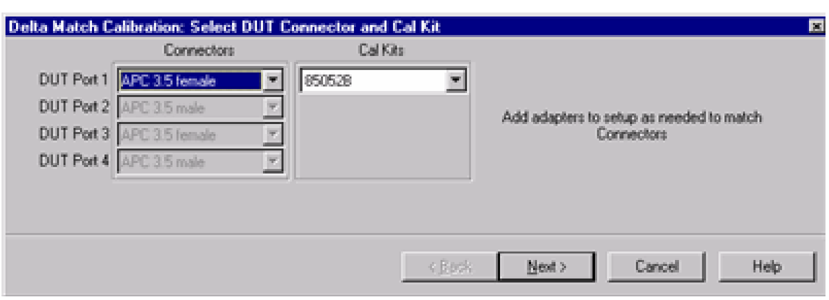
- Performed over the entire frequency range of the PNA.
- Uses very dense data points, particularly at low frequencies.
- Uses 100 Hz IF Bandwidth.

Note: For highest accuracy, perform Global Delta Match Cal using an insertable ECal module and select Flush-thru as the Calibration Thru method.

How to perform a Global Delta Match Cal

These selections will only be available if the PNA hardware requires a Delta Match Calibration.

Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Calibration** 2. then **Global Delta Match Cal**
For PNA-X - Not required **For PNA 'C' Models**	Programming Commands
1. Press CAL 2. then **[Start Cal]** 3. then **[Global Delta Match**	1. Click **Response** 2. then **Cal** 3. then **Start Cal** 4. then **Global Delta Match**



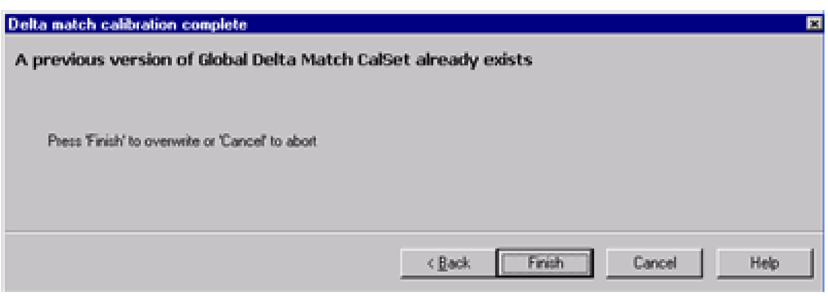
Delta Match Calibration. Select DUT Connectors and Cal Kit dialog box help

- Only one Cal Kit is specified and necessary to perform a Delta Match Cal. However, ALL of the PNA test ports are calibrated in a Delta Match Cal.
- You must configure ALL test ports to terminate in the specified connector / gender using the necessary adapters. The errors from adapters are removed during calibration, but the Thru connections must be made as specified.
- **If you select an ECal module that does NOT cover the entire frequency range of the PNA**, your selection will change to a different Cal Kit. The Global Delta Match Cal covers the entire frequency range of the PNA. Your selected Cal Kit or ECal module must also cover the frequency range of the PNA.

Guided Calibration Steps dialog box help

Click **Measure** for each standard.

When all standards have been measured, click **Done** to complete the measurement steps.



Delta Match Calibration Complete dialog box help

Click **Finish** to store the Global Delta Match Calibration as a special type of Cal Set.

By default, it will be used when a Delta Match Calibration is required.

It should ONLY be used as a Delta Match Cal. It does NOT provide all of the standard error correction terms.

Last modified:

9-Nov-2007	Edits for requirements
23-Feb-2007	Modified requirements for multiport
9/12/06	Added link to programming commands

Markers

Markers provide a numerical readout of measured data, a search capability for specific values, and can change stimulus settings. There are 9 regular markers and one Reference marker (used with Delta markers) available per trace. This topic discusses all aspects of markers.

Note: Marker Readout can be turned ON / OFF and customized from the **View/Display** menu. See Marker Readout

- **Creating and Moving Markers**
- **Delta Markers**
- **Searching with Markers**
- **Marker Functions (Change Instrument Settings)**
- **Advanced Marker Settings**
- **Marker Table**

Other Analyze Data topics

How to Create Markers

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press **MARKER** The first button press creates marker 1. 2. To create more markers, use the Active Entry toolbar 3. Or use the Marker toolbar	1. Click **Marker** 2. then **Marker**
For PNA-X and 'C' models	Programming Commands
1. Press **MARKER** 2. then **[Marker n]**	1. Click **Marker/Analysis** 2. then **Marker** 3. select a marker number

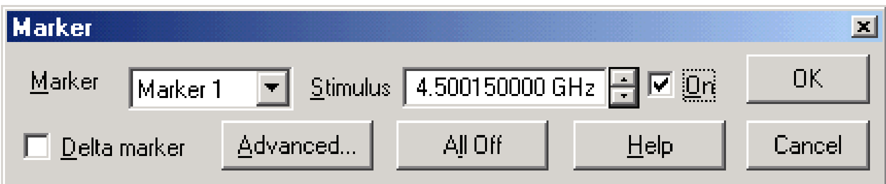
Moving a Marker

To move a marker, make the marker active by selecting its number in any of the previous 3 methods. The **active marker** appears on the analyzer display as Ñ. All of the other markers are inactive and are represented on the analyzer display as D. Then change the stimulus value using any of the following methods:

- Type a value.
- Scroll to a stimulus value using the up / down arrows. The resolution can not be changed.
- Click the stimulus box, then use the front-panel knob.

Click and Drag Markers - PNA-X ONLY

Markers can also be moved across a trace using a finger (touchscreen) or by left-clicking and holding a marker symbol. Then drag the marker to any point on the trace. This feature is NOT allowed in Smith Chart or Polar display formats or with a Fixed Marker type.



Marker dialog box help

Marker Specifies the current (active) marker number.

Stimulus Specifies the X-axis value of the active marker. To change stimulus value, type a value, use the up and down arrows, or click in the text box and use the front-panel knob.

On Check to display the marker and corresponding data on the screen.

Delta Marker Check to make the active marker display data that is relative to the reference (R) marker. There is only one reference marker per trace. All nine other markers can be regular markers or delta markers. When a delta marker is created, if not already displayed, the reference marker is displayed automatically.

A delta marker can be activated from the Marker dialog box or the Marker Toolbar.

Advanced... Invokes the Advanced Markers dialog box.

All Off Switches OFF all markers on the active trace.

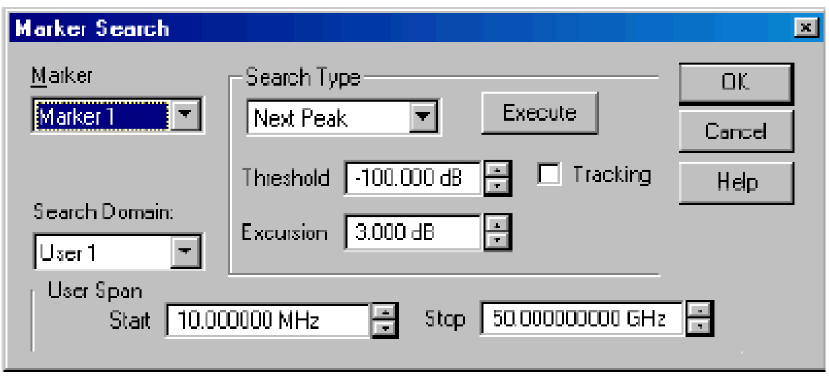
Searching with Markers

You can use markers to search measurement data for specific criteria.

If there is no valid data match for any of the search types, the marker will not move from its current position.

How to Search with Markers

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press MARKER SEARCH 2. Only **Max, Min, Left Peak**, and **Right Peak** search types are available from Active Entry Keys	1. Click **Marker** 2. then **Marker Search**
For PNA-X and 'C' models	Programming Commands
1. Press SEARCH	1. Click **Marker/Analysis** 2. then **Marker Search**



Marker Search dialog box help

Marker Specifies the marker that you are defining.

Search Domain Defines the area where the marker can move or search. For full span, the marker searches for specified values within the full measurement span. For user span, the marker searches for specified values within a measurement span that you define. Learn more about Search Domain.

Search Type

Maximum Marker locates the maximum (highest) data value.

Minimum Marker locates the minimum (lowest) data value.

Next Peak Marker locates the peak with the next lower amplitude value relative to its starting position.

Peak Right The marker locates the **next valid peak to the right** of its starting position on the X-axis.

Peak Left The marker locates the **next valid peak to the left** of its starting position on the X-axis.

- **Threshold** - Minimum amplitude (dB). To be considered valid, the peak must be **above** the threshold level. The valley on either side can be below the threshold level.

- **Excursion** The vertical distance (dB) between the peak and the valleys on both sides. To be considered a peak, data values must "fall off" from the peak on both sides by the excursion value.

For more information, see **What is a Peak?**

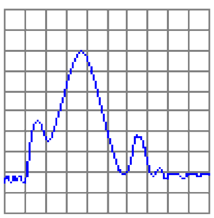
Target Enter the Target value. The marker moves to the first occurrence of the Target value **to the right of its current position**. Subsequent presses of the Execute button cause the marker to move to the next value to the right that meets the Target value. When the marker reaches the upper end of the stimulus range, it will "wrap around" and continue the search from the lower end of the stimulus range (left side of the window).

- If **Discrete Marker** is OFF, the marker locates the interpolated data point that equals the target value.
- If **Discrete Marker** is ON and there are two data points on either side of the target value, the marker locates the data point closest to the Target value

Bandwidth Four markers are automatically generated to find the first negative or positive bandpass in the selected search domain. Specify the level in dB from the peak or valley where bandwidth is measured.

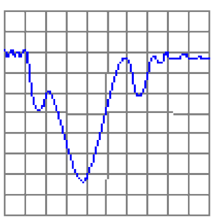
- Bandwidth Search can be used ONLY with Log Mag display format.
- To use Bandwidth Search on a peak or valley other than the maximum or minimum values, change the Search Domain.

Enter a **Negative** number to search for a **Peak** bandpass, such as a filter S21 response:



- Marker 1: Maximum value within the Search Domain.
- Marker 2: Specified level DOWN the left of the peak.
- Marker 3: Specified level DOWN the right of the peak.
- Marker 4: Center frequency between markers 2 and 3.

Enter a **Positive** number to search for a **Valley** bandpass, such as a filter S11 response:



- Marker 1: Minimum value within the Search Domain.
- Marker 2: Specified level UP the left of the valley.
- Marker 3: Specified level UP the right of the valley.
- Marker 4: Center frequency between markers 2 and 3.

The following four values are displayed for Bandwidth Search:

- **BW**: (Marker 3 x-axis value) **-** (Marker 2 x-axis value) = width of the filter.
- **Center** Mathematical midpoint between markers 2 and 3.

- **Q** Ratio of Center Frequency to Bandwidth (Center Frequency / Bandwidth).
- **Loss** Y-axis value of Marker 4. This is the loss of the filter at its center frequency. The ideal filter has no loss (0 dB) in the passband.

Note You must either press **Execute** or check **Tracking** to initiate all search types.

Execute Click to cause the marker to search for the specified criteria.

Tracking Check to cause the marker to search for the specified criteria with each new sweep. The searches begin with the first sweep after Tracking has been checked, based on the current search type and domain information. Therefore, make sure that the search criteria are in the desired state before using the data. You cannot manually change the stimulus setting for a marker if Tracking is selected for that marker.

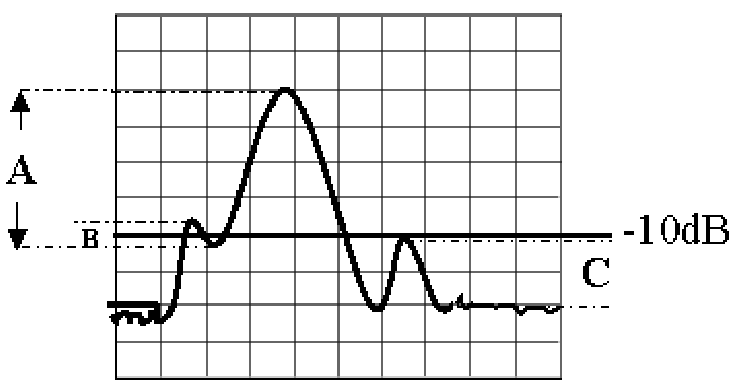
What Is a "Peak"?

You define what the analyzer considers a "peak" by selecting the following two peak criteria settings:

- **Threshold** - Minimum amplitude (dB). To be considered valid, the peak must be **above** the threshold level. The valley on either side can be below the threshold level.
- **Excursion** - The vertical distance (dB) between the peak and the valleys on both sides. To be considered a peak, data values must "fall off" from the peak on both sides by the excursion value.

Example:

Threshold Setting: -10dB
Excursion Setting: 1dB
Scale = 1 dB / Division
Mouse over the graphic to find a valid peak.



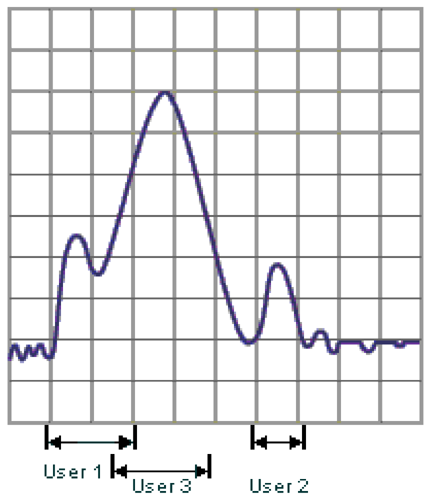
- **Peak A** = Valid Peak (Above Threshold and Excursion Settings)
- **Peak B** = Invalid Peak (Below Excursion Setting)
- **Peak C** = Invalid Peak (Below Threshold Setting)

Search Domain

Search domain settings restrict the stimulus values (X-axis for rectangular format) to a specified span. Set the Start and Stop stimulus settings of these **User** spans. If Start is greater than Stop, the marker will not move.

- The default domain of each new marker is "full span".
- There are 16 user-defined domains for every channel.
- The user-defined domains can overlap.
- More than one marker can use a defined domain.

The graphic below shows examples of search domains.



Marker Functions - Change Instrument Settings

The following settings change the relevant PNA settings to the position of the active maker.

How to change instrument setting using markers	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Press MARKER FUNCTION 2. Only **Center, Ref Level**, and **Delay** are available	1. Click **Marker** 2. then **Marker Function**
For PNA-X and 'C' models	Programming Commands
1. Press MARKER 2. then **[Marker Function]**	1. Click **Marker/Analysis** 2. then **Marker Function**

Marker Function dialog box help

Note: Marker Functions do not work with channels that are in CW or Segment Sweep mode.

Marker =>Start Sets the start sweep setting to the value of the active marker.

Marker =>Stop Sets the stop sweep setting to the value of the active marker.

Marker =>Center Sets the center of the sweep to the value of the active marker.

Marker =>Ref Level Sets the screen reference level to the value of the active marker.

Marker =>Delay The phase slope at the **active marker** stimulus position is used to adjust the line length to the receiver input. This effectively flattens the phase trace around the active marker. (Additional Electrical Delay adjustments are required on devices without constant group delay over the measured frequency span.) You can use this to measure the electrical length or deviation from linear phase.

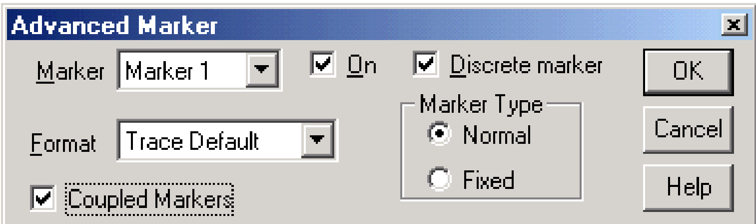
This feature adds phase delay to a variation in phase versus frequency; therefore, it is only applicable for ratioed measurements. (See Measurement Parameters.)

Marker =>Span Sets the sweep span to the span that is defined by the delta marker and the marker that it references. Unavailable if there is no delta marker.

How to select Advanced Marker settings

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press **MARKER**	1. Click **Marker** 2. then **Marker** 3. then **Advanced** on the Maker Dialog
For PNA-X and 'C' models	Programming Commands

1. Press **MARKER** 2. then **[Properties]** 3. then **[Advanced Markers]**	1. Click **Marker/Analysis** 2. then **Marker Function**



Advanced Marker dialog box help

Marker Specifies the marker number that you are defining.

On Check to display the marker and corresponding data on the screen.

Format Displays the marker data in a format that you choose. The marker format could be different from the grid format. In the default setting, the marker and grid formats are the same.

Discrete Marker Check to display values at only the discrete points where data is measured. Clear to display values that are interpolated from the data points. The interpolated marker will report y-axis data from ANY frequency value between the start and stop frequency.

Coupled Markers Check to couple markers by marker number, 1 to 1, 2 to 2 and so forth. The markers will remain coupled until this box in unchecked. Learn more about coupled markers.

Marker Type

Normal Has a fixed stimulus position (X-axis) and responds to changes in data amplitude (Y-axis). It can be scrolled left and right on the X-axis by changing the marker stimulus value. Use this marker type with one of the marker search types to locate the desired data.

Fixed Has a fixed X and Y-axis position based on its placement on the trace when it was set to fixed. It does NOT move with trace data amplitude. It can be scrolled left and right on the X-axis by changing the marker stimulus value.

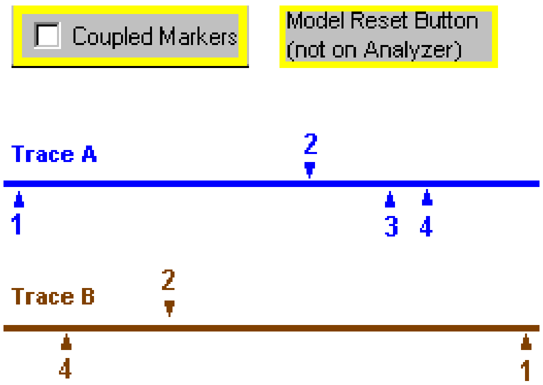
Use this marker type to quickly monitor "before and after" changes to your test device. For example, you could use fixed markers to record the difference of test results before and after tuning a filter.

Coupled Markers

The coupled markers feature causes markers on different traces to line up with the markers on the selected trace. Markers are coupled by marker number, 1 to 1, 2 to 2, 3 to 3, and so forth. If the x-axis domain is the same (such as frequency or time), coupling occurs across all channels, windows, and traces. Trace markers in a different x-axis domain will not be coupled. If a trace marker has no marker to couple with on the selected trace, the marker remains independent.

Coupled Markers Model

This model simulates the use of coupled markers in the PNA



1. Click **Trace A** or **Trace B**
2. Click **Coupled Markers**
3. Notice the following:
   * Markers on the unselected trace move to the x-axis position of the selected trace.
   * If a marker number on the unselected trace has no corresponding marker on the selected trace, no movement occurs for that marker.
4. Click **Reset** to run the model again. (There is no Reset for coupled markers on the PNA.)

Set Coupled Markers from the Advanced Markers dialog box.

Marker Table

You can display a table that provides a summary of marker data for the active trace. The marker data is displayed in the specified format for each marker.

How to view the Marker Table	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Marker** 2. then **Marker Table**
For PNA-X and 'C' models	Programming Commands
1. Press **DISPLAY** 2. then **[More]**	1. Click **Response** 2. then **Display**

3. then **[Tables]**	3. then **Tables**
4. then **[Marker Table]**	4. then **Marker Table**

Last Modified:

4-Jan-2008	Added bookmark to move marker
17-Jul-2007	Clarified bandwidth search
2-Feb-2007	MX Added UI

Using Math Operations

You can perform four types of math on the active trace versus a memory trace. In addition three statistics (Mean, Standard Deviation and Peak to Peak) can be calculated and displayed for the active data trace.

- Trace Math
- Trace Statistics

Note: Trace Math (described here) allows you to quickly apply one of four math operations using memory traces. Equation Editor allows you to build custom equations using several types of traces from the same, or different channels.

Other Analyze Data topics

Trace Math

To perform any of the math operations, you must first store a trace to memory. You can display the memory trace using the View options.

Trace math is performed on the complex data before it is formatted for display. See the PNA data processing map.

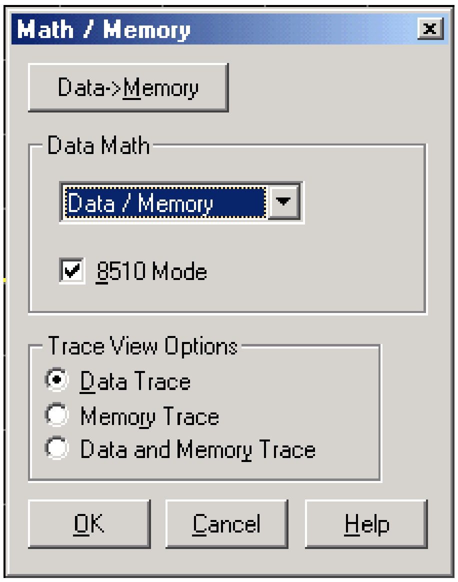
Markers can be used while viewing a memory trace.

How to select Trace Math

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press **MATH/MEMORY** 2. Only the following are available from Active Entry • **Data>>Mem** (stores Data trace into Memory) • **Data/Mem** (performs math operation: Data divided by memory) • **Data** (displays data trace with no math operation applied) • **Mem on/OFF** (turns Memory trace on or off)	1. Click **Trace** 2. then **Math**

For [PNA-X](#) and ['C' models](#)	Programming Commands
1. Press **MEMORY**	1. Click **Marker/Analysis** 2. then **Memory** 3. then **Memory**

Normalize, available only from the Memory menu, (not on the Math / Memory dialog), performs the same function as **Data=>Memory**, then **Data / Memory.**



Math / Memory dialog box help

Normalize, available only from the Memory menu, (not on the Math / Memory dialog), performs the same function as **Data=>Memory**, then **Data / Memory**.

Data=>Memory Puts the active data trace into memory. You can store one memory trace for every displayed trace.

Data Math

All math operations are performed on linear (real and imaginary) data before being formatted. See the PNA Data flow (below).

Data Does no mathematical operation.

Data / Memory - Current measurement data is divided by the data in memory. Use for ratio comparison of two traces, such as measurements of gain or attenuation. Learn more.

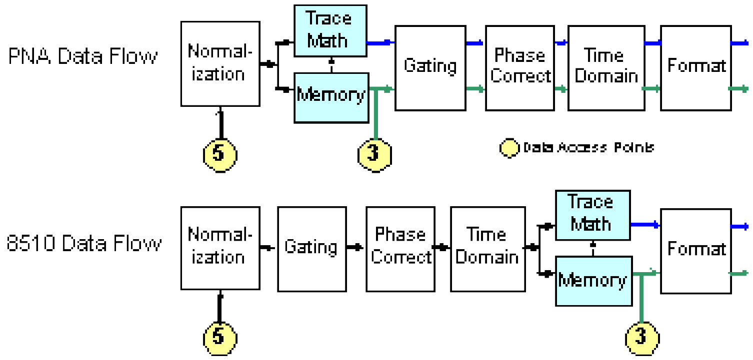
Data – Memory - Data in memory is subtracted from the current measurement data. For example, you can use this feature for storing a measured vector error, then subtracting this error from the DUT measurement. Learn more.

Data + Memory - Current measurement data is added to the data in memory. Learn more.

Data * Memory - Current measurement data is multiplied by the data in memory. Learn more.

8510 Mode Check to simulate the Agilent 8510 data processing chain as it pertains to Trace Math and Memory. This setting applies to all channels. When the box is checked or cleared, the PNA performs an Instrument Preset and retains its setting through subsequent Instrument Presets.

This setting is saved as part of an instrument state. However, when recalled, this setting is assumed only temporarily. When a subsequent PNA Preset is performed, the PNA reverts to the setting that was in effect before the state was recalled.



This represents the relevant portion of the data flow. See the entire PNA data processing chain.

A settings change in any of the operations that occur after the Memory operation on the above **PNA Data Flow** diagram changes both the Data trace and the Memory trace. For example, after storing a data trace to memory, when you change the format for the Data Trace, the format for the Memory Trace is also changed to the same setting.

Trace View Options

Data Trace Displays ONLY the Data trace (with selected math operation applied).

Memory Trace Displays ONLY the trace that was put in memory.

Data and Memory Trace Displays BOTH the Data trace (with selected math operation applied). and the trace that was put in memory.

Learn more about Trace Math (scroll up)

(Data / Memory) and (Data - Memory)

(Data / Memory) and (Data - Memory) math operations are performed on linear data before it is formatted. Because data is often viewed in log format, it is not always clear which of the two math operations should be used. Remember: dividing linear data is the same as subtracting logarithmic data. The following illustrates, in general, when to use each operation.

Use **Data / Memory** for normalization purposes, such as when comparing S21 traces "before" and "after" a change is made or measurement of trace noise. In the following table, the Data/Mem values intuitively show the differences between traces. It is not obvious what Data-Mem is displaying.

S21 values to compare	Data/Mem	Data-Mem
0.5 dB and 0.6 dB	0.1 dB	-39 dB
0.5 dB and 0.7 dB	0.2 dB	-33 dB

Use **Data - Memory** to show the relative differences between two signals. Use for comparison of very small signals, such as the S11 match of two connectors.

In the following table, Data/Mem shows both pairs of connectors to have the same 2 dB difference. However, the second pair of connectors have much better S11 performance (-50 and -52) and the relative significance is shown in the Data-Mem values.

S11 values to compare	Data/Mem	Data-Mem
-10 dB and -12 dB	2 dB	-24 dB
-50 dB and -52 dB	2 dB	-64 dB

Data * Memory and Data + Memory

Use **Data * Memory and Data + Memory** to perform math on an active data trace using data from your own formulas or algorithms rather than data from a measurement. For example, if you want to simulate the gain of a theoretical amplifier placed in series before the DUT, you could do the following:

1. Create an algorithm that would characterize the frequency response of the theoretical amplifier.
2. Enter complex data pairs that correspond to the number of data points for your data trace.
3. Load the data pairs into memory with SCPI or COM commands. The analyzer maps the complex pairs to correspond to the stimulus values at the actual measurement points.
4. Use the **data + memory** or **data * memory** function to add or multiply the frequency response data to the measured data from the active data trace.

Note: The data trace must be configured before you attempt to load the memory.

Trace Statistics

You can calculate and display statistics for the active data trace. These statistics are:

- Mean
- Standard deviation
- Peak-to-peak values

You can calculate statistics for the full stimulus span or for part of it with user ranges.

There are nine user ranges per channel. These user ranges are the same as the search domains specified for a marker search in that same channel; they use the same memory registers and thus share the same stimulus spans. If you specified search domains with marker search for a channel, you can recall these same spans by selecting the corresponding user ranges. The user ranges for a channel can overlap each other.

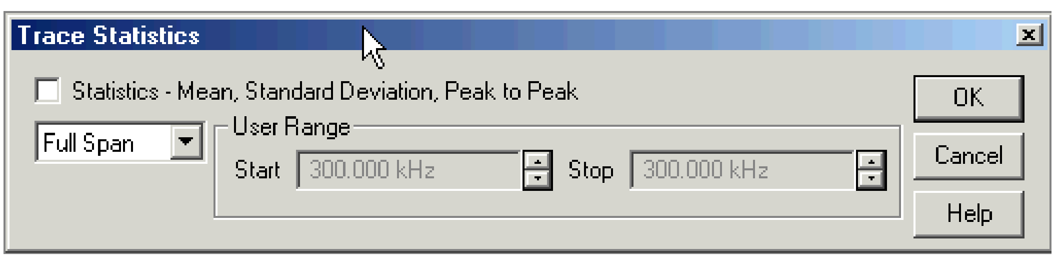
A convenient use for trace statistics is to find the peak-to-peak value of passband ripple without searching separately for the minimum and maximum values.

The trace statistics are calculated based on the format used to display the data.

- Rectangular data formats are calculated from the scalar data represented in the display
- Polar or Smith Chart formats are calculated from the data as it would be displayed in Log Mag format

See how to make Trace Statistics display settings.

How to activate Trace Statistics	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using **MENU/DIALOG**	1. Click **Trace** 2. then **Statistics**
For PNA-X and 'C' models	Programming Commands
1. Press **ANALYSIS** 2. then **[Statistics]** 3. then **[Trace Statistics]**	1. Click **Marker/Analysis** 2. then **Analysis** 3. then **Trace Statistics**



Trace Statistics dialog box help

See how to make Trace Statistics display settings.

Statistics Check to display mean, standard deviation, and peak to peak values for the active trace.

Span Specifies the span of the active trace where data is collected for a math operation. You can define up to 9 user spans per channel with Start and Stop. You can also define the user spans from the Marker Search dialog box.

Start Defines the start of a user span.

Stop Defines the stop of a user span.

Learn more about Trace Statistics (scroll up)

Last Modified:

27-Aug-2007	Edited trace display settings
2-Feb-2007	MX added UI

Equation Editor

Equation Editor, new with PNA release 6.03, allows you to enter an algebraic equation that can mathematically manipulate measured data. The results are displayed as a data trace. Data that is used in the equation can be from the same or different channels.

Note: Equation Editor is NOT available with FCA measurements.

Other 'Analyze Data' topics

Overview

Equation Editor allows you to enter an algebraic equation of standard mathematical operators and functions, referencing data that is available in the PNA. Once a valid equation is entered and enabled, the display of the active trace is replaced with the results of the equation, and updated in real-time as new data is acquired. For equations that can be expressed with Equation Editor's supported functions, operators, and data. There is no need for off-line processing in a separate program.

For example, enter the equation “S21 / (1 - S11)”. The resulting trace is computed as each S21 data point divided by one minus the corresponding S11 data point. For a 201 point sweep setup, the computation is repeated 201 times, once for each point.

As another example, suppose you want the PNA to make a directivity measurement of your 3-port DUT. This is not a “native” PNA measurement, but can be achieved using the Equation Editor. The desired result is the sum and difference of LogMag formatted traces, expressed as: S12 + S23 - S13.

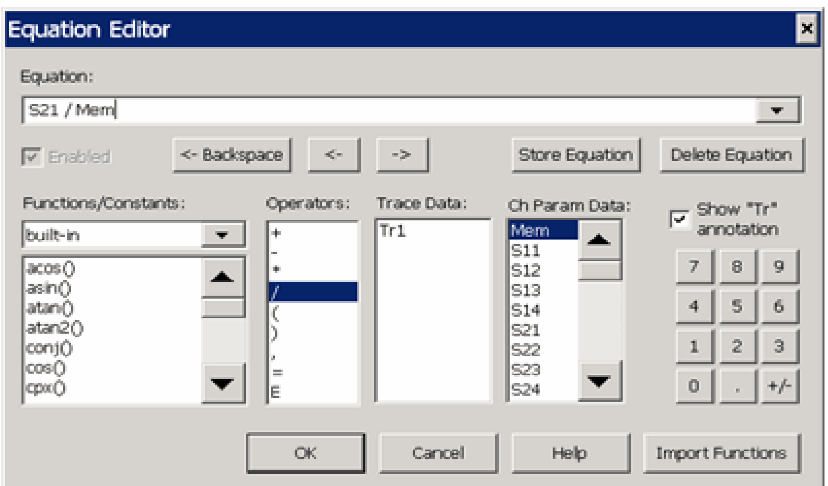
Because Equation Editor operates on **unformatted complex data**, the required equation is:

```
DIR = S12 * S23 / S13
```

DIR becomes a display label to help you identify the computed data trace.

On the equation trace, set the format to LogMag.

How to start Equation Editor	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Trace** 2. then **Equation**
For PNA-X and 'C' models	Programming Commands
1. Press **ANALYSIS** 2. then **[Equation Editor]**	1. Click **Marker/Analysis** 2. then **Analysis** 3. then **Equation Editor**



Equation Editor dialog box help

Notes

- **Double-click,** or type, the Functions, Operators, and Data to build an Equation.
- Equation Editor is NOT available with FCA measurements.
- Scroll down to learn more about Using Equation Editor

Equation: The field in which equations are built. Click the down arrow to the right to use or modify equations that have been previously saved. This is where equations are saved when you press 'Store Equation'.

Enabled Check this box to enable the equation that is currently in the Equation field. If the Enabled box is not available, then the equation is not valid. If a data trace is used that is from a different channel than the Equation trace, the channels MUST have the same number of data points to be valid.

<-Backspace Moves the cursor to the left while erasing characters.

<- Moves the cursor to the left without erasing characters.

-> Moves the cursor to the right without erasing characters.

Store Equation Press to save the current equation. To later recall the equation, click the down arrow to the right of the equation.

Delete Equation Removes the current equation from the drop-down list.

Functions/Constants: See descriptions of Functions.

Operators: See descriptions of Operators.

Trace Data: Select from ALL of the currently **displayed** traces on ALL channels.

Ch Param Data: Select from **undisplayed** data that is available ONLY from the active channel (same channel as the equation trace).

Note: With an external test set enabled, only parameters involving ports 1 through 4 are listed. However, all available parameters can be typed directly into the **Equation** field.

See Data that is used in Equations.

Show "Tr" annotation Check to show the **TrX** annotation on PNA display and Trace Status buttons.

Keypad: Provided to allow navigation of the entire dialog with a mouse.

Using Equation Editor

1. Pick a trace in which to enter the equation

- Equation Editor works on the active trace.
- Either create a new trace, or click the Trace Status button on an existing trace to make the trace active.

2. Enter an equation

Start Equation Editor (click **Trace**, then **Equation**)

Note: Equation Editor is NOT available for FCA measurements.

- The equation text can be in the form of an expression (S21)/(1-S11) or an equation (DIR = S12 * S23 / S13). This topic refers to both types as equations.
- Either type, or double-click the Functions, Operators, and Data to build an equation.
- Functions and Constants ARE case-sensitive; Data names are NOT case sensitive.
- Learn more about referring to data traces.

3. Check for a valid equation

When a valid equation is entered, the Enabled checkbox becomes available for checking. When the Enabled box is checked:

- The Equation Trace becomes computed data.
- The equation is visible on the Trace Status (up to about 10 characters).
- The equation is visible in the trace Title area (up to about 45 characters) when the Equation trace is active.
- The equation is visible in the Status Bar at the bottom of the display. This is updated only after the equation is entered and the Trace Status button is clicked.
- If an equation is NOT valid, and a trace from a different channel is used, make sure the number of data points is the same for both channels.

Learn more about the Functions, Operators, and Data that are used in Equation Editor.

Data that is used in Equation Editor

Definitions

- **Equation trace** A trace in which an equation resides.
- **Referred trace** A trace that is used as data in an equation.

Example: eq=Tr2+S11 is entered into **Tr1**.

Tr1 becomes an equation trace.

Tr2 and **S11** are both referred traces because they are used in the equation trace.

Notes

- Referred traces are processed one data point at a time. For example, the expression “S11/S21” means that for each data point in S11 and S21, divide point N of S11 by point N of S21.
- Once an equation is enabled, the trace is no longer identified by its original measurement parameter. It becomes an equation trace.

- An equation trace can NOT refer to itself. For example, an equation in Tr1 cannot refer to trace Tr1.
- Referred traces can be selected from S-Parameters, Receiver data, and Memory traces.
- See note regarding External Test Sets.

There are three ways to refer to traces:

The following distinction is important when discussing the three ways to refer to traces/data.

- **Trace** - a sequential collection of data points that are displayed on the PNA screen.
- **Data** - PNA measurements that are acquired but not displayed. When an equation trace refers to data that is not displayed, the PNA will automatically acquire the data.

1. Using **TrX** Trace notation (for example, Tr2).

When a trace is created, check "Show Tr Annotation" to see the **Tr** number of that trace.

- **Simple -** ALWAYS refers to displayed traces.
- Must be used for referring to traces in a different channel as the equation trace.
- All trace settings are preserved in the equation trace. If you do NOT want a trace setting to be used in the equation trace, you must disable it in the referred trace.
- If the referred trace is error corrected, then that data is corrected in the equation trace.
- Used to refer to a memory trace (it must already be stored in memory). Append .MEM to the **TrX** trace identifier. For example, **Tr2.mem** refers to the memory trace that is stored for Tr2.

2. Using **S-parameter** notation (for example, S11/S21)

- **Convenient** - ALWAYS refers to data that is NOT displayed.
- Refers to data that resides in the same channel as the equation.
- NOT the same as referring to a displayed S11 trace using **TrX** notation. See Example.
  - The referred data includes NO trace settings.
  - If the channel has error correction available, then it can be applied by turning error correction ON for the Equation trace.

3. Using **Receiver** notation (for example AB_2); NOT case sensitive.

At least one receiver is required, followed by an underscore and a number.

- The **letters** before the underscore refer to the receivers.
  - Letters alone refer to physical receivers.

    - Letters immediately followed by numbers refer to logical receivers. Learn more.
    - If two receivers are referenced, they are ratioed.
- The **number** after the underscore refers to the source port for the measurement.

Examples

- AR1_2 = physical receiver A / physical receiver R1 with 2 as the source port.
- a3b4_1 = reference receiver for port 3 / test port receiver for port 4 with 1 as the source port.

Learn more about ratioed and unratioed receiver measurements.

Receiver notation is like S-parameter notation in that:

- Refers to data that is NOT displayed and resides in the same channel as the equation.
- The referred data includes NO trace settings.
- If the channel has error correction available for that receiver, then it can be applied by turning error correction ON for the Equation trace.

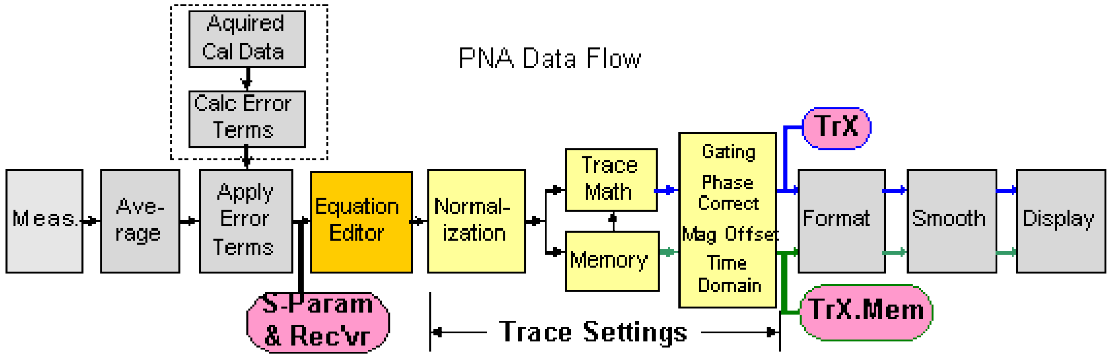
Referring to Traces in a different channel

When the equation trace refers to a trace on a different channel:

- The trace must already be displayed.
- Must refer to the trace using **TrX** notation.
- The Equation trace and the referred trace MUST have the same number of data points or the Enable checkbox will not be available.
- The Equation trace is updated when the last referred data in the same channel is acquired. Therefore, to prevent 'stale' data from being used, the Equation trace must be on a higher numbered channel than the referred trace. This is because the PNA acquires data in ascending channel number order - first channel 1, then channel 2, and so forth. If the Equation trace is on channel 1, and it refers to a trace on channel 2, the Equation trace will update after channel 1 is finished sweeping, using 'old' data for the channel 2 trace.

Trace Settings, Error Correction, and an Example

This discussion highlights the differences between using **S-parameter / Receiver** notation and **TrX** notation when referring to traces. The key to understanding the differences is realizing that **S-parameter / Receiver** notation ALWAYS refers to data that is NOT displayed.



- **Trace Settings** Normalization, Trace Math, Gating, Phase and Mag Offset, Electrical Delay, Time Domain.
- **Equation Editor** processing occurs on the **equation trace** immediately after error correction.
- **Referred Data/Trace** (used in the equation) is taken from the following locations:
  - When using **TrX** notation, data is taken immediately before formatting . These traces are always displayed and include **Trace Settings**.
  - When using **S-parameter / Receiver** notation, data is taken immediately after error correction. This data is NOT displayed and includes **NO** trace settings (see example).

Error-correction and Equation Editor

Using **TrX** notation:

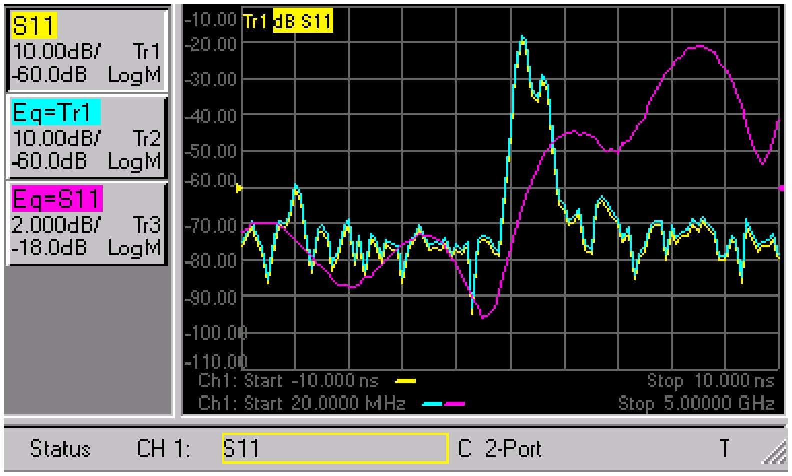
- The Trace Settings and Error-correction on the referred trace are used in the Equation trace.
- If error correction is NOT ON, then the raw, uncorrected data is used in the equation trace.
- To see if error correction is ON, make the trace active, then see the Correction level in the status bar.
- Turning error correction ON/OFF on the equation trace has no meaning. The referred data that is used in the equation is ALWAYS what determines its level of correction.

Using **S-parameter** and **Receiver** notation:

- Because the data is not displayed, NO trace settings are used in the Equation trace.
- Correction can be turned ON/OFF if corrected data is available for the referred data. Exception: When using S-parameter and Receiver notation to refer to a trace on a channel that has been calibrated with a Response Cal or Receiver Cal, correction can NOT be turned ON, even though the Status Bar indicates otherwise. For example: Tr1 is an S11 measurement with a Response Cal. Tr2 is an equation trace that refers to S11. The Tr2 equation trace is NOT corrected, even though the Status Bar may indicate that it is corrected. However, if Tr2 refers to Tr1 (not S11), the Tr2 equation trace is corrected.

Example

This example illustrates the differences when referring to a trace using **S-parameter** notation and **TrX** notation:



- **Tr1** is an S11 measurement with no equation, 2-port correction ON, and Time Domain transform ON.
- **Tr2** is an equation trace that refers to **Tr1**. Tr2 is corrected because Tr1 is corrected. Tr2 is transformed because Tr1 is transformed. If transform is turned ON for Tr2, the data will be transformed AGAIN, which results in "unusual" data.
- **Tr3** is an equation trace that refers to **S11**. This is NOT the same as referring to Tr1. The S11 trace that is referred to is a different instance of S11 that is NOT displayed, and has NO trace settings. Notice that Tr3 data is NOT transformed, although Tr1 is transformed. Correction for **Tr3** can be turned ON and OFF because a calibration was performed on the channel in which the S11 trace resides.
- **Note:** X- axis annotation of the Equation trace is completely independent of the data that is presented. ONLY the **data values** from a referred trace are used. For example, notice that the Equation trace **Tr2** has Frequency on the X-axis although the referred trace **Tr1** is presented in Time.

Functions and Constants used in Equation Editor

ALL trace data that is used in Equation Editor is unformatted, complex data.

In the following table,

- Function(scalar x) means that an automatic conversion from a complex number to its scalar magnitude is performed before passing the value to the function.
- Function(complex x) means that the entire complex value is used.
- **a, b, c, d** are arguments that are used in the function.

Function/Constant	Description
acos(scalar a)	returns the arc cosine of **a** in radians
asin(scalar a)	returns the arc sine of **a** in radians

atan(scalar a)	returns the arc tangent of **a** in radians
atan2	returns the phase of complex **a** = (re,im) in radians has the following two argument sets: • atan2(complex a) - returns the phase in radians • atan2(scalar a, scalar b)
cpx(scalar a, scalar b)	returns a complex value (**a**+i**b**) from two scalar values
cos(complex a)	takes **a** in radians and returns the cosine
e	returns the constant =~ 2.71828...
exp(complex a)	returns the exponential of **a**
im(complex a)	returns the imag part of **a** as the scalar part of the result (zeroes the imag part)
kfac(complex a, complex b, complex c, complex d) when entered in EE: kfac(S11,S21,S12,S22)	k-factor: k = (1 - |a|^2 - |d|^2 + |a*d-b*c|^2) / (2 * |b*c|) returns a scalar result - the imaginary part of the complex result is always 0
ln(complex a)	returns the natural logarithm of **a**
log10(complex a)	returns the base 10 logarithm of **a**
mag(complex a)	returns sqrt(**a**.re***a**.re+**a**.im***a**.im)
max(complex a, complex b, ...)	returns the complex value that has the largest magnitude of a list of values.
median(complex a, complex b,...)	returns the median of a list of complex values • The median is determined by sorting the values by magnitude, and returning the middle one. • If an even number of values is passed, then the smaller of the two middle values is returned.
min(complex a, complex b, ...)	returns the complex value that has the smallest magnitude of a list of values.
mu1(complex a, complex b, complex c, complex d) when entered in EE: mu1(S11,S21,S12,S22)	mu1 = (1 - |**a**|^2) / (|d - conj**(a)** * (a*d-b*c)| + |b*c|)

mu2(complex a, complex b, complex c, complex d) when entered in EE: mu1(S11,S21,S12,S22)	mu2 = (1 - |**d**|^2) / (|a - conj**(d)** * (a*d-b*c)| + |b*c|)
for both mu1 and mu2 (Usually written with the Greek character **μ**)	• conj is the complex conjugate. For scalars **a** and **b**, conj(a+ib) = (a-ib) • returns a scalar result - the imaginary part of the complex result is always 0
phase(complex a)	returns atan2(**a**) in degrees
PI	returns the numeric constant pi (3.141592), which is the ratio of the circumference of a circle to its diameter
pow(complex a,complex b)	returns **a** to the power **b**
re(complex a)	returns the scalar part of **a** (zeroes the imag part)
sin(complex a)	takes **a** in radians and returns the sine
sqrt(complex a)	returns the square root of **a**, with phase angle in the half-open interval (-pi/2, pi/2]
tan(complex a)	takes **a** in radians and returns the tangent
xAxisIndex(scalar a)	**New** returns the numeric data point (a) of the sweep
xAxisTraceData(scalar a)	**New** for each point (a) on the sweep, returns the x-axis value on the selected channel.

Operators used in Equation Editor

Operator	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division
(	Open parenthesis
)	Close parenthesis
,	Comma - separator for arguments (as in S11, S22)
=	Equal (optional)
E	Exponent (as in 23.45E6)

Example Equations

The following examples may help you get started with Equation Editor.

Offset each data point in Tr2 from Tr1 by 2dB

Use the function: pow(complex **a**, complex **b**) -- returns **a** to the power **b**.

```
20log(a) + 2 = 20log(x)
log( a ) + 2/20 = log( x ) // divide all by 20.
x = 10^(log(a) + 2/20)   // swap sides and take 10 to the power of both sides
x = 10^log(a) * 10^(2/20)
x = a * 10^(2/20)
```

The equation is entered into Tr2 as:

```
Offset=Tr1*pow(10, 2/20)
```

To offset by **5** dB

```
Offset=Tr1*pow(10, 5/20).
```

Balanced Match using a 2-port PNA

```
SDD11 = (S11-S21-S12+S22)/2
```

Conversion loss

```
B_1/pow(10,-15/20)
```

- B_1 is a receiver measurement;

- -15 is the input power in dBm

Third-order intercept point (IP3 or TOI)

```
TR1*sqrt(Tr1/Tr3)
```

- Tr1 = input signal power
- Tr3 = intermodulation power (both traces measured with single receivers)

Harmonics in dBc

```
B_1/Tr2
```

- B_1 is tuned to a harmonic frequency
- Tr2 = power at fundamental frequency, measured with B_1 receiver

PAE (Power Added Efficiency)

Pout - Pin / Pdc

Type the following equation into a new trace with an unratioed measurement, such as AI1. The data format is REAL:

```
PAE = 100 * (.001*pow(mag(Tr1),2)-(.001*pow(mag(Tr1),2)/pow(mag(Tr2),2)))/(Tr3*Tr4)
```

Where:

- Tr1 - a trace that measures unratioed B receiver.
- Tr2 - a corrected S21 trace (amplifier gain)
- Tr3 - a trace that measures ADC voltage (AI1) across a sensing resistor.
- Tr4 = an equation trace containing Isupp = (Tr3 / value of sensing resistor).

Data is displayed in Real format with units actually being watts.

1-port Insertion Loss

When it is not possible to connect both ends of a cable to the PNA, a 1-port insertion loss measurement can be made. However, the measured loss must be divided by 2 because the result includes the loss going down **and** coming back through the cable. This assumes that the device is terminated with a short to reflect all of the power. The 'divide by 2' operation is performed as follows using Equation Editor:

- Tr1 - an S11 trace
- Tr2 - an equation trace containing **`20*log10(Tr1)/2`**

Saving Equation Editor Data

Equation data can be saved to the PNA hard drive in the following formats:

- Citifile (.cti) - Equation data is saved and recalled. The file header indicates the "underlying" s-parameter trace type.
- Trace (.prn) - read by spreadsheet software. Can NOT be recalled by the PNA.
- Print to File (bmp, jpg, png) - saves image of PNA screen.

Equation data is NOT saved in .SnP file format. When attempting to save an Equation trace in .SnP format, the "underlying" S-parameter data is saved; not Equation data.

Last Modified:

17-Oct-2007	Added new functions
30-Aug-2007	Added 1-port insertion loss
3-Jul-2007	Added PAE and other notes
18-Jun-2007	Added examples

Using Limit Lines

Limit lines allow you to compare measurement data to performance constraints that you define.

Other Analyze Data topics

Overview

Limit lines are visual representations on the PNA screen of the specified limits for a measurement. You can use limit lines to do the following:

- Give the operator **visual guides** when tuning devices.
- Provide **standard criteria** for meeting device specification.
- Show the **comparison** of data versus specifications.

Limit testing compares the measured data with defined limits, and provides optional **Pass or Fail** information for each measured data point.

You can have up to **100** discrete lines for each measurement trace allowing you to test all aspects of your DUT response.

Limit lines and limit testing are NOT available with **Smith Chart** or **Polar** display format. If limit lines are ON and you change to Smith Chart or Polar format, the analyzer will automatically disable the limit lines and limit testing.

Create and Edit Limit Lines

You can create limit lines for all measurement traces. The limit lines are the same color as the measurement trace.

Limit lines are made up of discrete lines with four coordinates:

- BEGIN and END stimulus - X-axis values.
- BEGIN and END response - Y-axis values.

How to create, edit, and test with Limit Lines

All limit line settings are made with the limit table. Use one of the following methods to show the limit table:

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press **LIMIT TABLE** 2. then Active Entry keys	1. Click **Trace** 2. then **Limit Test**
For PNA-X and 'C' models	Programming Commands
1. Press **ANALYSIS** 2. then **[Limits]** 3. then **[Limit Test]**	1. Click **Marker/Analysis** 2. then **Analysis** 3. then **Limit Test**

Limit Table

	TYPE	BEGIN STIMULUS	END STIMULUS	BEGIN RESPONSE	END RESPONSE
1	MIN	1.930000 GHz	1.990000 GHz	-5.000000 dB	-5.000000 dB
2	MAX	1.000000 GHz	1.900000 GHz	-60.000000 dB	-50.000000 dB
3	MAX	2.050000 GHz	3.000000 GHz	-50.000000 dB	-60.000000 dB
4	OFF	0 Hz	0.000000 Hz	0.000000 dB	0.000000 dB

Note: To ADD a limit line to the table, change the last limit line to either MAX or MIN

1. In the **Type** area of the Limit Table, select **MIN** or **MAX** for Limit Line 1.
   - The MIN value will fail measurements BELOW this limit.
   - The MAX value will fail measurements ABOVE this limit.
2. Click **BEGIN STIMULUS** for Limit Segment 1. Enter the desired value.
3. Click **END STIMULUS** for Limit Segment 1. Enter the desired value.
4. Click **BEGIN RESPONSE** for Limit Segment 1. Enter the desired value.
5. Click **END RESPONSE** for Limit Segment 1. Enter the desired value.
6. Repeat Steps 1-5 for each desired limit line.

Displaying and Testing with Limit Lines

After creating limit lines, you can then choose to **display** or **hide** them for each trace. The specified limits remain valid even if limit lines are not displayed.

Limit testing cannot be performed on memory traces.

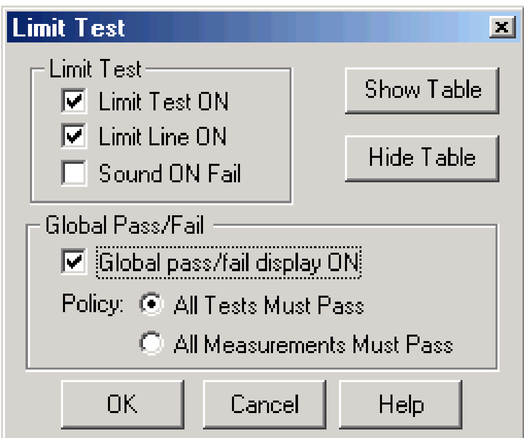
You can choose to provide a visual and / or audible PASS / FAIL indication.

With limit testing turned ON:

- Any portion of the measurement trace that **fails** is **displayed in red**.
- Any portion of the measurement trace that does **NOT fail** remains unchanged and silent.

PASS is the default mode of Pass / Fail testing. A data point will FAIL only if a measured point falls outside of the limits.

- If the limit line is set to OFF, the entire trace will PASS.
- If there is no measured data point at a limit line stimulus setting, that point will PASS.



Limit Test dialog box help

Show Table Shows the table that allows you to create and edit limits.

Hide Table Makes the limits table disappear from the screen.

Note: To ADD a limit line to the table, change the last limit line to either MAX or MIN

Limit Test

Limit Test ON Check the box to compare the data trace to the limits and display PASS or FAIL.

Limit Line ON Check the box to make the limits visible on the screen. (Testing still occurs if the limits are not visible.)

Sound ON Fail Check the box to make the PNA beep when a point on the data trace fails the limit test.

Global Pass/Fail

The Pass/Fail indicator provides an easy way to monitor the status of ALL measurements.

Global pass/fail display ON Check to display the Global Pass/Fail status.

Policy: Choose which of the following must occur for the Global Pass/Fail status to display PASS:

- All Tests (with **Limit Test** ON) Must Pass - This setting reads the results from the Limit Tests. If all tests (with **Limit Test** ON) PASS, then the Global Pass/Fail status will PASS.
- All Measurements Must Pass - This more critical setting shows FAIL unless all measured data points fall within established test limits **and** Limit Test is ON. **Note:** In this mode, if one measurement does NOT have **Limit Test ON**, Global Pass/Fail will show FAIL.

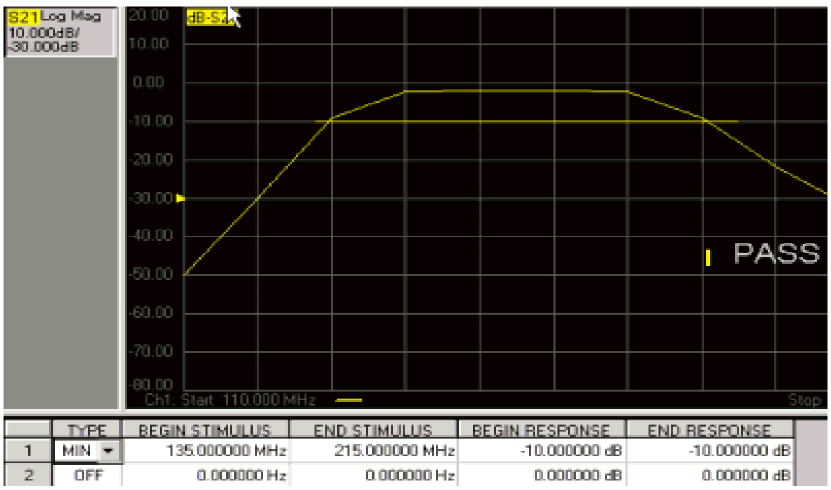
[Learn more about displaying and testing with Limits (scroll up)]

Testing with Sufficient Data Points

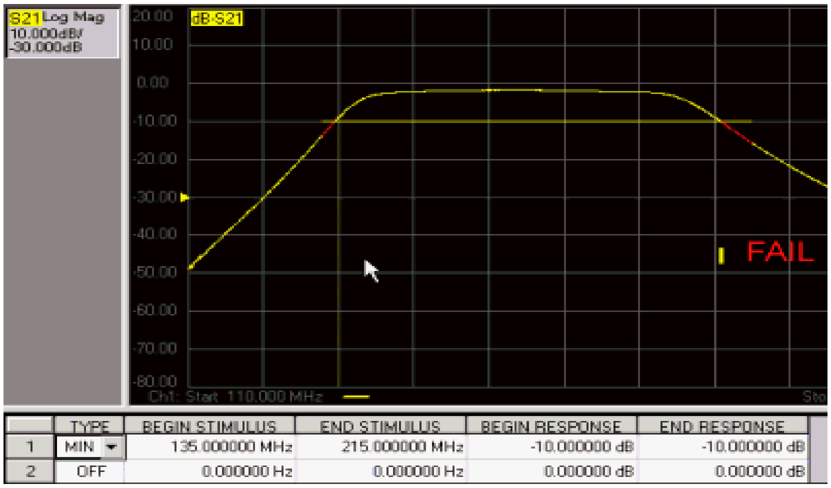
Limits are checked only at the actual measured data points. Therefore, It is possible for a device to be out of specification without a limit test failure indication if the data point density is insufficient.

The following image is a data trace of an actual filter using 11 data points (approximately one every vertical graticule). The filter is being tested with a minimum limit line (any data point under the limit line fails).

Although the data trace is clearly below the limit line on both sides of the filter skirts, there is a PASS indication because there is no data point being measured at these frequencies.



The following image shows the exact same conditions, except the number of data points is increased to 1601. The filter now fails the minimum limit test indicated by the red data trace.



	TYPE	BEGIN STIMULUS	END STIMULUS	BEGIN RESPONSE	END RESPONSE
1	MIN	135.000000 MHz	215.000000 MHz	-10.000000 dB	-10.000000 dB
2	OFF	0.000000 Hz	0.000000 Hz	0.000000 dB	0.000000 dB

Last Modified:

2-Feb-2007 MX Added UI

Save and Recall a File

The PNA allows you to save and recall files to and from an internal or external storage device in a variety of file formats.

- **How to Save a File**
- **How to Recall a File**
- **Instrument / Calibration State Files (.csa, .cst, .sta, .cal)**
- **Measurement Data Files (.prn, .sNp, .cti, .csv)**
- **Define Data Saves**
- **Managing Files without a Mouse**

Other Data Outputting topics

How to Save a File

Use one of the following methods:

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press **SAVE** 2. then **Save, Save As**, or **Auto Save**	1. Click **File** 2. then **Save, Save As**, or **Auto Save**
For PNA-X and 'C' models	Programming Commands
1. Press **SAVE** 2. then **[Save], [Save As], or [Auto Save]**	1. Click **File** 2. then **Save** or **Save As**

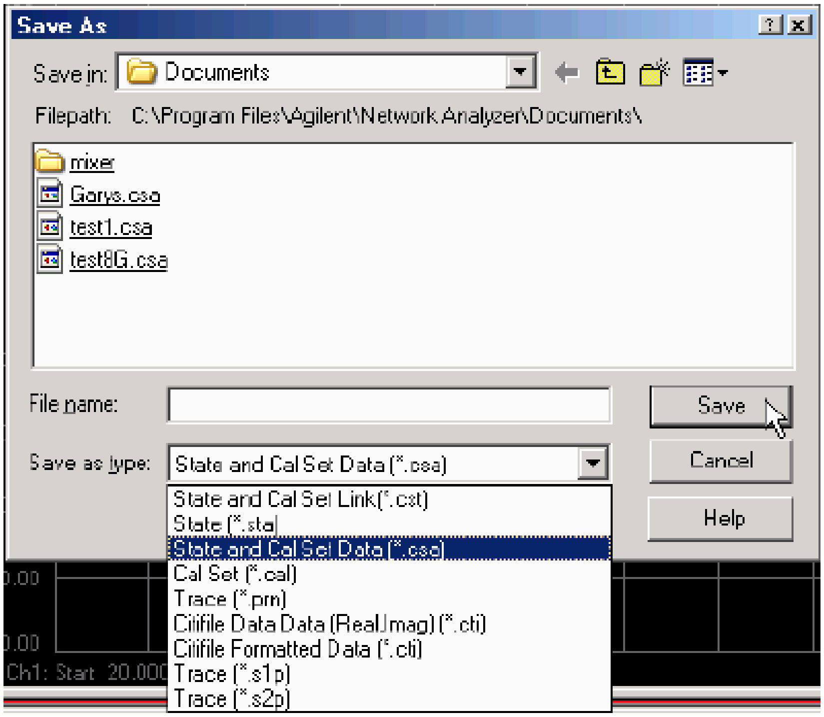
Save Immediately saves the PNA state and possibly calibration data to the filename and extension you used when you last performed a Save. Only .cst, .sta, and .csa files are remembered when Save is performed. This file will be overwritten the next time you click **Save.** To prevent this, use one of the following methods.

Save As Invokes the Save As dialog box.

Auto Save (Only available from the Active Entry keys) Saves state and calibration data to the internal hard disk in the C:\Program Files\Agilent\Network Analyzer\Documents folder. A filename is generated automatically using the syntax "**atxxx.csa**"; where xxx is a number that is incremented by one when a new file is Auto

Saved.

Note: You can NOT save Frequency Converter Application .S2P files using this method. To learn how, see Using FCA, Save Data.



Save As dialog box help

Save in Allows you to navigate to the directory where you want to save the file.

File name Displays the filename that you either typed in or clicked on in the directory contents box.

Save as type

The following file types save **Instrument states and Calibration data**. You can save, and later recall, instrument settings and calibration data for **all channels** currently in use on the PNA.

These file types are only recognized by Agilent PNA Series analyzers. Learn more about these file types.

- ***.csa** - save Instrument state and actual Cal Set data (cal/state archive) **Default selection.**
- ***.cst** - save Instrument state and a link to the Cal Set data.
- ***.sta** - save Instrument state ONLY (**no** calibration data)
- ***.cal** - save actual Calibration data ONLY (**no** Instrument state)

Note: Before saving a .cst file (Instrument State and link to Cal Set), be sure that a User Cal Set is being used for the calibration; not a Cal Register. Cal Registers are overwritten with new data whenever a calibration is performed, and may not be accurate cal data when the .cst file is recalled. Learn more about Cal Sets.

The following file types save **Measurement data** for use in spreadsheet or CAE programs. Click to learn more about these file types.

- [*.prn]
- [*.sNp]
- [*cti (citifile)]
- *.csv (used to save 2D Gain Compression data).

Note: To save the PNA screen as .bmp, .jpg, or .png graphics file types, click **File / Print to File.** Learn more.

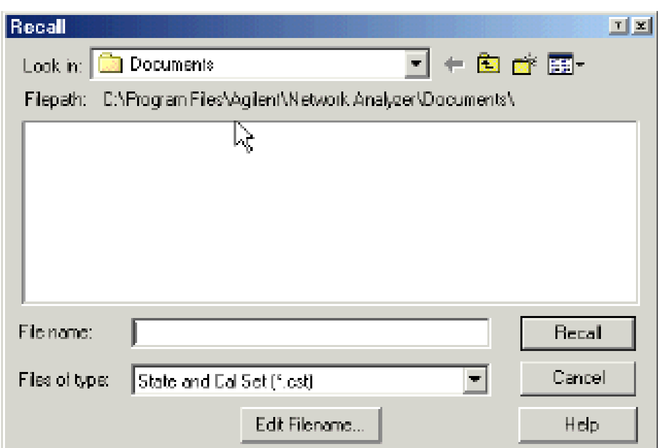
Save Saves the file to the specified file name and directory.

How to Recall (open) a file

Select a file from the 'most recently used' list. The list is saved when the PNA application exits.

Use one of the following methods:

Using front-panel HARDKEY **[softkey]** buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press **RECALL** 2. then Active Entry keys	1. Click **File** 2. then **Recall**
For PNA-X and 'C' models	Programming Commands
1. Press **RECALL** 2. then **[Recall]**	1. Click **File** 2. then **Recall**



Recall dialog box help
Look in Allows you to select the directory that contains the file that you want to recall.
File name Displays the filename that you either typed in or clicked on in the directory contents box.
Files of type Allows you view and select files that are listed in categories of a file type.
Recall Recalls the file displayed in the file name box.
Note: *.sNp files cannot be recalled by the PNA.

Instrument State / Calibration Files

You can save, and later recall, instrument settings and calibration data **for all channels** currently in use on the PNA.

An **Instrument State** contains almost every PNA setting. The following PNA settings are NOT saved and recalled with Instrument State:

- GPIB address
- RF power ON/OFF (depends on current setting)
- Test set I/O settings

The following file types are used to save and recall instrument states and Cal Set information:

File Types				Information that is stored for each channel
.csa	.cst		.sta	**Instrument State Information** Channels/Traces · Averaging Windows · Markers Triggering · Math/memory Format · Limits Scale · More... Stimulus Information: Frequency range · Alternate sweep Number of points · Port powers IF bandwidth · Source attenuators Sweep type · Receiver attenuators Sweep mode · Test Set port map
.csa	.cst	.cal		**Cal Set Information** GUID (Globally Unique Identifier) provides link to Cal Set
.csa		.cal		Name, Description, Modify date Stimulus Information: Frequency range · Alternate sweep Number of points · Port powers

			IF bandwidth Source attenuators Sweep type Receiver attenuators Sweep mode Test Set port map Error Terms: Directivity, Crosstalk, Source match, Load match, Reflection tracking, Transmission tracking

File Type Descriptions and Recall

The following describes each file type, and what occurs when the file type is recalled.

***.sta files**

- Contain ONLY instrument state information.
- When recalled, they always replace the current instrument state immediately.

***.cst files**

- Contain BOTH instrument state and a LINK to the Cal Sets.
- The **quickest and most flexible** method of saving and recalling a calibrated instrument state.
- Channels need not have cal data to save as .cst file.
- When recalled, the state information is loaded first. Then the PNA tries to apply a Cal Set as you would do manually. If the stimulus settings are different between the instrument state and the linked Cal Set, the usual choice is presented (see Cal Sets). If the linked Cal Set has been deleted, a message is displayed, but the state information remains in place.
- Because only a link to the Cal Set is saved, the Cal Set can be shared with other measurements.

***.cal files**

- Contain ONLY Cal Set information.
- When recalled, the Cal Set is NOT automatically applied. Apply the calibration data to a channel as you would apply any Cal Set.
- Learn about Recalling

***.csa files**

- Contain ALL instrument state and the actual Cal Set; not a link to the Cal Set.

- The **safest** method of saving and recalling a calibrated instrument state. However, the file size is larger than a *cst file, and the save and recall times are longer. In addition, because the actual Cal Set is saved, it is very difficult to share the cal data with other measurements.

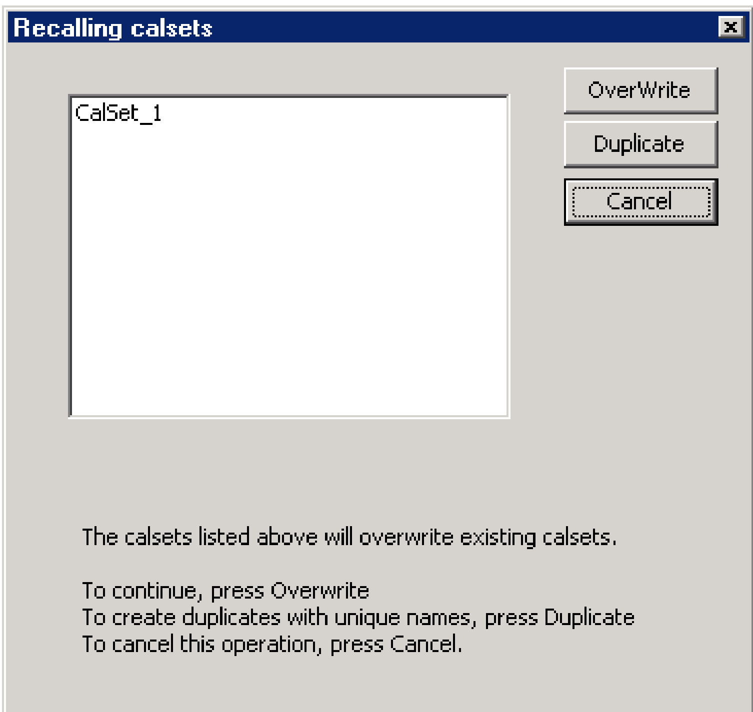
- Channels need not be calibrated to save as .cst file.

- The Cal Set that is saved could have been a Cal Register or a User Cal Set.

- Learn about Recalling

Note: *.pcs files are the internal file format the PNA uses for storing cal sets. There is no reason for users to access or copy these files.

Recalling Cal Sets



Recalling Cal Sets dialog box help
Both **.cal** and **.csa** file types contain whole Cal Sets When these file types are recalled, the PNA checks to see if the incoming Cal Set GUID matches an existing PNA Cal Set GUID. If it does, and if the rest of the Cal Set contents are different in any way, then both of these Cal Sets can NOT coexist in the PNA and you are offered the following choices. Because all PNA channels are saved, there could be more than one Cal Set in either of these file types. **Overwrite** The incoming Cal Set will replace the existing Cal Set. **Duplicate** (Only available with .cal recalls.) Because the Cal Set is not automatically applied, you can choose to apply either the original or duplicate Cal Set. The original Cal Set remains in the .cal file. **Cancel** Abandon the recall operation. The PNA will offer a choice as described in each file type below. Learn more about Cal Sets.

Measurement Data Files

Measurement data is saved as ASCII file types for use in a spreadsheet or CAE programs.

Note: Before saving measurement data, always trigger a single measurement, and then allow the PNA channel to go into Hold. This ensures that the entire measurement trace is saved.

The following three file types are used by the PNA. You can select the content and the format of *.SnP files and *.cti files through the Define Data Saves dialog box.

- ***.prn files**
- ***.sNp (Touchstone)**
- ***.cti (Citifile)**
- ***.csv**

*.prn Files

Prn files have the following attributes:

- Comma-separated data which can be read into rows and columns by spreadsheet software, such as Microsoft® Excel. To avoid the "delimiting" dialog boxes, change the filename extension from .prn to .csv. Then open directly into Microsoft Excel.
- Contain formatted and corrected stimulus and response data for the current active trace ONLY.
- Are Output only - they cannot be read by the analyzer.
- Beginning with Rev 6.2, FCA and Cal Set Viewer data can be saved to *.prn files

Example:

"S_{11} Log Mag"

"Frequency (Hz)",	**"dB"**
3.000000e+005 ,	**-3.528682e+001 ,**
4.529850e+007 ,	**-2.817913e+001 ,**
9.029700e+007 ,	**-3.216808e+001 ,**
1.352955e+008 ,	**-3.101017e+001 ,**

.sNp Format (*.s1p, *.s2p, *.s3p. *.s4p, and so forth)

This file format is used by CAE programs such as Agilent's Microwave Design System (MDS) and Advanced Design System (ADS).

Note: Frequency Converter Application .S2P files are saved using a different method. See Using FCA, Save Data.

- .sNp data is Output only; it can ONLY be read by the PNA embed/de-embed functions.
- .sNp data can be saved in various formats. See Define Data Saves
- The amount of data that is saved depends on the file type that you specify and the amount of data that is available:
- To save sNp data with an external test set enabled, at the File, Save As dialog, select **Snp File(*.s*p),** then complete the "Choose Ports " dialog.

File Type	# of Ports	# of S-parameters saved
***.s1p**	1	1 S-parameter
***.s2p**	2	4 S-parameters
***.s3p**	3	9 S-parameters
***.s4p**	4	16 S-parameters
...	**...**	**...**
*.s**N**p	**N**	**N**^2 S-parameters

.sNp data is generally used to gather all S-parameters for a fully corrected measurement. The PNA uses the data that is available on the channel of the active measurement.

- If correction is applied, then valid data is returned for all corrected s-parameters.
- If requesting **less** data then is available, the Choose ports for sNp data dialog appears. Previous to PNA release 6.2, data was returned beginning with the first calibrated ports until your request if fulfilled.

- If correction is NOT applied, the PNA returns as much applicable raw data as possible using S-parameter measurements on the selected channel. Data that is not available is zero-filled. For example, if correction is NOT applied and the active measurement is S11, and an S21 measurement also exists on the channel, then data is returned for the S11 and S21 measurements. Data for S12 and S22 is not available and therefore returned as zeros.

- **IMPORTANT** - ALL valid data is saved using the same format and settings (trace math, offset, delay, and so forth) as the active measurement. This can cause the data that is saved for the non-active measurements to be dramatically different from the data that is displayed. For example, when saving an S2P file, if the active S11 measurement is set to Data/Mem (data divided by memory), then ALL 4 S-parameters are saved using Data/Mem. The memory trace that is used in the Data/Mem operation is the same as that used in the active (S11) measurement.

- Before saving measurement data, always trigger a single measurement, and then allow the PNA channel to go into Hold. This ensures that the entire measurement trace is saved.

.sNp Data Output

.sNp files contain header information, stimulus data, a response data pair for EACH S-parameter measurement. The only difference between .s1p, s2p, and so forth, is the number of S-parameters that are saved.

The following is a sample of **Header information:**

```
!Agilent Technologies,E8362B,US42340026,Q.03.54
!Agilent E8362B: Q.03.54
!Date: Friday, April 25, 2003 13:46:41
!Correction: S11(Full 2 Port SOLT,1,2) S21(Full 2 Port SOLT,1,2) S12(Full 2 Port
SOLT,1,2) S22(Full 2 Port SOLT,1,2)
!S2P File: Measurements:S11,S21,S12,S22:
# Hz  S RI R 50
```

Note: Although the following shows Real / Imag pairs, the format could also be LogMag / Phase or LinMag / Phase

*.s1p Files

Each record contains 1 stimulus value and 1 S-parameter (total of 3 values)

Stim Real (Sxx) Imag(Sxx)

*.s2p Files

Each record contains 1 stimulus value and 4 S-parameters (total of 9 values)

Stim Real (S11) Imag(S11) Real(S21) Imag(S21) Real(S12) Imag(S12) Real(S22) Imag(S22)

*.s3p Files

Each record contains 1 stimulus value and 9 S-parameters (total of 19 values)

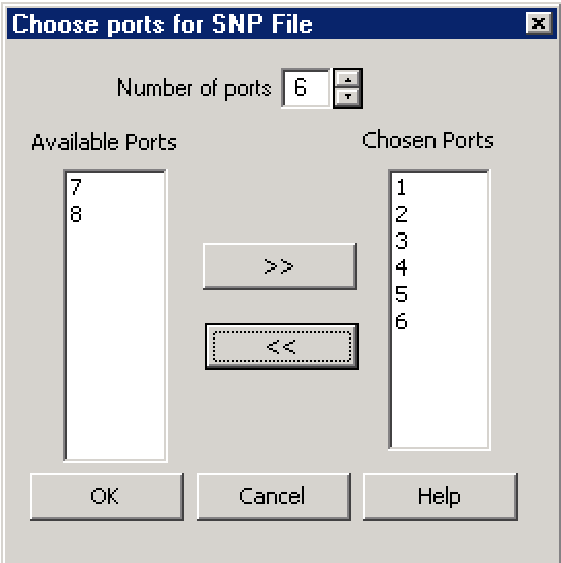
Stim Real (S11) Imag(S11) Real(S12) Imag(S12) Real(S13) Imag(S13)
Real (S21) Imag(S21) Real(S22) Imag(S22) Real(S23) Imag(S23)
Real (S31) Imag(S31) Real(S32) Imag(S32) Real(S33) Imag(S33)

*.s4p Files (and so forth...)

Each record contains 1 stimulus value and 16 S-parameters (total of 33 values)

Stim Real (S11) Imag(S11) Real(S12) Imag(S12) Real(S13) Imag(S13) Real(S14) Imag(S14)
Real (S21) Imag(S21) Real(S22) Imag(S22) Real(S23) Imag(S23) Real(S24) Imag(S24)

Real (S31) Imag(S31) Real(S32) Imag(S32) Real(S33) Imag(S33) Real(S34) Imag(S34)
Real (S41) Imag(S41) Real(S42) Imag(S42) Real(S43) Imag(S43) Real(S44) Imag(S44)



Choose ports for SNP File dialog box help

This dialog appears when selecting File, Save As, Trace sNp, and you request less data than is available, or you want data for more than 4 ports. This dialog allows you to choose which S-parameter data to save.

Number of ports Select the number of ports for which data will be saved.

Arrow buttons Click to Add and Remove ports for the following columns:

Available Ports The PNA / External test set ports. There may NOT be valid data available for all of these ports. Learn more.

Chosen Ports When **OK** is clicked, sNp data is saved for these ports.

OK Becomes available when the number of **Chosen ports** = the **Number of ports** to save. Click to save to sNp file.

With **Number of ports** = 2, .s2p data is saved; with **Number of ports** = 3, .s3p data is saved, and so forth. Learn more about sNp files

.cti CitiFiles

Citifile format is compatible with the Agilent 8510 Network Analyzer and Agilent's Microwave Design System (MDS).

Note: Before saving measurement data, always trigger a single measurement, and then allow the PNA channel to go into Hold. This ensures that the entire measurement trace is saved.

You can do the following using citifiles :

- save the active trace, or all traces. (see Define Data Saves
- save formatted or unformatted citifile data

Save Formatted data

1. Set the format using Define Data Saves.
2. Click **File** then **Save As**
3. Select **Citifile Formatted Data (*cti)**

FCA, GCA, and NFA traces can NOT be saved as formatted Citifile data.

On the data access map, Formatted data is taken from location 2 or 4.

Save Unformatted data

1. Click File Save As
2. Select **Citifile Data Data (*cti)**

On the data access map, Unformatted data is taken from the block just before Format.

Recalling Citifiles into the PNA

- To recall citifiles, click **File** then **Recall.** Specify **(*.cti)**
- Recalled citifile data is ALWAYS displayed on the PNA using LogMag format, regardless of how the file was stored.

Citifile traces are recalled into the same window / channel configuration as when they were saved. However, the new recalled channel numbers begin with channel 32 and decrement for each additional channel.

For example, when a citifile is saved, two traces are in window 1, channel 1 and two additional traces are in window 2, channel 2. When recalled into a factory preset condition (1 trace in window 1, channel 1), the first two recalled traces appear in window 2, channel 32, and the second two traces appear in window 3 channel 31.

If a channel is in use, you are prompted to create a new channel.

- Yes - skip down to the next available channel.
- No - add recalled data to the existing channel.

See also Traces, Channels, and Windows on the PNA

*.csv Files

This file format is available ONLY for saving 2D Gain Compression data. This data type can be read by spreadsheet programs, such as Microsoft Excel. Learn about Gain Compression App (Opt 086).

Note: Before saving measurement data, always trigger a single measurement, and then allow the PNA channel to go into Hold. This ensures that the entire measurement trace is saved.

When a 2D Gain Compression trace is active, the following is saved:

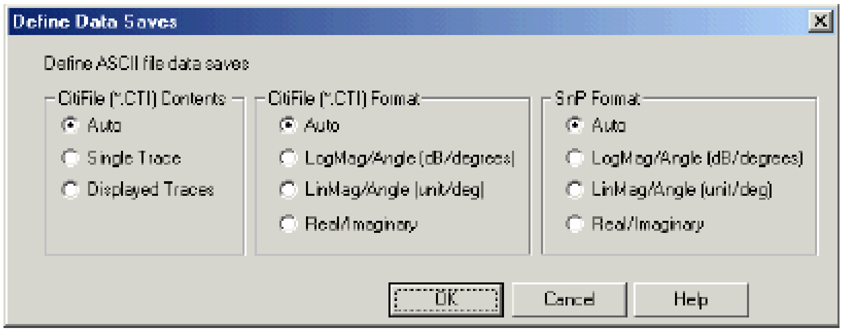
	A	B	C	D	E	F	G	H	I
1	!Agilent Technologies,N5242A,US46290053,Z.08.03.38								
2	!Date: Tuesday, November, 20, 2007 15:54:52								
3									
4	Calibratic	OFF							
5	Num Frec	201							
6	Num Pov	26							
7									
8	Frequenc	S11		Pin Data		Pout Data		S21	
9	<Hz>	<LogM.	<Phase	<LogM.	<Phase	<LogM.	<Phase	<LogM.	<Phase
10	1.00E+09	-0.99	54.1	-30.07	114.8	-40.43	-169.9	-10.35	75.3
11	1.00E+09	-1.08	53.7	-29.34	116.1	-39.83	-169.3	-10.49	74.6
12	1.00E+09	-0.89	53.8	-27.96	119.1	-38.26	-166.1	-10.3	74.8
13	1.00E+09	-0.96	54.1	-26.11	122	-36.56	-163	-10.45	74.9
14	1.00E+09	-0.95	54.1	-24.36	125.8	-34.74	-158.9	-10.38	75.3
15	1.04E+09	-0.57	7.4	-30.52	-167.2	-41.77	-142.7	-11.26	24.4
16	1.04E+09	-0.64	7.9	-29.61	-165.9	-40.8	-141.9	-11.19	24
17	1.04E+09	-0.71	6.9	-27.7	-162.6	-39.13	-138.7	-11.43	23.9
18	1.04E+09	-0.67	7.3	-25.84	-159.6	-37.3	-136	-11.46	23.6
19	1.04E+09	-0.6	7.4	-24.58	-157	-35.92	-133.1	-11.34	23.8
20	1.08E+09	-1.58	-33	-30.56	23.6	-42.98	-2.3	-12.41	-25.9

The data are organized by frequency regardless of the 2D method used to acquire the data. The above image shows 5 power points at each frequency. For 201 frequency points and 5 power points, there are 1005 rows of data.

If calibration is turned on when the file is saved, then all data are calibrated. Otherwise, raw data is saved.

Define Data Saves

How to select Define Data Saves	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **File** 2. then **Define Data Saves**
For PNA-X and 'C' models	Programming Commands
1. Press **SAVE** 2. then **[Define Data Saves]**	1. Click **File** 2. then **Define Data Saves**



Define Data Saves dialog box help

CitiFile Contents Determines what is saved to a .cti file.

Auto - Saves the active trace. Additional traces are saved if correction is ON and Full 2-port or Full 3-port calibration is performed. For Full 2-port calibration, 4 traces are saved. For Full 3-port calibration, 9 traces are saved.

Single Trace - Saves the active trace in the currently selected window.

Displayed Traces - Saves all displayed data traces

Citifile Formatted Data

Auto - Data is saved in LogMag or LinMag if one of these is the currently selected display format. If format is other than these, then data is saved in Real/Imag.

LogMag, LinMag, Real/Imag - Select output format.

The imaginary portion for all **LogMag** and **LinMag** data is output is in degrees.

SnP Formatted Data (.s1p, .s2p, .s3p) Learn more about SnP files.

Auto - Data is saved in LogMag or LinMag if one of these is the currently selected format. If format is other than these, then data is saved in Real/Imag.

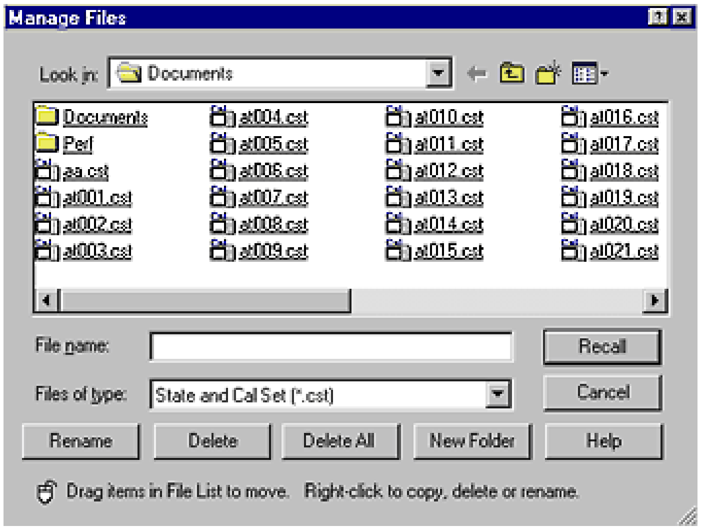
LogMag, LinMag, Real/Imag - Select output format.

The imaginary portion for all **LogMag** and **LinMag** data is output is in degrees.

Manage Files without a Mouse

The Manage Files dialog box is designed to be used from the front panel. It performs the same function as Windows Explorer, but can be used without the use of a mouse or keyboard.

Learn more about using the Front-panel interface.



Manage Files dialog box help

Recall Opens a Network Analyzer file already stored in memory.

Rename Renames a file that is selected in the open folder.

Delete Removes a selected file from the open folder.

Delete All Removes all files of the file type selected that appear in the open folder.

New folder Create a new folder and give it a name

Programming Commands

Last modified:

17-Oct-2007	Added note for MM
24-Jul-2007	Added clarification to define data save
10/23/06	Added pcs note
9/18/06	MQ Added choose ports for snp
9/12/06	Added link to programming commands

Drive Mapping

Drive mapping allows you to share disk drives between the PNA and an external computer. You can either map from the PNA, or from your PC, to the other.

- **From the PNA, map to a drive on an External PC**
- **From an External PC, map to a drive on the PNA**

To prepare for Drive Mapping:

1. Both the PC and PNA must be connected to a shared computer network
2. You must know the full computer name of the PC (or analyzer) you are mapping **TO**. Tell me how
3. Your logon and password on the analyzer must be the same as that on the external PC. You can add your PC logon to the analyzer. Tell me how

Note: These procedures require a mouse and keyboard. Also, the external PC must have Windows NT 4.0 (or later).

From the Analyzer, map to a drive on the External PC

1. On the external computer desktop, go to **Windows Explorer**. In the listing of drives, right click on the drive you want to share. Click **Sharing**.
2. In the dialog box, select **Shared As**. In the **Share Name** box, use the arrow key or type in a share name for the drive. For example: **C$**. Click **OK**.
3. On the analyzer desktop, click **Windows Explorer**. From the **Tools** menu, click **Map Network Drive**. (To get to the analyzer desktop, click **View**, then click **Title Bars)**
4. If you would like to connect to your external PC using a different logon, click **Connect using a different Logon**. This logon must be registered on the analyzer and you must be currently logged on the external PC using this logon.
    1. In the **Connect as** box, type your logon name.
       The logon name and password must be exactly the same on both the external PC and the analyzer.
    2. In the **Password** box, type the logon password that you use on the external computer. Click **OK**. The logon name and password must be exactly the same on both the external PC and the analyzer.
5. In the **Folder** box, type \(full computer name of analyzer)\share name (from step 2). (For example: **\SLT1234\C$**)
6. Click **Finish**.

From an External PC, map to a drive on the Analyzer

1. On the analyzer desktop, click **Windows Explorer**. Right click on the drive you want to share. Click on **Sharing...**

2. In the dialog box, select **Shared this folder**. In the **Share Name** box, type in a share name for the drive. For example: **C$**. Click **OK**.

3. On the external PC desktop, click **Windows Explorer**. From the **Tools** menu, click **Map Network Drive**.

4. If the current logon on your PC is different from the current logon on the analyzer, click **Connect using a different Logon** to connect to using the current analyzer logon, .This logon must be registered on the external PC. To see the current logon on either the PC or analyzer, hold **Ctrl** - **Alt**, and press **Delete**.

    1. In the **Connect as** box, type the logon currently being used by the analyzer.

    2. In the **Password** box, type the logon password that you use on the external computer. Click **OK**

5. In the **Folder** box, type *computername (prep1)\share name* (from step 2). (For example: **\\SLT1234\C$**)

6. Click **Finish**.

Print a Displayed Measurement

The analyzer allows you to print a displayed measurement to a printer or to a file. The printer can be either networked or local.

- **Connecting a Printer**
- **Printing**

Other Outputting Data topics

Connecting a Printer

You can connect your printer to the PNA using three different connector types:

- Parallel connector
- Serial connector
- USB

In addition to connecting the printer directly to the PNA via one of the above interfaces, LAN connected printers are also usable by the PNA.

Note: Early PNAs have a Centronics connector for connecting a printer. An adapter (36-pin male - 1284-C - to 25-pin female) was shipped with those PNAs to allow connection with a standard parallel printer cable.

CAUTION: Do NOT connect your printer to the 25-pin female port labeled **Ext. Test Set Interface.** Voltage levels of signal lines may damage the printer's I/O.

To Add a Printer

Note: If you try to print from the PNA application and the **Add Printer Wizard** appears, click **Cancel** and add the printer using the following procedure.

1. From the PNA application, click **View** then click **Minimize Application**
2. On the Windows taskbar, click **Start**, point to **Settings**, then click **Printers**.
3. Double-click **Add Printer**.
4. Follow the instructions in the **Add Printer** Wizard.

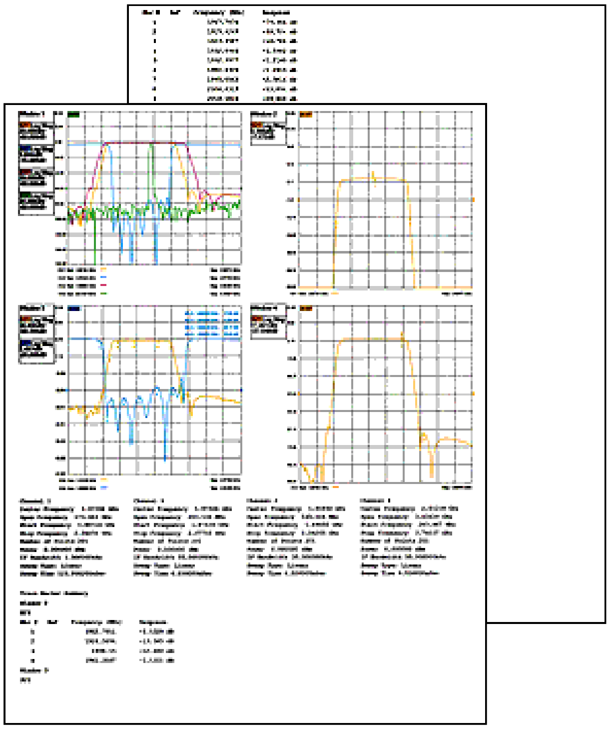
For more information, refer to Microsoft Windows Help or your printer documentation.

Printing

- **Print a Hardcopy**

- [Page Setup]
- [Print to File]

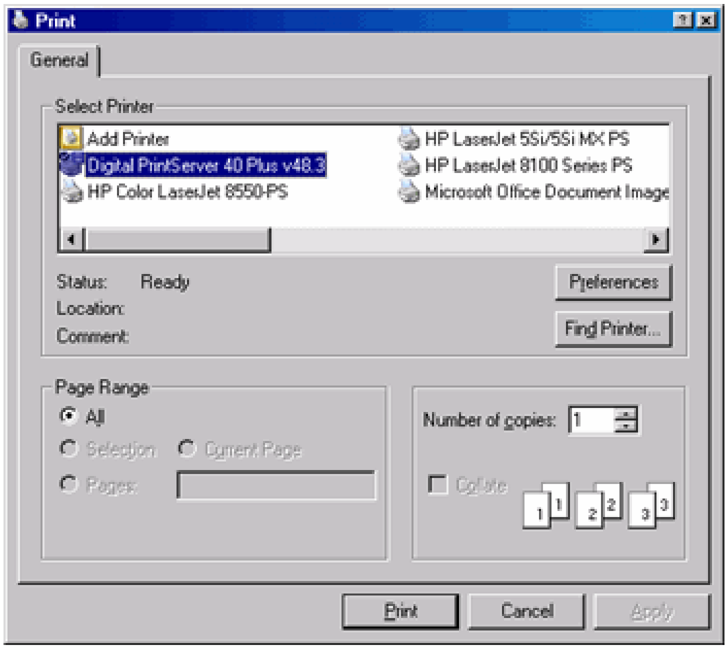
The measurement information on the screen can be printed to any local or networked printer that is connected to the PNA. The graphic below shows an example of how a screen-capture image appears when printed. The Page Setup settings allows you to customize the printed form of the measurement information.



How to Print a Hardcopy

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Press 	1. Click **File** 2. then **Print**
For PNA-X and 'C' models	

1. Press PRINT 2. then [Print]	1. Click **File** 2. then **Print** 3. then **Print**



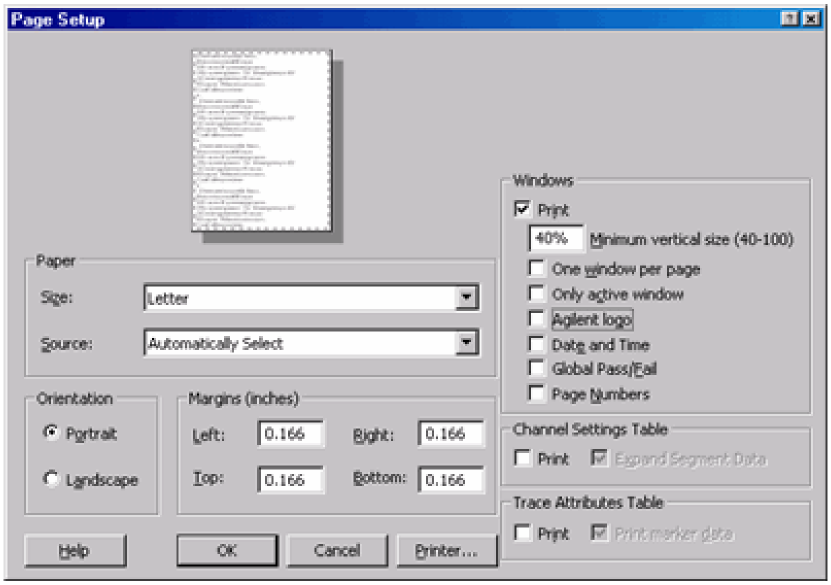
Note: For information on the choices in the Print dialog box, see Windows Help.

Page Setup

The Page Setup dialog allows flexibility in the appearance that measurement data is printed. After setting up the page, click **File**, then **Print...** to obtain a hard-copy.

How to select Page Setup	
Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **File** 2. then **Page Setup**
For PNA-X and 'C' models	Programming Commands

1. Press PRINT 2. then **[Page Setup]**	1. Click **File** 2. then **Print** 3. then **Print Options**



Page Setup dialog box help

Note: See Windows Help for information on the choices on the left side of this dialog.

Windows

Minimum vertical size Adjust to change the amount of a page that the measurement window fills. The adjustment range is from 40 to 100%.

One window per page Check to print one window per page. Clear to print all selected windows without a forced page break.

Only active window Check to print only the active window. Clear to print all windows.

Agilent logo Check to print the Agilent logo to the header.

Data and Time Check to add the current date and time to the header.

Global Pass/Fail Check to add the Global Pass/Fail status to the header.

Page Numbers Check to add page numbers (1 of n) to the header.

Channel Settings Table

Print Check to print the channel settings table.

Expand segment data Check to print segment sweep data.

Trace Attributes Table

Print Check to print the Trace Attributes Table. The Trace Attributes are measurement type, correction factors ON or OFF, smoothing, options, and marker details. The Trace Attributes are listed by Trace ID# for each window.

Each Trace ID# can have multiple entries depending on the number of markers associated with the trace. The marker details are marker number, position and response. If there are multiple markers on a trace, the trace attributes are only shown for the first marker. However, the trace attributes for the first marker apply to all other markers on that trace.

The options column can have one or more options. **D** for Delay, **M** for Marker, **G** for Gating. Multiple options selected would appear as follows: DMG.

Print marker data Check to print all marker data. The amount of data depends on how many markers are created.

Print to a File

The analyzer can save a screen-capture image in any of the following formats:

- **.png** (preferred format)
- **.bmp** (bitmap)
- **.jpg**

The analyzer automatically saves the file to the current path. If not previously defined, the analyzer automatically selects the default path C:/Program Files/Agilent/Network Analyzer/Documents/

A .bmp file, like a .prn file, can be imported into software applications such as Microsoft Excel, Word, or Paint to display a screen-capture image.

See Save and Recall files for more information.

How to Print to a File

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **File** 2. then **Print to File**
For PNA-X and 'C' models	Programming Commands
1. Press **PRINT** 2. then **[Print to File]**	1. Click **File** 2. then **Print** 3. then **Print to File**

Last modified:

10/19/06 Modified for new print dialog

PNA Application Notes

The following links require an **Internet connection.**

Note: Check out the multimedia PNA Demo presentations, including 'Network Analyzer Basics'.

Calibrations

Improving Measurement and Calibration Accuracy Using the Frequency Converter Application (5988-9642EN)

On-Wafer Calibration Using a 4-port, 20 GHz PNA-L Network Analyzer (N5230A Option 240/245) (5989-2287EN)

ECal

Agilent Electronic vs. Mechanical Calibration Kits: Calibration Methods and Accuracy (5988-9477EN)

User Characterization: Electronic Calibration Feature Allows Users to Customize to Specific Needs (5988-9478EN)

Embedding / De-embedding

De-embedding and Embedding S-Parameter Networks Using a Vector Network Analyzer (5980-2784EN)

Amplifier Measurements

High-power measurements using the PNA (5989-1349EN)

Amplifier Linear and Gain Measurements (5988-8644EN)

Amplifier Swept-Harmonic Measurements (5988-9473EN)

Amplifier and CW Swept Intermodulation-Distortion Measurements (5988-9474EN)

Antenna Measurements

Triggering PNA Microwave Network Analyzers for Antenna Measurements (5988-9518EN)

New Network Analyzer Methodologies in Antenna/RCS Measurements (5989-1937EN)

Pulsed Antenna Measurements Using PNA Network Analyzers (5989-0221EN)

Balanced Measurements (Although the following refer to the ENA, they are also relevant to the PNA.)

On-wafer Balanced Component Measurement with the Cascade Microtech Probing System (5988-5886EN)

Network De-embedding/Embedding and Balanced Measurement (5988-4923EN)

Mixer Measurements

Mixer Transmission Measurements Using the Frequency Conversion Application (5988-8642EN)

Mixer Conversion-Loss and Group Delay Measurement Techniques and Comparisons (5988-9619EN)

Comparison of Mixer Characterization using New Vector Characterization Techniques (5988-7827EN)

Novel Method for Vector Mixer Characterization and Mixer Test System Vector Error Correction (5988-7826EN)

Measuring Absolute Group Delay of Multistage Converters Using PNA Microwave Network Analyzers (5989-0219EN)

Pulsed Measurements

Pulsed-RF S-Parameter Measurements Using Wideband and Narrowband Detection (AN 1408-12)

Accurate Pulsed Measurements (5989-0563EN)

Pulsed Antenna Measurements Using PNA Network Analyzers (5989-0221EN)

Other Measurements

New Time Domain Analysis

Using the PNA Series to Analyze Lightwave Components (5989-3385EN)

Using the PNA for Banded Millimeter-Wave Measurements (5989-4098EN)

PNA MM-Wave Network Analyzers: Analysis of Cable Length on VNA System Performance (5989-1941EN)

Basics of Measuring the Dielectric Properties of Materials (5989-2589EN)

Automation

Connectivity Advances for Component Manufacturers (5980-2782EN)

Introduction to Application Development using the PNA (5980-2666EN)

The 'Need for Speed' in Component Manufacturing Test (5980-2783EN)

Network Analyzer Basics

This self-paced two hour video discusses the basic concepts of Network Analysis.

The files are installed and should work on older PNA models. If the PNA link does not work, then use the internet link, which requires an internet connection.

- **From the PNA:** Proceed with Network Analyzer Basics.
- **From the Internet:** http://wireless.agilent.com/networkanalyzers/pnademo.htm in both streaming and downloadable format.

Last modified:

10/18/06	Added link to pnademo.

Connector Care

Proper connector care is critical for accurate and repeatable measurements. The following information will help you preserve the precision and extend the life of your connectors - saving both time and money.

- **Connector Care Quick Reference Guide**
- **Connector Cleaning Supplies**
- **Safety Reminders**
- **About Connectors**
- **Gaging Fundamentals**
- **Connector Care Procedures**

See also mmWave Connector Care at http://na.tm.agilent.com/pna/connectorcare/Connector_Care.htm

Preventing Test Port Connector Damage

Handling and Storing Connectors	
Do	**Do Not**
Keep connectors clean	Touch mating-plane surfaces
Protect connectors with plastic end caps	Set connectors contact-end down
Keep connector temperature same as analyzer	Store connectors loose in box or drawer
Visual Inspection	
Do	**Do Not**
Inspect connectors with magnifying glass.	Use a connector with a bent or broken center conductor
Look for metal debris, deep scratches or dents	Use a connector with deformed threads
Cleaning Connectors	
Do	**Do Not**
Clean surfaces first with clean, dry compressed air	Use high pressure air (>60 psi)
Use lint-free swab or brush	Use any abrasives
Use minimum amount of alcohol	Allow alcohol into connector support beads
Clean outer conductor mating surface and threads	Apply lateral force to center conductor

Gaging Connectors	
Do	**Do Not**
Inspect and clean gage, gage master and device tested	Use an out of specification connector
Use correct torque wrench	Hold connector gage by the dial
zero gage before use	
Use multiple measurements and keep record of readings	
Making Connections	
Do	**Do Not**
Align connectors first	Cross thread the connection
Rotate only the connector nut	Twist connector body to make connection
Use correct torque wrench	Mate different connector types

Connector Care and Cleaning Supplies

Description	Web Site
Swabs	http://www.berkshire.com/swabs.shtml
Lint Free Cloths- Air dusters	http://www.ccrwebstore.com
Isopropyl	http://www.techspray.com
Nitrilite Gloves and Finger Cots	http://www.techni-tool.com

Safety Reminders

When cleaning connectors:

- Always use protective eyewear when using compressed air or nitrogen.
- Keep isopropyl alcohol away from heat, sparks and flame. Use with adequate ventilation. Avoid contact with eyes, skin and clothing.
- Avoid electrostatic discharge (ESD). Wear a grounded wrist strap (having a 1 MΩ series resistor) when cleaning device, cable or test port connectors.
- Cleaning connectors with alcohol shall only be done with the instruments power cord removed, and in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

About Connectors

- [Connector Service Life]
- [Connector Grades and Performance]
- [Adapters as Connector Savers]
- [Connector Mating Plane Surfaces]

Connector Service Life

Even though calibration standards, cables, and test set connectors are designed and manufactured to the highest standards, all connectors have a limited service life. This means that connectors can become defective due to wear during normal use. For best results, all connectors should be inspected and maintained to maximize their service life.

Visual Inspection should be performed each time a connection is made. Metal particles from connector threads often find their way onto the mating surface when a connection is made or disconnected. See Inspection procedure.

Cleaning the dirt and contamination from the connector mating plane surfaces and threads can extend the service life of the connector and improve the quality of your calibration and measurements. See Cleaning procedure.

Gaging connectors not only provides assurance of proper mechanical tolerances, and thus connector performance, but also indicate situations where the potential for damage to another connector may exist. See Gaging procedure.

Proper connector care and connection techniques yield:

- Longer Service Life
- Higher Performance
- Better Repeatability

Connector Grades and Performance

The three connector grades (levels of quality) for the popular connector families are listed below. Some specialized types may not have all three grades.

- **Production** grade connectors are the lowest grade and the least expensive. It is the connector grade most commonly used on the typical device under test (DUT). It has the lowest performance of all connectors due to its loose tolerances. This means that production grade connectors should always be carefully inspected before making a connection to the analyzer. Some production grade connectors are not intended to mate with metrology grade connectors.

- **Instrument** grade is the middle grade of connectors. It is mainly used in and with test instruments, most cables and adapters, and some calibration standards. It provides long life with good performance and tighter tolerances. It may have a dielectric supported interface and therefore may not exhibit the excellent match of a metrology grade connector.

- **Metrology** grade connectors have the highest performance and the highest cost of all connector grades. This grade is used on calibration standards, verification standards, and precision adapters. Because it is a high precision connector, it can withstand many connections and disconnections and, thus, has the longest life of all connector grades. This connector grade has the closest material and geometric specifications. Pin diameter and pin depth are very closely specified. Metrology grade uses an air dielectric interface and a slotless female contact which provide the highest performance and traceability.

Note: In general, Metrology grade connectors should not be mated with Production grade connectors.

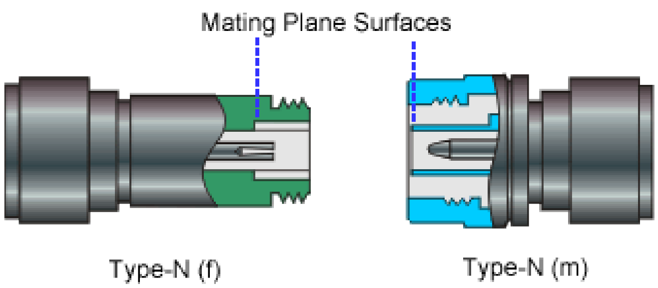
Adapters as Connector Savers

Make sure to use a high quality (Instrument grade or better) adapter when adapting a different connector type to the analyzer test ports. It is a good idea to use an adapter even when the device under test is the same connector type as the analyzer test ports. In both cases, it will help extend service life, and protect the test ports from damage and costly repair.

The adapter must be fully inspected before connecting it to the analyzer test port and inspected and cleaned frequently thereafter. Because calibration standards are connected to the adapter, the adapter should be the highest quality to provide acceptable RF performance and minimize the effects of mismatch.

Connector Mating Plane Surfaces

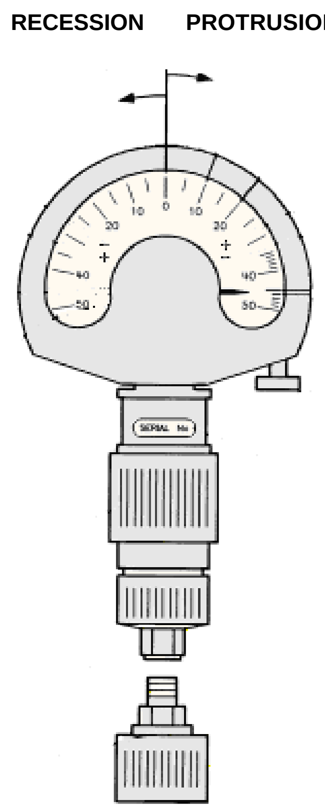
An important concept in RF and microwave measurements is the reference plane. For a network analyzer, this is the surface that all measurements are referenced to. At calibration, the reference plane is defined as the plane where the mating plane surfaces of the measurement port and the calibration standards meet. Good connections (and calibrations) depend on perfectly flat contact between connectors at all points on the mating plane surfaces (as shown in the following graphic).



Gaging Fundamentals

Connector gages are important tools used to measure center conductor pin depth in connectors. Connector pin depth, measured in terms of recession or protrusion, is generally the distance between the mating plane and the end of the center conductor, or the shoulder of the center conductor for a stepped male pin.

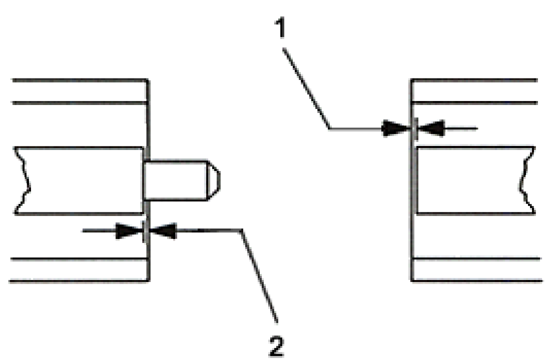
Typical Connector Gage



Recession and Protrusion

Pin depth is negative (recession) if the center conductor is recessed below the outer conductor mating plane, usually referred to as the "reference plane". Pin depth is positive (protrusion) if the center conductor projects forward from the connector reference plane.

Pin Depth



1. Recession of female contact
2. Recession of male pin shoulder

Difference with Type-N Connectors

Type-N connectors have the mating plane of the center conductors offset from the connector reference plane. In this case the zero setting "gage masters" generally offset the nominal distance between the center conductor mating plane and the connector reference plane.

When to Gage Connectors

- Before using a connector or adapter the first time.
- When visual inspection or electrical performance suggests the connector interface may be out of range.
- After every 100 connections, depending on use.

Connector Gage Accuracy

Connector gages (those included with calibration and verification kits), are capable of performing coarse measurements only. This is due to the repeatability uncertainties associated with the measurement. It is important to recognize that test port connectors and calibration standards have mechanical specifications that are extremely precise. Only special gaging processes and electrical testing (performed in a calibration lab) can accurately verify the mechanical characteristics of these devices. The pin depth specifications in the Agilent calibration kit manuals provide a compromise between the pin depth accuracy required, and the accuracy of the gages. The gages shipped with calibration and verification kits allow you to measure connector pin depth and avoid damage from out-of-specification connectors.

Note: Before gaging any connector, the mechanical specifications provided with that connector or device should be checked.

To Gage Connectors

1. Wear a grounded wrist strap (having a 1 MΩ series resistor).
2. Select proper gage for device under test (DUT).
3. Inspect and clean gage, gage master, and DUT.
4. Zero the connector gage.
    a. While holding gage by the barrel, carefully connect gage master to gage. Finger-tighten connector nut only.
    b. Use proper torque wrench to make final connection. If needed, use additional wrench to prevent gage master (body) from turning. Gently tap the barrel to settle the gage.
    c. The gage pointer should line up exactly with the zero mark on gage. If not, adjust "zero set" knob until gage pointer reads zero. On gages having a dial lock screw and a movable dial, loosen the dial lock screw and move the dial until the gage pointer reads zero. Gages should be zeroed before each set of measurements to make sure zero setting has not changed.
    d. Remove gage master.
5. Gage the device under test.
    a. While holding gage by the barrel, carefully connect DUT to gage. Finger-tighten connector nut only.
    b. Use proper torque wrench to make final connection and, if needed, use additional wrench to prevent DUT (body) from turning. Gently tap the barrel to settle the gage.

c. Read gage indicator dial for recession or protrusion and compare reading with device specifications.

Caution: If the gage indicates excessive protrusion or recession, the connector should be marked for disposal or sent out for repair.

6. For maximum accuracy, measure the device a minimum of three times and take an average of the readings. After each measurement, rotate the gage a quarter-turn to reduce measurement variations.

7. If there is doubt about measurement accuracy, be sure the temperatures of the parts have stabilized. Then perform the cleaning, zeroing, and measuring procedure again.

Connector Care Procedures

- **Inspecting Connectors**
- **Cleaning Connectors**
- **Making Connections**
- **Using a Torque Wrench**
- **Handling and Storing Connectors**

To Inspect Connectors

Wear a grounded wrist strap (having a 1 MΩ series resistor).

Use a magnifying glass (≥10X) and inspect connector for the following:

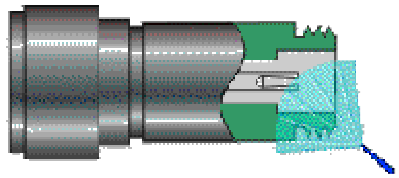
- Badly worn plating or deep scratches
- Deformed threads
- Metal particles on threads and mating plane surfaces
- Bent, broken, or mis-aligned center conductors
- Poor connector nut rotation

Caution: A damaged or out-of-specification device can destroy a good connector attached to it even on the first connection. Any connector with an obvious defect should be marked for disposal or sent out for repair.

To Clean Connectors

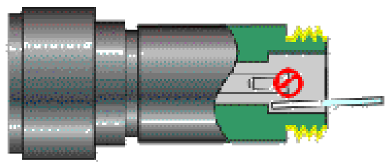
1. Wear a grounded wrist strap (having a 1 MΩ series resistor).

2. Use clean, low-pressure air to remove loose particles from mating plane surfaces and threads. Inspect connector thoroughly. If additional cleaning is required, continue with the following steps.



3. Moisten–do not saturate–a lint-free swab with isopropyl alcohol. See Cleaning Supplies for recommended type.

4. Clean contamination and debris from mating plane surfaces and threads. When cleaning interior surfaces, avoid exerting pressure on center conductor and keep swab fibers from getting trapped in the female center conductor.



5. Let alcohol evaporate–then use compressed air to blow surfaces clean.

6. Inspect connector. Make sure no particles or residue remains.

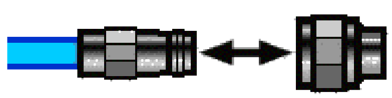
7. If defects are still visible after cleaning, the connector itself may be damaged and should not be used. Determine the cause of damage before making further connections.

To Make Connections

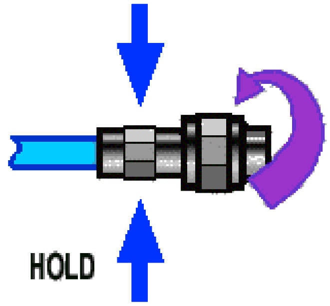
1. Wear a grounded wrist strap (having a 1 MΩ series resistor).

2. Inspect, clean, and gage connectors. All connectors must be undamaged, clean, and within mechanical specification.

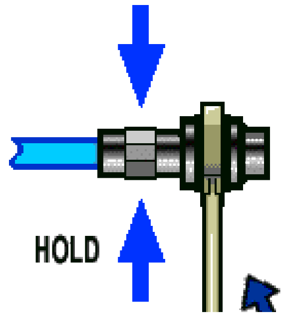
3. Carefully align center axis of both devices. The center conductor pin–from the male connector–must slip concentrically into the contact finger of the female connector.



4. Carefully push the connectors straight together so they can engage smoothly. Rotate the connector nut (not the device itself) until finger-tight, being careful not to cross the threads.



5. Use a torque wrench to make final connection. Tighten until the "break" point of the torque wrench is reached. Do **not** push beyond initial break point. Use additional wrench, if needed, to prevent device body from turning.

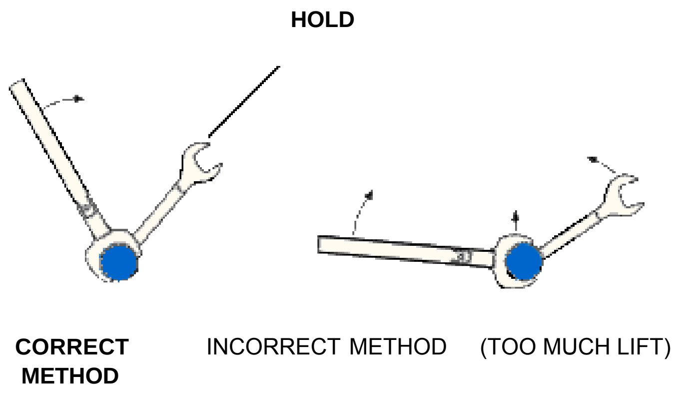


To Separate a Connection

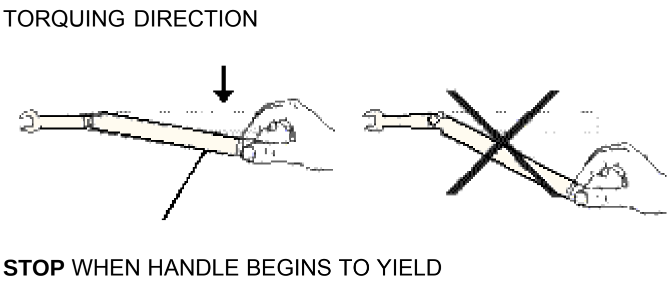
1. Support the devices to avoid any twisting, rocking or bending force on either connector.
2. Use an open-end wrench to prevent the device body from turning.
3. Use another open-end wrench to loosen the connector nut.
4. Complete the disconnection by hand, turning only the connector nut.
5. Pull the connectors straight apart.

To Use a Torque Wrench

1. Make sure torque wrench is set to the correct torque setting.
2. Position torque wrench and a second wrench (to hold device or cable) within 90° of each other before applying force. Make sure to support the devices to avoid putting stress on the connectors.



3. Hold torque wrench lightly at the end of handle–then apply force perpendicular to the torque wrench handle. Tighten until the "break" point of the torque wrench is reached. Do **not** push beyond initial break point.



To Handle and Store Connectors

- Install protective end caps when connectors are not in use.
- Never store connectors, airlines, or calibration standards loose in a box. This is a common cause of connector damage.
- Keep connector temperature the same as analyzer. Holding the connector in your hand or cleaning connector with compressed air can significantly change the temperature. Wait for connector temperature to stabilize before using in calibration or measurements.
- Do not touch mating plane surfaces. Natural skin oils and microscopic particles of dirt are difficult to remove from these surfaces.
- Do not set connectors contact-end down on a hard surface. The plating and mating plane surfaces can be damaged if the interface comes in contact with any hard surface.
- Wear a grounded wrist strap and work on a grounded, conductive table mat. This helps protect the analyzer and devices from electrostatic discharge (ESD).

Electrostatic Discharge (ESD) Protection

Protection against electrostatic discharge (ESD) is essential while removing or connecting cables to the network analyzer. Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the instrument:

- **Always** have a grounded, conductive table mat in front of your test equipment.
- **Always** wear a grounded wrist strap, connected to a grounded conductive table mat, having a 1 MO resistor in series with it, when making test setup connections.
- **Always** wear a heel strap when working in an area with a conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
- **Always** ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port or cable connector briefly.
- **Always** ground the center conductor of a test cable before making a connection to the analyzer test port or other static-sensitive device. This can be done as follows:
  1. Connect a short (from your calibration kit) to one end of the cable to short the center conductor to the outer conductor.
  2. While wearing a grounded wrist strap, grasp the outer shell of the cable connector.
  3. Connect the other end of the cable to the test port and remove the short from the cable.

See Analyzer Accessories for ESD part numbers.

Absolute Output Power

An absolute output-power measurement displays absolute power versus frequency.

See other Amplifier Parameters topics

What is Absolute Output Power?

An absolute-output power measurement displays the power present at the analyzer's input port. This power is absolute-it is not referenced (ratioed) to the incident or source power. In the log mag format, values associated with the grid's vertical axis are in units of dBm, which is the power measured in reference to 1 mW.

- 0 dBm = 1 mW
- -10 dBm = 100 µW
- +10 dBm = 10 mW

In the linear mag format, values associated with the grid's vertical axis are in units of watts (W).

Why Measure Absolute Output Power?

Absolute output power is measured when the amplifier's output must be quantified as absolute power rather than a ratioed relative power measurement. For example, during a gain compression measurement, it is typical to also measure absolute output power. This shows the absolute power out of the amplifier where 1-dB compression occurs.

Accuracy Considerations

The output power of the amplifier should be sufficiently attenuated if necessary. Too much output power could:

- Damage the analyzer receiver
- Exceed the input compression level of the analyzer receiver, resulting in inaccurate measurements.

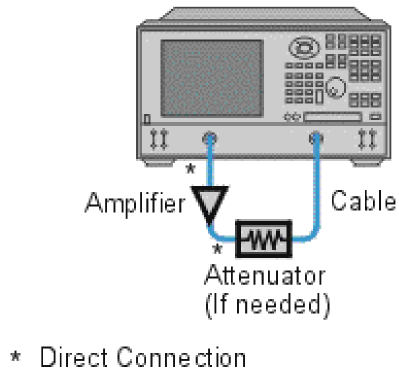
Attenuation of the amplifier's output power can be accomplished using either attenuators or couplers

The amplifier may respond very differently at various temperatures. The tests should be done when the amplifier is at the desired operating temperature.

How to Measure Absolute Power

Do the following to measure absolute output power:

1. Preset the analyzer.
2. Select an unratioed power measurement (receiver B).
3. Set the analyzer's source power to 0 dBm.
4. Select an external attenuator (if needed) so the amplifier's output power will be sufficiently attenuated to avoid causing receiver compression or damage to the analyzer's port-2.
5. Connect the amplifier as shown in the following graphic, and provide the dc bias.



6. Select the analyzer settings for your amplifier under test.
7. Remove the amplifier and connect the measurement ports together. Store the data to memory. Be sure to include the attenuator and cables in the test setup if they will be used when measuring the amplifier.
8. Save the instrument state to memory.
9. Reconnect the amplifier.
10. Select the data math function Data/Memory.
11. Scale the displayed measurement for optimum viewing and use a marker to measure the absolute output-power at a desired frequency.
12. Print or save the data to a disk.

AM-PM Conversion

The AM-PM conversion of an amplifier is a measure of the amount of undesired phase deviation (PM) that is caused by amplitude variations (AM) inherent in the system.

- What Is AM-PM Conversion?
- Why Measure AM-PM Conversion
- Accuracy Considerations
- How to Measure AM-PM Conversion

Other Tutorials topics

What Is AM-PM Conversion?

AM-to-PM conversion measures the amount of undesired phase deviation (PM) that is caused by amplitude variations (AM) of the system. For example, unwanted phase deviation (PM) in a communications system can be caused by:

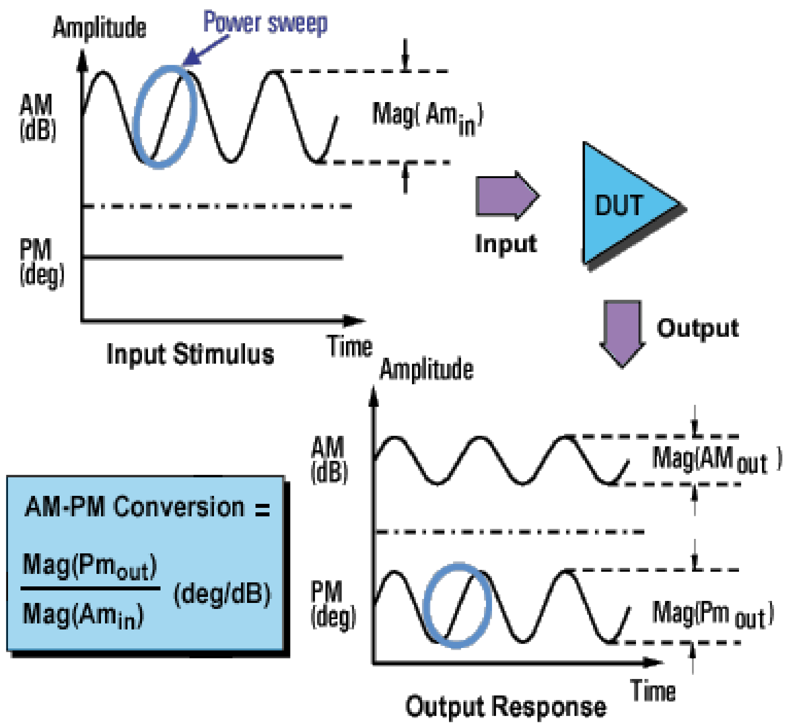
Unintentional amplitude variations (AM)

- Power supply ripple
- Thermal drift
- Multipath fading

Intentional modulation of signal amplitude

- QAM
- Burst modulation

AM-to-PM conversion is usually defined as the change in output phase for a 1-dB increment in the power-sweep applied to the amplifier's input (i.e. at the 1 dB gain compression point). It is expressed in degrees-per-dB (°/dB). An ideal amplifier would have no interaction between its phase response and the power level of the input signal.



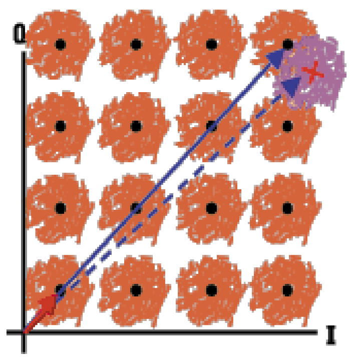
Why Measure AM-PM Conversion

AM-to-PM conversion is a critical parameter in systems where phase (angular) modulation is used, such as:

- FM
- QPSK
- 16QAM

It is a critical parameter because undesired phase deviation (PM) causes analog signal degradation, or increased bit-error rates (BER) in digital communication systems. While it is easy to measure the BER of a digital communication system, this measurement alone does not help you understand the underlying causes of bit errors. AM-to-PM conversion is one of the fundamental contributors to BER, and therefore it is important to quantify this parameter in communication systems.

Refer to the I/Q diagram below for the following discussion on how AM-to-PM conversion can cause bit errors.



- The desirable state change is from the small solid vector to the large solid vector.
- With AM-to-PM conversion, the large vector may actually end up as shown with the dotted line. This is due to phase shift that results from a change in the input power level.
- For a 64QAM signal as shown (only one quadrant is drawn), we see that the noise circles that surround each state would actually overlap, which means that statistically, some bit errors would occur.

Accuracy Considerations

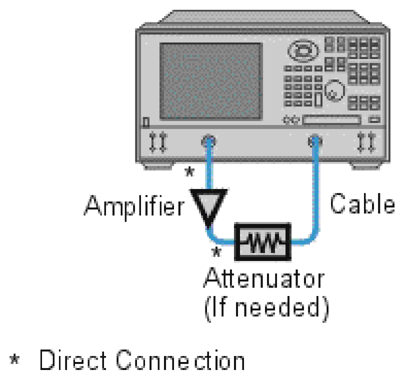
With this method of measuring AM-to-PM conversion, the modulation frequency is approximately the inverse of the sweep time. Even with the fastest power sweep available on most network analyzers, the modulation frequency ends up being fairly low (typically less than 10 Hz). This could cause a slight temperature change as the sweep progresses, especially if the amplifier has low thermal mass, typical of an unpackaged device. Results using this method could differ slightly if the nonlinear behavior of an amplifier is extremely sensitive to thermal changes. (The PNA series analyzers can make power sweeps <1 ms.)

- The amplifier may respond very differently at various temperatures. The tests should be done when the amplifier is at the desired operating temperature.
- The output power of the amplifier should be sufficiently attenuated if necessary. Too much output power could:
  - damage the analyzer receiver
  - exceed the input compression level of the analyzer receiver, resulting in inaccurate measurements
- Attenuation of the amplifier's output power can be accomplished using:
  - Attenuators
  - Couplers
- The frequency-response effects of the attenuators and couplers must be accounted for during calibration since they are part of the test system. Proper error-correction techniques can reduce these effects.
- The frequency response is the dominant error in an AM-to-PM conversion measurement setup. Performing a

thru-response measurement calibration significantly reduces this error. For greater accuracy, perform a 2-port measurement calibration.

How to Measure AM-PM Conversion

1. Preset the analyzer.
2. Select an S21 measurement in the power-sweep mode.
3. Enter the start and stop power levels for the analyzer's power sweep. The start power level should be in the linear region of the amplifier's response (typically 10-dB below the 1-dB compression point). The stop power should be in the compression region of the amplifier's response.
4. Select an external attenuator (if needed) so the amplifier's output power will be sufficiently attenuated to avoid causing receiver compression or damage to the analyzer's port 2.
5. Connect the amplifier as shown in the following graphic, and provide the dc bias.



6. Select the analyzer settings for your amplifier under test in order to perform a swept-power gain compression measurement at a chosen frequency. See Gain Compression.
7. Remove the amplifier and perform a measurement calibration. Be sure to include the attenuator and cables in the calibration setup if they will be used when measuring the amplifier.
8. Save the instrument state to memory.
9. Reconnect the amplifier.
10. Use a reference marker to target the amplifier's input power at the 1-dB gain compression point. Select a second marker and adjust its stimulus value until its response is 1-dB below the reference marker.
11. Change the S_{21} measurement from a log magnitude format to a phase format (no new calibration is required).
12. Find the phase change between the markers. The value is the AM-to-PM conversion coefficient at the 1-dB gain compression point.
13. Print the data or save it to a disk.

Amplifier Parameters Reference

Gain

$$\tau = \frac{V_{trans}}{V_{inc}}$$

$$\text{Gain (dB)} = -20\log_{10}|\tau|$$

$$\text{Gain (dB)} = P_{out}\ \text{(dBm)} - P_{in}\ \text{(dBm)}$$

The ratio of the amplifier's output power (delivered to a Z_0 load) to the input power (delivered from a Z_0 source). Z_0 is the characteristic impedance, in this case, 50Ω.

For small signal levels, the output power of the amplifier is proportional to the input power. Small signal gain is the gain in this linear region.

As the input power level increases and the amplifier approaches saturation, the output power reaches a limit and the gain drops. Large signal gain is the gain in this nonlinear region. See Gain Compression.

Gain Flatness

The variation of the gain over the frequency range of the amplifier. See Small Signal Gain and Flatness.

Reverse Isolation

The measure of transmission from output to input. Similar to the gain measurement except the signal stimulus is applied to the output of the amplifier. See Reverse Isolation.

Gain Drift versus Time (temperature, bias)

The maximum variation of gain as a function of time, with all other parameters held constant. Gain drift is also observed with respect to other parameter changes such as temperature, humidity or bias voltage.

Deviation from Linear Phase

The amount of variation from a linear phase shift. Ideally, the phase shift through an amplifier is a linear function of frequency. See Deviation from Linear Phase.

Group Delay

$$\tau_g\,(\text{sec}) = -\frac{\Delta\theta}{\Delta\omega}$$

$$= -\frac{1}{360} * \frac{\Delta\theta}{\Delta f}$$

The measure of the transit time through the amplifier as a function of frequency. A perfectly linear phase shift would have a constant rate of change with respect to frequency, yielding a constant group delay. See Group Delay.

Return Loss (SWR, Γ)

$$\Gamma = \frac{V_{refl}}{V_{inc}} = \rho\angle\theta$$

Reflection coefficient = ρ

Return loss (dB) = $-20\log_{10}\rho$

$$\text{SWR} = \frac{1+\rho}{1-\rho}$$

The measure of the reflection mismatch at the input or output of the amplifier relative to the system Z_0 characteristic impedance.

Complex Impedance

$$Z = \frac{1+\Gamma}{1-\Gamma} * Z_0$$

$$= -R + jX$$

Complex impedance (1+G). The amount of reflected energy from an amplifier is directly related to its impedance. Complex impedance consists of both a resistive and a reactive component. It is derived from the characteristic impedance of the system and the reflection coefficient. See Complex Impedance.

Gain Compression

See Gain Compression Application.

AM-to-PM Conversion Coefficient

$$\text{AM/PM} = \frac{\Delta\theta}{\Delta P}$$

The amount of phase change generated in the output signal of an amplifier as a result of an amplitude change of the input signal.

The AM-to-PM conversion coefficient is expressed in units of degrees/dB at a given power level (usually P_{1dB}, which is the 1 dB gain compression point). See AM-PM Conversion.

Antenna Measurements

This topic describes how to setup the PNA to make S21 measurements on an array of antennas. Measurements can be made on up to 100 antenna arrays (Ports) and up to 15 discrete frequencies

Measurement Sequence

1. The PNA is set to a start frequency.
2. As the antenna moves, the PNA responds to each external trigger signal by measuring an antenna port.
3. When all ports are measured, the PNA increments to the next frequency
4. Again the PNA measures all ports, and so forth until all ports are measured at all frequencies in the forward direction.
5. As the antenna begins moving in the opposite direction, the same sequence occurs, except the PNA decrements in frequency until all ports are measured at all frequencies and the PNA is set back to the original start frequency.

Once setup, only external trigger signals are sent to the PNA. After each trigger, measurement data is stored in internal PNA memory.

How to set up the PNA

See the Antenna Macro to learn how to do this automatically.

1. On the **System** menu click **Preset**
2. On the **Sweep** menu point to **Trigger** then click **Trigger**
3. In Trigger Source click **External**
4. In Trigger Scope click **Channel**
5. Click **OK**

Forward Sweep

1. On the **Trace** menu click **New Trace**
2. Click **S21** then Channel Number **1**
3. On the **Sweep** menu point to **Trigger** then click **Trigger**
4. In Channel Trigger State check **Point Sweep**
5. Click **OK**

6. On the Sweep menu click **Sweep Type**:then **Segment Sweep**
7. Click **OK**
8. On the **View** menu point to **Tables** then click **Segment Table**
9. Do this 15 times - Sweep menu point to **Segment Table** then **Insert Segment**
10. For each Segment in the Segment table:
    1. Click **State**:and select **ON**
    2. Double click both **START** and **STOP** Frequency: (each new segment ascends in frequency)
    3. Double click **Points**: type Number of Ports (elements)

Reverse sweep

Repeat the following steps for each frequency: (up to 15)

- Increment the channel number (**X**) Starting with Channel 2
- Decrement the frequency (**F**)

1. On the **Trace** menu click **New Trace...**
2. Click **S21** then Channel Number ***X***
3. When a window contains four traces, check **Create in New Window**.
4. Click **OK**
5. On the **Sweep** menu point to **Trigger** then click **Trigger**
6. In Channel Trigger State check **Point Sweep**
7. Click **OK**
8. On the Sweep menu click **Sweep Type**:then **Segment Sweep**
9. Click **OK**
10. On the **View** menu point to **Tables** then click **Segment Table**
11. In the Segment table
    1. Click **State**:and select **ON**
    2. Double click both **START** and **STOP** Frequency ***F***
    3. Double click **Points**: type Number of Ports (elements)

Balanced Measurements

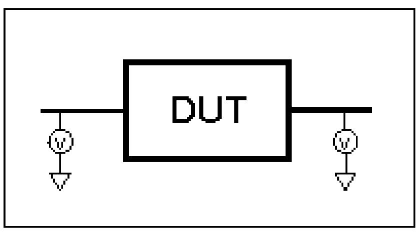
- [What are Balanced Devices?]
- Differential and Common Modes Model
- Measuring Mixed Mode (Balanced) S-Parameters
- Measuring Imbalance Parameters
- Measuring CMRR
- Port Mapping
- How the PNA makes Balanced Measurements

Other Measurement Setup Topics

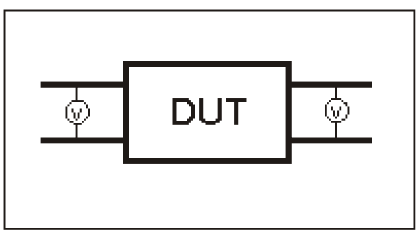
New Check out the **True Mode Stimulus Application** (TMSA) available for download at http://na.tm.agilent.com/pna/apps/applications.htm

What are Balanced Devices?

Standard **Single-ended devices** generally have one input port and one output port. Signals on the input and output ports are referenced to ground.



Balanced devices have two pins on either the input, the output, or both. The signal of interest is the difference and average of the two input or output lines, not referenced to ground.



Differential and Common Modes Model

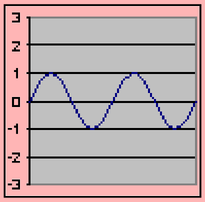
On balanced devices, the signal of interest is the **difference** and **average** of the two input or output lines. In balanced device terminology, these signals are known as the Differential and Common modes.

The following model shows how two signals (A and B) combine to create Differential and Common mode signals:

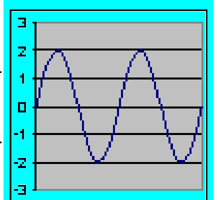
- **Signal A** is fixed at 1V peak
- **Signal B** is **selectable**
- **Differential** is calculated as **A minus B**
- **Common** is calculated as the **AVERAGE of A and B**

Note: Click **Signal B** selections to see various Differential and Common signals.

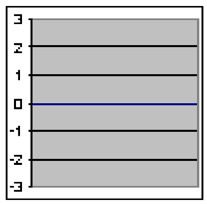
Signal A =1V

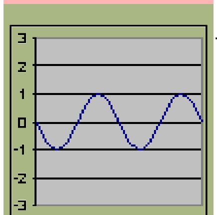


Differential (A - B)



Common (Avg) (A + B) / 2





Signal B = SELECTABLE	Calculations	
Single-ended 0V	1 - 0 = 1	(1 + 0)/2 = .5
180° Out of Phase 1V	1 - (-1) = 2	(1 + (-1))/2 = 0
180° Out of Phase 2V	1 - (-2) = 3	(1 + (-2))/2 = -.5
In Phase 1V	1 - 1 = 0	(1 + 1)/2 = 1
In Phase 2V	1 - 2 = -1	(1 + 2)/2 = 1.5

Notes:

- Even when Signal B is 0V, like a Single -ended signal, there is still a unique Differential and Common mode representation of the two individual signals.
- The above model does not show a DUT. The difference and average of two signals can be calculated for both the balanced INPUT and balanced OUTPUT of a device.

Measuring Mixed Mode (Balanced) S-Parameters

Mixed mode S-parameters combine traditional S-parameter notation with balanced measurement terminology.

Some balanced devices are designed to amplify the differential component and reject the common component. This allows noise that is common to both inputs to be virtually eliminated from the output. For example, a balanced device may amplify the differential signal by a factor of 5, and attenuate the common signal by a factor of 5. Using traditional S-parameter notation, an S21 is a ratio measurement of the device **Output** / device **Input**. Mixing this with balanced terminology, we could view the amplifier's Differential Output signal / Differential Input signal. To see this parameter on the PNA, we would select an Sdd21 measurement using the following balanced notation:

Sabxy -

Where

a - device output mode

b - device input mode

(choose from the following for both a and b:)

- **d** - differential
- **c** - common
- **s** - single ended

x - device output "logical" port number

y - device input "logical" port number

See Also

Logical port mapping

Port mapping with External Test Sets

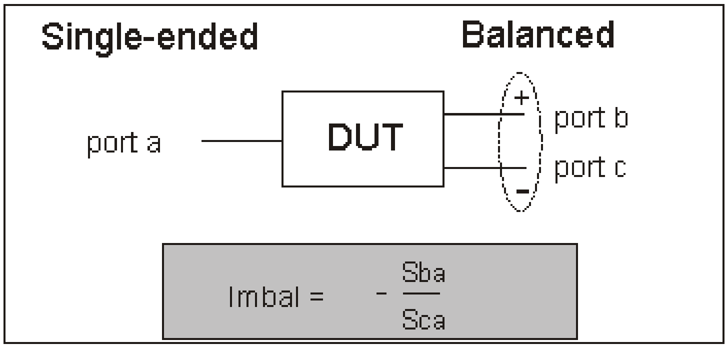
Measuring Imbalance Parameters

Imbalance is a measure of how well two physical ports that make up a balanced port are matched. With a perfectly balanced port, the same amount of energy flows to both ports and the magnitude of the ratio of these ports is 1.

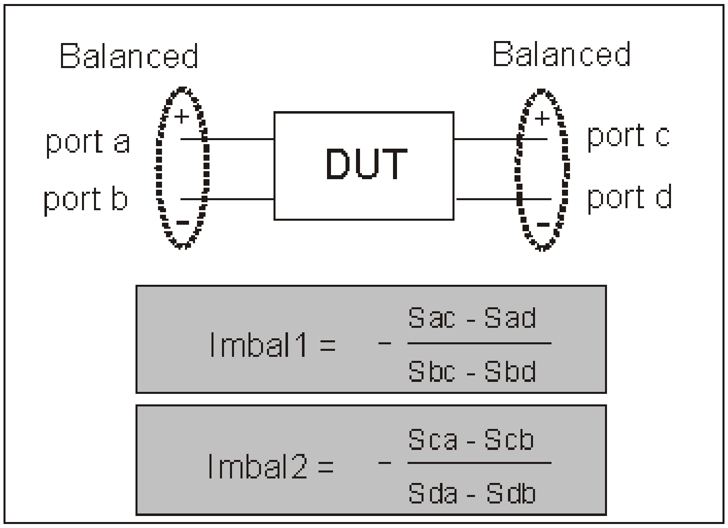
The notation is similar to traditional S-parameters. In the following diagrams, the letters a, b, c, and d are used because any PNA port can be assigned to any logical port using the port mapping process.

For example, in the following single-ended - balanced formula, **Sba** indicates the device output port is logical port b and the input port is logical port a.

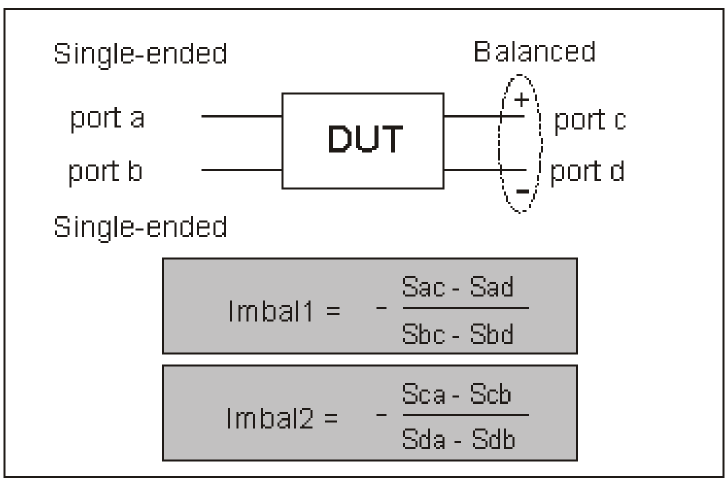
Imbalance parameter when measuring a **single-ended - balanced** device.



Imbalance1 and Imbalance2 parameters when measuring a **balanced - balanced** device.



Imbalance1 and Imbalance2 parameters when measuring a **single-ended - single-ended - balanced** device.



Measuring CMRR (Common Mode Rejection Ratio)

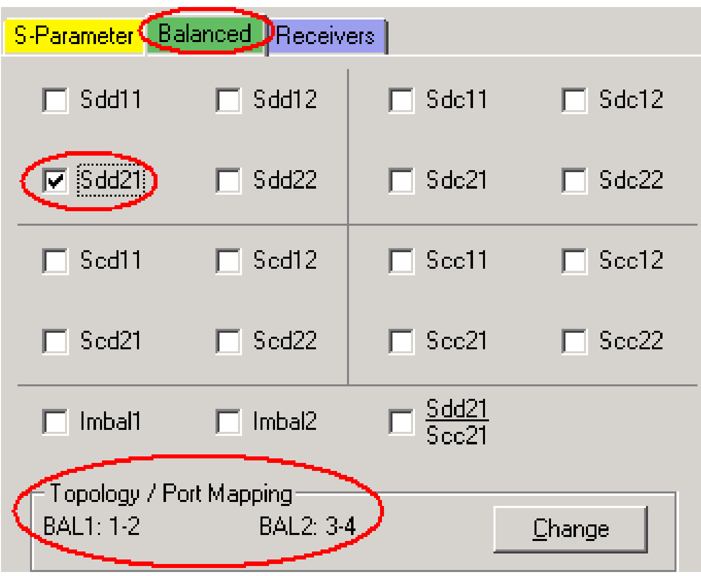
CMRR is a ratio of the transmission characteristic in differential mode over the transmission characteristic in the common mode of the balanced port as the measurement parameter. A high value indicates more rejection of common mode, which is desirable in a device that transmits information in the differential portion of the signal. The table below shows the CMRR parameter you can select when measuring each balanced device.

Single-ended - balanced device	$\frac{S_{ds21}}{S_{cs21}}$ and $\frac{S_{sd12}}{S_{sc12}}$
Balanced - balanced device	$\frac{S_{dd21}}{S_{cc21}}$
Single-ended - single-ended - balanced device	$\frac{S_{ds31}}{S_{cs31}}$ and $\frac{S_{ds32}}{S_{cs32}}$

Device Topology and Port Mapping

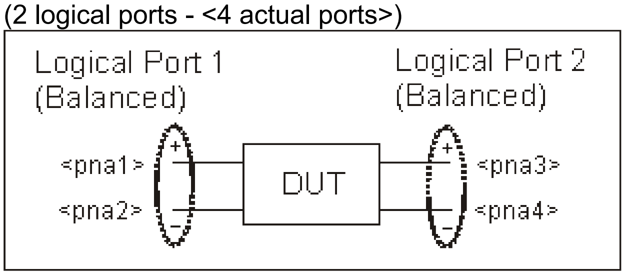
As we have seen on balanced inputs and outputs, the signal of interest is the difference or average of two BALANCED input or BALANCED output lines. It is also possible to have single-ended ports AND balanced ports on the same device. The two balanced input or output lines are referred to as a single "logical" port.

When configuring a balanced measurement on the PNA, select a device 'topology'. Then map each PNA test port to the DUT ports. The PNA assigns "logical ports". See how to set device topology in the PNA.

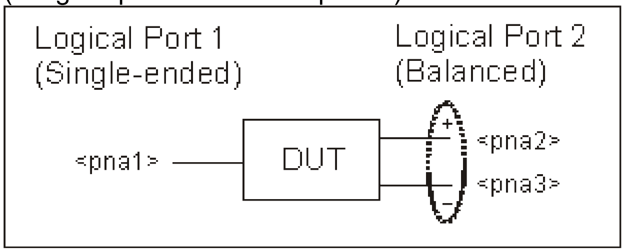


The following device topologies can be measured by a 4-port PNA.

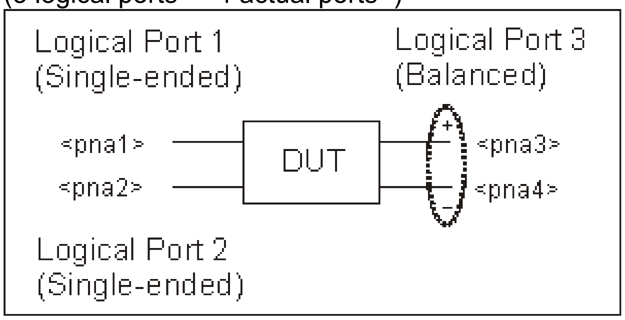
- **Balanced / Balanced**
  (2 logical ports - <4 actual ports>)



- **Single-ended / Balanced**
  (2 logical ports - <3 actual ports>)



- **Single-ended - Single-ended / Balanced**
  (3 logical ports - <4 actual ports>)



These topologies can be used in the reverse (**<==**) direction to measure:

- **Balanced / Single-ended** topology
- **Balanced / Single-ended - Single-ended** topology

For example, to measure a **Balanced / Single-ended** topology, measure the S12 (reverse direction) of a **Single-ended / Balanced** topology.

How the PNA makes Balanced Measurements

The PNA does not provide true balanced measurements by stimulating both balanced inputs together and measuring both outputs relative to one another. Instead, the PNA makes only Single-ended measurements. On a Balanced/ Balanced device, it stimulates each input and measures each output individually. From the output data, the PNA calculates the Differential and Common outputs from the DUT using the same math formulas as the above model. However, all measurements and calculations on the PNA are performed in frequency domain using complex (magnitude and phase) data. The Balanced S-parameter display data is then calculated from the Differential and Common inputs and outputs.

Complex Impedance

When making an S_{11} or S_{22} measurement of your device under test, you can view complex-impedance data such as series resistance and reactance as well as phase and magnitude information. Complex impedance data can be viewed using either the Smith Chart format or the Polar format.

- **What Is Complex Impedance?**
- **Accuracy Considerations**
- **How to Measure Complex Impedance**

What Is Complex Impedance?

Complex-impedance data is information that can be determined from an S_{11} or S_{22} measurement of your device under test, such as:

- Resistance
- Reactance
- Phase
- Magnitude

The amount of power reflected from a device is directly related to the impedances of both the device and the measuring system. For example, the value of the complex reflection coefficient (Γ) is equal to 0 only when the device impedance and the system impedance are exactly the same (i.e. maximum power is transferred from the source to the load). Every value for Γ corresponds uniquely to a complex device impedance (as a function of frequency), according to the equation:

$Z_L = [(1 + \Gamma) / (1 - \Gamma)] \times Z_0$

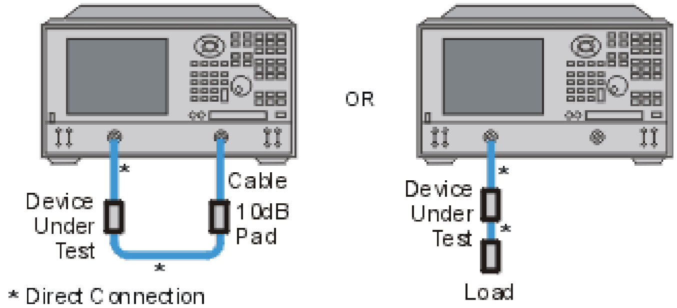
where Z_L is your test device impedance and Z_0 is the measuring system's characteristic impedance.

Complex Impedance is best viewed using either Polar or Smith Chart format.

Accuracy Considerations

- The Smith chart is most easily understood when used with a full scale value of 1.0.
- For greater accuracy when using markers in the Smith chart or polar formats, activate the discrete marker mode.
- The uncertainty of reflection measurements is affected by:
  - Directivity
  - Reflection tracking
  - Source match
  - Load match (with 2-port devices)

With a 2-port calibration, the effects of these factors are reduced. A 1-port calibration provides the same accuracy if the output of the device is well terminated. Refer to the graphic below for the following discussion.



- If you connect the device between both analyzer ports, it is recommended that you use a 10 dB pad on the output of the device to improve measurement accuracy. This is not necessary if you use a 2-port calibration since it corrects for load match.
- If you connect a two-port device to only one analyzer port, it is recommended that you use a high-quality load (such as a calibration standard) on the output of the device.

How to Measure Complex Impedance

1. Connect the device as shown in the previous graphic.
2. Preset the analyzer.
3. Set up, calibrate, and perform an S11 or S22 measurement.
4. View impedance data:
   a. Select the Smith Chart format.
   b. Scale the displayed measurement for optimum viewing.
   c. Position the marker to read the resistive and reactive components of the complex impedance at any point along the trace.
   d. Print the data or save it to a disk.
5. View the magnitude and phase of the reflection coefficient:
   a. Select the Smith chart format or the Polar format.
   b. Select either Lin Marker or Log Marker formats.
   c. Scale the displayed measurement for optimum viewing.
   d. Position the marker to read the frequency, magnitude, and phase of the reflection coefficient (Γ) at any point along the trace.
   e. Print the data or save it to a disk.

Comparing the PNA "Delay" Functions

The PNA has three Delay functions which are similar but are used in different ways.

1. Group Delay format is used to display the Group Delay of a network. Group Delay is defined as:

> **`-d(phi)/d(omega)`** -- where **`phi`** is radian angle, and **`omega`** is radian frequency.

Since it is defined by a derivative, the value must be determined from an analytic function. However, the PNA makes discrete measurements, so we approximate the group delay by taking the finite difference:

> **`-(1/360)*delta(phi)/delta(f)`** -- where **`phi`** is degree angle and **`f`** is frequency in Hz. The 1/360 does the proper conversion of degrees to radians and Hz frequency to radian frequency.

From this we can see that, if the phase response of a network varies with frequency, then the Group Delay must vary as well. In fact, many filters are specified by the variation of their Group Delay.

If we measure the phase response of a lossless cable, it should be a straight line. But, of course, nothing is perfect. The phase response will have a small amount of noise. This is due to trace noise of the PNA, and the loss with real cables or transmission lines, which causes a small amount of non-linear phase change with frequency. So, if we look at the Group Delay of a cable, we will see a small amount of variation. Also, if the frequency spacing is small enough when you make the measurement, the **`delta(f)`** in the denominator becomes very small, so the delay can have wide swings with just a little noise.

To overcome this issue, we sometimes add smoothing to a phase trace, which widens the effective **`delta(f)`**, called the aperture, and provides a less noisy Group Delay response. The Group Delay of a device is only valid for a given frequency aperture. Learn more about Group Delay.

2. Electrical Delay function. On many filters, the passband response is specified for a maximum value of "Deviation from Linear Phase". When looking at the passband of a multi-pole filter, one sees the phase changing very rapidly. This makes it difficult to determine the linearity of the phase response. The Electrical Delay function subtracts out a "LINEAR PHASE" equivalent to the delay time value computed as above. When you use this function, you dial in the Linear Delay such that a CONSTANT PHASE SLOPE is removed from the phase trace, until the phase trace is mostly flat. The remaining variation is the deviation from linear phase.

To make this task a little less tedious, the PNA has a marker function called Marker =>> Delay. This function computes the Group Delay value at the marker position, using a 20% smoothing aperture, then changes the Electrical Delay value to this value. Obviously, if the phase trace is not perfectly linear, moving the marker and recomputing the delay will result in different values. The phase slope added by the electrical delay function applies only to the current measurement. That is, each measurement (S11, S22, S12, S21) can have its own value of electrical delay. Learn more about Deviation from Linear Phase.

3. Port Extension is a function that is similar to calibration. It applies to all the traces in a given channel. It compensates for the phase response change that occurs when the calibration reference plane is not the same as the measurement plane of the device.

Let's look at an example of a DUT that is mounted on a PCB fixture with SMA connectors. We can easily calibrate at the SMA connectors. But if we add the fixture to measure the board-mounted device, the apparent phase of the DUT is changed by the phase of the PCB fixture. We use port extensions to add a LINEAR PHASE (constant delay) to the calibration routines to shift the phase reference plane to that of the DUT. This is ONLY valid if the fixture consists of a transmission line with linear phase response, and this limitation is usually met in practice. The main reason that it is NOT met is that there is mismatch at the SMA-to-PCB interface. This mismatch was not removed with the error correction because it occurs AFTER the SMA connector. Ripple can be seen on the display as signals bounce back and forth between the mismatch and the DUT. If the DUT is well matched, the ripple effect is very small. However, when we use Automatic Port Extension (APE), and we leave the fixture open (the DUT removed), the reflection is large and we see larger ripples. That is why APE uses a curve fitting process to remove the effects of the ripple. For best effect, the wider the IF Bandwidth, the better we can "smooth-out" the ripples with curve fitting. Still, we are fitting a LINEAR PHASE SLOPE to the phase response, and thus we use only a single Port Extension Delay value to represent the phase slope.

The method used by older VNAs to get this same functionality was to add a mechanical line stretcher to the reference channel, which removed a fixed delay amount from the port. Port extensions give 1x the delay for transmission at each port, and 2x the delay for reflection, so it differs somewhat from Electrical Delay above, in that the math function depends upon the measurement being made. The signal passes twice through the fixture for reflection (out and back), but only once for each port on transmission. For S21, the phase slope added is the sum of the port 1 and port 2 Port Extension Delay values.

The "User Range" APE function is used in cases where a fixture has limited bandwidth, perhaps due to tuning elements or bias elements. In this case, the model of constant delay for the fixture over the whole bandwidth is not valid, so a narrower "User Range" of frequencies can be selected to compute the delay. Since the aperture is smaller, there is more uncertainty in the delay computation for port extension. Also, for those who had been using the Marker =>> Delay function to estimate the delay, we added the "Active Marker" selection to APE, which works exactly the same as Marker->Delay. Learn more about Automatic Port Extensions.

Deviation from Linear Phase

Deviation from linear phase is a measure of phase distortion. The electrical delay feature of the analyzer is used to remove the linear portion of the phase shift from the measurement. This results in a high-resolution display of the non-linear portion of the phase shift (deviation from linear phase).

- **What Is Linear Phase Shift?**
- **What Is Deviation from Linear Phase?**
- **Why Measure Deviation from Linear Phase?**
- **Using Electrical Delay**
- **Accuracy Considerations**

See also Comparing the PNA Delay Functions

See other Tutorials

What Is Linear Phase Shift?

Phase shift occurs because the wavelengths that occupy the electrical length of the device get shorter as the frequency of the incident signal increases. *Linear* phase-shift occurs when the phase response of a device is linearly proportional to frequency. Displayed on the analyzer, the phase-versus-frequency measurement trace of this ideal linear phase shift is a straight line. The slope is proportional to the electrical length of the device. Linear phase shift is necessary (along with a flat magnitude response) for distortionless transmission of signals.

What Is Deviation from Linear Phase?

In actual practice, many electrical or electronic devices will delay some frequencies more than others, creating non-linear phase-shift (distortion in signals consisting of multiple-frequency components). Measuring deviation from linear phase is a way to quantify this non-linear phase shift.

Since it is only the deviation from linear phase which causes phase distortion, it is desirable to remove the linear portion of the phase response from the measurement. This can be accomplished by using the electrical delay feature of the analyzer to mathematically cancel the electrical length of the device under test. What remains is the deviation from linear phase, or phase distortion.

Why Measure Deviation from Linear Phase?

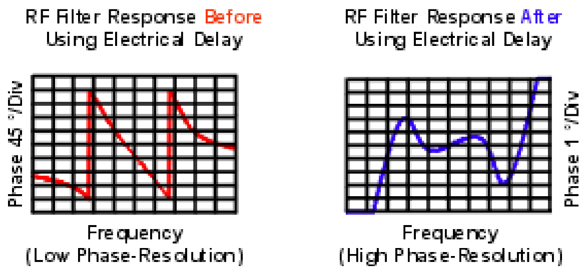
The deviation from linear phase measurement accomplishes the following:

- Presents data in units of phase rather than units of seconds (group delay). For devices that pass modulated signals, units of phase may be most practical.
- Provides a less noisy measurement than a group delay measurement.

Using Electrical Delay

The electrical delay feature is the electronic version of the mechanical "line stretcher" of earlier analyzers. This feature does the following:

- Simulates a variable-length lossless transmission line, which is effectively added to or removed from the reference signal path.
- Compensates for the electrical length of the device under test.
- Flattens the measurement trace on the analyzer's display. This allows the trace to be viewed at high resolution in order to see the details of the phase nonlinearity.
- Provides a convenient method to view the deviation from linear phase of the device under test. See the following graphic.



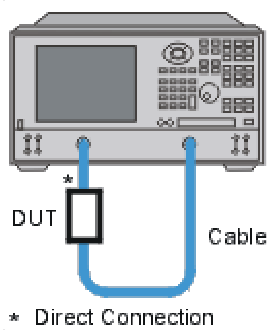
Learn how to set Electrical Delay.

Accuracy Considerations

The frequency response of the test setup is the dominant error in a deviation from linear phase measurement. To reduce this error, perform a 2-port measurement calibration.

How to Measure Deviation from Linear Phase:

1. Preset the analyzer.
2. If your device under test is an amplifier, it may be necessary to adjust the analyzer's source power:
   - Set the analyzer's source power to be in the linear region of the amplifier's output response (typically 10-dB below the 1-dB compression point).
   - Select an external attenuator (if needed) so the amplifier's output power will be sufficiently attenuated to avoid causing receiver compression or damage to the analyzer's port 2.
3. Connect the device under test as shown in the following graphic.



3. Select an S21 measurement.

4. Select the settings for your device under test, including the following:

   - Format: phase
   - Scale: autoscale

5. Remove the device and perform a calibration.

6. Reconnect the device.

7. Scale the displayed measurement for optimum viewing.

8. Create a marker in the middle of the trace.

9. Press the >**Delay** Active Entry Key to invoke the Marker to Electrical Delay function. This flattens the phase trace.

10. If desired, on the **Scale** menu, click Electrical Delay to fine-tune the flatness of the phase trace.

11. Use the markers to measure the maximum peak-to-peak deviation from linear phase.

12. Print the data or save it to a disk.

Synchronize PNA with an External (PSG) Source

Beginning with PNA Rev. 7.22, the PNA External Source Control feature can be used to automatically control external sources. However, this feature requires certain PNA options. Learn more.

Many PNA measurements require the use of at least one external source. For example, when measuring the insertion loss of a mixer, the LO must be swept at the same time as the RF input. This requires the PNA and external source to be synchronized.

The following procedure shows how to manually synchronize the PNA with an Agilent PSG Source. Although the settings will be different, the concept is useful with other sources.

Hardware configuration

- Connect the PNA and PSG Time Base (PNA 10 MHz OUT to PSG 10 MHz IN)

PNA-L, E836xB Models

Connect the PSG and PNA Trigger Connectors as follows:

- PNA Trigger IN to Source OUT
- PNA Trigger OUT to Source IN

PNA-X Models

Connect either pair (1 or 2) of the AUX Trigger I/O connectors as follows:

- PNA AUX Trig IN to Source Trigger OUT
- PNA AUX Trig OUT to Source Trigger IN

Learn more about the AUX Trigger capabilities.

PNA Settings

- Number of points: **Same as PSG**
- Frequency span: Does **NOT** have to be the same as PSG

PNA Trigger Settings

- Trigger Source:
  - PNA-L and E836xB models: **External**
  - PNA-X: **Internal, Manual**

- Trigger Scope: **Channel**
- Channel Trigger State: **Same as PSG Sweep Repeat setting.**(Continuous or Single)
- Point Sweep: **Checked**

External / Auxiliary Trigger Settings

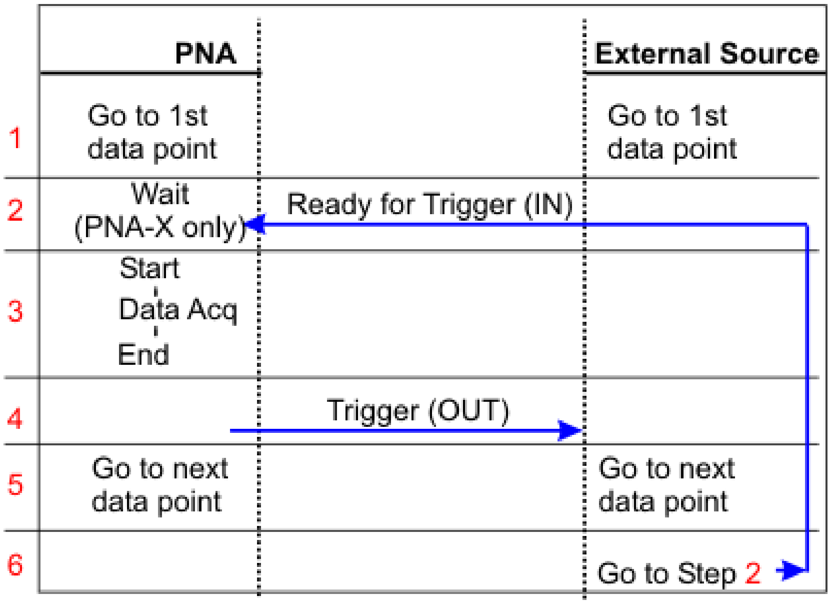
	PNA-L and E836xB	PNA-X
Input		
Where settings are made:	**External Tab**	**Aux Trigger Tab**
Level / Edge:	**Edge**	**Same as PSG (Hi or Low)**
Accept Trigger Before Armed:	**Checked**	N/A
Handshake	N/A	Checked
Output		
Where settings are made:	**I/O2 Trig Out Tab**	**Aux Trigger Tab**
Enable	**Checked**	**Checked**
Polarity:	**Same as PSG**	**Same as PSG**
Position:	**After**	**After**
Per Point	**Checked**	**Checked**

PSG Settings

- Number of points: **Same as PNA**
- Sweep: **Step** or **List**
- Sweep Trig: **Free Run**
- Sweep Repeat: **Same as PNA Channel Trigger State** (Continuous or Single)
- Sweep Direction: **UP**
- Point Trig: **Ext**
- Manual Mode: **OFF**
- Trigger In / Out Polarity: **Same as PNA**

What is Happening?

The following is a flow diagram showing the handshake / synchronization process between the PNA and an External Source.



Text Description

1. After the measurement setup is complete, both instruments wait on the first data point of a measurement sweep. Both instruments are configured for Continuous or Single sweep.

2. (see note below) A trigger signal from the source starts the measurement. This is usually accomplished by a key press on the source front panel.

3. PNA data acquisition (measurement) starts, and then stops AFTER the first data point acquisition.

4. The PNA sends a trigger signal out to the source telling it to move to the next frequency data point. This signal can optionally be sent BEFORE data acquisition if required by your application.

5. The external source and PNA move to the next data point. The source usually takes longer than the PNA.

6. The source sends the Ready for Trigger signal to the PNA.

- **PNA-L and E836xB models** - If the source arrives first, the **Accept Trigger Before Armed** setting is used to accept the trigger signal even if the PNA is not yet ready to start acquisition.
- **PNA-X using AUX Triggering** - If enabled, the PNA waits indefinitely for a trigger signal from the source. Although AUX triggering does NOT have the **Accept Trigger Before Armed** setting, the Ready for Trigger signal is latched and has the same effect.

Step 2 Note PNA-X (Aux TRIG IN) The PNA looks for a level trigger at the start of each sweep, and an edge thereafter. This assumes that the external source ready line will remain in the ready state (high or low) until triggered (step 4) and will then transition to the NOT ready state while moving to the next frequency, and then transition again to the ready state.

How do you know when the PNA and PSG are in synch?

The measurement results are the ultimate test of whether the source and PNA are synchronized. However, it is possible to see the PSG and PNA sweeping at exactly the same time.

First, lower the PNA IFBandwidth or increase the sweep time so that the sweep is slow enough to watch the sweep indicator moving across the PNA screen. At the same time, watch the PSG "progress bar" as it moves through the entire sweep.

If the PNA is stopped in the middle of a sweep, then retriggered, it returns to the first data point. The PSG continues from where it stopped. Therefore, to re-synch the two instruments, the PSG needs to return to the first data point. There are a number of ways to do this. One way is to press the PSG **Manual** button to ON, then OFF. Then trigger a new sweep.

To trigger a sweep

- **Single** Trigger mode: Both the PNA and PSG Single (trigger) buttons must be pressed (in any order) for each trigger.
- **Continuous** Trigger mode: First, reset the PSG to the first data point, then press the PNA Continuous (trigger) button.

Maintaining Synchronization

In general, the above setup should start the two instruments sweeping simultaneously. However, any interaction with the PNA could cause the PNA sweep to abort or delay, in which case the two instruments will be out of sync. To avoid this, you can use the PNA Interface Control feature to send an ABORT to the external device after each sweep.

When the PNA ends a sweep, it sends an ABORT to stop the source. A trigger signal is then sent, either Continuous (automatically) or Single (manual). In either case, both instruments start sweeping in synch.

This takes more time to sweep, but maintains synchronization.

For example, to use this feature with Agilent’s PSG source, you would add the following:

On the “After Sweep End” tab, type:

```
24  :ABORT
```

Where 24 is the GPIB address of the source.

Last Modified:

11-Feb-2008	Updated note
1-Jun-2007	Added 7.22 update
1-Jan-2007	MX Updated for PNA-X

Small Signal Gain and Flatness

Small signal gain is the gain in the amplifier's linear region of operation. This is typically measured at a constant input power over a swept frequency. Gain flatness is the measure of the variation of gain over a specified frequency range.

- **What Is Gain?**
- **What Is Flatness?**
- **Why Measure Gain and Flatness?**
- **Accuracy Considerations**
- **How to Measure Gain and Flatness**

See other Amplifier Parameter topics

What Is Gain?

RF amplifier gain is defined as the difference in power between the amplifier output signal and the input signal. It is assumed that both input and output impedances of the amplifier are the same as the characteristic impedance of the system.

- Gain is called S_{21} using S-parameter terminology
- Gain is expressed in dB-a logarithmic ratio of the output power relative to the input power.
- Gain can be calculated by subtracting the input from the output levels when both are expressed in dBm, which is power relative to 1 milliwatt.
- Amplifier gain is most commonly specified as a minimum value over a specified frequency range. Some amplifiers specify both minimum and maximum gain, to ensure that subsequent stages in a system are not under or over driven.

What Is Flatness?

Flatness specifies how much the amplifier's gain can vary over the specified frequency range. Variations in the flatness of the amplifier's gain can cause distortion of signals passing through the amplifier.

Why Measure Small-Signal Gain and Flatness?

Deviations in gain over the bandwidth of interest will induce distortion in the transmitted signal because frequency components are not amplified equally. Small-signal gain allows you to quantify the amplifier's gain at a particular frequency in a 50-ohm system. Flatness allows you to view the deviations in the amplifier's gain over a specified frequency range in a 50-ohm system.

Accuracy Considerations

- The amplifier may respond very differently at various temperatures. The tests should be done when the amplifier is at the desired operating temperature.
- The output power of the amplifier should be sufficiently attenuated if necessary. Too much output power could:
  - damage the analyzer receiver
  - exceed the input compression level of the analyzer receiver, resulting in inaccurate measurements.

Attenuation of the amplifier's output power can be accomplished using:

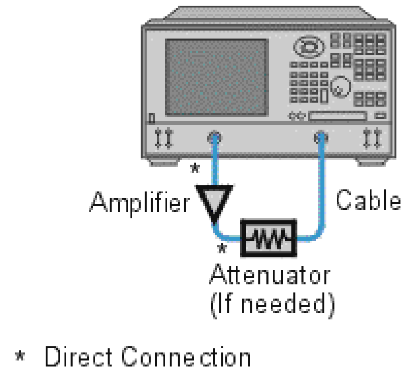
- attenuators
- couplers

The frequency-response effects and mismatches of the attenuators and couplers must be accounted for during calibration since they are part of the test system. Proper error-correction techniques can reduce these effects.

- The frequency response is the dominant error in a small-signal gain and flatness measurement setup. Performing a thru-response measurement calibration significantly reduces this error. For greater accuracy, perform a 2-port measurement calibration.
- Reducing IF bandwidth or using averaging improves measurement dynamic range and accuracy, at the expense of measurement speed.

How to Measure Gain and Flatness

1. Preset the analyzer.
2. Select an S21 measurement parameter.
3. Set the analyzer's source power to be in the linear region of the amplifier's output response (typically 10-dB below the 1-dB compression point).
4. Select an external attenuator (if needed) so the amplifier's output power will be sufficiently attenuated to avoid causing receiver compression or damage to the analyzer's port-2.



5. Connect the amplifier as shown in the following graphic, and provide the dc bias.

6. Select the analyzer settings for your amplifier under test.

7. Remove the amplifier and perform a measurement calibration. Be sure to include the attenuator and cables in the calibration setup if they will be used when measuring the amplifier.

8. Save the instrument-state to memory.

9. Reconnect the amplifier.

10. Scale the displayed measurement for optimum viewing and use a marker to measure the small signal gain at a desired frequency.

11. Measure the gain flatness over a frequency range by using markers to view the peak-to-peak ripple.

12. Print or save the data to a disk.

13. This type of measurement can be automated.

Gain Compression

Gain compression measures the level of input power applied to an amplifier that will cause a distorted output.

The Gain Compression Application (Opt 086) makes fast and accurate compression measurements.

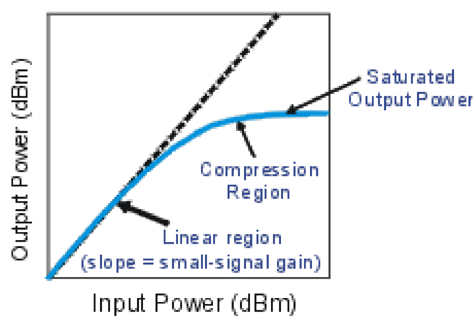
- **What Is Gain Compression?**
- **Why Measure Gain Compression?**
- **Accuracy Considerations**
- **How to Measure Gain Compression**

See other Amplifier Parameter topics

What Is Gain Compression?

Gain compression occurs when the input power of an amplifier is increased to a level that reduces the gain of the amplifier and causes a nonlinear increase in output power.

The analyzer has the ability to do power sweeps as well as frequency sweeps. Power sweeps help characterize the nonlinear performance of an amplifier. Refer to the graphic below (a plot of an amplifier's output power versus input power at a single frequency) for the following discussion.



- The amplifier has a linear region of operation where gain is constant and independent of power level. The gain in this region is commonly referred to as "small-signal gain."
- As the input power increases, the amplifier gain appears to decrease, and the amplifier goes into compression.
- The most common measurement of amplifier compression is the 1-dB compression point. This is defined as the input power (or sometimes the output power) which results in a 1-dB decrease in amplifier gain (relative to the amplifier's small-signal gain).

Why Measure Gain Compression?

When driven with a sinusoid, the output of an amplifier is no longer sinusoidal in the compression region. Some of the amplifier output appears in harmonics, rather than occurring only at the fundamental frequency of the input signal.

As input power is increased even more, the amplifier becomes saturated, and output power remains constant. At this point, further increases in amplifier input power result in no change in output power.

In some cases (such as with TWT amplifiers), output power actually decreases with further increases in input power after saturation, which means the amplifier has negative gain.

Since gain is desired in amplifier operation, it is important to know the limit of input signal that will result in gain compression.

Accuracy Considerations

The network analyzer must provide sufficient power to drive the amplifier into saturation. If you need a higher input-power level than the source of the analyzer can provide, use a preamplifier to boost the power level prior to the amplifier under test. (See High-Power Component Measurements.) If using a preamplifier, you can increase measurement accuracy in the following ways:

- Use a coupler on the output of the preamplifier so that a portion of the boosted input signal can be used for the analyzer's reference channel. This configuration removes the preamplifier's frequency response and drift errors from the measurement (by ratioing).
- Perform a thru-response calibration including the preamplifier, couplers, and attenuators in the test setup.

The output power of the amplifier should be sufficiently attenuated if necessary. Too much output power could:

- Damage the analyzer receiver
- Exceed the input compression level of the analyzer receiver

Attenuation of the amplifier's output power can be accomplished using:

- Attenuators
- Couplers

The frequency-response effects of the attenuators and couplers must be considered during calibration since they are part of the test system. Proper error-correction techniques can reduce these effects.

- The frequency response is the dominant error in a gain compression measurement setup. Performing a thru-response measurement calibration significantly reduces this error.
- The amplifier may respond very differently at various temperatures. The tests should be done when the amplifier is at the desired operating temperature.
- Reducing IF bandwidth or using measurement averages improves accuracy, at the expense of measurement speed.

How to Measure Gain Compression

This procedure shows you how to make the following three measurements used to determine amplifier gain compression:

1. A Swept-Frequency Gain Compression measurement locates the lowest frequency at which the 1-dB gain compression first occurs.

2. A Swept-Power Gain Compression measurement shows the input power at which a in a 1-dB drop in gain occurs as a power ramp is applied to the amplifier at a particular frequency point (found in measurement 1).

3. An Absolute Power measurement shows the absolute power out (in dBm) at compression.

Swept-Frequency Gain Compression Measurement

A measurement of swept frequency gain compression locates the frequency point where 1-dB compression first occurs.

1. Preset the analyzer.

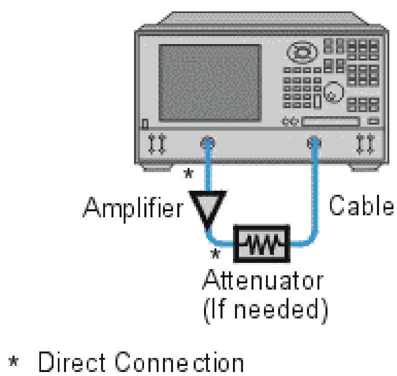
2. Select an S_{21} measurement parameter.

3. Set the analyzer's source power to be in the linear region of the amplifier's output response (typically 10-dB below the 1-dB compression point).

4. Select an external attenuator (if needed) so the amplifier's output power will be sufficiently attenuated to avoid causing receiver compression or damage to the analyzer's port-2.

5. Connect the amplifier as shown in the following graphic, and provide the dc bias.

6. Select the analyzer settings for your amplifier under test. To reduce the effects of noise, you may want to specify a narrower IF bandwidth.



7. Remove the amplifier and perform a thru-response calibration. Be sure to include the attenuator and cables in the calibration setup if they will be used when measuring the amplifier.

8. Save the instrument-state to memory.

9. Reconnect the amplifier.

10. Position a marker at approximately mid-span.

11. Adjust the analyzer's scale to 1 dB per division.

12. Store the trace in memory and display Data/Mem.
13. Gradually increase the source power until a 1-dB decrease in gain is observed at the first frequency over some portion of the trace.
14. Use markers to locate the frequency where the 1-dB decrease in gain first occurs. Note this frequency for use in the following measurement.
15. Print the data or save it to a disk.

Swept-Power Gain Compression Measurement

A swept-power gain compression measurement shows the input power resulting in a 1-dB drop in gain as a power ramp at a particular frequency (found in step 13 of the previous measurement) is applied to the amplifier.

1. If not already done, perform the previous measurement of swept-frequency gain compression.
2. Setup an S_{21} measurement in the power-sweep mode. Include the following settings:
    - Set the CW frequency to the frequency noted in step 14 of the previous measurement of swept-frequency gain compression.
    - Enter the start and stop power levels for the sweep. The start power should be in the linear region of the amplifier's response (typically 10 dB below the 1-dB compression point). The stop power should be in the compression region of the amplifier's response.
3. Adjust the scale to 1-dB per division.
4. Use markers (including reference marker) to find the input power where the 1-dB decrease in gain occurs.
5. Print the data or save it to a disk.

Absolute Output Power Measurement

An absolute-power measurement shows the absolute power-out (in dBm) of the amplifier at compression.

1. Select an unratioed (absolute) power measurement. Choose the B input if using the test setup in the previous graphic.
2. Retain the CW frequency used in the previous measurement of swept-power gain compression.
3. Set a marker to the input power level where the 1-dB decrease in gain occurs (found in step 4 of the previous measurement).
4. Scale the displayed measurement for optimum viewing.
5. Read the marker value to find the absolute output power of the amplifier (in dBm) where the 1-dB decrease in gain occurs.
6. Print the data or save it to a disk.

Note: The measurement calibration does not apply to absolute power. Therefore, if there is any attenuation external to the analyzer, you will have to correct for it manually.

Group Delay

Group delay is a measure of phase distortion. Group delay is the actual transit time of a signal through a device under test as a function of frequency. When specifying group delay, it is important to specify the aperture used for the measurement.

- What is Group Delay?
- Group Delay versus Deviation from Linear Phase
- What Is Aperture?
- Accuracy Considerations
- How to Measure Group Delay

See also Comparing the PNA Delay Functions.

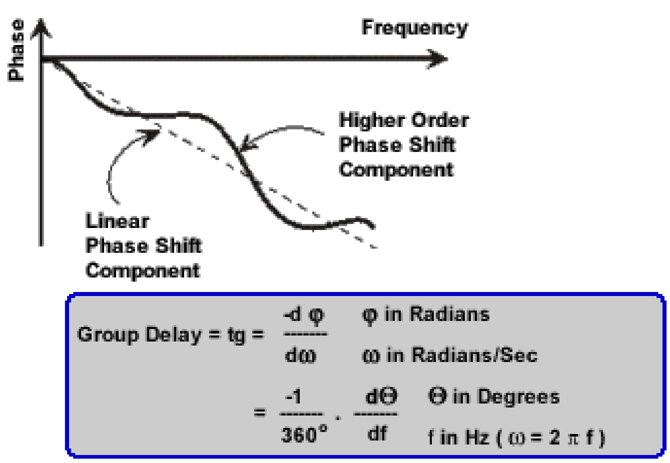
See other Amplifier Parameter topics

What Is Group Delay?

Group delay is:

- A measure of device phase distortion.
- The transit time of a signal through a device, versus frequency.
- The derivative of the device's phase characteristic with respect to frequency.

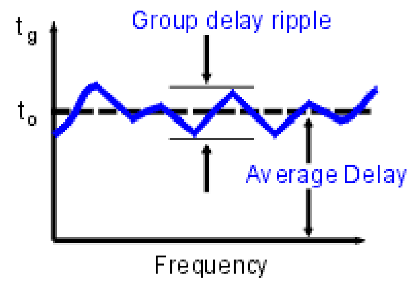
Refer to the graphic below for the following discussion:



The phase characteristic of a device typically consists of both linear and higher order (deviations from linear) phase-shift components.

Linear phase-shift component:	Higher-order phase-shift component:
Represents average signal transit time.	Represents variations in transit time for different frequencies.
Attributed to electrical length of test device.	Source of signal distortion.

Refer to the graphic below for the following discussion:



In a group delay measurement:

- The linear phase shift component is converted to a constant value (representing the average delay).
- The higher order phase shift component is transformed into deviations from constant group delay (or group delay ripple).
- The deviations in group delay cause signal distortion, just as deviations from linear phase cause distortion.
- The measurement trace depicts the amount of time it takes for each frequency to travel through the device under test.

Refer to the following equation for this discussion on how the analyzer computes group delay:

$$\text{Group Delay} = t_g = \frac{-d\varphi}{d\omega} = \frac{-1}{360°} \cdot \frac{d\Theta}{df}$$

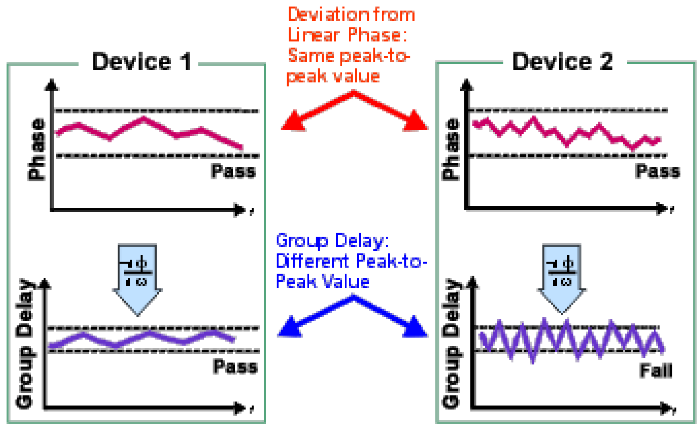
φ in Radians
ω In Radians/Sec
Θ in Degrees
f in Hz ($\omega = 2\pi f$)

- Phase data is used to find the phase change ($-d\phi$).
- A specified frequency aperture is used to find the frequency change ($d\omega$).
- Using the two values above, an approximation is calculated for the rate of change of phase with frequency.
- This approximation represents group delay in seconds (assuming linear phase change over the specified frequency aperture).

Group Delay versus Deviation from Linear Phase

Group delay is often a more accurate indication of phase distortion than Deviation from Linear Phase.

Deviation from linear phase results are shown in the upper region of the following graphic: Device 1 and device 2 have same value, despite different appearances.

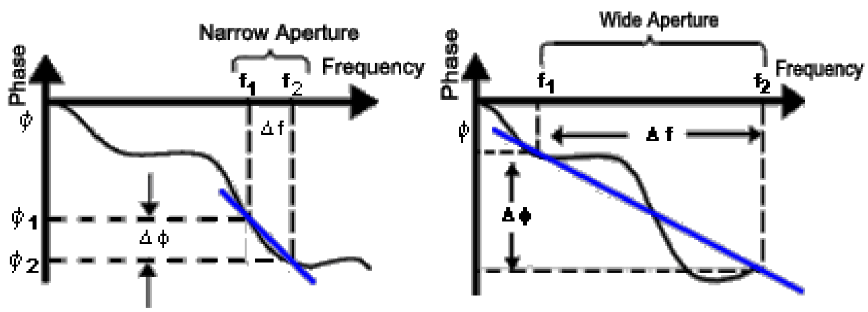


Group Delay results are shown in the lower region:
Device 1 and device 2 have different values of group delay. This is because in determining group delay, the analyzer calculates slope of phase ripple, which is dependent on number of ripples which occur per unit of frequency.

What Is Aperture?

During a group delay measurement, the analyzer measures the phase at two closely spaced frequencies and then computes the phase slope. The frequency interval (frequency delta) between the two phase measurement points is called the aperture. Changing the aperture can result in different values of group delay. The computed slope (delta phase) varies as the aperture is increased. This is why when you are comparing group delay data, you must know the aperture that was used to make the measurements.

Refer to the graphic below for the following discussion:



Narrow aperture:	Wide aperture:
Provides more fine detail in phase linearity.	Provides less fine detail in phase linearity because some phase response averaged-out or not measured.
Makes measurement susceptible to noise (smaller signal-to-noise ratio) and analyzer phase detector resolution.	Makes measurement less susceptible to noise (larger signal-to-noise ratio).

The analyzer's default setting for group delay aperture is the frequency span divided by the number of points across the display. There are two ways to set the aperture to a different value.

1. Adjust the number of measurement points or the frequency span.

- Increasing the number of points or reducing the frequency span narrows the aperture.
- Decreasing the number of points and/or increasing the frequency span widens the aperture.

Note: if the aperture is too wide (more than 180° of phase shift between adjacent frequency points), errors in group delay data will occur.

2. Use the analyzer's smoothing function.

- Performs a single-sweep, moving average of adjacent data-points over a specified percentage of the frequency span.
- Results in an action similar to changing the frequency interval between points.
- Allows a wider aperture because greater than 180º of phase shift can occur over the smoothing aperture.

Group delay measurements can be made on the following sweep types:

- Linear frequency
- List frequency sweep segment

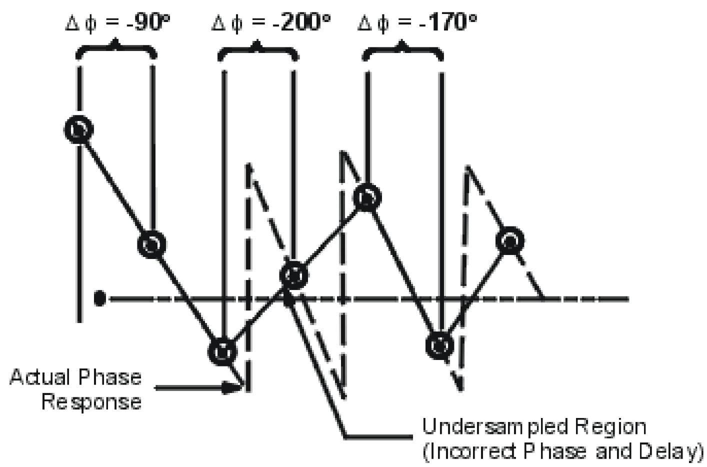
The group delay aperture varies depending on the frequency spacing and point density, therefore the aperture is not constant in segment sweep. In segment sweep, extra frequency points can be defined to ensure the desired aperture.

Accuracy Considerations

It is important to keep the phase difference between two adjacent measurement points less than 180° (see the following graphic). Otherwise, incorrect phase and delay information may result. Undersampling may occur when measuring devices with long electrical length. You can verify that the phase difference measured between two adjacent points is less than 180° by adjusting the following settings until the measurement trace no longer changes:

- Increase the number of points
- Narrow the frequency span

Electrical delay may also be used to compensate for this effect.

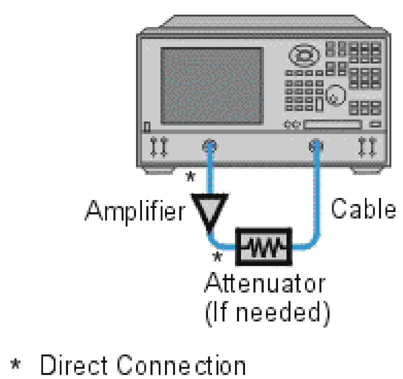


The frequency response is the dominant error in a group delay test setup. Performing a thru-response measurement calibration significantly reduces this error. For greater accuracy, perform a 2-port measurement calibration.

Particularly for an amplifier, the response may vary differently at various temperatures. The tests should be done when the amplifier is at the desired operating temperature.

How to Measure Group Delay

1. Preset the analyzer.
2. If your device under test is an amplifier, it may be necessary to adjust the analyzer's source power:
   - Set the analyzer's source power to be in the linear region of the amplifier's output response (typically 10-dB below the 1-dB compression point).
   - Select an external attenuator (if needed) so the amplifier's output power will be sufficiently attenuated to avoid causing receiver compression or damage to the analyzer's port 2.
3. Connect the device under test as shown in the following graphic.



4. Select an S_{21} measurement.

5. Select the settings for your device under test, including the following:

   - number of measurement points: maximum
   - format: delay
   - scale: autoscale

6. Remove the device under test and perform a measurement calibration.
7. Reconnect the device under test.
8. Scale the displayed measurement for optimum viewing.
9. Use the analyzer's smoothing feature to increase the aperture, reducing noise on the trace while maintaining meaningful detail. To increase the aperture:

   - Switch on the analyzer's smoothing feature.
   - Vary the smoothing aperture (up to 25% of the span swept).

10. Use the markers to measure group delay (expressed in seconds) at a particular frequency of interest.
11. Print the data or save it to a disk.

High-Power Amplifier Measurements Using a PNA

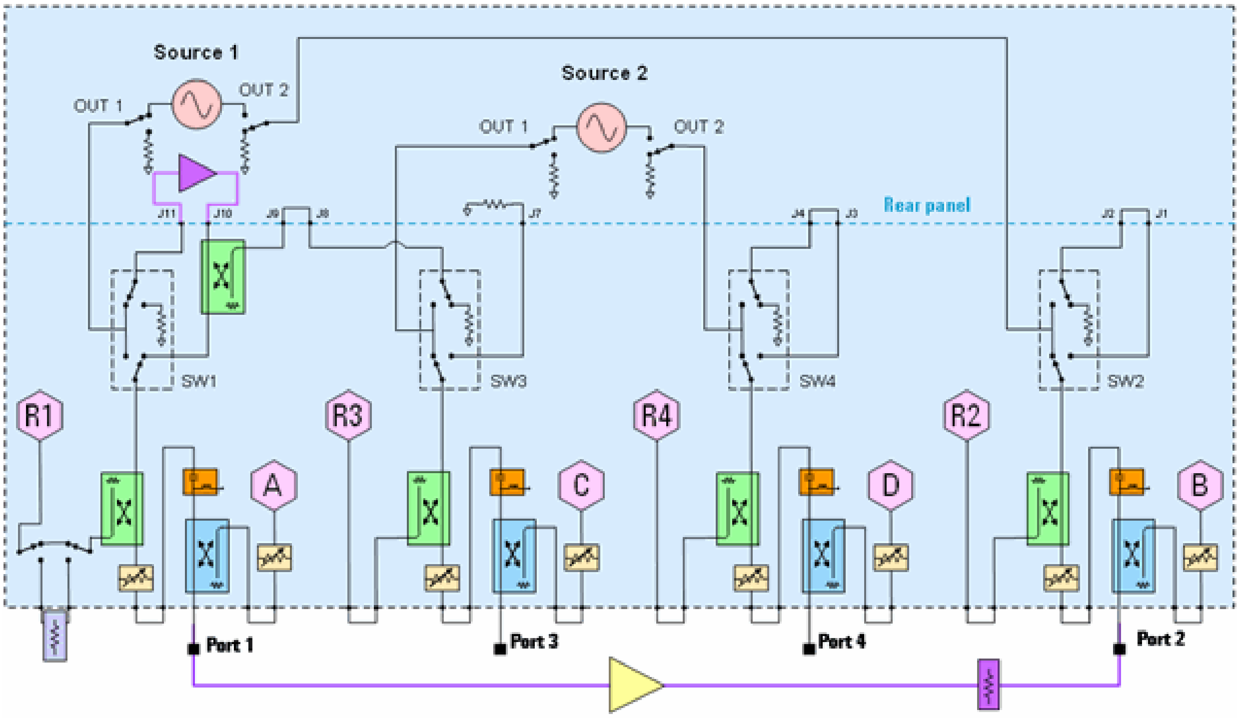
This topic is now covered in detail in Application Note 1408-10, High-power measurements using the PNA (5989-1349EN) at Agilent.com.

See Also

High-Power Amplifier Measurements using a PNA-X

High Power Amplifier Measurements with the PNA-X

The following is a block diagram of the PNA-X Opt 423. The configuration displayed here is used to make high power amplifier measurements using a preamplifier at the rear panel. The preamplifier can then be switched (SW1) as needed using the RF Configurator.



Legend

Color	Component	Damage Level
Green	Bridges	+33 dBm
Blue	Couplers	+43 dBm
Orange	Bias-tees	+30 dBm
Purple	User-supplied pre-amp and high-power attenuator	N/A

Notes

At J11 (rear-panel), max power is 4 dB to 11 dB higher than Source 1 Out at front panel jumper due to loss of the coupler thru arms, bias-tees, and cables.

At J10 max power +33 dBm, which is the damage level of the bridge. With +30 dBm into J10, there will be about +15 dBm at R1, assuming 15 dB coupling factor for the R1 bridge. +15 dBm is the damage level of that receiver. Therefore, it may be necessary to add attenuation in place of the R1 loop, not only to protect the receiver, but to bring it out of compression. The 0.1 dB compression level spec for the R1 receiver is between -3 and -18 dBm, depending on the frequency and option configuration.

At Test Port 2 (DUT output): With the bias-tees (orange), only +30 dBm is allowed into the test port. With Opt H85 (bias-tees removed), +43 dBm is allowed. Add appropriate attenuation to not damage other components.

See Also

- Front panel jumper specs.
- RF Path Configurator
- IF Path Configurator

Last Modified:

10-May-2007	MX New topic

Impedance Matching Model

Impedance matching is a procedure used in circuit design to match unequal source and load impedances, thereby optimizing the power delivered to the load from the source. Impedance matching is accomplished by inserting matching networks into a circuit between the source and the load.

Other Tutorials topics

Introduction

In this model, Smith Charts are used to visualize the interactive process of impedance matching to optimize transmitted power in simple circuits. Simple series/shunt, inductance/capacitance matching networks are used, and you can interactively adjust the values of corresponding L and C components. Adjusting the matching network components changes the reflectance of the overall circuit. The reflectance of each part of the circuit is indicated on the Smith Chart as a red or blue ball.

As you adjust the sliders and modify the component values, the model calculates new values for the circuit reflectance and moves the red and blue balls on the Smith Chart. The goal of each exercise is to move the reflectance point from the center of the Smith Chart, which represents either the load or source, into the appropriate red and blue rings which represent the desired matching condition. You can select three different impedance matching problems of increasing difficulty by clicking on one of the three labeled tabs.

Impedance Matching Model

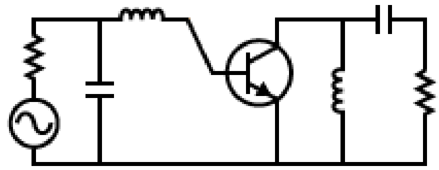
Maximize this window for optimum viewing. **Click** if the Impedance model is not visible.

Description of Exercises

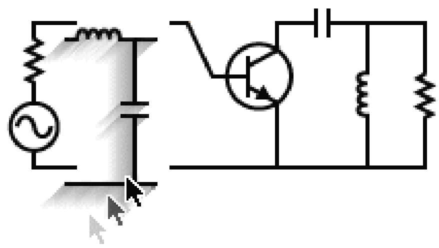
L–C Matching Network

The first exercise lets you use the Smith Chart to perform basic impedance matching between a resistive source and a resistive load. A simple series-inductance shunt-capacitance network is used to match the 50 ohm source to the 300 ohm load. The source reflectance of the circuit looking from the load toward the source is represented by the red ball, while the 300 ohm load is indicated by the stationary red ring.

The objective of the exercise is to interactively match these two impedances by adjusting the L and C sliders. The model will provide graphical feedback by moving the red ball indicating circuit reflectance on the Smith Chart. Adjust the series L and shunt C sliders to move the reflectance point from the center of the Smith Chart to the matching impedance position inside the red ring. You can study the Smith Chart Circuit Element Paths below for hints on how different circuit elements change circuit reflectance on the Smith Chart.



The second exercise provides the impedance matching experience of optimizing the transducer power gain of a transistor amplifier. Matching the 50 ohm source to the input reflectance of the transistor, s^*_{11}, and matching the 50 ohm load to the output reflectance of the transistor, s^*_{22}, optimizes the power delivered from the source, through the transistor, to the load. You are required to match both the input red ball and output blue ball of the transistor separately. Adjust the component values to move both reflectance points to their proper positions within the red and blue rings.

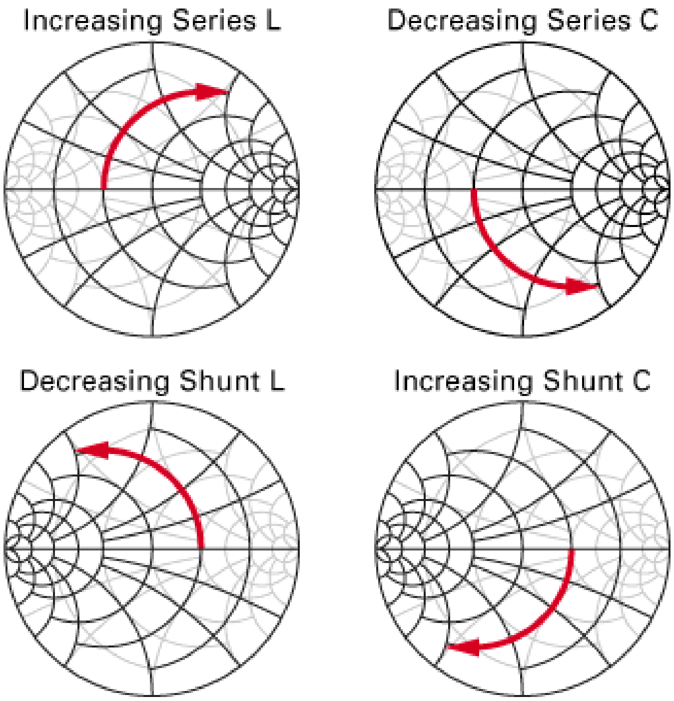


The third part of the interactive impedance matching model is a collection of exercises involving a modular circuit. You begin by constructing a circuit with either one or two modular drag-and-drop matching network components. Once the matching networks have been added to the circuit, the sliders will become active and allow you to adjust the component values. Then you will engage in impedance matching for the circuit you have just created! There are 8 different circuits you can construct and there are 5 different value pairs for s^*_{11} and s^*_{22}on the Smith Chart, altogether 40 impedance matching exercises. **You will find that not all matching networks will work!** For some of the circuits you will be able to construct, you will not be able to position the red ball within the red ring or the blue ball within the blue ring. To determine in advance which matching networks will work, take a close look at the Forbidden Regions of the Smith Chart below. There are 5 different location pairs for s^*_{11} and s^*_{22} corresponding to different frequencies that can be matched. Use the frequency indicator to select an operating frequency, and then drag-and-drop appropriate matching networks into the circuit and adjust the component values to move both reflectance points to their proper positions within the red and blue rings.

Smith Chart Circuit Elements Paths

The graphs below demonstrate how the various shunt and series L and C components change the circuit reflectance on the Smith Chart. Assuming the given component is the last component in the matching network, the circuit reflectance will move as indicated along constant resistance or constant conductance circles.

You can think of impedance matching using the Smith Chart as driving a car to a specific destination in Smith Town - a city were none of the streets are straight! By adjusting circuit components in appropriate order, we can constrain the circuit reflectance to paths along constant resistance or constant conductance circles. Just like road signs can direct a car along the circular streets of Smith Town, so can we reach the matching impedance condition in a straightforward and deterministic way.

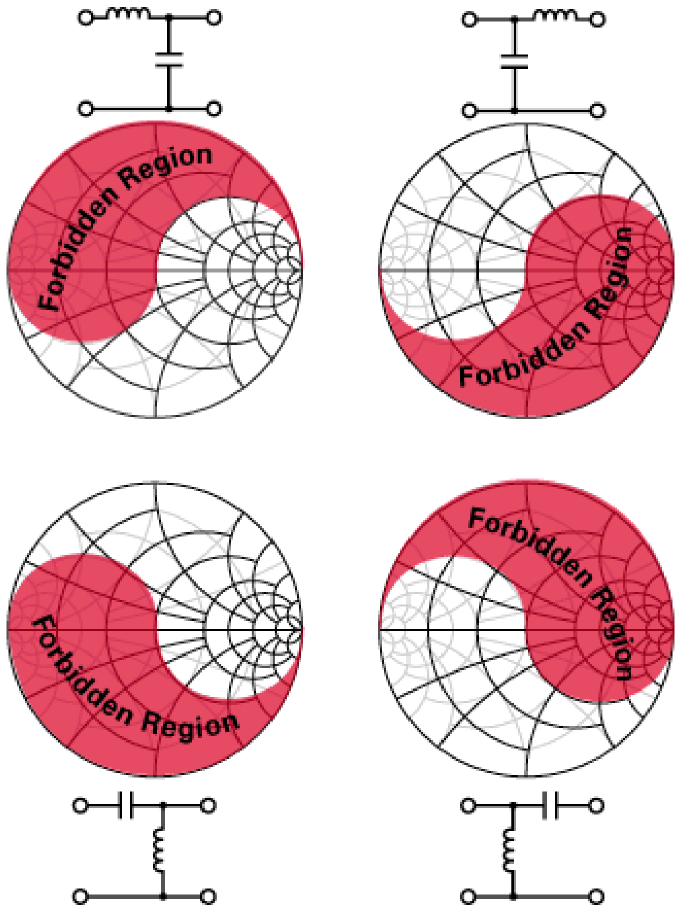


Forbidden Regions of the Smith Chart

For a given load reflectance, only certain L-C matching networks will be capable of transforming the source impedance to the load impedance. In fact, for any load reflectance, exactly two of the four possible L-C matching networks in the Transistor Amplifier-II model above will be able to do the matching job. But which two?

The charts below can be used to determine which matching networks will work in a given load situation. If the load reflectance lies within the forbidden region of the Smith Chart for the indicated matching network, then that network cannot perform the required matching operation. **You cannot drive your car into the forbidden neighborhoods of Smith Town! They are unpaved!**

Use these charts to determine which matching network should be used. First, visually locate the position of the load reflectance from the Transistor Amplifier-II model above on each of the four color Smith Charts below. Then, eliminate the two networks whose forbidden regions overlap the reflectance point, and use one of the remaining two networks to perform the impedance match.


Forbidden Region
Forbidden Region
Forbidden Region
Forbidden Region

Phase Measurements

Knowledge of both magnitude and phase characteristics is needed for successful higher-level component integration.

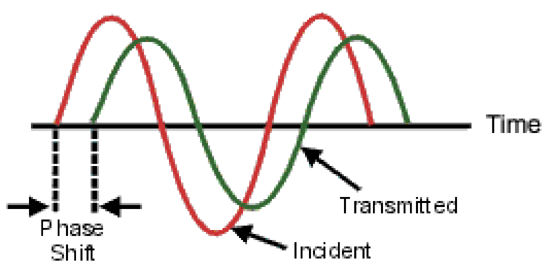
- **What are Phase Measurements?**
- **Why Measure Phase?**
- **Using the Analyzer's Phase Format**
- **Types of Phase Measurements**

See other Tutorials

What are Phase Measurements?

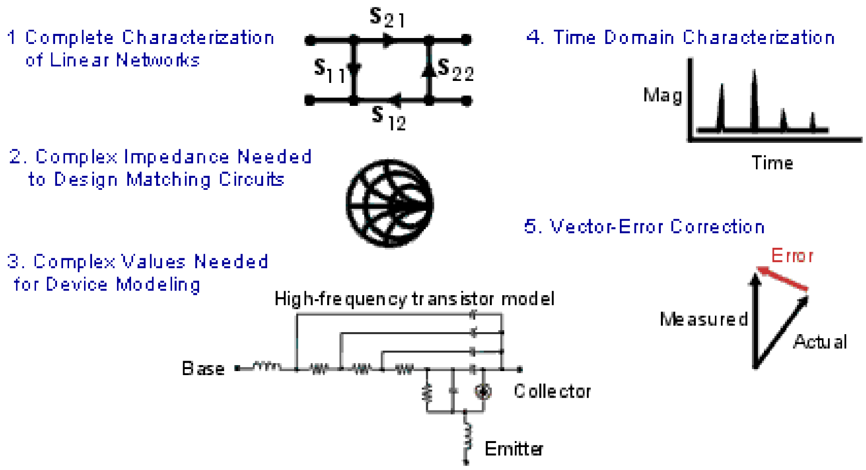
Phase measurements are made using S-parameters, just like amplitude measurements. A phase measurement is a relative (ratio) measurement and not an absolute measurement. Phase measurements compare the phase of the signal going into a device (the incident signal) to the phase of the device's response signal. The response signal can be either reflected or transmitted. Assuming an accurate calibration has been performed, the difference in phase between the two signals (known as phase shift) is a result of the electrical characteristics of the device under test.

The following graphic shows the phase shift (in time or degrees) between an incident signal and a transmitted signal (as might be seen on an oscilloscope display).



Why Measure Phase?

Measuring phase is a critical element of network analysis. The following graphic lists five reasons for measuring both magnitude and phase.



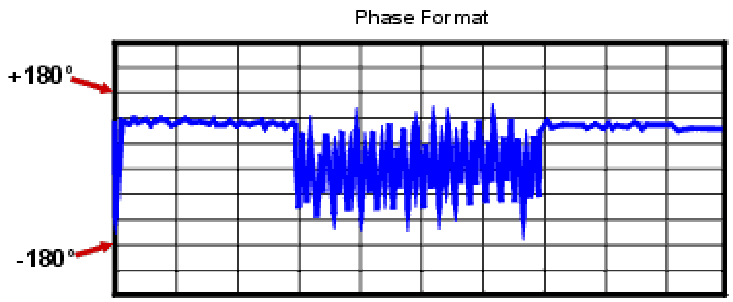
When used in communications systems to pass signals, components or circuits must not cause excessive signal distortion. This distortion can be:

- Linear, where flat magnitude and linear phase shift versus frequency is not maintained over the bandwidth of interest.
- Nonlinear, such as AM-to-PM conversion.

It is important to measure how reflective a component or circuit is, to ensure that it transmits or absorbs energy efficiently. Measuring the complex impedance of an antenna is a good example.

Using the Analyzer's Phase Format

The analyzer's phase format displays a phase-versus-frequency or phase-versus-power measurement. The analyzer does not display more than ±180 degrees phase difference between the reference and test signals. As the phase value varies between +180 degrees and -180 degrees, the analyzer display creates the sawtooth pattern as shown in the following graphic.



The sawtooth pattern does not always reach +180 degrees and -180 degrees. This is because the measurement is made at discrete frequencies, and the data point at +180 degrees and -180 degrees may not be measured for the selected sweep.

Types of Phase Measurements

Complex impedance data is information such as resistance, reactance, phase, and magnitude that can be determined from an S11 or S22 measurement. Complex impedance data can be viewed using either the Smith Chart format or the Polar format.

AM-to-PM conversion is a measure of the amount of undesired phase deviation (PM) that is caused by amplitude variations (AM) of the system. AM-to-PM conversion is usually defined as the change in output phase for a 1-dB increment in the input power to an amplifier (i.e. at the 1 dB gain compression point). This is expressed in degrees-per-dB (°/dB).

Deviation from linear phase is a measure of phase distortion caused by a device. Ideally, the phase shift through a device is a linear function of frequency. The amount of variation from this theoretical phase shift is known as its deviation from linear phase (also called phase linearity).

Group delay is another way to look at phase distortion caused by a device. Group delay is a measure of transit time through a device at a particular frequency. The analyzer computes group delay from the derivative of the measured phase response.

Deviation from Linear Phase Versus Group Delay

Although deviation from linear phase and group delay are similar measurements, they each have their purpose.

The following are the advantages of deviation from linear phase measurements:

- Less noisy than group delay.
- Able to characterize devices that pass phase modulated signals, and show units of phase rather than units of seconds.

The following are the advantages of group delay measurements:

- More easily interpreted indication of phase distortion than deviation from linear phase.
- Able to most accurately characterize a device under test. This is because in determining group delay, the analyzer calculates the slope of the phase ripple, which is dependent on the number of ripples which occur per unit of frequency. Comparing two phase responses with equal peak-to-peak phase ripple, the response with the larger phase slope results in:
  - More group delay variation.
  - More signal distortion.

See also Comparing the PNA Delay Functions.

Reverse Isolation

Reverse isolation is a measure of amplifier reverse transmission response- from output to input.

- What is Reverse Isolation
- Why Measure Reverse Isolation?
- Accuracy Considerations
- How to Measure Reverse Isolation

See other Tutorials

What is Reverse Isolation?

Reverse isolation is a measure of how well a signal applied to the device output is "isolated" from its input.

The measurement of reverse isolation is similar to that of forward gain, except:

- The stimulus signal is applied to the amplifier's output port.
- The response is measured at the amplifier's input port.

The equivalent S-parameter is S12.

Why Measure Reverse Isolation?

An ideal amplifier would have infinite reverse isolation-no signal would be transmitted from the output back to the input. However, reflected signals can pass through the amplifier in the reverse direction. This unwanted reverse transmission can cause the reflected signals to interfere with the desired fundamental signal flowing in the forward direction. Therefore, reverse isolation is important to quantify.

Accuracy Considerations

Since amplifiers often exhibit high loss in the reverse direction, generally there is no need for any attenuation that may have been used to protect the port 2 receiver during forward transmission measurements. Removing the attenuation will:

- Increase the dynamic range, resulting in improved measurement accuracy.
- Require a new calibration for maximum accuracy.

The RF source power can be increased to provide more dynamic range and accuracy.

Note: With the attenuation removed and the RF source power increased, a forward sweep could damage the analyzer's port 2 receiver. Do not perform a forward sweep or use 2-port calibration unless the forward power is set low enough to avoid causing port 2 receiver compression or damage.

If the isolation of the amplifier under test is very large, the transmitted signal level may be near the noise floor or crosstalk level of the receiver. To lower the noise floor:

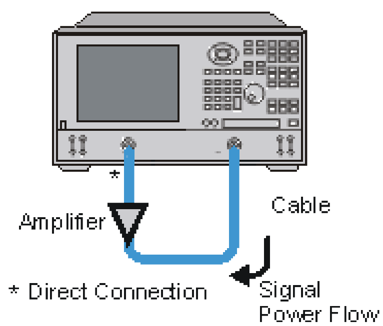
- Use or increase measurement averages.
- Reduce the IF bandwidth of the analyzer.

Note: Reducing IF bandwidth or using averaging improves measurement dynamic range and accuracy, at the expense of reduced measurement speed.

- When crosstalk levels affect the measurement accuracy, reduce the crosstalk error term by performing a response and isolation calibration. When performing the isolation part of the calibration it is important to use the same average factor and IF bandwidth during the calibration and measurement.
- The frequency response of the test setup is the dominant error in a reverse isolation measurement. Performing a thru-response measurement calibration significantly reduces this error. This calibration can be done as part of the response and isolation calibration.
- The amplifier may respond very differently at various temperatures. The tests should be done when the amplifier is at the desired operating temperature.

How to Measure Reverse Isolation

1. Connect the amplifier as shown in the following graphic.



2. Preset the analyzer.
3. Select an S12 measurement.
4. Select the settings for your amplifier under test.
5. Remove the amplifier and perform a thru-response calibration or a response and isolation calibration.
6. Scale the displayed measurement for optimum viewing and use a marker to measure the reverse isolation at a desired frequency.
7. Print or save the data to a disk.

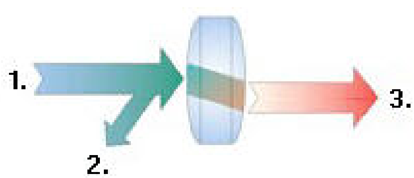
Reflection Measurements

Reflection measurements are an important part of network analysis.

See other Tutorials

What are Reflection Measurements?

To understand reflection measurements, it is helpful to think of traveling waves along a transmission line in terms of a lightwave analogy. We can imagine incident light striking some optical component like a clear lens. Some of the light is reflected off the surface of the lens, but most of the light continues on through the lens. If the lens had mirrored surfaces, then most of the light would be reflected and little or none would be transmitted.



1. Incident **2.** Reflected **3.** Transmitted

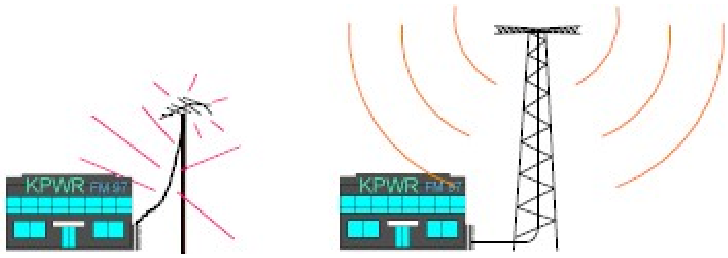
With RF energy, reflections occur when the impedance of two mated devices are not the same. A reflection measurement is the ratio of the reflected signal to the incident signal. Network analyzers measure the incident wave with the R (for reference) channel and the reflected wave with the A channel. Therefore, reflection is often shown as the ratio of A over R (A/R). We can completely quantify the reflection characteristics of our device under test (DUT) with the amplitude and phase information available at both the A and R channel. In S-parameter terminology, S11 is a reflection measurement of port1 of the device (the input port); S22 is a reflection measurement of the port 2 (the output port)

Why Make Reflection Measurements?

One reason we make reflection measurements to assure efficient transfer of RF power. We do this because:

1. RF energy is not cheap. When energy is reflected, that means less energy is transmitted to where it is intended to go.
2. If the reflected energy is large, it can damage components, like amplifiers.

For example, in the following graphic, the radio station on the left is not operating at peak efficiency. The amplifier impedance is not the same as the transmission line, and the transmission line impedance is not the same as the antenna. Both of these conditions cause high reflected power. This condition results in less transmitted power, and the high reflected power could damage the amplifier.



The radio station on the right installed properly "matched" transmission line and antenna. Very little of the transmitted signal is reflected, resulting in increased broadcast power, more listeners, more advertising revenue, and more profit. The amplifier, transmission, and antenna all need to be measured to ensure that reflected power is minimized.

Expressing Reflected Waves

After making a reflection measurement, the reflection data can be expressed in a number of ways, depending on what you are trying to learn. The various expressions are all calculated by the analyzer from the same reflection measurement data. Each method of expressing reflection data can be graphically displayed in one or more formats. For more information, see display formats.

Return Loss

The easiest way to convey reflection data is return loss. Return loss is expressed in dB, and is a scalar (amplitude only) quantity. Return loss can be thought of as the absolute value or dB that the reflected signal is below the incident signal. Return loss varies between infinity for a perfect impedance match and 0 dB for an open or short circuit, or a lossless reactance. For example, using the log magnitude format on the analyzer, the measured reflection value on the screen may be -18dB. The minus sign is ignored when expressing return loss, so the component is said to have 18dB of return loss.

VSWR

Two waves traveling in opposite directions on the same transmission line cause a "standing wave". This condition can be measured in terms of the voltage standing wave ratio (VSWR or SWR for short). VSWR is defined as the maximum reflected voltage over the minimum reflected voltage at a given frequency. VSWR is a scalar (amplitude only) quantity. VSWR varies between one for a perfect match, and infinity for an open or short circuit or lossless reactance.

Reflection Coefficient

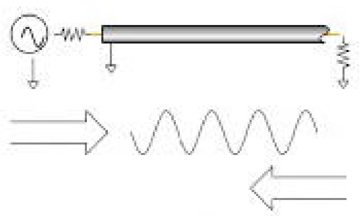
Another way of expressing reflection measurements is reflection coefficient gamma (Γ). Gamma includes both magnitude and phase.

The magnitude portion of gamma is called rho (ρ). Reflection coefficient is the ratio of the reflected signal voltage to the incident signal voltage. The range of possible values for ρ is between zero and one. A transmission line terminated in its characteristic impedance will have all energy transferred to the load; zero energy will be reflected and ρ = 0. When a transmission line terminated in a short or open circuit, all energy is reflected and ρ = 1. The value of rho is unitless.

Now for the phase information. At high frequencies, where the wavelength of the signal is smaller than the length of conductors, reflections are best thought of as waves moving in the opposite direction of the incident waves. The incident and reflected waves combine to produce a single "standing" wave with voltage that varies with position along the transmission line.

When a transmission line is terminated in its characteristic impedance (Zo) there is no reflected signal. All of the incident signal is transferred to the load, as shown in the following graphic. There is energy flowing in one direction along the transmission line.

Incident Voltage

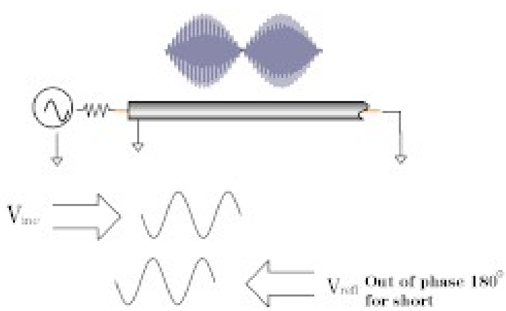


Zo

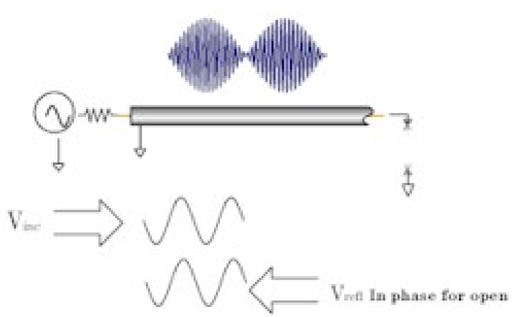
Reflected Voltage = 0

(All the incident power is absorbed in the load)

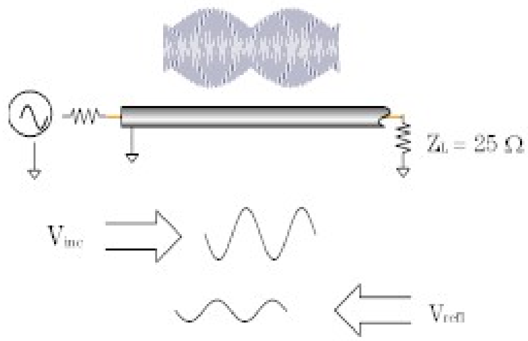
When a transmission line is terminated in a short circuit termination, all of the energy is reflected back to the source. The reflected wave is equal in magnitude to the incident wave (ρ = 1). The voltage across any short circuit is zero volts. Therefore, the voltage of the reflected wave will be 180 degrees out of phase with the incident wave, canceling the voltage at the load.



When a transmission line is terminated in an open circuit termination, all of the energy is reflected back to the source. The reflected wave is equal in magnitude to the incident wave (ρ = 1). However, no current can flow in an open circuit. Therefore, the voltage of the reflected wave will be in phase with the voltage of the incident wave.



When a transmission line is terminated in a 25 ohm resistor, some but not all of the incident energy will be absorbed, and some will be reflected back towards the source. The reflected wave will have an amplitude 1/3 that of the incident wave and the voltage of the two waves will be out of phase by 180 degrees at the load. The phase relationship will change as a function of distance along the transmission line from the load. The valleys of the standing wave pattern will no longer go to zero, and the peaks will be less than that of the open / short circuit.

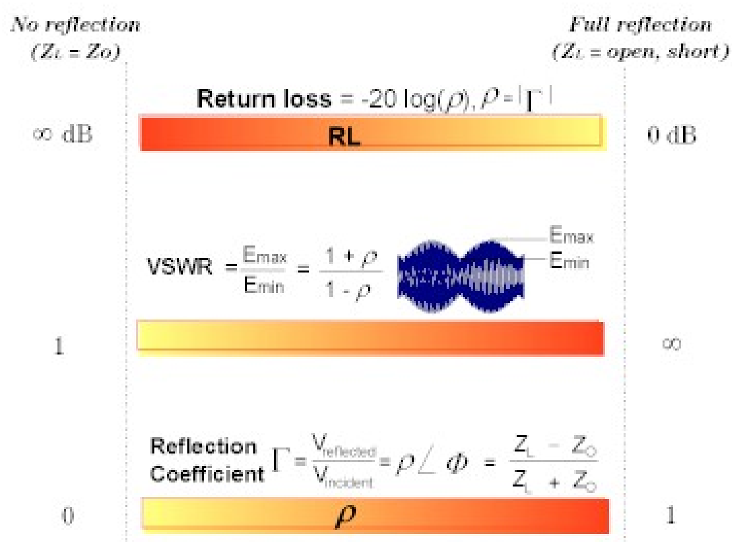


For more information, see Phase Measurements.

Impedance

Impedance is another way of expressing reflection data. For more information on Impedance, see Smith Charts.

Summary of the Expressions of Reflection Measurements:



Reflected Waves Along a Transmission line

When a sine wave from an RF signal generator is placed on a transmission line, the signal propagates toward the load. This signal, shown here in yellow, appears as a set of rotating vectors, one at each point on the transmission line.

Maximize this window for optimum viewing. **Click** if the applet is not visible.

In our example, the transmission line has a characteristic impedance of 50 ohms. If we choose a load of 50 ohms, then the amplitude of the signal will not vary with position along the line. Only the phase will vary along the line, as shown by the rotating vectors in yellow.

If the load impedance does not perfectly match the characteristic impedance of the line, there will be a reflected signal that propagates toward the source. At any point along the transmission line, that signal also appears to be a constant voltage whose phase is dependent upon physical position along the line.

The voltage seen at one particular point on the line will be the vector sum of the transmitted and reflected sinusoids. We can demonstrate this by looking at two examples.

Example 1: Perfect Match: 50 Ohms

Set the terminating resistor to 50 ohms by using the "down arrow" dialog box. Notice there is no reflection. We have a perfect match. Each rotating vector has a normalized amplitude of 1. If we were to observe the waveform at any point with a perfect measuring instrument, we would see equal sine wave amplitudes anywhere along the transmission line. The signal amplitudes are indicated by the green line.

Example 2: Mismatched Load: 200 Ohms

Now let's intentionally create a mismatched load. Set the terminating resistor to 200 ohms by using the down arrow. Hit the PLAY button and notice the change in the reflected waveform. If it were possible to measure just the reflected wave, we would see that its amplitude does not vary with position along the line. The only difference between the reflected (blue) signal, say at point z6 and point z4, is the phase.

But the amplitude of the resultant waveform, indicated by the standing wave (green), is not constant along the entire line because the transmitted and reflected signals (yellow and blue) combine. Since the phase between the transmitted and reflected signals varies with position along the line, the vector sums will be different, creating what's called a "standing wave".

With the load impedance at 200 ohms, a measuring device placed at point z6 would show a sine wave of constant amplitude. The sine wave at point z4 would also be of constant amplitude, but its amplitude would differ from that of the signal at point z6. And the two would be out of phase with each other. Again, the difference is shown by the green line, which indicates the amplitude at that point on the transmission line.

The impedance along the line also changes, as shown by the points labeled z1 through z7.

Programming Guide

Two ways to find programming commands:

1.	From a simulated PNA User Interface
New	File Trace/Chan Response Marker/Analysis Stimulus Utility
Legacy	File View Channel Sweep Calibration Trace Scale Marker System

What is **New** vs **Legacy** UI?

	GPIB / SCPI	COM
2.	**Command Tree**	**COM Object Model**
See Also	Example Programs Learning about GPIB	Example Programs Learning about COM

Important: Potential for programs to BREAK after upgrading to 6.0

If you have a SCPI or COM program that does NOT work after you upgraded to 6.0, it could be for the following reason. With 6.0 we implemented a change that defaults to saving completed calibrations to Cal Registers instead of User Cal Sets. Learn how to revert to the old behavior.

- New Programming Commands
- New Remotely Specifying a Source Port
- VEE Examples with runtime installed.
- Using Macros
- Code Translator App.
- Superseded / Replacement Commands
- Data Access Map
- See more PNA programming information and examples at:http://na.tm.agilent.com/pna/programming/

PNA Object Model

Application

- Channels
  - Channel
  - GainCompression
  - NoiseFigure
    - AuxiliaryTrigger
    - BalancedTopology
    - Calibrator
    - Fixturing
    - FOM
      - FOMRange
    - IFConfiguration
    - PathConfiguration
    - PulseGenerator
    - Segments
      - Segment
      - PathElement
    - SignalProcessing
- CalKit
  - CalStandard
- CalManager
  - CalSets
    - CalSet
  - GuidedCalibration
  - SMCType
  - VMCType
  - NoiseCal
  - GainCompressionCal
- Measurements
  - Measurement
    - IMixer
      - EmbeddedLO
        - ELODiag
    - Balanced Measurement
    - Equation
    - Gating
    - Marker
    - LimitTest
      - LimitSegment
    - Transform
- NaWindows
  - NaWindow
    - Traces
      - Trace
- Capabilities
- E5091ATestSets
  - E5091ATestSet
- ENRFile
- ExternalTestSets
  - TestSetControl
- HWAUXIO
- HWExternalTestSet
- HWMaterialHandlerIO

- SourcePowerCal
  - PowerLossSegments
    - PowerLossSegment
  - PowerMeterInterfaces
    - PoweMeterInterface
  - PowerSensors
    - PowerSensor
      - CalFactorSegs
        - PowerSensorCal FactorSegment

- InterfaceControl
- PathConfigurationMgr
- PortExtension
- Preferences
- SCPIStringParser
- TriggerSetup

Legend:

- Object
- Collection
- Interface

Last Modified:

13-Nov-2007	Replaced image with text
	Added NFA, ENRFile, and GCA

Application Object

Description

The Application object is the highest object in the PNA object model. This object presents methods and properties that affect the entire analyzer, rather than a specific channel or measurement. For example, the application object provides the GetIDString method. There's only one ID string for the instrument, unrelated to the channel or parameter being measured. Likewise, the TriggerSignal Property is global to the instrument. You can elect to use an internally generated (free run) trigger or a manual trigger. Either way, that type of trigger generation will be used on all measurements, on all channels. Therefore, it is under the Application object.

Accessing the Application object

This object is unique in that you must **create** this object rather than just get a handle to it.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)
```

Replace <analyzerName> with the full computer name of your PNA. For example, "My PNA". See Change Computer Name.

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Getting a Handle to an Object.
- Example Programs
- Superseded commands

(**Bold** Methods or Properties provide access to a child object)

Methods	Interface See History	Description
ActivateWindow	IApplication	Makes a window object the Active Window.
AllowAllEvents	IApplication	Monitors all events
AllowEventCategory	IApplication	Monitors an event category
AllowEventMessage	IApplication	Monitors an event
AllowEventSeverity	IApplication	Monitors an event severity level
BuildHybridKit	IApplication	Defines the user kit as port1kit + port2kit.
Channel	IApplication	Stimulus values like frequency, power, IF bandwidth, and number of points.

Configure	IApplication9	Restarts as an "N-port" PNA using the specified multiport test set.
CreateCustomMeasurementEx	IApplication3	Creates a new custom measurement with initialization.
CreateCustomMeasurement	IApplication	**Superseded with** CreateCustomMeasurementEx Method
CreateMeasurement	IApplication	Creates a new measurement.
CreateSParameter	IApplication	**Superseded with** Create SParameterEX Method
CreateSParameterEx	IApplication	Creates a new S-Parameter measurement with a 3-port load.
DeleteShortCut	IApplication	Removes a macro (shortcut) from the list of macros
DisallowAllEvents	IApplication	Monitors NO events
DoPrint	IApplication	Prints the screen to the active Printer.
ExecuteShortcut	IApplication	Executes a macro (shortcut) stored in the analyzer.
GetAuxIO	IApplication	Returns a handle to the AuxIO interface
GetCalManager	IApplication	Returns a handle to the CalManager interface
GetExternalTestSetIO	IApplication	Returns a handle to the ExternalTestSet IO interface
GetMaterialHandlerIO	IApplication	Returns a handle to the MaterialHandlerIO interface
GetShortcut	IApplication	Returns the title and path of the specified macro (shortcut).
LaunchCalWizard	IApplication	Launches the Cal Wizard
LaunchDialog	IApplication10	Launches the specified dialog box.
ManualTrigger	IApplication	Triggers the analyzer when TriggerSignal = naTriggerManual.
Preset	IApplication	Resets the analyzer to factory defined default settings.
PrintToFile	IApplication	Saves the screen data to bitmap (.bmp) file of the screen.
PutShortcut	IApplication	Puts a Macro (shortcut) file into the analyzer.
Quit	IApplication	Ends the Network Analyzer application.
Recall	IApplication	Recalls a measurement state, calibration state, or both from the hard drive into the analyzer.
RecallKits	IApplication	Recalls the calibration kits definitions that were stored with the SaveKits command.
Reset	IApplication	Removes all existing windows and measurements.

RestoreCalKitDefaults	IApplication	Restores the factory defaults for the specified kit.
RestoreCalKitDefaultsAll	IApplication	Restores the factory defaults for all kits.
Save	IApplication	Saves files to disk
SaveCitiDataData	IApplication5	Saves UNFORMATTED trace data to .cti file.
SaveCitiFormattedData	IApplication5	Saves FORMATTED trace data to .cti file.
SaveKits	IApplication	Saves all cal kits to disk.
SetFailOnOverRange	IApplication	Causes over range values to return an error code
ShowStatusBar	IApplication	Shows and Hides the Status Bar.
ShowStimulus	IApplication	Shows and Hides Stimulus information.
ShowTitleBars	IApplication	Shows and Hides the Title Bars.
ShowToolbar	IApplication	Shows and Hides the specified Toolbar.
UserPreset	IApplication7	Performs a User Preset.
UserPresetLoadFile	IApplication7	Loads an existing instrument state file (.sta or .cst) to be used for User Preset.
UserPresetSaveState	IApplication7	Saves the current instrument settings as UserPreset.sta.
Properties		**Description**
ActiveCalKit	IApplication	Returns a pointer to the kit identified by kitNumber.
ActiveChannel	IApplication	Returns a handle to the Active Channel object.
ActiveMeasurement	IApplication	Returns a handle to the Active Measurement object.
ActiveNAWindow	IApplication	Returns a handle to the Active Window object.
ArrangeWindows	IApplication	Sets or returns the arrangement of all the windows.
AuxiliaryTriggerCount	IApplication11	Returns the number of Aux trigger input / output connector pairs in the instrument.
CalKitType	IApplication	Sets or returns the calibration kit type for to be used for calibration or for kit modification. Shared with the CalKit object.
Capabilities	IApplication4	Return capabilities of the remote PNA.

Channels	IApplication	Collection for iterating through the channels
CoupledMarkers	IApplication	Sets (or reads) coupled markers ON and OFF
DisplayAutomationErrors	IApplication2	Enables or disables automation error messages from being displayed on the screen. U
DisplayGlobalPassFail	IApplication6	Shows or hides the dialog which displays global pass/fail results.
E5091Testsets	IApplication8	Collection to control the E5091A testset.
ENRFile	IApplication13	Manages Noise ENR files.
ExternalALC	IApplication	Sets or returns the source of the analyzer leveling control.
ExternalTestsets	IApplication9	Collection to control External Test sets.
GPIBAddress	IApplication8	Sets and returns the PNA GPIB address.
GPIBMode	IApplication	Makes the analyzer the system controller or a talker/listener.
IDString	IApplication	Returns the model, serial number and software revision of the analyzer
InterfaceControl	IApplication8	Control the Interface control features.
LocalLockoutState	IApplication4	Prevents use of the mouse, keyboard, and front panel while your program is running.
Measurement	IApplication	Create and manage measurements
Measurements	IApplication	Collection for iterating through the Application measurements.
MessageText	IApplication	Returns text for the specified eventID
NaWindows	IApplication	Collection for iterating through the Application windows.
NoiseSourceState	IApplication13	Sets and Reads the ON | OFF state of the noise source
NumberOfPorts	IApplication	Returns the number of hardware source ports on the PNA
Options	IApplication	Returns the options on the analyzer
PathConfigurationManager	IApplication11	Provides access to hardware configuration.
Port Extensions	IApplication	**Superseded with** Fixturing Object
Preferences	IApplication5	Preferences for saving citifiles.

ScpiStringParser	IApplication	Provides the ability to send a SCPI command from within the COM command.
SecurityLevel	IApplication4	Turns ON or OFF the display of frequency information.
SICL	IApplication5	Allows control of the PNA via SICL
SICLAddress	IApplication8	Sets and returns the PNA SICL address
SourcePowerCalibrator	IApplication2	Allows capability for performing source power calibrations.
SourcePowerState	IApplication	Turns Source Power ON and OFF.
SystemImpedanceZ0	IApplication	Sets the analyzer impedance value.
SystemName	IApplication	Returns the full computer name of the PNA.
Touchscreen	IApplication12	Enables and disables touchscreen.
TriggerDelay	IApplication	Sets or returns the delay time for a trigger.
TriggerSetup	IApplication4	Controls triggering for the entire PNA application.
TriggerSignal	IApplication	**Superseded with** Source Property
TriggerType	IApplication	**Superseded with** Scope Property
UserPresetEnable	IApplication7	'Checks' and 'clears' the enable box on the User Preset dialog box.
VelocityFactor	IApplication	Sets the velocity factor to be used with Electrical Delay, Port Extensions, and Time Domain marker distance calculations.
Visible	IApplication	Makes the Network Analyzer application visible or not visible.
WindowState	IApplication	Sets or returns the window setting of Maximized, Minimized, or Normal. Shared with the NAWindow Object
Events	**Interface**	**Description**
OnCalEvent	IApplication	Triggered by a calibration event.
OnChannelEvent	IApplication	Triggered by a channel event.
OnDisplayEvent	IApplication	Triggered by a display event.
OnHardwareEvent	IApplication	Triggered by a hardware event.

OnMeasurementEvent	IApplication	Triggered by a measurement event.
OnSCPIEvent	IApplication	Triggered by a SCPI event.
OnSystemEvent	IApplication	Triggered by a system event.
OnUserEvent	IApplication	For future use

IApplication History

Interface	Introduced with PNA Rev:
IApplication	1.0
IApplication2	3.0
IApplication3	3.2
IApplication4	3.5
IApplication5	4.0
IApplication6	5.0
IApplication7	5.0
IApplication8	5.2
IApplication9	6.0
IApplication10	7.20
IApplication11	7.20
IApplication12	7.21
IApplication13	8.0

Last Modified:

17-Oct-2007	Updated IPathConfigMgr Prop

AuxiliaryTrigger Object

Description

These properties setup Auxiliary triggering on a channel.

Accessing the object

Use chan.AuxTrigger (**n**) to access the object.

where **n**= the connector pair to be used for Auxiliary Triggering.

- N5242A models: Use **1** or **2**
- All other PNA models: Use **1**

Use app.AuxiliaryTriggerCount to determine the number of auxiliary Trigger pairs on the back of a PNA.

```
Dim app as AgilentPNA835x.Application
Dim chan as Channel
Set chan = app.ActiveChannel
Dim AuxTrig as AuxTrigger
Set AuxTrig = chan.AuxTrigger(2)
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Triggering in the PNA
- Example Programs

Methods	Interface See History (below)	Description
None		

Properties		Description
Delay	IAuxTrigger	Specifies the delay that should be applied by the PNA after the Aux trigger input is received and before the acquisition is made
Enable	IAuxTrigger	Turns ON / OFF the trigger output.

HandshakeEnable	IAuxTrigger	Turns handshake ON / OFF.
Number	IAuxTrigger	Reads the number of the Aux I/O pair being used.
TriggerInPolarity	IAuxTrigger	Specifies the polarity of the trigger IN signal to which the PNA will respond.
TriggerInType	IAuxTrigger	Specifies the type of Aux trigger input being supplied to the PNA
TriggerOutDuration	IAuxTrigger	Specifies the width of the pulse or the time that the Aux trigger output will be asserted
TriggerOutInterval	IAuxTrigger	Specifies how often a trigger output signal is sent.
TriggerOutPolarity	IAuxTrigger	Specifies the polarity of the trigger output signal being supplied by the PNA.
TriggerOutPosition	IAuxTrigger	Specifies whether the Aux trigger out signal is sent Before or After the acquisition.

IAuxTrigger History

Interface	Introduced with PNA Rev:
IAuxTrigger	7.2

BalancedMeasurement Object

Description

These properties set the measurement type that is used with balanced topologies.

Use the BalancedTopology Object to set the topology and port mappings for the DUT,

Accessing the BalancedMeasurement object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim balMeas As BalancedMeasurement
Set balMeas = app.ActiveMeasurement.BalancedMeasurement
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- About Balanced Measurements
- Example Programs

(**Bold** Methods or Properties provide access to a child object)

Method	Description
None	

Property	Interface See History	Description
BalancedMode	IBalancedMeasurement	Sets and returns whether the balanced transform is ON or OFF.
BalancedTopology	IBalancedMeasurement	Sets and returns the topology of a balanced DUT.
BBalMeasurement	IBalancedMeasurement	Sets and returns the measurement for the Balanced - Balanced topology.
SBalMeasurement	IBalancedMeasurement	Sets and returns the measurement for the Single-Ended - Balanced topology.

SSBMeasurement	IBalancedMeasurement	Sets and returns the measurement for the Single-Ended - Single-Ended - Balanced topology

IBalancedMeasurement History

Interface	Introduced with PNA Rev:
IBalancedMeasurement	5.0

BalancedTopology Object

Description

The DUTTopology property sets and returns the topology of a balanced DUT.

The following methods **set** the port mappings for the DUT.

The remaining properties **return** the port mappings for the DUT.

Use the BalancedMeasurement object to set the measurement type.

Accessing the BalancedTopology object

```
Dim app as AgilentPNA835x.Application
Dim chan as Channel
Set chan = app.ActiveChannel

Dim balTopology as BalancedTopology
Set balTopology = chan.BalancedTopology
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- About Balanced Measurements
- Example Programs

Method	Interface See History	Description
SetBBPorts	IBalancedTopology	Sets the physical port mappings for the Balanced - Balanced DUT topology.
SetSBPorts	IBalancedTopology	Sets the physical port mappings for the Single-Ended - Balanced DUT topology.
SetSSBPorts	IBalancedTopology	Sets the physical port mappings for the Single-Ended - Single-Ended - Balanced DUT topology.

Property	Interface	Description
BB_BalPort1Negative	IBalancedTopology	Returns the PNA port number that is connected to the Negative side of the DUT's logical Port 1 .

BB_BalPort1Positive	IBalancedTopology	Returns the first positive balanced port number in the Balanced - Balanced topology
BB_BalPort2Negative	IBalancedTopology	Returns the second negative balanced port number in the Balanced - Balanced topology.
BB_BalPort2Positive	IBalancedTopology	Returns the second positive balanced port number in the Balanced - Balanced topology.
DUTTopology	IBalancedTopology	Sets and returns the device topology setting.
SB_BalPortNegative	IBalancedTopology	Returns the negative balanced port number in the Single-Ended - Balanced topology.
SB_BalPortPositive	IBalancedTopology	Returns the positive balanced port number in the Single-Ended - Balanced topology.
SB_SEPort	IBalancedTopology	Returns the single ended port number in the Single-Ended - Balanced topology.
SSB_BalPortNegative	IBalancedTopology	Returns the negative balanced port number in the Single-Ended - Single-Ended - Balanced topology.
SSB_BalPortPositive	IBalancedTopology	Returns the positive balanced port number in the Single-Ended - Single-Ended - Balanced topology
SSB_SEPort1	IBalancedTopology	Returns the first single ended port in the Single-Ended - Single-Ended - Balanced topology.
SSB_SEPort2	IBalancedTopology	Returns the second single ended port in the Single-Ended - Single-Ended - Balanced topology.

BalancedTopology History

Interface	Introduced with PNA Rev:
IBalancedTopology	5.0

CalFactorSegments Collection

Description

A collection object that provides a mechanism for iterating through the segments of a power sensor cal factor table.

Accessing the CalFactorSegments collection

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim calFact As CalFactorSegments
Set calFact = app.SourcePowerCalibrator.PowerSensors(1).CalFactorSegments
```

See Also:

- **PowerSensorCalFactorSegment Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	Description
Add	Adds a PowerSensorCalFactorSegment object to the collection
Item	Use to get a handle to a PowerSensorCalFactorSegment object in the collection.
Remove	Removes an object from the collection.
Properties	**Description**
Count	Returns the number of objects in the collection.
Parent	Returns a handle to the Parent object (PowerSensor) of this collection.

Calibrator Object

See Also

- Example Programs
- Calibrator Methods and Properties
- ICalData Interface for putting and getting typed Calibration data.
- Superseded commands

Description

The Calibrator object, a child of the channel, is used to perform an Unguided calibration.

Note: You can NOT perform a full 3 or 4-port using the Calibrator object; you must use the GuidedCalibration object.

There must be a measurement present for the calibrator to use or you will receive a "no measurement found" error. Therefore, to perform a 2-port cal, you must have any S-parameter measurement on the channel. For a 1-port measurement, you must have the measurement (S11 or S22) on the channel. The same is true for a response measurement.

There are a number of approaches to calibration with the calibrator object:

- You can collect data yourself and download it to the ACQUISITION buffer. The acquisition buffer holds the actual measured data for each standard. See the PNA data map.

1. Calibrator.SetCalInfo
2. Connect a standard
3. Trigger a sweep
4. Retrieve the data for the standard
5. Download the data - calibrator.putStandard
6. Repeat for each standard
7. Calibrator.CalculateErrorCoefficients

- You can tell the calibrator to acquire a standard. In this case, the calibrator collects the data and places it in the ACQUISITION buffer.

1. Calibrator.SetCalInfo
2. Connect a standard
3. Calibrator.AcquireCalStandard2
4. Repeat for each standard
5. Calibrator.CalcuateErrorCoefficients

- You can put previously-retrieved error terms in the error correction buffer.

1. PutErrorTerm
2. Repeat for each term
3. Measurement.Caltype = pick one

- You can also "piece together" a 2-port cal from two 1-port cals (S11 and S22) and four response (thru) cals. The system will detect that all the standards needed for a 2-port cal have been acquired even though they may not have gathered at the same time.

Accessing the Calibrator object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim cal As ICalibrator
Set cal = app.ActiveChannel.Calibrator
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Learn about reading and writing Calibration data.

Methods	Interface See History	Description
AcquireCalConfidenceCheckECAL	ICalibrator	**Superseded with** AcquireCalConfidenceCheckECALEx
AcquireCalConfidenceCheckECALEx	**ICalibrator4**	Transfers ECAL confidence data into analyzer memory
AcquireCalStandard	ICalibrator	**Superseded with** AcquireCalStandard2
AcquireCalStandard2	ICalibrator	Causes the analyzer to measure a calibration standard. Also provides for sliding load.
CalculateErrorCoeffecients	ICalibrator	Generates Error Terms from standard and actual data in the error correction buffer.
DoECAL1Port	ICalibrator	**Superseded with** DoECAL1PortEx
DoECAL1PortEx	**ICalibrator4**	Completes a 1 port ECAL
DoECAL2Port	ICalibrator	**Superseded with** DoECAL2PortEx

DoECAL2PortEx	**ICalibrator4**	Completes a 2 port ECAL
DoneCalConfidenceCheckECAL	ICalibrator	Concludes an ECAL confidence check
DoReceiverPowerCal	**ICalibrator5**	Perform a receiver power cal.
GetECALModuleInfo	ICalibrator	**Superseded with** Get ECALModuleInfoEx
Get ECALModuleInfoEx	**ICalibrator4**	Returns information about the attached module
getErrorTerm	ICalibrator	**Superseded with** GetErrorTermByString
getStandard	ICalibrator	**Superseded with** GetStandardByString
putErrorTerm	ICalibrator	**Superseded with** PutErrorTermByString
putStandard	ICalibrator	**Superseded with** PutStandardByString
SaveCalSets	ICalibrator	**Superseded with** CalSet.Save
setCalInfo	ICalibrator	Specifies the type of calibration and prepares the internal state for the rest of the calibration.
Properties	**Interface**	**Description**
AcquisitionDirection	ICalibrator	Specifies the direction in a 2-Port cal using one set of standards.
ECALCharacterization	**ICalibrator2**	**Superseded with** ECALCharacterizationEx
ECALCharacterizationEx	**ICalibrator4**	Specifies which set of characterization data within an ECal module will be used for ECal operations with that module.
ECALCharacterizationIndexList	**ICalibrator6**	Returns a list of characterizations stored in the specified ECal module.
ECAL Isolation	**ICalibrator**	Specifies whether the acquisition of the ECal calibration should include isolation or not.
ECALModuleNumberList	**ICalibrator6**	Returns a list of index numbers to be used for referring to the ECal modules that are currently attached to the PNA.
ECALPortMap	**ICalibrator3**	**Superseded with** ECALPortMapEx
ECALPortMapEx	**ICalibrator4**	Specifies which ports of the ECal module are connected to which ports of the PNA.
IsECALModuleFound	ICalibrator	**Superseded with** IsECALModuleFoundEx

IsECALModuleFoundEx	**ICalibrator4**	**Superseded with** ECALCharacterizationIndexList and ECALModuleNumberList
IsolationAveragingIncrement	**ICalibrator7**	Value to increase the channel's averaging factor.
OrientECALModule	**ICalibrator3**	Specifies if the PNA should perform orientation of the ECal module during calibration.
Simultaneous2PortAcquisition	ICalibrator	Allows the use of 2 sets of standards at the same time.

ICalibrator History

Interface	Introduced with PNA Rev:
ICalibrator	1.0
ICalibrator2	3.1
ICalibrator3	3.1
ICalibrator4	3.5
ICalibrator5	5.0
ICalibrator6	5.26
ICalibrator6	7.21

ICalData Interface

Description

Contains methods for putting Calibration data in and getting Calibration data out of the analyzer using typed data. This interface transfers data more efficiently than variant data. However, this interfaces is only usable from VB6, C, & C++. All other programming languages must use the ICalSet interface.

There is also an ICalData Interface on the CalSet Object

Learn about reading and writing Calibration data.

Methods	Description
getErrorTermComplex	Retrieves error term data
getStandardComplex	Retrieves calibration data from the acquisition data buffer (before error-terms are applied).
putErrorTermComplex	Puts error term data
putStandardComplex	Puts calibration data into the acquisition data buffer (before error-terms are applied).

Properties	Description
None	

ICalData History

Interface	Introduced with PNA Rev:
ICalData	1.0

CalKit Object

Description

The calkit object provides the properties and methods to access and modify a calibration kit. The calkitType property can be set from two objects:

- Application object - app.calKitType
- CalKit object - calKit.calKitType

Both of these commands specify or read the calibration kit type. When specified, the cal kit also becomes the Active cal kit.

Accessing a CalKit object

To get a handle to a cal kit, use **app.ActiveCalKit**.

The calKit object behaves differently from other objects in the system in that you can only have a handle to **one** cal kit -- the active calkit. Therefore, when you change the calkitType from either the Application object or the CalKit object, you may also be changing the object to which you may have other references.

For example, the following example specifies two calKit type objects and in turn, assigns them to two different variables: ck1 and ck2.

```
Dim app As AgilentPNA835x.Application
Dim ck1 As calKit
Dim ck2 As calKit

Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)
app.CalKitType = naCalKit_User1
Set ck1 = app.ActiveCalKit
ck1.Name = "My CalKit1"

app.CalKitType = naCalKit_User2
Set ck2 = app.ActiveCalKit
ck2.Name = "My CalKit2"

Print "ck1: " & ck1.Name
Print "ck2: " & ck2.Name
```

When the pointer to each of these kits is read (printed), they each have a pointer to the last kit to be assigned to the Active cal kit:

```
ck1: My CalKit2
ck2: My CalKit2
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model

- Example Programs

(**Bold** Methods or Properties provide access to a child object)

Methods	Description
getCalStandard	Returns a handle to a calibration standard for modifying its definitions.
GetStandardsForClass	Returns the calibration standard numbers for a specified calibration class.
SetStandardsForClass	Sets the calibration standard numbers for a specified calibration class
Properties	**Description**
CalKitType	Sets or returns the calibration kit type for to be used for calibration or for kit modification. Shared with the Application object.
Name	Sets and returns the name of the cal kit
PortLabel	Labels the ports for the kit; only affects the cal wizard annotation.
StandardForClass	**Superseded with** Use GetStandardForClass and SetStandardForClass. Maps a standard device to a cal class.

ICalKit History

Interface	Introduced with PNA Rev:
ICalKit	1.0

CalManager Object

Description

Use this interface to list, save, and delete Cal Sets.

Accessing the CalManager object

Get a handle to a the CalManager with the app.GetCalManager Method.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim mgr as ICalManager
Set mgr = app.GetCalManager
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs
- Superseded commands

(**Bold** Methods or Properties provide access to a child object)

Methods	Interface See History	Description
AllowChannelToSweepDuringCalAcquisition	ICalManager5	Specifies the channel to sweep during a Calibration.
CreateCalSet	ICalManager	Creates a new Cal Set
CreateCustomCal	ICalManager2	Creates an FCA cal object.
CreateCustomCalEx	ICalManager5	Creates a custom cal object.
DeleteCalSet	ICalManager	Deletes a Cal Set
DisplayNAWindowDuringCalAcquisition	ICalManager5	Set the 'show' state of the window to be displayed durin
DisplayOnlyCalWindowDuringCalAcquisition	ICalManager5	Clears the flags for windows to be shown during calibrat
EnumerateCalSets	ICalManager4	Returns an array of Cal Set names being stored on the I
GetCalSetByGUID	ICalManager	Get a handle to a Cal Set

GetCalSetCatalog	ICalManager	**Superseded with** EnumerateCalSets
GetCalSetUsageInfo	ICalManager	Returns the Cal Set ID and Error Term ID currently in us
GetCalTypes	ICalManager2	Query for a list of available calibration types.
GetRequiredEtermNames	ICalManager2	Returns an array of strings specifying the error terms re
SaveCalSets	ICalManager	**Superseded with** CalSet.Save
SweepOnlyCalChannelDuringCalAcquisition	ICalManager5	Clears ALL flags for channels to sweep during calibratio
Properties		
Cal Sets	ICalManager	Collection for iterating through all the Cal Sets in the ana
GuidedCalibration	ICalManager3	Used to perform a Guided Calibration.

ICalManager History

Interface	Introduced with PNA Rev:
ICalManager	2.0
CalManager2	3.1
CalManager3	3.5
CalManager4	5.0
ICalManager5	8.0

CalSet Object

See ICalData Interface for putting and getting typed Cal Set data.

Description

Use this interface to query and or change the contents of a Cal Set.

Accessing the CalSet object

Get a handle to a CalSet object by using the CalSets collection. This is done through the CalManager object with the app.GetCalManager Method.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim calst As ICalSet
Set calst = app.GetCalManager.CalSets.Item(1)
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Reading and Writing Calibration data
- Example Programs
- Superseded commands

Methods	Interface See History	Description
CloseCalSet	ICalSet	**Obsolete** - No longer necessary.
ComputeErrorTerms	ICalSet	Computes error terms for the CalType specified by a preceding OpenCal Set call.
Copy	ICalSet	Creates a new Cal Set and copies the current Cal Set data into it.
getErrorTerm	ICalSet	**Superseded with** getErrorTermByString
getErrorTermByString	ICalSet2	Returns variant error term data by specifying the string name of the error term.
getErrorTermList	ICalSet	**Superseded with** getErrorTermList2
getErrorTermList2	ICalSet2	Returns a list of error term names found in a calset.

GetGUID	ICalSet	Returns the GUID identifying a Cal Set
getStandard	ICalSet	**Superseded with** getStandardByString
getStandardByString	ICalSet2	Returns variant standard acquisition data by specifying the string name of the standard.
getStandardsList	ICalSet	**Superseded with** getStandardList2
getStandardList2	ICalSet2	Returns a list of standard names found in a Cal Set.
HasCalType	ICalSet	Verifies that the Cal Set object contains the error terms required to apply the specified CalType to an appropriate measurement.
OpenCalSet	ICalSet	**Obsolete** - No longer necessary.
putErrorTerm	ICalSet	**Superseded with** putErrorTermByString
putErrorTermByString	ICalSet2	Writes variant error term data by specifying the string name of the error term.
putStandard	ICalSet	**Superseded with** putStandardByString
putStandardByString	ICalSet2	Writes variant standard acquisition data by specifying the string name of the standard.
Save	ICalSet	Saves the current Cal Set to disk.
StringToNACalClass	ICalSet	Converts string values from GetStandardsList into enumeration data
StringToNAErrorTerm2	ICalSet	Converts string values from GetErrorTermList into enumeration data
Properties		**Description**
AlternateSweep	ICalSet3	Reads sweep either alternate or chopped.
Attenuator	ICalSet3	Returns the value of the attenuator control for the specified port number.
AttenuatorMode	ICalSet3	Returns the mode of operation (auto or manual) of the attenuator control for the specified port number.
CouplePorts	ICalSet3	Returns state of couple ports (ON or OFF)
CWFrequency	ICalSet3	Returns CW Frequency

Description	ICalSet	Set or return the descriptive string assigned to the Cal Set
DwellTime	ICalSet3	Returns the dwell time for the channel.
FrequencyOffsetCWOverride	ICalSet3	Reads state of CW Override (ON or OFF)
FrequencyOffsetDivisor	ICalSet3	Reads Frequency Offset Divisor value
FrequencyOffsetFrequency	ICalSet3	Reads Offset Frequency
FrequencyOffsetMultiplier	ICalSet3	Reads Frequency Offset Multiplier value
FrequencyOffsetState	ICalSet3	Reads Frequency Offset state (ON or OFF)
IFBandwidth	ICalSet3	Reads IF Bandwidth of the channel
LastModified	ICalSet3	Reads the time stamp of when the file was last modified
Name	ICalSet4	Sets and returns the Cal Set name.
NumberOfPoints	ICalSet3	Returns the Number of Points of the channel.
PowerSlope	ICalSet3	Returns the Power Slope value.
ReceiverAttenuator	ICalSet3	Returns the value of the specified receiver attenuator control.
StartFrequency	ICalSet3	Returns the start frequency of the channel.
StartPower	ICalSet3	Returns the start power of the PNA when sweep type is set to Power Sweep.
StimulusValues	ICalSet3	Returns x-axis values for stimulus or response frequencies
StopFrequency	ICalSet3	Returns the stop frequency of the channel.
StopPower	ICalSet3	Returns the stop power of the PNA when sweep type is set to Power Sweep.
SweepGenerationMode	ICalSet3	Returns the method being used to generate a sweep: analog or stepped.
SweepTime	ICalSet3	Returns the sweep time of the analyzer.
SweepType	ICalSet3	Returns the type of X-axis sweep that is performed on a channel.
TestPortPower	ICalSet3	Returns the RF power level for the channel.

ICalSet History

Interface	Introduced with PNA Rev:
ICalSet	2.0
ICalSet2	3.0
ICalSet3	3.2
ICalSet4	6.0

ICalData Interface

Description

Use this interface as an alternative to the ICalSet Interface to avoid using variants when transmitting data to and from the Cal Set

Learn about reading and writing Calibration data.

Methods	Interface See History	Description
get ErrorTermComplex	ICalData2	**Superseded with** getErrorTermComplexByString
getErrorTermComplexByString	ICalData3	Returns typed error term data by specifying the string name of the error term.
getStandardComplex	ICalData2	**Superseded with** getStandardComplexByString
getStandardComplexByString	ICalData3	Returns typed standard acquisition data by specifying the string name of the standard.
putErrorTermComplex	ICalData2	**Superseded with** putErrorTermComplexByString
putErrorTermComplexByString	ICalData3	Writes typed error term data by specifying the string name of the error term.
putStandardComplex	ICalData2	**Superseded with** putStandardComplexByString
putStandardComplexByString	ICalData3	Writes typed standard acquisition data by specifying the string name of the standard.
Properties		**Description**

None

History

Interface	Introduced with PNA Rev:
The original ICalData Interface was introduced with PNA 1.0 on the Calibrator Object.	
ICalData2	2.0
ICalData3	3.1

Last modified:

Nov. 1, 2006	New start and stop freq commands added

Cal Sets Collection

Description

A collection object that provides a mechanism for iterating through all the Cal Sets in the analyzer. There is no ordering to the items in the collection. Therefore make no assumptions about the formatting of the collection.

For the Item and Remove methods, you can specify either the Cal Set string name, or the integer item of the Cal Set in the collection.

Accessing the CalSets collection

Get a handle to the CalSets collection through the CalManager object with the app.GetCalManager Method.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim calsts As CalSets
Set calsts = app.GetCalManager.CalSets
```

See Also:

- **Cal Set Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	Description
Item	Returns a handle to a Cal Set object in the collection.
Remove	Deletes the Cal Set residing at position index in the collection.
Properties	**Description**
Count	Returns the number of Cal Sets in the collection.

Last Modified:

30-Oct-2007 added item and remove note.

CalStandard Object

Description

Contains all of the settings that are required to modify a calibration standard.

Accessing the CalStandard object

Get a handle to a standard with the calkit.GetCalStandard Method.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim std As ICalStandard
Set std = app.ActiveCalKit.GetCalStandard(1)
std.Delay = 0.00000003
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Reading and Writing Calibration data
- Example Programs

Methods

None

Properties	Interface See History	Description
C0	ICalStandard	Sets and Returns the C0 (C-zero) value (the first capacitance value) for the calibration standard, when the Type is set to "naOpen".
C1	ICalStandard	Sets and Returns the C1 value (the second capacitance value) for the calibration standard, when the Type is set to "naOpen".
C2	ICalStandard	Sets and Returns the C2 value (the third capacitance value) for the calibration standard, when the Type is set to "naOpen".
C3	ICalStandard	Sets and Returns the C3 value (the fourth capacitance value) for the calibration standard, when the Type is set to "naOpen".
Delay	ICalStandard	Sets and Returns the electrical delay value for the calibration standard.

L0	ICalStandard	Sets and Returns the L0 (L-zero) value (the first inductance value) for the calibration standard, when the Type is set to "naShort".
L1	ICalStandard	Sets and Returns the L1 value (the second inductance value) for the calibration standard, when the Type is set to "naShort"..
L2	ICalStandard	Sets and Returns the L2 value (the third inductance value) for the calibration standard, when the Type is set to "naShort"..
L3	ICalStandard	Sets and Returns the L3 value (the third inductance value) for the calibration standard, when the Type is set to "naShort"..
Label	ICalStandard	Sets and Returns the label for the calibration standard.
loss	ICalStandard	Sets and Returns the insertion loss for the calibration standard.
Maximum Frequency	ICalStandard	Sets and Returns the maximum frequency for the calibration standard.
Medium	ICalStandard	Sets and Returns the media type of the calibration standard.
Minimum Frequency	ICalStandard	Sets and Returns the minumum frequency for the calibration standard.
Type	ICalStandard	Sets and Returns the type of calibration standard. Selections are: **naOpen, naShort, naLoad, naThru, naArbitraryImpedance and naSliding.**
TZReal	**ICalStandard2**	Sets and Returns the TZReal value (the Real Terminal Impedance value) for the calibration standard, when the Type is set to "naArbitraryImpedance".
TZImag	**ICalStandard2**	Sets and Returns the TZImag value (the Imaginary Terminal Impedance value) for the calibration standard, when the Type is set to "naArbitraryImpedance".
Z0	ICalStandard	Sets and Returns the characteristic impedance for the calibration standard.

ICalStandard History

Interface	Introduced with PNA Rev:
CalStandard	1.0
CalStandard2	3.0

Capabilities Object

Description

These properties return capabilities of the remote PNA.

Accessing the Capabilities object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim cap As Capabilities
Set cap = app.Capabilities
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- ICapabilities History
- Example Programs

Methods	Interface See History	
GetPortNumber Method	ICapabilities4	Returns the port number for the specified string port name.

Properties		Description
FirmwareMajorRevision	ICapabilities	Returns integer portion of firmware revision number.
FirmwareMinorRevision	ICapabilities	Return decimal portion of firmware revision number.
FirmwareSeries	ICapabilities	Returns the Alpha portion of the firmware revision number.
GPIBPortCount	ICapabilities3	Returns the number of GPIB ports (1or 2)
InternalTestsetPortCount	ICapabilities	Returns the number of PNA test ports.
IsFrequencyOffsetPresent	ICapabilities	Returns the presence of Frequency Offset Option 080 (True or False).
IsReceiverStepAttenuatorPresent	ICapabilities	Returns the presence of receiver step attenuators (True or False).

IsReferenceBypassSwitchPresent	ICapabilities	Returns the presence of the reference switch (True or False).
MaximumFrequency	ICapabilities	Returns the maximum frequency of the PNA.
MaximumNumberOfChannels	ICapabilities2	Returns the maximum possible number of Channels
MaximumNumberOfPoints	ICapabilities	Returns the maximum possible number of data points.
MaximumNumberOfTracesPerWindow	ICapabilities2	Returns the maximum possible number of traces per window
MaximumNumberOfWindows	ICapabilities2	Returns the maximum possible number of windows
MaximumReceiverStepAttenuator	ICapabilities	Returns the maximum amount of receiver attenuation.
MaximumSourceALCPower	ICapabilities	Returns the maximum amount of source ALC power.
MaximumSourceStepAttenuator	ICapabilities	Returns the maximum amount of source attenuation.
MinimumFrequency	ICapabilities	Returns the minimum frequency of the PNA.
MinimumNumberOfPoints	ICapabilities	Returns the minimum possible number of data points.
MinimumReceiverStepAttenuator	ICapabilities	Returns the minimum amount of receiver attenuation.
MinimumSourceALCPower	ICapabilities	Returns the minimum amount of source ALC power.
ReceiverCount	ICapabilities	Returns the number of receivers in the PNA.
ReceiverStepAttenuatorStepSize	ICapabilities	Returns the step size of the attenuator.
SourceCount	ICapabilities	Returns the number of sources.
SourcePortCount	ICapabilities4	Returns the number of source ports.
SourcePortNames	ICapabilities4	Returns the string names of source ports.

ICapabilities History

I Interface	Introduced with PNA Rev:
ICapabilities	3.5
ICapabilities2	5.23
ICapabilities3	6.0
ICapabilities4	7.20

Channel Object

See SourcePowerCalData Interface for putting and getting typed source power calibration data.

Description

The channel object is like the engine that produces data. Channel settings consist of stimulus values like frequency, power, IF bandwidth, and number of points.

Accessing the Channel object

You can get a handle to a channel in a number of ways. But first you have to make sure that the channel exists. When you first startup the analyzer, there is one S11 measurement on channel 1. Thus there is only one channel in existence. You can do the following:

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim chan As IChannel
Set chan = app.ActiveChannel
```

or

```
Set chan = app.Channels(2)
```

The first method returns the channel object that is driving the active measurement. If there is no measurement, there may not be a channel. Once a channel is created, it does not go away. So if there once was a measurement (hence a channel), the channel will still be available.

If there is no channel you can create one in a couple ways. You can do the following:

```
Pna.CreateMeasurement( ch1, "S11", port1, window2)
```

or

```
Pna.Channels.Add(2)
```

The latter will have no visible effect on the analyzer. It will simply create channel 2 if it does not already exist.

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Reading and Writing Calibration data.
- Example Programs
- Superseded commands

(**Bold** Methods or Properties provide access to a child object)

Methods	Interface See History	Description
Abort	IChannel	Aborts the current measurement sweep on the channel.

ApplySourcePowerCorrectionTo	IChannel11	Copies an existing Source Power Calibration to another channel.
AveragingRestart	IChannel	Clears and restarts averaging of the measurement data.
Continuous	IChannel	The channel continuously responds to trigger signals.
CopyToChannel	IChannel	Sets up another channel as a copy of this objects channel.
GetErrorCorrection	IChannel8	Returns the channel error correction state.
GetNumberOfGroups	IChannel3	Returns the number of groups a channel has yet to acquire.
getSourcePowerCalData	IChannel	**Superseded with** Get SourcePowerCalDataEx
getSourcePowerCalDataEx	IChannel4	Returns requested source power calibration data, if it exists.
GetSupportedALCModes	IChannel10	Returns a list of supported ALC modes
GetXAxisValues	IChannel	Returns the channel's X-axis values into a dimensioned Variant array.
GetXAxisValues2	IChannel	Returns the channel's X-axis values into a dimensioned NON-Variant array.
Hold	IChannel	Puts the Channel in Hold - not sweeping.
Next_IFBandwidth	IChannel	A function that returns the Next higher IF Bandwidth value.
NumberOfGroups	IChannel	Sets the Number of trigger signals the channel will receive.
Preset	IChannel	Resets the channel to factory defined settings.
PreviousIFBandwidth	IChannel	Returns the previous IF Bandwidth value.
putSourcePowerCalData	IChannel	**Superseded with** Put SourcePowerCalDataEx Method
putSourcePowerCalDataEx	IChannel4	Inputs source power calibration data to this channel for a specific source port.
SelectCalSet	IChannel	Specifies the Cal Set to use for the Channel
Single	IChannel	Channel responds to one trigger signal from any source (internal, external, or manual). Then channel switches to Hold.
Properties	Interface	**Description**
ALCLevelingMode	IChannel10	Set or return the ALC leveling mode.
AlternateSweep	IChannel	Sets sweeps to either alternate or chopped.

Attenuator	IChannel	Sets or returns the value of the attenuator control for the specified port number.
AttenuatorMode	IChannel	Sets or returns the mode of operation of the attenuator control for the specified port number.
AuxiliaryTrigger	IChannel10	Used to configure AuxiliaryTriggering
Averaging	IChannel	Turns trace averaging ON or OFF for all measurements on the channel.
AveragingCount	IChannel	Returns the number of sweeps that have been averaged into the measurements.
AveragingFactor	IChannel	Specifies the number of measurement sweeps to combine for an average.
BalancedTopology	IChannel6	Sets and returns the topology of a balanced DUT.
Calibrator	IChannel4	Used to perform an Unguided calibration.
CalSet	IChannel	Change the contents of a Cal Set
centerFrequency	IChannel	Sets or returns the center frequency of the channel. Shared with the Segment Object
channelNumber	IChannel	Returns the Channel number. Shared with the Measurement Object
CoupleChannelParams	IChannel5	Turns ON and OFF Time Domain Trace Coupling.
CouplePorts	IChannel	Turns ON and OFF port power coupling.
CustomChannelConfiguration	IChannel12	Provides access to custom application objects, such as NoiseFigure and GainCompression
CWFrequency	IChannel	Set the Continuous Wave (CW) frequency.
DwellTime	IChannel	Sets or returns the dwell time for the channel. Shared with the Segment Object
ErrorCorrection	IChannel7	Attempts to sets error correction ON or OFF for all of the measurements on the channel.
ExternalTriggerDelay	IChannel6	Sets or returns the external trigger delay value for the channel.
Fixturing	IChannel6	Port Ext, Embedding, and De-embedding functions.
FOM Collection	IChannel9	Configure Frequency Offset Measurements

FrequencyOffsetDivisor	IChannel2	
FrequencyOffsetFrequency	IChannel2	
FrequencyOffsetMultiplier	IChannel2	**Superseded** with FOM and FOMRange
FrequencyOffsetCWOverride	IChannel2	
FrequencyOffsetState	IChannel2	
FrequencySpan	IChannel	Sets or returns the frequency span of the channel. Shared with the Segment Object.
IFBandwidth	IChannel	Sets or returns the IF Bandwidth of the channel. Shared with the Segment Object.
IFConfiguration	IChannel4	Control the IF gain and source path settings for the H11 Option.
IsContinuous	IChannel3	Returns whether or not a channel is in continuous mode.
IsHold	IChannel3	Returns whether or not a channel is in hold mode.
NumberOfPoints	IChannel	Sets or returns the Number of Points of the channel. Shared with the Segment Object.
Parent	IChannel	Returns a handle to the parent object of the channel.
PowerSlope	IChannel	Sets or returns the Power Slope value.
R1InputPath	IChannel2	Throws internal reference switch (option 081).
ReceiverAttenuator	IChannel	Sets or returns the value of the specified receiver attenuator control.
ReduceIFBandwidth	IChannel5	Sets or returns the state of the Reduced IF Bandwidth at Low Frequencies setting.
Segments	IChannel	Collection for iterating through the sweep segments of a channel.
SourcePortMode	IChannel9	Sets the state of the PNA sources. (AUTO | ON | OFF)
SourcePowerCalPowerOffset	IChannel4	Sets or returns a power level offset from the PNA test port power.
SourcePowerCorrection	IChannel	Turns source power correction ON or OFF for a specific source port.

StartFrequency	IChannel	Sets or returns the start frequency of the channel. Shared with the Segment Object
StartPower	IChannel	Sets the start power of the analyzer when sweep type is set to Power Sweep.
StopFrequency	IChannel	Sets or returns the stop frequency of the channel. Shared with the Segment Object
StopPower	IChannel	Sets the Stop Power of the analyzer when sweep type is set to Power Sweep.
SweepGenerationMode	IChannel	Sets the method used to generate a sweep: continuous ramp (analog) or discrete steps (stepped).
SweepTime	IChannel	Sets the Sweep time of the analyzer.
SweepType	IChannel	Sets the type of X-axis sweep that is performed on a channel.
TestPortPower	IChannel	Sets or returns the RF power level for the channel. Shared with the Segment Object
TriggerMode	IChannel	Determines the measurement that occurs when a trigger signal is sent to the channel.
UserRangeMax	IChannel	Sets the stimulus stop value for the specified User Range.
UserRangeMin	IChannel	Sets the stimulus start value for the specified User Range.
XAxisPointSpacing	IChannel	Sets X-Axis point spacing for the active channel.

IChannel History

Interface	Introduced with PNA Rev:
IChannel	1.0
IChannel2	3.0
IChannel3	4.0
IChannel4	4.0
IChannel5	4.2
IChannel6	5.0
IChannel7	5.2

IChannel8	6.0
IChannel9	7.0
IChannel10	7.2
IChannel11	7.5
IChannel12	8.0

ISourcePowerCalData Interface

Description

Contains methods for putting source power calibration data in and getting source power calibration data out of the analyzer using typed data. The methods in this interface transfer data more efficiently than methods that use variant data. However, this interfaces is only usable from VB6, C, & C++. All other programming languages must use the methods on the Channel Object.

Note: Interface **ISourcePowerCalData** is abbreviated as **ISPCD** in the following table.

Methods	Interface See History	Description
getSourcePowerCalDataScalar	ISPCD	**Superseded with** - use PutSourcePowerCalDataScalarEx Method
getSourcePowerCalDataScalarEx	**ISPCD2**	Returns requested source power calibration data, if it exists.
putSourcePowerCalDataScalar	ISPCD	**Superseded with** - use PutSourcePowerCalDataEx Method
putSourcePowerCalDataScalarEx	**ISPCD2**	Inputs source power calibration data to a channel, for a specific source port.
Properties		**Description**
None		

ISourcePowerCalData History

Interface	Introduced with PNA Rev:
ISourcePowerCalData	2.0
ISourcePowerCalData2	4.0

Channels Collection

Description

A collection object that provides a mechanism for iterating through the channels

Collections are, by definition, unordered lists of like objects. You cannot assume that Channels.Item(1) is always Channel 1.

Accessing the Channels collection

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim chans As Channels
Set chans = app.Channels
```

See Also:

- **Channel Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	Interface	Description
Add	IChannels	An alternate way to create a measurement.
Hold	IChannels	Places all channels in Hold trigger mode.
Item	**IChannels2**	Use to get a handle on a channel in the collection.
Resume	**IChannels2**	Resumes the trigger mode of all channels that was in effect before sending the channels.Hold method.

Properties		Description
Count	IChannels	Returns the number of channels in the analyzer.
Parent	IChannels	Returns a handle to the current Application.
UnusedChannelNumbers	**IChannels2**	Returns an array of channel numbers that are NOT in use.
UsedChannelNumbers	**IChannels2**	Returns an array of channel numbers that are in use.

E5091Testsets Collection

Description

Two testsets can be connected and controlled by the PNA at any time.

The item number in the testsets collection is set by the DIP switches on the testset rear-panel. The valid item numbers are 1 and 2. If the testset DIP switches are set to 1, then item number in the collection is 1, and so forth. See your E5091A documentation for more information.

If the specified testset is not connected to USB or not ON, then setting Enabled = True will return an error. All other properties can be set when the testset is not connected.

Accessing the E5091Testsets collection

Child of the **Application** Object. Get a handle to one of the E5091Testset objects by specifying an item of the collection.

```
Dim pna
Set pna = CreateObject("AgilentPNA835x.Application")
Dim testsets As E5091Testsets
Set testsets = pna.E5091Testsets
Dim tset1 As E5091Testset
Set tset1 = testsets(1)
```

See Also:

- E5091Testset Control COM Example
- **E5091Testset Object**
- Collections in the Analyzer
- The PNA Object Model

Methods	Description
Item	Use to get a handle to a testset in the collection.
Properties	**Description**
Count	Returns the number of items in a collection of objects.
Parent	Returns a handle to the current naNetworkAnalyzer application.

E5091Testsets History

Interface	Introduced with PNA Rev:
IE5091Testsets	5.2

E5091Testset Object

Description

There can be two test sets connected and controlled by the PNA at any time.

The item number in the testsets collection is set by the DIP switches on the test set rear-panel. The valid item numbers are 1 and 2. If the test set DIP switches are set to 1, then item number in the collection is 1, and so forth. See your E5091A documentation for more information.

If the specified test set is not connected to USB or not ON, then setting Enabled = True will return an error. All other properties can be set when the test set is not connected.

Accessing the E5091Testset object

Child of the **Application** Object. Get a handle to a E5091Testset object by specifying an item of the collection.

```
Dim pna
Set pna = CreateObject("AgilentPNA835x.Application")
Dim testsets As E5091Testsets
Set testsets = pna.E5091Testsets
Dim tset1 As E5091Testset
Set tset1 = testsets(1)
```

See Also:

- E5091Testset Control COM Example
- E5091 TestSet Control
- E5091Testsets Collection
- TestsetControl Object (for different test sets)
- The PNA Object Model

Methods	Description
None	

Properties	Description
ControlLines	Sets the control lines of the specified E5091A.
Enabled	Enables and disables (ON/OFF) the port mapping and control line output of the specified testset.
ID	Returns the test set ID number.
NumberOfPorts	Reads the number of ports (7 or 9) that are on the specified E5091A test set.

OutputPort	Switches an input to one of the valid outputs on the specified E5091A.
ShowProperties	Turns ON and OFF the display of the test set control status bar.

E5091Testset History

Interface	Introduced with PNA Rev:
IE5091Testset	5.2

EmbeddedLO Object

Description

Provides access to the properties that allow measurement of mixers that contain an embedded LO.

Accessing the EmbeddedLO Interface

Access the Interface through the IMixer Object.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application")
app.Preset

' FCA Measurements can't share the channel with standard measurements
' Because preset creates a single measurement in channel 1, we first delete the
standard measurement
Dim standardMeas As IMeasurement
Set standardMeas = app.ActiveMeasurement
standardMeas.Delete

' Create a Measurement object, in this case using the IMeasurement interface
Dim meas As IMeasurement
Set meas = app.CreateCustomMeasurementEx(1, "SMC_Forward.SMC_ForwardMeas", "SC21")

' See if this measurement object supports IMixer
Dim mixer As IMixer
Dim embeddedLO
Set embeddedLO = mixer.EmbeddedLO
```

See an example program that shows how to create and calibrate a standard SMC or VMC measurement or a fixed output SMC measurement.

See Also:

PNA Automation Interfaces

The PNA Object Model

Making Embedded LO Measurements

Methods	Interface See History	Description
ResetLOFrequency	IEmbeddedLO	Reset LO Delta frequency.
ResetTuningParameters	IEmbeddedLO	Resets the tuning parameters to their defaults.

Properties		Description
BroadbandTuningSpan	IEmbeddedLO	Set broadband sweep span.
EmbeddedLODiagnostic	IEmbeddedLO	Provides access to the status of tuning sweeps.
IsOn	IEmbeddedLO	Set and return Embedded LO ON | OFF.
LOFrequencyDelta	IEmbeddedLO	Sets and returns LO delta frequency.
MaxPreciseTuningIterations	IEmbeddedLO	Sets and returns precise tuning iterations.
NormalizePoint	IEmbeddedLO	Sets and returns tuning point.
PreciseTuningTolerance	IEmbeddedLO	Sets and returns precise tuning tolerance.
TuningIFBW	IEmbeddedLO	Sets and returns the IF Bandwidth for tuning sweeps.
TuningMode	IEmbeddedLO	Sets and returns the method used to determine the embedded LO Freque
TuningSweepInterval	IEmbeddedLO	Set how often a tuning sweep is performed.

IEmbeddedLO History

Interface	Introduced with PNA Rev:
IEmbeddedLO	7.21

EmbeddedLODiagnostic Object

Description

Allows access to the properties that provide information about the broadband and precise tuning of an embedded LO.

Accessing the EmbeddedLODiagnostic Interface

Access the Interface through the EmbeddedLO Object.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application")
app.Preset

' FCA Measurements can't share the channel with standard measurements
' Because preset creates a single measurement in channel 1, we first delete the
standard measurement
Dim standardMeas As IMeasurement
Set standardMeas = app.ActiveMeasurement
standardMeas.Delete

' Create a Measurement object, in this case using the IMeasurement interface
Dim meas As IMeasurement
Set meas = app.CreateCustomMeasurementEx(1, "SMC_Forward.SMC_ForwardMeas", "SC21")

' See if this measurement object supports IMixer
Dim mixer As IMixer
Dim embeddedLO
Set embeddedLO = mixer.EmbeddedLO

Dim embeddedLODiagnostic
Set embeddedLODiagnostic = embeddedLO.EmbeddedLODiagnostic
```

See an example program that shows how to create and calibrate a standard SMC or VMC measurement or a fixed output SMC measurement.

See Also:

PNA Automation Interfaces

The PNA Object Model

Making Embedded LO Measurements

EmbeddedLO Object

Methods	Interface See History	Description
Clear	IELODiag	Clear current diagnostic information.

Properties		Description
IsMarkerOn	IELODiag	Was a marker was used for a tuning sweep?
LODeltaFound	IELODiag	Returns the LO frequency delta from this tuning sweep.
NumberOfSweeps	IELODiag	Get number of tuning sweeps.
MarkerAnnotation	IELODiag	Get the marker annotation.
MarkerPosition	IELODiag	Get the marker X-axis position.
Parameter	IELODiag	Returns the tuning sweep parameter name.
StatusAsString	IELODiag	Get result of the last tuning sweeps.
StepData	IELODiag	Get a tuning sweep data.
StepTitle	IELODiag	Returns the tuning sweep title.
XAxisAnnotation	IELODiag	Get the tuning sweep X axis annotation.
XAxisStart	IELODiag	Get the Start sweep value.
XAxisStop	IELODiag	Get the Stop sweep value.
YAxisAnnotation	IELODiag	Get the tuning sweep Y axis annotation.

History

Interface	Introduced with PNA Rev:
IEmbeddedLODiagnostic	7.21

ENRFile Object

Description

Provide commands for creating or editing an ENR file. This is rarely necessary as ENR files, which contain factory calibrated data, are typically provided by the manufacturer of the noise source.

Learn more about Noise Figure Application

Accessing the ENRFile object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim enr As ENRFile
Set enr = app.ENRFile
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Program

Methods	Interface See History	Description
GetENRData	IENRFile	Read the ENR calibration data from PNA memory.
PutENRData	IENRFile	Write the ENR calibration data to PNA memory.
LoadENRFile	IENRFile	Recalls an ENR file from disk into PNA Memory.
SaveENRFile	IENRFile	Saves an ENR file from PNA memory to disk.

Properties	Interface See History	Description
ENRID	IENRFile	Sets and returns ID of ENR table.
ENRSN	IENRFile	Sets and returns the serial number of the noise source.

IENRFile History

Interface	Introduced with PNA Rev:
IENRFile	8.0

Last Modified:

2-Aug-2007 MX New topic

Equation Object

Description

Provide commands for creating an equation.

[Learn more about Equation Editor]

Accessing the Equation object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim eq As Equation
Set eq = app.Equation
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model

Methods	Interface See History	Description

None

Properties	Interface See History	Description
Text	IEquation	Sets the Equation
State	IEquation	Sets the Equation enabled state
Valid	IEquation	Returns whether the equation is presently valid.

Example Program using these commands:

```
Dim na
Dim meas
Set na = CreateObject("AgilentPNA835x.Application")
Set meas = na.ActiveMeasurement
'Define the measurement
meas.Equation.Text = "mysillyequ=sqrt(AR1_1)"
'Check to see if the equation is valid
valid_e = meas.Equation.Valid
MsgBox valid_e
'Turn on the Equation Editor
meas.Equation.State = True
```

IEquation History

Interface	Introduced with PNA Rev:
IEquation	6.03

Last Modified:

4-Dec-2007	Added example

ExternalTestsets Collection

Description

ExternalTestsets collection provides access to a TestsetControl object. Only one external testset can be controlled by the PNA at any time.

Accessing the ExternalTestsets collection

The ExternalTestsets collection is a property of the main **Application** Object. You can obtain a handle to a testset by specifying an item in the collection.

Visual Basic Example

```
Dim pna
Dim testsets As ExternalTestsets
Dim tset1 As TestsetControl
Set pna = CreateObject("AgilentPNA835x.Application")
Set testsets = pna.ExternalTestsets
Set tset1 = testsets(1)
' make COM calls on tset1 object
End Sub
```

See Also:

ExternalTestset Control COM Example

About External TestSet Control

TestsetControl Object

The PNA Object Model

Methods	Description
Add	Adds a testset to the collection and loads a test set configuration file.
Item	Use to get a handle to a testset in the collection.
TestsetCatalog	Returns a list of supported test sets.
Properties	**Description**
Count	Returns the number of items in a collection of objects.
Parent	Returns a handle to the current naNetworkAnalyzer application.

ExternalTestsets History

Interface	Introduced with PNA Rev:
IExternalTestsets	6.0
IExternalTestsets	6.2

Fixturing Object

Description

Contains the properties for Embedding and De-embedding test fixtures.

Accessing the Fixturing object

```
Dim app as AgilentPNA835x.Application
Dim chan as Channel
Set chan = app.ActiveChannel
Dim fixt as Fixturing
Set fixt = chan.Fixturing
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- About Fixturing
- Example Programs

Methods		Description
AutoPortExtMeasure	IFixturing2	Measures either an OPEN or SHORT standard.
AutoPortExtReset	IFixturing2	Clears old port extension delay and loss data.
Properties	**Interface** See History	**Description**
AutoPortExtConfig	IFixturing2	Sets the frequency span that is used to calculate Automatic Port Extension.
AutoPortExtDCOffset	IFixturing2	Specifies whether or not to include DC Offset as part of Automatic port extension.
AutoPortExtLoss	IFixturing2	Specifies whether or not to include loss correction as part of Automatic Port Extension.
AutoPortExtSearchStart	IFixturing2	Set the start frequency for custom user span.
AutoPortExtSearchStop	IFixturing2	Set the stop frequency for custom user span.

AutoPortExtState	IFixturing2	Enables and disables automatic port extensions on the specified port.
CmnModeZConvPortImag	IFixturing2	Sets imaginary value for common port impedance conversion.
CmnModeZConvPortReal	IFixturing2	Sets real value for common port impedance conversion.
CmnModeZConvState	IFixturing2	Turns ON/OFF common port impedance conversion.
CmnModeZConvPortZ0	IFixturing2	Sets impedance value for common port impedance conversion.
DiffPortMatch_C	IFixturing2	Sets Capacitance value of the differential matching circuit.
DiffPortMatch_G	IFixturing2	Sets Conductance value of the differential matching circuit.
DiffPortMatch_L	IFixturing2	Sets Inductance value of the differential matching circuit.
DiffPortMatch_R	IFixturing2	Sets Resistance value of the differential matching circuit.
DiffPortMatchMode	IFixturing2	Sets type of circuit to embed.
DiffPortMatchUserFilename	IFixturing2	Specifies the 4-port touchstone file for user-defined differential matching circuit.
DiffPortMatchState	IFixturing2	Turns ON/OFF differential matching circuit function.
DiffZConvPortImag	IFixturing2	Sets imaginary value for differential port impedance conversion.
DiffZConvPortReal	IFixturing2	Sets real value for differential port impedance conversion.
DiffZConvPortZ0	IFixturing2	Sets impedance value for differential port impedance conversion.
DiffZConvState	IFixturing2	Turns ON/OFF differential port impedance conversion.
Embed4PortA	IFixturing2	Returns PNA portA connections.
Embed4PortB	IFixturing2	Returns PNA portB connections.
Embed4PortC	IFixturing2	Returns PNA portC connections.

Embed4PortD	IFixturing2	Returns PNA portD connections.
Embed4PortList	IFixturing2	Specifies all PNA port connections.
Embed4PortNetworkFilename	IFixturing2	Specifies *.s4p filename.
Embed4PortNetworkMode	IFixturing2	Specify embed, de-embed, or none.
Embed4PortState	IFixturing2	Turns ON or OFF 4-port Network Embed/De-embed.
Embed4PortTopology	IFixturing2	Specifies the PNA / DUT topology.
FixturingState	IFixturing	Turns Fixturing ON and OFF on this channel.
Port2PdeembedCktModel	IFixturing	Sets and returns the 2 port De-embedding circuit model for the specified port number.
Port2PdeembedState	IFixturing	Turns 2 port de-embedding ON and OFF on this channel.
PortArbzImag	IFixturing3	Sets and returns the imaginary impedance value for the specified single-ended port number.
PortArbzReal	IFixturing3	Sets and returns the real impedance value for the specified single-ended port number.
PortArbzState	IFixturing	Turns single-ended port impedance ON and OFF on the specified channel.
PortArbzZ0	IFixturing3	Sets and returns the real and imaginary impedance value for the specified single-ended port number.
PortDelay	IFixturing	Sets and returns the Port Delay value for the specified port number.
PortExtState	IFixturing	Turns Port Extension ON and OFF on this channel.
PortExtUse1	IFixturing	Sets and returns the USE1 ON/OFF state for the Loss1 and Freq1 values for the specified port number.
PortExtUse2	IFixturing	Sets and returns the USE2 ON/OFF state for the Loss2 and Freq2 values for the specified port number.
PortFreq1	IFixturing	Sets and returns the 1st Port Frequency value for the specified port number.

PortFreq2	IFixturing	Sets and returns the 2nd Port Frequency value for the specified port number.
PortLoss1	IFixturing	Sets and returns the 1st Port Loss value for the specified port number.
PortLoss2	IFixturing	Sets and returns the 2nd Port Loss value for the specified port number.
PortLossDC	IFixturing	Sets and returns the Port Loss at DC value for the specified port number.
PortMatching_C	IFixturing	Sets and returns the Capacitance, 'C' value for the specified port number.
PortMatching_G	IFixturing	Sets and returns the Conductance, 'G' value for the specified port number.
PortMatching_L	IFixturing	Sets and returns the Inductance, 'L' value for the specified port number.
PortMatching_R	IFixturing	Sets and returns the Resistance, 'R' value for the specified port number.
PortMatchingCktModel	IFixturing	Sets and returns the Port Matching circuit model for the specified port number.
PortMatchingState	IFixturing	Turns Port Matching ON and OFF on this channel.
strPort2Pdeembed_S2PFile	IFixturing	Sets and returns the 2 port De-embedding 'S2P' file name for the specified port number.
strPortMatch_S2PFile	IFixturing	Sets and returns the Port Matching 'S2P' file name for the specified port number.

IFixturing History

Interface	Introduced with PNA Rev:
IFixturing	5.0
IFixturing2	5.2
IFixturing3	5.25

FOM Collection

Description

The FOM collection provides access to the source and receiver range objects which are used for configuring frequency offset measurements.

The FOM range items are typically numbered as follows:

1. Primary
2. Source
3. Receivers
4. Source2 (if present)

Accessing the FOM Collection and FOMRange objects

```
Dim app as AgilentPNA835x.Application
Dim chan as Channel
Set chan = app.ActiveChannel

Dim ifom as FOM
Set ifom = chan.FOM

ifom.item(2).Coupled = false
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- About FOM
- Example Programs

Method	Interface [See History](#)	Description
[Item](#)	IFOM	

Property	Interface	Description
[DisplayRange](#)	IFOM	Sets the range to be displayed on the PNA x-axis.
[FOMRange](#)	IFOM	Object
[RangeCount](#)	IFOM	Returns the number of FOM ranges available on the PNA.
[State](#)	IFOM	Turns Frequency Offset ON and OFF.

FOM History

Interface	Introduced with PNA Rev:
IFOM	7.10

Last Modified:

8-Mar-2007 Modified Access

FOMRange Object

Description

The FOM Range object provides access to the properties and methods for configuring a specific Range for frequency offset measurements.

Accessing an FOMRange object

Get a handle to a FOM Range by specifying an item in the FOM collection.

The FOM range items are typically numbered as follows:

1. Primary
2. Source
3. Receivers
4. Source2 (if present)

```
Dim app as AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim ranges as FOM
Set ranges = app.ActiveChannel.FOM
ranges.item(2).Coupled = False
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- About FOM
- Example Programs

Method	Interface See History	Description

None

Property	Interface	Description
Coupled	IFOMRange	Sets and returns the state of coupling (ON or OFF) of this range to the primary range.
CWFrequency	IFOMRange	Set the Continuous Wave (CW) frequency.
Divisor	IFOMRange	Sets and returns the Divisor value to be used when coupling this range to the primary range.
Multiplier	IFOMRange	Sets and returns the Multiplier value to be used when coupling this range to the primary range.
Name	IFOMRange	Returns the name of this FOM range object.
Offset	IFOMRange	Sets and returns the offset value to be used when coupling this range to the primary range.
rangeNumber	IFOMRange	Returns the index number of the range within the FOM collection.
Segments	IFOMRange	Collection - Used to add segment sweep capability to a range.
StartFrequency	IFOMRange	Sets or returns the start frequency of this FOM Range.
StopFrequency	IFOMRange	Sets or returns the stop frequency of this FOM Range.
Sweep Type	IFOMRange	Sets the type of range sweep.

Note: Use the Start Power and Stop Power settings from the channel object.

FOM History

Interface	Introduced with PNA Rev:
IFOM	7.10

Last Modified:

7-Jan-2008	Added Start/Stop power note
7-Mar-2007	Modified Receivers

Gain Compression Object

Description

Controls the Gain Compression Application settings.

Accessing the GainCompression object

```
Dim app as AgilentPNA835x.Application
app.CreateCustomMeasurementEx(1, "Gain Compression", "CompIn21", 1)
Dim GCA
Set GCA = app.ActiveChannel.CustomChannelConfiguration
```

See Also:

- **Example Program** Create and Cal a Gain Compression Measurement
- GainCompressionCal Object
- About Gain Compression Application
- PNA Automation Interfaces
- The PNA Object Model

Note: Set the Start/Stop Frequency and Start/Stop Power Settings using the Channel Object.

Method	Interface See History	Description
GetRaw2DData	IGainCompression	Reads Gain Compression data from specified location.
GetDataIm	IGainCompression	Reads Imaginary part of specified frequency or power points.
GetDataRe	IGainCompression	Reads REAL part of specified frequency or power points.
SetPortMap	IGainCompression	Maps the PNA ports to the DUT ports
Property	**Interface**	**Description**

AcquisitionMode	IGainCompression	Set and read the method by which gain compression data is acquired.
CompressionAlgorithm	IGainCompression	Set and read the algorithm method used to compute gain compression.
CompressionBackoff	IGainCompression	Set and read value for the BackOff compression algorithm.
CompressionDeltaX	IGainCompression	Set and read the 'X" value in the delta X/Y compression algorithm.
CompressionDeltaY	IGainCompression	Set and read the 'Y" value in the delta X/Y compression algorithm.
CompressionInterpolation	IGainCompression	Sets whether or not to interpolate the final power level when the measured compression level deviates from the specified level.
CompressionLevel	IGainCompression	Set and read the decrease in gain which indicates that the amplifier is compressing.
DeviceInputPort	IGainCompression	Set and read the PNA port number which is connected to the DUT input.
DeviceOutputPort	IGainCompression	Set and read the PNA port number which is connected to the DUT Output.
EndOfSweepOperation	IGainCompression	Set and read the action which should be taken at the end of the last frequency or power sweep in the measurement.
InputLinearPowerLevel	IGainCompression	Set and read the input power level that should produce linear gain.
MaximumNumberOfPoints	IGainCompression	Returns the maximum possible number of data points.
NumberOfFrequencyPoints	IGainCompression	Set and read the number of data points in each frequency sweep.
NumberOfPowerPoints	IGainCompression	Set and read the number of data points in each power sweep.
ReverseLinearPowerLevel	IGainCompression	Set and read the reverse power level to the DUT.

SafeSweepCoarsePowerAdjustment	IGainCompression	Set and read the Safe Sweep COURSE power adjustment.
SafeSweepEnable	IGainCompression	Set and read the (ON | OFF) state of Safe Sweep mode.
SafeSweepFinePowerAdjustment	IGainCompression	Set and read the Safe Sweep FINE power adjustment.
SafeSweepFineThreshold	IGainCompression	Set and read the compression level in which Safe Sweep changes from the COARSE power adjustment to the FINE power adjustment.
SearchFailures	IGainCompression	Read number of points that did not achieve compression.
SmartSweepMaximumIterations	IGainCompression	Set and read the maximum number of iterations to be used to find the compression level in a SMART sweep.
SmartSweepSettlingTime	IGainCompression	Set and read SMART sweep settling time.
SmartSweepShowIterations	IGainCompression	Set and read whether to show results for each SMART sweep iteration.
SmartSweepTolerance	IGainCompression	Set and read the level of tolerance to be used to find the compression level in a SMART sweep.
TotalNumberOfPoints	IGainCompression	Set and read the total number of data points.(Freq x Power)

IGainCompression History

Interface	Introduced with PNA Rev:
IGainCompression	8.0

Last Modified:

11-Sep-2007 MX New topic

Gain CompressionCal Object

Description

Sets properties that are unique to a Gain Compression Cal (opt 086).

The remaining commands to perform a GCA Cal use the Guided Calibration commands.

Accessing the GainCompressionCal object

```
Dim app as AgilentPNA835x.Application
Set GCAcal = pna.GetCalmanager.CreateCustomCalEx(channelNum)
Set GCACalExtension = GCAcal.CustomCalConfiguration
GCACalExtension.PowerLevel = 5
```

See Also:

- **Example Program** Create and Cal a Gain Compression Measurement
- GainCompression Object
- About Gain Compression Application
- The PNA Object Model
- PNA Automation Interfaces

Method	Interface See History	Description
None		

Property	Interface	Description
PowerLevel	IGainCompressionCal	Set and read the power level of the source power cal.

IGainCompressionCal History

Interface	Introduced with PNA Rev:
IGainCompressionCal	8.0

Last Modified:

27-Nov-2007 MX New topic

Gating Object

Description

Contains the methods and properties that control Time Domain Gating.

Accessing the Gating Object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim gate As Gating
Set gate = app.ActiveMeasurement.Gating
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Time Domain Topics
- Example Programs

Methods
None

Properties	Interface (see History)	Description
Center	IGating	Sets or returns the Center time. Shared with the Transform Object
CoupledParameters	**IGating2**	Select Gating parameters to couple
Shape	IGating	Specifies the shape of the gate filter.
Span	IGating	Sets or returns the Span time. Shared with the Transform Object
Start	IGating	Sets or returns the Start time. Shared with the Transform Object
State	IGating	Turns an Object ON and OFF.

Stop	IGating	Sets or returns the Stop time. Shared with the Transform Object
Type	IGating	Specifies the type of gate filter used.

History

Interface	Introduced with PNA Rev:
IGating	1.0
IGating2	4.2

GuidedCalibration Object

Description

Contains the methods and properties used to perform a Guided Calibration.

A Guided Calibration must be performed on the Active Channel. To activate a channel, activate any measurement on that channel. Do this using meas.Activate, which requires you already have a handle to the measurement.

Note: ECal orientation is performed using the OrientECALModule_Property and ECALPortMapEx_Property on the Calibrator Object.

Accessing the GuidedCalibration object

```
Dim app as AgilentPNA835x.Application
Dim CalMgr
Set CalMgr = App.GetCalManager
Dim guidedCal
Set guidedCal = CalMgr.GuidedCalibration
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods		Description
AcquireStep	IGuidedCalibration	Acquire data for a cal step.
ApplyDeltaMatchFromCalSet Method	IGuidedCalibration2	Apply a cal as Delta Match Cal.
GenerateErrorTerms	IGuidedCalibration	Generates the error terms for the calibration.
GenerateGlobalDeltaMatchSequence	IGuidedCalibration2	Initiates a global delta match calibration.
GenerateSteps	IGuidedCalibration	Request to generate a connection list and return the number of steps required.
GetIsolationPaths	IGuidedCalibration3	Gets the list of port pairings for which isolation standards will be measured during calibration.
GetStepDescription	IGuidedCalibration	Query description of a step.

Initialize	IGuidedCalibration	Initial setup with channel context for the remote cal object.
SetIsolationPaths	IGuidedCalibration3	Sets the list of port pairings for which isolation standards will be measured during calibration.
SetupMeasurementsForStep	IGuidedCalibration4	Show the Cal Window, or custom Cal Window, before acquiring a Cal standard.

Properties	**Interface** See History	**Description**
CalKitType	IGuidedCalibration	Sets the cal kit for the port.
CompatibleCalKits	IGuidedCalibration	Returns the list of cal kits for the port.
ConnectorType	IGuidedCalibration	Sets the connector type for the port.
IsolationAveragingIncrement	IGuidedCalibration3	Value by which to increment the channel's averaging factor during measurement of isolation standards.
PathCalMethod	IGuidedCalibration3	Specifies the calibration method for each port pair.
PathThruMethod	IGuidedCalibration3	Specifies the calibration **THRU** method for each port pair.
PortsNeedingDeltaMatch	IGuidedCalibration2	Returns port numbers that need delta match cal.
ThruCalMethod	IGuidedCalibration	**Superseded with** PathCalMethod and PathThruMethod
ThruPortList	IGuidedCalibration	Sets the thru connection port pairs.
UseCalWindow	IGuidedCalibration	Turns Cal window ON or OFF
ValidConnectorTypes	IGuidedCalibration	Gets Valid Connector Types.

IGuidedCalibration History

Interface	Introduced with PNA Rev:
IGuidedCalibration	5.0
IGuidedCalibration2	5.25
IGuidedCalibration3	7.11
IGuidedCalibration4	8.0

Last Modified:

9-Nov-2007 Added Setup command and Activate note

HWAuxIO Object

Description

Contains the methods and properties that control the rear panel Auxiliary Input / Output connector.

Note: PNA-X models do NOT have this connector. However, the get/put Input/Output voltage commands can be used on the PNA-X to control ADC voltages on the Power I/O connector: Sending other Control:AUX commands to a PNA-X may result in unusual behavior.

Accessing the HWAuxIO object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim AuxIO As HWAuxIO
Set AuxIO = app.GetAuxIO
```

See Also:

- Pinout of the Aux IO Connector
- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Interface See History	Description
get_InputVoltage	IHWAuxIO	**Superseded** by get InputVoltageEX
get InputVoltageEX	**IHWAuxIO5**	Reads the ADC input voltage
get_OutputVoltage	IHWAuxIO	Reads ADC output voltages.
get_OutputVoltageMode	**IHWAuxIO2**	Reads mode setting for either DAC output.
get_PortCData	IHWAuxIO	Reads a 4-bit value from Port C
put_OutputVoltage	IHWAuxIO	Writes voltages to the DAC/Analog Output 1 and Output 2
put_OutputVoltageMode	**IHWAuxIO2**	Writes the mode setting for either DAC output.
put_PortCData	IHWAuxIO	Writes a 4-bit value to Port C

Properties		Description
FootSwitch	IHWAuxIO	Reads the Footswitch Input
FootswitchMode	**IHWAuxIO3**	Determines the action that occurs when the footswitch is pressed.
PassFailLogic	IHWAuxIO	Sets and reads the logic of the PassFail line Shared with the HWMaterialHandler Object
PassFailMode	IHWAuxIO	Sets and reads the mode of the PassFail line Shared with the HWMaterialHandler Object
PassFailPolicy	**IHWAuxIO4**	Sets the policy used to determine how global pass/fail is computed. Shared with the HWMaterialHandler Object
PassFailScope	IHWAuxIO	Sets and reads the scope of the PassFail line Shared with the HWMaterialHandler Object
PassFailStatus	**IHWAuxIO4**	Returns the most recent pass/fail status value. Shared with the HWMaterialHandler Object
PortCLogic	HWAuxIO	Sets and reads the logic mode of Port C
PortCMode	HWAuxIO	Sets and reads the mode of Port C
SweepEndMode	HWAuxIO	Sets and reads the event that causes the Sweep End line to go to a false state. Shared with the HWMaterialHandler Object

IHWAuxIO History

Interface	Introduced with PNA Rev:
IHWAuxIO	2.0
IHWAuxIO2	3.0
IHWAuxIO3	3.0
IHWAuxIO4	5.0
IHWAuxIO5	7.5

Last Modified:

10-Jul-2007	Added new command
29-Jun-2007	Updated for PNA-X ADC commands

HWExternalTestSetIO Object

Description

Contains the methods and properties that control the rear panel External Test Set Input / Output connector

Accessing the HWExternalTestSetIO object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim ExtTS As HWExternalTestSetIO
Set ExtTS = app.GetExternalTestSetIO
```

See Also:

- Pinout of the Aux IO Connector
- Pinout for the External Test Set Connector
- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Description
ReadData	Reads data and generates the appropriate timing signals
ReadRaw	Reads data, but does NOT generate appropriate timing signals
WriteData	Writes data and generates the appropriate timing signals
WriteRaw	Writes data, but does NOT generate the appropriate timing signals

Properties	Description
Interrupt	Returns the state of the Interrupt line
SweepHoldOff	Returns the state of the Sweep Holdoff line

IHWExternalTestSetIO History

Interface	Introduced with PNA Rev:
HWExternalTestSetIO	2.0

HWMaterialHandlerIO Object

Description

Contains the methods and properties that control the rear panel Material Handler Input / Output connector.

Accessing the HWMaterialHandlerIO object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim MatHdlr As HWMaterialHandlerIO
Set MatHdlr = app.GetMaterialHandlerIO
```

See Also:

- Pinout for the Material HandlerIO Connector
- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Interface	Description
get_Input1	HWMaterialHandlerIO	Reads a hardware latch that captures low to high transition on Input1
get_Output	HWMaterialHandlerIO	Returns the last value written to the selected output pin.
get_Port	HWMaterialHandlerIO	Returns the value from the specified "readable" port.
put_Output	HWMaterialHandlerIO	Writes a TTL HI or TTL Low to output pins 3 or 4.
put_Port	HWMaterialHandlerIO	Writes a value to the specified port.
Properties		**Description**
IndexState	**HWMaterialHandlerIO2**	Determines the control of Material Handler connector Pin 20
ReadyForTriggerState	**HWMaterialHandlerIO2**	Determines the control of Material Handler connector Pin 21

PassFailLogic	HWMaterialHandlerIO	Sets and reads the logic of the PassFail line Shared with the HWAuxIO Object
PassFailMode	HWMaterialHandlerIO	Sets and reads the mode for the PassFail line Shared with the HWAuxIO Object
PassFailPolicy	**HWMaterialHandlerIO2**	Sets the policy used to determine how global pass/fail is computed. Shared with the HWAuxIO Object
PassFailScope	HWMaterialHandlerIO	Sets and reads the scope for the PassFail line Shared with the HWAuxIO Object
PassFailStatus	**HWMaterialHandlerIO2**	Returns the most recent pass/fail status value. Shared with the HWAuxIO Object
PortLogic	HWMaterialHandlerIO	Sets and returns the logic mode of data ports A-H
PortMode	HWMaterialHandlerIO	Sets and returns whether Port C or Port D is used for writing or reading data
SweepEndMode	HWMaterialHandlerIO	Sets and reads the event that cause the Sweep End line to go to a low state. Shared with the HWAuxIO Object

HWMaterialHandlerIO History

Interface	Introduced with PNA Rev:
HWMaterialHandlerIO	2.0
HWMaterialHandlerIO2	5.0

IFConfiguration Object

Description

These properties control the IF gain and source path settings for the following:

- E836x Opt H11 - all IFConfiguration and IFConfiguration2 commands
- PNA-X - IFConfiguration3 commands ONLY

Accessing the IFConfiguration object

```
Dim app as AgilentPNA835x.Application
Dim chan as Channel
Set chan = app.ActiveChannel
Dim cfg as IIFConfiguration
Set cfg = chan.IFConfiguration
```

See Also:

- SignalProcessingModuleFour Object (PNA-X ONLY)
- PulseGenerator Object (PNA-X ONLY)
- IF Path Configuration (PNA-X ONLY)
- IF Access User Interface Settings
- PNA Automation Interfaces
- The PNA Object Model
- Pulsed Application
- Pulsed Measurement Example

Methods	Description
None	

Properties	Interface See History	Description
IFFilterSampleCount	IFConfiguration2	Sets or returns the number of taps in the IF filter.
IFFilterSamplePeriod	IFConfiguration2	Sets or returns the IF filter sample period time.
IFFilterSamplePeriodList	IFConfiguration2	Returns the list of available IF filter sample periods for the instrument.
IFFilterSamplePeriodMode	IFConfiguration2	Sets or returns the IF filter sample period mode.(Auto or Manual).
IFFilterSource	IFConfiguration2	Sets or retrieves type of IF filter to be used.
IFFrequency	IFConfiguration3	Sets IF frequency in manual mode.
IFFrequencyMode	IFConfiguration3	Sets IF frequency mode to automatic or manual.
IFGainLevel	IFConfiguration	Sets the gain level for the specified receiver.
IFGainMode	IFConfiguration	Sets the gain state for ALL receivers.
IFGateEnable	IFConfiguration2	Sets or retrieves the state of the IF Gate.
IFSourcePath	IFConfiguration	Sets the source path of the specified receiver to Internal or External.
MaximumIFFilterSampleCount	IFConfiguration2	Returns the maximum allowed value for the IFFilterSampleCount.
MinimumIFFilterSampleCount	IFConfiguration2	Returns the minimum allowed value for the IFFilterSampleCount.
MaximumIFFrequency	IFConfiguration3	Returns the maximum IF frequency setting
MinimumIFFrequency	IFConfiguration3	Returns the minimum IF frequency setting

IFConfiguration History

Interface	Introduced with PNA Rev:
IIFConfiguration	4.0
IIFConfiguration2	4.0
IIFConfiguration3	7.2

IMixer Interface (Option 083)

Description

Contains the methods and properties to setup FCA Mixer measurements. For performing calibrations, use either the SMC Type Object or the VMC Type Object .

Accessing the IMixer Interface

Access the IMixer Interface through the Measurement Object. If the particular type of Measurement that was created supports IMixer, then the program determines this at run time and can access the functionality exposed by IMixer. Because the determination of IMixer support is not made until runtime, the program should handle the case where IMixer is not supported on the object.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", "analyzerName ")
app.Preset

' FCA Measurements can't share the channel with standard measurements
' Because preset creates a single measurement in channel 1, we first delete the
standard measurement
Dim standardMeas As IMeasurement
Set standardMeas = app.ActiveMeasurement
standardMeas.Delete

' Create a Measurement object, in this case using the IMeasurement interface
Dim meas As IMeasurement
Set meas = app.CreateCustomMeasurementEx(1, "SMC_Forward.SMC_ForwardMeas", "SC21")

' See if this measurement object supports IMixer
Dim mixer As IMixer
```

See an example program that shows how to create and calibrate a standard SMC or VMC measurement or a fixed output SMC measurement.

See Also:

PNA Automation Interfaces

The PNA Object Model

Methods	**Interface** See History	**Description**
Apply	**IMixer3**	Applies mixer settings.
Calculate	IMixer	Automatically calculate Input and Output frequencies for mixer setup.
LoadFile	IMixer	Loads a previously-configured mixer attributes file (**.mxr**)

SaveFile	IMixer	Saves the settings for the mixer/converter test setup to a mixer attributes file

Properties		Description
ActiveXAxisRange	**IMixer3**	Sets or returns the swept parameter to display on the X-axis.
AvoidSpurs	IMixer	Sets and returns the state of the avoid spurs feature.
EmbeddedLO	**IMixer7**	Provides measurements of mixers with an embedded LO.
IFDenominator	IMixer	Sets or returns the denominator value of the IF Fractional Multiplier.
IFNumerator	IMixer	Sets or returns the numerator value of the IF Fractional Multiplier.
IFSideband	IMixer	Sets or returns the value of the IF sideband.
IFStartFrequency	IMixer	Returns the start frequency of the mixer IF.
IFStopFrequency	IMixer	Returns the stop frequency of the mixer IF.
InputDenominator	IMixer	Sets or returns the denominator value of the Input Fractional Multiplier.
InputFixedFrequency	**IMixer6**	Sets or returns the mixer fixed Input frequency value.
InputNumerator	IMixer	Sets or returns the numerator value of the Input Fractional Multiplier.
InputPower	IMixer	Sets or returns the value of the Input Power.
InputRangeMode	**IMixer6**	Sets or returns the Input sweep mode.
InputStartFrequency	IMixer	Sets or returns the start frequency of the mixer input.
InputStopFrequency	IMixer	Sets or returns the stop frequency of the mixer input.
IsInputGreaterThanLO	**IMixer2**	Specifies whether to use the Input frequency that is greater than the LO or l
LODenominator	IMixer	Sets or returns the denominator value of the LO Fractional Multiplier.
LOFixedFrequency	IMixer	Sets or returns the fixed frequency of the specified LO.
LOName	IMixer	Sets or returns the LO name.
LONumerator	IMixer	Sets or returns the numerator value of the LO Fractional Multiplier.
LOPower	IMixer	Sets or returns the value of the LO Power.
LORangeMode	**IMixer3**	Sets or returns the LO sweep mode to fixed or swept.
LOStage	IMixer	Returns the number of stages.

LOStartFrequency	**IMixer3**	Sets or returns the start frequency of the specified LO.
LOStopFrequency	**IMixer3**	Sets or returns the start frequency of the specified LO.
NominalIncidentPowerState	**IMixer4**	Toggles Nominal Incident Power ON and OFF.
OutputFixedFrequency	**IMixer3**	Sets or returns the fixed frequency of the mixer output.
OutputRangeMode	**IMixer6**	Sets or returns the Output sweep mode.
OutputSideband	IMixer	Sets or returns the value of the output sideband.
OutputStartFrequency	IMixer	Sets or returns the start frequency of the mixer output.
OutputStopFrequency	IMixer	Sets or returns the stop frequency of the mixer output.

IMixer History

Interface	Introduced with PNA Rev:
IMixer	1.0
IMixer2	3.5
IMixer3	4.0
IMixer4	4.8
IMixer5	6.04
IMixer6	6.20
IMixer7	7.21

InterfaceControl Object

Description

Contains the methods and properties that support Interface Control.

Accessing the InterfaceControl object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim IntControl As InterfaceControl
Set IntControl = app.InterfaceControl
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Interface Control Feature
- Example Programs

Methods	Interface	Description
ConfigurationFile	InterfaceControl	Recalls an Interface Control file
Properties		**Description**
State	InterfaceControl	Turns Interface Control ON and OFF

InterfaceControl History

Interface	Introduced with PNA Rev:
InterfaceControl	5.2

Limit Test Collection

Description

Child of the **Measurement** Object. A collection that provides a mechanism for iterating through the Measurement's Limit Segment objects (Limit Lines). The collection has 100 limit lines by default.

Accessing the LimitTest collection

Get a handle to an individual limit segment by specifying an item of the LimitTest collection.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim limSegs As LimitTest
Set limSegs = app.ActiveMeasurement.LimitTest
limSegs.Item(1).BeginResponse = 1000000000#
```

See Also:

- **LimitSegment Object**
- Collections in the Analyzer
- The PNA Object Model
- Limit Line Testing Example

Methods	Description
GetTestResult	Retrieves the Pass/Fail results of the Limit Test (State).
Item	Use to get a handle on a limit line in the collection.

Properties	Description
Count	Returns the number of limit lines used in the measurement.
LineDisplay	Displays the limit lines on the screen.
SoundOnFail	Enables a beep on Limit Test fails.
State	Turns ON and OFF limit testing.

LimitTest History

Interface	Introduced with PNA Rev:
ILimitTest	1.0

LimitSegment Object

Description

The LimitSegment object is an individual limit line.

Accessing the LimitSegment object

Get a handle to an individual limit line by using the LimitTest collection.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim limSegs As LimitTest
Set limSegs = app.ActiveMeasurement.LimitTest
limSegs(1).BeginResponse = 1000000000#
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Description
None	

Properties	Description
BeginResponse	Specifies the Y-axis value that corresponds with Begin Stimulus (X-axis) value.
BeginStimulus	Specifies the beginning X-axis value of the Limit Line.
EndResponse	Specifies the Y-axis value that corresponds with End Stimulus (X-axis) value.
EndStimulus	Specifies the End X-axis value of the Limit Line.
Type	Specifies the Limit Line type.

LimitSegment History

Interface	Introduced with PNA Rev:
ILimitSegment	1.0

Marker Object

Description

Contains the methods and properties that control Markers. There are 10 markers available per measurement:

- 1 reference marker
- 9 markers for absolute data or data relative to the reference marker (delta markers).

There are two ways to control markers through COM.

1. The Measurement object has properties that apply to ALL of the markers for that measurement. For example, **meas.MarkerFormat = naLinMag** applies formatting to all markers.

2. Marker object properties override the Measurement object properties. For example, you can then override the format setting for an individual marker by specifying **mark.Format = naLogMag** on the marker object.

Note: SearchFilterBandwidth is available through the measurement object.

Accessing the Marker object

To turn ON a marker, get a handle to the marker through the measurement object. If not already activated, this command will turn ON marker 1

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

app.ActiveMeasurement.marker(1).Format = naLinMag
```

You can also set the marker object to an object variable:

```
Dim m1 As Marker
Set m1 = app.ActiveMeasurement.Marker(1)
m1.Format = naMarkerFormat_LinMag
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Interface	Description
Activate	IMarker	Makes an object the Active Object. Shared with the Marker Object
SearchMax	IMarker	Searches the marker domain for the maximum value.

SearchMin	IMarker	Searches the marker domain for the minimum value.
SearchNextPeak	IMarker	Searches the marker's domain for the next largest peak value.
SearchPeakLeft	IMarker	Searches the marker's domain for the next VALID peak to the left of the marker.
SearchPeakRight	IMarker	Searches the marker's domain for the next VALID peak to the right of the marker.
SearchTarget	IMarker	Searches the marker's domain for the target value.
SearchTargetLeft	IMarker	Moving to the left of the marker position, searches the marker's domain for the target value.
SearchTargetRight	IMarker	Moving to the right of the marker position, searches the marker's domain for the target value.
SetCenter	IMarker	Changes the analyzer's center frequency to the X-axis position of the marker.
SetCW	IMarker	Changes the analyzer to sweep type CW mode and makes the CW frequency the marker's frequency.
SetElectricalDelay	IMarker	Changes the measurement's electrical delay to the marker's delay value.
SetReferenceLevel	IMarker	Changes the measurement's reference level to the marker's Y-axis value.
SetStart	IMarker	Changes the analyzer's start frequency to the X-axis position of the marker.
SetStop	IMarker	Changes the analyzer's stop frequency to the X-axis position of the marker.
Properties		**Description**
Bucket Number	IMarker	Marker data point number
DeltaMarker	IMarker	Makes a marker relative to the reference marker
Distance	**IMarker2**	Sets or returns distance value for time domain trace.
Format	IMarker	Linear, SWR, and so forth
Interpolated	IMarker	Turn marker interpolation ON and OFF
Number	IMarker	Read the number of the active marker
PeakExcursion	IMarker	Sets and reads the peak excursion value for the specified marker.

PeakThreshold	IMarker	Sets peak threshold for the specified marker.
SearchFunction	IMarker	Emulates the Tracking function in the marker search dialog box.
Stimulus	IMarker	Sets and reads the X-Axis value of the marker.
Target Value	IMarker	Sets the target value for the marker when doing Target Searches.
Tracking	IMarker	The tracking function finds the selected search function every sweep.
Type	IMarker	Sets and reads the marker type.
UserRange	IMarker	Assigns the marker to the specified User Range.
UserRangeMax	IMarker	Sets the stimulus stop value for the specified User Range.
UserRangeMin	IMarker	Sets the stimulus start value for the specified User Range.
Value	IMarker	Reads the Y-Axis value of the marker.

Marker History

Interface	Introduced with PNA Rev:
IMarker	1.0
IMarker2	4.2

Measurement Object

See IArrayTransfer Interface for putting and getting typed data.

See IMixer Interface (used with Option 083)

Description

The Measurement object is probably the most used object in the PNA Object Model. A measurement object represents the chain of data processing algorithms that take raw data from the channel and make it ready for display, which then becomes the scope of the Trace object.

A Measurement object is defined by it's parameter (S11, S22, A/R1, B and so forth). The measurement object is associated with a channel which drives the hardware that produces the data that feeds the measurement. The root of a measurement is the raw data. This buffer of complex paired data then flows through a number of processing blocks: error-correction, trace math, phase correction, time domain, gating, formatting. All of these are controlled through the measurement object.

The ACTIVE measurement is the measurement that will be acted upon if you make a setting from the front panel. It is the measurement whose "button" is pressed in the window with the red "active window" frame. If you create a new measurement, that measurement becomes the active measurement.

Therefore, all automation methods with the word "Active" in them refer to the object associated with the Active measurement, whether that object is a Channel, Window, Trace or Limit line.

Learn about the IMeasurement2 Interface for reading stimulus properties.

Accessing the Measurement object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim meas As IMeasurement
Set meas = app.ActiveMeasurement
```

or

```
Set meas = app.Measurements(n)
```

You can access four other objects through the Measurement object: markers, limit test, transform, and gating. For example, because each measurement has its own set of markers, you can set a marker by doing this:

```
Dim meas as measurement
Set meas = app.ActiveMeasurement
meas.marker(1).Stimulus = 900e6
```

IMeasurement2 Interface

Some of the properties and methods for the IMeasurement2 Interface return stimulus values that are set using the channel object. The following is the reason these properties and methods are duplicated.

Every measurement carries with it a snapshot of the stimulus properties of the channel that were in effect when the measurement last acquired data. Therefore, it is the measurement that provides the most accurate stimulus description of its data. Any change made to the channel after the measurement was acquired renders the IChannel interface unreliable in terms of describing the measurement.

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs
- Superseded commands

(**Bold** Methods or Properties provide access to a child object)

Methods	Interface	Description
Activate	IMeasurement	Makes an object the Active Object. Shared with the Marker Object
ActivateMarker	IMeasurement	Makes a marker the Active Marker.
ChangeParameter	IMeasurement	Changes the parameter of the measurement.
DataToDivisor	IMeasurement	**Superseded with** DoReceiverPowerCal Method
DataToMemory	IMeasurement	Stores the active measurement into memory.
Delete	IMeasurement	Deletes the measurement object.
DeleteAllMarkers	IMeasurement	Deletes all of the markers from the measurement.
DeleteMarker	IMeasurement	Deletes a marker from the active measurement.
getData	IMeasurement	Retrieves Complex data from analyzer memory
getDataByString	IMeasurement	Retrieves variant data from the specified location in your choice of formats.
GetFilterStatistics	IMeasurement	Returns all four Filter Statistics
GetReferenceMarker	IMeasurement	Returns a handle to the reference marker.
Get SnPData	IMeasurement3	Returns SnP data.
GetSnpDataWithSpecifiedPorts	IMeasurement7	Returns sNp data for the specified ports.
GetTraceStatistics	IMeasurement	Returns the Trace Statistics.
GetXAxisValues	IMeasurement2	Returns the stimulus values for the measurement.
InterpolateMarkers	IMeasurement	Turns All Marker Interpolation ON and OFF for the measurement.
putDataComplex	IMeasurement	Puts complex data into one of five data buffers.
putDataScalar	IMeasurement	Puts formatted variant data into the measurement results buffer.

SearchFilterBandwidth	IMeasurement	Searches the domain with the current BW target.
WriteSnpFileWithSpecifiedPorts	IMeasurement7	Write sNp data for specified ports to a file.
Properties	**Interface**	**Description**
ActiveMarker	IMeasurement	Returns a handle to the Active Marker object.
BalancedMeasurement	IMeasurement	Sets the measurement type that is used with balanced topologies.
BandwidthTarget	IMeasurement	The insertion loss value at which the bandwidth of a filter is measured.
BandwidthTracking	IMeasurement	Turns Bandwidth Tracking function ON and OFF.
CalibrationName	IMeasurement2	Returns the name of the cal type.
CalibrationType	IMeasurement	**Superseded with** CalibrationTypeID property
CalibrationTypeID	IMeasurement2	Sets or returns the cal type for the current measurement.
Center	IMeasurement2	Returns the stimulus value of the center point for the measurement.
channelNumber	IIMeasurement	Returns the channel number. Shared with the Channel Object
Domain	IMeasurement2	Returns the domain (frequency, time, power) for the measurement.
ElectricalDelay	IMeasurement	Sets electrical delay.
ElecDelayMedium	IMeasurement2	Sets or returns the characteristic of the electrical delay medium.
Equation	IMeasurement6	Access Equation Editor
ErrorCorrection	IMeasurement	Set or get the state of error correction for the measurement.
FilterBW	IMeasurement	Returns the results of the SearchBandwidth method.
FilterCF	IMeasurement	Returns the Center Frequency result of the SearchBandwidth method.
FilterLoss	IMeasurement	Returns the Loss value of the SearchBandwidth method.
FilterQ	IMeasurement	Returns the Q (quality factor) result of the SearchBandwidth method.

Format	IMeasurement	Sets display format.
Gating	IMeasurement	Controls Time Domain Gating.
InterpolateCorrection	IMeasurement	Turns ON and OFF the calculation of new error terms when stimulus values change.
InterpolateNormalization	IMeasurement	**Superseded with** DoReceiverPowerCal Method
IsSparameter	IMeasurement2	Returns true if measurement represents an S-Parameter.
LimitTest	IMeasurement	Collection for iterating through the Limit Segment objects (Limit Lines).
LimitTestFailed	IMeasurement	Returns the results of limit testing
LoadPort	IMeasurement	Returns the load port number associated with an S-parameter reflection measurement.
LogMagnitudeOffset	IMeasurement	**Superseded with** DoReceiverPowerCal Method
MagnitudeOffset	IMeasurment4	Offsets the magnitude of the entire data trace to a specified value.
MagnitudeSlopeOffset	IMeasurment4	Offsets the magnitude of the data trace to a value that changes linearly with frequency.
Marker	IMeasurement	Contains the methods and properties that control Markers.
MarkerFormat	IMeasurement	Sets or returns the format of all the markers in the measurement.
Marker State	IMeasurement3	Sets or returns the ON / OFF state of a marker.
Mean	IMeasurement	Returns the mean value of the measurement.
Name	IMeasurement	Sets or returns the name of the measurement.
NAWindow	IMeasurement	Controls the part of the display that contains the graticule, or what is written on the display.
Normalization	IMeasurement	**Superseded with** DoReceiverPowerCal Method
Number	IMeasurement	Returns the number of the measurement.
NumberOfPoints	IMeasurement2	Returns the Number of Points of the measurement.
Parameter	IMeasurement	Returns the measurement Parameter.

PeakToPeak	IMeasurement	Returns the Peak to Peak value of the measurement.
PhaseOffset	IMeasurement	Sets the Phase Offset for the active channel.
ReceivePort	IMeasurement2	Returns the receiver port of the measurement.
ReferenceMarkerState	IMeasurement	Turns the reference marker ON or OFF
ShowStatistics	IMeasurement	Displays and hides the measurement statistics (peak-to-peak, mean, standard deviation) on the screen.
Smoothing	IMeasurement	Turns ON and OFF data smoothing.
SmoothingAperture	IMeasurement	Specifies or returns the amount of smoothing as a ratio of the number of data points in the measurement trace.
SourcePort	IMeasurement2	Returns the source port of the measurement.
Span	IMeasurement2	Returns the stimulus span (stop - start) for the measurement.
StandardDeviation	IMeasurement	Returns the standard deviation of the measurement.
Start	IMeasurement2	Returns the stimulus value of the first point for the measurement.
StatisticsRange	IMeasurement	Sets the User Range number for calculating measurement statistics.
Stop	IMeasurement2	Returns the stimulus value of the last point for the measurement.
Trace	IMeasurement	Controls scale, reference position, and reference line.
TraceMath	IMeasurement	Performs math operations on the measurement object and the trace stored in memory.
TraceTitle	IMeasurement8	Writes and reads a trace title.
TraceTitleState	IMeasurement8	Turns trace title ON and OFF
Transform	IMeasurement	Controls Time Domain transforms.
View	IMeasurement	Sets (or returns) the type of trace displayed on the screen
WGCutoffFreq	IMeasurement2	Sets or returns the value of the waveguide cut off frequency

IMeasurement History

Interface	Introduced with PNA Rev:
IMeasurement	1.0
IMeasurement2	3.0
IMeasurement3	4.0
IMeasurement4	4.2
IMeasurement5	5.0
IMeasurement7	6.2

IArrayTransfer Interface

Description

Contains methods for putting data in and getting data out of the analyzer using typed data. This interface transfers data more efficiently than the IMeasurement Interface. However, this interfaces is only usable from VB6, C, & C++.

Methods	Description
getComplex	Retrieves real and imaginary data from the specified buffer.
getNAComplex	Retrieves typed **NAComplex** data from the specified buffer.
getPairedData	Retrieves magnitude and phase data pairs from the specified buffer.
getScalar	Retrieves scalar data from the specified buffer.
putComplex	Puts real and imaginary data into the specified buffer.
putNAComplex	Puts typed **NAComplex** data into the specified buffer.
putScalar	Puts scalar data into the measurement result buffer.

Properties	Description
None	

IArrayTransfer History

Interface	Introduced with PNA Rev:
IArrayTransfer	1.0

Measurement Collection

Description

A collection object that provides a mechanism for iterating through the Application measurements.

Accessing the Measurements collection

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim measments As Measurements
Set measments = app.Measurements
```

See Also:

- **Measurement Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	Description
Add	Adds a Measurement to the collection.
Item	Use to get a handle on a measurement in the collection.
Remove	Removes a measurement from the measurements collection.
Properties	**Description**
Count	Returns the number of measurements in the analyzer.
Parent	Returns a handle to the current Application.

NAWindow Object

Description

The NAWindow object controls the part of the display that contains the graticule, or what is written on the display.

Accessing the NaWindow object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim window As NAWindow
Set window = app.NAWindows(1)
window.AutoScale
```

or

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", "analyzerName")

app.NAWindows(1).AutoScale
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

(**Bold** Methods or Properties provide access to a child object)

Methods	Description
Autoscale	Autoscales all measurements in the window. Shared with the Trace Object
ShowMarkerReadout	Shows and Hides the Marker readout for the active marker in the upper-right corner of the window object.
ShowTable	Shows or Hides the specified table for the active measurement in the lower part of the window object.

Properties	Description
ActiveTrace	Sets a trace to the Active Trace.
MarkerReadout	Sets and reads the state of the Marker readout for the active marker in the upper-right corner of the window object.

MarkerReadoutSize	Specifies the size of font used when displaying Marker readout in the selected window.
OneMarkerReadoutPerTrace	Either show marker readout of only the active trace or all of the traces simultaneously.
Title	Writes or reads a custom title for the window.
TitleState	Turns ON and OFF the window title.
Traces	Collection for getting a handle to a trace or iterating through the traces in a window.
WindowNumber	Reads the number of the active window.
WindowState	Maximizes or minimizes a window. Shared with the Application Object

INaWindow History

Interface	Introduced with PNA Rev:
INaWindow	1.0

NAWindows Collection

Description

A collection object that provides a mechanism for iterating through the Application windows.

Accessing the NaWindows collection

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim windows As NAWindows
Set windows = app.NAWindows
```

See Also:

- **NAWindow Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	Description
Add	Adds a window to the NAWindows collection.
Item	Use to get a handle to a window in the collection.
Remove	Removes a window from the NAWindows collection.

Properties	Description
Count	Returns the number of windows on the analyzer.
Parent	Returns a handle to the current Application.

NoiseCal Object

Description

Controls the noise figure calibration settings. These commands are extensions which supplement the standard calibration commands on the GuidedCalibration Object.

Accessing the NoiseCal object

```
Dim app as AgilentPNA835x.Application
Set noisecal = pna.GetCalmanager.CreateCustomCalEx(channelNum)
Set noiseCalExtension = noisecal.CustomCalConfiguration
noiseCalExtension.NoiseSourceCold  = 300
```

See Also:

- **Example** Create and Cal a Noise Figure Measurement
- NoiseFigure Object
- About Noise Figure Measurements
- PNA Automation Interfaces
- The PNA Object Model

Method	Interface See History	Description
None		

Property	Interface	Description
CalMethod	INoiseCal	Sets and returns the method for performing calibration on a noise channel.
ENRFile	INoiseCal	Sets and returns the name of the ENR file associated with the noise source.
NoiseSourceCalKitType	INoiseCal	Sets and reads the Cal Kit type used to perform a cal at the adapter which is used to connect the noise source (if required.)

NoiseSourceCold	INoiseCal	Sets and returns the current temperature at the noise source.
NoiseSourceConnectorType	INoiseCal	Sets and reads the connector type of the noise source used during the cal.

NoiseConfiguration History

Interface	Introduced with PNA Rev:
INoiseCal	8.0

Last Modified:

30-May-2007	MX New topic

NoiseFigure Object

Description

Controls the Noise Figure application settings.

Accessing the NoiseFigure object

```
Dim app as AgilentPNA835x.Application
app.CreateCustomMeasurementEx(1, "NoiseFigure", "NF", 1)
Dim NoiseFig
Set NoiseFig = app.ActiveChannel.CustomChannelConfiguration
```

See Also:

- Example program Create and Cal a NoiseFigure Measurment
- About Noise Figure Measurements
- Noise Figure Calibration Object
- app.NoiseSourceState (ON and OFF)
- ENRFile Object
- PNA Automation Interfaces
- The PNA Object Model

Method	Interface See History	Description
None		

Property	Interface	Description
AmbientTemperature	INoiseFigure	Sets the air temperature at which the measurement is being performed.
ImpedanceStates	INoiseFigure	Sets the number of impedance states to use during calibrated measurements.
NoiseAverageFactor	INoiseFigure	Set averaging of noise receiver.

NoiseAverageState	INoiseFigure	Turn noise averaging ON and OFF
NoiseBandwidth	INoiseFigure	Set bandwidth of noise receiver.
NoiseGain	INoiseFigure	Set gain state of noise receiver.
NoiseTuner	INoiseFigure	Sets and returns the noise tuner identifier,
NoiseTunerIn	INoiseFigure	Sets and returns the port identifier of the ECal noise tuner Input
NoiseTunerOut	INoiseFigure	Sets and returns the port identifier of the ECal noise tuner Output

NoiseFigure History

Interface	Introduced with PNA Rev:
INoiseFigure	8.0

Last Modified:

29-May-2007 MN New topic

PathConfiguration Object

Description

Provides access to the path configuration currently active on the channel object.

To load, store, or delete a configuration, see ConfigurationManager Object.

Accessing the PathConfiguration object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim chan as Channel
Set chan = app.ActiveChannel

Dim pathConfig As PathConfiguration
Set pathConfig = chan.PathConfiguration
```

Note:

To learn how to make configuration (element) settings, see this Path Configuration Example

Also see this list of configurable elements and settings.

See Also:

- PathConfigurationManager Object
- PathElement Object
- Path Configurator UI
- PNA Automation Interfaces
- The PNA Object Model

Methods	Interface See History	Description
Elements	IPathConfiguration	Elements are the objects that can be configured (switches and so forth). See the list of elements and settings.
Store	IPathConfiguration	Saves the current configuration to the specified name.

Properties	Interface See History	Description
DescriptiveText	IPathConfiguration	Write and read descriptive text associated with the configuration.

Element	IPathConfiguration	Returns a handle to the IPathElement object.
Name	IPathConfiguration	Returns the name of the current configuration.
Parent	IPathConfiguration	Returns a pointer to the parent COM object (Channel).

IPathConfiguration History

Interface	Introduced with PNA Rev:
IPathConfiguration	7.2

PathConfigurationManager Object

Description

These commands allow configurations to be stored, loaded, or deleted on the PNA.

To **make** path configuration settings, see PathConfiguration Object and the PathElement Object

Accessing the PathConfigurationManager object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim pathConfig As PathConfigurationManager
Set pathConfig = app.PathConfigurationManager
```

Note:

To learn how to make configuration (element) settings, see this Path Configuration Example

Also see this list of configurable elements and settings.

See Also:

- **Path Configuration Example**
- Path Configurator
- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Interface See History	Description
DeleteConfiguration	IPathConfigurationManager	Deletes the specified configuration from the PNA.
LoadConfiguration	IPathConfigurationManager	Loads the named configuration.
StoreConfiguration	IPathConfigurationManager	Saves the path configuration

Properties	Interface See History	Description
Configurations	IPathConfigurationManager	Returns a list of configuration names stored in the PNA.

Parent	IPathConfigurationManager	Returns a handle to the Application object.

IPathConfigurationManager History

Interface	Introduced with PNA Rev:
IPathConfigurationManager	7.2

PathElement Object

Description

Provides access to the settings for the PathElement object.

Accessing the PathElement object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim chan as Channel
Set chan = app.ActiveChannel

Dim pathConfig As PathConfiguration
Set pathConfig = chan.PathConfiguration

Dim element as PathElement
Set element = pathConfig.PathElement("Src1")
```

Note:

To learn how to make configuration (element) settings, see this Path Configuration Example

Also see this list of configurable elements and settings.

See Also:

- Path Configurator
- PathConfigurationManager Object
- PathConfiguration Object

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Interface See History	Description
None		

Properties	Interface See History	Description
Name	IPathElement	Returns the name of the element.
Parent	IPathElement	Returns a pointer to the Parent Object (PathConfiguration)
Value	IPathElement	Read / Write get the current setting for the element.
Values	IPathElement	Returns all valid settings for the element.

IPathElement History

Interface	Introduced with PNA Rev:
IPathElement	7.2

PortExtension Object Superseded

ALL methods and properties on the PortExtension Object are Superseded with the Fixturing Object.

Description

Contains the methods and properties that control Port Extensions.

Accessing a PortExtension object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim PortExt As PortExtension
Set PortExt = app.PortExtension
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs
- Superseded commands

Methods
None

Property	Description
Input A	Sets the Input A extension value.
Input B	Sets the Input B extension value.
Input C	Sets the Input C extension value.
Port 1	Sets the Port 1 extension value.
Port 2	Sets the Port 2 extension value.
Port 3	Sets the Port 3 extension value.
State	Turns Port Extensions ON and OFF.

IPort Extension History

Interface	Introduced with PNA Rev:
IPort Extension	1.0

PowerLossSegment Object

Description

Contains the properties describing a segment of the power loss table used in source power calibration.

You can get a handle to one of these segments through the segments.Item Method of the PowerLossSegments collection.

Accessing the PowerLossSegment object

You can get a handle to one of these segments through PowerLossSegments.Item(n)

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim PwrLossSeg As PowerLossSegment
Set PwrLossSeg = app.SourcePowerCalibrator.PowerLossSegments(1)
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods
None

Properties	Description
Frequency	The frequency (Hz) associated with this segment. Shared with the PowerSensorCalFactorSegment Object
Loss	The loss value (dB) associated with this segment.
SegmentNumber	Returns the number of this segment Shared with the PowerSensorCalFactorSegment Object

IPowerLossSegment History

Interface	Introduced with PNA Rev:
IPowerLossSegment	2.0

PowerLossSegments Collection

Description

A collection object that provides a mechanism for iterating through the segments of the power loss table used in source power calibration.

Accessing the PowerLossSegments collection

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim PwrLossSegs As PowerLossSegments
Set PwrLossSegs = app.SourcePowerCalibrator.PowerLossSegments
```

See Also:

- **PowerLossSegment Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	Description
Add	Adds a PowerLossSegment object to the collection.
Item	Use to get a handle to a PowerLossSegment object in the collection.
Remove	Removes an object from the collection.
Properties	**Description**
Count	Returns the number of objects in the collection.
Parent	Returns a handle to the Parent object (SourcePowerCalibrator) of this collection.

PowerMeterInterface Object

Description

Contains the properties used to select a power meter and sensor to be used for a source power calibration.

Note: This object replaces the PowerMeterGPIBAddress Property.

Accessing the PowerMeterInterface object

Get a handle to a power meter object using the PowerMeterInterfaces collection.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)
Dim pwrMtrInterfaces As PowerMeterInterfaces
Set pwrMtrInterfaces = app.SourcePowerCalibrator.PowerMeterInterfaces
If pwrMtrInterfaces.Count > 0 Then
   Dim pwrMtrInterface As PowerMeterInterface
   Set pwrMtrInterface = pwrMtrInterfaces(1)
   pwrMtrInterface.Path = naUSB
   pwrMtrInterface.Locator = ”Agilent Technologies,U2000A,MY12345678”
End If
```

See Also:

- Source Power Calibration
- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods
None

Properties	Description
Path	Specifies the interface to use: GPIB, USB, LAN
Locator	Specifies the location (address) of the power meter/sensor.

IPowerMeterInterface History

Interface	Introduced with PNA Rev:
IPowerMeterInterface	7.50

Last Modified:

5-Jul-2007	MX New topic

PowerMeterInterfaces Collection

Description

A collection object that provides a mechanism for accessing the PowerMeterInterface objects.

The collection size is limited to one PowerMeterInterface object. By default, that PowerMeterInterface object refers to GPIB, and to the GPIB address that is currently set for the power meter on that PNA.

The power meter is specified by using the Interface property.

Accessing the PowerMeterInterfaces collection

Get a handle to a power meter object using the PowerMeterInterfaces collection.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)
Dim pwrMtrInterfaces As PowerMeterInterfaces
Set pwrMtrInterfaces = app.SourcePowerCalibrator.PowerMeterInterfaces
If pwrMtrInterfaces.Count > 0 Then
   Dim pwrMtrInterface As PowerMeterInterface
   Set pwrMtrInterface = pwrMtrInterfaces(1)
   pwrMtrInterface.Path = naUSB
   pwrMtrInterface.Locator = ”Agilent Technologies,U2000A,MY12345678”
End If
```

See Also:

- Source Power Calibration
- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	
Item	Use to get a handle to a PowerMeterInterface object in the collection.

Properties	Description
Count	Returns the number of objects in the collection.

IPowerMeterInterfaces History

Interface	Introduced with PNA Rev:
IPowerMeterInterfaces	7.50

Last Modified:

9-Jul-2007	MX New topic

PowerSensor Object

Description

Each power sensor connected to the power meter associated with Source Power Calibration will have a PowerSensor object created to represent it. These PowerSensor objects reside in the PowerSensors collection within the SourcePowerCalibrator object. You cannot directly create PowerSensor objects, but can only retrieve existing ones from the PowerSensors collection.

The PowerSensorCalFactorSegment object is also accessed through the PowerSensor object. These are accessed through the CalFactorSegments collection in the PowerSensor object.

Accessing a PowerSensor object

```
Dim pna As AgilentPNA835x.Application
Set pna = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim powerCalibrator as SourcePowerCalibrator
Dim powerSensor as PowerSensor
Dim calFactorSegment as PowerSensorCalFactorSegment

Set powerCalibrator = pna.SourcePowerCalibrator

' Specify GPIB address of the power meter.
powerCalibrator.PowerMeterGPIBAddress = 13

' Each time the PowerSensors collection is accessed, the power meter is queried to
determine which channels have sensors attached. The collection is updated
accordingly.

If powerCalibrator.PowerSensors.Count > 0 Then
' If channel B of the meter has a sensor attached but channel A does not, then
element 1 of the
' collection is sensor B.  Whenever channel A has a sensor, sensor A will be element
1.
Set powerSensor = powerCalibrator.PowerSensors(1)
' Insert one new PowerSensorCalFactorSegment at the beginning of the collection
(index 1).

powerSensor.CalFactorSegments.Add(1)
' Assign our variable to refer to that object.
Set calFactorSegment = powerSensor.CalFactorSegments(1)

' Set property values for that object.
calFactorSegment.Frequency = 300000
' frequency in Hz
calFactorSegment.CalFactor = 98
' cal factor in percent

End If
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

(**Bold** Methods or Properties provide access to a child object)

Methods	Description
None	

Properties	Description
CalFactorSegments	Collection for iterating through the segments of a power sensor cal factor table.
MinimumFrequency	Minimum usable frequency (Hz) specified for this power sensor.
MaximumFrequency	Maximum usable frequency (Hz) specified for this power sensor.
PowerMeterChannel	Identifies which power sensor this object corresponds to (or which channel of the power meter the sensor is connected to).
ReferenceCalFactor	Reference cal factor (%) associated with this power sensor.

IPowerSensor History

Interface	Introduced with PNA Rev:
IPowerSensor	2.0

PowerSensorCalFactorSegment Object

Description

Contains the properties describing a segment of a power sensor cal factor table.

Accessing the PowerSensorCalFactorSegment object

You can get a handle to one of these segments through CalFactorSegments.Item(n)

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim calFactSeg As CalFactorSegments
Set calFactSeg = app.SourcePowerCalibrator.PowerSensors(1).CalFactorSegments(1)
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods
None

Properties	Description
Frequency	The frequency (Hz) associated with this segment. Shared with the PowerLossSegment Object
CalFactor	The cal factor (%) associated with this segment.
SegmentNumber	Returns the number of this segment. Shared with the PowerLossSegment Object

IPowerSensorCalFactorSegment History

Interface	Introduced with PNA Rev:
IPowerSensorCalFactorSegment	2.0

PowerSensors Collection

Description

A collection object that provides a mechanism for iterating through the PowerSensor objects which are connected to the power meter. Each time this collection object is accessed, the power meter is queried to determine how many sensors are connected to it. The collection size and order of objects is then adjusted accordingly before the requested method or property operation is performed. The power meter is specified by using the PowerMeterGPIBAddress property of the SourcePowerCalibrator object.

Accessing the PowerSensors Collection

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim PwrSensors As PowerSensors
Set PwrSensors = app.SourcePowerCalibrator.PowerSensors
```

See Also:

- **PowerSensor Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	**Description**
Item	Use to get a handle to a PowerSensor object in the collection.
Properties	**Description**
Count	Returns the number of objects in the collection.
Parent	Returns a handle to the Parent object (SourcePowerCalibrator) of this collection.

Preferences Object

Description

Sets the preferences for the behavior of several properties.

Accessing the Preferences object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim pref As Preferences
Set pref = app.Preferences
```

See Also:

- Citifile Define Data Saves
- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods
None

Properties	Interface See History	Description
AuxTriggerScopeIsGlobal	IPreferences5	Sets the External Trigger OUT behavior to have either Global or Channel scope.
CitiContents	IPreferences	Specifies the contents of subsequent citifile saves.
CitiFormat	IPreferences	Specifies the format of subsequent citifile saves.
EnableSourceUnleveledEvents Property	IPreferences6	Specifies whether or not to report Source Unleveled errors as system events.
OffsetReceiverAttenuator	IPreferences6	Mathematically offset the test port receiver.
OffsetSourceAttenuator	IPreferences6	Mathematically offset the reference receiver.
Port1NoiseTunerSwitchPresetsToExternal	IPreferences8	Sets default setting for Noise Figure switch.

PowerOnDuringRetraceMode	IPreferences4	Specify whether to turn RF power ON or OFF during a retrace for single-band frequency or segment sweeps ONLY.
PowerSweepRetracePowerMode	IPreferences3	At the end of a power sweep, specifies whether to maintain source power at the start or stop power level.
PreferInternalTriggerOnChannelSingle	IPreferences2	Sets the preference for chan.Single behavior.
PreferInternalTriggerOnUnguidedCal	IPreferences2	Set the preference for the trigger behavior when performing an Unguided calibration.
RemoteCalStoragePreference	IPreferences7	Specifies the default manner in which calibrations performed via SCPI or COM are to be stored.
SnPFormat	IPreferences	Specifies the format of subsequent .S1P, .S2P, .S3P file saves.

IPreferences History

Interface	Introduced with PNA Rev:
IPreferences	4.0
IPreferences2	6.0
IPreferences3	7.2
IPreferences4	6.04
IPreferences5	7.10
IPreferences6	7.20
IPreferences7	7.21
IPreferences8	8.0

PulseGenerator Object

Description

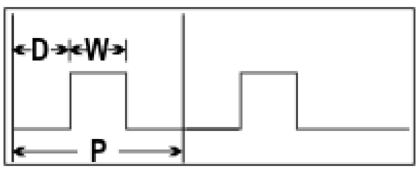
Contains the properties for configuring the five internal pulse generators in the PNA-X.

Accessing the PulseGenerator object

```
Dim app as AgilentPNA835x.Application
Dim chan as Channel
Set chan = app.ActiveChannel
Dim pulse as PulseGenerator
Set pulse = chan.PulseGenerator
```

Each pulse generator is specified in the Pulse Generator properties. See below.

Pulse Definitions



- D = Delay; the time before each pulse begins
- W = Width; the time the pulse is ON
- P = Period; one complete pulse cycle
- W/P = Duty Cycle; the ratio of pulse ON/OFF

Important: If **D + W** is greater than **P**, then undefined PNA behavior results. There is NO error message or warning.

See Also:

- IF Path Block Diagram.
- PNA Automation Interfaces
- The PNA Object Model
- About PNA-X Pulse Capabilities
- Example Programs

Methods		Description
None		

Properties	Interface See History	Description
Delay	IPulsedGenerator	Sets the pulse delay.
DelayIncrement	IPulsedGenerator	Sets the pulse delay increment.
Period	IPulsedGenerator	Sets the pulse-period (1/PRF) for ALL PNA-X internal pulse generators.
State	IPulsedGenerator	Turns the specified pulse generator ON and OFF.
Width	IPulsedGenerator	Sets the pulse width for the specified pulse generator.

IPulseGenerator History

Interface	Introduced with PNA Rev:
IPulseGenerator	7.2

Last Modified:

1-Jan-2007	MX New topic

SCPIStringParser Object

Description

Provides the ability to send a SCPI command from within the COM command. The two commands differ in the following ways:

Execute - will not return an error unless the Execute command itself fails, which is unlikely. Otherwise, you are required to read the SCPI error queue for errors that were caused by the SCPI command. The Execute command operates with minimal interference between you, the programmer, and the SCPI parser. It does not presume how you want to handle errors: handle by ignore, handle by reading the status byte, etc. This command was defined because automation engines like VB throw runtime errors when a COM method returns a failed HRESULT.

Parse - parses the input command, and then reads the SCPI error queue until the queue is empty. If the queue contains errors, Parse returns a failed HRESULT (E_NA_BAD_SCPI_EXECUTE). It then creates an IErrorInfo object and bundles the error numbers and descriptions into the error object. This object is available so that you can detect the failed HRESULT and interrogate the errorInfo object for more details.

See an example of how to return error information when using the Parse method.

Accessing the ScpiStringParser object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim SCPI As IScpiStringParser
Set SCPI = app.ScpiStringParser
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Interface	Description
Parse	ISCPIStringParser	Provides the ability to send a SCPI command from within the COM command.
Execute	**ISCPIStringParser2**	Does not convert scpi errors. Use :SYST:ERR?
Properties		
None		

History

Interface	Introduced with PNA Rev:
ISCPIStringParser	1.0
ISCPIStringParser2	3.0

Segment Object

Description

Contains the methods and properties that affect a sweep segment.

Note: All of these properties are shared with at least one of the following objects: Channel, Cal Set, PowerSensorCalFactorSegment, or PowerLossSegment.

Accessing a Segment object

You can get a handle to a sweep segment through the segments collection.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim segs As ISegments
Set segs = app.ActiveChannel.Segments

segs(2).NumberOfPoints = 30
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Segment Sweep
- Example Programs

Methods

None

Properties	Interface	Description
centerFrequency	ISegment	Sets or returns the center frequency of the segment. Shared with the Channel Object
DwellTime	ISegment	Dwell time value. Shared with the Channel Object
FrequencySpan	ISegment	Sets or returns the frequency span of the segment. Shared with the Channel Object
IFBandwidth	ISegment	Sets or returns the IF Bandwidth of the segment. Shared with the Channel Object and Cal Set object.

NumberOfPoints	ISegment	Sets or returns the Number of Points of the segment. Shared with the Channel Object
SegmentNumber	ISegment	Returns the number of the current segment.
StartFrequency	ISegment	Sets or returns the start frequency of the segment. Shared with the Channel Object
State	ISegment	Turns On or OFF a segment.
StopFrequency	ISegment	Sets or returns the stop frequency of the segment. Shared with the Channel Object
SweepTime	**ISegment2**	Sets or returns the sweep time of the segment. Shared with the Channel Object
TestPortPower	ISegment	Sets or returns the RF power level of the segment. Shared with the Channel Object

ISegment History

Interface	Introduced with PNA Rev:
ISegment	1.0
ISegment2	7.1

Last modified:

9/29/06	MQQ Added Sweep time

Segments Collection

Description

A collection object that provides a mechanism for iterating through the sweep segments of a channel. Sweep segments are a potentially faster method of sweeping the analyzer through only the frequencies of interest. Learn more about Segment Sweep.

Accessing the Segments collection

There are two paths to the Segments Collection:

1. From the Channel object
2. From the FOMRange object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim segs As ISegments
Set segs = app.ActiveChannel.Segments
```

or

```
Set segs = app.ActiveChannel.FOM.FOMRange(1).Segments
```

See Also:

- **Segment Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	Interface See History	Description
Add	ISegments	Adds an item to either the Segments collection.
Item	ISegments	Use to get a handle to a segment in the collection..
Remove	ISegments	Removes an item from a collection of objects.
SetAllSegments	**ISegments2**	Uploads a segment table to the PNA.

Properties		Description

AllowArbitrarySegments	**ISegments3**	Enables the setup of arbitrary segment sweep
Count	ISegments	Returns the number of items in a collection of objects.
IF Bandwidth Option	ISegments	Enables the IFBandwidth to be set on individual sweep segments.
Parent	ISegments	Returns a handle to the current naNetworkAnalyzer application..
Source Power Option	ISegments	Enables setting the Source Power for a segment.
SweepTimeOption	**ISegments4**	Enables the Sweep time or Dwell time to be set independently on sweep segments.

ISegments History

Interface	Introduced with PNA Rev:
ISegments	1.0
ISegments2	3.5
ISegments3	4.2
ISegments4	7.1

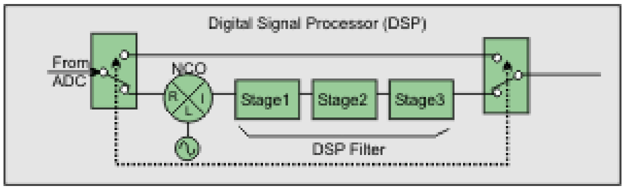
Last modified:

8-Mar-2007	Modified access via fom
9/29/06	Added ISegments4

SignalProcessingModuleFour Object

Description

Contains the properties for configuring the DSP (digital filters) in the PNA-X.



See the entire IF Path Block diagram.

Accessing the SignalProcessingModuleFour object

```
Dim app as AgilentPNA835x.Application
Dim chan as Channel
Set chan = app.ActiveChannel
Dim digFilter as SignalProcessingModuleFour
Set digFilter = chan.SignalProcessingModuleFour
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- About PNA-X Pulse Capabilities
- Example Programs

Methods		Description
None		

Properties	Interface See History	Description
ADCCaptureMode	ISPM4	Sets ADC capture mode: auto or manual
FilterErrors	ISPM4	Returns errors with manual digital filter settings
FilterMode	ISPM4	Sets digital filter mode:auto or manual
Stage1Coefficients	ISPM4	Sets Stage1Coefficients

Stage1Frequency	ISPM4	Sets Stage1 NCO frequency
Stage1MaximumCoefficient	ISPM4	Returns the maximum value of any single stage1coefficient.
Stage1MaximumCoefficientCount	ISPM4	Returns the maximum number of Stage1 coefficients.
Stage1MaximumCoefficientSum	ISPM4	Returns the maximum sum of all Stage1 coefficients.
Stage1MinimumCoefficientCount	ISPM4	Returns the minimum number of Stage1 coefficients
Stage2Coefficients	ISPM4	Sets Stage2 Coefficients
Stage2MaximumCoefficient	ISPM4	Returns the maximum value of any single stage2 coefficient.
Stage2MaximumCoefficientCount	ISPM4	Returns the maximum number of Stage2 coefficients
Stage2MaximumCoefficientSum	ISPM4	Returns the maximum sum of all Stage2 coefficients.
Stage2MinimumCoefficientCount	ISPM4	Returns the minimum number of Stage2 coefficients
Stage3FilterType	ISPM4	Sets and returns stage3 filter type
Stage3FilterTypes	ISPM4	Returns the names of supported types of Stage3 filters.
Stage3Parameter	ISPM4	Sets and returns the parameter value of the current filter type.
Stage3ParameterMaximum	ISPM4	Returns maximum parameter value for the current filter type.
Stage3ParameterMinimum	ISPM4	Returns minimum parameter value for the current filter type.
Stage3Parameters	ISPM4	Returns the names of parameters for the current filter type.

ISignalProcessingModuleFour History

Interface	Introduced with PNA Rev:
ISignalProcessingModuleFour	7.2

Last Modified:

5-Jan-2007 MX New topic

SMCType Object

Description

Contains the methods and properties to perform an Scalar Measurement Calibration for the Frequency Converter Application (option 083).

Accessing the SMCType object

See an example which creates and calibrates an SMC measurement.

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Interface See History	Description
AcquireStep	ISMCType	Acquire the measurement data for the specified step in the calibration process.
GenerateErrorTerms	ISMCType	Generates the error terms for the calibration.
GenerateSteps	ISMCType	Returns the number of steps required to complete the calibration.
GetStepDescription	ISMCType	Returns the description of the specified step calibration process.
Initialize	ISMCType	Begins a calibration.
Properties		**Description**
AutoOrient	ISMCType	Sets ECAL module automatic orientation ON or OFF.
CalibrationPort	ISMCType	Sets or returns the calibration source port for the calibration.
CalKitType	ISMCType	Sets and returns a calibration kit type for calibration.
CompatibleCalKits	ISMCType	Returns a list of cal kits that are compatible with the connector type for the specified port.

ConnectorType	ISMCType	Sets or queries the connector type for the specified port.
Do2PortEcal	ISMCType	Specify ECAL or Mechanical calibration.
EcalCharacterization	ISMCType	Specifies the characterization data within an ECal module to be used for the calibration.
EcalOrientation	ISMCType	Specifies which port of the ECal module is connected to which port of the PNA when the AutoOrient property = False.
NetworkFilename	ISMCType2	Specifies the S2P filename to embed or de-embed on the input or output of your mixer measurement.
NetworkMode	ISMCType2	Embed (add) or de-embed (remove) circuit network effects on the input and output of your mixer measurement.
OmitIsolation	ISMCType	Sets and returns whether Isolation portion of the calibration will be performed or not.
ThruCalMethod	ISMCType	Sets and returns the method for performing the thru portion of the calibration.
ValidConnectorTypes	ISMCType	Returns a list of connector types for which there are calibration kits.

ISMCType History

Interface	Introduced with PNA Rev:
ISMCType	3.5
ISMCType2	6.0

SourcePowerCalibrator Object

Description

This object is a child of the Application object and is a vehicle for performing source power calibrations.

Accessing the SourcePowerCalibrator Object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim ispc As ISourcePowerCalibrator
Set ispc = app.SourcePowerCalibrator
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Note: Interface **ISourcePowerCalibrator** is abbreviated as **ISPC** in the following table.

(**Bold** Methods or Properties provide access to a child object)

Methods	Interface See History	Description
AbortPowerAcquisition	ISPC	Aborts a source power cal acquisition sweep that is currently in progress.
AcquirePowerReadings	ISPC	**Superseded with** AcquirePowerReadingsEx
AcquirePowerReadingsEx	ISPC4	Initiates a source power cal acquisition.
ApplyPowerCorrectionValues	ISPC	**Superseded with** ApplyPowerCorrectionValuesEx
ApplyPowerCorrectionValuesEx	ISPC5	Applies correction values after completing a source power cal acquisition sweep. Optionally perform a calibration of the reference receiver used in the source power cal.
CheckPower	ISPC2	Measures power at a specific frequency. Used to test power level before and/or after applying a source power calibration.
LaunchPowerMeterSettingsDialog	ISPC2	Launches the Power Meter Settings dialog on the PNA.
SetCalInfo	ISPC	**Superseded with** SetCalInfoEx Method

SetCalInfo2	ISPC3	**Superseded with** SetCalInfoEx Method
SetCalInfoEx Method	ISPC4	Specifies the channel and source port to be used for the source power calibration.
SetPowerAcquisitionDevice	ISPC3	Sets the power sensor channel (A or B) to be used. This method is ONLY necessary when performing an SMC calibration.
Properties	**Interface**	**Description**
CalPower	ISPC	Specifies the power level that is expected at the desired reference plane.
IterationsTolerance	ISPC3	Sets the maximum desired deviation from the sum of the test port power and the offset value.
MaximumIterationsPerPoint	ISPC3	Specifies maximum number of readings to take at each data point for iterating the source power.
PowerAcquisitionDevice	ISPC2	Specifies the power sensor channel (A or B) that is currently selected for use at a specific frequency.
PowerLossSegments (collection)	ISPC2	Collection for iterating through the segments of the power loss table used in source power calibration.
PowerMeterGPIBAddress	ISPC	Specifies the GPIB address of the power meter.
PowerMeterInterfaces	ISPC6	Collection for getting a handle to the available power meters.
PowerSensors (collection)	ISPC2	Collection for iterating through the PowerSensor objects which are connected to the power meter for a source power cal.
ReadingsPerPoint	ISPC	Specifies the maximum power readings for power meter settling.
ReadingsTolerance	ISPC3	Power meter settling tolerance value.
USBPowerMeterCatalog	**ISPC6**	Returns a list of USB power meters that are connected to the PNA.
UsePowerLossSegments	ISPC	Specifies if subsequent calls to the AcquirePowerReadings method will make use of the loss table (PowerLossSegments).

UsePowerSensorFrequencyLimits	ISPC	Specifies if subsequent calls to the AcquirePowerReadings method will make use of power sensor frequency checking capability.

ISourcePowerCalibrator History

Interface	Introduced with PNA Rev:
ISourcePowerCalibrator	2.0
ISourcePowerCalibrator2	3.5
ISourcePowerCalibrator3	4.0
ISourcePowerCalibrator4	6.2
ISourcePowerCalibrator5	7.2
ISourcePowerCalibrator6	7.5

TestsetControl Object

Description

A TestsetControl object is used to control one of the supported test sets. Only one external test set can be controlled by the PNA at any time. The Testset Control object appears as an item in the ExternalTestsets collection, which in turn is a property of the main application object.

If the specified test set is not connected to the PNA or is not ON, then setting Enabled = True will return an error. All other properties can be set even if the test set is not connected.

Note: The ONLY way to load a test set configuration file is by sending the testsets.Add method. There is no method to query the test set type. See an example program.

Accessing a TestsetControl object

The ExternalTestsets collection is a property of the main **Application** Object. You can obtain a handle to a testset object by specifying an item in the collection.

Visual Basic Example

```
Dim pna
Dim testsets As ExternalTestsets
Dim tset1 As TestsetControl
Set pna = CreateObject("AgilentPNA835x.Application")
Set testsets = pna.ExternalTestsets
Set tset1 = testsets(1)
' make COM calls on tset1 object
End Sub
```

See Also:

- E5091A Testset Object
- About External Testset Control
- ExternalTestset Control Example
- ExternalTestsets Collection
- The PNA Object Model

Methods	Interface (See history)	Description
None		

Properties		Description
ControlLines	IExternalTestset	Sets the control lines of the specified Test set.
Enabled	IExternalTestset	Enables and disables (ON/OFF) the port mapping and control line output of the specified test set.
ID	IExternalTestset	Returns the test set ID number.
Label	IExternalTestset	Returns the label on a given channel for the specified test set.
NumberOfPorts	IExternalTestset	Reads the number of ports that are on the specified test set.
OutputPorts	IExternalTestset	Sets or returns the port mappings for ALL ports.
PortCatalog	IExternalTestset	Returns the selections available for a given logical port.
SelectPort	IExternalTestset	Sets and returns the logical port value.
ShowProperties	IExternalTestset	Turns status bar display of test set properties on or off.
Type	IExternalTestset	Returns the test set model.

ExternalTestset History

Interface	Introduced with PNA Rev:
IExternalTestset	6.0
IExternalTestset	6.0

Trace Object

Description

The Trace object controls how the measurement data is displayed. You can control scale, reference position, and value from the Trace Object.

Accessing a Trace object

There are several ways to get a handle to a trace.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim trace As Trace
```

Then you can do any of the following:

```
Set trace = app.NAWindows(1).traces(1)
```

```
set trace = app.NAWindows.item(1).ActiveTrace
```

```
set trace = app.ActiveNAWindow.traces.item(1)
```

```
set trace = app.ActiveNAWindow.ActiveTrace
```

```
Set trace = app.Measurements(1).trace
```

```
Set trace = app.ActiveMeasurement.trace
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Traces, Channels, and Windows on the PNA
- Example Programs

Methods	Description
Autoscale	Autoscales the trace or all of the traces in the selected window. Shared with the NAWindow Object

Property	Description
Name	Sets or returns the trace name
ReferencePosition	Sets or returns the Reference Position of the active trace.
ReferenceValue	Sets or returns the value of the Y-axis Reference Level of the active trace.
YScale	Sets or returns the Y-axis Per-Division value of the active trace.

ITrace History

Interface	Introduced with PNA Rev:
ITrace	1.0

Traces Collection

Description

Child of the **Application** Object. A collection that provides a mechanism for getting a handle to a trace or iterating through the traces in a window.

Accessing the Traces collection

Get a handle to the traces collection through the NaWindows collection. The following example sets the variable **trcs** to the collection of traces in window 1 of the NaWindows collection.

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim trcs As traces
Set trcs = app.NAWindows(1).traces
```

See Also:

- **Trace Object**
- Collections in the Analyzer
- The PNA Object Model
- Example Programs

Methods	Description
Item	Use to get a handle to a trace
Properties	**Description**
Count	Returns the number of traces in the collection.
Parent	Returns a handle to the current Application.

Transform Object

Description

Contains the methods and properties that control Time Domain transforms.

Accessing the Transform Object

```
Dim app As AgilentPNA835x.Application
Set app = CreateObject("AgilentPNA835x.Application", <analyzerName>)

Dim trans As Transform
Set trans = app.ActiveMeasurement.Transform
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Time Domain Topics
- Example Programs

Note: Sweep Type must be set to Linear before setting Time Domain Transform (state) ON.

Methods	Interface	Description
SetFrequencyLowPass	ITransform	Sets low frequencies for low pass.
Properties		**Description**
Center	ITransform	Sets or returns the Center time. Shared with the Gating Object
CoupledParameters	**ITransform2**	Select Transform parameters to couple
DistanceMarkerMode	**ITransform2**	Sets the measurement type in order to determine the correct marker distance.
DistanceMarkerUnit	**ITransform2**	Sets the unit of measure for the display of marker distance values.
ImpulseWidth	ITransform	Sets or returns the Impulse Width of Time Domain transform windows.
KaiserBeta	ITransform	Sets or returns the Kaiser Beta of Time Domain transform windows.
Mode	ITransform	Sets the type of transform.

Span	ITransform	Sets or returns the Span time. Shared with the Gating Object
Start	ITransform	Sets or returns the Start time. Shared with the Gating Object
State	ITransform	Turns an Object ON and OFF.
StepRiseTime	ITransform	Sets or returns the Rise time of the stimulus in Low Pass Step Mode.
Stop	ITransform	Sets or returns the Stop time. Shared with the Gating Object

ITransform History

Interface	Introduced with PNA Rev:
ITransform	1.0
ITransform2	4.2

TriggerSetup Object

Description

These properties setup Global triggering that effects the entire PNA application.

Accessing the TriggerSetup object

```
Dim app as AgilentPNA835x.Application
Dim trigSetup as ITriggerSetup
Set trigSetup = app.TriggerSetup
```

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Triggering in the PNA
- Example Programs

Methods	Interface See History (below)	Description
None		

Properties		Description
AcceptTriggerBeforeArmed	ITriggerSetup2	Allows a trigger signal to be remembered and then used when the PNA becomes armed (ready to be triggered).
ExternalTriggerConnectionBehavior	ITriggerSetup	Configures the external triggering signal for the PNA
Scope	ITriggerSetup	Determines whether a trigger signal affects a single channel or all channels in the PNA.
Source	ITriggerSetup	Sets or returns the source of triggering in the PNA.
TriggerOutputEnabled	ITriggerSetup2	Enables the PNA to send trigger signals out the rear-panel TRIGGER OUT connector.

ITriggerSetup History

Interface	Introduced with PNA Rev:
ITriggerSetup	4.0
ITriggerSetup2	4.2

VMC Type Object

Description

Contains the methods and properties to perform a Vector Measurement Calibration for the Frequency Converter Application (option 083).

Accessing the VMCType object

See an example which creates and calibrates a VMC measurement.

See Also:

- PNA Automation Interfaces
- The PNA Object Model
- Example Programs

Methods	Interface See History	Description
AcquireStep	IVMCType	Acquire the measurement data for the specified step in the calibration process.
GenerateErrorTerms	IVMCType	Generates the error terms for the calibration.
GenerateSteps	IVMCType	Returns the number of steps required to complete the calibration.
GetStepDescription	IVMCType	Returns the description of the specified step in the calibration process.
Initialize	IVMCType	Begins a calibration.
Properties		**Description**
AutoOrient	IVMCType	Sets ECAL module automatic orientation ON or OFF.
CalKitType	IVMCType	Sets and returns a calibration kit type for calibration.
CharacterizeMixerOnly	IVMCType	Sets and returns whether to perform a mixer characterization ONLY or full 2-port calibration.
CharFileName	IVMCType	Specifies the .S2P mixer characterization file name.

CharMixerReverse	IVMCType2	Specifies the direction in which to characterize the calibration mixer.
CompatibleCalKits	IVMCType	Returns a list of cal kits that are compatible with the connector type for the specified port.
ConnectorType	IVMCType	Sets or queries the connector type for the specified port.
Do1PortEcal	IVMCType	Specify ECAL or Mechanical calibration for the mixer characterization portion of a VMC calibration.
Do2PortEcal	IVMCType	Specify ECAL or Mechanical calibration for the 2-port calibration portion of a VMC calibration.
EcalCharacterization	IVMCType	Specifies the characterization data within an ECal module to be used for the calibration.
EcalOrientation1Port	IVMCType	For Mixer Characterization ONLY - Specifies which port of the ECal module is connected to which port of the PNA
EcalOrientation2Port	IVMCType	For full 2-port VMC cal - Specifies which port of the ECal module is connected to which port of the PNA
LoadCharFromFile	IVMCType	Specifies and loads a mixer characterization (S2P) file.
NetworkFilename	IVMCType3	Specifies the S2P filename to embed or de-embed on the input or output of your mixer measurement.
NetworkMode	IVMCType3	Embed (add) or de-embed (remove) circuit network effects on the input and output of your mixer measurement.
OmitIsolation	IVMCType	Sets and returns whether Isolation portion of the calibration will be performed or not.
ThruCalMethod	IVMCType	Sets and returns the method for performing the thru portion of the calibration.
ValidConnectorTypes	IVMCType	Returns a list of connector types for which there are calibration kits.

IVMCType History

Interface	Introduced with PNA Rev:
IVMCType	3.5
IVMCType2	3.53
IVMCType3	6.0

AcceptTriggerBeforeArmed Property

Description Determines what happens to an EDGE trigger signal if it occurs before the PNA is ready to be triggered. (LEVEL trigger signals are always ignored.) For more information, see External triggering.

VB Syntax *trigsetup.***AcceptTriggerBeforeArmed** = *boolean*

Variable **(Type) - Description**

trigsetup A TriggerSetup2 **(object)**

boolean Choose from:

False - A trigger signal is ignored if it occurs before the PNA is ready to be triggered.

True - A trigger signal is remembered and then used when the PNA becomes armed (ready to be triggered). The PNA remembers only one trigger signal.

Return Type Boolean

Default False

Examples

```
trigsetup.AcceptTriggerBeforeArmed = True 'Write
```

```
atba = trigsetup.AcceptTriggerBeforeArmed 'Read
```

C++ Syntax HRESULT get_AcceptTriggerBeforeArmed(BOOL *pVal);

HRESULT put_AcceptTriggerBeforeArmed(BOOL newVal);

Interface ITriggerSetup2

AcquisitionDirection Property

Description	Specifies the direction of each part of a 2-port calibration.
VB Syntax	*cal*.**AcquisitionDirection** = *value*
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
value	**(enum NADirection)** - Choose from: **0 - naForward** - measures the forward direction **1 - naReverse** - measures the reverse direction
Return Type	Long Integer
Default	naForward
Examples	`cal.AcquisitionDirection = naForward`
C++ Syntax	HRESULT AcquisitionDirection(tagNADirection dir);
Interface	ICalibrator

Write/Read About Compression Mode

AcquisitionMode Property

Description Set and read the method by which gain compression data is acquired.

VB Syntax *gca*.**AcquisitionMode** = *value*

Variable **(Type) - Description**

gca A GainCompression **(object)**

value **(NAGCAAcquisitionMode)** Choose from:

- **naSmartSweep (0)** Iterate quickly to find compression point
- **naSweepPowerAtEachFreq2D (1)** Sweep power at each frequency
- **naSweepFreqAtEachPower2D (2)** Sweep frequency at each power level

Return Type Enum

Default **naSmartSweep**

Examples

```
gca.AcquisitionMode = naSmartSweep 'Write
```

```
acqMode = gca.AcquisitionMode 'Read
```

C++ Syntax HRESULT get_AcquisitionMode(tagNAGCAAcquisitionMode* mode)

HRESULT put_AcquisitionMode(tagNAGCAAcquisitionMode mode)

Interface IGainCompression

Last Modified:

11-Sep-2007 MX New topic

ActiveCalKit Property

Description	Returns a handle to the Active CalKit object. You can either **(1)** use the handle directly to access CalKit properties and methods, or **(2)** set a variable to the CalKit object. The variable retains a handle to the original object if another CalKit becomes active.
VB Syntax	1) app.**ActiveCalKit.**<*setting*> **or** 2) Set *cKit* = *app*.**ActiveCalKit**
Variable	**(Type) - Description**
app	An Application **(object)**
<setting>	A CalKit property (or method) and arguments
cKit	**(object)** - A CalKit object
Return Type	CalKit object
Default	None
Examples	`Public cKit as calKit` `Set cKit = app.ActiveCalKit 'read`
C++ Syntax	HRESULT get_ActiveCalKit (ICalkit * kit)
Interface	IApplication

ActiveChannel Property

Description Returns a handle to the Active Channel object. You can either **(1)** use the handle directly to access channel properties and methods, or **(2)** set a variable to the channel object. The variable retains a handle to the original channel if another channel becomes active.

VB Syntax (1) *app*.**ActiveChannel.**<*setting*>
or
(2) Set *chan* = *app*.**ActiveChannel**

Variable **(Type) - Description**

chan A Channel **(object)**

app An Application **(object)**

<setting> A channel property (or method) and arguments

Return Type Channel object

Default Not applicable

Examples

```
1) app.ActiveChannel.Averaging = 1
2) Public chan as Channel
  Set chan = app.ActiveChannel
```

C++ Syntax HRESULT get_ActiveChannel(IChannel* *pVal)

Interface IApplication

ActiveMarker Property

Description	Returns a handle to the Active Marker object. You can either **(1)** use the handle directly to access Marker properties and methods, or **(2)** set a variable to the Marker object. The variable retains a handle to the original object if another Marker becomes active.
VB Syntax	1) *meas*.**ActiveMarker.**<*setting*> **or** 2) Set *mark* = *meas*.**ActiveMarker**
Variable	**(Type) - Description**
meas	**(object)** - An Measurement object
<*setting*>	A marker property (or method) and arguments
mark	**(object)** - A marker object
Return Type	marker object
Default	None
Examples	`Public mark as marker` `Set mark = meas.ActiveMarker`
C++ Syntax	HRESULT get_ActiveMarker(IMarker** marker)
Interface	IMeasurement

Read-only

ActiveMeasurement Property

Description Returns a handle to the Active Measurement object. You can either **(1)** use the handle directly to access measurement properties and methods, or **(2)** set a variable to the measurement object. The variable retains a handle to the original measurement.

VB Syntax 1) *app.*ActiveMeasurement.<*setting*>
or
2) Set *meas* = *app*.**ActiveMeasurement**

Variable (Type) - Description

meas A Measurement **(object)**

app An Application **(object)**

<setting> A measurement property (or method) and arguments

Return Type Measurement object

Default None

Examples

```
1) app.ActiveMeasurement.Averaging = 1
2) Public meas as Measurement
  Set meas = app.ActiveMeasurement
```

C++ Syntax HRESULT get_ActiveMeasurement(IMeasurement **ppMeas)

Interface IApplication

ActiveNAWindow Property

Description	Returns a handle to the Active Window object. You can either **(1)** use the handle directly to access window properties and methods, or **(2)** set a variable to the window object. The variable retains a handle to the original window if another window becomes active.
VB Syntax	1) *app*.**ActiveNAWindow**.*<setting>* **or** 2) Set *win* = *app*.**ActiveNAWindow**
Variable	**(Type) - Description**
win	A NAWindow **(object)**
app	An Application **(object)**
<setting>	A NAWindow property (or method) and arguments
Return Type	A NAWindow object
Default	Not applicable
Examples	`Public win as NAWindow` `Set win = app.ActiveWindow`
C++ Syntax	HRESULT get_ActiveNAWindow(INAWindow **ppWindow)
Interface	IApplication

ActiveXAxisRange Property

Description Sets or returns the swept parameter to display on the X-axis for the selected FCA measurement.

VB Syntax *mixer*.**ActiveXAxisRange** = *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(Enum as MixerStimulusRange)** - Parameter to display on the X-axis. Choose from:

0 - mixINPUT - Input frequency span

1 - mixOUTPUT - Output frequency span

2 - mixLO_1 - First LO frequency span

3 - mixLO_2 - Second LO frequency span

Return Type Enum

Default OUTPUT

Examples

```
mixer.ActiveXAxisRange = 1 'Write
variable = mixer.ActiveXAxisRange  'Read
```

C++ Syntax HRESULT get_ActiveXAxisRange(tagMixerStimulusRange *Val)

HRESULT put_ActiveXAxisRange(tagMixerStimulusRange newVal)

Interface IMixer3

ADCCaptureMode Property

Description Sets and returns the ADC capture mode modeled as a 2-pole switch in the diagram on the SignalProcessingModuleFour page. The switch either bypasses or routes the IF through the 3-stage digital filter.

VB Syntax *spm4*.**ADCCaptureMode** = *value*

Variable **(Type) - Description**

spm4 A SignalProcessingModuleFour **(object)**

value **(Enum as NAStates)** Capture mode.

naOFF (0) - The digital filters are used to process IF information. The filters can be configured automatically or manually using FilterMode Property**.**

naON (1) - The digital filters are bypassed and the raw ADC readings are taken directly. A maximum of 4096 data points per sweep can be acquired.

Return Type Enum

Default OFF

Examples

```
spm4.ADCCaptureMode = 0 'Write
```

```
mode = spm4.ADCCaptureMode 'Read
```

C++ Syntax

HRESULT get_ADCCaptureMode(tagNAStates* pCaptureMode);

HRESULT put_ADCCaptureMode(tagNAStates pCaptureMode);

Interface ISignalProcessingModuleFour

Last Modified:

18-Jun-2007 MX New topic

ALCLevelingMode Property

Description

Sets and returns the ALC mode for the specified channel and port. Use GetSupportedALCModes to return a list of valid ALC modes for the PNA.

Learn more about ALC mode.

VB Syntax

chan.**ALCLevelingMode** *(sourcePort) = value*

Variable

(Type) - Description

chan

(object) - A Channel object

sourcePort

(long integer) - The source port for which to make this setting. If ports are remapped, specify the logical port number.

Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.

value

(enum as naALCLevelingMode) - Choose from:

- **0** naALCInternal
- **1** naALCExternal (E835x Only)
- **2** naALCOpenLoop (PNA-X only)
- **3** naALCIF (For future use)

Return Type

Enum

Default

naALCInternal

Examples

```
chan.ALCLevelingMode(1) =  'Write
state = chan.ALCLevelingMode(4) 'Read
```

C++ Syntax

HRESULT get_ALCLevelingMode(long port, tagNAALCLevelingMode* pVal);

HRESULT put_ALCLevelingMode(long port,tagNAALCLevelingMode newVal);

Interface

IChannel9

Last modified:

30-Apr-2007	Edited for src strings
10/18/06	MX New topic

ActiveTrace Property

Description	Returns a handle to the Active Trace object. You can either **(1)** use the handle directly to access trace properties and methods, or **(2)** set a variable to the trace object. The variable retains a handle to the original trace if another trace becomes active.
VB Syntax	1) *win*.**ActiveTrace**.*<setting>* **or** *2)* Set *trce* = *win*.**ActiveTrace**
Variable	**(Type) - Description**
trce	A Trace **(object)**
win	An NAWindow **(object)**
<setting>	A trace property (or method) and arguments
Return Type	An NAWindow object
Default	None

Examples	`1) win.ActiveTrace.Autoscale`
	`2) Public trce as Trace`
	`Set trce = Application.ActiveNAWindow.ActiveTrace`

C++ Syntax	HRESULT get_ActiveTrace(ITrace* *pVal)
Interface	INAWindow

AllowArbitrarySegments Property

Description Enables you to setup a segment sweep with arbitrary frequencies. The start and stop frequencies of each segment can overlap other segments. Also, each segment can have a start frequency that is greater than its stop frequency which causes a reverse sweep over that segment. Learn more about Arbitrary Segment Sweep.

VB Syntax *segs*.**AllowArbitrarySegments** = *value*

Variable **(Type) - Description**

segs A Segments collection **(object)**

value **(boolean)**
True - Allows the setup of arbitrary segment sweep.

False - Prevents the setup of arbitrary segment sweep.

Return Type Boolean

Default False

Examples

```
segs.AllowArbitrarySegments = True 'Write
```

```
AllowArbSegs = AllowArbitrarySegments 'Read
```

C++ Syntax HRESULT get_AllowArbitrarySegments(VARIANT_BOOL *pVal)

HRESULT put_AllowArbitrarySegments(VARIANT_BOOL newVal)

Interface ISegments3

AlternateSweep Property

Description	Sets sweeps to either alternate or chopped.
VB Syntax	*object*.**AlternateSweep** = *value*
Variable	**(Type) - Description**
object	Channel **(object)** **or** CalSet **(object) -** Read-only property
value	**(boolean)** - Choose either: **False** - Sweep mode set to **Chopped** - reflection and transmission are measured on the same sweep. **True** - Sweep mode set to **Alternate** - reflection and transmission measured on separate sweeps. Improves Mixer bounce and Isolation measurements. Increases cycle time.
Return Type	boolean
Default	False (0)
Examples	`chan.AlternateSweep = True 'Write` `altSwp = chan.AlternateSweep 'Read`
C++ Syntax	HRESULT AlternateSweep(VARIANT_BOOL *pVal) HRESULT AlternateSweep(VARIANT_BOOL newVal)
Interface	IChannel ICalSet3

AmbientTemperature Property

Description	Sets and returns the temperature at which the current noise measurement is occurring. Learn more.
VB Syntax	*noiseCal*.**AmbientTemperature** = *value*
Variable	**(Type) - Description**
noiseCal	A NoiseCal **(object)**
value	**(double)** Ambient temperature in Kelvin.
Return Type	Double
Default	295
Examples	`noise.AmbientTemperature = 289'Write` `temp = noise.AmbientTemperature 'Read`
C++ Syntax	HRESULT get_AmbientTemperature(Double* pValue) HRESULT put_AmbientTemperature(Double pNewValue)
Interface	INoiseCal

Last Modified:

6-Sep-2007 MX New topic

Read-only

Application Property

Description	Returns the name of the Analyzer making measurements on the channel.
VB Syntax	*chan.***Application**
Variable	**(Type) - Description**
chan	A Channel **(object)**
Return Type	object
Default	None
Examples	`rfna = chan.Application 'returns the Analyzer name`
C++ Syntax	HRESULT get_Application(IApplication** Application)
Interface	IChannel

ArrangeWindows Property

Description	Sets the arrangement of all the windows. Overlay, Stack2, Split3 and Quad4 will create windows. To control the state of one window, use app.WindowState.
VB Syntax	*app.*__ArrangeWindows__ = *value*
Variable	**(Type) - Description**
app	An Application **(object)**
value	**(enum NAWindowModes)** - Choose from: **0 - naTile** **1 - naCascade** **2 - naOverlay** **3 - naStack2** **4 - naSplit3** **5 - naQuad4**
Return Type	Not Applicable
Default	naTile
Examples	`app.ArrangeWindow = naTile 'Write`
C++ Syntax	HRESULT put_ArrangeWindows(tagNAWindowModes newVal)
Interface	IApplication

AttenuatorMode Property

Description Sets or returns the mode of operation of the attenuator control for the specified port number. This command is automatically set to Manual when an Attenuator value is set.

VB Syntax *object*.**AttenuatorMode(***portNum***)** = *value*

Variable **(Type) - Description**

object Channel (object)

or

CalSet **(object) -** Read-only property

portNum **(long)** - Port number of attenuator control to be changed.

value **(enum NAModes)** - Choose from:

0 - naAuto - Attenuator control set to automatic. The analyzer will set the attenuator control appropriately to deliver the specified power at the source.

1 - naManual - Specify the attenuator setting using chan.Attenuator (which automatically sets AttenuatorMode = naManual.

Return Type NAModes

Default 0 - Auto

Examples

```
chan.AttenuatorMode(1) = naAuto 'Write
```

```
attn = chan.AttenuatorMode(1) 'Read
```

C++ Syntax HRESULT get_AttenuatorMode(long port, tagNAModes* pVal)
HRESULT put_AttenuatorMode(long port, tagNAModes newVal)

Interface IChannel

ICalSet3

Attenuator Property

Description	Sets or returns the value of the source attenuator for the specified port number. Sending this command automatically sets AttenuatorMode to Manual.
VB Syntax	*object*.**Attenuator(***portNum***)** = *value*
Variable	**(Type) - Description**
object	Channel **(object)** **or** CalSet **(object)** - Read-only property
portNum	**(long integer)** - Port number of source attenuator to be changed.
value	**(double)** - Attenuation value. The range of settable values depends on the PNA model. To determine the valid settings, do one of the following: • See PNA models and options to see the range and step size for each model / option. • To determine the maximum attenuator value use MaximumSourceStepAttenuator and . However, this will not tell you the attenuation step size. If an invalid attenuation setting is entered, the PNA will select the next lower valid value. For example, if 19 is entered, then for an E8361A, 10 dB attenuation will be selected.
Return Type	Double
Default	20 dB
Examples	`chan.Attenuator(1) = 20 'Write` `attn = chan.Attenuator(cnum) 'Read`
C++ Syntax	HRESULT get_Attenuator(long port, double *pVal) HRESULT put_Attenuator(long port, double newVal)
Interface	IChannel ICalSet3

Last Modified:

25-Oct-2007	Edit value text
30-Apr-2007	Minor edits

AutoIFBWAdjustment Property

Description	Set and read auto IFBW adjustment ON | OFF state for Gain Compression measurements.
VB Syntax	*gca*.**AutoIFBWAdjustment** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(Boolean) -** Auto IFBW adjustment state. Choose from: **False** - Sets auto IFBW adjustment OFF **True -** Sets auto IFBW adjustment ON
Return Type	Boolean
Default	ON
Examples	`gca.AutoIFBWAdjustment = True 'Write` `aifbw = gca.AutoIFBWAdjustment 'Read`
C++ Syntax	HRESULT get_AutoIFBWAdjustment(VARIANT_BOOL* bState) HRESULT put_AutoIFBWAdjustment(VARIANT_BOOL bState)
Interface	IGainCompression

Last Modified:

8-Nov-2007 MX New topic

AutoOrient Property

Description Sets ECAL module automatic orientation ON or OFF.

VB Syntax *obj*.**AutoOrient** = *bool*

Variable **(Type) - Description**

obj SMCType (object)

or

VMCType (object)

bool (Boolean)

True - Set AutoOrientation ON

False - Set AutoOrientation OFF

Return Type Boolean

Default True

Examples

```
Smc.AutoOrient = True
```

C++ Syntax HRESULT put_AutoOrient(VARIANT_BOOL bAutoOrient);

HRESULT get_AutoOrient(VARIANT_BOOL *bAutoOrient);

Interface SMCType

VMCType

AutoPortExtConfig Property

Description Sets the frequency span that is used to calculate Automatic Port Extension. Learn more about calculating Automatic Port Extension.

VB Syntax *fixture*.**AutoPortExtConfig** = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

value (ENUM as NAAutoPortExtConfig)

0 naAPEC_CSPN - Use current span.

1 naAPEC_AMKR - Use active marker frequency.

2 naAPEC_USPN - Use custom user span. Use AutoPortExtSearchStart Property and AutoPortExtSearchStop Property to specify start and stop frequency.

Return Type ENUM

Default **0 naAPEC_CSPN**

Examples

```
fixture.AutoPortExtConfig = naAPEC_AMKR
```

```
value = fixture.AutoPortExtConfig 'Read
```

C++ Syntax HRESULT get_AutoPortExtConfig(tagNAAutoPortExtConfig *pVal);

HRESULT put_AutoPortExtConfig(tagNAAutoPortExtConfig Val);

Interface IFixturing2

AutoPortExtDCOffset Property

Description Specifies whether or not to include DC Offset as part of automatic port extension. Learn more about Automatic DC Offset. Only allowed when AutoPortExtLoss Property is set to ON.

VB Syntax *fixture*.**AutoPortExtDCOffset** = *bool*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

bool **True** - Includes DC Offset correction.

False - Does NOT include DC Offset correction.

Return Type Boolean

Default False

Examples

```
fixture.AutoPortExtDCOffset = True
```

```
value = fixture.AutoPortExtDCOffset 'Read
```

C++ Syntax HRESULT get_AutoPortExtDCOffset(VARIANT_BOOL *pState);

HRESULT put_AutoPortExtDCOffset(VARIANT_BOOL bState);

Interface IFixturing2

AutoPortExtLoss Property

Description Specifies whether or not to include loss correction as part of automatic port extension. Learn more about Loss Compensation in port extension.

VB Syntax *fixture*.**AutoPortExtLoss** = *bool*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

bool **True** - Includes Loss correction.

False - Does NOT include Loss correction.

Return Type Boolean

Default False

Examples

```
fixture.AutoPortExtLoss = True
```

```
value = fixture.AutoPortExtLoss 'Read
```

C++ Syntax HRESULT get_AutoPortExtLoss(VARIANT_BOOL *pState);

HRESULT put_AutoPortExtLoss(VARIANT_BOOL bState);

Interface IFixturing2

AutoPortExtSearchStart Property

Description Set the start frequency for custom user span. Only applies when fixture.AutoPortExtConfig = **0 naAPEC_CSPN.**

Learn more about User Span.

VB Syntax *fixture.***AutoPortExtSearchStart** = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

value (Double) User span start value. Must be within the frequency range of the active channel and less than the value set by AutoPortExtSearchStop Property

Return Type Double

Default Start frequency of the current active channel.

Examples

```
fixture.AutoPortExtSearchStart = 1E9
```

```
value = fixture.AutoPortExtSearchStart 'Read
```

C++ Syntax HRESULT get_AutoPortExtSearchStart(double *pdVal);

HRESULT put_AutoPortExtSearchStart(double dVal);

Interface IFixturing2

AutoPortExtSearchStop Property

Description	Set the stop frequency for custom user span. Only applies when fixture.AutoPortExtConfig = **0 naAPEC_CSPN.** Learn more about User Span. Only applies when fixture.AutoPortExtConfig = **0 naAPEC_CSPN**
VB Syntax	*fixture*.**AutoPortExtSearchStop** = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
value	(Double) User span stop value. Must be within the frequency range of the active channel and greater than the value set by AutoPortExtSearchStart Property
Return Type	Double
Default	Stop frequency of the current active channel.
Examples	`fixture.AutoPortExtSearchStop = 1E9` `value = fixture.AutoPortExtSearchStop 'Read`
C++ Syntax	HRESULT get_AutoPortExtSearchStop(double *pdVal); HRESULT put_AutoPortExtSearchStop(double dVal);
Interface	IFixturing2

AutoPortExtState Property

Description	Enables and disables automatic port extensions on the specified port. All enabled ports will have their reference plane automatically adjusted after performing Automatic Port Extension.
VB Syntax	*fixture*.**AutoPortExtState** *(port)* = *bool*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
port	**(Integer)** Port number to enable or disable.
bool	(Boolean) **True** - Enables Auto Port Extensions **False** - Disables Auto Port Extensions
Return Type	Boolean
Default	False
Examples	`fixture.AutoPortExtState(1) = True` `value = fixture.AutoPortExtState(2) 'Read`
C++ Syntax	HRESULT get_AutoPortExtConfig(AutoPortExtState(short port, VARIANT_BOOL *pState); HRESULT put_AutoPortExtConfig(AutoPortExtState(short port, VARIANT_BOOL bVal);
Interface	IFixturing2

AuxiliaryTriggerCount Property

Description	Returns the number of aux trigger input / output connector pairs in the PNA
VB Syntax	*value* = *app*.**AuxiliaryTriggerCount**
Variable	**(Type) - Description**
value	**(Long Integer)** Variable to store the returned value. 2 = N5242A models (PNA-X) 1 = All other PNA models
app	An Application **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`ioConns = app.AuxiliaryTriggerCount`
C++ Syntax	HRESULT AuxiliaryTriggerCount(long *count);
Interface	IApplication11

Last Modified:

14-Dec-2006 MX New topic

AuxTriggerScopeIsGlobal Property

Description Sets the Trigger OUT behavior to either Global or Channel. Learn more about this setting.

This command will cause the PNA to Preset.

This setting remains until changed again using this command, or until the hard drive is changed or reformatted.

See the AuxTrigger Object.

VB Syntax *pref*.**AuxTriggerScopeIsGlobal** = *value*

Variable **(Type) - Description**

pref A Preferences **(object)**

value **(Boolean)** - Choose from:

- **True** - Trigger properties apply to ALL channels (Global).
  - Default setting for **E836x and PNA-L** models.
  - Allows use of command to configure the external trigger properties.
  - "Per Point" trigger property is not settable. Use the channel's Point trigger setting.
- **False** - External Trigger properties apply to each channel independently.
  - Default setting for **PNA-X** models.
  - Must use AuxTrigger commands to configure the external trigger properties. ExternalTriggerConnectionBehavior Property will NOT work.
  - "Per Point" trigger output property is set using the channel's Point trigger setting **AND** TriggerOutInterval Property.

Return Type Boolean

Default **True** - E836xB and PNA-L models

False - PNA-X models

Examples

```
pref.AuxTriggerScopeIsGlobal = 1 'Write
```

```
auxTrigPref = pref.AuxTriggerScopeIsGlobal 'Read
```

C++ Syntax HRESULT get_AuxTriggerScopeIsGlobal(VARIANT_BOOL * pref);

HRESULT put_AuxTriggerScopeIsGlobal(VARIANT_BOOL pref);

Interface IPreferences5

Last modified:

25-Feb-2008	Clarification
Jan 3, 2007	MX New command

AveragingCount Property

Description	Returns the number of sweeps that have been acquired and averaged into the measurements on this channel. AveragingFactor specifies the number of sweeps to average. AveragingCount indicates the progress toward that goal.
VB Syntax	*value* = *chan*.**AveragingCount**
Variable	**(Type) - Description**
chan	A Channel **(object)**
value	**(Long Integer)** - Variable to store the returned count
Return Type	Long Integer
Default	Not Applicable
Example	`avgcount = chan.AveragingCount`
C++ Syntax	HRESULT get_AveragingCount(long* count)
Interface	IChannel

AveragingFactor Property

Description	Specifies the number of measurement sweeps to combine for an average. Must also turn averaging ON by setting *chan*.Averaging = 1. Averaging is only allowed on ratioed measurements; not on single input measurements.
VB Syntax	*chan*.**AveragingFactor** = *value*
Variable	**(Type) - Description**
chan	A Channel **(object)**
value	**(Long Integer)** - Number of measurement sweeps to average. Choose any number between **1** and **65536** (2^16).
Return Type	Long Integer
Default	1
Examples	`chan.AveragingFactor = 5 'Write` `avgfact = chan.AveragingFactor ' Read`
C++ Syntax	HRESULT get_AveragingFactor(long *pVal) HRESULT put_AveragingFactor(long newVal)
Interface	IChannel

 About Averaging

Averaging Property

Description	Turns trace averaging ON or OFF for all measurements on the channel. Averaging is only allowed on ratioed measurements; not on single input measurements.
VB Syntax	*chan*.**Averaging** = *state*
Variable	**(Type) - Description**
chan	A Channel **(object)**
state	**(boolean)** **False** - Turns averaging OFF **True** - Turns averaging ON
Return Type	Boolean
Default	False

Examples	`chan.Average = True 'Write`
	
	`averg = chan.Averaging 'Read`

C++ Syntax	HRESULT get_Averaging(BOOL *pVal) HRESULT put_Averaging(BOOL newVal)
Interface	IChannel

AvoidSpurs Property

Description Sets and returns the state of the avoid spurs feature.

VB Syntax *mixer*.**AvoidSpurs =** *boolean*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(Boolean)** - State of avoid spurs feature. Choose from

False Avoid spurs OFF

True Avoid spurs ON

Return Type Boolean

Default False

Examples

```
mixer.AvoidSpurs = True 'Write
variable = mixer.AvoidSpurs  'Read
```

C++ Syntax HRESULT get_AvoidSpurs(Bool *bVal)

HRESULT put_AvoidSpurs(Bool newVal)

Interface IMixer3

BalancedMode Property

Description Sets and returns whether the balanced transform is ON or OFF

VB Syntax *balMeas*.**BalancedMode** = *value*

Variable (Type) - Description

balMeas A BalancedMeasurement **(object)**

value **(Boolean)** - State of balanced transform. Choose from

False Balanced Transform OFF

True Balanced Transform ON

Return Type Boolean

Default **False**

Examples

```
balMeas.BalancedMode = True 'Write
variable = balMeas.BalancedMode  'Read
```

C++ Syntax HRESULT get_BalancedMode(VARIANT_BOOL *bVal)

HRESULT put_BalancedMode(VARIANT_BOOL newVal)

Interface IBalancedMeasurement

BandwidthTarget Property

Description	Sets the insertion loss value at which the bandwidth of a filter is measured (using BandwidthTracking or SearchFilterBandwidth). For example, if you want to determine the filter bandwidth 3 db below the bandpass peak value, set BandwidthTarget to **-3**.
VB Syntax	*meas*.**BandwidthTarget** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(single)** - Target value. Choose any number between **-500** and **500**
Return Type	Single
Default	-3
Examples	`meas.BandwidthTarget = -3 'Write` `fbw = meas.BandwidthTarget 'Read`
C++ Syntax	HRESULT put_BandwidthTarget(float target) HRESULT get_BandwidthTarget(float* target)
Interface	IMeasurement

BandwidthTracking Property

Description Searches continually (every sweep) for the current BandwidthTarget (default is -3). To search the filter bandwidth for ONE SWEEP only (not continually), use meas.SearchFilterBandwidth.

This feature uses markers 1-4. To turn off these markers, either turn them off individually or DeleteAllMarkers.

The bandwidth statistics are displayed on the analyzer screen. To get the bandwidth statistics, use either GetFilterStatistics or FilterBW, FilterCF , FilterLoss ,or FilterQ.

The analyzer screen will show either Bandwidth statistics OR Trace statistics; not both.

To restrict the search to a UserRange with the bandwidth search, first activate marker 1 and set the desired UserRange. Then send the SearchFilterBandwidth command. The user range used with bandwidth search only applies to marker 1 searching for the max value. The other markers may fall outside the user range.

VB Syntax *meas*.**BandwidthTracking** = *value*

Variable **(Type) - Description**

meas A Measurement **(object)**

value **(boolean)**
True - Turns bandwidth tracking ON
False - Turns bandwidth tracking OFF

Return Type Boolean

Default **False**

Examples

```
meas.BandwidthTracking = False 'Write
```

```
bwtrack = meas.BandwidthTracking 'Read
```

C++ Syntax HRESULT put_BandwidthTracking(VARIANT_BOOL state)
HRESULT get_BandwidthTracking(VARIANT_BOOL* state)

Interface IMeasurement

BB_BalPort1Negative Property

Description	With a Balanced - Balanced topology, returns the PNA port number that is connected to the Negative side of the DUT's logical Port 1. Use SetBBPorts Method to set the port mapping for a Balanced - Balanced topology.
VB Syntax	*var* = *balTopology*.**BB_BalPort1Negative**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTop.BB_BalPort1Negative  'Read`
C++ Syntax	HRESULT get_BB_BalPort1Negative(long *bVal)
Interface	IBalancedTopology

BB_BalPort1Positive Property

Description	With a Balanced - Balanced topology, returns the PNA port number that is connected to the Positive side of the DUT's logical Port 1. Use SetBBPorts Method to set the port mapping for a Balanced - Balanced topology.
VB Syntax	*var* = *balTopology*.**BB_BalPort1Positive**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTop.BB_BalPort1Positive  'Read`
C++ Syntax	HRESULT get_BB_BalPort1Positive(long *bVal)
Interface	IBalancedTopology

BB_BalPort2Negative Property

Description	With a Balanced - Balanced topology, returns the PNA port number that is connected to the Negative side of the DUT's logical Port 2. Use SetBBPorts Method to set the port mapping for a Balanced - Balanced topology.
VB Syntax	*var* = *balTopology*.**BB_BalPort2Negative**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTop.BB_BalPort2Negative 'Read`
C++ Syntax	HRESULT get_BB_BalPort2Negative(long *bVal)
Interface	IBalancedTopology

BB_BalPort2Positive Property

Description	With a Balanced - Balanced topology, returns the PNA port number that is connected to the Positive side of the DUT's logical Port 2. Use SetBBPorts Method to set the port mapping for a Balanced - Balanced topology.
VB Syntax	*var* = *balTopology*.**BB_BalPort2Positive**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTop.BB_BalPort2Positive  'Read`
C++ Syntax	HRESULT get_BB_BalPort2Positive(long *bVal)
Interface	IBalancedTopology

BBalMeasurement Property

Description Sets and returns the measurement for the Balanced - Balanced topology.

VB Syntax *balMeas*.**BBalMeasurement =** *value*

Variable **(Type) - Description**

balMeas A BalancedMeasurement **(object)**

value **(String)** - Balanced - Balanced Measurement parameter. Not case sensitive. Choose from:

Sdd11	Sdd12	Sdc11	Sdc12
Sdd21	Sdd22	Sdc21	Sdc22
Scd11	Scd12	Scc11	Scc12
Scd21	Scd22	Scc21	Scc22
Imb1	Imb2	CMRR -(Sdd21/Scc21)	

Return Type String

Default Sdd11

Examples

```
balMeas.BBalMeasurement = "Sdd11" 'Write
variable = balMeas.BBalMeasurement  'Read
```

C++ Syntax HRESULT get_BBalMeasurement(BSTR *pVal)

HRESULT put_BBalMeasurement(BSTR newVal)

Interface IBalancedMeasurement

BeginResponse Property

Description	When constructing a limit line, specifies the amplitude value of the start of a limit segment.
VB Syntax	*limtseg*.**BeginResponse** = *value*
Variable	**(Type) - Description**
limtseg	A LimitSegment **(object)**
value	**(double)** - Amplitude value. No units
Return Type	Double
Default	0

Examples	`Set limtseg = meas.LimitTest(1)`
	`limtseg.BeginResponse = 10 'Write`
	
	`BegResp = limtseg.BeginResponse 'Read`

C++ Syntax	HRESULT get_BeginResponse(double *pVal) HRESULT put_BeginResponse(double newVal)
Interface	ILimitSegment

BeginStimulus Property

Description	When constructing a limit line, specifies the beginning X-axis value.
VB Syntax	*limtseg*.**BeginStimulus** = *value*
Variable	**(Type) - Description**
limtseg	A LimitSegment **(object)**
value	**(double)** - Stimulus value. No units
Return Type	Double
Default	0

Examples

```
Set limtseg = meas.LimitTest(1)
 limtseg.Type = naLimitSegmentType_Maximum
 limtseg.BeginStimulus = 3e9
 limtseg.EndStimulus = 4e9
 limtseg.BeginResponse = 10
 limtseg.EndResponse = 10
```

```
BegStim = limtseg.BeginStimulus 'Read
```

C++ Syntax	HRESULT get_BeginStimulus(double *pVal) HRESULT put_BeginStimulus(double newVal)
Interface	ILimitSegment

BroadbandTuningSpan Property

Description	Sets and returns the frequency span for the broadband tuning sweep.
VB Syntax	*embedLO*.**BroadbandTuningSpan** = *value*
Variable	**(Type) - Description**
embedLO	An EmbeddedLO **(object)**
value	**(Double)** Broadband frequency span in Hz.
Return Type	**(Double)**
Default	3 MHz
Examples	`embedLO.BroadbandTuningSpan = 1E6 'write`
	`value = embedLO.BroadbandTuningSpan 'read`
C++ Syntax	HRESULT get_BroadbandTuningSpan(double* span); HRESULT put_BroadbandTuningSpan(double span);
Interface	IEmbededLO

Last Modified:

13-Apr-2007 MX New topic

BucketNumber Property

Description Sets or returns the bucket number (data point) for the active marker. When the markers are interpolated (non-discrete), the returned value is the nearest marker bucket position.

VB Syntax *mark*.**BucketNumber** = *value*

Variable **(Type) - Description**

mark A Marker **(object)**

value **(long integer)** - Data point. Choose any number between 0 and the measurement's number of data points - 1. For example, with Number of points = 201, choose between 0 and 200

Return Type Long Integer

Default The first marker is set to the middle of the span. Subsequent markers are set to the bucket number of the previously active marker.

Examples

```
mark.BucketNumber = 100 'moves the active marker to data point 100 -Write
```

```
pointNumber = mark.BucketNumber 'returns the data point number of the
marker object. When the markers are interpolated (non-discrete), the
returned value is the nearest marker bucket position.
```

C++ Syntax HRESULT get_BucketNumber(long *pVal)
HRESULT put_BucketNumber(long newVal)

Interface IMarker

C0 Property

Description Sets and Returns the C0 (C-zero) value (the first capacitance value) for the calibration standard.

To set the other capacitance values, use C1, C2, C3

For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

VB Syntax *calstd*.**C0** = *value*

Variable (Type) - Description

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(single)** - Value for C0 in femtofarads (1E-15)

Return Type Single

Default Not Applicable

Examples

```
calstd.C0 = 15 'Write the value of C0 to 15femtofarads
```

```
cap0 = calstd.C0 'Read the value of C0
```

C++ Syntax

HRESULT get_C0(float *pVal)
HRESULT put_C0(float newVal)

Interface ICalStandard

C1 Property

Description Sets and Returns the C1 value (the second capacitance value) for the calibration standard.

To set the other capacitance values, use C0, C2, C3.

For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

VB Syntax *calstd*.**C1** = *value*

Variable (Type) - Description

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(single)** - Value for C1.

Return Type Single

Default Not Applicable

Examples

```
calstd.C1 = 15 'Write the value of C1.
```

```
cap1 = calstd.C1 'Read the value of C1.
```

C++ Syntax

HRESULT get_C1(float *pVal)
HRESULT put_C1(float newVal)

Interface ICalStandard

C2 Property

Description Sets and Returns the C2 value (the third capacitance value) for the calibration standard.

To set the other capacitance values, use C0, C1, C3.

For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

VB Syntax *calstd*.**C2** = *value*

Variable **(Type) - Description**

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(single)** - Value for C2.

Return Type Single

Default Not Applicable

Examples

```
calstd.C2 = 15 'Write the value of C2.
```

```
cap2 = calstd.C2 'Read the value of C2
```

C++ Syntax HRESULT get_C2(float *pVal)
HRESULT put_C2(float newVal)

Interface ICalStandard

C3 Property

Description Sets and Returns the C3 value (the fourth capacitance value) for the calibration standard.

To set the other capacitance values, use C0, C1, C2

For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

VB Syntax *calstd*.**C3** = *value*

Variable **(Type) - Description**

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(single)** - Value for C3.

Return Type Single

Default Not Applicable

Examples

```
calstd.C3 = 15 'Write the value of C3.
```

```
cap3 = calstd.C3 'Read the value of C3
```

C++ Syntax HRESULT get_C3(float *pVal)
HRESULT put_C3(float newVal)

Interface ICalStandard

CalFactor Property

Description	Sets or returns the cal factor value associated with a power sensor cal factor segment.
VB Syntax	*calFactSeg*.**CalFactor** = *value*
Variable	**(Type) - Description**
powerCalibrator	**(object) -** A PowerSensorCalFactorSegment (object)
value	**(double)** – Cal factor in percent. Choose any value between 1 and 150
Return Type	Double
Default	0
Examples	`calFactSeg.CalFactor = 98 'Write` `factor = calFactSeg.CalFactor 'Read`
C++ Syntax	HRESULT put_CalFactor(Double newVal); HRESULT get_CalFactor(Double *pVal);
Interface	IPowerSensorCalFactorSegment

CalibrationType Property Superseded

Description

Note: This command has been replaced by CalibrationTypeID property, which provides selection of Calibration Type by string.

Specifies the type of calibration to perform or apply to the active S-Parameter measurement. This command determine the ports involved in the CalType by the ports being used by the active measurement.

For example:

- If the measurement is an S23, it uses ports 2 and 3.
- If the measurement is an S22 it will use the legacy load port to figure out which two ports form the caltype. The legacy load port is set using CreateMeasurement.
- If **naCalType_ThreePort_SOLT** is specified on a 4-port PNA, an E_NA_DEPRECATED_COMMAND error is returned. There is no way to determine the intended three ports.
- If **naCalType_FourPort_SOLT** is specified on a 4-port PNA, it is obvious that the ports involved are ports 1,2,3, and 4.

Note: For FCA measurements, use CalibrationName and CalibrationTypeID.

VB Syntax *meas*.**CalibrationType** = *type*

Variable **(Type) - Description**

meas A Measurement **(object)**

type **(enum NACalType)** - Calibration type. Choose from:

0 - naCalType_Response_Open

1 - naCalType_Response_Short

2 - naCalType_Response_Thru

3 - naCalType_Response_Thru_And_Isol

4 - naCalType_OnePort

5 - naCalType_TwoPort_SOLT

6 - naCalType_TwoPort_TRL

7 - naCalType_None

8 - naCalType_ThreePort_SOLT

9 - Custom

10 - naCalType_FourPort_SOLT

Return Type **NACalType**

Default naCalType_None

Examples

```
meas.CalibrationType = naCalType_Response_Open 'Write
```

```
meascal = meas.CalibrationType 'Read
```

C++ Syntax HRESULT put_CalibrationType (tagNACalType CalType)
HRESULT get_CalibrationType (tagNACalType* pCalType)

Interface IMeasurement

Read only

CalibrationName Property

Description	Returns the name of the current Cal Type.
VB Syntax	*value* = *meas*.**CalibrationName**
Variable	**(Type) - Description**
value	**(string)** - Variable to store the returned value.
meas	A Measurement **(object)**
Return Type	String
Default	Not Applicable
Examples	`ct = meas.CalibrationName`
C++ Syntax	HRESULT get_CalibrationName(BSTR* CalibrationName);
Interface	IMeasurement2

Read / Write

CalibrationPort Property - Obsolete

Description	**Note:** Beginning with Rev 6.0, this command is no longer necessary. Learn more. Because of improved calibration techniques, **Both** is always selected although a power meter measurement is performed only on port 1. Specifies which SMC port to calibrate.
VB Syntax	*SMC*.**CalibrationPort** = *value*
Variable	(Type) - **Description**
SMC	SMCType (object)
value	(String) Port number to be calibrated. Choose from: • **1** - SMC forward • **2** - SMC reverse • **Both**
Return Type	String
Default	1
Examples	`value = SMC.CalibrationPort = "Both"`
C++ Syntax	HRESULT put_CalibrationPort(BSTR port); HRESULT get_CalibrationPort(BSTR *port);
Interface	SMCType VMCType

CalibrationTypeID Property

Description

Note: This command replaces Calibration Type Property.

Sets or returns the current cal type for channel using a Cal Type Name.

This command is used to set the Cal Type after recalling a Cal Set. Learn more

You can also use the CLSID or GUID associated with the Cal Type.

VB Syntax *meas*.**CalibrationTypeID =** *id*

Variable **(Type) - Description**

meas A Measurement **(object)**

id **(String)** Cal type. Case sensitive. Use one of the following:

For Full Calibrations:

This command does not distinguish between TRL and SOLT. The same number of error terms is applied for both Cal Types.

"Full n Port(x,y,z...)"

where

n = the number of ports to calibrate

x,y,z = the port numbers to calibrate

For example:

```
"Full 7 Port(2,3,4,5,6,7,8)"
```

For Response Calibrations:

"Response(param)" OR

"ResponseAndIsolation(param)"

Where param =

- S-parameter. For example"
  - `"Response(S21)"`
  - `"ResponseAndIsolation(A/R)"`
- Single or ratioed receivers using either logical receiver notation or physical receiver notation. For example:
  - `"Response(A)"`
  - `"ResponseAndIsolation(a3/b4)"`

For FCA Calibrations:

- "Scalar Mixer Cal"
- "SMC with NO Output Match Correction"
- "SMC with NO Input Match Correction"
- "SMC with NO Match Correction"
- "Vector Mixer Cal"
- "Characterize Mixer Only"

You can also use a ClassID or GUID. For example:

- CLSID - "VectorMixerCal.VCMCType"
- GUID - "{2061767B-0FE2-4F6F-86D0-9AB332B18DA5}"

For Gain Compression Cal

where r = receive port; s = source port

- "GCA 2P (r,s)" - full 2-port cal
- "GCA Enh Resp (r,s)" - Enhanced Response Cal

Return Type String

Default Not Applicable

Examples

```
Dim pna
Dim m

 Set pna = CreateObject("AgilentPNA835x.Application")
 Set m = pna.ActiveMeasurement
 m.CalibrationTypeID = "Vector Mixer Cal"
 m.ErrorCorrection = True
 MsgBox   m.CalibrationName
```

C++ Syntax HRESULT get_CalibrationTypeID(BSTR* CalibrationTypeID);

HRESULT put_CalibrationTypeID(BSTR CalibrationTypeID);

Interface IMeasurement2

Last modified:

11-Feb-2008 Fixed typo

9/12/06 MQ Added for multiport.

CalKitType Property

Description Sets and returns a calibration kit type for calibration or to be used for kit modification. To get a ha kit, use app.ActiveCalKit .

There is also a CalKitType property on the GuidedCalibration, SMC, and VMC objects.

VB Syntax *object* .**CalKitType** = *value*

Variable **(Type) - Description**

object calkit (object) or

Application (object)

Note: app .CalKitType and **calkit** .calKitType perform exactly the same function.

value **(enum naCalKit)** - Calibration Kit type. Choose from:

1 - naCalKit_User1
2 - naCalKit_User2
3 - naCalKit_User3
4 - naCalKit_User4
..
..
..
49 - naCalKit_User49
50 - naCalKit_User50

These enumerated values correspond with the calibration kit ID on the Advanced Cal Kit Modify

To change the cal kit name, use Name property .

Return Type NACalKit

Default Not Applicable

Examples

```
calkit.CalKitType = naCalKit_User27
```

```
kitype = app.CalKitType
```

C++ Syntax

```
HRESULT get_CalKitType(tagNACalKit *pVal);
HRESULT put_CalKitType(tagNACalKit newVal);
```

Interface IApplication
ICalKit

CalKitType Property

Description Sets and returns a calibration kit type for the specified port number to be used during the calibration.

Note: Sliding loads are not fully supported from the GuidedCalibration object. The **Measure** button must be pressed manually on the PNA.

VB Syntax *object*.**CalKitType** *(port)* = *value*

Variable **(Type) - Description**

object Any of the following:

GuidedCalibration (object)

SMCType (object)

VMCType (object)

port (Long) Port number to which the cal kit will be assigned.

For All Guided Cals, select port number.

For SMC and VMC calibrations:

1 - Input port of the mixer under test.

2 - Output port of the mixer under test.

For VMC cal only:

Output port of MUT +1 - Output port of the calibration mixer. Generally this is port 3.

See the user interface (UI) equivalent of this command.

value **(string)** - Calibration Kit type.

Use CompatibleCalKits property for a list of valid Cal Kits.

Return Type String

Default Not Applicable

Examples

```
SMC.CalKitType(1) = naCalKit_User27
```

```
value = smc.CalKitType(1)
```

C++ Syntax HRESULT get_CalKitType(long port, BSTR *calkit)

HRESULT put_CalKitType(long port, BSTR calkit)

Interface	IGuidedCalibration SMCType VMCType

Last Modified:

13-Aug-2007	Added detail for port argument

CalMethod Property

Description	Sets and returns the method for performing calibration on a noise channel.
VB Syntax	*noise*.**CalMethod** = *value*
Variable	**(Type) - Description**
noise	A NoiseCal **(object)**
value	**(string)** Cal Method. Choose from: "VectorFull" "SParameter"
Return Type	String
Default	"VectorFull"
Examples	`noise.CalMethod = "VectorFull"'Write` `calMethod = noise.CalMethod 'Read`
C++ Syntax	HRESULT get_CalMethod(BSTR* pValue) HRESULT put_CalMethod(BSTR pNewValue)
Interface	INoiseCal

Last Modified:

29-May-2007 MN New topic

Read-only

About Source Power Cal

CalPower Property Superseded

Description

This command is replaces by SetCalInfoEx Method.

Specifies the power level that is expected at the desired reference plane (DUT input or output). This is not used for segment sweep with independent power levels or power sweeps.

VB Syntax

value = *powerCalibrator*.**CalPower** *(chan, sourcePort)*

Variable

(Type) - Description

value

(double) - Variable to store the returned Cal power value in dBm.

powerCalibrator

(object) - A SourcePowerCalibrator object

chan

(long integer) - Channel number of the PNA.

sourcePort

(long integer) - Source port number.

Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.

Return Type

None

Default

0

Examples

```
Set powerCalibrator = pna.SourcePowerCalibrator
powerCalibrator.CalPower = -10 'Write

power = powerCalibrator.CalPower 'Read
```

C++ Syntax

HRESULT get_CalPower(long channel, long sourcePort, double *pVal);

Interface

ISourcePowerCalibrator

Last Modified:

30-Apr-2007 Superseded

Center Property

Description Sets or returns the Center time of either Gating or Time Domain transform windows

VB Syntax *object*.**Center** = *value*

Variable (Type) - Description

object **(object)** As Gating
or
(object) As Transform

value **(double)** - Center time in seconds. Choose any number between:
± (points-1) / frequency span

Return Type Double

Default 0

Examples

```
trans.Center = 4.5e-9 'sets the Center time of a transform window -Write
gate.Center = 4.5e-9 'sets the Center time of a gating window - Write
```

```
cnt = trans.Center 'Read
```

C++ Syntax HRESULT get_Center(double *pVal)
HRESULT put_Center(double newVal)

Interface ITransform
IGating

Read-only

Center Property

Description Returns the stimulus value of the center data point for the measurement. This function does NOT work for segment sweep measurements. To understand how this property is useful, see IMeasurement2 Interface.

VB Syntax *value* = *meas*.**Center**

Variable **(Type) - Description**

value **(Double)** - Variable to store the returned value.

meas A Measurement **(object)**

Return Type Double

Default Not Applicable

Examples

```
Print meas.Center 'prints the center data point
```

C++ Syntax HRESULT get_Center(double * Val);

Interface IMeasurement2

CenterFrequency Property

Description	Sets or returns the center frequency of the channel **or** Sets or returns the center frequency of the segment. See the Measurement2 Interface to learn how this method differs from meas.Center.
VB Syntax	*object*.**centerFrequency** = *value*
Variable	**(Type) - Description**
object	A Channel **(object)** **or** A Segment **(object)**
value	**(double)** - Center frequency in Hertz. Choose any number between the **minimum** and **maximum** frequencies of the analyzer.
Return Type	Double
Default	Center of the frequency range
Examples	`chan.centerFrequency = 4.5e9 'sets the center frequency of a linear sweep for the channel object -Write` `centfreq = chan.centerFrequency 'Read`
C++ Syntax	HRESULT get_CenterFrequency(double *pVal) HRESULT put_CenterFrequency(double newVal)
Interface	IChannel ISegment

ChannelNumber Property

Description Returns the Channel number of the Channel or Measurement object.

VB Syntax *object.***ChannelNumber**

Variable **(Type) - Description**

object A Channel **(object)**
or
A Measurement **(object)**

Return Type Long Integer

Default Not applicable

Examples

```
chanNum = chan.ChannelNumber 'returns the channel number
chanNum = meas.ChannelNumber 'returns the channel number of the measurement
```

C++ Syntax HRESULT get_ChannelNumber(long *pVal)

Interface IChannel
IMeasurement

CharacterizeMixerOnly Property

Description	Sets and returns whether to perform ONLY a mixer characterization.
VB Syntax	*VMC*.**CharacterizeMixerOnly** = *bool*
Variable	**(Type) - Description**
VMC	VMCType (object)
bool	(Boolean) **True** - Perform ONLY mixer characterization. **False** - Perform both mixer characterization and calibration.
Return Type	Boolean
Default	**False**
Examples	`value = VMC.CharacterizeMixerOnly`
C++ Syntax	HRESULT put_CharacterizeMixerOnly(VARIANT_BOOL bCharMixerOnly); HRESULT get_CharacterizeMixerOnly(VARIANT_BOOL *bCharMixerOnly);
Interface	VMCType

CharFileName Property

Description	Specifies the mixer characterization (.S2P) file and immediately loads the file. Also specify the use of a characterization file with LoadCharFromFile Property
VB Syntax	*VMC*.**CharFileName** = *value*
Variable	**(Type) - Description**
VMC	VMCType (object)
value	(String) Full path, file name, and extension of the mixer characterization file.
Return Type	Not Applicable
Default	Not Applicable
Examples	`VMC.CharFileName = "C:\Program Files\Agilent\Network Analyzer\Documents\default.S2P"`
C++ Syntax	HRESULT put_CharFileName(BSTR filename); HRESULT get_CharFileName(BSTR *filename);
Interface	VMCType

Read-Write

CharMixerReverse Property

Description	Specifies the direction in which to characterize the calibration mixer. Learn more about the calibration mixer.
VB Syntax	*VMC*.**CharMixerReverse** = *bool*
Variable	**(Type) - Description**
VMC	VMCType (object)
bool	(Boolean) **0** - Characterize the calibration mixer in the SAME direction as that specified in the mixer setup. **1** - Characterize the calibration mixer in the REVERSE direction as that specified in the mixer setup.
Return Type	Boolean
Default	0
Examples	`VMC.CharMixerReverse = 0`
C++ Syntax	HRESULT put_CharMixerReverse(VARIANT_BOOL bcharReverse); HRESULT get_CharMixerReverse(VARIANT_BOOL *bcharReverse);
Interface	VMCType2

CitiContents Property

Description	Specifies the contents of subsequent citifile saves using app.SaveCitiDataData or app.SaveCitiFormattedData
VB Syntax	*pref*.**CitiContents** = *value*
Variable	**(Type) - Description**
pref	A Preferences **(object)**
value	**(string)** - Contents that will be saved with subsequent save commands. Choose from: **"Single"** - Single trace **"Displayed"** - All displayed traces **"Auto"** - All displayed traces
Return Type	String
Default	"Auto"
Examples	`pref.CitiContents = "Single" 'Write` `content = pref.CitiContents 'Read`
C++ Syntax	HRESULT get_CitiContents(BSTR *Contents) HRESULT put_CitiContents(BSTR Contents)
Interface	IPreferences

CitiFormat Property

Description	Specifies the format of subsequent citifile saves using app.SaveCitiFormattedData
VB Syntax	*pref*.**CitiFormat** = *value*
Variable	**(Type) - Description**
pref	A Preferences **(object)**
value	**(string)** - Format in which the citifile will be saved with subsequent save commands. Choose from: **"MA"** - Linear Magnitude / degrees **"DB"** - Log Mag / degrees **"RI" -** Real / Imaginary **"Auto"** - Format in which the trace is already displayed. If other than Log Mag, Linear Magnitude, or Real/Imag, then the format will be in Real/Imag.
Return Type	String
Default	"Auto"
Examples	`pref.CitiFormat = "MA" 'Write` `format = pref.CitiFormat 'Read`
C++ Syntax	HRESULT get_CitiFormat(BSTR *Format) HRESULT put_CitiFormat(BSTR Format)
Interface	IPreferences

CmnModeZConvPortImag Property

Description Sets the imaginary part of the impedance value for the common port impedance conversion function.

VB Syntax *fixture*.**CmnModeZConvPortImag**(*portNum*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

portNum **(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.

value **(Double)** Imaginary part of the Impedance value. Choose a value between 0 and 1E18.

Return Type Double

Default 0

Examples

```
fixture.CmnModeZConvPortImag(2) = 75 'Write
```

```
value = fixture.CmnModeZConvPortImag(1) 'Read
```

C++ Syntax HRESULT get_CmnModeZConvPortImag(short portNum, double *pVal)
HRESULT put_CmnModeZConvPortImag(short portNum, double newVal)

Interface IFixturing2

CmnModeZConvPortReal Property

Description Sets the real part of the impedance value for the common port impedance conversion function.

VB Syntax *fixture.***CmnModeZConvPortReal***(portNum)* = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

portNum **(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.

value **(Double)** Real part of the Impedance value. Choose a value between 0 and 1E18.

Return Type Double

Default See Common Mode Port Z Conversion Default

Examples

```
fixture.CmnModeZConvPortReal(2) = 75 'Write
```

```
value = fixture.CmnModeZConvPortReal(1) 'Read
```

C++ Syntax
HRESULT get_CmnModeZConvPortImag(short portNum, double *pVal)
HRESULT put_CmnModeZConvPortImag(short portNum, double newVal)

Interface IFixturing2

CmnModeZConvPortZ0 Property

Description Sets the impedance value for the common port impedance conversion function. Set either this single value or set the real and imaginary parts separately. The imaginary part is set to 0.0 using this command.

VB Syntax *fixture*.**CmnModeZConvPortZ0**(*portNum*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

portNum **(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.

value **(Double)** Impedance value. Choose a value between 0 and 1E7.

Return Type Double

Default See Common Mode Port Z Conversion Default

Examples

```
fixture.CmnModeZConvPortZ0(2) = 75 'Write
```

```
value = fixture.CmnModeZConvPortZ0(1) 'Read
```

C++ Syntax HRESULT get_CmnModeZConvPortImag(short portNum, double *pVal)
HRESULT put_CmnModeZConvPortImag(short portNum, double newVal)

Interface IFixturing2

CmnModeZConvState Property

Description	Turns ON or OFF 4-port common port impedance conversion function. Must also set the fixture simulator function to ON using FixturingState Property.
VB Syntax	*fixture*.**CmnModeZConvState** = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
value	**(Boolean)** **False** - Turns common port impedance conversion OFF **True** - Turns common port impedance conversion ON
Return Type	Boolean
Default	False
Examples	`fixture.CmnModeZConvState = False 'Write` `value = fixture.CmnModeZConvState 'Read`
C++ Syntax	HRESULT get_CmnModeZConvState(VARIANT_BOOL *pVal) HRESULT put_CmnModeZConvState(VARIANT_BOOL newVal)
Interface	IFixturing2

Read-only

CompatibleCalKits Property

Description	Returns a list of cal kits that are compatible with the connector type for the specified port. If two or more identical ECal modules are connected to the PNA, the returned list will include the serial numbers to distinguish the ECal modules.
VB Syntax	*value* = *obj*.**CompatibleCalKits** *(port)*
Variable	**(Type) - Description**
value	(Variant) Variable to store the returned list of Cal Kits.
obj	Any of the following: GuidedCalibration (object) SMCType (object) VMCType (object)
port	(Long) Port number for which you want compatible kits.
Return Type	Variant
Default	Not Applicable
Examples	`Dim kits As Variant` `kits = MySMC.CompatibleCalKits(1)`
C++ Syntax	HRESULT get_CompatibleCalKits(long port, VARIANT* Kits);
Interface	IGuidedCalibration SMCType VMCType

Write/Read [About Compression Algorithm]

CompressionAlgorithm Property

Description	Set and read the algorithm method used to compute gain compression.
VB Syntax	*gca*.**CompressionAlgorithm** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(tagNAGCACompressionAlgorithm) -** Algorithm method. Choose from: • **naCompressionFromLinearGain (0)** • **naCompressionFromMaximumGain (1)** • **naBackoffCompression (2)** • **naXYCompression (3)**
Return Type	Enum
Default	naCompressionFromLinearGain (0)
Examples	`gca.CompressionAlgorithm = naXYCompression 'Write` `compAlg = gca.CompressionAlgorithm 'Read`
C++ Syntax	HRESULT get_CompressionAlgorithm(tagNAGCACompressionAlgorithm* pVal) HRESULT put_CompressionAlgorithm(tagNAGCACompressionAlgorithm newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

CompressionBackoff Property

Description	Set and read value for the BackOff compression algorithm.
VB Syntax	*gca*.**CompressionBackoff** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(Double)** Backoff value in dB. Choose from 30 to (-30)
Return Type	Double
Default	10
Examples	`gca.CompressionBackoff = 7 'Write` `acqMode = gca.CompressionBackoff 'Read`
C++ Syntax	HRESULT get_CompressionBackoff(double* pValue) HRESULT put_CompressionBackoff(double newValue)
Interface	IGainCompression

Last Modified:

21-Nov-2007	MX New topic

Write/Read

About Gain Compression

CompressionDeltaX Property

Description	Set and read the 'X" value in the delta X/Y compression algorithm.
VB Syntax	*gca*.**CompressionDeltaX** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(double)** X value in dB. Choose from 30 to (-30)
Return Type	Double
Default	10
Examples	`gca.CompressionDeltaX =  'Write`
	`xDelta = gca.CompressionDeltaX 'Read`
C++ Syntax	HRESULT get_CompressionDeltaX(double* pVal) HRESULT put_CompressionDeltaX(double newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

CompressionDeltaY

Description	Set and read the 'Y" value in the delta X/Y compression algorithm.
VB Syntax	*gca*.**CompressionDeltaY** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(double) -**
Return Type	Double
Default	9
Examples	`gca.CompressionDeltaY = 7 'Write` `xDelta = gca.CompressionDeltaY 'Read`
C++ Syntax	HRESULT get_CompressionDeltaY(double* pVal) HRESULT put_CompressionDeltaY(double newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

CompressionInterpolation Property

Description	Sets whether or not interpolation should be performed on 2D measured compression data. Applies ONLY to 2D acquisition modes.
VB Syntax	*gca*.**CompressionInterpolation** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(boolean) -** Choose from: **True** Interpolate the results **False** Do NOT interpolate the results but return the value closest to compression.
Return Type	Boolean
Default	False
Examples	`gca.CompressionInterpolation = True 'Write` `compInt = gca.CompressionInterpolation 'Read`
C++ Syntax	HRESULT get_CompressionInterpolation(VARIANT_BOOL* pVal) HRESULT put_CompressionInterpolation(VARIANT_BOOL newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

CompressionLevel Property

Description	Set and read the desired gain reduction (from reference gain). This value is used for Compression Methods: Compression from Linear Gain and Compression from Maximum Gain.
VB Syntax	*gca*.**CompressionLevel** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(Double) -** Compression level in dB. Choose a value greater than 0.1 dB.
Return Type	Double
Default	1
Examples	`gca.CompressionLevel = 1.5 'Write` `compLevel = gca.CompressionLevel 'Read`
C++ Syntax	HRESULT get_CompressionLevel(double* pVal) HRESULT put_CompressionLevel(double newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007   MX New topic

Read / Write

ConnectorType Property

Description Sets or queries the connector type for the specified port.

VB Syntax *obj*.**ConnectorType** *(port)* = *value*

Variable **(Type) - Description**

obj Any of the following:

GuidedCalibration (object)

SMCType (object)

VMCType (object)

port (Long) Port number of the connector type.

value (String) - Connector type.

Use ValidConnectorType Property to list connector types.

Return Type String

Default None

Examples

```
Dim value As String
Value = MySMC.ConnectorType
```

C++ Syntax HRESULT get_ConnectorType(long port, BSTR *connector)

HRESULT put_ConnectorType(long port, BSTR connector)

Interface IGuidedCalibration

SMCType

VMCType

Last Modified:

13-Aug-2007 Added detail to port argument

ControlLines Property

Description Sets the control lines of the specified test set. Control lines, provided through the front panel connector of a test set, are used to control external equipment such as a part handler. See your test set documentation to learn more about control lines.

VB Syntax *tset*.**ControlLines** *(chNum) = value*

Variable **(Type) - Description**

tset A TestsetControl object.

OR

An E5091Testset object.

chNum **(Integer)** Channel number of the measurement.

value **(Double)** Data value used to set control lines. Values are obtained by adding weights from the following table that correspond to individual lines.

Line	Weight
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

- The E5091A interprets SENS:MULT1:OUTP 0 as all lines LOW.
- All "Z"and "H" series test sets interpret SENS:MULT1:OUTP 0 as all lines HIGH.

Refer to your test set documentation for setting control line values.

Return Type Variant

Default 0

Examples

```
'For a Z5623A K64 test set, the following sets line 3 and 4 OFF;
all other lines ON.

testset1.ControlLines(2) = 12
```

See E5091A Example Program

See External Testset Program

C++ Syntax

HRESULT get_ControlLines(long channelNum, VARIANT *stateByte);
HRESULT put_ControlLines(long channelNum, VARIANT stateByte);

Interface

ITestsetControl

IE5091Testset

Last Modified:

17-Aug-2007 Added different test sets active High and low

Read-only

Count Property

Description	Returns the number of items in a collection of objects.
VB Syntax	*object*.**Count**
Variable	**(Type) - Description**
object	Any of the following **(objects):** • CalFactorSegments collection • Cal Sets collection • Channels collection • E5091Testset Collection • ExternalTestsets Collection • LimitTest collection • Measurements collection • NaWindows collection • PowerLossSegments collection • PowerSensors collection • Segments collection • Traces collection • PowerMeterInterfaces Collection
Return Type	Long Integer
Default	Not applicable
Examples	`numofchans = chans.Count 'return the number of channels -Read`
C++ Syntax	HRESULT get_Count(long *p<interface>)
Interface	All listed above

CouplePorts Property

Description	Turns ON and OFF port power coupling. ON means the power level is the same for both ports. OFF means the power level may be set independently for each port.
VB Syntax	*object*.**CouplePorts** = *value*
Variable	**(Type) - Description**
object	Channel **(object)** **or** CalSet **(object) -** Read-only property
value	**(enum NAStates)** Choose from: **0 - NaOff** - Turns coupling OFF **1 - NaOn -** Turns coupling ON
Return Type	Long Integer **1** - ON **0** - OFF
Default	NaON (1)
Examples	`chan.CouplePorts = NaOff 'Write` `couplport = chan.CouplePorts 'Read`
C++ Syntax	HRESULT get_CouplePorts(tagNAStates *pState) HRESULT put_CouplePorts(tagNAStates newState)
Interface	IChannel |CalSet3

CoupleChannelParams Property

Description Turns ON and OFF Time Domain Trace Coupling. All of the measurements in the specified channel are coupled.

- To select Transform parameters to couple, use Trans.CoupledParameters Property
- To select Gating parameters to couple, use Gate.CoupledParameters Property

VB Syntax *chan*.**CoupleChannelParams** = *state*

Variable **(Type) - Description**

chan A Channel **(object)**

state **(boolean)**
False - Turns Trace Coupling OFF

True - Turns Trace Coupling ON

Return Type Boolean

Default True

Examples

```
chan.CoupleChannelParams = False 'Write
```

```
couple = chan.CoupleChannelParams 'Read
```

C++ Syntax HRESULT get_CoupleChannelParams(VARIANT_BOOL *isCoupled);

HRESULT put_CoupleChannelParams(VARIANT_BOOL isCoupled);

Interface IChannel5

Coupled Property

Description Sets and returns the state of coupling (ON or OFF) of this range to the primary range.

VB Syntax *FOMRange*.**Coupled** = *value*

Variable **(Type) - Description**

object An FOMRange **(object)**

value **(boolean)** - State of coupling.

True - Couple range to primary range.

False - Do NOT couple to primary range.

Return Type Boolean

Default True

Examples

```
fomRange.Coupled = False 'this range is NOT coupled to the primary range.
```

```
coupl = fomRange.Coupled 'Read
```

C++ Syntax HRESULT get_Coupled(VARIANT_BOOL *pVal)
HRESULT put_Coupled(VARIANT_BOOL pVal)

Interface IFOMRange

CoupledMarkers Property

Description	Sets and Reads the state of Coupled Markers (ON and OFF)
VB Syntax	*app*.**CoupledMarkers** = *state*
Variable	**(Type) - Description**
app	An Application **(object)**
state	**(boolean)** **False (0)** - Turns Coupled Markers OFF **True (1)** - Turns Coupled Markers ON
Return Type	Boolean **False** - OFF **True** - ON
Default	**False**
Examples	`app.CoupledMarkers = True 'Write` `coupl = app.CoupledMarkers 'Read`
C++ Syntax	HRESULT put_CoupledMarkers(VARIANT_BOOL bState) HRESULT get_CoupledMarkers(VARIANT_BOOL *bState)
Interface	IApplication

CoupledParameters Property (Gating)

Description Specifies the time domain gating parameters to be coupled. The settings for those parameters will be copied from the active measurement to all other measurements on the channel.

To turn coupling ON and OFF, use CoupleChannelParams Property

To specify Transform parameters to couple, use Transform.CoupledParameters Property

VB Syntax *gate*.**CoupledParameters** = *value*

Variable **(Type) - Description**

trans A Gating **(object)**

value **(Enum As NAGatingCoupledParams)** - Parameters to couple. To specify more than one parameter, add the numbers. Choose from:

1 - naGatingStimulusCoupled (Start, Stop, Center, and Span TIME settings.)

2 - naGateStateCoupled (ON / OFF)

4 - naGatingShapeCoupled (Minimum, Normal, Wide, and Maximum)

8 - naGatingTypeCoupled (Bandpass and Notch)

Return Type Enum

Default 29

Examples

```
gate.CoupledParameters = 15 'Couple all parameters
```

```
CP = gate.CoupledParameters 'Read
```

C++ Syntax HRESULT get_CoupledParameters(long *lParams);

HRESULT put_CoupledParameters(long lParams);

Interface IGating2

CoupledParameters Property (Transform)

Description Specifies the time domain transform parameters to be coupled. The settings for those parameters will be copied from the active measurement to all other measurements on the channel.

To turn coupling ON and OFF, use CoupleChannelParams Property

To specify Gating parameters to couple, use Gate.CoupledParameters Property

VB Syntax *trans*.**CoupledParameters** = *value*

Variable **(Type) - Description**

trans A Transform **(object)**

value **(Enum As NATransformCoupledParams)** - Parameters to couple. To specify more than one parameter, add the numbers. Choose from:

1 - naTransformStimulusCoupled (Start, Stop, Center, and Span TIME settings.)

2 - naTransformStateCoupled (ON / OFF)

4 - naTransformWindowCoupled (Kaiser Beta / Impulse Width)

8 - naTransformModeCoupled (Low Pass Impulse, Low Pass Step, Band Pass)

16 - naTransformDistMkrUnitCoupled (Distance maker Units)

Return Type Enum

Default 29

Examples

```
trans.CoupledParameters = 31 'Couple all parameters
```

```
CP = trans.CoupledParameters 'Read
```

C++ Syntax HRESULT get_CoupledParameters(long *lParams);

HRESULT put_CoupledParameters(long lParams);

Interface ITransform2

Read-only

CustomChannelConfiguration Property

Description	Returns a handle to the custom application object on the active channel. You can either **(1)** use the handle directly to access measurement properties and methods, or **(2)** set a variable to the measurement object. The variable retains a handle to the original measurement. Currently, the custom application objects to which this property provides access ares: • NoiseFigure Object • GainCompression Object
VB Syntax	1) *set custChan* = *chan*.**CustomChannelConfiguration.** *<setting>* **or** 2) *set custChan* = *app.***ActiveChannel.CustomChannelConfiguration**
Variable	**(Type) - Description**
custChan	A variable in which the handle to a custom application is returned. **(object)**
chan	A Channel **(object)**
<setting>	A property or method setting on the custom application object.
Return Type	Custom application object
Default	None
Examples	`See NoiseFigure or GainCompression examples`
C++ Syntax	HRESULT CustomChannelConfiguration(IDispatch** value);
Interface	IChannel12

Last Modified:

16-Oct-2007 MX New topic

CWFrequency Property

Description Set the Continuous Wave (CW) frequency. Must first send chan.SweepType = naCWTimeSweep

VB Syntax *object*.**CWFrequency** = *value*

Variable **(Type) - Description**

object One of the following:

- Channel (object)
- FOMRange (object) Range must be UNCOUPLED.
- CalSet (object) - Read-only property

See also Measurement2 interface.

value **(double)** CW frequency. Choose any number between:
the **minimum** and **maximum** frequency limits of the analyzer
Units are Hz

Return Type Double

Default 1e9

Examples

```
chan.CWFrequency = 5e9 'Write
```

```
cwfreq = chan.CWFrequency 'Read
```

C++ Syntax

HRESULT put_CWFrequency(double newVal)
HRESULT get_CWFrequency(double *pVal)

Interface

IChannel

|CalSet3

IFOMRange

Delay Property

Description Sets and Returns the electrical delay value for the calibration standard.

VB Syntax *calstd*.**Delay** *(n)* = *value*

Variable **(Type) - Description**

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

n Pulse Generator number.

value **(single)** - Electrical delay in picoseconds

Return Type Single

Default Not Applicable

Exaamples

```
calstd.Delay = 12 'Write 12ps Delay
```

```
stdDelay = calstd.Delay 'Read the value of Delay
```

C++ Syntax HRESULT get_Delay(float *pVal)
HRESULT put_Delay(float newVal)

Interface ICalStandard

Last Modified:

5-Jan-2007 MX New topic

Delay (pulse) Property

Description	Sets the pulse delay - the amount of time before a new pulse begins.
VB Syntax	*pulse*.**Delay**(*n*) = *value*
Variable	**(Type) - Description**
pulse	A PulseGenerator **(object)**
n	**(Integer)** Pulse generator number. Choose from 0 to 4. 0 is the generator that pulses the ADC.
value	**(Double)** Delay value in seconds. Choose a value from about 33ns to about 70 seconds.
Return Type	Double
Default	0
Examples	`pulse.Delay(1) = 1ms 'Write` `value = pulse.Delay(4) 'Read`
C++ Syntax	HRESULT get_Delay(integer pulse, double* delay); HRESULT put_Delay(integer pulse, double delay);
Interface	IPulseGenerator

Last Modified:

1-Jan-2007 MX New topic

Write/Read	About Auxiliary Triggering

Delay Property

Description	Specifies the delay that should be applied by the PNA after the aux trigger input is received and before the acquisition is made.
VB Syntax	*auxTrig*.**Delay** = *value*
Variable	**(Type) - Description**
auxTrig	An AuxTrigger **(object)**
value	**(double)** - Delay value in seconds. Choose a value between 0 and 3.0 seconds.
Return Type	Double
Default	Not Applicable
Exaamples	`auxTrig.Delay = 1.2 'Write 1.2s Delay` `value = auxTrig.Delay 'Read the value`
C++ Syntax	HRESULT get_Delay(double *val); HRESULT put_Delay(double val);
Interface	IAuxTrigger

Last Modified:

14-Dec-2006 MX New topic

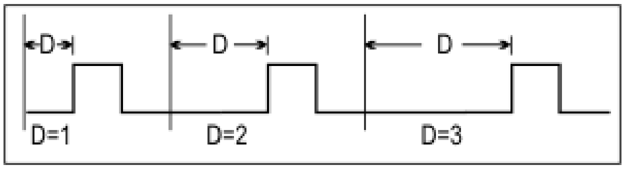
DelayIncrement Property

Description Sets the pulse delay increment. The delay increments with each pulse by the <value> amount.

For example, in this diagram the delay starts as 1. On the second pulse, delay=2. On the third pulse, delay=3.

Important: If **D + W** is greater than **P**, then undefined PNA behavior results. There is NO error message or warning. Delay includes the incremented value.

This is useful for pulse profiling.



VB Syntax *pulse*.**DelayIncrement**(*n*) = *value*

Variable **(Type) - Description**

pulse A PulseGenerator **(object)**

n **(Integer)** Pulse generator number. Choose from 0 to 4.

0 is the generator that pulses the ADC.

value **(Double)** Delay increment value in seconds.

Return Type Double

Default 0

Examples

```
pulse.DelayIncrement(1) = 1ms 'Write
```

```
value = pulse.DelayIncrement(4) 'Read
```

C++ Syntax HRESULT get_DelayIncrement(integer pulse, double* dIncre);

HRESULT put_DelayIncrement(integer pulse, double dIncre);

Interface IPulseGenerator

Last Modified:

18-Jun-2007 MX New topic

DeltaMarker Property

Description Sets a marker as a delta marker. The reference marker must already be turned ON. See meas.ReferenceMarkerState

VB Syntax *mark*.**DeltaMarker** = *state*

Variable (Type) - Description

app A Marker **(object)**

state **(boolean)** -

True - marker is a delta marker

False - marker is NOT a delta marker

Return Type Boolean

Default **False**

Examples

```
mark.DeltaMarker = True 'Write
```

```
delta = mark.DeltaMarker 'Read
```

C++ Syntax HRESULT get_DeltaMarker(VARIANT_BOOL bState)
HRESULT put_DeltaMarker(VARIANT_BOOL *bState)

Interface IMarker

Description Property

Description Sets or returns the descriptive string assigned to the Cal Set. Change this string so that you can easily identify each Cal Set constructed.

VB Syntax *CalSet*.**Description** = *value*

Variable (Type) - Description

CalSet **(object) -** A Cal Set object

value **(string)** – Description of the Cal Set

Return Type String

Default "CalSet_n" where n is an integer number.

Examples

```
CalSet.Description = "My Cal Set" 'Write
desc = CalSet.Description 'Read
```

C++ Syntax HRESULT get_Description(BSTR *pVal)

HRESULT put_Description(BSTR newVal);

Interface ICalSet

Last modified:

Dec.12, 2006 MX New topic

DescriptiveText Property

Description	Write and read descriptive text associated with the configuration. This text is displayed in the path configuration dialog. Text is generally used to describe external connections that must be made manually to complete the configuration setup.
VB Syntax	*pathConfig*.**DescriptiveText =** *text*
Variable	**(Type) - Description**
name	**(String)** Variable to store the returned configuration name.
pathConfig	A PathConfiguration **(object)**
text	**(String)** Descriptive text enclosed in quotes.
Return Type	String
Default	Not Applicable
Examples	`pathConf.DescriptiveText "here are the instructions for connecting the device for this configuration"`
C++ Syntax	HRESULT get_DescriptionText(BSTR* pConnectionText); HRESULT put_DescriptionText(BSTR connectionText);
Interface	IPathConfiguration

Last Modified:

14-Dec-2006	MX New topic

DeviceInputPort Property

Description	Read the PNA port number which is connected to the DUT input. Use SetPortMap Method to change the port mapping.
VB Syntax	*gca*.**DeviceInputPort**
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
Return Type	Integer
Default	1
Examples	`inPort = gca.DeviceInputPort 'Read`
C++ Syntax	HRESULT get_DeviceInputPort(int* pVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007	MX New topic

InputLinearPowerLevel Property

Description	Set and read the input power at which Linear Gain and all S-parameters are measured.
VB Syntax	*gca*.**InputLinearPowerLevel** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(double)** Linear input power level in dBm. Choose a value from +30 to (-30).
Return Type	Double
Default	- 25 dBm
Examples	`gca.InputLinearPowerLevel = -10 'Write` `LinPwr = gca.InputLinearPowerLevel 'Read`
C++ Syntax	HRESULT get_InputLinearPowerLevel(double* pVal) HRESULT put_InputLinearPowerLevel(double newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

DeviceOutputPort Property

Description	Read the PNA port number which is connected to the DUT Output. Use SetPortMap Method to change the port mapping.
VB Syntax	*gca*.**DeviceOutputPort**
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
Return Type	Integer
Default	2
Examples	`outPort = gca.DeviceOutputPort 'Read`
C++ Syntax	HRESULT get_DeviceOutputPort(int* pVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

DiffPortMatch_C Property

Description	Sets the Capacitance value of the differential matching circuit.
VB Syntax	*fixture*.**DiffPortMatch_C** *(portNum)* = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
portNum	**(Integer)** Balanced (logical) port number. Choose from logical ports 1,2 ,3. Learn more about logical ports.
value	**(Double)** Capacitance value in farads. Choose a value between **-1E18** to **1E18.**
Return Type	Double
Default	0
Examples	`fixture.DiffPortMatch_C(2) = 1e-6 'Write` `value = fixture.DiffPortMatch_C(1) 'Read`
C++ Syntax	HRESULT get_DiffPortMatch_C(short portNum, double *pVal) HRESULT put_DiffPortMatch_C(short portNum, double newVal)
Interface	IFixturing2

DiffPortMatch_G Property

Description	Sets the Conductance value of the differential matching circuit.
VB Syntax	*fixture*.**DiffPortMatch_G**(*portNum*) = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
portNum	**(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.
value	**(Double)** Conductance value in siemens. Choose a value between **-1E18** to **1E18.**
Return Type	Double
Default	0
Examples	`fixture.DiffPortMatch_G(2) = 1e-3 'Write` `value = fixture.DiffPortMatch_G(1) 'Read`
C++ Syntax	HRESULT get_DiffPortMatch_G(short portNum, double *pVal) HRESULT put_DiffPortMatch_G(short portNum, double newVal)
Interface	IFixturing2

DiffPortMatch_L Property

Description	Sets the Inductance value of the differential matching circuit.
VB Syntax	*fixture*.**DiffPortMatch_L***(portNum)* = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
portNum	**(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.
value	**(Double)** Inductance value in henries. Choose a value between **-1E18** to **1E18.**
Return Type	Double
Default	0
Examples	`fixture.DiffPortMatch_L(2) = 1e-3 'Write` `value = fixture.DiffPortMatch_L(1) 'Read`
C++ Syntax	HRESULT get_DiffPortMatch_L(short portNum, double *pVal) HRESULT put_DiffPortMatch_L(short portNum, double newVal)
Interface	IFixturing2

DiffPortMatch_R Property

Description	Sets the Resistance value of the differential matching circuit.
VB Syntax	*fixture*.**DiffPortMatch_R**(*portNum*) = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
portNum	**(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.
value	**(Double)** Resistance value in ohms. Choose a value between **-1E18** to **1E18.**
Return Type	Double
Default	0
Examples	`fixture.DiffPortMatch_R(2) = 1e3 'Write` `value = fixture.DiffPortMatch_R(1) 'Read`
C++ Syntax	HRESULT get_DiffPortMatch_R(short portNum, double *pVal) HRESULT put_DiffPortMatch_R(short portNum, double newVal)
Interface	IFixturing2

DiffPortMatchMode Property

Description Sets the differential matching circuit type. To select a user-defined circuit, specify IN ADVANCE the 2-port touchstone filename with DiffPortMatch_UserFilename Property. If you do not specify the appropriate file and you select USER, an error occurs and naNO_CIRCUIT is automatically selected.

VB Syntax *fixture*.**DiffPortMatchMode**(*pNum*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

pNum **(Integer)** Balanced (logical) port number. Choose from logical ports **1, 2, or 3**. Learn more about logical ports.

value **(Enum as NADiffPortMatchCircuitMode)** Choose from:

0 or **naSHUNT_L_SHUNT_C_CIRCUIT** - Specifies the circuit that consists of shunt L and shunt C.

1 or **naUSER_FILE_CIRCUIT** - Specifies the user-defined circuit.

2 or **naNO_CIRCUIT** - Specifies no-circuit.

Return Type Enum

Default **naSHUNT_L_SHUNT_C_CIRCUIT**

Examples

```
fixture.DiffPortMatchMode(2) = naNO_CIRCUIT 'Write
```

```
value = fixture.DiffPortMatchMode(1) 'Read
```

C++ Syntax HRESULT get_DiffPortMatchMode(short port, tagNADiffPortMatchCircuitMode *eVal)

HRESULT put_DiffPortMatchMode(short port, tagNADiffPortMatchCircuitMode eVal)

Interface IFixturing2

DiffPortMatchState Property

Description	Turns ON or OFF 4-port differential port matching function. Must also set the fixture simulator function to ON using FixturingState Property.
VB Syntax	*fixture*.**DiffPortMatchState** = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
value	**(Boolean)** **False** - Turns differential port matching OFF **True** - Turns differential port matching ON
Return Type	Boolean
Default	False
Examples	`fixture.DiffPortMatchState = False 'Write` `value = fixture.DiffPortMatchState 'Read`
C++ Syntax	HRESULT get_DiffPortMatchState(VARIANT_BOOL *pVal) HRESULT put_DiffPortMatchState(VARIANT_BOOL newVal)
Interface	IFixturing2

DiffPortMatchUserFilename Property

Description Specifies the 2-port touchstone file in which the information on the user-defined differential matching circuit is saved. Following this command, send DiffPortMatchCircuit Property. If the specified file does not exist, an error occurs when you set the type of differential matching circuit to USER.

VB Syntax *fixture*.**DiffPortMatchUserFilename***(pNum)* = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

pNum **(Integer)** Balanced (logical) port number. Choose from logical ports **1, 2** or **3**. Learn more about logical ports.

value **(String)** Full path, file name, and extension (.s2P) of the de-embedding circuit.

Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents

Return Type String

Default Not Applicable

Examples

```
fixture.DiffPortMatchUserFilename(2) = "C:\Program Files\Agilent\Network Analyzer\Documents\myFile.s4p" 'Write
```

```
value = fixture.DiffPortMatchUserFilename(1) 'Read
```

C++ Syntax HRESULT get_DiffPortMatchUserFilename(short port, BSTR *bstrFile)

HRESULT put_DiffPortMatchUserFilename(short port, BSTR bstrFile)

Interface IFixturing2

DiffZConvPortImag Property

Description	Sets the imaginary part of the impedance value for the differential port impedance conversion function.
VB Syntax	*fixture*.**DiffZConvPortImag**(*portNum*) = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
portNum	**(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.
value	**(Double)** Imaginary part of the Impedance value. Choose a value between 0 and 1E18
Return Type	Double
Default	0
Examples	`fixture.DiffZConvPortImag(2) = 75 'Write` `value = fixture.DiffZConvPortImag(1) 'Read`
C++ Syntax	HRESULT get_DiffZConvPortImag(short portNum, double *pVal) HRESULT put_DiffZConvPortImag(short portNum, double newVal)
Interface	IFixturing2

DiffZConvPortReal Property

Description Sets the imaginary part of the impedance value for the differential port impedance conversion function.

VB Syntax *fixture*.**DiffZConvPortReal***(portNum)* = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

portNum **(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.

value **(Double)** Real part of the Impedance value. Choose a value between 0 and 1E18

Return Type Double

Default See Differential Port Z Conversion Default

Examples

```
fixture.DiffZConvPortReal(2) = 75 'Write
```

```
value = fixture.DiffZConvPortReal(1) 'Read
```

C++ Syntax HRESULT get_DiffZConvPortReal(short portNum, double *pVal)
HRESULT put_DiffZConvPortReal(short portNum, double newVal)

Interface IFixturing2

DiffZConvPortZ0 Property

Description Sets the impedance value for the differential port impedance conversion function. Set either this single value or set the real and imaginary parts separately. The imaginary part is set to 0.0 using this command.

VB Syntax *fixture*.**DiffZConvPortZ0**(*portNum*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

portNum **(Integer)** Balanced (logical) port number. Choose from logical ports 1, 2, or 3. Learn more about logical ports.

value **(Double)** Impedance value. Choose a value between 0 and 1E18

Return Type Double

Default See Differential Port Z Conversion Default

Examples

```
fixture.DiffZConvPortZ0(2) = 75 'Write
```

```
value = fixture.DiffZConvPortZ0(1) 'Read
```

C++ Syntax HRESULT get_DiffZConvPortZ0(short portNum, double *pVal)
HRESULT put_DiffZConvPortZ0(short portNum, double newVal)

Interface IFixturing2

DiffZConvState Property

Description Turns ON or OFF 4-port differential impedance conversion function. Must also set the fixture simulator function to ON using FixturingState Property.

VB Syntax *fixture*.**DiffZConvState** = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

value **(Boolean)**

False - Turns differential impedance conversion OFF.

True - Turns differential impedance conversion ON.

Return Type Boolean

Default False

Examples

```
fixture.DiffZConvState = False 'Write
```

```
value = fixture.DiffZConvState 'Read
```

C++ Syntax HRESULT get_DiffZConvState(VARIANT_BOOL *pVal)
HRESULT put_DiffZConvState(VARIANT_BOOL newVal)

Interface IFixturing2

Format Property

Description	Sets or returns the display format of the measurement.
VB Syntax	*meas*.**Format** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(enum NADataFormat)** - Choose from: 0 - naDataFormat_LinMag 1 - naDataFormat_LogMag 2 - naDataFormat_Phase 3 - naDataFormat_Polar 4 - naDataFormat_Smith 5 - naDataFormat_Delay 6 - naDataFormat_Real 7 - naDataFormat_Imaginary 8 - naDataFormat_SWR 9 - naDataFormat_PhaseUnwrapped 10 - naDataFormat_InverseSmith 11 - naDataFormat_Kelvin 12 - naDataFormat_Fahrenheit 13 - naDataFormat_Celsius
Return Type	Long Integer
Default	**1** - naDataFormat_LogMag
Examples	`meas.Format = naDataFormat_Real 'Write` `fmt = meas.Format 'Read`
C++ Syntax	HRESULT get_Format(tagDataFormat *pVal) HRESULT put_Format(tagDataFormat newVal)
Interface	IMeasurement

Last Modified:

1-Oct-2007 Added temperature formats

Write-Read

DisplayAutomationErrors Property

Description Enables or disables automation error messages from being displayed on the screen.

VB Syntax app.**DisplayAutomationErrors** = value

Variable **(Type) - Description**

app An Application **(object)**

value (Boolean)

True allows error to show on display,

False turns error off from display.

Return Type Boolean

Default True

Examples

```
Dim app As Application
Set app = New Application
app.DisplayAutomationErrors = False    'Turns off display
print app.DisplayAutomationErrors      'prints False
```

C++ Syntax HRESULT get_DisplayAutomationErrors(VARIANT_BOOL * Val);

HRESULT put_DisplayAutomationErrors(VARIANT_BOOL Val);

Interface IApplication2

Write-Read

DisplayGlobalPassFail Property

Description Shows or hides the dialog which displays global pass/fail results. Learn more about Global Pass/Fail.

VB Syntax *app*.**DisplayGlobalPassFail** = *value*

Variable **(Type) - Description**

app An Application **(object)**

value (Boolean)

True - displays the pass/fail dialog.

False - hides the pass/fail dialog.

Return Type Boolean

Default False

Examples

```
Dim app As Application
Set app = New Application
app.DisplayGlobalPassFail = true  'shows dialog
```

C++ Syntax HRESULT get_DisplayGlobalPassFail(VARIANT_BOOL * Val);

HRESULT put_DisplayGlobalPassFail(VARIANT_BOOL Val);

Interface IApplication6

DisplayRange Property

Description Sets or returns the range to be displayed on the PNA x-axis. All traces in the channel have this same x-axis scaling.

VB Syntax *FOM*.**DisplayRange** = *value*

Variable **(Type) - Description**

object An FOM **(object)**

value **(string)** - Range to be displayed on the PNA x-axis. Case insensitive.

Return Type String

Default "Receivers"

Examples

```
fom.DisplayRange = "Source" 'sets the x-axis to the frequency range of "source"
```

```
disprange = fom.DisplayRange 'Read
```

C++ Syntax HRESULT get_DisplayRange(BSTR *pDspRange)
HRESULT put_DisplayRange(BSTR pDspRange)

Interface IFOM

Last Modified:

7-Mar-2007 Changed to receivers

Distance Property

Description	Set or query marker distance on a time domain trace. The Write command moves the marker to the specified distance value. Once moved, you can read the Y axis value or read the X-axis time value. (Distance is calculated from the X-axis time value.) The Read command reads the distance of the marker. If the marker is set as delta, the WRITE and READ data is relative to the reference marker.
VB Syntax	*mark*.**Distance** = *value*
Variable	**(Type) - Description**
mark	A Marker **(object)**
value	**(double)** - Marker distance in the unit of measure specified with DistanceMarkerUnit Property
Return Type	Double
Default	Not Applicable
Examples	`mark.Distance = 3e9 'Write` `XVal = mark.Distance 'Read`
C++ Syntax	HRESULT get_Distance(double *pVal); HRESULT put_Distance(double newVal);
Interface	IMarker2

DistanceMarkerMode Property

Description Specifies the measurement type in order to determine the correct marker distance.

- Select Auto for S-Parameter measurements.
- Select Reflection or Transmission for arbitrary ratio or unratioed measurements.

This settings affects the display of ALL markers for only the ACTIVE measurement.

VB Syntax *trans*.**DistanceMarkerMode** = *value*

Variable **(Type) - Description**

trans A Transform **(object)**

value **(enum As NADistanceMarkerMode)** - Choose from:

0 - naDistanceMarkerModeAuto

1 - naDistanceMarkerModeReflection

2 - naDistanceMarkerModeTransmission

Return Type Enum

Default 0 - naDistanceMarkerModeAuto

Examples

```
trans.DistanceMarkerMode = naDistanceMarkerModeReflection 'Write
```

```
DMM = trans.DistanceMarkerMode 'Read
```

C++ Syntax HRESULT get_DistanceMarkerMode(tagNADistanceMarkerMode *pVal);

HRESULT put_DistanceMarkerMode(tagNADistanceMarkerMode newVal);

Interface ITransform2

DistanceMarkerUnit Property

Description Specifies the unit of measure for the display of marker distance values. This settings affects the display of ALL markers for only the ACTIVE measurement (unless Distance Maker Units are coupled using CoupledParameters Property.

VB Syntax *trans*.**DistanceMarkerUnit** = *value*

Variable **(Type) - Description**

trans A Transform **(object)**

value **(Enum As NADistanceMarkerUnit)** - Distance Marker Units. Choose from

0 - naDistanceMarkerUnitMeter

1 - naDistanceMarkerUnitFeet

2 - naDistanceMarkerUnitInch

Return Type Enum

Default 0 - naDistanceMarkerUnitMeter

Examples

```
trans.DistanceMarkerUnit = naDistanceMarkerUnitFeet 'sets the
```

```
U = trans.DistanceMarkerUnit 'Read
```

C++ Syntax HRESULT get_DistanceMarkerUnit(tagNADistanceMarkerUnit *pVal);

HRESULT put_DistanceMarkerUnit(tagNADistanceMarkerUnit newVal);

Interface ITransform2

Divisor Property

Description	Sets and returns the Divisor value to be used when coupling this range to the primary range. This setting is valid only if the specified range is coupled to the primary range.
VB Syntax	*FOMRange*.**Divisor** = *value*
Variable	**(Type) - Description**
object	An FOMRange **(object)**
value	**(Double)** - Divisor value.-(Unitless)
Return Type	Double
Default	0
Examples	`fomRange.Divisor = .5 'Write` `Div = fomRange.Divisor 'Read`
C++ Syntax	HRESULT get_Divisor(double *pVal) HRESULT put_Divisor(double *pVal)
Interface	IFOMRange

Read-Write

Do1PortEcal Property

Description	Specify ECAL or Mechanical calibration for the mixer characterization portion of a VMC calibration.
VB Syntax	*VMC*.**Do1PortEcal** = *bool*
Variable	**(Type) - Description**
VMC	VMCType (object)
bool	(Boolean) **True** - ECAL **False** - Mechanical
Return Type	Boolean
Default	**False**
Examples	`value = VMC.Do1PortECal`
C++ Syntax	HRESULT put_Do1PortEcal(VARIANT_BOOL bDoEcal); HRESULT get_Do1PortEcal(VARIANT_BOOL *bDoEcal);
Interface	VMCType

Read-Write

Do2PortEcal Property

Description	Specify ECAL or Mechanical calibration. For VMC, this selection only applies to the 2-port calibration portion. For mixer characterization (VMC), use Do1PortEcal Property
VB Syntax	*object*.**Do2PortEcal** = *bool*
Variable	**(Type) - Description**
object	SMCType (object) or VMCType (object)
bool	(Boolean) **True** - ECAL **False** - Mechanical
Return Type	Boolean
Default	**False**
Examples	`value = VMC.Do2PortECal`
C++ Syntax	HRESULT put_Do2PortEcal(VARIANT_BOOL bDoEcal); HRESULT get_Do2PortEcal(VARIANT_BOOL *bDoEcal);
Interface	SMCType VMCType

Read-only

Domain Property

Description	Returns the domain (frequency,time, power) of the measurement. To understand how this property is useful, see IMeasurement2 Interface.
VB Syntax	*value* = *meas*.**Domain**
Variable	**(Type) - Description**
value	(**Enum** as NADomainType) - variable to store the returned value 0 - Frequency 1 - Time 2 - Power
meas	A Measurement **(object)**
Return Type	Enum as NADomainType
Default	Not Applicable
Examples	`Print meas.Domain 'prints the value of the domain enum`
C++ Syntax	HRESULT get_Domain(tagNADomainType * Val);
Interface	IMeasurement2

DUTTopology Property

Description Returns the device topology setting.

VB Syntax *balTopology*.**DUTTopology** = *value*

Variable **(Type) - Description**

balTopology A BalancedTopology **(object)**

value **(enum NADUTTopology)** - **Choose either:**

0 naSEBal: Single-Ended - Balanced measurement

1 naSESEBal: Single-Ended - Single-Ended - Balanced measurement

2 naBalBal: Balanced - Balanced measurement

Return Type Enum as NADUTTopology

Default naSEBal

Examples

```
balTop.DUTTopology = naSESEBal 'Write
```

```
DutTop = balTop.DUTTopology 'Read
```

C++ Syntax HRESULT get_DUTTopology(tagNADUTTopology* pVal)
HRESULT put_DUTTopology(tagNADUTTopology newVal)

Interface IBalancedTopology

Write/Read About Dwell Time

DwellTime Property

Description Sets or returns the dwell time at the start of each sweep point for all measurements in a channel. Dwell time is only available with Chan.SweepGenerationMode **= naSteppedSweep** (not naAnalogSweep).

Sets or returns the dwell time of a specified sweep segment.

VB Syntax *object*.**DwellTime** = *value*

Variable **(Type) - Description**

object A Channel (object)

or CalSet (object) - Read-only property

or Segment (object)

value **(double)** - Dwell Time in seconds. Choose any number between **0** and **86400**

Return Type Double

Default 0

Examples

```
chan.DwellTime = 3e-3 'sets the dwell time for the channel -Write
segs(3).DwellTime = 1e9 'sets the dwell time of segment 3 -Write

dwell = chan.DwellTime 'Read
```

C++ Syntax HRESULT get_DwellTime(double *pVal)
HRESULT put_DwellTime(double newVal)

Interface IChannel
ISegment

|CalSet3

Write/Read

ECALCharacterization Property

Description	Specifies the characterization data within an ECal module to be used for the SMC calibration. Learn more about ECal User Characterization.
VB Syntax	*SMC*.**ECALCharacterization**(*mod) = value*
Variable	**(Type) - Description**
SMC	SMCType (object)
module	1- ECal module
value	**(Long)** – Characterization data within the ECal module to be used for ECal operations. Choose from: **0** – Factory Characterization **1** – UserCharacterization1 **2** – UserCharacterization2 **3** – UserCharacterization3 **4** – UserCharacterization4 **5** – UserCharacterization5
Return Type	Long
Default	**0** - Factory Characterization
Examples	`SMC.ECALCharacterization(1)= 2`
C++ Syntax	HRESULT put_ECALCharacterization(long moduleNumber, long characterization); HRESULT get_ECALCharacterization(long moduleNumber, long* characterization);
Interface	ICalibrator2

Write/Read

ECALCharacterization Property

Description	Specifies the characterization data within an ECal module to be used, and the portion of the VMC calibration. Learn more about ECal User Characterization.
VB Syntax	*VMC*.**ECALCharacterization** (*module,port) = value*
Variable	**(Type) - Description**
VMC	VMCType (object)
module	**(long integer)** **1** - ECAL module
port	**(boolean)** **True** - 2-port calibration portion of the VMC **False** - 1-port (mixer characterization portion of the VMC cal
value	**(Long)** – Characterization data within the ECal module to be used for ECal operations. Choose from: **0** – Factory Characterization **1** – UserCharacterization1 **2** – UserCharacterization2 **3** – UserCharacterization3 **4** – UserCharacterization4 **5** – UserCharacterization5
Return Type	Long
Default	**0** - Factory Characterization
Examples	`VMC.ECALCharacterization (1,True) = 4`
C++ Syntax	HRESULT put_ECALCharacterization(long moduleNumber, long characterization); HRESULT get_ECALCharacterization(long moduleNumber, long* characterization);
Interface	ICalibrator2

Write/Read

ECALCharacterizationEx Property

Description	This property replaces ECALCharacterization Property. Specifies the characterization data within an ECal module to be used for the calibration. Learn more about ECal User Characterization.
VB Syntax	*cal*.**ECALCharacterizationEx** (*module) = value*
Variable	**(Type) - Description**
cal	Calibrator (object)
module	**(long integer)** Optional argument. ECal module. Choose from modules **1** through **8** Use IsECALModuleFoundEx to determine the number of modules connected to the PNA Use GetECALModuleInfoEx to returns the model and serial number of each module.
value	**(Long)** – Characterization data within the ECal module to be used for ECal operations. Choose from: **0** – Factory Characterization **1** – UserCharacterization1 **2** – UserCharacterization2 **3** – UserCharacterization3 **4** – UserCharacterization4 **5** – UserCharacterization5
Return Type	Long
Default	**0** - Factory Characterization
Examples	`cal.ECALCharacterizationEx (4) = 2`
C++ Syntax	HRESULT put_ECALCharacterizationEx(long moduleNumber, long characterization); HRESULT get_ECALCharacterizationEx(long moduleNumber, long* characterization);
Interface	ICalibrator4

ECALIsolation Property

Description	**Note:** The inherent isolation of the PNA is better than that attained with this command. ONLY use this command when using an external test set, and ONLY using a 8509x ECal module. Specifies whether the acquisition of the ECal calibration should include isolation or not.
VB Syntax	*cal*.**ECALIsolation** = *value*
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
value	**(boolean)** **False** - Exclude Isolation **True** - Include Isolation
Return Type	Boolean
Default	False

Examples

```
Dim oPNA as AgilentPNA835x.Application
Dim oCal as Calibrator
Set oPNA = CreateObject("AgilentPNA835x.Application",
"MachineName")
Set oCal = oPNA.ActiveChannel.Calibrator
' Uncomment the following line to have the cal include isolation
' oCal.ECALIsolation = True
' Uncomment the following line to have the cal omit isolation
'oCal.ECALIsolation = False
oCal.DoECAL2Port ' Do the cal
```

C++ Syntax	HRESULT put_ECALIsolation (VARIANT_BOOL bIsolationState); HRESULT get_ECALIsolation (VARIANT_BOOL *bIsolationState);
Interface	Calibrator

Last Modified:

16-Apr-2007 Un-obsoleted

Read-only

ECALModuleNumberList Property

Description Returns a list of index numbers to be used for referring to the ECal modules that are currently attached to the PNA.

VB Syntax *clist* = *cal*.**ECALModuleNumberList**

Variable **(Type) - Description**

clist Variable to store the returned list of index numbers.

cal Calibrator (object)

Return Type Variant

Default Not Applicable

Examples

```
clist = cal.ECALModuleNumberList
'If 2 modules are attached to the PNA
'then the returned list will be:
1,2
```

C++ Syntax HRESULT get_ECALModuleNumberList(VARIANT *modules);

Interface ICalibrator6

Read/Write

EcalOrientation Property

Description Specifies which port of the ECal module is connected to which port of the PNA when the AutoOrient property = False.

VB Syntax *SMC*.**EcalOrientation** *(mod) = value*

Variable **(Type) - Description**

SMC SMCType **(object)**

mod (Long)

1 - Use ECAL Module for the calibration.

value **(string) -**Format this parameter in the following manner:

Aw,Bx,Cy,Dz

where

- A, B, C, and D are literal ports on the ECAL module
- w,x,y, and z are substituted for PNA port numbers to which the ECAL module port is connected.

Ports of the module which are not used are omitted from the string.

For example, on a 4-port ECal module with

- port A connected to PNA port 2
- port B connected to PNA port 3
- port C not connected
- port D connected to PNA port 1

the string would be: A2,B3,D1

Return Type String

Default "A1,B2"

Examples

```
SMC.EcalOrientation (1) = "A2,B1"
```

C++ Syntax HRESULT put_EcalOrientation(long lModuleNum, BSTR orientation);

HRESULT get_EcalOrientation(long lModuleNum, BSTR *orientation);

Interface SMCType

Read/Write

EcalOrientation1Port Property

Description	**For Mixer Characterization ONLY** Specifies which port of the ECal module is connected to which port of the PNA for the Do1PortECAL property when the AutoOrient property = False.
VB Syntax	*VMC*.**EcalOrientation1Port** *(mod)* = *value*
Variable	**(Type) - Description**
VMC	VMCType **(object)**
mod	(Long) **1** - Use ECAL Module for the calibration.
value	**(string) -** Choose from: **"A1"** - ECAL module port A is connected to PNA port 1 **"B1" -** ECAL module port A is connected to PNA port 1
Return Type	String
Default	"A1" If anything other than port 1 is specified, "B1" will be used. For example, if "A2" is specified, "B1" is used.
Examples	`VMC.EcalOrientation1Port(1) = "B1"`
C++ Syntax	HRESULT put_EcalOrientation1Port(long lModuleNum, BSTR orientation); HRESULT get_EcalOrientation1Port(long lModuleNum, BSTR
Interface	VMCType

Read/Write

EcalOrientation2Port Property

Description Specifies which port of the ECal module is connected to which port of the PNA for the Do2PortECAL property when the AutoOrient property = False.

VB Syntax *VMC*.**EcalOrientation2Port** *(mod)* = *value*

Variable **(Type) - Description**

VMC VMCType **(object)**

mod (Long) Module being used for the calibration.

Choose from 1 or 2.

value **(string) -**Format this parameter in the following manner:

Aw,Bx,Cy,Dz

where

- A, B, C, and D are literal ports on the ECAL module
- w,x,y, and z are substituted for PNA port numbers to which the ECAL module port is connected.

Ports of the module which are not used are omitted from the string.

For example, on a 4-port ECal module with

- port A connected to PNA port 2
- port B connected to PNA port 3
- port C not connected
- port D connected to PNA port 1

the string would be: A2,B3,D1

Return Type String

Default "A1,B2"

Examples

```
VMC.EcalOrientation1Port(1) = "A2,B1"
```

C++ Syntax HRESULT put_EcalOrientation2Port(long lModuleNum, BSTR orientation);

HRESULT get_EcalOrientation2Port(long lModuleNum, BSTR *orientation);

Interface VMCType

Write/Read

ECALPortMapEx Property

Description This property replaces ECALPortMap Property

Specifies which ports of the ECal module are connected to which ports of the PNA for the DoECAL1PortEx and DoECAL2PortEx methods when the OrientECALModule property = False.

This setting remains until the PNA is restarted or this command is sent again.

Note: For guided calibrations where Orient is OFF and the same ECal module is used in more than one Connection Step, you are not allowed to specify how the ECal module is connected. Instead, the PNA determines the orientation. The PNA does not verify that you made the connection properly.

This command, and OrientECALModule_Property, can be used to perform ECal orientation using the Guided Calibration interface.

VB Syntax *cal*.**ECALPortMapEx** *(module)* = *value*

Variable **(Type) - Description**

cal A Calibrator **(object)**

module **(long integer)** Optional argument. ECal module.

Choose from modules **1** through **8**

Use IsECALModuleFoundEx to determine the number of modules connected to the PNA

Use GetECALModuleInfoEx to return the model and serial number of each module.

value **(string) -**Format this parameter in the following manner:

Aw,Bx,Cy,Dz

where

- A, B, C, and D are literal ports on the ECAL module
- w,x,y, and z are substituted for PNA port numbers to which the ECAL module port is connected.

Ports of the module which are not used are omitted from the string.

For example, on a 4-port ECal module with

- port A connected to PNA port 2
- port B connected to PNA port 3
- port C not connected
- port D connected to PNA port 1

the string would be: A2,B3,D1

DoECAL1PortEx or **DoECAL2PortEx** methods will fail if the port numbers passed to those methods are not in the string of this property and OrientECALModule property = False.

Return Type String

Default Not Applicable

Examples

```
Dim cal As Calibrator
Dim sPortMap As String
Set cal = PNAapp.ActiveChannel.Calibrator
cal.ECALPortMapEx = “a2,b1” 'Write
sPortMap = cal.ECALPortMap 'Read
```

C++ Syntax HRESULT put_ECALPortMapEx(long moduleNumber, BSTR strPortMap);

HRESULT get_ECALPortMapEx(long moduleNumber, BSTR *strPortMap);

Interface ICalibrator4

Last Modified:

7-May-2007 Added note about orient

ElecDelayMedium Property

Description	Sets or returns the electrical delay medium.
VB Syntax	*meas*.**ElecDelayMedium =** *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(enum NACalStandardMedium)** choose from 0 - naCoax 1 - naWaveGuide
Return Type	NACalStandardMedium
Default	Not Applicable
Examples	`Print meas.ElecDelayMedium 'prints the value of the electrical delay medium`
C++ Syntax	HRESULT get_ElecDelayMedium(tagNACalStandardMedium *pVal); HRESULT put_ElecDelayMedium(tagNACalStandardMedium newVal);
Interface	IMeasurement2

ElectricalDelay Property

Description	Sets the Electrical Delay for the active channel.
VB Syntax	*meas*.**ElectricalDelay** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(double)** - Electrical Delay in seconds. Choose any number between **-9.99** and **9.99**
Return Type	Double
Default	0
Examples	`meas.ElectricalDelay = 1e-3 'Write` `edelay = meas.ElectricalDelay 'Read`
C++ Syntax	HRESULT get_ElectricalDelay(double *pVal) HRESULT put_ElectricalDelay(double newVal)
Interface	IMeasurement

Element Property

Description Returns a handle to the specified PathElement object. Each element object contains a unique set of values.

The Value Property is used to set the value for each element.

See a list of configurable elements and values for various PNA models.

VB Syntax Set elem = *pathConfig*.**Element** *(element)*

Variable **(Type) - Description**

elem **(Object)** IPathElement

pathConfig A PathConfiguration **(object)**

element **(String)** Configurable element. Use pathConfig.Elements to return a list of configurable elements or see a list of configurable elements for various PNA models.

Return Type Object

Default Not Applicable

Examples

```
Dim elem as PathElement
Set elem = app.ActiveChannel.PathConfiguration.Element("Src1")
```

C++ Syntax HRESULT Element(BSTR elemName, IPathElement** ppElement);

Interface IPathConfiguration

Last Modified:

14-Dec-2006 MX New topic

Elements Property

Description	Returns an array containing the names of configurable elements. See a list of configurable elements and settings for various PNA models.
VB Syntax	*values* = *pathConfig*.**Elements**
Variable	**(Type) - Description**
values	**(Variant array)** Variable to store the array of configurable elements.
pathConfig	A PathConfiguration **(object)**
Return Type	Variant array
Default	Not Applicable
Examples	`elems=pathconfig.Elements`
C++ Syntax	HRESULT Elements(VARIANT* pElements);
Interface	IPathConfiguration

Last Modified:

14-Dec-2006	MX New topic

Embed4PortA Property

Description Returns the PNA port number associated with **'a'** based on the device topology.

To see **'a'** for all topologies, and to specify the port connections, use Embed4PortList Property

Specify topology using Embed4PortTopology Property

VB Syntax *value* = *fixture*.**Embed4PortA**

Variable **(Type) - Description**

value (Short Integer) Variable to store the returned PNA port number.

fixture A Fixturing **(object)**

Return Type Integer

Default Not Applicable

Examples

```
value = fixture.Embed4PortA 'Read
```

C++ Syntax HRESULT get_Embed4PortA(short *portA);

Interface IFixturing2

Embed4PortB Property

Description	Returns the PNA port number associated with **'b'** based on the device topology. To see **'b'** for all topologies, and to specify the port connections, use Embed4PortList Property. Specify topology using Embed4PortTopology Property
VB Syntax	*value* = *fixture*.**Embed4PortB**
Variable	**(Type) - Description**
value	(Short Integer) Variable to store the returned PNA port number.
fixture	A Fixturing **(object)**
Return Type	Integer
Default	Not Applicable
Examples	`value = fixture.Embed4PortB 'Read`
C++ Syntax	HRESULT get_Embed4PortB(short *portB);
Interface	IFixturing2

Embed4PortC Property

Description	Returns the PNA port number associated with **'c'** based on the device topology. To see **'c'** for all topologies, and to specify the port connections, use Embed4PortList Property. Specify topology using Embed4PortTopology Property
VB Syntax	*value* = *fixture*.**Embed4PortC**
Variable	**(Type) - Description**
value	(Short Integer) Variable to store the returned PNA port number.
fixture	A Fixturing **(object)**
Return Type	Integer
Default	Not Applicable
Examples	`value = fixture.Embed4PortC 'Read`
C++ Syntax	HRESULT get_Embed4PortC(short *portC);
Interface	IFixturing2

Embed4PortD Property

Description Returns the PNA port number associated with **'d'** based on the device topology.

To see **'d'** for all topologies, and to specify the port connections, use Embed4PortList Property.

Specify topology using Embed4PortTopology Property

VB Syntax *value* = *fixture*.**Embed4PortD**

Variable **(Type) - Description**

value (Short Integer) Variable to store the returned PNA port number.

fixture A Fixturing **(object)**

Return Type Integer

Default Not Applicable

Examples

```
value = fixture.Embed4PortD 'Read
```

C++ Syntax HRESULT get_Embed4PortD(short *portD);

Interface IFixturing2

Embed4PortList Property

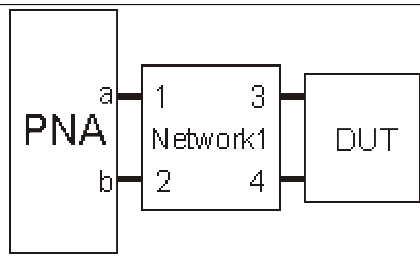
Description Specifies the PNA port connections for ALL topologies. The port assignment is dependent on the DUT topology. All four port numbers are required. However, for:

- Topology A, only the first **two** arguments are valid,
- Topology B, only the first **three** arguments are valid,
- Topology C, **ALL** arguments are valid.

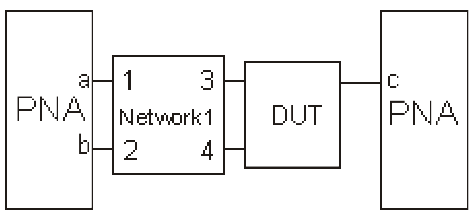
Specify topology using Embed4PortTopology Property.

Read the port assignments using the following commands. A, B, C, and D, refer to the port; NOT the topology.

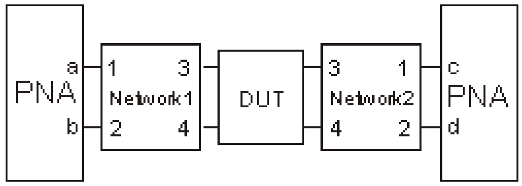
- Embed4PortA Property
- Embed4PortB Property
- Embed4PortC Property
- Embed4PortD Property



Topology A



Topology B



Topology C

VB Syntax *fixture*.**Embed4PortList** = *p1, p2, p3, p4*

Variable **[(Type)]() - Description**

fixture A [Fixturing]() **(object)**

p1 PNA Port number assigned to **a** in above graphic.

p2 PNA Port number assigned to **b** in above graphic.

p3 PNA Port number assigned to **c** in above graphic.

p4 PNA Port number assigned to **d** in above graphic.

Return Type Four Integers

Default 1,2,3,4

Examples

```
fixture.4PortNetworkTopoCPorts = 4,3,2,1 'Write
```

C++ Syntax HRESULT put_4PortNetworkTopoCPorts(short ChannelNum, short pPortA, short pPortB, short pPortC, short pPortD)

Interface IFixturing2

Embed4PortNetworkFilename Property

Description	Specifies the 4-port touchstone file (*.s4p) in which the network to embed or de-embed resides. If the specified file does not exist, an error occurs when type command is sent. Following this command, send Embed4PortNetworkMode Property. **Note:** This command affects ALL measurements on the channel.
VB Syntax	*fixture*.**Embed4PortNetworkFilename***(netNum)* = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
netNum	**(Integer)** Network position. Choose from **1** or **2**. See Embed4PortTopology Property
value	**(String)** Full path, file name, and extension (.s4P) of the circuit. Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents"
Return Type	String
Default	Not Applicable
Examples	`fixture.Embed4PortNetworkFilename(2) = "C:\Program Files\Agilent\Network Analyzer\Documents\myFile.s4p" 'Write` `value = fixture.Embed4PortNetworkFilename(1) 'Read`
C++ Syntax	HRESULT get_Embed4PortNetworkFilename(short networkNum, BSTR *filename); HRESULT put_Embed4PortNetworkFilename(short networkNum, BSTR filename);
Interface	IFixturing2

Embed4PortNetworkMode Property

Description Specify the type of processing to take place on the specified 4-port network. First specify the network filename with FSim.Embed4PortNetworkFilename Property.

VB Syntax *fixture*.**Embed4PortNetworkMode***(netNum)* = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

netNum **(Integer)** Network position. Choose from **1** or **2**. See Embed4PortTopology Property

value **(Enum as NA4PortEmbedNetworkMode)** Processing mode. Choose from:

- **0** or **naNO_NETWORK** - The same as disabling.
- **1** or **naEMBED_NETWORK** - Add Network circuit.
- **2** or **naDEEMBED_NETWORK** - Remove Network circuit

Return Type Enum

Default naNO_NETWORK

Examples

```
fixture.Embed4PortNetworkMode(1) = naNO_NETWORK 'Write
```

```
value = fixture.Embed4PortNetworkMode(2) 'Read
```

C++ Syntax HRESULT get_Embed4PortNetworkMode(short networkNum, tagNA4PortEmbedNetworkMode *eVal);
HRESULT put_Embed4PortNetworkMode(short networkNum, tagNA4PortEmbedNetworkMode eVal);

Interface IFixturing2

Embed4PortState Property

Description Turns ON or OFF 4-port Network embedding for all ports on the channel.

VB Syntax *fixture*.**Embed4PortState** = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

value **(Boolean)**

False - Turns Embedding OFF

True - Turns Embedding ON

Return Type Boolean

Default False (OFF)

Examples

```
fixture.Embed4PortState = False 'Write
```

```
value = fixture.Embed4PortState 'Read
```

C++ Syntax HRESULT get_Embed4PortState(VARIANT_BOOL *pVal)
HRESULT put_Embed4PortState(VARIANT_BOOL newVal)

Interface IFixturing2

Embed4PortTopology Property

Description	Specifies the PNA / DUT topology. Learn more about these and other PNA/DUT configurations.
VB Syntax	*fixture*.**Embed4PortTopology** = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
value	**(Enum as NA4PortEmbedTopology)** PNA / DUT topology. Choose from: **0** or **naTOPOLOGY_A** - 2 PNA/DUT Ports **1** or **naTOPOLOGY_B** - 3 PNA/DUT Ports **2** or **naTOPOLOGY_C** - 4 PNA/DUT Ports
Return Type	Enum
Default	**naTOPOLOGY_A** (2 PNA/DUT Ports)
Examples	`fixture.Embed4PortTopology = naTOPOLOGY_A 'Write` `value = fixture.Embed4PortTopology 'Read`
C++ Syntax	HRESULT get_Embed4PortTopology(tagNA4PortEmbedTopology *eVal); HRESULT put_Embed4PortTopology(tagNA4PortEmbedTopology eVal);
Interface	IFixturing2

Enable Property

Description	Turns ON / OFF the trigger output.
VB Syntax	*auxTrig*.**Enable** = *state*
Variable	**(Type) - Description**
auxTrig	An AuxTrigger **(object)**
state	**(boolean)** **True** - Trigger Output ON **False** - Trigger Output OFF
Return Type	Boolean
Default	False
Exaamples	`auxTrig.Enable = True 'Write` `value = auxTrig.Enable 'Read`
C++ Syntax	HRESULT get_Enable(VARIANT_BOOL * enable); HRESULT put_Enable(VARIANT_BOOL enable);
Interface	IAuxTrigger

Last Modified:

14-Dec-2006 MX New topic

Enabled Property

Description

Enables and disables (ON/OFF) the port mapping and control line output of the specified test set.

If the specified test set is not connected or not ON, then setting Enabled = True will report an error. All other properties can be set when the test set is not connected.

When this command is set to ON or OFF, then the display of the test set status bar (ShowProperties Property) is also set to ON or OFF.

VB Syntax *tset*.**Enabled** = *value*

Variable **(Type) - Description**

tset A TestsetControl object

OR

An E5091Testset object

value **(Boolean)**

True Enables test set control.

False Disables test set control.

Return Type Boolean

Default False

Examples

`See E5091A Example Program`

`See External Testset Program`

C++ Syntax

HRESULT get_Enabled(VARIANT_BOOL *state);
HRESULT put_Enabled(VARIANT_BOOL state);

Interface ITestsetControl

IE5091Testsets

EnableSourceUnleveledEvents Property

Description Specifies whether or not to report Source Unleveled errors as system events. These events can trigger an OnSystemEvent call.

VB Syntax *pref*.**EnableSourceUnleveledEvents** = *bool*

Variable **(Type) - Description**

pref A Preferences **(object)**

bool **(Boolean)** - Choose from:

False - Do NOT report Source Unleveled Errors.

True - Report Source Unleveled Errors.

Return Type Boolean

Default False

Examples

```
pref.EnableSourceUnleveledEvents = False 'Write
```

```
prefer = pref.EnableSourceUnleveledEvents 'Read
```

C++ Syntax HRESULT put_EnableSourceUnleveledEvents(VARIANT_BOOL bsourcUnlEnable)

HRESULT get_EnableSourceUnleveledEvents(VARIANT_BOOL *bsourcUnlEnable)

Interface IPreferences3

Last modified:

Nov. 15, 2006 MX New command

EndOfSweepOperation Property

Description Set and read the action which should be taken at the end of the last frequency or power sweep in the measurement. This setting is used to protect a sensitive device from too much power during the sweep retrace.

VB Syntax *gca*.**EndOfSweepOperation** = *value*

Variable **(Type) - Description**

gca A GainCompression **(object)**

value **(NAGCAEndOfSweepOperation)**

- **naStandard (0)** Use the default PNA method. Learn more.
- **naSetToStartPower (1)** Sweep Start power
- **naSetToStopPower (2)** Sweep Stop power.
- **naSetRFOff (3)** Always turn power OFF while waiting.

Return Type Enum

Default naStandard

Examples

```
gca.EndOfSweepOperation = naSetToStartPower 'Write
```

```
eos = gca.EndOfSweepOperation 'Read
```

C++ Syntax HRESULT get_EndOfSweepOperation(tagNAGCAEndOfSweepOperation* pVal)

HRESULT put_EndOfSweepOperation(tagNAGCAEndOfSweepOperation newVal)

Interface IGainCompression

Last Modified:

11-Sep-2007 MX New topic

ENRFile Property

Description Sets and returns the name of the ENR file associated with the noise source.

VB Syntax *noise*.**ENRFile** = *value*

Variable (Type) - Description

noise A NoiseCal **(object)**

value **(string)** Full path and ENR filename.

Return Type String

Default Not Applicable

Examples

```
noise.ENRFile = "c:\ProgramFiles\Agilent\Network
Analyzer\Documents\ENR\346C.enr"'Write
```

```
ENR = noise.ENRFile 'Read
```

C++ Syntax HRESULT get_ENRFile(BSTR* pValue)

HRESULT put_ENRFile(BSTR pNewValue)

Interface INoiseCal

Last Modified:

29-May-2007 MN New topic

ENRID Property

Description	Sets and returns ID of ENR table.
VB Syntax	*enr*.**ENRSN** = *ID*
Variable	**(Type) - Description**
enr	An ENRFile **(object)**
ID	Identifier for the ENR table
Return Type	String
Default	Not Applicable
Examples	See example program
C++ Syntax	HRESULT get_ENRID(BSTR *Val); HRESULT put_ENRID(BSTR Val);
Interface	IENRFile

Last Modified:

2-Aug-2007 MX New topic

ENRSN Property

Description	Sets and returns the serial number of the noise source for which the ENR file applies.
VB Syntax	*enr*.**ENRSN** = *serialNumber*
Variable	**(Type) - Description**
enr	An ENRFile **(object)**
serialNumber	(String) Serial number of the noise source.
Return Type	String
Default	Not Applicable
Examples	See example program
C++ Syntax	HRESULT get_ENRSNBSTR *Val); HRESULT put_ENRSN(BSTR Val);
Interface	IENRFile

Last Modified:

2-Aug-2007 MX New topic

Write/Read

About Error Correction

ErrorCorrection Property

Description Sets (or returns) error correction ON or OFF for the measurement.

VB Syntax *meas*.**ErrorCorrection** = *value*

Variable **(Type) - Description**

meas A Measurement **(object)**

value **(boolean)**

False - Turns error correction OFF

True - Turns error correction ON

Return Type Boolean

Default See Error Correction

Examples

```
meas.ErrorCorrection = True 'Write
```

```
errcorr = meas.ErrorCorrection 'Read
```

C++ Syntax HRESULT put_ErrorCorrection (VARIANT_BOOL bState)
HRESULT get_ErrorCorrection (VARIANT_BOOL *bState)

Interface IMeasurement

ErrorCorrection (Channel) Property

Description	Attempts to sets error correction ON or OFF for all of the measurements on the channel. This setting may not be successful for some measurements because the Cal Set currently in place may not contain the appropriate calibration data. To read the error correction state for a measurement, use Error Correction Property.
VB Syntax	*chan*.**ErrorCorrection** = *value*
Variable	**(Type) - Description**
chan	A Channel **(object)**
value	**(boolean)** **False** - Turns error correction OFF **True** - Turns error correction ON
Return Type	Boolean
Default	About Error Correction
Examples	`chan.ErrorCorrection = True`
C++ Syntax	HRESULT put_ErrorCorrection (VARIANT_BOOL bState)
Interface	IChannel7

Write/Read

ExternalALC Property

Description	Sets or returns the source of the analyzer leveling control.
VB Syntax	*app*.**ExternalALC** = *value*
Variable	**(Type) - Description**
app	An Application **(object)**
value	**(boolean)** - Choose from: **True** - Leveling control supplied through the rear panel. **False** - Leveling control supplied inside the analyzer
Return Type	Boolean
Default	False
Examples	`app.ExternalALC = True 'Write` `extALC = app.ExternalALC 'Read`
C++ Syntax	HRESULT get_ExternalALC(VARIANT_BOOL *pVal) HRESULT put_ExternalALC(VARIANT_BOOL newVal)
Interface	IApplication

ExternalTriggerConnectionBehavior Property

Description Configures the external triggering signal for the PNA.

- To control BNC1 and BNC2 with this command, then you **MUST** have AuxTriggerScopeIsGlobal = True.
- TriggerSouce Property is automatically set to External when **ExternalTriggerConnectionBehavior** is sent.
- Edge triggering is only available on some PNA models.
- For more information, see External Triggering.

VB Syntax *trigsetup.***ExternalTriggerConnectionBehavior** (*conn*) = *value*

Variable **(Type) - Description**

trigsetup A TriggerSetup **(object)**

conn **(enum NATriggerConnection)** Rear Panel connector to send or receive trigger signals. Choose from:

Only one of the input connectors is active at a time. When a command is sent to one, the PNA automatically makes the other INACTIVE.

0 - **naTriggerConnectionAUXT** Trigger IN from rear-panel AUX IO connector Pin 19

1 - **naTriggerConnectionBNC1** Trigger IN from rear-panel Trigger IN BNC connector

2 - **naTriggerConnectionBNC2** Trigger OUT to rear-panel Trigger OUT BNC connector. Only useful in point sweep mode.

3 - **naTriggerConnectionMATH** Trigger IN from rear-panel Material Handler connector Pin 18

value **(enum NAExternalTriggerBehavior)** -

0 - **naTriggerInactive** - Disables the specified connector.

Choose from ONLY 1 through 4 when <conn> is set to either naTriggerConnection**BNC1** or naTriggerConnection**AUXT**

1 - **naTriggerInEdgeNegative** - Triggers the PNA when receiving a negative going signal

2 - **naTriggerInEdgePositive** - Triggers the PNA when receiving a positive going signal

3 - **naTriggerInLevelLow** - Triggers the PNA when receiving a low level signal

4 - **naTriggerInLevelHigh** - Triggers the PNA when receiving a High-level signal

Choose from ONLY 5 through 8 when <conn> is set to naTriggerConnection**BNC2.**

In addition to sending this command, you must also use TriggerOutputEnabled Property to enable the BNC2 output.

5 - **naTriggerOutPulsePositiveAfter** - Sends a POSITIVE going TTL pulse at the END of each point during the sweep.

6 - **naTriggerOutPulsePositiveBefore** - Sends a POSITIVE going TTL pulse at the START of each point during the sweep.

7 - **naTriggerOutPulseNegativeAfter** - Sends a NEGATIVE going TTL pulse at the END of each point during the sweep.

8 - **naTriggerOutPulseNegativeBefore** - Sends a NEGATIVE going TTL pulse at the START of each point during the sweep.

Return Type Enum as NAExternalTriggerBehavior

Default BNC1 = **naTriggerInactive**

BNC2 = **naTriggerInactive**

AUXT = **naTriggerInLevelHigh**

When Output is enabled

BNC1 = **naTriggerInactive**

BNC2 = **naTriggerOutPulsePositiveAfter**

AUXT = **naTriggerInLevelHigh**

Examples

```
trigsetup.ExternalTriggerConnectionBehavior (naTriggerConnectionAUXT) =
naTriggerInLevelLow 'Write
```

```
trigBehav = trigsetup.ExternalTriggerConnectionBehavior
(naTriggerConnectionAUXT) 'Read
```

C++ Syntax HRESULT get_ExternalTriggerConnectionBehavior(tagNATriggerConnection connection,tagNAExternalTriggerBehavior *trigger);

HRESULT put_ExternalTriggerConnectionBehavior(tagNATriggerConnection connection,tagNAExternalTriggerBehavior trigger);

Interface ITriggerSetup

Last Modified:

25-Feb-2008 Added 'Global' note

ExternalTriggerDelay Property

Description Sets and reads the trigger delay for all measurements in the CHANNEL. This delay is only applied while in app.Source = naTriggerSourceExternal and trigsetup.Scope = naChannelTrigger . After an external trigger is applied, the start of the sweep is delayed for the specified delay value plus any inherent latency.

To apply a trigger delay for all channels (Global), use TriggerDelay Property.

VB Syntax *chan.***ExternalTriggerDelay** = *value*

Variable **(Type) - Description**

chan A Channel **(object)**

value **Double**- Trigger delay value in seconds. Range is from 0 to 107 seconds

Return Type Double

Default 0

Examples

```
chan.ExternalTriggerDelay = .003  'Write
```

```
delay = chan.ExternalTriggerDelay 'Read
```

C++ Syntax HRESULT get_ExternalTriggerDelay(double *delay);

HRESULT put_ExternalTriggerDelay(double delay)

Interface IChannel6

FilterBW Property

Description	Returns the results of the SearchBandwidth method.
VB Syntax	*filtBW* = *meas*.**FilterBW**
Variable	**(Type) - Description**
filtBW	**(single)** - Variable to store bandwidth data
meas	A Measurement **(object)**
Return Type	Single
Default	Not applicable
Examples	`filterBW = meas.FilterBW 'Read`
C++ Syntax	HRESULT get_FilterBW(float* bw)
Interface	IMeasurement

FilterCF Property

Description	Returns the Center Frequency result of the SearchBandwidth method.
VB Syntax	*filtCF* = *meas*.**FilterCF**
Variable	**(Type) - Description**
filtCF	**(double)** - Variable to store bandwidth CF data
meas	A Measurement **(object)**
Return Type	Double
Default	Not applicable
Examples	`filtCF = meas.FilterCF 'Read`
C++ Syntax	HRESULT get_FilterCF(double* centerFrequency)
Interface	IMeasurement

FilterLoss Property

Description	Returns the Loss value of the SearchBandwidth method.
VB Syntax	*filtLoss* = *meas*.**FilterLoss**
Variable	**(Type) - Description**
filtLoss	**(single)** - Variable to store bandwidth Loss data
meas	A Measurement **(object)**
Return Type	Single
Default	Not applicable
Examples	`filterLoss = meas.FilterLoss 'Read`
C++ Syntax	HRESULT get_FilterLoss(float* loss)
Interface	IMeasurement

FilterQ Property

Description	Returns the Q (quality factor) result of the SearchBandwidth method.
VB Syntax	*filtQ* = *meas*.**FilterQ**
Variable	**(Type) - Description**
filtQ	**(single)** - Variable to store bandwidth Q data
meas	A Measurement **(object)**
Return Type	Single
Default	Not applicable
Examples	`filtQ = meas.FilterQ 'Read`
C++ Syntax	HRESULT get_FilterQ(float* quality)
Interface	IMeasurement

FilterErrors Property

Description Returns the error string associated with the digital filters. The return string has three fields separated by commas: "stage1 status, stage2 status, stage3 status"

Each of these fields can contain one or more of the following error codes:

- **NO ERROR**
- ***NUMBER-OF-COEFFICIENTS** - the number of coefficients is excessive for that filter-stage
- ***COEFFICIENT VALUE** - one or more coefficients are out of range for that filter-stage
- ***SUM-OF-COEFFICIENTS** - the sum of all coefficients is excessive for that filter-stage,
- ***FREQUENCY** - the frequency for Stage 1 is out of range (only applies stage1 field),
- ***PARAMETER** - one or more parameters are out of range (only applies to stage 3 field)

VB Syntax *value* = *spm4*.**FilterErrors**

Variable **(Type) - Description**

value Variable to store the returned errors.

spm4 A SignalProcessingModuleFour **(object)**

Return Type String

Default Not Applicable

Examples

```
mode = spm4.FilterErrors 'Read
'example return strings"
NO ERROR, NO ERROR, NO ERROR
indicates no errors,
*SUM-OF-COEFFICIENTS, NO ERROR, NO ERROR
indicates that the sum of all filter coefficients exceed the
maximum value for the Stage-1 filter,
*COEFFICIENT *SUM-OF-COEFFICIENTS, NO ERROR, *PARAMETER
indicates a problems with Stage 1 coefficients and a problem
with one or more of the parameters associated with the Stage 3
filter.
```

C++ Syntax HRESULT get_FilterErrors(BSTR* dspErrors);

Interface ISignalProcessingModuleFour

Last Modified:

1-Jan-2007	MX New topic

FilterMode Property

Description	Sets and returns whether the PNA configures the 3-stage digital filter settings or they will be configured manually. When making manual settings, also send ADCCaptureMode Property which routes the IF through the 3-stage filter.
VB Syntax	*spm4*.**FilterMode** = *value*
Variable	**(Type) - Description**
spm4	A SignalProcessingModuleFour **(object)**
value	**(enum as NAModes)** Filter mode. Choose from: **naAUTO** PNA controls digital filter settings. **naMANUAL** You control digital filter settings using other SignalProcessingModuleFour commands.
Return Type	Enum
Default	naAUTO
Examples	`spm4.FilterMode = naAUTO 'Write` `mode = spm4.FilterMode 'Read`
C++ Syntax	HRESULT get_FilterMode(tagNAModes* dspMode); HRESULT put_FilterMode(tagNAModes dspMode);
Interface	ISignalProcessingModuleFour

Last Modified:

24-Jan-2007 MX New topic

FirmwareMajorRevision Property

Description	Returns the major firmware revision number as an integer. For example, given a firmware revision number A.03.30, this command returns 3.
VB Syntax	*value* = *cap*.**FirmwareMajorRevision**
Variable	**(Type) - Description**
value	(Long) - Variable to store the returned integer value of the firmware revision number.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.FirmwareMajorRevision 'Read`
C++ Syntax	HRESULT get_FirmwareMajorRevision(long * majorRev);
Interface	ICapabilities

Read only | About PNA Options

FirmwareMinorRevision Property

Description	Returns the minor firmware revision number as an integer. For example, given a firmware revision number A.03.30, this command returns 30.
VB Syntax	*value* = *cap*.**FirmwareMinorRevision**
Variable	**(Type) - Description**
value	(Long) - Variable to store the returned decimal value of the firmware revision number.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.FirmwareMinorRevision 'Read`
C++ Syntax	HRESULT get_FirmwareMinorRevision(long * minorRev);
Interface	ICapabilities

FirmwareSeries Property

Description	Returns the alpha portion of the firmware revision number. For example, given a firmware revision number A.03.30, this command returns A.
VB Syntax	*value* = *cap*.**FirmwareSeries**
Variable	**(Type) - Description**
value	(String) - Variable to store the returned alpha value of the firmware revision number.
cap	A Capabilities **(object)**
Return Type	String
Default	Not Applicable
Examples	`value = cap.FirmwareSeries 'Read`
C++ Syntax	HRESULT get_FirmwareSeries(BSTR * series);
Interface	ICapabilities

FixturingState Property

Description	Turns all three fixturing functions (de-embedding, port matching, impedance conversion) ON or OFF for all ports on the specified channel. This does NOT affect port extensions.
VB Syntax	*fixture*.**FixturingState** = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
value	**(boolean)** **True** - Turns Fixturing ON **False -** Turns Fixturing OFF
Return Type	Boolean
Default	False
Examples	`fixture.FixturingState = True 'Write` `value = fixture.FixturingState 'Read`
C++ Syntax	HRESULT get_FixturingState(VARIANT_BOOL *pVal) HRESULT put_FixturingState(VARIANT_BOOL newVal)
Interface	IFixturing

Read-only

FootSwitch Property

Description	Reads the Footswitch Input (pin 20 of the AUX IO connector).
VB Syntax	*value* = *AuxIO*.**Footswitch**
Variable	**(Type) - Description**
value	**(boolean) -** Variable to store the returned value **False** - foot switch is released **True** - footswitch is depressed
AuxIO	**(object) -** A Hardware Aux I/O object
Return Type	Boolean
Default	True
Examples	`fs = aux.Footswitch`
C++ Syntax	HRESULT get_FootSwitch (VARIANT_BOOL* State);
Interface	IHWAuxIO

FootswitchMode Property

Description Determines what occurs when the footswitch is pressed. For more information see the FootSwitch In pin description in the Auxiliary IO connector.

VB Syntax *AuxIo.***FootSwitchMode** = *value*

Variable **(Type) - Description**

value **(enum NAFootSwitchMode)**

0 - naIgnoreFootswitch - Footswitch presses are ignored.

1 - naSweepTrigger - Footswitch presses trigger a sweep. The PNA must be in Manual Trigger Mode.

2 - naRecallNextState - Footswitch presses recall an instrument state. When more than one state is available, then each footswitch press recalls the next state, then starts over from the beginning. It is possible for a recalled state to override the current mode. If the recalled state is IGNore, then mode changes and additional footswitch presses are ignored.

3 - naRunMacro - Footswitch presses load and run a macro. When more than one macro is available, then each footswitch press loads and runs the next macro, then starts over from the beginning. It is possible for a Macro to override the current mode. If the macro contains a Preset, then the mode changes to the default setting IGNore and additional footswitch presses are ignored.

AuxIO **(object) -** A Hardware Aux I/O object

Return Type **NAFootSwitchMode**

Default **0 - naIgnoreFootswitch**

Examples

```
auxIo.FootSwitchMode = naIgnoreFootSwitch 'Write
```

C++ Syntax HRESULT get_FootSwitchMode(NAFootSwitchMode *pFootSwitchMode)

HRESULT put_FootSwitchMode(NAFootSwitchMode newFootSwitchMode)

Interface IHWAuxIO3

Format Property (marker)

Description	Sets (or returns) the format of the marker.
VB Syntax	*mark*.**Format** = *value*
Variable	**(Type) - Description**
mark	A Marker **(object)**
value	**(enum NAMarkerFormat)** - Choose from: 0 - naMarkerFormat_LinMag 1 - naMarkerFormat_LogMag 2 - naMarkerFormat_Phase 3 - naMarkerFormat_Delay 4 - naMarkerFormat_Real 5 - naMarkerFormat_Imaginary 6 - naMarkerFormat_SWR 7 - naMarkerFormat_LinMagPhase 8 - naMarkerFormat_LogMagPhase 9 - naMarkerFormat_RealImaginary 10 - naMarkerFormat_ComplexImpedance 11 - naMarkerFormat_ComplexAdmittance 12 - naMarkerFormat_Kelvin 13 - naMarkerFormat_Fahrenheit 14 - naMarkerFormat_Celsius
Return Type	NAMarkerFormat
Default	**1** - naMarkerFormat_LogMag
Examples	`mark.Format = naMarkerFormat_SWR 'Write` `fmt = mark.Format 'Read`
C++ Syntax	HRESULT get_Format(tagNAMarkerFormat *pVal) HRESULT put_Format(tagNAMarkerFormat newVal)
Interface	IMarker

Last Modified:

1-Oct-2007	Added temperature formats

Frequency Property

Description	Sets or returns the frequency associated with a PowerSensorCalFactorSegment or Sets or returns the frequency associated with a PowerLossSegment.
VB Syntax	*object.***Frequency** = *value*
Variable	**(Type) - Description**
object	**(object) -** PowerSensorCalFactorSegment or PowerLossSegment
value	**(double)** – Frequency in units of Hz. This can be any non-negative value (limited by the maximum value of double).
Return Type	Double
Default	0
Examples	`seg.Frequency = 6e9 'Write` `freq = seg.Frequency 'Read`
C++ Syntax	HRESULT put_Frequency(double newVal); HRESULT get_Frequency(double *pVal);
Interface	IPowerSensorCalFactorSegment IPowerLossSegment

FrequencySpan Property

Description Sets or returns the frequency span of the channel.

Sets or returns the frequency span of the segment.

VB Syntax *object*.**FrequencySpan** = *value*

Variable **(Type) - Description**

object A Channel **(object)**
or
A Segment **(object)**

value **(double)** - Frequency span in Hertz. Choose any number between the **minimum** and **maximum** frequencies of the analyzer.

Return Type Double

Default Full frequency span of the analyzer

Examples

```
chan.FrequencySpan = 4.5e9 'sets the frequency span of a linear sweep for the channel object -Write
```

```
freqspan = chan.FrequencySpan 'Read
```

C++ Syntax HRESULT get_FrequencySpan(double *pVal)
HRESULT put_FrequencySpan(double newVal)

Interface IChannel
ISegment

Read / Write

FrequencyList Property

Description

VB Syntax	*guidedCal*.**FrequencyList** = *value*
Variable	**(Type) - Description**
guidedCal	GuidedCalibration (object)
value	(Variant) -
Return Type	Variant
Default	
Examples	`Dim value` `value = MySMC.FrequencyList`
C++ Syntax	HRESULT get_FrequencyList(Variant *freqList) HRESULT put_FrequencyList(Variant freqList)
Interface	IGuidedCalibration

Write/Read About Frequency Offset

FrequencyOffsetDivisor Property Superseded

Description This method is replaced by properties on the FOMRange Object.

Specifies (along with FrequencyOffsetMultiplier) the value to multiply by the stimulus.

See other Frequency Offset properties

VB Syntax *object*.**FrequencyOffsetDivisor** = *value*

Variable **(Type) - Description**

object Channel **(object)**

or

CalSet **(object) -** Read-only property

value **(Double)** - Divisor value. Range is 1 to 1000

Return Type Double

Default 1

Examples

```
chan.FrequencyOffsetDivisor = 2 'Write
```

```
fOffsetDiv = chan.FrequencyOffsetDivisor 'Read
```

C++ Syntax HRESULT get_FrequencyOffsetDivisor(double*pval)

HRESULT put_FrequencyOffsetDivisor(double newVal)

Interface IChannel2

|CalSet3

FrequencyOffsetFrequency Property Superseded

Description This method is replaced by properties on the FOMRange Object.

Specifies an absolute offset frequency in Hz. For mixer measurements, this would be the LO frequency. See other Frequency Offset properties.

VB Syntax *object*.**FrequencyOffsetFrequency** = *value*

Variable **(Type) - Description**

object Channel **(object)**

or

CalSet **(object) -** Read-only property

value **(Double)** - Offset value. Range is +/- 1000 GHz. (Offsets can be positive or negative.)

Return Type Double

Default 0 Hz

Examples

```
chan.FrequencyOffsetFrequency = 2 'Write
```

```
fOffsetFreq = chan.FrequencyOffsetFrequency 'Read
```

C++ Syntax HRESULT get_FrequencyOffsetFrequency(double*pval)
HRESULT put_FrequencyOffsetFrequency(double newVal)

Interface IChannel2

|CalSet3

FrequencyOffsetMultiplier Property Superseded

Description This method is replaced by properties on the FOMRange Object.

Specifies (along with FrequencyOffsetDivisor) the value to multiply by the stimulus. See other Frequency Offset properties.

VB Syntax *object*.**FrequencyOffsetMultiplier** = *value*

Variable **(Type) - Description**

object Channel **(object)**

or

CalSet **(object) -** Read-only property

value **(Double)** - Multiplier value. Range is 1 to 1000

Return Type Double

Default 1

Examples

```
chan.FrequencyOffsetMultiplier = 2 'Write
```

```
fOffsetMult = chan.FrequencyOffsetMultiplier 'Read
```

C++ Syntax

HRESULT get_FrequencyOffsetMultiplier (double*pval);
HRESULT put_FrequencyOffsetMultiplier (double newVal);

Interface IChannel2

|CalSet3

FrequencyOffsetCWOverride Property Superseded

Description

This method is replaced by properties on the FOMRange Object.

Establishes a fixed (CW) stimulus frequency while measuring the Response over a swept frequency range. For example, a fixed-frequency PNA stimulus may be applied to the RF input of a mixer whose local oscillator (LO) is being swept. Because the IF output of the mixer will be swept, the PNA receivers must also be swept.

See other Frequency Offset properties.

VB Syntax *object*.**FrequencyOffsetCWOverride** = *value*

Variable (Type) - **Description**

object Channel **(object)**

or

CalSet **(object) -** Read-only property

value **(Enum as NaStates)** - Choose from:

naOFF (0) - Turns CW override OFF

naON (1) - Turns CW override ON

Return Type Enum

Default 0 Hz

Examples

```
chan.FrequencyOffsetCWOverride = 1 'Write
```

```
fOffsetOV = chan.FrequencyOffsetCWOverride 'Read
```

C++ Syntax

HRESULT get_FrequencyOffsetCWOverride (tagNAStates *pstate)
HRESULT put_FrequencyOffsetCWOverride (tag NAStates newState)

Interface IChannel2

|CalSet3

FrequencyOffsetState Property Superseded

Description	This method is replaced by properties on the FOMRange Object. Enables Frequency Offset on ALL measurements that are present on the active channel. This immediately causes the source and receiver to tune to separate frequencies. The receiver frequencies are specified with other channel and offset settings. To make the stimulus settings, use Channel Start, Stop Frequency properties. See other Frequency Offset properties. Tip: To avoid unnecessary errors, first make other frequency offset settings. Then turn Frequency Offset ON.
VB Syntax	*object*.**FrequencyOffsetState** = *value*
Variable	**(Type) - Description**
object	Channel **(object)** **or** CalSet **(object) -** Read-only property
value	**(Enum as NaStates)** - Choose from: **naOFF** (0) - Turns Frequency Offset OFF **naON** (1) - Turns Frequency Offset ON
Return Type	Enum
Default	naOFF (0)
Examples	`chan.FrequencyOffsetState = naON 'Write` `Foffset = chan.FrequencyOffsetState 'Read`
C++ Syntax	HRESULT FrequencyOffsetState (tag NAStates *pState); HRESULT FrequencyOffsetState (tag NAStates newState)
Interface	IChannel2 |CalSet3

Shape Property

Description Specifies the shape of the gate filter.

VB Syntax *gat*.**Shape** = *value*

Variable (Type) - **Description**

gat A Gating **(object)**

value **(enum** NAGateShape**)** - Choose from:

0 - naGateShapeMaximum
1 - naGateShapeWide
2 - naGateShapeNormal
3 - naGateShapeMinimum

Return Type NAGateShape

Default 2 - Normal

Examples

```
gat.Shape = naGateShapeMaximum 'Write

filterShape = gat.Shape 'Read
```

C++ Syntax

HRESULT get_Shape(tagNAGateShape *pVal)
HRESULT put_Shape(tagNAGateShape newVal)

Interface IGating

Type (gate) Property

Description	Specifies the type of gate filter used.
VB Syntax	*gat*.**Type** = *value*
Variable	**(Type) - Description**
gat	A Gating **(object)**
value	**(enum NAGateType)** - Choose from: **0 - naGateTypeBandpass -** Includes (passes) the range between the start and stop times. **1 - naGateTypeNotch** - Excludes (attenuates) the range between the start and stop times.
Return Type	NAGateType
Default	Bandpass
Examples	`gate.Type = naGateTypeNotch 'Write` `filterType = gate.Type 'Read`
C++ Syntax	HRESULT get_Type(tagNAGateType *pVal) HRESULT put_Type(tagNAGateType newVal)
Interface	IGating

GPIBAddress Property

Description	Sets and returns the PNA GPIB address bus.
VB Syntax	*app*.**GPIBAddress** (*bus) = value*
Variable	**(Type) - Description**
app	An Application **(object)**
bus	(Short Integer) GPIB bus. MUST be set to 0.
value	(Short Integer) GPIB Address on the PNA. Choose a value between 0 and 30.
Return Type	Short Integer
Default	16
Examples	`address=app.GPIBAddress(0) 'Read` `app.GPIBAddress(0)=16 'Write`
C++ Syntax	HRESULT get_GPIBAddress(short busIndex, short* address); HRESULT put_GPIBAddress(short busIndex,short address);
Interface	IApplication8

GPIBMode Property

Description Changes the analyzer to a GPIB system controller or a talker/listener on the bus. The analyzer must be the controller if you want to use it to send commands to other instruments. The analyzer must be a talker/listener if you want to send it commands from another PC.

Note: This command has no affect in PNAs with dedicated Controller and Talker/Listener GPIB connectors. Learn more.

VB Syntax *app.***GPIBMode** *value*

Variable (Type) - Description

app An Application **(object)**

value **(enum NAGPIBMode)** -Choose either:
0 - naTalkerListener - the analyzer is a talker / listener
1 - naSystemController - the analyzer is the system controller

Return Type Long Integer

Default 0 - naTalkerListener

Examples

```
app.GPIBMode = naTalkerListener 'Write
```

```
mode = app.GPIBMode 'Read
```

C++ Syntax HRESULT get_GPIBMode(tagGPIBModeEnum* eGpibMode)
HRESULT put_GPIBMode(tagGPIBModeEnum eGpibMode)

Interface IApplication

GPIBPortCount Property

Description	Returns the number of GPIB ports that are present on the PNA rear-panel. • 1.1 GHz CPU board = 2 • All other CPU boards = 1
VB Syntax	*value* **=** *cap*.**GPIBPortCount**
Variable	**(Type) - Description**
value	(Long) - Variable to store the returned integer value of the number of GPIB ports.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.GPIBPortCount 'Read`
C++ Syntax	HRESULT get_GPIBPortCount(long * gpibPorts);
Interface	ICapabilities3

HandshakeEnable Property

Description	Turns handshake ON / OFF. To enable handshake, the main trigger enable must ALSO be set using Enable. When ON, PNA acquisition waits indefinitely for the input line to be asserted before continuing with the acquisition.
VB Syntax	*auxTrig*.**HandshakeEnable** = *state*
Variable	**(Type) - Description**
auxTrig	An AuxTrigger **(object)**
state	**(boolean)** - **True** - Handshake enabled **False** - Handshake NOT enabled
Return Type	Boolean
Default	False
Exaamples	`auxTrig.HandshakeEnable = True 'Write` `value = auxTrig.HandshakeEnable 'Read`
C++ Syntax	HRESULT get_HandshakeEnable(VARIANT_BOOL * enable); HRESULT put_HandshakeEnable(VARIANT_BOOL enable);
Interface	IAuxTrigger

Last Modified:

14-Dec-2006	MX New topic

ID Property

Description	Returns the test set ID number. For GPIB testsets, the ID is equivalent to the GPIB address. For testset I/O testsets, the ID is the base address of the testset (0 for the first testset, 1 for the second, and so on).
VB Syntax	*value* = *tset*.**ID**
Variable	**(Type) - Description**
value	(Long) variable to store the returned information.
testsets(1)	A TestsetControl object. OR An E5091Testset object.
Return Type	Long Integer
Default	Not Applicable
Examples	`value = testset1.ID` See E5091A Example Program See External Testset Program
C++ Syntax	HRESULT get_ID(long *idNumber);
Interface	ITestsetControl IE5091Testset

Read-only

IDString Property

Description	Returns the ID of the analyzer, including the Model number, Serial Number, and the Software revision number. **Note:** Beginning with Rev 6.01, this command now returns the software revision with 6 digits instead of 4. For example, A.06.01.02.
VB Syntax	*value* = *app*.**IDString**
Variable	**(Type) - Description**
app	An Application **(object)**
value	**(string)** - variable to contain the returned ID string
Return Type	String
Default	Not Applicable
Examples	`id = app.IDString`
C++ Syntax	HRESULT IDString(BSTR* IDString)
Interface	IApplication

IFBandwidthOption Property

Description	Enables the IFBandwidth to be set on individual sweep segments. This property must be set True **before** *seg*.IFBandwidth = *value* is sent. Otherwise, this command will be ignored.
VB Syntax	*segs*.**IFBandwidthOption** = *value*
Variable	**(Type) - Description**
segs	A Segments collection **(object)**
value	**(boolean)** **True** - Enables variable IFBandwidth setting for segment sweep **False** - Disables variable IFBandwidth setting for segment sweep
Return Type	Boolean
Default	False
Examples	`segs.IFBandwidthOption = True 'Write` `IFOption = IFBandwidthOption 'Read`
C++ Syntax	HRESULT get_IFBandwidthOption(VARIANT_BOOL *pVal) HRESULT put_IFBandwidthOption(VARIANT_BOOL newVal)
Interface	ISegments

IFBandwidth Property

Description	Sets or returns the IF Bandwidth of the channel. Sets or returns the IF Bandwidth of the segment. Returns the IF Bandwidth used in the Cal Set
VB Syntax	*object*.**IFBandwidth** = *value*
Variable	**(Type) - Description**
object	Channel **(object)** **or** Segment **(object)** **or** CalSet **(object) -** Read-only property
value	**(double)** - IF Bandwidth in Hz. The list of valid IF Bandwidths is different depending on the PNA model. (Click to see the lists.) If an invalid number is specified, the analyzer will round up to the closest valid number.
Return Type	Double
Default	See Preset IFBW for your PNA model.

Examples

```
chan.IFBandwidth = 3e3 'sets the IF Bandwidth of for the channel object to 3 kHz. -Write
seg.IFBandwidth = 5 'sets the IF Bandwidth of the segment to 5 Hz. -Write
```

```
ifbw = chan.IFBandwidth -Read
```

C++ Syntax

HRESULT get_IFBandwidth(double *pVal);
HRESULT put_IFBandwidth(double newVal);

Interface

IChannel
ISegment
|CalSet3

IFDenominator Property

Description	Sets or returns the denominator value of the IF Fractional Multiplier. Only applies to 2 stage mixers. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**IFDenominator =** *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(long)** IF Denominator value.
Return Type	Long
Default	1
Examples	`Print mixer.IFDenominator 'prints the value of the IFDenominator`
C++ Syntax	HRESULT get_IFDenominator(long *pVal) HRESULT put_IFDenominator(long newVal)
Interface	IMixer

Last Modified:

10-Mar-2008 MX New topic

IFFilterSampleCount Property

Description	**Note:** This setting applies only to the E836X Opt. H11. Sets or retrieves the number of taps in the IF filter when the IFFilterSource property is set to naIFFilterSourceManual.
VB Syntax	*IfConfig*.**IFFilterSampleCount** = *value*
Variable	**(Type) - Description**
IfConfig	IFConfiguration (object)
value	**(long)** – The IF filter sample count. The minimum and maximum allowed values for this property can vary by model number, but can be queried using the MinimumIFFilterSampleCount and MaximumIFFilterSampleCount properties.
Return Type	Long Integer
Default	PNA Model number dependent

Examples	`App.ActiveChannel.IFConfiguration.IFFilterSampleCount = 200 'Write`
	`variable = App.ActiveChannel.IFConfiguration.IFFilterSampleCount 'Read`
	See an example program

C++ Syntax	HRESULT get_IFFilterSampleCount(long * pSampleCount); HRESULT put_IFFilterSampleCount (long sampleCount);
Interface	IIFConfiguration2

IFFilterSamplePeriod Property

Description	**Note:** This setting applies only to the E836X Opt. H11. Sets or returns the IF filter sample period time. This time is only used if the IFFilterSamplePeriodMode is set to naManual.
VB Syntax	*IfConfig*.**IFFilterSamplePeriod** = *value*
Variable	**(Type) - Description**
IfConfig	IFConfiguration (object)
value	**(double)** – The sample period time in seconds. Valid sample period times can be queried using the IFFilterSamplePeriodList property.
Return Type	Double
Default	PNA Model number dependent.

Examples	`App.ActiveChannel.IFConfiguration.IFFilterSamplePeriod = .000006 'Write`
	`variable = App.ActiveChannel.IFConfiguration.IFFilterSamplePeriod 'Read`
	See an example program

C++ Syntax	HRESULT get_IFFilterSamplePeriod(double * pSamplePeriod); HRESULT put_IFFilterSamplePeriod (double samplePeriod);
Interface	IIFConfiguration2

IFFilterSamplePeriodList Property

Description Retrieves the list of available IF filter sample periods for the instrument.

Note: This setting applies only to the E836X Opt. H11.

VB Syntax *variable* = *IfConfig*.**IFFilterSamplePeriodList**

Variable **(Type) - Description**

variable (Array) An array of permissible values that can be passed to the IFFilterSamplePeriod property.

IfConfig IFConfiguration (object)

Return Type Array

Default Not applicable

Examples

```
Dim Variable
Variable =
App.ActiveChannel.IFConfiguration.IFFilterSamplePeriodList 'Read
MsgBox “First IF Sample Period Value: “ & Variable(0)
```

See an example program

C++ Syntax HRESULT get_IFFilterSamplePeriodList(SAFEARRAY ** ppSamplePeriodList);

Interface IIFConfiguration2

Write/Read [About Pulsed Application](#)

IFFilterSamplePeriodMode Property

Description Sets or returns the IF filter sample period mode.

Note: This setting applies only to the E836X Opt. H11.

VB Syntax *IfConfig*.**IFFilterSamplePeriodMode** = *value*

Variable **(Type) - Description**

IfConfig IFConfiguration (object)

value **(enum NAModes)** -

0 - naAuto - IF filter sample period is chosen automatically.

1 - naManual - the IF filter sample period is the value specified by the IFSamplePeriod property.

Return Type NAModes

Default 0 - naAuto

Examples

```
App.ActiveChannel.IFConfiguration.IFFilterSamplePeriodMode = naAuto
'Write
```

```
variable = App.ActiveChannel.IFConfiguration.IFFilterSamplePeriodMode
'Read
```

See an example program

C++ Syntax HRESULT get_IFFilterSamplePeriodMode(tagNAModes * pMode);

HRESULT put_IFFilterSamplePeriodMode (tagNAModes mode);

Interface IIFConfiguration2

IFFilterSource Property

Description Sets or retrieves type of IF filter to be used.

Note: This setting applies only to the E836X Opt. H11.

VB Syntax *IfConfig*.**IFFilterSource** = *value*

Variable **(Type) - Description**

object IFConfiguration (object)

value **(NAIFFilterSource)** – The type of filter to use. Choose from:

naIFFilterSourceAuto – The IF filter type is automatically chosen.

naIFFilterSourceManual – The IF filter is a predetermined shape where the IFFilterSampleCount determines the number of taps in the filter.

Return Type NAIFFilterSource

Default naIFFilterSourceAuto

Examples

```
App.ActiveChannel.IFConfiguration.IFFilterSource =
naIFFilterSourceManual 'Write
```

```
Variable = App.ActiveChannel.IFConfiguration.IFFilterSource 'Read
```

See an example program

C++ Syntax HRESULT get_IFFilterSource(tagNAIFFilterSource * pFilterSource);

HRESULT put_IFFilterSource(tagNAIFFilterSource filterSource);

Interface IIFConfiguration2

IFGainLevel Property

Description	**Note:** This setting applies only to the E836X Opt. H11. Manually sets the gain level for the specified receiver.
VB Syntax	*IfConfig*.**IFGainLevel** *(id)* **=** *value*
Variable	**(Type) - Description**
IfConfig	An IFConfiguration **(object)**
id	Receiver for which to set the gain level. Choose from: 'A', 'B', 'R1', 'R2'. **Note**: The A and R1 receivers are always switched together. B and R2 are also always switched together. For example, if you specify 'A', R1 will also be switched.
value	(long Integer) Gain Level. Choose from: 0 - Lowest gain setting 1 2 - Highest gain setting
Return Type	Long Integer
Default	0 (Lowest setting)
Examples	`IfConfig.IFGainLevel("A") = 1`
C++ Syntax	HRESULT get_IFGainLevel (BSTR IDString, *GainLevel) HRESULT put_IFGainLevel (BSTR IDString, GainLevel)
Interface	IFConfiguration

Last Modified:

21-Sep-2007 Fixed example

IFGainMode Property

Description	**Note:** This setting applies only to the E836X Opt. H11. Sets the gain state for ALL receivers to Auto or Manual.
VB Syntax	*IfConfig*.**IFGainMode** *(id)* **=** *value*
Variable	**(Type) - Description**
IfConfig	An IFConfiguration **(object)**
id	Receivers for which to set the state. Choose 'ALL'.
value	**(enum as NAModes)** Choose from: 0 - naAUTO 1 - naMANUAL (use IFGainLevel Property to manually set gain level)
Return Type	NAModes
Default	0 - naAUTO
Examples	`IfConfig.IFGainMode("ALL") = naAUTO`
C++ Syntax	HRESULT get_IFGainMode (BSTR IDString, NAModes *gainMode) HRESULT put_IFGainMode (BSTR IDString, NAModes gainMode)
Interface	IIFConfiguration

IFGateEnable Property

Description	Sets or retrieves the state of the IF Gate. **Note:** This setting applies only to the E836X Opt. H11.
VB Syntax	*IfConfig*.**IFGateEnable** = *value*
Variable	**(Type) - Description**
IfConfig	IFConfiguration (object)
value	**(Boolean**) – The state of the IF Gate. **True** – The IF Gate is in use. **False** – The IF Gate is not in use.
Return Type	Boolean
Default	False

Examples	`App.ActiveChannel.IFConfiguration.IFGateEnable = True 'Write`
	`variable = App.ActiveChannel.IFConfiguration.IFGateEnable 'Read`
	See an example program

C++ Syntax	HRESULT get_IFGateEnable(VARIANT_BOOL * pGateEnabled); HRESULT put_IFGateEnable(VARIANT_BOOL gateEnabled);
Interface	IIFConfiguration

IFFrequency Property

Description	Sets and returns the IF frequency for ALL receiver paths being used for the specified channel. To set this frequency, IFFrequencyMode Property must be set to OFF (Manual).
VB Syntax	*IfConfig*.**IFFrequency** = *value*
Variable	**(Type) - Description**
IfConfig	An IFConfiguration **(object)**
value	(double) IF Frequency. Use MaximumIFFrequency and MinimumIFFrequency to determine the range of value for this command.
Return Type	Double
Default	9 MHz
Examples	`IfConfig.IFFrequency = 9.3e6`
C++ Syntax	HRESULT get_IFFrequency (double *pVal); HRESULT put_IFFrequency (double pVal);
Interface	IFConfiguration3

Last Modified:

18-Jun-2007 MX New topic

IFFrequencyMode Property

Description	Sets and returns method for specifying the way the IF Frequency is determined.
VB Syntax	*IfConfig*.**IFFrequencyMode** = *value*
Variable	**(Type) - Description**
IfConfig	An IFConfiguration **(object)**
value	(enum as NAModes) IF Frequency mode. Choose from: **0 - naAUTO** PNA determines the setting for the IF frequency. **1 - naMANUAL** (use IFFrequency Property to manually set frequency.
Return Type	Enum
Default	0 naAuto
Examples	`IfConfig.IFFrequencyMode = naMANUAL`
C++ Syntax	HRESULT get_IFFrequencyMode (tagNAModes* pdspMode); HRESULT put_IFFrequencyMode (tagNAModes* pdspMode);
Interface	IFConfiguration3

Last Modified:

18-Jun-2007 MX New topic

IFNumerator Property

Description Sets or returns the numerator value of the IF Fractional Multiplier.

Only applies to 2 stage mixers.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**IFNumerator =** *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(Long)**

Return Type long

Default Not Applicable

Examples

```
Print mixer.IFNumerator 'prints the value of the IFNumerator
```

C++ Syntax HRESULT get_IFNumerator(long *pVal)

HRESULT put_IFNumerator(long newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

IFSideband Property

Description Sets or returns the value of the IF sideband, high or low.

Only applies to 2 stage mixers.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**IFSideband =***value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(enum as FCASideBand)** - Choose from:

0 - LOW

1 - HIGH

Return Type FCASideBand

Default 0 - LOW

Examples

```
Print mixer.IFSideband 'prints the value of the IFSideband
```

C++ Syntax HRESULT get_IFSideband(FCASideBand *pVal)

HRESULT put_IFSideband(FCASideBand newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

IFSourcePath Property

Description	**Note:** This setting applies only to the E836X Opt. H11. Sets the source path of the specified receiver. An error is returned if <*id*> is not valid, or if <*value*> is not valid for the specified <*id*>.
VB Syntax	*IfConfig*.**IFSourcePath** *(id)* = *value*
Variable	**(Type) - Description**
IfConfig	An IFConfiguration **(object)**
id	Receiver for which to set the gain level. Choose from: 'A', 'B', 'R1', 'R2'.. **Note**: The A and R1 receivers are always switched together. B and R2 are also always switched together. For example, if you specify "A", R1 will also be switched.
value	**(Enum as NAIFSourcePath)** Source path. Choose from: 0 - **naNormalIFPath** - the PNA decides the appropriate IF input paths. 1 - **naExternalIFPath** - always use the rear panel IF inputs.
Return Type	NAIFSourcePath
Default	0 - naNormalIFPath
Examples	`IfConfig.IFSourcePath('A') = naNormalIFPath`
C++ Syntax	HRESULT get_IFSourcePath (BSTR IDString, naIFSourcePath *IFSourcePath) HRESULT put_IFSourcePath (BSTR IDString, naIFSourcePath IFSourcePath)
Interface	IIFConfiguration

IFStartFrequency Property

Description	Sets or returns the start frequency value of the mixer IF frequency. Only applies to 2 stage mixers. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**IFStartFrequency =** *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(double)** - Frequency in Hertz.
Return Type	Double
Default	Not Applicable
Examples	`Print mixer.IFStartFrequency 'prints the value of the IFStartFrequency`
C++ Syntax	HRESULT get_IFStartFrequency(double *pVal) HRESULT put_IFStartFrequency(double newVal)
Interface	IMixer

Last Modified:

4-Mar-2008 Added note.

IFStopFrequency Property

Description	Sets or returns the stop frequency value of the mixer IF frequency. Only applies to 2 stage mixers. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**IFStopFrequency =** *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(double)** - IF stop frequency in Hertz.
Return Type	Double
Default	Not Applicable
Examples	`Print mixer.IFStopFrequency 'prints the value of the IFStopFrequency`
C++ Syntax	HRESULT get_IFStopFrequency(double *pVal) HRESULT put_IFStopFrequency(double newVal)
Interface	IMixer

Last Modified:

4-Mar-2008 Added note.

Write/Read [About Noise Figure](#)

ImpedanceStates Method

Description	Sets the number of impedance states to use during calibrated measurements.
VB Syntax	*noise*.**ImpedanceStates** = *value*
Variable	**(Type) - Description**
noise	A NoiseFigure **(object)**
value	**(double) -** Impedance states. Choose between 4 and the maximum number allowed by the noise tuner device. If the specified number exceeds the capability of the device, the measurement will use the maximum number of states the device allows.
Return Type	Double
Default	4
Examples	`noise.ImpedanceStates = 10 'Write` `AvgNoise = noise.ImpedanceStates 'Read`
C++ Syntax	HRESULT get_ImpedanceStates(double* pVal) HRESULT put_ImpedanceStates(double newVal)
Interface	INoiseFigure

Last Modified:

29-May-2007 MN New topic

ImpulseWidth Property

Description	Sets or returns the Impulse Width of Time Domain transform windows
VB Syntax	*trans*.**ImpulseWidth** = *value*
Variable	**(Type) - Description**
trans	A Transform **(object)**
value	**(double)** - Impulse Width in seconds. Range of settings depends on the frequency range of your analyzer.
Return Type	Double
Default	.98 / Default Span
Examples	`trans.ImpulseWidth = 200e-12 'sets the Impulse width of a transform window -Write` `IW = trans.ImpulseWidth 'Read`
C++ Syntax	HRESULT get_ImpulseWidth(double *pVal) HRESULT put_ImpulseWidth(double newVal)
Interface	ITransform

IndexState Property

Description	Determines the control of Material Handler connector Pin 20.
VB Syntax	*handler*.**IndexState** = *value*
Variable	**(Type) - Description**
handler	**(object) -** A Handler I/O object
value	(**boolean**) False - Pin 20 is controlled by Output Port B6 True - Pin 20 is controlled by the Index signal
Return Type	Boolean
Default	False
Examples	`handler.IndexState = False 'Write` `bState = handler.IndexState 'Read`
C++ Syntax	HRESULT put_IndexState (BOOL *pVal); HRESULT get_IndexState (BOOL newVal);
Interface	IHWMaterialHandlerIO2

InputA Property - Obsolete

Description	**This property has NO replacement and no longer works correctly. (Sept. 2004)**
	Sets a Port Extension value for Receiver A
VB Syntax	*portExt*.**InputA** = *value*
Variable	**(Type) - Description**
portExt	A Port Extension **(object)**
value	**(double)** - Port Extension value in seconds. Choose any number between **-10** and **10**
Return Type	Double
Default	0
Examples	`portExt.InputA = 10e-6 'Write`
	`inA = portExt.InputA 'Read`
C++ Syntax	HRESULT get_InputA(double *pVal) HRESULT put_InputA(double newVal)
Interface	IPortExtension

InputB Property - Obsolete

Description **This property has NO replacement and no longer works correctly. (Sept. 2004)**

Sets the Port Extension value for Receiver B

VB Syntax *portExt*.**InputB** = *value*

Variable **(Type) - Description**

portExt A Port Extension **(object)**

value **(double)** - Port Extension value in seconds. Choose any number between **-10** and **10**

Return Type Double

Default 0

Examples

```
portExt.InputB = 10e-6 'Write
```

```
inB = portExt.InputB 'Read
```

C++ Syntax HRESULT get_InputB(double *pVal)
HRESULT put_InputB(double newVal)

Interface IPortExtension

InputC Property Obsolete

Description	**This property has NO replacement and no longer works correctly. (Sept. 2004)** Sets the Port Extension value for Receiver C
VB Syntax	*portExt*.**InputC** = *value*
Variable	**(Type) - Description**
portExt	A Port Extension **(object)**
value	**(double)** - Port Extension value in seconds. Choose any number between **-10** and **10**
Return Type	Double
Default	0
Examples	`portExt.InputC = 10e-6 'Write` `inC = portExt.InputC 'Read`
C++ Syntax	HRESULT get_InputC(double *pVal) HRESULT put_InputC(double newVal)
Interface	IPortExtension

InputDenominator Property

Description Sets or returns the denominator value of the Input Fractional Multiplier.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**InputDenominator =** *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(Long)** - Input denominator value.

Return Type Long

Default 1

Examples

```
Print mixer.InputDenominator 'prints the value of the InputDenominator
```

C++ Syntax HRESULT get_InputDenominator(long *pVal)

HRESULT put_InputDenominator(long newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

InputFixedFrequency Property

Description	Sets or returns the mixer fixed Input frequency value. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**InputFixedFrequency** = *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(double)** - Input Fixed Frequency in Hertz.
Return Type	Double
Default	Not Applicable
Examples	`mixer.InputFixedFrequency = 1e9`
C++ Syntax	HRESULT get_InputFixedFrequency(double *pVal) HRESULT put_InputFixedFrequency(double newVal)
Interface	IMixer6

Last Modified:

4-Mar-2008 Added note.

IsInputGreaterThanLO Property

Description	Specifies whether to use the Input frequency that is greater than the LO or less than the LO. To learn more, see the mixer setup dialog box help. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**IsInputGreaterThanLO** *(LO)* **=** *bool*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
LO	(Integer) - LO stage number Choose from 1 (default) or 2
bool	**(Boolean)** - **True** - Use the Input that is Greater than the specified LO. **False** - Use the Input that is Less than the specified LO.
Return Type	Boolean
Default	True
Examples	`mixer.IsInputGreaterThanLO(1) = True`
C++ Syntax	HRESULT get_IsInputGreaterThanLO(VARIANT_BOOL * val); HRESULT put_IsInputGreaterThanLO(VARIANT_BOOL val);
Interface	IMixer2

Last Modified:

4-Mar-2008 Added note.

InputNumerator Property

Description Sets or returns the numerator value of the Input Fractional Multiplier.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**InputNumerator =** *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(Long)** - Input numerator value.

Return Type Long

Default 1

Examples

```
Print mixer.InputNumerator 'prints the value of the InputNumerator
```

C++ Syntax HRESULT get_InputNumerator(long *pVal)

HRESULT put_InputNumerator(long newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

InputPower Property

Description	Sets or returns the value of the Input Power. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**InputPower =** *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(double)** - Input power in dBm.
Return Type	Double
Default	-17dBm
Examples	`Print mixer.InputPower 'prints the value of the InputPower`
C++ Syntax	HRESULT get_InputPower(double *pVal) HRESULT put_InputPower(double newVal)
Interface	IMixer

Last Modified:

4-Mar-2008 Added note.

InputRangeMode Property

Description	Sets or returns the Input sweep mode. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**InputRangeMode =** *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(Enum as MixerRangeMode)** - Input sweep mode. Choose from: 0 - **mixSwept** 1 - **mixFixed**
Return Type	Enum
Default	0 - mixSwept
Examples	`mixer.InputRangeMode = mixSwept`
C++ Syntax	HRESULT get_InputRangeMode(long *pVal) HRESULT put_InputRangeMode(long newVal)
Interface	IMixer6

Last Modified:

4-Mar-2008 Added note.

InputStartFrequency Property

Description	Sets and returns the start frequency value of the mixer Input frequency. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**InputStartFrequency** = *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(double)** - Input start frequency in Hertz.
Return Type	Double
Default	Start frequency of the PNA
Examples	`mixer.InputStartFrequency = Start_Freq`
C++ Syntax	HRESULT get_InputStartFrequency(double *pVal) HRESULT put_InputStartFrequency(double newVal)
Interface	IMixer

Last Modified:

4-Mar-2008 Added note.

InputStopFrequency Property

Description	Sets and returns the stop frequency value of the mixer Input frequency. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**InputStopFrequency** = *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(double)** - Input stop frequency in Hertz.
Return Type	Double
Default	Stop frequency of the PNA
Examples	`mixer.InputStopFrequency = Stop_Freq`
C++ Syntax	HRESULT get_InputStopFrequency(double *pVal) HRESULT put_InputStopFrequency(double newVal)
Interface	IMixer

Last Modified:

4-Mar-2008 Added note.

InternalTestsetPortCount Property

Description	Returns the number of PNA test ports. This does not include the ports on an external test set.
VB Syntax	*value* = *cap*.**InternalTestsetPortCount**
Variable	**(Type) - Description**
value	(Long) - Variable to store the returned number of PNA test ports.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.InternalTestsetPortCount 'Read`
C++ Syntax	HRESULT get_InternalTestsetPortCount(long *numPorts);
Interface	ICapabilities

Interpolate Correction Property

Description	Turns ON and OFF correction interpolation which calculates new error terms when stimulus values change after calibration. When this property is ON and error correction is being applied, the calibration subsystem attempts to interpolate the error terms whenever the stimulus parameters are changed. When this property is OFF under the same circumstances, error correction is turned OFF.
VB Syntax	*meas*.**InterpolateCorrection** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(boolean)** - Choose from: **True** - Turns correction interpolation ON **False** - Turns correction interpolation OFF
Return Type	Boolean
Default	True
Examples	`meas.InterpolateCorrection = False` `calInterpolate = InterpolateCorrection 'Read`
C++ Syntax	HRESULT get_InterpolateCorrection(boolean *pVal) HRESULT put_InterpolateCorrection(boolean newVal)
Interface	IMeasurement

Interpolated Property

Description	Turns marker Interpolation ON and OFF. Marker interpolation enables X-axis resolution beyond the discrete data values. The analyzer will calculate the x and y-axis data values between discrete data points. Use meas.Interpolate to change interpolation of **all** markers in a measurement. This command will override the measurement setting.
VB Syntax	*mark*.**Interpolated** = *value*
Variable	**(Type) - Description**
mark	A Marker **(object)**
value	**(boolean)** **False** - Turns interpolation OFF **True** - Turns interpolation ON
Return Type	Boolean
Default	True
Examples	`mark.Interpolated = True 'Write` `interpolate = mark.Interpolated 'Read`
C++ Syntax	HRESULT get_Interpolated(VARIANT_BOOL *pVal) HRESULT put_Interpolated(VARIANT_BOOL newVal)
Interface	IMarker

InterpolateNormalization Property Superseded

Description

Note: This property is replaced by DoReceiverPowerCal Method.

Turns ON and OFF normalization interpolation which calculates new divisor data when stimulus values change after normalization.

When this property is ON and normalization is being applied, the Normalization algorithm attempts to interpolate the divisor data whenever the stimulus parameters are changed.

When this property is OFF under the same circumstances, normalization is turned OFF.

Normalization is currently supported only on measurements of unratioed power for the purpose of performing a receiver power calibration.

VB Syntax *meas*.**InterpolateNormalization** = *value*

Variable **(Type) - Description**

meas **(object) -** A Measurement object

value **(boolean)**

False – Turns normalization interpolation OFF

True – Turns normalization interpolation ON

Return Type Boolean

Default False -OFF

Examples

```
meas.InterpolateNormalization = False 'Write
```

```
normalized = meas.InterpolateNormalization 'Read
```

C++ Syntax HRESULT put_InterpolateNormalization(VARIANT_BOOL bState);

HRESULT get_InterpolateNormalization(VARIANT_BOOL *bState);

Interface IMeasurement

Interrupt Property

Description Reads the boolean that represents the state of the Interrupt In line (pin 13) on the external test set connector.

VB Syntax *value* = *ExtIO*.**Interrupt**

Variable **(Type) - Description**

value **(boolean)** - Variable to store the returned data

ExtIO **(object) -** An ExternalTestSetIO object

Return Type Boolean

False - indicates the line is being held at a TTL High

True - indicates the line is being held at a TTL Low

Default Not Applicable

Examples

```
value = ExtIO.Interrupt
```

C++ Syntax HRESULT get_Interrupt(VARIANT_BOOL* bValue);

Interface IHWExternalTestSetIO

IsContinuous Property

Description	Returns whether or not a channel is in continuous mode. To set the channel to continuous mode, use Continuous Method.
VB Syntax	*value* = *chan*.**IsContinuous**
Variable	**(Type) - Description**
value	**(boolean)** - Choose either: **False** - Channel trigger is NOT set to continuous. **True** - Channel trigger IS set to continuous.
chan	Channel **(object)**
Return Type	Boolean
Default	Not Applicable
Examples	`trig = chan.IsContinuous 'Read`
C++ Syntax	HRESULT get_IsContinuous (VARIANT_BOOL *bContinuous);
Interface	IChannel3

IsECALModuleFoundEx Property

Description	This property replaces IsECALModuleFound Property. Returns true or false depending on whether communication was established between the PNA and the specified ECal module.
VB Syntax	*modFound* = *cal*.**IsECALModuleFoundEx** *(module)*
Variable	**(Type) - Description**
modFound	**(boolean) -** Variable to store the returned test result. **True -** The PNA identified the presence of the specified ECal module. **False** - The PNA did NOT identify the presence of the specified ECal module.
cal	**(object) -** A Calibrator object
module	**(long integer)** ECal module. Choose from modules **1** through **8** Use GetECALModuleInfoEx to return the model and serial number of each module.
Return Type	Boolean
Default	Not applicable
Examples	`Set cal = pna.ActiveChannel.Calibrator` `moduleFound = cal.IsECALModuleFoundEx(1)`
C++ Syntax	HRESULT get_IsECALModuleFoundEx(long moduleNumber, VARIANT_BOOL *bModuleFound);
Interface	ICalibrator4

IsFrequencyOffsetPresent Property

Description Returns a value indicating the presence of Frequency Offset Option 080 in the remote PNA.

VB Syntax *value* = *cap*.**IsFrequencyOffsetPresent**

Variable **(Type) - Description**

value (Boolean) - Variable to store the returned value

True - Frequency Offset Option 080 is present

False - Frequency Offset Option 080 is not present

cap A Capabilities **(object)**

Return Type Boolean

Default Not Applicable

Examples

```
value = cap.isFrequencyOffsetPresent(1) 'Read
```

C++ Syntax HRESULT get_IsFrequencyOffsetPresent(VARIANT_BOOL * present);

Interface ICapabilities

IsHold Property

Description Returns whether or not a channel is in hold mode. To set the channel to hold mode, use Hold Method.

VB Syntax *value* = *chan*.**IsHold**

Variable **(Type) - Description**

value **(boolean)** - Choose either:

False - Channel trigger is NOT set to hold.

True - Channel trigger IS set to hold.

chan Channel **(object)**

Return Type Boolean

Default Not Applicable

Examples

```
trig = chan.IsHold 'Read
```

C++ Syntax HRESULT get_IsHold (VARIANT_BOOL *bHold);

Interface IChannel3

Read-only

About Embedded LO

IsMarkerOn Property

Description	Returns whether or not a marker was used for the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**IsMarkerOn** *(n)*
Variable	**(Type) - Description**
value	**(Boolean)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Return Type	**(String)**
Default	Not Applicable
Examples	`data= embedLO.IsMarkerOn 3 'read`
C++ Syntax	HRESULT IsMarkerOn(long sweep, VARIANT_BOOL* markerOn);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

IsolationIncrementAveraging Property

Description	Value by which to increment (increase) the channel's averaging factor during measurement of isolation in an ECal calibration. **Note:** If <value> is greater than 1 and the channel currently has averaging turned OFF, averaging will be turned ON only during the isolation measurements and with the averaging factor equal to <value>.
VB Syntax	*cal*.**IsolationIncrementAveraging** = *value*
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
value	**(Long)** Incremental Averaging factor. The maximum averaging factor is 65536 (2^16).
Return Type	Long Integer
Default	8
Examples	`oCal.IsolationAveragingIncrement = 16 'Write` `avgIncr = oCal.IsolationAveragingIncrement ' Read`
C++ Syntax	HRESULT get_IsolationAveragingIncrement(long *pVal); HRESULT put_IsolationAveragingIncrement(long newVal);
Interface	ICalibrator7

Last Modified:

16-Apr-2007 MX New topic

IsOn Property

Description Sets and returns the ON |OFF state of Embedded LO.

VB Syntax *embedLO*.**IsOn =** *value*

Variable **(Type) - Description**

embedLO An EmbeddedLO **(object)**

value **(Boolean)**

False - Turns Embedded LO OFF

True - Turns Embedded LO ON

Return Type **(Boolean)**

Default False (OFF)

Examples

```
embedLO.IsOn = True 'write
```

```
data= embedLO.IsOn 'read
```

C++ Syntax HRESULT get_IsOn(VARIANT_BOOL* IsOn);

HRESULT put_IsOn(VARIANT_BOOL IsOn);

Interface IEmbededLO

Last Modified:

13-Apr-2007 MX New topic

IsReceiverStepAttenuatorPresent Property

Description	Returns a value indicating the presence of Receiver step attenuators in the remote PNA.
VB Syntax	*value* **=** *cap*.**IsReceiverStepAttenuatorPresent** *(n)*
Variable	**(Type) - Description**
value	**(Boolean)** - Variable to store the returned value. True - Receiver step attenuators are present. False - Receiver step attenuators are not present.
cap	A Capabilities **(object)**
n	**(Long) -** port number to query for step attenuators
Return Type	Boolean
Default	Not Applicable
Examples	`value = cap.IsReceiverStepAttenuatorPresent(1)'Read`
C++ Syntax	HRESULT get_IsReceiverStepAttenuatorPresent(long portNumber, VARIANT_BOOL * present);
Interface	ICapabilities

IsReferenceBypassSwitchPresent Property

Description	Returns a value indicating the presence of a Reference Bypass Switch in the remote PNA.
VB Syntax	*value* = *cap*.**IsReferenceBypassSwitchPresent** *(n)*
Variable	**(Type) - Description**
value	(Boolean) - Variable to store the returned value. True - Reference Bypass Switch is present. False - Reference Bypass Switch is not present.
cap	A Capabilities **(object)**
n	**(Long) -** port number to query for reference bypass switch
Return Type	Boolean
Default	Not Applicable
Examples	`value = cap.IsReferenceBypassSwitchPresent(1) 'Read`
C++ Syntax	HRESULT get_IsReferenceBypassSwitchPresent(long portNumber, VARIANT_BOOL * present);
Interface	ICapabilities

Read-only

IsSParameter Property

Description	Returns true if measurement represents an S-Parameter
VB Syntax	*value* = *meas*.**IsSparameter**
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(Boolean)** True - measurement is an S-Parameter False - measurement is NOT an S-Parameter
Return Type	Boolean
Default	True
Examples	`print app.IsSparameter`
C++ Syntax	HRESULT IsSparameter([out, retval] VARIANT_BOOL * bVal);
Interface	IMeasurement2

IterationsTolerance Property

Description	This command, along with MaximumIterationsPerPoint Property deal with ADUSTMENTS made to the source power. Sets the maximum desired deviation from the sum of the test port power and the offset value. Power readings will continue to be made, and source power adjusted, until a reading is within this tolerance value or the max number of readings has been met. The last value to be read is the valid reading for that data point. The following two commands allow for settling of power READINGS. ReadingsPerPoint Property ReadingsTolerance Property
VB Syntax	*pwrCal*.**IterationsTolerance** = *value*
Variable	**(Type) - Description**
pwrCal	**(object) -** A SourcePowerCalibrator (object)
value	**(Double)** – Tolerance value in dBm. Choose any number between 0 and 5
Return Type	Double
Default	.05 dB

Examples	`Set powerCalibrator = pna.SourcePowerCalibrator`
	`powerCalibrator.IterationsTolerance = .1 'Write`
	`ReadTol = powerCalibrator.IterationsTolerance 'Read`

C++ Syntax	HRESULT get_IterationsTolerance(double *pVal); HRESULT put_IterationsTolerance(double newVal);
Interface	ISourcePowerCalibrator3

Last Modified:

17-Apr-2007	Clarified verbage

KaiserBeta Property

Description	Sets or returns the Kaiser Beta of Time Domain transform windows
VB Syntax	*trans*.**KaiserBeta** = *value*
Variable	**(Type) - Description**
trans	A Transform **(object)**
value	**(single)** - Kaiser Beta. Choose any number between **0** and **13.**
Return Type	Single
Default	0

Examples	`trans.KaiserBeta = 6 'sets the Kaiser Beta of a transform window -Write`
	
	`KB = trans.KaiserBeta 'Read`

C++ Syntax	HRESULT get_KaiserBeta(float *pVal) HRESULT put_KaiserBeta(float newVal)
Interface	ITransform

L0 Property

Description Sets and Returns the L0 (L-zero) value (the first inductance value) for the calibration standard.

To set the other inductance values, use L1, L2, L3.

For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

VB Syntax *calstd*.**L0** = *value*

Variable **(Type) - Description**

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(single)** - Value for L0 in femtohenries(1E-15)

Return Type Single

Default Not Applicable

Examples

```
calstd.L0 = 15 'Write the value of L0 = 15 femtohenries
```

```
Induct0 = calstd.L0 'Read the value of L0
```

C++ Syntax HRESULT get_L0(float *pVal)
HRESULT put_L0(float newVal)

Interface ICalStandard

L1 Property

Description	Sets and Returns the L1 value (the second inductance value) for the calibration standard. To set the other inductance values, use L0, L2, L3. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.
VB Syntax	*calstd*.**L1** = *value*
Variable	**(Type) - Description**
calstd	A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.
value	**(single)** - Value for L1.
Return Type	Single
Default	Not Applicable
Examples	`calstd.L1 = 15 'Write the value of L1` `Induct1 = calstd.L1 'Read the value of L1`
C++ Syntax	HRESULT get_L1(float *pVal) HRESULT put_L1(float newVal)
Interface	ICalStandard

L2 Property

Description Sets and Returns the L2 value (the third inductance value) for the calibration standard.

To set the other inductance values, use L0, L1, L3.

For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

VB Syntax *calstd*.**L2** = *value*

Variable **(Type) - Description**

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(single)** - Value for L2.

Return Type Single

Default Not Applicable

Examples

```
calstd.L2 = 15 'Write the value of L2.
```

```
Induct2 = calstd.L2 'Read the value of L2
```

C++ Syntax

HRESULT get_L2(float *pVal)
HRESULT put_L2(float newVal)

Interface ICalStandard

L3 Property

Description	Sets and Returns the L3 value (the third inductance value) for the calibration standard. To set the other inductance values, use L0, L1, L2. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.
VB Syntax	*calstd*.**L3** = *value*
Variable	**(Type) - Description**
calstd	A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.
value	**(single)** - Value for L3.
Return Type	Single
Default	Not Applicable
Examples	`calstd.L3 = 15 'Write the value of L3.` `Induct3 = calstd.L3 'Read the value of L3`
C++ Syntax	HRESULT get_L3(float *pVal) HRESULT put_L3(float newVal)
Interface	ICalStandard

Label Property

Description Sets and Returns the label for the calibration standard. The label is used to prompt the user to connect the specified standard.

VB Syntax *calstd*.**Label** = *value*

Variable (Type) - Description

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(string)** - between 1 and 12 characters long. Cannot begin with a numeric.

Return Type String

Default Not Applicable

Examples

```
calstd.Label = "Short" 'Write
```

```
stdLabel = calstd.Label 'Read
```

C++ Syntax HRESULT get_Label(BSTR *pVal)
HRESULT put_Label(BSTR newVal)

Interface ICalStandard

Label Property

Description Sets or gets the display label for a given channel/testset combination. The label appears in a status bar at the bottom of the PNA display when the ShowProperties property is set to TRUE.

VB Syntax *tset*.**Label**(*chNum) = value*

Variable **(Type) - Description**

tset A TestsetControl object.

Obtained from the ExternalTestsets collection.

chNum **(Integer)** Channel number of the measurement.

value **(String)** The text of the label.

Return Type String

Default None

Examples

```
'The following sets the label for channel 5 corresponding to a given testset object.
testset1.label(5) = 'High-power output'
```

See External Testset Program

C++ Syntax HRESULT get_Label(long channelNum, BSTR *pLabel);
HRESULT put_Label(long channelNum, BSTR label);

Interface ITestsetControl

LastModified Property

Description	Returns the time stamp of the last modification to this Cal Set. This property always returns a time stamp based on the Greenwich Mean Time (GMT) regardless of the local time zone setting of the PNA. The Cal Set properties that are viewed on the PNA user interface are converted to the local time of the PNA.
VB Syntax	*value* = *Object*.**LastModified**
Variable	**(Type) - Description**
object	Channel **(object)** **or** CalSet **(object) -** Read-only property
value	**(Variant)** – Variable to store the time stamp.
Return Type	Variant
Default	Not Applicable
Examples	`date = CalSet.LastModified 'Read`
C++ Syntax	HRESULT get_LastModified(VARIANT* datetime)
Interface	ICalSet3

Last Modified:

25-Apr-2007 Added GMT note

LimitTestFailed Property

Description	Returns the results of limit testing for the measurement.
VB Syntax	*testFailed* = *meas*.**LimitTestFailed**
Variable	**(Type) - Description**
testFailed	**(boolean)** Variable to store the returned value **False** - Limit Test Passed **True** - Limit Test Failed
meas	A Measurement **(object)**
Return Type	Boolean
Default	False returned if there is no testing in progress.

Examples	`Dim testRes As Boolean`
	`testRes = meas.LimitTestFailed`
	`MsgBox (testRes)`

C++ Syntax	HRESULT get_LimitTestFailed(VARIANT_BOOL* trueIfFailed)
Interface	IMeasurement

EndStimulus Property

Description When constructing a limit line, specifies the stimulus value for the end of the segment.

VB Syntax *limtseg*.**EndStimulus** = *value*

Variable (Type) - Description

limtseg A LimitSegment **(object)**

value **(double)** - End Stimulus X-axis value. No units

Return Type Double

Default 0

Examples

```
Set limtseg = meas.LimitTest(1)
limtseg.EndStimulus = 8e9 'Write
```

```
EndStim = limtseg.EndStimulus 'Read
```

C++ Syntax
HRESULT get_EndStimulus(double *pVal)
HRESULT put_EndStimulus(double newVal)

Interface ILimitSegment

EndResponse Property

Description	When constructing a limit line, specifies the amplitude value at the end of the limit segment.
VB Syntax	*limtseg*.**EndResponse** = *value*
Variable	**(Type) - Description**
limts	A LimitSegment **(object)**
value	**(double)** - Y-axis value of the End Response limit. No units
Return Type	Double
Default	0

Examples

```
Set limtseg = meas.LimitTest(1)
limtseg.EndResponse = 10 'Write
```

```
EndResp = limtseg.EndResponse 'Read
```

C++ Syntax	HRESULT get_EndResponse(double *pVal) HRESULT put_EndResponse(double newVal)
Interface	ILimitSegment

Type (limit) Property

Description Specifies the Limit Line type.

VB Syntax *limt(index)*.**Type** = value

Variable **(Type) - Description**

limt A LimitSegment **(object)**

index **(variant)** - Limit line number in the LimitTest collection

value **(enum NALimitSegmentType)** - Limit Line type. Choose from:
0 - naLimitSegmentType_OFF - turns limit line OFF
1 - naLimitSegmentType_Maximum - limit line fails with a data point ABOVE the line
2 - naLimitSegmentType_Minimum - limit line fails with a data point BELOW the line

Return Type Long Integer

Default 0 - OFF

Examples

```
Set limts = meas.LimitTest
limts.Type = naLimitSegmentType_Maximum 'Write
```

```
limitType = limts.Type 'Read
```

C++ Syntax HRESULT put_Type(tagNALimitSegmentType *pVal)
HRESULT get_Type(tagNALimitSegmentType newVal)

Interface ILimitSegment

LineDisplay Property

Description	Turns the display of limit lines ON or OFF. To turn limit TESTING On and OFF, use State Property. **Note**: Trace data must be ON to view limit lines
VB Syntax	*limitst.***LineDisplay** = *state*
Variable	**(Type) - Description**
limitst	A LimitTest **(object)**
state	**(boolean)** **False** - Turns the display of limit lines OFF **True** - Turns the display of limit lines ON
Return Type	Long Integer
Default	**True**
Examples	`Limttest.LineDisplay = true 'Write` `lineDsp = Limttest.LineDisplay 'Read`
C++ Syntax	HRESULT get_LineDisplay(VARIANT_BOOL *pVal) HRESULT put_LineDisplay(VARIANT_BOOL newVal)
Interface	ILimitTest

Read/Write

LoadCharFromFile Property

Description	Sets and returns whether a Mixer characterization file is to be loaded. Specify and load the filename with CharFileName Property
VB Syntax	*VMC*.**LoadCharFromFile** = *bool*
Variable	**(Type) - Description**
VMC	VMCType (object)
bool	(Boolean) **True** - Load from file **False** - Perform mixer characterization
Return Type	Boolean
Default	False
Examples	`value = VMC.LoadCharFromFile`
C++ Syntax	HRESULT put_LoadCharFromFile(VARIANT_BOOL bLoadCharFromFile); HRESULT get_LoadCharFromFile(VARIANT_BOOL *bLoadCharFromFile);
Interface	VMCType

LoadPort Property

Description	Returns the load port number associated with an S-parameter reflection measurement. If the measurement is not a reflection S-parameter, the number returned by this property will have no meaning.
VB Syntax	*loadPort* = *meas.***LoadPort**
Variable	**(Type) - Description**
loadPort	**(long integer) -** The reflection measurement's load port number.
meas	A Measurement **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`Set meas = pna.ActiveMeasurement` `loadPort = meas.LoadPort`
C++ Syntax	HRESULT get_LoadPort(long *pPortNumber);
Interface	IMeasurement

Write/Read

LocalLockoutState Property

Description	Prevents use of the mouse, keyboard, and front panel while your program is running. Use of these controls while this property is set TRUE causes an error message on the PNA display. To prevent these messages, see About Error Messages.
VB Syntax	*app*.**LocalLockoutState** = *bool*
Variable	**(Type) - Description**
app	An Application **(object)**
bool	**(boolean)** -Choose either: **False -** User Interface is NOT locked out. **True -** User Interface IS locked out.
Return Type	Boolean
Default	False
Examples	`app.LocalLockoutState = True 'Write` `block = app.LocalLockoutState 'Read`
C++ Syntax	HRESULT get_LocalLockoutState(VARIANT_BOOL *State); HRESULT put_LocalLockoutState(VARIANT_BOOL *State);
Interface	IApplication4

Locator Property

Description Specifies the location of the power meter / sensor that is used during a source power calibration.

Use Interface Property to specify the type of interface.

VB Syntax *pwrMtrInterface*.**Locator** = *value*

Variable **(Type) - Description**

pwrMtrInterface **(object) -** A PowerMeterInterface (object)

value **(string)** Location of the power meter / sensor, depending on the type of Interface.

- For **naGPIB**, address of the power meter. Choose any integer between 0 and 30.
- For **naUSB**, the ID string of the power sensor. Use USBPowerMeterCatalog Property to see a list of ID strings of connected power sensors.
- For **naLAN**, the hostname or IP address of the power meter.

Return Type String

Default Not applicable

Examples

```
pwrMeterInterface.Locator = "13"  'GPIB address
```

```
pwrMeterInterface.Locator = "Agilent
Technologies,U2000A,MY12345678,X.01.16”  'USB ID string
```

```
pwrMeterInterface.Locator = "mymeter.agilent.com"  'LAN
```

C++ Syntax HRESULT put_Locator(BSTR pValue);

HRESULT get_Locator(BSTR* pValue);

Locator IPowerMeterInterface

Last Modified:

24-Jul-2007 MX New topic

Read-only

About Embedded LO

LODeltaFound Property

Description	Returns the LO frequency delta from the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**LODeltaFound** *(n)*
Variable	**(Type) - Description**
value	**(Double)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.LODeltaFound 3 'read`
C++ Syntax	HRESULT LODeltaFound(long sweep, double* deltaLO);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

LODenominator Property

Description Sets or returns the denominator value of the LO Fractional Multiplier.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**LODenominator** *(n)* **=** *value*

Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(Long)** - LO denominator value
n	**(Long)** - LO stage number Choose from 1 or 2

Return Type Long

Default 1

Examples

```
Print mixer.LODenominator(1) 'prints the value of the
first LODenominator
```

C++ Syntax HRESULT get_LODenominator(long *pVal)

HRESULT put_LODenominator(long newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

LOFixedFrequency Property

Description Sets or returns the LO frequency value.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**LOFixedFrequency** *(n)* = *value*

Variable (Type) - Description

mixer A Mixer **(object)**

value **(double)** - LO Frequency in Hertz.

n **(Long)** - LO stage number

Choose from 1 or 2

Return Type Double

Default 0 Hz

Examples

```
Print mixer.LOFixedFrequency(1) 'prints the value of the first
LO fixed frequency
```

C++ Syntax HRESULT get_LOFixedFrequency(double *pVal)

HRESULT put_LOFixedFrequency(double newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

LOFrequencyDelta Property

Description	Sets and returns LO Frequency Delta. There is usually no need to set this value. Read this value to determine the difference between the LO Frequency that is stated in the Mixer dialog box and the last measured LO Frequency.
VB Syntax	*embedLO*.**LOFrequencyDelta** = *value*
Variable	**(Type) - Description**
embedLO	An EmbeddedLO **(object)**
value	**(Double)** LO Frequency delta in Hertz.
Return Type	**(Double)**
Default	Not Applicable

Examples	`embedLO.LOFrequencyDelta = 0 'write`
	
	`value = embedLO.LOFrequencyDelta 'read`

C++ Syntax	HRESULT get_LOFrequencyDelta(double* val); HRESULT put_LOFrequencyDelta(double val);
Interface	IEmbededLO

Last Modified:

13-Apr-2007 MX New topic

LogMagnitudeOffset Property Superseded

Description

Note: This property is replaced by DoReceiverPowerCal Method.

For Receiver Calibration - Sets or returns the value to offset the normalized unratioed power measurement data. The unratioed power measurement is effectively calibrated to the power level specified by the value of LogMagnitudeOffset as soon as the Normalization property is set to ON after calling the DataToDivisor method.

To offset the data trace magnitude a specified value, use MagnitudeOffset Property

VB Syntax *meas*.**LogMagnitudeOffset** = *value*

Variable **(Type) - Description**

meas **(object) -** A Measurement object

value **(double) -** Offset value in dBm.

Return Type Double

Default 0

Examples

```
meas.LogMagnitudeOffset = -10 'Write (-10 dBm)
```

```
calpower = meas.LogMagnitudeOffset 'Read
meas.DataToDivisor 'Store meas data as measurement divisor
meas.Normalize = 1 'Measurement is now calibrated to -10 dBm
```

C++ Syntax HRESULT put_LogMagnitudeOffset(double newVal);

HRESULT get_LogMagnitudeOffset(double *pVal);

Interface IMeasurement

LOName Property

Description	Sets or returns the name of the PNA internal source or external source to use as the LO in an FCA measurement. See Remotely Specifying a Source Port.
VB Syntax	*mixer*.**LOName** *(n)* **=***value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
n	**(Long)** - LO stage number Choose from 1 or 2
value	**(string)** - LO Source name. Use SourcePort Property to return a list of valid source ports. An external source must be configured and selected to be valid. Learn more about external source configuration.
Return Type	String
Default	"Not controlled"
Examples	`mixer.LOName(1) = "MySource"`
C++ Syntax	HRESULT get_LOName(string *pVal) HRESULT put_LOName(string newVal)
Interface	MIXer

Last Modified:

23-Jul-2007 Updated for external source config.

LONumerator Property

Description Sets or returns the numerator value of the LO Fractional Multiplier.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**LONumerator** *(n)* = *value*

Variable (Type) - Description

mixer A Mixer **(object)**

value **(Long)** - LO denominator value

n **(Long)** - LO stage number

Choose from 1 or 2

Return Type Long

Default 1

Examples

```
Print mixer.LONumerator(1) 'prints the value of the
first LO Numerator
```

C++ Syntax HRESULT get_LONumerator(long *pVal)

HRESULT put_LONumerator(long newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

LOPower Property

Description Sets or returns the value of LO Power.

VB Syntax *mixer*.**LOPower** *(n)* **=** *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

n **(Long)** - LO stage number

Choose from 1 or 2

value **(double)** - LO Power in dBm.

Return Type Double

Default -10dBm

Examples

```
Print mixer.LOPower(1) 'prints the value of the LO Power
```

C++ Syntax HRESULT get_LOPower(double *pVal)

HRESULT put_LOPower(double newVal)

Interface IMixer

LORangeMode Property

Description	Sets or returns the LO sweep mode. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**LORangeMode** *(n)* = *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
n	**(Long)** - LO stage number. Choose from 1 or 2
value	**(Enum as MixerRangeMode)** - LO sweep mode. Choose from: 0 - **mixSwept** 1 - **mixFixed**
Return Type	Enum
Default	0 - mixSwept
Examples	`mixer.LORangeMode(1)=mixSwept`
C++ Syntax	HRESULT get_LORangeMode(long *pVal) HRESULT put_LORangeMode(long newVal)
Interface	IMixer3

Last Modified:

4-Mar-2008 Added note.

Loss Property

Description Sets and Returns the insertion loss for the calibration standard.

VB Syntax *calstd*.**loss** = *value*

Variable **(Type) - Description**

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(single)** - Insertion loss in Gohms / sec. (Giga Ohms per second of electrical delay)

Return Type Single

Default Not Applicable

Examples

```
calstd.loss = 3.5 'Write 3.5 Gohms of loss
```

```
stdLoss = calstd.loss 'Read the value of Loss
```

C++ Syntax HRESULT get_Loss(float *pVal)
HRESULT put_Loss(float newVal)

Interface ICalStandard

Loss (Source Power Cal) Property

Description	Sets or returns the loss value associated with a PowerLossSegment.
VB Syntax	*lossSeg*.**Loss** = *value*
Variable	**(Type) - Description**
lossSeg	**(object) -** PowerLossSegment
value	**(double)** – Loss value in dB. This can be any value between 0 and 200.
Return Type	Double
Default	0
Examples	`lossSeg.Loss = 0.5 'Write` `lossVal = lossSeg.Loss 'Read`
C++ Syntax	HRESULT put_Loss(Double newVal); HRESULT get_Loss(Double *pVal);
Interface	IPowerLossSegment

LOStage Property

Description	Sets or returns the number of LO stages present in the mixer.
VB Syntax	*mixer*.**LOStage =** *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(Long)** - Number of LO stages. Choose from **1** or **2**
Return Type	Long
Default	1
Examples	`mixer.LOStage = 1 'sets the LO Stage value to 1`
C++ Syntax	HRESULT get_LOStage(long *pVal) HRESULT put_LOStage(long newVal)
Interface	IMixer

LOStartFrequency Property

Description Sets or returns the LO start frequency value. This command can only be used with SMC (not VMC) measurements.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**LOStartFrequency** *(n)* = *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(double)** - LO Start Frequency in Hertz.

n **(Long)** - LO stage number

Choose from 1 or 2

Return Type Double

Default Not Applicable

Examples

```
Print mixer.LOStartFrequency(1) 'prints the value of the first LO start frequency
```

C++ Syntax HRESULT get_LOStartFrequency(long id, double *pVal)

HRESULT put_LOStartFrequency(long id,double newVal)

Interface IMixer3

Last Modified:

4-Mar-2008 Added note.

LOStopFrequency Property

Description Sets or returns the LO stop frequency value. This command can only be used with SMC (not VMC) measurements.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**LOStopFrequency** *(n)* = *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(double)** - LO Stop Frequency in Hertz.

n **(Long)** - LO stage number

Choose from 1 or 2

Return Type Double

Default Not Applicable

Examples

```
Print mixer.LOStopFrequency(1) 'prints the value of the first LO stop frequency
```

C++ Syntax HRESULT get_LOStopFrequency(long id, double *pVal)

HRESULT put_LOStopFrequency(long id,double newVal)

Interface IMixer3

Last Modified:

4-Mar-2008 Added note.

MagnitudeOffset Property

Description	Offsets the data trace magnitude by the specified value. To offset the data trace magnitude to a slope value that changes with frequency, use MagnitudeSlopeOffset Property. To implement a Receiver Cal offset, use LogMagnitudeOffset property.
VB Syntax	*meas*.**MagnitudeOffset** = *value*
Variable	**(Type) - Description**
meas	**(object) -** A Measurement object
value	**(double) -** Offset value in dB.
Return Type	Double
Default	0
Examples	`meas.MagnitudeOffset = 4 'Write` `offs = meas.MagnitudeOffset 'Read`
C++ Syntax	HRESULT put_MagnitudeOffset(double newVal); HRESULT get_MagnitudeOffset(double *pVal);
Interface	IMeasurement4

MagnitudeSlopeOffset Property

Description	Offsets the data trace magnitude to a value that changes linearly with frequency. The offset slope begins at 0 Hz. To offset the entire data trace magnitude by a specified value, use MagnitudeOffset Property.
VB Syntax	*meas*.**MagnitudeSlopeOffset** = *value*
Variable	**(Type) - Description**
meas	**(object) -** A Measurement object
value	**(double) -** Offset slope value in dB / 1GHz.
Return Type	Double
Default	0
Examples	`meas.MagnitudeSlopeOffset = 4 'Writes a slope offset of 4dB/1GHz.` `offs = meas.MagnitudeSlopeOffset 'Read`
C++ Syntax	HRESULT put_MagnitudeSlopeOffset(double newVal); HRESULT get_MagnitudeSlopeOffset(double *pVal);
Interface	IMeasurement4

MarkerAnnotation Property

Description	Returns the Y-axis marker value from the specified tuning sweep. Use IsMarkerOn to confirm if a marker was used for the tuning sweep.
VB Syntax	*value* = *embedLODiag*.**MarkerAnnotation** *(n)*
Variable	**(Type) - Description**
value	**(String)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.MarkerAnnotation 3 'read`
C++ Syntax	HRESULT MarkerAnnotation(long sweep, BSTR* annotation);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007	MX New topic

MarkerFormat Property

Description	Sets (or returns) the format of all the markers in the measurement. To override this setting for an individual marker, use **mark.Format**
VB Syntax	*meas*.**MarkerFormat** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(enum NAMarkerFormat)** - Choose from: 0 - naMarkerFormat_LinMag 1 - naMarkerFormat_LogMag 2 - naMarkerFormat_Phase 3 - naMarkerFormat_Delay 4 - naMarkerFormat_Real 5 - naMarkerFormat_Imaginary 6 - naMarkerFormat_SWR 7 - naMarkerFormat_LinMagPhase 8 - naMarkerFormat_LogMagPhase 9 - naMarkerFormat_RealImaginary 10 - naMarkerFormat_ComplexImpedance 11 - naMarkerFormat_ComplexAdmittance 12 - naMarkerFormat_Kelvin 13 - naMarkerFormat_Fahrenheit 14 - naMarkerFormat_Centigrade
Return Type	Long Integer
Default	**1** - naMarkerFormat_LogMag
Examples	`meas.MarkerFormat = naMarkerFormat_SWR 'Write` `fmt = mark.Format 'Read`
C++ Syntax	HRESULT put_MarkerFormat(tagNAMarkerFormat NewFormat)
Interface	IMeasurement

Last Modified:

1-Oct-2007	Added temperature formats

InterpolateMarkers Method

Description	Turns **All** Marker Interpolation ON and OFF for the measurement. Marker interpolation enables X-axis resolution between the discrete data values. The analyzer will calculate the x and y-axis data values between discrete data points. To override this property for individual markers, use the Interpolated property.
VB Syntax	*meas*.**Interpolate** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(boolean)** **False** - Turns interpolation OFF for all markers in the measurement **True** - Turns interpolation ON for all markers in the measurement
Return Type	Boolean
Default	True (ON)
Examples	`meas.Interpolate = 1`
C++ Syntax	HRESULT InterpolateMarkers(VARIANT_BOOL bNewVal)
Interface	IMeasurement

Number Property

Description	Returns the number of the marker.
VB Syntax	*marknum* = *mark*.**Number**
Variable	**(Type) - Description**
marknum	**(long)** - Variable to store marker number
mark	A Marker **(object)**
Return Type	Long Integer
Default	Not applicable
Examples	`marknum = mark.Number 'Read`
C++ Syntax	HRESULT get_Number(long *pVal)
Interface	IMarker

MarkerPosition Property

Description	Returns the X-axis marker position from the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**MarkerPosition** *(n)*
Variable	**(Type) - Description**
value	**(Double)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.MarkerPosition 3 'read`
C++ Syntax	HRESULT MarkerPosition(long sweep, double *position);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

MarkerReadout Property

Description	Enables or disables the readout of markers in the window. To show the marker on the screen use ShowMarkerReadout Method.
VB Syntax	*win*.**MarkerReadout** = *state*
Variable	**(Type) - Description**
win	A NAWindow (object)
state	**(boolean)** **True** - enables marker readout **False** - disables marker readout
Return Type	Boolean
Default	True
Examples	`win.MarkerReadout = True 'Write` `State = app.ActiveNAWindow.MarkerReadout 'Read`
C++ Syntax	HRESULT get_MarkerReadout(VARIANT_BOOL *pVal) HRESULT put_MarkerReadout(VARIANT_BOOL newVal)
Interface	INAWindow

MarkerReadoutSize Property

Description Specifies the size of font used when displaying Marker Readout in the selected window.

VB Syntax *win*.**MarkerReadoutSize** = *value*

Variable **(Type) - Description**

win A NAWindow (object)

value **(enum NAFontSize)**

0 - naDefault - marker readout appears in default font size

1 - naLarge - marker readout appears in large font size

Return Type Long Integer

Default naDefault

Examples

```
win.MarkerReadoutSize = naDefault 'write default size for marker readout
```

```
Dim Size As NAFontSize
Size = app.ActiveNAWindow.MarkerReadoutSize 'Read
```

C++ Syntax HRESULT get_MarkerReadoutSize(tagNAFontSize *pVal)

HRESULT put_MarkerReadoutSize(tagNAFontSize newVal)

Interface INAWindow

MarkerState Property

Description Sets or returns the ON / OFF state of the specified marker.

VB Syntax *meas*.**MarkerState** *(n) = state*

Variable **(Type) - Description**

meas A Measurement **(object)**

n (Long Integer) Marker number to turn on or off.

state (boolean) -
True - turns the specified marker ON
False - turns the specified marker OFF

Return Type Boolean

Default False

Examples

```
meas.MarkerState(1) = True
```

```
reference = meas.MarkerState(2)
```

C++ Syntax HRESULT get_MarkerState(long markerNum, VARIANT_BOOL bState)
HRESULT put_MarkerState(long markerNum, VARIANT_BOOL* bState)

Interface IMeasurement3

Type (Marker) Property

Description	Sets and reads the marker type.
VB Syntax	*mark*.**Type** = *value*
Variable	**(Type) - Description**
chan	A Marker **(object)**
value	**(enum NAMarkerType)** - Marker Type. Choose from: **0 - naMarkerType_Normal -** the X-axis value for a normal marker will always be determined by the measurement data of the marker. **1 - naMarkerType_Fixed -** retains and keeps its x-axis value at the time the marker type is set.
Return Type	Long Integer
Default	naMarkerType_Normal
Examples	`mark.Type = naMarkerType_Normal 'Write` `MrkType = mark.Type 'Read`
C++ Syntax	HRESULT get_Type(tagNAMarkerType *pVal) HRESULT put_Type(tagNAMarkerType newVal)
Interface	IMarker

Stimulus Property

Description	Sets and reads the X-Axis value of the marker. If the marker is a delta marker, the value will be relative to the reference marker.
VB Syntax	*mark*.**Stimulus** = *value*
Variable	**(Type) - Description**
mark	A Marker **(object)**
value	**(double)** - X-Axis value. Choose any number within the full span of the channel or User Range (if set).
Return Type	Double
Default	First activated Marker turns ON in the middle of the X-axis range. Subsequent markers turn ON at the position of the most recently active marker.
Examples	`mark.Stimulus = 3e9 'Write` `XVal = mark.Stimulus 'Read`
C++ Syntax	HRESULT get_Stimulus(double *pVal) HRESULT put_Stimulus(double newVal)
Interface	IMarker

Value Property

Description Reads the Y-axis value of the marker. If the marker is a delta marker, the value will be relative to the reference marker.

You cannot set the Y-axis value of a marker. The marker remains at the position at the time you set marker.Type.

Note: To accurately read the marker Y-axis value with trace smoothing applied, the requested format must match the displayed format. Otherwise, the returned value is un-smoothed data. For example, to read the smoothed marker value when measuring group delay, both the display format and the marker format must be set to (Group) Delay.

VB Syntax *YValue* = *mark*.**Value** *(format)*

Variable **(Type) - Description**

YValue A variable to store the Y-axis value

mark A Marker **(object)**

format **(enum NAMarkerFormat)** - The format in which to return the marker's Y-axis value. The number in parenthesis following the format is the number of values that are returned in a variant array. Choose from:

0 - naMarkerFormat_**LinMag** (1)

1 - naMarkerFormat_**LogMag** (1)

2 - naMarkerFormat_**Phase** (1)

3 - naMarkerFormat_**Delay** (1)

4 - naMarkerFormat_**Real** (1)

5 - naMarkerFormat_**Imaginary** (1)

6 - naMarkerFormat_**SWR** (1)

7 - naMarkerFormat_**LinMagPhase** (2)

8 - naMarkerFormat_**LogMagPhase** (2)

9 - naMarkerFormat_**RealImaginary** (2)

10 - naMarkerFormat_**ComplexImpedance** (3)

11 - naMarkerFormat_**ComplexAdmittance** (3)

12 - naMarkerFormat_**Kelvin** (1)

13 - naMarkerFormat_**Fahrenheit** (1)

14 - naMarkerFormat_**Celsius** (1)

Return Type Variant - The previous list of formats indicates the number of values that are returned in a variant array

Default	Not applicable
Examples	`YVal = mark.Value 'Read`
C++ Syntax	HRESULT get_Value(tagNAMarkerFormat format, VARIANT *pVal)
Interface	IMarker

Last modified:

1-Oct-2007	Added temperature formats
Dec. 4, 2006	Added smoothing note

MaximumFrequency Property

Description	Sets and Returns the maximum frequency for the calibration standard.
VB Syntax	*calstd*.**MaximumFrequency** = *value*
Variable	**(Type) - Description**
calstd	A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.
value	**(double)** - Maximum frequency in Hertz.
Return Type	Double
Default	Not Applicable
Examples	`calstd.MaximumFrequency = 9e9 'Write` `maxFrequency = calstd.MaximumFrequency 'Read`
C++ Syntax	HRESULT get_MaximumFrequency(double *pVal) HRESULT put_MaximumFrequency(double newVal)
Interface	ICalStandard

Read only

About PNA Options

MaximumFrequency Property

Description	Returns the maximum frequency of the remote PNA.
VB Syntax	*value* = *cap*.**MaximumFrequency**
Variable	**(Type) - Description**
value	(Double) - Variable to store the returned maximum frequency of the PNA.
cap	A Capabilities **(object)**
Return Type	Double
Default	Not Applicable
Examples	`value = cap.MaximumFrequency 'Read`
C++ Syntax	HRESULT get_MaximumFrequency(&frequencyMax);
Interface	ICapabilities

MaximumFrequency (Source Power Cal) Property

Description	Maximum usable frequency specified for the power sensor.
VB Syntax	*pwrSensor*.**MaximumFrequency** = *value*
Variable	**(Type) - Description**
pwrSensor	**(object) -** A PowerSensor (object)
value	**(double)** -Frequency in Hertz.
Return Type	Double
Default	0

Examples

```
Set powerCalibrator = pna.SourcePowerCalibrator
powerCalibrator.PowerSensors(1).MaximumFrequency = 6e9
'Write

MaxFreq = powerCalibrator.PowerSensors(1).MaximumFrequency
'Read
```

C++ Syntax	HRESULT put_MaximumFrequency(double newVal); HRESULT get_MaximumFrequency(double *pVal);
Interface	IPowerSensor

MaximumIFFilterSampleCount Property

Description	Returns the maximum allowed value for the IFFilterSampleCount property for the queried PNA. **Note:** This setting applies only to the E836X Opt. H11.
VB Syntax	*value* = *IfConfig*.**MaximumIFFilterSampleCount**
Variable	**(Type) - Description**
value	**(long)** The maximum allowed value that can be applied to the IFFilterSampleCount property.
IfConfig	IFConfiguration (object)
Return Type	Long Integer
Default	PNA Model number dependent
Examples	`variable = App.ActiveChannel.IFConfiguration.MaximumIFFilterSampleCount 'Read` See an example program
C++ Syntax	HRESULT get_MaximumIFFilterSampleCount(long * pMaxSampleCount);
Interface	IIFConfiguration2

MaximumIFFrequency Property

Description	Returns the Maximum allowed value for the IFFrequency Property
VB Syntax	*value* = *IfConfig*.**MaximumIFFrequency**
Variable	**(Type) - Description**
value	**(double)** Variable to store the returned maximum allowed frequency that can be applied to the IFFrequency Property.
IfConfig	IFConfiguration (object)
Return Type	Double
Default	Not Applicable
Examples	`val = App.ActiveChannel.IFConfiguration.MaximumIFFrequency 'Read`
C++ Syntax	HRESULT get_**MaximumIFFrequency**(double * pMaxFreq);
Interface	IIFConfiguration3

Last Modified:

18-Jun-2007 MX New topic

MaximumIterationsPerPoint Property

Description

This command, along with IterationsTolerance Property deal with ADUSTMENTS made to the source power.

Sets the maximum number of readings to take at each data point for iterating the source power. Power readings will continue to made, and source power adjusted, until a reading is within the IterationsTolerance value or this max number of readings has been met. The last value to be read is the valid reading for that data point.

The following two commands allow for settling of power READINGS.

ReadingsPerPoint Property

ReadingsTolerance Property

VB Syntax

pwrCal.**MaximumIterationsPerPoint** = *value*

Variable **(Type) - Description**

pwrCal **(object) -** A SourcePowerCalibrator (object)

value **(Long)** – Maximum number of readings. Choose any number between 1 and 100.

Return Type Long Integer

Default 5

Examples

```
Set powerCalibrator = pna.SourcePowerCalibrator
powerCalibrator.MaximumIterationsPerPoint = 5 'Write
MaxReads = powerCalibrator.MaximumIterationsPerPoint 'Read
```

C++ Syntax

HRESULT get_MaximumIterationsPerPoint(long *pVal);

HRESULT put_MaximumIterationsPerPoint(long newVal);

Interface ISourcePowerCalibrator3

Last Modified:

17-Apr-2007 Clarified verbage

MaximumNumberOfChannels Property

Description	Returns the maximum possible number of channels that can be used in the PNA.
VB Syntax	*value* = *cap*.**MaximumNumberOfChannels**
Variable	**(Type) - Description**
value	**(Long)** - Variable to store the returned maximum value for number of channels.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.MaximumNumberOfChannels 'Read`
C++ Syntax	HRESULT get_MaximumNumberOfChannels(long * maximumNumberOfChans);
Interface	ICapabilities2

MaximumNumberOfTracesPerWindow Property

Description	Returns the maximum possible number of traces that can reside in any window.
VB Syntax	*value* = *cap*.**MaximumNumberOfTracesPerWindow**
Variable	**(Type) - Description**
value	**(Long)** - Variable to store the returned maximum value for number of traces.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.MaximumNumberOfTracesPerWindow 'Read`
C++ Syntax	HRESULT get_MaximumNumberOfTracesPerWindow(long * maximumNumberOfTraces);
Interface	ICapabilities2

MaximumNumberOfWindows Property

Description	Returns the maximum possible number of windows that can be present on the PNA screen.
VB Syntax	*value* = *cap*.**MaximumNumberOfWindows**
Variable	**(Type) - Description**
value	**(Long)** - Variable to store the returned maximum value for number of windows.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.MaximumNumberOfWindows 'Read`
C++ Syntax	HRESULT get_MaximumNumberOfWindows(long * maximumNumberOfWindows);
Interface	ICapabilities2

MaximumNumberOfPoints Property

Description	Returns the maximum possible number of data points.
VB Syntax	*value* = *obj*.**MaximumNumberOfPoints**
Variable	**(Type) - Description**
value	**(Long)** - Variable to store the returned maximum value for number of points.
cap	A Capabilities **(object)** **or** A GainCompression **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.MaximumNumberOfPoints 'Read`
C++ Syntax	HRESULT get_MaximumNumberOfPoints(long * maximumNumberOfPoints);
Interface	ICapabilities IGainCompression

Last Modified:

3-Dec-2007 MX New topic

MaximumReceiverStepAttenuator Property

Description	Returns the maximum amount of receiver attenuation.
VB Syntax	*value* **=** *cap*.**MaximumReceiverStepAttenuator** *(n)*
Variable	**(Type) - Description**
value	**(Double)** - Variable to store the returned value of maximum receiver attenuation.
cap	A Capabilities **(object)**
n	**(Long) -** port number to query for step attenuators
Return Type	Double
Default	Not Applicable
Examples	`value = cap.MaximumReceiverStepAttenuator'Read`
C++ Syntax	HRESULT get_MaximumReceiverStepAttenuator(long portNumber, double * attenuation);
Interface	ICapabilities

Read only	[About PNA Options]

MaximumSourceALCPower Property

Description	Returns a value indicating the maximum amount of source ALC power.
VB Syntax	*value* = *cap*.**MaximumSourceALCPower** *(n)*
Variable	**(Type) - Description**
value	**(Double)** - Variable to store the returned value for the maximum amount of source ALC power.
cap	A Capabilities **(object)**
n	**(Long) -** source number to query for maximum ALC power
Return Type	Double
Default	Not Applicable
Examples	`value = cap.MaximumSourceALCPower'Read`
C++ Syntax	HRESULT get_MaximumSourceALCPower(long sourceNum, double * power);
Interface	ICapabilities

MaximumSourceStepAttenuator Property

Description	Returns a value for the maximum amount of source attenuation.
VB Syntax	*value* = *cap*.**MaximumSourceStepAttenuator** *(n)*
Variable	**(Type) - Description**
value	**(Double)** - Variable to store the returned value for the maximum amount of source attenuation.
cap	A Capabilities **(object)**
n	**(Long) -** port number to query for the maximum amount of source attenuation
Return Type	Double
Default	Not Applicable
Examples	`value = cap.MaximumSourceStepAttenuator 2'Read`
C++ Syntax	HRESULT get_MaximumSourceStepAttenuator(long portNumber, double * attenuation);
Interface	ICapabilities

Last Modified:

19-Sep-2007 Added port arg to ex.

MaxPreciseTuningIterations Property

Description Sets and returns the maximum number of tuning iterations to achieve the precise tolerance.

VB Syntax *embedLO*.**MaxPreciseTuningIterations** = *value*

Variable **(Type) - Description**

embedLO An EmbeddedLO **(object)**

value **(Long)** Maximum number of tuning iterations. Choose a number between

Return Type **(Long)**

Default 5

Examples

```
embedLO.MaxPreciseTuningIterations = 3 'write
```

```
value = embedLO.MaxPreciseTuningIterations 'read
```

C++ Syntax HRESULT get_MaxPreciseTuningIterations long* iter);

HRESULT put_MaxPreciseTuningIterations long iter);

Interface IEmbededLO

Last Modified:

13-Apr-2007 MX New topic

Read-only

About Trace Statistics

Mean Property

Description	Returns the mean value of the measurement . To retrieve all 3 statistics value at the same time, use meas.GetTraceStatistics
VB Syntax	*average* = *meas*.**Mean**
Variable	**(Type) - Description**
average	**(single)** - Variable to store mean value
meas	A Measurement **(object)**
Return Type	Single
Default	Not applicable
Examples	`Dim average as Single` `average = meas.Mean 'Read`
C++ Syntax	HRESULT get_Mean(float* mean)
Interface	IMeasurement

Medium Property

Description Sets and Returns the media type of the calibration standard.

VB Syntax *calstd*.**Medium** = *value*

Variable (Type) - Description

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(enum** NACalStandardMedium**)** - Medium of the transmission line of the standard. Choose from:
0 - naCoax - Coaxial Cable
1 - naWaveGuide

Return Type Long Integer

Default Not Applicable

Examples

```
calstd.Medium = naCoax 'Write

stdMedium = calstd.Medium 'Read
```

C++ Syntax HRESULT get_Medium(tagNACalStandardMedium *pVal)
HRESULT put_Medium(tagNACalStandardMedium newVal)

Interface ICalStandard

MinimumFrequency Property

Description	Sets and Returns the minimum frequency for the calibration standard.
VB Syntax	*calstd*.**MinimumFrequency** = *value*
Variable	**(Type) - Description**
calstd	A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.
value	**(double)** -Minimum frequency in Hertz.
Return Type	Double
Default	Not Applicable
Examples	`calstd.MinimumFrequency = 300e3 'Write` `minFrequency = calstd.MinimumFrequency 'Read`
C++ Syntax	HRESULT get_MinimumFrequency(double *pVal) HRESULT put_MinimumFrequency(double newVal)
Interface	ICalStandard

MinimumFrequency Property

Description	Returns the minimum frequency of the remote PNA.
VB Syntax	*value* = *cap*.**MinimumFrequency**
Variable	**(Type) - Description**
value	(Double) - Variable to store the returned minimum frequency of the PNA.
cap	A Capabilities **(object)**
Return Type	Double
Default	Not Applicable
Examples	`value = cap.MinimumFrequency 'Read`
C++ Syntax	HRESULT get_MinimumFrequency(double *pVal)
Interface	ICapabilities

MinimumFrequency (Source Power Cal) Property

Description	Minimum usable frequency specified for the power sensor.
VB Syntax	*pwrSensor*.**MinimumFrequency** = *value*
Variable	**(Type) - Description**
pwrSensor	**(object) -** A PowerSensor (object)
value	**(double)** -Frequency in Hertz.
Return Type	Double
Default	0

Examples

```
Set powerCalibrator = pna.SourcePowerCalibrator
powerCalibrator.PowerSensors(1).MinimumFrequency = 300e3
'Write

MinFreq = powerCalibrator.PowerSensors(1).MinimumFrequency
'Read
```

C++ Syntax

HRESULT put_MinimumFrequency(double newVal);

HRESULT get_MinimumFrequency(double *pVal);

Interface IPowerSensor

MinimumIFFilterSampleCount Property

Description Returns the Minimum allowed value for the IFFilterSampleCount property for the queried PNA.

Note: This setting applies only to the E836X Opt. H11.

VB Syntax *value* = *IfConfig*.**MinimumIFFilterSampleCount**

Variable **(Type) - Description**

value **(long)** The minimum allowed value that can be applied to the IFFilterSampleCount property.

IfConfig IFConfiguration (object)

Return Type Long Integer

Default PNA Model number dependent

Examples

```
variable =
App.ActiveChannel.IFConfiguration.MinimumIFFilterSampleCount
'Read
```

See an example program

C++ Syntax HRESULT get_MinimumIFFilterSampleCount(long * pMinSampleCount);

Interface IIFConfiguration2

MinimumIFFrequency Property

Description	Returns the minimum allowed value for the IFFrequency Property
VB Syntax	*value* = *IfConfig*.**MinimumIFFrequency**
Variable	**(Type) - Description**
value	**(double)** Variable to store the returned minimum allowed frequency that can be applied to the IFFrequency Property.
IfConfig	IFConfiguration (object)
Return Type	Double
Default	Not Applicable
Examples	`val = App.ActiveChannel.IFConfiguration.MinimumIFFrequency 'Read`
C++ Syntax	HRESULT get_MinimumIFFrequency(double * pMinFreq);
Interface	IIFConfiguration3

Last Modified:

18-Jun-2007 MX New topic

MinimumNumberOfPoints Property

Description	Returns the minimum possible number of data points for a data trace.
VB Syntax	*value* = *cap*.**MinimumNumberOfPoints**
Variable	**(Type) - Description**
value	(Long) - Variable to store the returned minimum value for number of points.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.MinimumNumberOfPoints 'Read`
C++ Syntax	HRESULT get_MinimumNumberOfPoints(double * minimumNumberOfPoints);
Interface	ICapabilities

Read only [About PNA Options]

MinimumReceiverStepAttenuator Property

Description	Returns a value indicating the minimum amount of receiver attenuation.
VB Syntax	*value* **=** *cap*.**MinimumReceiverStepAttenuator** *(n)*
Variable	**(Type) - Description**
value	**(Double)** - Variable to store the returned minimum value of receiver attenuation.
cap	A Capabilities **(object)**
n	**(Long) -** port number to query for minimum value of receiver attenuation
Return Type	Double
Default	Not Applicable
Examples	`value = cap.MinimumReceiverStepAttenuator 'Read`
C++ Syntax	HRESULTget_ MinimumReceiverStepAttenuator(long portNumber, double * attenuation);
Interface	ICapabilities

MinimumSourceALCPower Property

Description	Returns a value indicating the minimum amount of source ALC power.
VB Syntax	*value* = *cap*.**MinimumSourceALCPower** *(n)*
Variable	**(Type) - Description**
value	**(Double)** - Variable to store the returned minimum value of source ALC power.
cap	A Capabilities **(object)**
n	**(Long) -** source number to query for the minimum value of source ALC power
Return Type	Double
Default	Not Applicable
Examples	`value = cap.MinimumSourceALCPower'Read`
C++ Syntax	HRESULT get_MinimumSourceALCPower(long sourceNum, double * power);
Interface	ICapabilities

Mode Property

Description Sets the type of transform.

VB Syntax *trans*.**Mode** = *value*

Variable (Type) - Description

trans A Transform **(object)**

value **(enum NATransformMode)** - Choose from:

0 - naTransformBandpassImpulse
1 - naTransformLowpassImpulse
2 - naTransformLowpassStep

Return Type NATransformMode

Default **0** - naTransformBandpassImpulse

Examples

```
trans.Mode = naTransformLowpassStep 'Write
```

```
transmode = trans.Mode 'Read
```

C++ Syntax HRESULT get_Mode(tagNATransformMode *pVal)
HRESULT put_Mode(tagNATransformMode newVal)

Interface ITransform

Multiplier Property

Description	Sets and returns the multiplier value to be used when coupling this range to the primary range. Learn more about multiplier value. This setting is valid only if this range is coupled to the primary range.
VB Syntax	*FOMRange*.**Multiplier** = *value*
Variable	**(Type) - Description**
object	An FOMRange **(object)**
value	**(Double)** - Multiplier value.-(Unitless)
Return Type	Double
Default	1
Examples	`fomRange.Multiplier = 2 'Write` `Mult = fomRange.Multiplier 'Read`
C++ Syntax	HRESULT get_Multiplier(double *pVal) HRESULT put_Multiplier(double pVal)
Interface	IFOMRange

Name Property

Description Sets or returns the Name of the Cal Set.

VB Syntax *CalSet*.**Name** = *value*

Variable **(Type) - Description**

CalSet **(object) -** A Cal Set object

value **(string)** - Name of the Cal Set.

Return Type String

Default Not Applicable

Examples

```
Dim pna
set
pna=CreateObject("AgilentPNA835x.Application")

Dim calsets
set calsets=pna.getcalmanager.calsets

Dim c
for each c in calsets
wscript.echo c.name
'Changes the name of CalSet_1
if c.name="CalSet_1" then c.name="New"
next
```

C++ Syntax HRESULT get_Name(BSTR *name)

HRESULT put_Name(BSTR name);

Interface ICalSet4

Name (CalKit) Property

Description Sets and Returns a name for the selected calibration kit.

VB Syntax *calKit*.**Name** = *value*

Variable (Type) - Description

calKit A CalKit **(object).**

value **(string)** -Calibration Kit name. Any string name, can include numerics, period, and spaces; any length (although the dialog box display is limited to about 30 characters).

Return Type String

Default Not Applicable

Examples

```
calKit.Name = "MyCalKit" 'Write
```

```
KitName = calKit.Name 'Read
```

C++ Syntax HRESULT get_Name(BSTR *pVal)
HRESULT put_Name(BSTR newVal)

Interface ICalKit

Name (PathConfig) Property

Description	Returns the name of the current configuration only if NO individual element settings had been changed since selecting or storing a configuration. When element settings change, the path configuration name is cleared.
VB Syntax	*name* = *pathConfig*.**Name**
Variable	**(Type) - Description**
name	**(String)** Variable to store the returned configuration name.
pathConfig	A PathConfiguration **(object)**
Return Type	String
Default	'default' - name of the default factory configuration
Examples	`name=pathConf.Name`
C++ Syntax	HRESULT get_Name(BSTR* ppName)
Interface	IPathConfiguration

Last Modified:

14-Dec-2006 MX New topic

Name Property

Description	Returns the name of the current element object
VB Syntax	*name* = *pathElement*.**Name**
Variable	**(Type) - Description**
name	**(String)** Variable to store the returned element name.
pathElement	A PathElement **(object)**
Return Type	String
Default	Not Applicable
Examples	`name=pathElement.Name`
C++ Syntax	HRESULT get_Name(BSTR* ppName)
Interface	IPathElement

Last Modified:

15-Dec-2006 MX New topic

Name Property

Description	Returns the name of this FOM range object.
VB Syntax	*value* = *FOMRange*.**Name**
Variable	**(Type) - Description**
value	**(string)** - Variable to store the returned range name.
FOMRange	An FOMRange **(object)**
Return Type	String
Default	Not Applicable
Examples	`Rname = fomRange.Name 'Read`
C++ Syntax	HRESULT get_Name(BSTR *pRName)
Interface	IFOMRange

Last Modified:

8-Mar-2007	Major Modifications

Name (Measurement) Property

Description Sets (or returns) the Name of the measurement. Measurement names must be unique among the set of measurements. Measurement names cannot be an empty string.

Note: This is the same name as trace.Name; when one changes, the other changes.

VB Syntax *meas*.**Name** = *value*

Variable (Type) - Description

meas A Measurement **(object)**

value **(string)** - A user defined name of the measurement

Return Type String

Default "CH1_S11_1" - name of the default measurement

Examples

```
meas.Name = "Filter BPass" 'Write
```

```
MName = meas.Name 'Read
```

C++ Syntax HRESULT get_Name(BSTR *pVal)
HRESULT put_Name(BSTR newVal)

Interface IMeasurement

Name (trace) Property

Description	Sets or returns the name of the Trace. Use the trace name to identify the trace and refer to the trace in the collection. **Note:** This is the same name as meas.Name; when one changes, the other changes.
VB Syntax	*trac*.**Name** = *value*
Variable	**(Type) - Description**
trac	A Trace **(object)**
value	**(String)** Trace name
Return Type	String
Default	"CH1_S11_1" - name of the default measurement
Examples	`trace.Name = "myTrace" 'Write` `traceName = Name.Trace 'Read`
C++ Syntax	HRESULT put_Name(BSTR name) HRESULT get_Name(BSTR *name)
Interface	ITrace

Read-Write | About FCA embed/deembed

NetworkFilename Property

Description	Specifies the S2P filename to embed or de-embed on the input or output of your mixer measurement.
VB Syntax	*object*.NetworkFilename*(n)* = *filename*
Variable	**(Type) - Description**
object	SMCType (object) or VMCType (object)
n	(Integer) Apply network to input or output of mixer. Choose from: **1** - Input of mixer **2** - Output of mixer
filename	(String) Filename of the S2P used for embedding or de-embedding. Use the full path name, file name, and .S2P suffix, enclosed in quotes.
Return Type	String
Default	Not Applicable
Examples	`VMC.Filename(2) = "C:\Program Files\Agilent\Network Analyzer\Documents\WaveguideAdapt.S2P"`
C++ Syntax	HRESULT put_NetworkFilename(short networkNum, BSTR filename); HRESULT get_NetworkFilename(short networkNum, BSTR *filename);
Interface	SMCType2 VMCType2

Last Modified:

29-Feb-2008 Several edits

NetworkMode Property

Description	Allows you to embed (add) or de-embed (remove) circuit network effects on the input and output of your mixer measurement. Learn more.
VB Syntax	*object*.NetworkMode*(n)* = *value*
Variable	**(Type) - Description**
object	SMCType (object) or VMCType (object)
n	(Integer) Apply network to input or output of mixer. Choose from: **1** - Input of mixer **2** - Output of mixer
value	(ENum as ENetworkMode) Choose from: **NO_NETWORK** Do nothing with effects of S2P file **EMBED_NETWORK** - Add effects of S2P file from the measurement results. **DEEMBED_NETWORK** - Remove effects of S2P file from the measurement results.
Return Type	Enum
Default	NO_NETWORK
Examples	`VMC.NetworkMode = EMBED_NETWORK`
C++ Syntax	HRESULT put_NetworkMode(short networkNum, enum ENetworkMode networkMode); HRESULT get_NetworkMode(short networkNum, enum ENetworkMode *networkMode);
Interface	SMCType2 VMCType2

NoiseAverageFactor Property

Description	Sets and reads the averaging of the noise receiver.
VB Syntax	*noise*.**NoiseAverageFactor** = *value*
Variable	**(Type) - Description**
noise	A NoiseFigure **(object)**
value	**(long integer) -** Averaging value. Choose a number between 1 and 99.
Return Type	Long Integer
Default	1
Examples	`noise.NoiseAverageFactor = 10 'Write` `AvgNoise = noise.NoiseAverageFactor 'Read`
C++ Syntax	HRESULT get_NoiseAverageFactor(long* pVal) HRESULT put_NoiseAverageFactor(long newVal)
Interface	INoiseFigure

Last Modified:

29-May-2007 MN New topic

NoiseAverageState Property

Description Turns Noise Averaging ON and OFF.

VB Syntax *noise*.**NoiseAverageState** = *value*

Variable (Type) - Description

noise A NoiseFigure **(object)**

value **(boolean) -** Averaging state.

False - Turns Noise Averaging OFF

True - Turns Noise Averaging ON

Return Type Boolean

Default OFF

Examples

```
noise.NoiseAverageState = OFF 'Write
```

```
NoiseAvgState = noise.NoiseAverageState 'Read
```

C++ Syntax HRESULT get_NoiseAverageState(VARIANT_BOOL* on);

HRESULT put_NoiseAverageState(VARIANT_BOOL on);

Interface INoiseFigure

Last Modified:

21-Jun-2007 MX New topic

NoiseBandwidth Property

Description	Set the bandwidth of the noise receiver.
VB Syntax	*noise*.**NoiseBandwidth** = *value*
Variable	**(Type) - Description**
noise	A NoiseFigure **(object)**
value	**(double)** Bandwidth value. Choose from: 800 KHz, 2 MHz, 4 MHz, 8 MHz, or 24 MHz. Or the numerical equivalent, such as 8e6 and so forth. If the value does not match one of these, it is rounded up to the next legal value.
Return Type	Double
Default	4 MHz
Examples	`noise.NoiseBandwidth = 2E6 'Write` `NoiseBW = noise.NoiseBandwidth 'Read`
C++ Syntax	HRESULT get_NoiseBandwidth(double *pVal); HRESULT put_NoiseBandwidth(double newVal);
Interface	INoiseFigure

Last Modified:

20-Sep-2007 MX New topic

NoiseGain Property

Description Sets and reads the gain state of the noise receiver.

VB Syntax *noise*.**NoiseGain** = *value*

Variable **(Type) - Description**

noise A NoiseFigure **(object)**

value **(long integer) -** Gain value. Choose from:

0 Low Gain select if the gain of your DUT is relatively high (>35 dB).

15 Medium Gain select if the gain of your DUT is about average (20 dB to 45 dB).

30 High Gain ..select if the gain of your DUT is relatively low (<30 dB).

If the value does not match one of these, it is rounded up to the next legal value.

Learn more about Noise Receiver Gain setting.

Return Type Long Integer

Default 30

Examples

```
noise.NoiseGain = 30 'Write
```

```
GainNoise = noise.NoiseGain 'Read
```

C++ Syntax HRESULT get_NoiseGain(long* pVal)

HRESULT put_NoiseGain(long newVal)

Interface INoiseFigure

Last Modified:

29-May-2007 MN New topic

NoiseSourceCalKitType Property

Description Set and read the Cal Kit that will be used for the Noise Source adapter.

An adapter is always necessary to connect a 346C Noise Source to the PNA port 2. Select a Cal Kit that is the same type and gender as the noise source connector.

If the Noise Source mates directly to PNA port 2, then set this type to "None".

VB Syntax *noise*.**NoiseSourceCalKitType** = *value*

Variable **(Type) - Description**

noise A NoiseCal **(object)**

value **(string)** Cal Kit type. To read possible cal kit strings for the adapter:

1. Change the port connector type to that of the noise source using: ConnectorType
2. Then read the possible cal kit strings for that port using: CompatibleCalKits

Return Type String

Default Not applicable

Examples

```
noise.NoiseSourceCalKitType = "N4691-60004 ECAL"'Write

calkit = noise.NoiseSourceCalKitType 'Read
```

C++ Syntax HRESULT get_NoiseSourceCalKitType(BSTR* pValue)

HRESULT put_NoiseSourceCalKitType(BSTR pNewValue)

Interface INoiseCal

Last Modified:

29-May-2007 MN New topic

Write/Read [About Noise Figure]

NoiseSourceCold Property

Description	Sets and returns the temperature of the noise source connector.
VB Syntax	*noise*.**NoiseSourceCold** = *value*
Variable	**(Type) - Description**
noise	A NoiseCal **(object)**
value	**(double)** Noise source temperature in Kelvin.
Return Type	Double
Default	Not Applicable
Examples	`noise.NoiseSourceCold = 295 'Write`
	`temp = noise.NoiseSourceCold 'Read`
C++ Syntax	HRESULT get_NoiseSourceCold(double* pTemp) HRESULT put_NoiseSourceCold(double pNewTemp)
Interface	INoiseCal

Last Modified:

21-Jun-2007 MX New topic

NoiseSourceConnectorType Property

Description	Set and read the Noise Source connector type and gender. The Agilent 346C has an "APC 3.5 male" connector.
VB Syntax	*noise*.**NoiseSourceConnectorType** = *value*
Variable	**(Type) - Description**
noise	A NoiseCal **(object)**
value	**(string)** Connector type. Use ValidConnectorType to return a list of valid connector types.
Return Type	String
Default	Not applicable
Examples	`noise.NoiseSourceConnectorType = "APC 3.5 male"'Write` `connector = noise.NoiseSourceConnectorType 'Read`
C++ Syntax	HRESULT get_NoiseSourceConnectorType(BSTR* pConnectorType) HRESULT put_NoiseSourceConnectorType(BSTR pConnectorType)
Interface	INoiseCal

Last Modified:

29-May-2007 MN New topic

NoiseSourceState Property

Description	Sets and Reads the state of the noise source (ON and OFF).
VB Syntax	*app*.**NoiseSourceState** = *state*
Variable	**(Type) - Description**
app	An Application **(object)**
state	**(boolean)** **False (0)** - Turns Noise Source OFF **True (1)** - Turns Noise Source ON
Return Type	Boolean
Default	**False**
Examples	`app.NoiseSourceState = True 'Write` `coupl = app.NoiseSourceState 'Read`
C++ Syntax	HRESULT put_NoiseSourceState(VARIANT_BOOL bState) HRESULT get_NoiseSourceState(VARIANT_BOOL *bState)
Interface	IApplication13

Last Modified:

29-May-2007 MN New topic

NoiseTuner Property

Description Sets and returns the noise tuner identifier, which is an ECal model and serial number string.

VB Syntax *noise*.**NoiseTuner** = *value*

Variable **(Type) - Description**

noise A NoiseFigure **(object)**

value **(string)** Noise Tuner. Return the connected ECal identifiers by sending GetCalKitTypeString and passing the module number.

Return Type String

Default Not Applicable

Examples

```
noise.NoiseTuner = "N4691-60004 ECal 02822"'Write
```

```
noiseT = noise.NoiseTuner 'Read
```

C++ Syntax HRESULT get_NoiseTuner(BSTR* pValue)

HRESULT put_NoiseTuner(BSTR pNewValue)

Interface INoiseFigure

Last Modified:

18-Jun-2007 MN New topic

NoiseTunerIn Property

Description	Sets and returns the port identifier of the ECal noise tuner that is connected to the PNA Source.
VB Syntax	*noise*.**NoiseTunerIn** = *value*
Variable	**(Type) - Description**
noise	A NoiseFigure **(object)**
value	**(string)** Noise Tuner port identifier that is connected to the PNA source, as it is labeled on the ECal module. For example, for 2-port ECal modules, choose either "A" or "B".
Return Type	String
Default	Not Applicable
Examples	`noise.NoiseTunerIn = "A"'Write` `EcalPort = noise.NoiseTunerIn 'Read`
C++ Syntax	HRESULT get_NoiseTunerIn(BSTR* pValue) HRESULT put_NoiseTunerIn(BSTR pNewValue)
Interface	INoiseFigure

Last Modified:

29-May-2007 MN New topic

NoiseTunerOut Property

Description Sets and returns the port identifier of the ECal noise tuner that is connected to the DUT.

VB Syntax *noise*.**NoiseTunerOut** = *value*

Variable **(Type) - Description**

noise A NoiseFigure **(object)**

value **(string)** Noise Tuner port identifier that is connected to the DUT, as it is labeled on the ECal module. For example, for 2-port ECal modules, choose either "A" or "B".

Return Type String

Default Not Applicable

Examples

```
noise.NoiseTunerOut = "A"'Write
```

```
EcalPort = noise.NoiseTunerOut 'Read
```

C++ Syntax HRESULT get_NoiseTunerOut(BSTR* pValue)

HRESULT put_NoiseTunerOut(BSTR pNewValue)

Interface INoiseFigure

Last Modified:

29-May-2007 MN New topic

NominalIncidentPowerState Property

Description	Toggles the Nominal Incident Power setting ON and OFF. This setting is ONLY to be used with SMC measurements, not VMC. Learn more about Nominal Incident Power.
VB Syntax	*mixer*.**NominalIncidentPowerState** = *bool*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
bool	**(boolean)** - Nominal Incident Power State. Choose from: 1 -(True) Turn nominal incident power ON 0 -(False) Turn nominal incident power OFF
Return Type	Boolean
Default	0 -(False)
Examples	`mixer.NominalIncidentPowerState = True 'sets NominalIncidentPowerState to ON`
C++ Syntax	HRESULT get_NominalIncidentPowerState(VARIANT_BOOL *pVal) HRESULT put_NominalIncidentPowerState(VARIANT_BOOL val);
Interface	IMixer4

NormalizePoint Property

Description	Sets and returns the sweep data point around which to perform broadband and precise tuning.
VB Syntax	*embedLO*.**NormalizePoint** = *value*
Variable	**(Type) - Description**
embedLO	An EmbeddedLO **(object)**
value	**(Long)** Mixer Sweep data point. Choose a data point number between 1 and the max number of data points in the sweep that has the least amount of expected noise.
Return Type	**(Long)**
Default	Center point in the sweep span
Examples	`embedLO.NormalizePoint = 101 'write` `value = embedLO.NormalizePoint 'read`
C++ Syntax	HRESULT get_NormalizePoint(long *point); HRESULT put_NormalizePoint(long point);
Interface	IEmbededLO

Last Modified:

13-Apr-2007 MX New topic

Number (Measurement) Property

Description	Returns the Number of the measurement. Measurement numbers are assigned internally.
	Note: Measurement numbers are NOT the same as their number in the Measurements collection. Measurement number is used to identify the measurement associated with an event.
	This property is used to identify measurements when events occur through the OnMeasurementEvent callback. For example:
	`OnMeasurementEvent (naEventId_MSG_LIMIT_FAILED, 3)`
VB Syntax	*measNum* = *meas*.**Number**
Variable	**(Type) - Description**
measNum	**(long)** - variable to store the measurement number
meas	A Measurement **(object)**
Return Type	Long Integer
Default	"1" - number of the default measurement
Examples	`measNum = meas.Number`
C++ Syntax	HRESULT get_Number(long *MeasurementNumber)
Interface	IMeasurement

Read-only

About Auxiliary Triggering

Number Property

Description	Returns the number of the Auxiliary Trigger connector pair currently being used with the instance of the AuxTrigger object. Set the trigger pair with the AuxTrig object.
VB Syntax	*value* = *auxTrig*.**Number**
Variable	**(Type) - Description**
auxTrig	An AuxTrigger **(object)**
value	**(Long Integer)** - Connector pair. PNA-X returns 1 or 2. E836x returns 1.
Return Type	Single
Default	Not Applicable
Exaamples	`value = auxTrig.Number 'Read the value`
C++ Syntax	HRESULT get_Number(long *auxID);
Interface	IAuxTrigger

Last Modified:

14-Dec-2006 MX New topic

NumberOfFrequencyPoints Property

Description	Set and read the number of frequency points. Applies to all acquisition modes.
VB Syntax	*gca*.**NumberOfFrequencyPoints** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(integer) -** Frequency points. Do not exceed the max number of points. For 2D sweeps, total = frequency x power. Max = 20,001 For Smart sweep, total = frequency. Max = 10,000.
Return Type	Integer
Default	201
Examples	`gca.NumberOfFrequencyPoints = 101 'Write` `freqPts = gca.NumberOfFrequencyPoints 'Read`
C++ Syntax	HRESULT get_NumberOfFrequencyPoints(int* pVal) HRESULT put_NumberOfFrequencyPoints(int newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

NumberOfPoints Property

Description Sets or returns the Number of Points of the channel.

Sets or returns the Number of Points of the segment.

See the Measurement2 Interface to learn how this method differs from meas.NumberofPoints

VB Syntax *object*.**NumberOfPoints** = *value*

Variable **(Type) - Description**

object Channel **(object)**

or

CalSet **(object) -** Read-only property

value **(long)** - Number of Points.

For channel, choose any number from **1** to **20001.**

For segment, the total number of points in all segments cannot exceed **20001.** A segment can have as few as 1 point.

Return Type Long Integer

Default 201 for channel

21 for segment

Examples

```
chan.NumberOfPoints = 201 'sets the number of points for all
measurements in the channel. -Write
```

```
numofpts = chan.NumberOfPoints 'Read
```

C++ Syntax HRESULT get_NumberOfPoints(long *pVal)
HRESULT put_NumberOfPoints(long newVal)

Interface IChannel
ISegment

|CalSet3

Last Modified:

21-Jun-2007 Increased max

Read-only

NumberOfPoints Property

Description	Returns the number of data points of the measurement. To understand how this property is useful, see IMeasurement2 Interface.
VB Syntax	*value* = *meas*.**NumberOfPoints**
Variable	**(Type) - Description**
value	(**Long)** - variable to store the returned value
meas	A Measurement **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`Print meas.NumberOfPoints 'prints the number of data points`
C++ Syntax	HRESULT get_NumberOfPoints(long *pVal);
Interface	IMeasurement2

Read-only

NumberOfPorts Property

Description	Returns the number of hardware source ports on the PNA.
VB Syntax	*value* = *app*.**NumberOfPorts**
Variable	**(Type) - Description**
app	An Application **(object)**
value	**(long integer)** - variable to contain the returned value
Return Type	(long integer)
Default	Not Applicable
Examples	`iNumPorts = app.NumberOfPorts`
C++ Syntax	HRESULT NumberOfPorts(long* NumPorts)
Interface	IApplication

NumberOfPorts Property

Description	Returns the number of ports on the specified testset. Returns 0 if no test set is connected.
VB Syntax	*value* = *tset*.**NumberOfPorts**
Variable	**(Type) - Description**
value	(Long) variable to store the returned information.
tset	A TestsetControl object. OR An E5091Testset object.
Return Type	Long Integer
Default	Not Applicable
Examples	`value = testset1.NumberOfPorts` See E5091A Example Program See External Testset Program
C++ Syntax	HRESULT get_NumberOfPorts(long *numberOfPorts);
Interface	ITestsetControl IE5091Testset

NumberOfPowerPoints Property

Description	Set and read the number of data points in each power sweep. Applies ONLY to 2D acquisition modes.
VB Syntax	*gca*.**NumberOfPowerPoints** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(integer) -** Power points. Do not exceed the max number of points. For 2D sweeps, total = frequency x power. Max = 20,001 For Smart sweep, total = frequency. Max = 10,000.
Return Type	Integer
Default	26
Examples	`gca.NumberOfPowerPoints = 31 'Write` `pwrPts = gca.NumberOfPowerPoints 'Read`
C++ Syntax	HRESULT get_NumberOfPowerPoints(int* pVal) HRESULT put_NumberOfPowerPoints(int newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

Read-only

About Embedded LO

NumberOfSweeps Property

Description	Returns the number of tuning sweeps used for the latest embedded LO measurement.
VB Syntax	*value* = *embedLODiag*.**NumberOfSweeps**
Variable	**(Type) - Description**
value	**(Long)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
Return Type	**(Long)**
Default	Not Applicable
Examples	`data= embedLODiag.NumberOfSweeps 'read`
C++ Syntax	HRESULT get_NumberOfSweeps(long * numSweeps);
Interface	IEmbededLODiagnostic

Last Modified:

12-Apr-2007 MX New topic

Offset Property

Description	Sets and returns the offset value to be used when coupling this range to the primary range. This setting is valid only if the specified range is coupled to the primary range.
VB Syntax	*FOMRange*.**Offset** = *value*
Variable	**(Type) - Description**
object	An FOMRange **(object)**
value	**(Double)** - Offset value.-(Unitless)
Return Type	Double
Default	0
Examples	`fomRange.Offset = 1e9 'Write` `Offs = fomRange.Offset 'Read`
C++ Syntax	HRESULT get_Offset(double *pVal) HRESULT put_Offset(double pVal)
Interface	IFOMRange

Last Modified:

8-Mar-2007	Modified links.

OffsetReceiverAttenuator Property

Description	Set and return whether to offset the reference receiver by the amount of receiver attenuation. Learn more. This setting remains until changed again using this (or equivalent SCPI) command, or until the hard drive is changed or reformatted.
VB Syntax	*pref*.**OffsetReceiverAttenuator** = *value*
Variable	**(Type) - Description**
pref	A Preferences **(object)**
value	**(Boolean)** - Choose from: **False** Do NOT offset the test port receivers. **True** Offset the test port receivers.
Return Type	Boolean
Default	**True** PNA-X models **False** E836xB and PNA-L models
Examples	`pref.OffsetReceiverAttenuator = 1 'Write` `Rcvroffset = pref.OffsetReceiverAttenuator 'Read`
C++ Syntax	HRESULT get_OffsetReceiverAttenuator(VARIANT_BOOL * val); HRESULT put_OffsetReceiverAttenuator(VARIANT_BOOL val);
Interface	IPreferences6

Last Modified:

14-Jan-2007 MX New topic

OffsetSourceAttenuator Property

Description	Set and return whether to mathematically offset the reference receivers by the amount of source attenuation. Learn more. This setting remains until changed again using this (or equivalent SCPI) command, or until the hard drive is changed or reformatted.
VB Syntax	*pref*.**OffsetSourceAttenuator** = *value*
Variable	**(Type) - Description**
pref	A Preferences **(object)**
value	**(Boolean)** - Choose from: **False** Do NOT offset the reference receivers. **True** Offset the reference receivers.
Return Type	Boolean
Default	**True** PNA-X models **False** E836xB and PNA-L models
Examples	`pref.OffsetSourceAttenuator = 1 'Write` `Rcvroffset = pref.OffsetSourceAttenuator 'Read`
C++ Syntax	HRESULT get_OffsetSourceAttenuator(VARIANT_BOOL * val); HRESULT put_OffsetSourceAttenuator(VARIANT_BOOL val);
Interface	IPreferences6

Last Modified:

14-Jan-2007 MX New topic

Read/Write

OmitIsolation Property

Description	Sets and returns whether Isolation portion of the calibration will be performed or not.
VB Syntax	*obj*.**OmitIsolation** = *bool*
Variable	**(Type) - Description**
obj	SMCType (object) or VMCType (object)
bool	(Boolean) **True** - Isolation is NOT performed **False** - Isolation is performed
Return Type	Boolean
Default	True
Examples	`value = SMC.OmitIsolation`
C++ Syntax	HRESULT put_OmitIsolation (VARIANT_BOOL bState) HRESULT get_OmitIsolation (VARIANT_BOOL *bState)
Interface	SMCType VMCType

OneReadoutPerTrace Property

Description	Either show marker readout of only the active trace or all of the traces simultaneously.
VB Syntax	*win*.**OneReadoutPerTrace** = *state*
Variable	**(Type) - Description**
win	A NAWindow (object)
value	**(boolean)** **True** - Shows the readout of only the active marker for each trace. **False** - Shows up to 5 marker readouts per trace, up to 20 total readouts.
Return Type	Boolean
Default	False
Examples	`win.OneReadoutPerTrace = True 'Write` `State = app.ActiveNAWindow.OneReadoutPerTrace 'Read`
C++ Syntax	HRESULT get_OneReadoutPerTrace(VARIANT_BOOL *pVal) HRESULT put_OneReadoutPerTrace(VARIANT_BOOL newVal)
Interface	INAWindow

Options Property

Description	Returns a string identifying the analyzer option configuration.
VB Syntax	*value* = *app*.**Options**
Variable	(Type) - **Description**
app	An Application **(object)**
value	**(string)** - variable to contain the returned string
Return Type	String
Default	Not Applicable
Examples	`availOptions = app.Options`
C++ Syntax	HRESULT Options(BSTR* OptionString)
Interface	IApplication

Write/Read

OrientECALModule Property

Description Specifies if the PNA should perform orientation of the ECal module during calibration. Orientation is a technique by which the PNA automatically determines which ports of the module are connected to which ports of the PNA. Orientation begins to fail at very low power levels or if there is much attenuation in the path between the PNA and the ECal module.

Note: For guided calibrations where Orient is OFF and the same ECal module is used in more than one Connection Step, you are not allowed to specify how the ECal module is connected. Instead, the PNA determines the orientation. The PNA does not verify that you made the connection properly.

This setting remains until the PNA is restarted or this command is sent again.

This command, and ECALPortMapEx, can be used to perform ECal using the Guided Calibration interface.

VB Syntax *cal*.**OrientECALModule** = *value*

Variable **(Type) - Description**

cal A Calibrator **(object)**

value **(boolean)**

False – DoECAL1PortEX and DoECAL2PortEx methods will use the value of the ECALPortMapEx property to determine the port connections.

True - DoECAL1PortEX and DoECAL2PortEx methods will use auto Orientation technique to determine port connections.

Return Type Boolean

Default True

Examples

```
Dim cal As Calibrator
Dim bOrient As Boolean
Set cal = PNAapp.ActiveChannel.Calibrator
cal.OrientECALModule = False 'Write
bOrient = cal.OrientECALModule 'Read
```

C++ Syntax

```
HRESULT put_OrientECALModule(VARIANT_BOOL bOrient);
HRESULT get_OrientECALModule(VARIANT_BOOL *bOrient);
```

Interface ICalibrator3

Last Modified:

7-May-2007	Added note about Guided Cal.

OutputFixedFrequency Property

Description	Sets or returns the mixer output fixed frequency value. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**OutputFixedFrequency** = *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(double)** - Output Fixed Frequency in Hertz.
Return Type	Double
Default	Not Applicable
Examples	`Print mixer.OutputFixedFrequency 'prints the output fixed frequency value of the mixer.`
C++ Syntax	HRESULT get_OutputFixedFrequency(double *pVal) HRESULT put_OutputFixedFrequency(double newVal)
Interface	IMixer3

Last Modified:

4-Mar-2008 Added note.

OutputPort Property

Description Switches an input to one of the valid outputs on the specified E5091A. The following are valid input/output combinations. If a combination other than these are sent, an "invalid argument" error will occur.

Input	Valid Outputs
1	**A**
	T1- If Port 2 already is connected to T1, then Port 2 will be switched to T2.)
2	**T1** - If Port 1 already is connected to T1, then Port 1 will be switched to A.
	T2
3	**R1+**
	R2+
	R3+ If option 007 (7port), R2 is selected.
4	**R1-**
	R2-
	R3- If option 007 (7port), R2 is selected.

Note: Do not confuse the similar Testset.OutputPorts Property, which sets or gets the port mapping for ALL ports.

VB Syntax *testsets(1)*.**OutputPort** *(chNum,input)* = *output*

Variable (Type) - **Description**

testsets(1) An item from Testsets **(collection)**

Learn how to identify a testset in the collection.

chNum **(Long)** Channel number of the measurement.

input **(Long)** Testset Input port. Choose from 1|2|3|4.

output (Enum as NAE5091OutputPort) Output port to switch to specified Input. Choose from:

0 or **naE5091PortA -** Port A

1 or **naE5091PortT1 -** Port T1

2 or **naE5091PortT2 -** Port T2

3 or **naE5091PortR1 -** Port R1

4 or **naE5091PortR2 -** Port R2

5 or **naE5091PortR3 -** Port R3

Return Type	Enum
Default	Not Applicable
Examples	`See Example Program`
C++ Syntax	HRESULT get_OutputPort(long channelNum, long inputPort, E5091OutputPort *outPort); HRESULT put_OutputPort(long channelNum, long inputPort, E5091OutputPort outPort);
Interface	IE5091Testsets

OutputPorts (Cal Set) Property

Description	Returns the port mapping for the Cal Set.
VB Syntax	*portMap* = *calset*.**OutputPorts**
Variable	**(Type) - Description**
portMap	(String) Variable to store the returned string. The returned values are the physical ports. The POSITION of the returned values corresponds to the logical ports. For example, with an N44xx test set, if the returned string is "PNA 1,TS 2,PNA 2, TS 4" this means: • PNA 1 is assigned to logical port 1 • TS 2 is assigned to logical port 2 • PNA 2 is assigned to logical port 3 • TS 4 is assigned to logical port 4
calset	A Cal Set object.
Return Type	String
Default	Depends on the test set.
Example	`portMap = calset.OutputPorts`
C++ Syntax	HRESULT get_OutputPorts(BSTR *mapping);
Interface	ICalset5

Last modified:

9/18/06 MQ Added for multiport

OutputPorts Property

Description Sets or gets the port mappings for ALL ports. An "invalid argument" error will occur if you attempt to set an illegal port combination.

Refer to your testset documentation for valid port combinations.

Note: Do not confuse the similar E5091.OutputPort Property, which sets or gets the port mapping for a single port.

VB Syntax *tset*.**OutputPorts**(*chNum*) = *portList*

Variable **(Type) - Description**

tset A TestsetControl object.

chNum **(Long)** Channel number of the measurement.

portList **(String)** A comma-separated list of port mappings. Spaces are ignored at the beginning and end of this text, and before or after commas. Space characters in other locations are not ignored.

Return Type String

Default Not Applicable

Examples `See External Testset Program`

C++ Syntax HRESULT get_OutputPorts(long channelNum, BSTR *outPorts);
HRESULT put_OutputPorts(long channelNum, BSTR outPorts);

Interface ITestsetControl

OutputRangeMode Property

Description Sets or returns the Output sweep mode.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**OutputRangeMode =** *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(Enum as MixerRangeMode)** - Output sweep mode. Choose from:

0 - **mixSwept**

1 - **mixFixed**

Return Type Enum

Default 0 - mixSwept

Examples

```
mixer.OutputRangeMode = mixSwept
```

C++ Syntax HRESULT get_OutputRangeMode(long *pVal)

HRESULT put_OutputRangeMode(long newVal)

Interface IMixer6

Last Modified:

4-Mar-2008 Added note.

OutputSideband Property

Description Sets or returns the value of the output sideband, high or low.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**OutputSideband =** *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(FCASideBand) -**

Choose from:

0 - LOW

1 - HIGH

Return Type FCASideBand

Default LOW

Examples

```
Print mixer.OutputSideband 'prints the value of the OutputSideband
```

C++ Syntax HRESULT get_OutputSideband(FCASideBand *pVal)

HRESULT put_OutputSideband(FCASideBand newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

OutputStartFrequency Property

Description	Sets or returns the mixer output start frequency. If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.
VB Syntax	*mixer*.**OutputStartFrequency =** *value*
Variable	**(Type) - Description**
mixer	A Mixer **(object)**
value	**(double)** - Output Start Frequency in Hertz.
Return Type	Double
Default	Not Applicable
Examples	`Print mixer.OutputStartFrequency 'prints the value of the OutputStartFrequency`
C++ Syntax	HRESULT get_OutputStartFrequency(double *pVal) HRESULT put_OutputStartFrequency(double newVal)
Interface	IMixer

Last Modified:

4-Mar-2008 Added note.

OutputStopFrequency Property

Description Sets or returns the mixer Output Stop frequency.

If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

VB Syntax *mixer*.**OutputStopFrequency =** *value*

Variable **(Type) - Description**

mixer A Mixer **(object)**

value **(double)** - Output stop frequency in Hertz.

Return Type Double

Default Not Applicable

Examples

```
Print mixer.OutputStopFrequency 'prints the value of the OutputStopFrequency
```

C++ Syntax HRESULT get_OutputStopFrequency(double *pVal)

HRESULT put_OutputStopFrequency(double newVal)

Interface IMixer

Last Modified:

4-Mar-2008 Added note.

Read-only

Parameter Property

Description	Returns the measurement Parameter. To change the parameter, use meas.ChangeParameter
VB Syntax	*measPar* = *meas*.**Parameter**
Variable	**(Type) - Description**
measPar	**(string)** - Variable to store Parameter string
meas	A Measurement **(object)**
Return Type	String
Default	Not applicable
Examples	`measPar = meas.Parameter 'Read`
C++ Syntax	HRESULT get_Parameter(BSTR *pVal)
Interface	IMeasurement

Parameter (Embedded LO) Property

Description	Returns the name of the parameter of the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**Parameter** *(n)*
Variable	**(Type) - Description**
value	**(String)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.Parameter 3 'read`
C++ Syntax	HRESULT Parameter(long sweep, BSTR * param);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

Read-only

Parent Property

Description Returns a handle to the parent object of the collection object being referred to in the statement. The parent property allows the user to traverse from an object back up the object hierarchy.

VB Syntax *collection.***Parent**

Variable **(Type) - Description**

collection

- CalFactorSegments collection
- Channels collection
- E5091Testset Collection
- ExternalTestsets Collection
- Measurements collection
- NaWindows collection
- PowerLossSegments collection
- PowerSensors collection
- Segments collection
- Traces collection
- PathConfigurationManager

Return Type Object

Default Not Applicable

Examples

```
parentobj = chans.Parent 'returns a handle to the parent object (Application) of the chans collection. -Read
```

C++ Syntax HRESULT get_Parent(IApplication* *pApplication); //IChannels, IChannel, IMeasurements and INAWindows

HRESULT get_Parent(IChannel* *pChannel); //ITraces

HRESULT get_Parent(INAWindow* *pWindow); //ISegments

HRESULT get_Parent(IPowerSensor* *pSensor); //ICalFactorSegments

HRESULT get_Parent(ISourcePowerCalibrator* *pCalibrator); //IPowerSensors and IPowerLossSegments

Interface All listed above

Read/Write

PassFailLogic Property

Description Sets and reads the logic of the PassFail line on the HANDLER IO connector (pin 33) and AUX IO connector (pin 12). Learn more about Global Pass/Fail.

Note: This line is connected to both the Handler IO and Aux IO in the PNA. Therefore, this command will affect both of these connectors in the same way.

VB Syntax *object*.**PassFailLogic** = *value*

Variable **(Type) - Description**

object **(object)** - An Aux I/O or Handler I/O object

value **(enum as NARearPanelIOLogic)** Choose from:

0 - naPositiveLogic - Causes the PassFail line to have positive logic (high = pass, low = fail).

1 - naNegativeLogic - Causes the PassFail line to have negative logic (high = fail, low = pass).

Return Type Long Integer

Default naPositiveLogic

Examples

```
aux.PassFailLogic = naNegativeLogic 'Write
Text1.Text = aux.PassFailLogic 'Read
```

C++ Syntax HRESULT put_PassFailLogic (tagNARearPanelIOLogic Mode);

HRESULT get_PassFailLogic (tagNARearPanelIOLogic* Mode);

Interface IHWAuxIO

IHWMaterialHandlerIO

Read/Write

PassFailMode Property

Description	Sets and reads the mode of the PassFail line on the HANDLER IO connector (pin 33) and AUX IO connector (pin 12). Learn more about Global Pass/Fail. **Note**: This line is connected to both the Handler IO and Aux IO in the PNA. Therefore, this command will affect both of these connectors in the same way.
VB Syntax	*object*.**PassFailMode** = *value*
Variable	**(Type) - Description**
object	**(object)** - An Aux I/O or Handler I/O object
value	**(enum as NAPassFailMode)**.Choose from: **0 - naDefaultPassNoWaitMode**- the line stays in PASS state. When a device fails, then the line goes to fail IMMEDIATELY. **1 - naDefaultPassWaitMode** - the line stays in PASS state. When a device fails, then the line goes to fail after the Sweep End line is asserted. **2 - naDefaultFailWaitMode**- the line stays in FAIL state. When a device passes, then the line goes to PASS state after the Sweep End line is asserted.
Return Type	Long Integer
Default	0 - naDefaultPassNoWaitMode
Examples	`HWAuxIO.PassFailMode = naDefaultPassNoWaitMode 'Write` `mode = HWAuxIO.PassFailMode 'Read`
C++ Syntax	HRESULT put_PassFailMode (tagNAPassFailMode Mode); HRESULT get_PassFailMode (tagNAPassFailMode* Mode);
Interface	IHWAuxIO IHWMaterialHandlerIO

Read/Write

PassFailPolicy Property

Description Sets the policy used to determine how global pass/fail is computed. Learn more about Global Pass/Fail.

VB Syntax *object*.**PassFailPolicy** = *value*

Variable **(Type) - Description**

object **(object)** - An Aux I/O or Handler I/O object

value **(enum as NAPassFailPolicy)** Choose from:

0 - **naPolicyAllTests** - - Pass/Fail Status returns PASS if all tests on all measurements pass.

1 - **naPolicyAllMeas** - Pass/Fail Status returns PASS if all measurements have associated tests, and all tests pass. FAIL is returned if even one measurement has no associated limit test.

Only those measurements which are not in HOLD mode contribute to the pass/fail result.

Return Type Long Integer

Default naPolicyAllTests

Examples

```
matHndler.PassFailPolicy = naPolicyAllTests 'Write
policy = aux.PassFailPolicy 'Read
```

C++ Syntax HRESULT put_PassFailPolicy (tagNAPassFailPolicy Policy);

HRESULT get_PassFailPolicy (tagNARearPanelIOLogic* Policy);

Interface IHWAuxIO4

IHWMaterialHandlerIO2

Read/Write

PassFailScope Property

Description	Sets and reads the Scope of the PassFail line on the HANDLER IO connector (pin 33) and AUX IO connector (pin 12). Learn more about Global Pass/Fail. **Note**: The PassFail line is connected to both the Handler IO and Aux IO in the PNA. Therefore, this command will affect both of these connectors in the same way.
VB Syntax	*object*.**PassFailScope** = *value*
Variable	**(Type) - Description**
object	**(object)** - An Aux I/O or Handler IO object
value	**(enum NAPassFailScope)** Choose from: **0 - naChannelScope** - The PassFail line returns to its default state before sweeps on the next channel start. (A channel measurement may require several sweeps.) **1 - naGlobalScope** - The PassFail line returns to its default state before the sweeps for the next **triggerable** channel start. The default state of the PassFail line before a measurement occurs and after a failure occurs is set by the PassFailMode property.
Return Type	enum NAPassFailScope
Default	1 - naGlobalScope

Examples	`HWAuxIO.PassFailScope = naGlobalScope 'Write`
	
	`scope = HWAuxIO.PassFailScope 'Read`

C++ Syntax	HRESULT put_PassFailScope (tagNAPassFailScope Scope); HRESULT get_PassFailScope (tagNAPassFailScope* Scope);
Interface	IHWAuxIO IHWMaterialHandlerIO

Read-Only

PassFailStatus Property

Description Returns the most recent pass/fail status value. Use this command as follows:

1. Set the PNA trigger scope to GLOBAL
2. Set the PNA trigger source to MANUAL or EXTERNAL.
3. Configure and enable Limit Testing
4. Trigger the PNA.
5. Use the *OPC? (with SCPIStringParser object) to determine when the sweep is complete.
6. Use the **PassFailStatus** property to obtain the global pass/fail result.

Learn more about Global Pass/Fail.

VB Syntax *var* = *object*.**PassFailStatus**

Variable **(Type) - Description**

var (enum as NAPassFailStatus) Variable to store returned status. One of the following will be returned:

0 - naStatusFail - all measurements not in HOLD mode have been swept, and one or more limit tests failed according to the specified Pass/Fail policy.

1 - naStatusPass - all measurements not in HOLD mode have been swept, and all associated limit tests have passed.

2 - naStatusNone - status cannot be determined because measurements are in progress.

object **(object)** - An Aux I/O or Handler I/O object

Return Type Long Integer

Default Not Applicable

Examples

```
status = aux.PassFailStatus 'Read
```

C++ Syntax HRESULT get_PassFailPolicy (tagNAPassFailStatus* status);

Interface IHWAuxIO4

IHWMaterialHandlerIO2

Path Property

Description	Specifies an interface to use for the power meter / sensor during a source power calibration.
VB Syntax	*pwrMtrInterface*.**Path** = *value*
Variable	**(Type) - Description**
pwrMtrInterface	**(object) -** A PowerMeterInterface (object)
value	**(enum as NACommunicationPath)** Choose from: **0 - naGPIB** - GPIB interface **1 - naUSB** - USB interface **2 - naLAN** - LAN interface
Return Type	Enum
Default	naGPIB
Examples	See example
C++ Syntax	HRESULT put_Path(tagNACommunicationPath pNewVal); HRESULT get_Path(tagNACommunicationPath *pVal);
Interface	IPowerMeterInterface

Last Modified:

2-Aug-2007 MX New topic

PathCalMethod Property

Description

Note: This command replaces ThruCalMethod.

(Read-Write) Specifies the calibration method for each port pair.

Note: Before using this command, first do the following:

- Set the connector types:ConnectorType
- Set cal kit:CalKitType
- Set or query the thru path pairs:ThruPortList

After sending or querying this command, send the Thru method: PathThruMethod

See an example of a 4-port guided calibration using COM.

VB Syntax *guidedCal*.**PathCalMethod** *(port1, port2) = "caltype1[,caltype2]"*

Variable	**(Type) - Description**
guidedCal	GuidedCalibration (object)
port1	First port of the pair to be calibrated.
port2	Second port of the pair to be calibrated.
"caltype1,[caltype2]"	(String) Cal types for 1st and 2nd ports of the pair, enclosed in a single pair of quotes. NOT case-sensitive.

caltype1 Cal type for the pair if caltype2 is not specified. Otherwise, Cal type for port 1.Choose from:

- “TRL”
- “SOLT”
- “QSOLT**N**”
- “EnhResp**N**

For the last two arguments, replace **N** with the port to be used as the source port, which MUST be one of the port pair.

[caltype2] Optional argument. Use only when performing an adapter removal cal on the pair. This argument specifies the Cal Type on the second port; ***caltype1*** then specifies the Cal Type of the first port.

Choose from the same arguments as ***caltype1***.

Return Type **String -** Returns comma-separated cal types.

Default Not Applicable

Example

```
guidedCal.PathCalMethod(2,3) = "TRL" 'Write trl for port pair
```

```
guidedCal.PathCalMethod(1,4) = "TRL,SOLT" 'Write adapter removal cal, consisting of trl on port 1 and solt on port 4
```

```
calmethod = guided.PathCalMethod(1,4) 'Read previous example, returns: "TRL,SOLT"
```

C++ Syntax HRESULT get_PathCalMethod(long firstport, long secondport, BSTR *calMethod);

HRESULT put_PathCalMethod(long firstport, long secondport, BSTR calMethod);

Interface IGuidedCalibration3

Last modified:

April 9, 2007	MX New topic

PathConfiguration Property

Description Saves or reads a path configuration file.

This command is valid only on a PNA-X model.

VB Syntax *chan*.**PathConfiguration** = *value*

Variable **(Type) - Description**

chan **(object) -** A Channel object

value **(String)** - Full path name of the configuration file to read or save.:

Return Type String

Default Not Applicable

Examples

```
chan.PathConfiguration = 'MyConfigFile' 'Write
config = chan.PathConfiguration 'Read
```

C++ Syntax HRESULT get_PathConfiguration(IPathConfiguration** ppOut);

HRESULT put_PathConfiguration(BSTR pathConfigName);

Interface IChannel9

Last modified:

10/18/06 MX New topic

PathThruMethod Property

Description

Note: This command replaces ThruCalMethod.

(Read-Write) Specifies the calibration THRU method for each port pair.

Before using this command, first do the following:

- Set the connector types:ConnectorType
- Set cal kit:CalKitType
- Set or query the thru path pairs:ThruPortList
- Set or query the Cal Type:PathCalMethod

See an example of a 4-port guided calibration using COM.

VB Syntax *guidedCal*.**PathThruMethod** *(port1, port2) = "ThruType1[,ThruType2]"*

Variable	**(Type) - Description**
guidedCal	GuidedCalibration (object)
port1	First port of the pair to be calibrated.
port2	Second port of the pair to be calibrated.
"ThruType1[,ThruType2]"	(String) Thru methods for 1st and 2nd ports of the pair, enclosed in a single pair of quotes. NOT case-sensitive.

thruType1 Calibration thru method for the pair if thruType2 is not specified. Otherwise, thru method for port 1.

Choose from:

- **"Defined Thru"** A thru type for which there is a stored definition in the Cal Kit.
- **"Zero Thru"** Zero length thru, also known as flush-thru.
- **"Undefined Thru"** A thru type for which there is NOT a stored definition in the Cal Kit. Also known as Unknown Thru. Valid ONLY for SOLT cal type.
- **"Undefined Thru using a Defined Thru"** Using an ECal module, measure the internal thru using the "Undefined Thru" method.

ThruType2 (String) Optional argument. Use only when performing an adapter removal cal on the pair as determined by PathCalMethod. The only valid arguments for ThruType1&2 is "Defined Thru, Defined Thru".

Return Type **String -** Returns comma-separated ThruTypes.

Default Not Applicable

Example

```
guidedCal.PathThruMethod(2,3) = "Zero Thru" 'Write for port pair
```

```
guidedCal.PathThruMethod(1,4) = "Defined Thru, Defined Thru" 'Write for adapter removal cal.
```

```
calmethod = guided.PathThruMethod(1,4) 'Read previous example, return: "Defined Thru, Defined Thru"
```

C++ Syntax HRESULT get_PathThruMethod(long firstport, long secondport, BSTR *thruMethod);

HRESULT put_PathThruMethod(long firstport, long secondport, BSTR thruMethod);

Interface IGuidedCalibration3

Last modified:

April 9, 2007	MX New topic

PeakExcursion Property

Description Sets and reads the peak excursion value for the specified marker. The Excursion value determines what is considered a "peak".

VB Syntax *mark*.**PeakExcursion** = *value*

Variable **(Type) - Description**

mark A Marker **(object)**

value **(single)** - Peak Excursion. Choose any number between **-500** and **500**

Return Type Single

Default 3

Examples

```
mark.PeakExcursion = 1 'Write
```

```
PkExcur = mark.PeakExcursion 'Read
```

C++ Syntax HRESULT get_PeakExcursion(float *pVal)
HRESULT put_PeakExcursion(float newVal)

Interface IMarker

PeakThreshold Property

Description	Sets peak threshold for the specified marker. If a peak (using the criteria set with PeakExcursion) is below this reference value, it will not be considered when searching for peaks.
VB Syntax	*mark*.**PeakThreshold** = *value*
Variable	**(Type) - Description**
mark	A Marker **(object)**
value	**(single)** - Peak Threshold. Choose any number between: **-500** and **500**
Return Type	Single
Default	-100db
Examples	`mark.PeakThreshold = 1 'Write` `PkThresh = mark.PeakThreshold 'Read`
C++ Syntax	HRESULT get_PeakThreshold(float *pVal) HRESULT put_PeakThreshold(float newVal)
Interface	IMarker

PeakToPeak Property

Description	Returns the Peak to Peak value of the measurement.To retreive all 3 statistics value at the same time, use meas.GetTraceStatistics
VB Syntax	*pp* = *meas*.**PeakToPeak**
Variable	**(Type) - Description**
pp	**(single)** - Variable to store peak-to-peak value
meas	A Measurement **(object)**
Return Type	Single
Default	Not applicable
Examples	`pp = meas.PeakToPeak 'Read`
C++ Syntax	HRESULT get_PeakToPeak(float* pp)
Interface	IMeasurement

Period Property

Description Sets the pulse-period (1/PRF) for ALL PNA-X internal pulse generators.

The resolution of the period is 16.667nS.

VB Syntax *pulse*.**Period** = *value*

Variable **(Type) - Description**

pulse A PulseGenerator **(object)**

value **(Double)** Pulse period in seconds. Choose a value from about 33ns to about 70 seconds.

Return Type Double

Default 1e-3 sec

Examples

```
pulse.Period = 1ms 'Write
```

```
value = pulse.Period 'Read
```

C++ Syntax HRESULT get_Period(double* period);

HRESULT put_Period(double period);

Interface IPulseGenerator

Last Modified:

1-Jan-2007 MX New topic

PhaseOffset Property

Description Sets the Phase Offset for the active channel.

VB Syntax *meas*.**PhaseOffset** = *value*

Variable (Type) - Description

meas A Measurement **(object)**

value **(double)** - PhaseOffset in degrees. Choose any number between: **-360** and **+360**

Return Type Double

Default 0

Examples

```
meas.PhaseOffset = 25 'Write
```

```
poffset = meas.PhaseOffset 'Read
```

C++ Syntax

HRESULT get_PhaseOffset(double *pVal)
HRESULT put_PhaseOffset(double newVal)

Interface IMeasurement

Port1 Property Superseded

Description This command is replaced by PortDelay property.

Sets a Port Extension value for Port 1

VB Syntax *portExt*.**Port1** = *value*

Variable **(Type) - Description**

portExt A Port Extension **(object)**

value **(double)** - Port Extension value in seconds. Choose any number between **-10** and **10**

Return Type Double

Default 0

Examples

```
portExt.Port1 = 10e-6 'Write
```

```
prt1 = portExt.Port1 'Read
```

C++ Syntax HRESULT get_Port1(double *pVal)
HRESULT put_Port1(double newVal)

Interface IPortExtension

Port2 Property Superseded

Description	This command is replaced by PortDelay property. Sets a Port Extension value for Port 2
VB Syntax	*portExt*.**Port2** = *value*
Variable	**(Type) - Description**
portExt	A Port Extension **(object)**
value	**(double)** - Port Extension value in seconds. Choose any number between **-10** and **10**
Return Type	Double
Default	0
Examples	`portExt.Port2 = 10e-6 'Write` `prt2 = portExt.Port2 'Read`
C++ Syntax	HRESULT get_Port2(double *pVal) HRESULT put_Port2(double newVal)
Interface	IPortExtension

Port3 Property Superseded

Description	This command is replaced by PortDelay property. Sets a Port Extension value for Port 3
VB Syntax	*portExt*.**Port3** = *value*
Variable	**(Type) - Description**
portExt	A Port Extension **(object)**
value	**(double)** - Port Extension value in seconds. Choose any number between **-10** and **10**
Return Type	Double
Default	0
Examples	`portExt.Port3 = 10e-6 'Write` `prt3 = portExt.Port3 'Read`
C++ Syntax	HRESULT get_Port3(double *pVal) HRESULT put_Port3(double newVal)
Interface	IPortExtension

Write/Read [About Fixturing](#)

Port2PdeembedCktModel Property

Description Select whether or not to load a 2-port De-embedding circuit model for the specified port number. Circuit model is applied when both "USER" is selected and the filename is specified. To set the filename, use strPort2Pdeembed_S2PFile Property

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**Port2PdeembedCktModel**(*port*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive circuit model.

value **(Enum as NAFixturing2PdeembedCkt)**

0 **naFix2PD_USER** load a 2-port De-embedding circuit model

1 **naFix2PD_NONE** no model

Return Type Long Integer

Default naFix2PD_NONE

Examples

```
fixture.Port2PdeembedCktModel(2) = naFix2PD_USER 'Write
```

```
value = fixture.Port2PdeembedCktModel(1) 'Read
```

C++ Syntax HRESULT get_Port2PdeembedCktModel(short port tagNAFixturing2PdeembedCkt *pVal)
HRESULT put_Port2PdeembedCktModel(short port tagNAFixturing2PdeembedCkt newVal)

Interface IFixturing

Port2PdeembedState Property

Description Turns de-embedding ON or OFF for all ports on the channel.

VB Syntax *fixture*.**Port2PdeembedState** = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

value **(Boolean)**

False - Turns De-embedding OFF

True - Turns De-embedding ON

Return Type Boolean

Default False

Examples

```
fixture.Port2PdeembedState = False 'Write
```

```
value = fixture.Port2PdeembedState 'Read
```

C++ Syntax HRESULT get_Port2PdeembedState(VARIANT_BOOL *pVal)
HRESULT put_Port2PdeembedState(VARIANT_BOOL newVal)

Interface IFixturing

PortArbzImag Property

Description	Sets and returns the Imaginary portion of the impedance value for the specified single-ended port. Use PortArbzReal to set the real value. Or use PortArbzZ0 to set both values together.
VB Syntax	*fixture*.**PortArbzImag***(portNum) = value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
portNum	**(Integer)** Single-ended port number to receive impedance value.
value	**(Double)** Real Impedance value. Choose a value between -1E18 and 1E18
Return Type	Double
Default	0
Examples	`fixture.PortArbzImag(2) = 75 'Write` `value = fixture.PortArbzImag(1) 'Read`
C++ Syntax	HRESULT get_PortArbzImag(short portNum, double *pVal) HRESULT put_PortArbzImag(short portNum, double newVal)
Interface	IFixturing3

PortArbzReal Property

Description Sets and returns the Real portion of the impedance value for the specified single-ended port. Use PortArbzImag to set the imaginary value. Or use PortArbzZ0 to set both values together.

VB Syntax *fixture*.**PortArbzReal**(*portNum*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

portNum **(Integer)** Single-ended port number to receive impedance value.

value **(Double)** Real Impedance value. Choose a value between 0 to 1E7

Return Type Double

Default 50

Examples

```
fixture.PortArbzReal(2) = 75 'Write
```

```
value = fixture.PortArbzReal(1) 'Read
```

C++ Syntax HRESULT get_PortArbzReal(short portNum, double *pVal)
HRESULT put_PortArbzReal(short portNum, double newVal)

Interface IFixturing3

PortArbzState Property

Description	Turns Port Impedance ON or OFF for all ports on the channel.
VB Syntax	*fixture*.**PortArbzState** = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
value	**(Boolean)** **False** - Turns Port Impedance OFF **True** - Turns Port Impedance ON
Return Type	Boolean
Default	False
Examples	`fixture.PortArbzState = False 'Write` `value = fixture.PortArbzState 'Read`
C++ Syntax	HRESULT get_PortArbzState(VARIANT_BOOL *pVal) HRESULT put_PortArbzState(VARIANT_BOOL newVal)
Interface	IFixturing

PortArbzZ0 Property

Description Sets and returns the Real portion of the impedance value for the specified single-ended port. The imaginary portion is automatically set to 0.0.

To set both values separately, use PortArbzReal and PortArbzImag.

VB Syntax *fixture*.**PortArbzZ0**(*portNum*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

portNum **(Integer)** Single-ended port number to receive impedance value.

value **(Double)** Impedance value. Choose a value between 0 to 1E7

Return Type Double

Default 50

Examples

```
fixture.PortArbzZ0(2) = 75 'Write

value = fixture.PortArbzZ0(1) 'Read
```

C++ Syntax HRESULT get_PortArbzZ0(short portNum, double *pVal)
HRESULT put_PortArbzZ0(short portNum, double newVal)

Interface IFixturing3

PortCatalog Property

Description	Returns a comma-separated list of the Output port selections that are available for a given logical input port. Read the number of input ports for the test set using NumberOfPorts Property.
VB Syntax	*value* = *tset*.**PortCatalog***(logPort)*
Variable	**(Type) - Description**
value	**(String)** Variable to store the returned information.
tset	A TestsetControl object.
logPort	**(Long)** Logical Input port number for which to return valid output ports.
Return Type	**String**
Default	Not Applicable
Examples	`value = testset1.PortCatalog 2` See External Testset Program
C++ Syntax	HRESULT get_PortCatalog(long inputPort, BSTR *outPort);
Interface	ITestsetControl

Last Modified:

18-Jan-2007 Fixed argument

PortCLogic Property

Description Sets and reads the logic mode of Port C on the AUX IO connector and the Handler IO connector.

Note: Port C lines are connected to both the Handler IO and Aux IO in the PNA. Therefore, this command will affect both of these connectors in the same way.

VB Syntax *AuxIO*.**PortCLogic** = *value*

Variable **(Type) - Description**

AuxIO **(object) -** A Hardware Aux I/O object

value (**Enum as NaRearPanelIOLogic**) - Choose from:

0 - naPositiveLogic - The associated data line goes **HIGH** when writing a 1 to a PortC bit.

1 - naNegativeLogic - The associated data line goes **LOW** when writing a 1 to a PortC bit.

When Port C is in Output/Write mode, a change in logic causes the output lines to change state immediately. For example, Low levels change to High levels.

When Port C is in Input/Read mode, a change in logic will not cause the lines to change, but data read from Port C will reflect the change in logic.

Return Type Enum

Default 1 - naNegativeLogic

Examples

```
auxIO.PortCLogic = value 'Write
value = auxIo.PortCLogic 'Read
```

C++ Syntax HRESULT put_PortCLogic (tagNARearPanelIOLogic Mode);

HRESULT get_PortCLogic (tagNARearPanelIOLogic* Mode);

Interface IHWAuxIO

PortCMode Property

Description Sets and reads whether Port C is setup for writing or reading data on the AUX IO connector and the Handler IO connector.

Note: Port C lines are connected to both the Handler IO and Aux IO in the PNA. Therefore, this command will affect both of these connectors in the same way.

VB Syntax *AuxIO*.**PortCMode** = *value*

Variable **(Type) - Description**

AuxIO **(object) -** A Hardware Aux I/O object

value **(enum as NaPortMode)** - Choose from:

0 - naInput - set the port for reading

1 - naOutput - set the port for writing

Return Type Enum as NaPortMode

Default 1 - naInput

Examples

```
auxIo.get_PortCMode = naInput 'Write
value = auxIo.get_PortCMode 'Read
```

C++ Syntax HRESULT get_PortCMode(tagNAPortMode* pMode);

HRESULT put_PortCMode(tagNAPortMode pMode);

Interface IHWAuxIO

PortDelay Property

Description Sets and returns the Port Extensions Delay value for the specified port number.

Note: This command affects ALL measurements on the channel.

This command replaces Port 1 Port 2 Port 3 Properties.

VB Syntax *fixture*.**PortDelay***(port)* = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive delay value.

value **(Double)** Delay value in seconds. Choose a value between -1E18 and 1E18.

Return Type Double

Default 0

Examples

```
fixture.PortDelay(2) = .002 'Write
```

```
value = fixture.PortDelay(1) 'Read
```

C++ Syntax HRESULT get_PortDelay(short port double *pVal)
HRESULT put_PortDelay(short port double newVal)

Interface IFixturing

PortExtState Property

Description Turns Port Extension ON or OFF for all ports on the channel.

VB Syntax *fixture*.**PortExtState** = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

value **(Boolean)**

False - Turns Port Extensions OFF

True - Turns Port Extensions ON

Return Type Boolean

Default False

Examples

```
fixture.PortExtState = 0 'Write
```

```
value = fixture.PortExtState 'Read
```

C++ Syntax HRESULT get_PortExtState(VARIANT_BOOL *pVal)
HRESULT put_PortExtState(VARIANT_BOOL newVal)

Interface IFixturing

PortExtUse1 Property

Description Sets and returns the Use1 ON/OFF state for the use of the PortLoss1 and PortFreq1 values for the specified port number.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**PortExtUse1**(*port*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive Use1 ON / OFF state.

value **(Boolean)**

False - Turns Use1 OFF

True - Turns Use1 ON

Return Type Boolean

Default False

Examples

```
fixture.PortExtUse1(2) = False 'Write
```

```
value = fixture.PortExtUse1(1) 'Read
```

C++ Syntax HRESULT get_PortExtUse1(short port VARIANT_BOOL *pVal)
HRESULT put_PortExtUse1(short port VARIANT_BOOL newVal)

Interface IFixturing

PortExtUse2 Property

Description Sets and returns the Use2 ON/OFF state for the use of the PortLoss2 and PortFreq2 values for the specified port number.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**PortExtUse2**(*port*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive Use2 ON / OFF state.

value **(Boolean)**

False - Turns Use1 OFF

True - Turns Use1 ON

Return Type Boolean

Default False

Examples

```
fixture.PortExtUse2(2) = False 'Write
```

```
value = fixture.PortExtUse2(1) 'Read
```

C++ Syntax HRESULT get_PortExtUse2(short port VARIANT_BOOL *pVal)
HRESULT put_PortExtUse2(short port VARIANT_BOOL newVal)

Interface IFixturing

PortFreq1 Property

Description Sets and returns Frequency1 value for the specified port number.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**PortFreq1**(*port*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive extrapolated loss.

value (Double) Frequency1 value. Choose a frequency within the frequency span of the PNA.

Return Type Double

Default 1 GHz

Examples

```
fixture.PortFreq1(2) = naFix2PD_USER 'Write
```

```
value = fixture.PortFreq1(1) 'Read
```

C++ Syntax HRESULT get_PortFreq1(short port double *pVal)
HRESULT put_PortFreq1(short port double newVal)

Interface IFixturing

PortFreq2 Property

Description Sets and returns Frequency2 value for the specified port number.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**PortFreq2***(port)* = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive extrapolated loss.

value (Double) Frequency2 value. Choose a frequency within the frequency span of the PNA.

Return Type Double

Default 1 GHz

Examples

```
fixture.PortFreq2(2) = 10E9 'Write
```

```
value = fixture.PortFreq2(1) 'Read
```

C++ Syntax HRESULT get_PortFreq2(short port double *pVal)
HRESULT put_PortFreq2(short port double newVal)

Interface IFixturing

PortLabel Property

Description Sets and returns the label on the calibration kit Port for the calibration wizard.

VB Syntax *calKit*.**Portlabel** (*portNum*) = *value*

Variable **(Type) - Description**

calKit A CalKit **(object)**

portNum **(long integer)** - number of the port to be labeled. Choose either **1** or **2**

value **(string)** - Label that is visible in the calibration wizard.

Return Type String

Default Depends on the Cal Kit.

Examples

```
calKit.PortLabel = "MyCalKit" 'Write
```

```
kitLabel = calKit.PortLabel 'Read
```

C++ Syntax HRESULT get_PortLabel(long port, BSTR *pVal)
HRESULT put_PortLabel(long port, BSTR newVal)

Interface ICalKit

PortLogic Property

Description Sets and returns the logic mode of data ports A-H on the HandlerIO connector. Port C of the Handler IO is connected internally to the Port C of the Aux IO connector. Therefore, it will have the same logic mode.

VB Syntax *handler*.**PortLogic** = *value*

Variable **(Type) - Description**

handler **(object) -** A HandlerI/O object

value (**enum as NaRearPanelIOLogic**) - Choose from:

0 - naPositiveLogic - When a value of one is written, the associated line goes High

1 - naNegativeLogic - When a value of one is written, the associated line goes Low

For ports that are in output (write) mode, a change in logic causes the output lines to change state immediately. For example, Low levels change immediately to High levels.

For ports that are in input (read) mode (C,D,E only), a change in logic will be reflected when data is read from that port. For example, if a line read 0, the next read after a logic change will read 1.

Return Type Long Integer

Default 1 - naNegativeLogic

Examples

```
handler.PortLogic = value 'Write
value = handler.PortLogic 'Read
```

C++ Syntax HRESULT put_PortLogic(tagNARearPanelIOLogic Mode);

HRESULT get_PortLogic(tagNARearPanelIOLogic* Mode);

Interface IHWMaterialHandlerIO

PortLoss1 Property

Description	Sets and returns the Loss1 value for the specified port number. **Note:** This command affects ALL measurements on the channel.
VB Syntax	*fixture***.PortLoss1***(port)* = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
port	**(Integer)** Port number to receive Loss value
value	**(Double)** Loss1 value in dB. Choose a value between -90 and 90.
Return Type	Double
Default	0
Examples	`fixture.PortLoss1(2) = .002 'Write` `value = fixture.PortLoss1(1) 'Read`
C++ Syntax	HRESULT get_PortLoss1(short port double *pVal) HRESULT put_PortLoss1(short port double newVal)
Interface	IFixturing

PortLoss2 Property

Description	Sets and returns the Loss2 value for the specified port number. **Note:** This command affects ALL measurements on the channel.
VB Syntax	*fixture*.**PortLoss2**(*port*) = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
port	**(Integer)** Port number to receive Loss value
value	**(Double)** Loss2 value in dB. Choose a value between -90 and 90.
Return Type	Double
Default	0
Examples	`fixture.PortLoss2(2) = .002 'Write` `value = fixture.PortLoss2(1) 'Read`
C++ Syntax	HRESULT get_PortLoss2(short port double *pVal) HRESULT put_PortLoss2(short port double newVal)
Interface	IFixturing

PortLossDC Property

Description	Sets and returns the Loss value at DC for the specified port number. Learn about Loss compensation values. **Note:** This command affects ALL measurements on the channel.
VB Syntax	*fixture*.**PortLossDC**(*port*) = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
port	**(Integer)** Port number to receive Loss value at DC.
value	**(Double)** Loss value in ohms. Choose a value between -90 and 90
Return Type	Double
Default	0
Examples	`fixture.PortLossDC(2) = .002 'Write` `value = fixture.PortLossDC(1) 'Read`
C++ Syntax	HRESULT get_PortLossDC(short port double *pVal) HRESULT put_PortLossDC(short port double newVal)
Interface	IFixturing

PortMatching_C Property

Description	Sets and returns the Capacitance value for the specified port number. **Note:** This command affects ALL measurements on the channel.
VB Syntax	*fixture*.**PortMatching_C**(*port*) = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
port	**(Integer)** Port number to receive capacitance value
value	**(Double)** Capacitance value in farads. Choose a value between -1E18 to 1E18.
Return Type	Double
Default	0
Examples	`fixture.PortMatching_C(2) = .00002 'Write` `value = fixture.PortMatching_C(1) 'Read`
C++ Syntax	HRESULT get_PortMatching_C(short port double *pVal) HRESULT put_PortMatching_C(short port double newVal)
Interface	IFixturing

PortMatching_G Property

Description Sets and returns the Conductance value for the specified port number.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**PortMatching_G**(*port*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive conductance value.

value **(Double)** Conductance value in siemens. Choose a value between -1E18 and 1E18.

Return Type Double

Default 0

Examples

```
fixture.PortMatching_G = .002 'Write
```

```
value = fixture.PortMatching_G 'Read
```

C++ Syntax HRESULT get_PortMatching_G(short port double *pVal)
HRESULT put_PortMatching_G(short port double newVal)

Interface IFixturing

PortMatching_L Property

Description	Sets and returns the Inductance value for the specified port number. **Note:** This command affects ALL measurements on the channel.
VB Syntax	*fixture*.**PortMatching_L**(*port*) = *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
port	**(Integer)** Port number to receive inductance value
value	**(Double)** Inductance value in henries. Choose a value between -1E18 and 1E18.
Return Type	Double
Default	0
Examples	`fixture.PortMatching_L = .002 'Write` `value = fixture.PortMatching_L 'Read`
C++ Syntax	HRESULT get_PortMatching_L(short port double *pVal) HRESULT put_PortMatching_L(short port double newVal)
Interface	IFixturing

PortMatching_R Property

Description Sets and returns the Resistance value for the specified port number.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**PortMatching_R**(*port*) = *value*

Variable (Type) - Description

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive resistance value.

value **(Double)** Resistance value in ohms. Choose a value between -1E18 and 1E18.

Return Type Double

Default 0

Examples

```
fixture.PortMatching_R = .1 'Write

value = fixture.PortMatching_R 'Read
```

C++ Syntax HRESULT get_PortMatching_R(short port double *pVal)
HRESULT put_PortMatching_R(short port double newVal)

Interface IFixturing

PortMatchingCktModel Property

Description Sets and returns the Port Matching circuit model for the specified port number.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**PortMatchingCktModel**(*port*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive circuit model.

value **(Enum as NAFixturingPortMatchCkt)** Circuit model. Choose from

0 **naFixPMC_SLPC** Series L - Parallel C

1 **naFixPMC_PCSL** Parallel C - Series L

2 **naFixPMC_PLSC** Parallel L - Series C

3 **naFixPMC_SCPL** Series C - Parallel L

4 **naFixPMC_PLPC** Parallel L - Parallel C

5 **naFixPMC_USER** Load S2P file - also set filename to load with strPortMatch_S2PFile Property

6 **naFixPMC_NONE** No circuit model

Return Type Long Integer

Default **naFixPMC_NONE**

Examples

```
fixture.PortMatchingCktModel(2) = naFixPMC_PLSC 'Write
```

```
value = fixture.PortMatchingCktModel(1) 'Read
```

C++ Syntax HRESULT get_PortMatchingCktModel(short port tagNAFixturingPortMatchCkt *pVal)
HRESULT put_PortMatchingCktModel(short port tagNAFixturingPortMatchCkt newVal)

Interface IFixturing

PortMatchingState Property

Description Sets and returns the Port Matching State on the channel.

VB Syntax *fixture*.**PortMatchingState** = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

value **(boolean)**
True - Turns Port Matching ON
False - Turns Port Matching OFF

Return Type Boolean

Default False

Examples

```
fixture.PortMatchingState = True 'Write
```

```
value = fixture.PortMatchingState 'Read
```

C++ Syntax HRESULT get_PortMatchingState(VARIANT_BOOL *pVal)
HRESULT put_PortMatchingState(VARIANT_BOOL newVal)

Interface IFixturing

PortMode Property

Description	Sets and returns whether Port C or Port D is used for writing or reading data on the Handler IO connector. The Handler IO Port C is connected internally to the Port C of the Aux IO connector. Therefore, the Aux IO connector will have the same input/output mode.
VB Syntax	*handler*.**PortMode** *(port)* = *value*
Variable	**(Type) - Description**
handler	**(object) -** A Handler I/O object
port	**(enum as NAMatHandlerPort)** Port to be changed. Choose from: **2 -naPortC** **3- naPortD**
value	**(enum as NaPortMode)** - Choose from: **0 - naInput** - set the port for reading **1 - naOutput** - set the port for writing
Return Type	Long Integer
Default	1 - naInput
Examples	`handler.PortMode(naPortC) = naInput 'Write` `value = handler.PortMode(naPortD) 'Read`
C++ Syntax	HRESULT put_PortMode (tagNAMatHandlerPort Port, tagNAPortMode Mode); HRESULT get_PortMode (tagNAMatHandlerPort Port, tagNAPortMode* Mode);
Interface	IHWMaterialHandlerIO

Read-only

PortsNeedingDeltaMatch Property

Description Returns the port numbers for which delta match correction is required. 0 (zero) is returned if the Cal does NOT require Delta Match correction for one of the following reasons:

- The Cal does NOT involve Unknown Thru or TRL. You specify this using ThruCalMethod Property.
- The Cal DOES involve Unknown Thru or TRL, but the delta match data can be calculated by the Unknown Thru or TRL Cal. Learn how this is possible. However, you can force the Cal to use the Delta Match data from a Cal Set.

VB Syntax *value* = *guided*.**PortsNeedingDeltaMatch**

Variable **(Type) - Description**

value (Variant) Variable to store the returned list of port numbers.

guided GuidedCalibration (object)

Return Type Variant

Default Not Applicable

Examples

```
Dim ports As Variant
ports = guided.PortsNeedingDeltaMatch
```

C++ Syntax HRESULT get_PortsNeedingDeltaMatch (VARIANT* portList);

Interface IGuidedCalibration2

Write/Read

About Power Slope

PowerSlope Property

Description	Sets or returns the Power Slope value. Power Slope function increases or decreases the output power over frequency. Units are db/GHz. For example: PowerSlope = 2 will increase the power 2db/1GHZ.
VB Syntax	*object*.**PowerSlope** = *value*
Variable	**(Type) - Description**
object	Channel **(object)** **or** CalSet **(object) -** Read-only property
value	**(double)** - Power Slope. Choose any number between -2 and 2. **No slope = 0**
Return Type	Double
Default	0
Examples	`chan.PowerSlope = 2 'Write` `pwrslp = chan.PowerSlope 'Read`
C++ Syntax	HRESULT get_PowerSlope(double *pVal) HRESULT put_PowerSlope(double newVal)
Interface	IChannel |CalSet3

PowerAcquisitionDevice Property

Description Returns the power sensor channel (A or B) that is currently selected for use at a specific frequency.

If UsePowerSensorFrequencyLimits is set to False, this property will return the sensor channel last used for a source power calibration. This setting corresponds to the **Use this sensor only** checkbox in the Power Sensor Settings dialog.

When performing an SMC calibration, use SetPowerAcquisitionDevice Method to set the power sensor channel.

VB Syntax *sensor* = *pwrCal*.**PowerAcquisitionDevice***(dFreq)*

Variable **(Type) - Description**

sensor (**enum NAPowerAcquisitionDevice**) The currently selected sensor channel for the specified frequency. Choose from:

0 – naPowerSensor_A

1 – naPowerSensor_B

pwrCal A SourcePowerCalibrator (object)

dFreq (double) Frequency (Hz) for the power reading of interest.

Return Type enum NAPowerAcquisitionDevice

Default Not Applicable

Examples

```
selectedSensor = pwrCal.PowerAcquisitionDevice(1.E9) 'Write
```

C++ Syntax HRESULT get_PowerAcquisitionDevice(double dFreq, tagNAPowerAcquisitionDevice* enumAcqDevice);

Interface ISourcePowerCalibrator2

PowerLevel Property

Description	Set and read the power level at which to perform the Source Power Cal portion of a GainCompression Calibration.
VB Syntax	*gcaCal*.**PowerLevel** = *value*
Variable	**(Type) - Description**
gcaCal	A GainCompressionCal **(object)**
value	**(Double) -** Power level in dB. Choose a value from +30 to (-30). Learn about choosing a power level.
Return Type	Double
Default	0
Examples	`gca.PowerLevel = -5 'Write` `pLevel = gca.PowerLevel 'Read`
C++ Syntax	HRESULT get_PowerLevel(double* pVal) HRESULT put_PowerLevel(double newVal)
Interface	IGainCompressionCal

Last Modified:

10-Mar-2008 MX New topic

PowerMeterChannel Property

Description Identifies which channel of the power meter the power sensor is connected to.

VB Syntax *chan* = *powerSensor*.**PowerMeterChannel**

Variable (Type) - Description

chan **(enum NAPowerAcquisitionDevice)** – Power meter channel identifier for sensor. Choose from:

0 – naPowerSensor_A

1 – naPowerSensor_B

pwrSensor **(object) -** A PowerSensor (object)

Return Type NAPowerAcquisitionDevice

Default Not Applicable

Examples

```
Set pwrCal = pna.SourcePowerCalibrator
meterChannel = pwrCal.PowerSensors(1).PowerMeterChannel
```

C++ Syntax HRESULT PowerMeterChannel(tagNAPowerAcquisitionDevice *pSensor);

Interface IPowerSensor

Write / Read

About Source Power Cal

PowerMeterGPIBAddress Property Superseded

Description

This command is replaced with PowerMeterInterface Object.

Specifies the GPIB address of the power meter that will be referenced by the SourcePowerCalibrator object.

When performing a source power cal, the PNA will search VISA interfaces that are configured in the Agilent IO LIbraries on the PNA.

VB Syntax

powerCalibrator.**PowerMeterGPIBAddress** = *value*

Variable	(Type) - Description
powerCalibrator	**(object) -** A SourcePowerCalibrator (object)
value	**(long integer)** – Power meter GPIB address. Choose any number between 0 and 30.

Return Type

Long integer

Default

13

Examples

```
Set powerCalibrator = pna.SourcePowerCalibrator
powerCalibrator.PowerMeterGPIBAddress = 13 'Write

pwrMtrAddress = powerCalibrator.PowerMeterGPIBAddress 'Read
```

C++ Syntax

HRESULT put_PowerMeterGPIBAddress(long newVal);

HRESULT get_PowerMeterGPIBAddress(long *pVal);

Interface

ISourcePowerCalibrator

Last Modified:

9-Jul-2007 Superseded

Write/Read | About RF power during sweep retrace

PowerOnDuringRetraceMode Property

Description	For single-band frequency or segment sweeps ONLY, specify whether to turn RF power ON or OFF during a retrace. This setting remains until changed using this command, or until the hard drive is changed or reformatted.
VB Syntax	*pref*.**PowerOnDuringRetraceMode** = *value*
Variable	**(Type) - Description**
pref	A Preferences **(object)**
value	**(Enum)** - Choose from: 0 - **naRetracePowerMode_Auto** Power is left ON during retrace of single-band frequency or segment sweeps ONLY. 1 - **naRetracePowerMode_OFF** Power is turned OFF during retrace of single-band frequency or segment sweeps ONLY.
Return Type	Enum
Default	0 - naRetracePowerMode_Auto
Examples	`pref.PowerOnDuringRetraceMode = naPowerSweepRetraceMode_Start 'Write` `psMode = pref.naPowerOnDuringRetraceMode_Start 'Read`
C++ Syntax	HRESULT get_PowerOnDuringRetraceMode (tagNARetracePowerMode* preference); HRESULT put_PowerOnDuringRetraceMode (tagNARetracePowerMode val)
Interface	IPreferences4

Last modified:

Nov. 16, 2006	New command

PowerSweepRetracePowerMode Property

Description	At the end of a power sweep, while waiting to trigger the next sweep, maintain source power at either the start power level or at the stop power level.
VB Syntax	*pref*.**PowerSweepRetracePowerMode** = *value*
Variable	**(Type) - Description**
pref	A Preferences **(object)**
value	**(Enum)** - Choose from: 0 - **naPowerSweepRetraceMode_Start** - maintain source at start power level. 1 - **naPowerSweepRetraceMode_Stop** - maintain source at stop power level.
Return Type	Enum
Default	0 - naPowerSweepRetraceMode_Start
Examples	`pref.PowerSweepRetracePowerMode = naPowerSweepRetraceMode_Start 'Write` `psMode = pref.naPowerSweepRetraceMode_Start 'Read`
C++ Syntax	HRESULT get_PowerSweepRetracePowerMode (tagNAPowerSweepRetraceMode* preference); HRESULT put_PowerSweepRetracePowerMode (tagNAPowerSweepRetraceMode val)
Interface	IPreferences3

Last modified:

Oct. 25, 2006	New command

PreciseTuningTolerance Property

Description	Sets and returns the tuning tolerance for precise tuning.
VB Syntax	*embedLO*.**PreciseTuningTolerance** = *value*
Variable	**(Type) - Description**
embedLO	An EmbeddedLO **(object)**
value	**(Double)** Tuning tolerance in Hz. Choose a number between and
Return Type	**(Double)**
Default	1 Hz
Examples	`embedLO.PreciseTuningTolerance = .5 'write` `value = embedLO.PreciseTuningTolerance 'read`
C++ Syntax	HRESULT get_PreciseTuningTolerance(double* tolerance); HRESULT put_PreciseTuningTolerance(double tolerance);
Interface	IEmbededLO

Last Modified:

13-Apr-2007 MX New topic

PreferInternalTriggerOnChannelSingle Property

Description Set and read the preference for the chan.Single trigger behavior. This setting persists until changed.

These preferences are important when performing a Guided calibration, as the PNA uses the **chan.Single** trigger command to measure standards.

- set PreferInternalTriggerOnChannelSingle **= False** to use an External trigger sweep to measure a cal standard.
- set PreferInternalTriggerOnChannelSingle **= True** to use an External sweep for the measurement, but rely on the PNA to send Internal trigger signals for calibrating.

To set this preference for an **Unguided** Calibration, use PreferInternalTriggerOnUnguidedCal Property

The **chan.Single** trigger command NEVER respects the Trigger Source = Manual setting. It always switches to Internal for one trigger, then back to Manual, regardless of this preference command.

VB Syntax *pref*.**PreferInternalTriggerOnChannelSingle** = *bool*

Variable **(Type) - Description**

pref A Preferences **(object)**

bool **(Boolean)** - Choose from:

0 - False - the Single trigger property does respect the **Trigger Source = External** setting. For example, if Trigger source = External, the single trigger method will wait for the External trigger signal and then allow only one sweep.

1 - True - the Single trigger command does NOT respect the **Trigger Source = External** setting. For example, when the Single method is sent, the PNA immediately switches to Internal sweep, responds to one trigger signal, then switches back to External.

Return Type Boolean

Default 0 - False

Examples

```
pref.PreferInternalTriggerOnChannelSingle = False 'Write
```

```
prefer = pref.PreferInternalTriggerOnChannelSingle 'Read
```

C++ Syntax HRESULT put_PreferInternalTriggerOnChannelSingle(VARIANT_BOOL bprefSingle)

HRESULT get_PreferInternalTriggerOnChannelSingle(VARIANT_BOOL *bprefSingle)

Interface IPreferences2

PreferInternalTriggerOnUnguidedCal Property

Description Set and read the preference for the trigger behavior when performing an Unguided calibration.

VB Syntax *pref*.**PreferInternalTriggerOnUnguidedCal** = *bool*

Variable **(Type) - Description**

pref A Preferences **(object)**

bool **(Boolean)** - Choose from:

0 - False - The trigger behavior during an Unguided calibration DOES respect the setting of the Trigger source command. For example, during an Unguided Cal, when Trigger source = External, the PNA will wait for the External trigger signal and then allow only one sweep.

1 - True -The trigger behavior during an Unguided calibration does NOT respect the **Trigger Source = External** setting. For example, during an Unguided Cal, when Trigger source = External, the PNA immediately switches to Internal sweep, measures the standard with one trigger signal, then switches back to External trigger.

Note: When Trigger Source = Manual during a calibration, the PNA ALWAYS switches to Internal for one trigger to measure a standard, then back to Manual, regardless of this preference command.

Return Type Boolean

Default 0 - False

Examples

```
pref.PreferInternalTriggerOnUnguidedCal = False 'Write
```

```
prefer = pref.PreferInternalTriggerOnUnguidedCal 'Read
```

C++ Syntax HRESULT put_PreferInternalTriggerOnUnguidedCal(VARIANT_BOOL bprefUnguided)

HRESULT get_PreferInternalTriggerOnUnguidedCal(VARIANT_BOOL *bprefUnguided)

Interface IPreferences2

Read-only | About FOM

RangeCount Property

Description	Returns the number of ranges that are available in the PNA. To see the range names, query the Name property of each range in the FOM collection.
VB Syntax	*value* = *FOM*.**RangeCount**
Variable	**(Type) - Description**
object	An FOM **(collection object)**
value	**(long)** - Variable to store the returned number of ranges.
Return Type	Long Integer
Default	Not Applicable
Examples	`NumRanges = fom.RangeCount 'Read`
C++ Syntax	HRESULT get_RangeCount(long *count)
Interface	IFOM

Last Modified:

8-Mar-2007 Added link to Name property

rangeNumber Property

Description	Returns the index number of the range within the FOM collection.
VB Syntax	*value* = *FOMRange*.**rangeNumber**
Variable	**(Type) - Description**
value	**(Long)** - Variable to store the returned range number.
object	An FOMRange **(object)**
Return Type	Long
Default	Not Applicable
Examples	`num = fomRange.rangeNumber 'Read`
C++ Syntax	HRESULT get_rangeNumber(long *pVal)
Interface	IFOMRange

Write/Read [About Frequency Offset](#)

R1inputPath Property

Description PNA models with option 081 have a switch in the test set that allows access to the port 1 reference receiver through the front panel Reference 1 connectors. This command throws that switch between the internal path to the receiver, or through the external connectors. You could use this feature to make converter measurements relative to a reference ("golden") mixer.

See other Frequency Offset properties.

VB Syntax chan.**R1InputPath** = *value*

Variable (Type) - **Description**

chan A Channel **(object)**

value **(Enum as naInputPath)** - Choose from:naPathInternal -

(0) - internal path to the reference receiver naPathExternal

(1) - path through external connectors

Return Type Enum

Default naPathInternal - (0)

Examples

```
chan.R1InputPath = naPathInternal 'Write
```

```
Inpath = chan.R1InputPath 'Read
```

C++ Syntax HRESULT get_R1InputPath (tag NAInputPath *pPath);

HRESULT put_R1InputPath (tag NAInputPath newPath);

Interface IChannel2

ReadingsPerPoint Property

Description	This command, along with ReadingsTolerance, allows for settling of the power sensor READINGS. Specifies the maximum number of power readings that are taken at each stimulus point to allow for power meter settling. Each reading is averaged with the previous readings at that stimulus point. When this average meets the ReadingsTolerance value or this number of readings has been made, the average is returned as the valid reading. The following two commands deal with the source power ADJUSTMENTS: IterationsTolerance Property MaximumIterationsPerPoint Property
VB Syntax	*pwrCal*.**ReadingsPerPoint** = *value*
Variable	**(Type) - Description**
pwrCal	**(object) -** A SourcePowerCalibrator (object)
value	**(long integer)** – Number of power readings. Choose any number between 3 and 100.
Return Type	Long Integer
Default	3

Examples	`Set powerCalibrator = pna.SourcePowerCalibrator`
	`powerCalibrator.ReadingsPerPoint = 3 'Write`
	
	`numReadings = powerCalibrator.ReadingsPerPoint 'Read`

C++ Syntax	HRESULT put_ReadingsPerPoint(long newVal); HRESULT get_ReadingsPerPoint(long *pVal);
Interface	ISourcePowerCalibrator

Last Modified:

17-Apr-2007	Clarified verbage

ReadingsTolerance Property

Description	This command, along with ReadingsPerPoint Property allows for settling of the power sensor READINGS. Each power reading is averaged with the previous readings at each stimulus point. When the average meets this tolerance value or the maximum ReadingsPerPoint has been made, the average is returned as the valid reading. The following two commands deal with the source power ADJUSTMENTS: IterationsTolerance Property MaximumIterationsPerPoint Property
VB Syntax	*pwrCal*.**ReadingsTolerance** = *value*
Variable	**(Type) - Description**
pwrCal	**(object) -** A SourcePowerCalibrator (object)
value	**(Double)** – Power meter settling tolerance value in dB. Choose any number between 0 and 5.
Return Type	Double
Default	.05 dB

Examples	`Set powerCalibrator = pna.SourcePowerCalibrator`
	`powerCalibrator.ReadingsTolerance = .1 'Write`
	`ReadTol = powerCalibrator.ReadingsTolerance 'Read`

C++ Syntax	HRESULT get_ReadingsTolerance(double *pVal); HRESULT put_ReadingsTolerance(double newVal);
Interface	ISourcePowerCalibrator3

Last Modified:

17-Apr-2007 Clarified verbage

ReadyForTriggerState Property

Description	Determines the control of Material Handler connector Pin 21.
VB Syntax	*handler*.**ReadyForTriggerState** = *value*
Variable	**(Type) - Description**
handler	**(object) -** A Handler I/O object
value	(**boolean**) False - Pin 21 is controlled by Output Port B7 True - Pin 21 is controlled by the Ready for Trigger signal
Return Type	Boolean
Default	False
Examples	`handler.ReadyForTriggerState = False 'Write` `bState = handler.ReadyForTriggerState 'Read`
C++ Syntax	HRESULT put_ReadyForTriggerState (BOOL *pVal); HRESULT get_ReadyForTriggerState (BOOL newVal);
Interface	IHWMaterialHandlerIO2

ReceiverAttenuator Property

Description Sets or returns the value of the specified receiver attenuator control.

VB Syntax *object*.**ReceiverAttenuator(***rec***)** = *value*

Variable (Type) - **Description**

object Channel **(object)**

or

CalSet **(object) -** Read-only property

rec **(long integer)** - Receiver with attenuator control to be changed. Choose from any of the available receivers in your PNA

1 - Receiver A

2 - Receiver B

Receiver attenuation can not be set using logical receiver notation.

value **(double)** - Attenuator value in dB. Choose any Long Integer between 0 and 35 in 5dB steps:

If an invalid value is entered, the analyzer will select the next lower valid value. For example, if 19.9 is entered the analyzer will select 15 dB attenuation.

Return Type Double

Default 0 db

Examples

```
chan.ReceiverAttenuator(1) = 5 'Write
```

```
attn = chan.ReceiverAttenuator(2) 'Read
```

C++ Syntax HRESULT get_ReceiverAttenuator(long lport, double *pVal)
HRESULT put_ReceiverAttenuator(long lport, double newVal)

Interface IChannel

|CalSet3

ReceiverCount Property

Description	Returns the number of receivers in the remote PNA. The returned number includes both test port receivers and reference receivers. See the number of reference receivers in your PNA.
VB Syntax	*value* = *cap*.**ReceiverCount**
Variable	**(Type) - Description**
value	(Long) - Variable to store the returned number of receivers.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.ReceiverCount 'Read`
C++ Syntax	HRESULT get_ReceiverCount(long * receiverCount);
Interface	ICapabilities

ReceiverStepAttenuatorStepSize Property

Description	Returns a value indicating the step size of the attenuator.
VB Syntax	*value* **=** *cap*.**ReceiverStepAttenuatorStepSize** *(n)*
Variable	**(Type) - Description**
value	**(Double)** - Variable to store the returned value of the attenuator step size.
cap	A Capabilities **(object)**
n	**(Long) -** port number to query for the value of the attenuator step size.
Return Type	Double
Default	Not Applicable
Examples	`value = cap.ReceiverStepAttenuatorStepSize'Read`
C++ Syntax	HRESULT get_ReceiverStepAttenuatorStepSize(long portNumber, double * stepSize);
Interface	ICapabilities

Read-only

ReceivePort Property

Description	Returns the receiver (response) port number of measurement. To understand how this property is useful, see IMeasurement2 Interface. **Note:** Returning a receiver port is only supported for S-Parameter measurements. If the measurement is not an S-Parameter, then E_NA_BAD_PARAMETER is returned.
VB Syntax	*value* = *meas*.**ReceivePort**
Variable	**(Type) - Description**
value	**(Long)** - Variable to store the returned value
meas	A Measurement **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`rp = meas.ReceivePort`
C++ Syntax	HRESULT ReceivePort(Long* rcvPort);
Interface	IMeasurement2

ReduceIFBandwidth Property

Description Sets or returns the state of the Reduced IF Bandwidth at Low Frequencies setting.

VB Syntax *chan*.**ReduceIFBandwidth** = *state*

Variable **(Type) - Description**

chan A Channel **(object)**

state **(boolean)**

False - Turns Reduce IFBW **OFF**

True - Turns Reduce IFBW **ON**

Return Type Boolean

Default True

Examples

```
chan.ReduceIFBandwidth = False 'Write
```

```
reduce = chan.ReduceIFBandwidth 'Read
```

C++ Syntax HRESULT get_ReduceIFBandwidth(BOOL *pVal)
HRESULT put_ReduceIFBandwidth(BOOL newVal)

Interface IChannel5

Last Modified:

16-Aug-2007 Corrected Interface number

ReferenceCalFactor Property

Description Reference cal factor (%) associated with this power sensor. This property and the CalFactorSegments collection are used to perform source power calibration **only** if the power sensor does not contain cal factors in EPROM (for example, HP/Agilent 848x sensors).

VB Syntax *powerSensor*.**ReferenceCalFactor** = *value*

Variable **(Type) - Description**

pwrSensor **(object) -** A PowerSensor (object)

value **(double)** – Cal factor in units of percent. This can be any value between 1 and 150.

Return Type Double

Default 100

Examples

```
Set powerCalibrator = pna.SourcePowerCalibrator
powerCalibrator.PowerSensors(1).ReferenceCalFactor = 99 'Write
```

```
RefFact = powerCalibrator.PowerSensors(1).ReferenceCalFactor
'Read
```

C++ Syntax HRESULT put_ReferenceCalFactor(double newVal);
HRESULT get_ReferenceCalFactor(double *pVal);

Interface IPowerSensor

ReferenceMarkerState Property

Description	Turn ON or OFF the reference marker.
VB Syntax	*meas*.**ReferenceMarkerState** = *state*
Variable	**(Type) - Description**
app	A Measurement **(object)**
state	(boolean) - **True -** turns the reference marker ON **False -** turns the reference marker OFF
Return Type	Boolean
Default	**False**
Examples	`meas.ReferenceMarkerState = True` `reference = meas.ReferenceMarkerState`
C++ Syntax	HRESULT get_ReferenceMarkerState(VARIANT_BOOL bState) HRESULT put_ReferenceMarkerState(VARIANT_BOOL* bState)
Interface	IMeasurement

ReferenceValue Property

Description	Sets or returns the value of the Y-axis Reference Level of the active trace.
VB Syntax	*trce*.**ReferenceValue** = *value*
Variable	**(Type) - Description**
trce	A Trace **(object)**
value	**(double)** - Reference Value. Units and range depend on the current data format.
Return Type	Double
Default	Not applicable
Examples	`meas.ReferenceValue = 0 'Write` `rlev = meas.ReferenceValue 'Read`
C++ Syntax	HRESULT get_ReferenceValue(double *pVal) HRESULT put_ReferenceValue(double newVal)
Interface	ITrace

ReferencePosition Property

Description	Sets or returns the Reference Position of the active trace.
VB Syntax	*trce*.**ReferencePosition** = *value*
Variable	**(Type) - Description**
trce	A Trace **(object)**
value	**(double)** - Reference position on the screen measured in horizontal graticules from the bottom of the screen. Choose from any number between: **0** and **10.**
Return Type	Double
Default	0
Examples	`meas.ReferencePosition = 5 'Middle of the screen -Write` `rpos = meas.ReferencePosition -Read`
C++ Syntax	HRESULT get_ReferencePosition(double *pVal) HRESULT put_ReferencePosition(double newVal)
Interface	ITrace

RemoteCalStoragePreference Property

Description Specifies the default manner in which calibrations performed using COM or SCPI are to be stored.

Cal data is always stored to the channel's Cal Register regardless of this setting.

This setting survives instrument preset and reboot. It remains until changed by another invocation of this property.

VB Syntax *pref.***RemoteCalStoragePreference** = *value*

Variable **(Type) - Description**

cal A Preferences **(object)**

value **(Enum)** - Choose from:

0 - naPreferCalRegister - Cal is saved ONLY to the channel's Cal Register.

1 - naPreferNewUserCalSet - Cal is automatically saved to a new User Cal Set file when performing a calibration using COM. The Cal Set name is automatically generated. This corresponds to pre-6.0 behavior. Use the Name property to change the name after the cal is complete.

2 - naPreferReuseCurrentCalSet - The cal is saved to the Cal Set is that is currently selected on the specific channel. This could be the channel's Cal Register. If the channel does not yet have a selected Cal Set, the cal will be saved to a new User Cal Set with an automatically-generated name.

Return Type Enum

Default 0 - naPreferCalRegister

Examples

```
pref.RemoteCalStoragePreference = naPreferNewUserCalSet 'Write
```

```
calStorageMode = pref.RemoteCalStoragePreference ' Read
```

C++ Syntax HRESULT get_RemoteCalStoragePreference(enum NARemoteCalStoragePreference* preference);

HRESULT put_RemoteCalStoragePreference(enum NARemoteCalStoragePreference val);

Interface IPreferences7

Last Modified:

16-Apr-2007 MX New topic

ReverseLinearPowerLevel Property

Description	Set and read the reverse power level to the DUT. This is applied to the DUT output port when making reverse measurements like S22.
VB Syntax	*gca*.**ReverseLinearPowerLevel** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(double)** Reverse power level in dBm. Choose a value from +30 to (-30).
Return Type	Double
Default	-5
Examples	`gca.ReverseLinearPowerLevel = -10 'Write`
	`LinPwr = gca.ReverseLinearPowerLevel 'Read`
C++ Syntax	HRESULT get_ReverseLinearPowerLevel(double* pVal) HRESULT put_ReverseLinearPowerLevel(double newVal)
Interface	IGainCompression

Last Modified:

21-Nov-2007 MX New topic

SafeSweepCoarsePowerAdjustment Property

Description	Set and read the Safe Sweep COARSE power adjustment.
VB Syntax	*gca*.**SafeSweepCoarsePowerAdjustment** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(Double)** Coarse power adjustment setting in dBm. Choose a value from +30 to (-30).
Return Type	Double
Default	3.0
Examples	`gca.SafeSweepCoarsePowerAdjustment = 2.0 'Write` `SSCourse = gca.SafeSweepCoarsePowerAdjustment 'Read`
C++ Syntax	HRESULT get_SafeSweepCoarsePowerAdjustment(double* value) HRESULT put_SafeSweepCoarsePowerAdjustment(double value)
Interface	IGainCompression

Last Modified:

1-Dec-2007 MX New topic

SafeSweepEnable Property

Description	Set and read the (ON | OFF) state of Safe Sweep mode.
VB Syntax	*gca*.**SafeSweepEnable** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(Boolean)** Safe Sweep state. Choose from: **False** - Disable Safe Sweep **True -** Enable Safe Sweep
Return Type	Boolean
Default	False
Examples	`gca.SafeSweepEnable = True 'Write` `SSEnable = gca.SafeSweepEnable 'Read`
C++ Syntax	HRESULT get_SafeSweepEnable(VARIANT_BOOL* value) HRESULT put_SafeSweepEnable(VARIANT_BOOL value)
Interface	IGainCompression

Last Modified:

1-Dec-2007 MX New topic

SafeSweepFinePowerAdjustment Property

Description Set and read the Safe Sweep FINE power adjustment.

VB Syntax *gca*.**SafeSweepFinePowerAdjustment** = *value*

Variable **(Type) - Description**

gca A GainCompression **(object)**

value **(Double)** Fine power adjustment setting in dBm. Choose a value from +30 to (-30).

Return Type Double

Default 1.0

Examples

```
gca.SafeSweepFinePowerAdjustment = 0.1 'Write
```

```
SSfine = gca.SafeSweepFinePowerAdjustment 'Read
```

C++ Syntax HRESULT get_SafeSweepFinePowerAdjustment(double* value)

HRESULT put_SafeSweepFinePowerAdjustment(double value)

Interface IGainCompression

Last Modified:

1-Dec-2007 MX New topic

SafeSweepFineThreshold Property

Description	Set and read the compression level at which Safe Sweep changes from the COARSE power adjustment to the FINE power adjustment.
VB Syntax	*gca*.**SafeSweepFineThreshold** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(Double)** Threshold setting in dBm. Choose a value from +30 to (-30).
Return Type	Double
Default	0.75 dBm
Examples	`gca.SafeSweepFineThreshold = 0.1 'Write` `SSThresh = gca.SafeSweepFineThreshold 'Read`
C++ Syntax	HRESULT get_SafeSweepFineThreshold(double* value) HRESULT put_SafeSweepFineThreshold(double value)
Interface	IGainCompression

Last Modified:

1-Dec-2007 MX New topic

SB_BalPortNegative Property

Description	With a Single-ended - Balanced topology, returns the PNA port number that is connected to the Negative side of the DUT's Balanced Port. Use SetSBPorts Method to set the port mapping for a Single-Ended - Balanced topology.
VB Syntax	*var* = *balTopology*.**SB_BalPortNegative**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTop.SB_BalPortNegative 'Read`
C++ Syntax	HRESULT get_SB_BalPortNegative(long *bVal)
Interface	IBalancedTopology

SB_BalPortPositive Property

Description	With a Single-ended - Balanced topology, returns the PNA port number that is connected to the Positive side of the DUT's Balanced Port. Use SetSBPorts Method to set the port mapping for a Single-Ended - Balanced topology.
VB Syntax	*var* = *balTopology*.**SB_BalPortPositive**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTop.SB_BalPortPositive  'Read`
C++ Syntax	HRESULT get_SB_BalPortPositive(long *bVal)
Interface	IBalancedTopology

SB_SEPort Property

Description	With a Single-ended - Balanced topology, returns the PNA port number that is connected to the DUT's Single-ended port. Use SetSBPorts Method to set the port mapping for a Single-Ended - Balanced topology.
VB Syntax	*var* = *balTopology*.**SB_SEPort**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTopology.SB_SEPort 'Read`
C++ Syntax	HRESULT get_SB_SEPort(long *bVal)
Interface	IBalancedTopology

SBalMeasurement Property

Description Sets and returns the measurement for the Single-Ended - Balanced topology.

VB Syntax *balMeas*.**SBalMeasurement** = *value*

Variable **(Type) - Description**

balMeas A BalancedMeasurement **(object)**

value **(String)** - Single-ended - Balanced Measurement parameter. Not case-sensitive. Choose from:

Sss11	Ssd12	Ssc12
Sds21 Scs21	Sdd22 Scd22	Sdc22 Scc22
Imb	CMRR1 (Sds21/Scs21)	CMRR2 (Ssd12/Ssc12)

Return Type Sss11

Default Not Applicable

Examples

```
balMeas.SBalMeasurement  = "Ssd12" 'Write
variable = balMeas.SBalMeasurement   'Read
```

C++ Syntax HRESULT get_SBalMeasurement(BSTR *pVal)

HRESULT put_SBalMeasurement(BSTR newVal)

Interface IBalancedMeasurement

Scope Property

Description	Sets or returns the scope of a trigger signal. This determines whether a trigger signal affects a single channel or all channels in the PNA. **Note:** Trigger Modes Point and EverySweep require that Trigger.Scope be set to naChannelTrigger.
VB Syntax	*trigsetup*.**Scope** = *value*
Variable	**(Type) - Description**
trigsetup	A TriggerSetup **(object)**
value	**(enum NATriggerType)** - Trigger type. Choose from: **0 - naGlobalTrigger** - a trigger signal is applied to all triggerable channels **1 - naChannelTrigger -** a trigger signal is applied to the current channel. The next trigger signal will be applied to the next channel;not necessarily the next channel in numeric sequence (1-2-3-4 and so forth).
Return Type	Long Integer
Default	naGlobalTrigger
Examples	`trigsetup.Scope = naGlobalTrigger 'Write` `trigtyp = trigsetup.Scope 'Read`
C++ Syntax	HRESULT get_Scope(tagNATriggerType *pTrigger) HRESULT put_Scope(tagNATriggerType trigger)
Interface	ITriggerSetup

Last Modified:

6-Nov-2007 Updated for new sweep mode

SearchFunction Property

Description Emulates the Tracking function in the marker search dialog box. The value you choose for SearchFunction will determine the type of search that takes place when the Tracking property is set true.

The tracking function finds the selected search function every sweep. In effect, turning Tracking ON is the same as executing one of the "Search..." methods (such as SearchMin, SearchMax) for every sweep.

VB Syntax *mark*.**SearchFunction** = *value*

Variable **(Type) - Description**

mark A Marker **(object)**

value **(enum NAMarkerFunction)** - search function. Choose from:

0 - naMarkerFunction_**None**
1 - naMarkerFunction_**Min**
2 - naMarkerFunction_**Max**
3 - naMarkerFunction_**Target**
4 - naMarkerFunction_**NextPeak**
5 - naMarkerFunction_**PeakRight**
6 - naMarkerFunction_**PeakLeft**

Return Type Long Integer

Default **0** - naMarkerFunction_None

Examples

```
mark.SearchFunction = naMarkerFunction_Target 'When this marker is set to track, it will track the Target value.
```

```
searchfunction = mark.SearchFunction 'Read
```

C++ Syntax HRESULT get_SearchFunction(tagNAMarkerFunction *pVal)
HRESULT put_SearchFunction(tagNAMarkerFunction newVal)

Interface IMarker

SecurityLevel Property

Description Controls the display of frequency information on the PNA screen and printouts.

VB Syntax *app*.**SecurityLevel** *value*

Variable **(Type) - Description**

app An Application **(object)**

value **(enum NASecurityLevel)** -Choose from:

0 - naNoSecurity ALL frequency information is displayed.

1 - naLowSecurity NO frequency information is displayed. Frequency information can be redisplayed using the Security Setting dialog box or this command.

2 - naHighSecurity LOW setting plus GPIB console is disabled. Frequency information can be redisplayed ONLY by performing a Preset, recalling an instrument state with None or Low security settings, or using this command.

3 - naExtraSecurity HIGH setting plus ASCII data saving is disabled. Same method to redisplay frequency information as HIGH setting.

Return Type Long Integer

Default 0 - None

Examples

```
app.SecurityLevel = naLowSecurity 'Write
```

```
level = app.SecurityLevel 'Read
```

C++ Syntax HRESULT get_NASecurityLevel(tagNASecurityLevel *level);
HRESULT put_NASecurityLevel(tagNASecurityLevel level);

Interface IApplication4

Last Modified:

17-Jul-2007 Add Extra level

SegmentNumber Property

Description	Returns the number of the current segment, PowerSensorCalFactorSegment or PowerLossSegment object.
VB Syntax	*seg.***SegmentNumber**
Variable	**(Type) - Description**
seg	**(object)** - A Segment, PowerSensorCalFactorSegment or PowerLossSegment. Get a handle to the object by referring to the item in the appropriate collection (Segments, CalFactorSegments or PowerLossSegments).
Return Type	Long Integer
Default	Not Applicable
Examples	`segNum = seg.SegmentNumber 'returns the segment number -Read`
C++ Syntax	HRESULT get_SegmentNumber(long *pVal)
Interface	ISegment IPowerSensorCalFactorSegment IPowerLossSegment

SelectPort Property

Description	Sets and returns a port mapping for a single port. If this command creates a conflict with an existing port, the PNA will resolve the conflict. **Note:** This command is currently not supported for the Z5623AK44.
VB Syntax	*tset*.**SelectPort***(chNum, portNum) = portValue*
Variable	**(Type) - Description**
tset	A TestsetControl object.
chNum	**(Long)** Channel number of the measurement.
portNum	**(Long)** Physical port number to map.
portValue	**(Long)** **Logical** port value to assign
Return Type	Long
Default	Not Applicable
Examples	`See External Testset Program`
C++ Syntax	HRESULT get_SelectPort(long channelNum, long PortNum long *outPort); HRESULT put_SelectPort(long channelNum, long PortNum long outPort);
Interface	ITestsetControl

ShowStatistics Property

Description Displays and hides the measurement (Trace) statistics (peak-to-peak, mean, standard deviation) on the screen. To display measurement statistics for a narrower band of the X-axis, use StatisticsRange.

The analyzer will display either measurement statistics or Filter Bandwidth statistics; not both.

VB Syntax *meas*.**ShowStatistics** = *value*

Variable **(Type) - Description**

meas A Measurement **(object)**

value **(boolean)** - Boolean value:

True - Show statistics

False - Hide statistics

Return Type Boolean

Default **False**

Examples

```
meas.ShowStatistics = True 'Write
```

```
showstats = meas.ShowStatistics 'Read
```

C++ Syntax HRESULT put_ShowStatistics(VARIANT_BOOL bState)

Interface IMeasurement

ShowProperties Property

Description Turns ON and OFF the display of the test set control status bar. This status bar indicates the test set that is being controlled and the current port mappings.

This setting is turned ON and OFF automatically when the test set is enabled or disabled.

VB Syntax *tset*.**ShowProperties** = *value*

Variable **(Type) - Description**

tset A TestsetControl object.

OR

An E5091Testset object.

value **(Boolean)**

True - Turns display of testset properties ON.

False - Turns display of testset properties OFF.

Return Type Boolean

Default **False** (True when test set control is enabled.)

Examples

```
See E5091A Example Program
```

```
See External Testset Program
```

C++ Syntax HRESULT get_ShowProperties(VARIANT_BOOL *state);
HRESULT put_ShowProperties(VARIANT_BOOL state);

Interface IE5091Testsets

ITestsetControl

SICL Property

Description Allows you to control the PNA via SICL (standard instrument control library). In this mode, the analyzer can receive SCPI commands from the LAN interface or from a program residing on the PNA itself. This command performs the same function as the SICL / GPIB dialog box - **SICL Enabled** checkbox. See Configuring the analyzer for SICL/VISA.

With this method you can augment a test program written using SICL that resides on the PNA so that it will run unattended. An automation script can be written to start the PNA, enable SICL (using the SICL property), and then start the SICL based program.

VB Syntax *app*.**SICL** *value*

Variable **(Type) - Description**

app An Application **(object)**

value **(Boolean)** Choose from:

True - enable SICL

False - disable SICL

Return Type Boolean

Default False

Examples

```
Dim Pna as AgilentPNA835x.Application
Dim siclState as Boolean
Set Pna = CreateObject("AgilentPNA835x.Application")
Pna.SICL = true           'write

siclState = Pna.SICL      'Read
```

C++ Syntax HRESULT get_SICL(VARIANT_BOOL *pVal)

HRESULT put_SICL(VARIANT_BOOL newVal)

Interface IApplication5

SICLAddress Property

Description	Sets and returns the PNA SICL address. This is the address used for SICL over LAN.
VB Syntax	*app*.**SICLAddress** = *value*
Variable	**(Type) - Description**
app	An Application **(object)**
value	(Integer) SICL Address of the PNA. Choose a value between 0 and 30.
Return Type	Short Integer
Default	16
Examples	`address=app.SICLAddress 'Read` `app.SICLAddress=16 'Write`
C++ Syntax	HRESULT get_SICLAddress(short busIndex, short* address); HRESULT put_SICLAddress(short busIndex,short address);
Interface	IApplication8

Simultaneous2PortAcquisition Property

Description	Specifies whether a 2-port calibration will be done with a single set of standards (one port at a time) or with two sets of standards (simultaneously). The AcquireCalStandard2 command uses the same standard index for each calibration class. To specify the calibration standard gender for each port, you must first ensure that the order of calibration class accurately reflects the configuration of your DUT. For example, for a DUT with a male connector on port 1 and a female connector on port 2, order the devices within the S11 classes (A, B, and C) such that the MALE standards are first in the list. Then order the S22 classes specifying the FEMALE standards as the first in the list.
VB Syntax	*cal*.**Simultaneous2PortAcquisition** = *state*
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
state	**(boolean)** - Choose from: **True** - measures 2 ports simultaneously **False** - measures 1 port at a time
Return Type	Boolean
Default	True
Examples	`cal.Simultaneous2PortAcquisition = True`
C++ Syntax	HRESULT put_Simultaneous2PortAcquisition(VARIANT_BOOL bTwoSetsOfStandards) HRESULT Simultaneous2PortAcquisition(VARIANT_BOOL *bTwoSetsOfStandards)
Interface	ICalibrator

Last modified:

9/20/06	Changed default to True
9/12/06	Modified for cross-browser

SmartSweepMaximumIterations Property

Description	Set and read the maximum permitted number of iterations which SMART Sweep may utilize to find the desired compression level, to within the specified tolerance.
VB Syntax	*gca*.**SmartSweepMaximumIterations** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(integer) -** Maximum number of iterations. Choose a value between 1 and 50.
Return Type	Integer
Default	20
Examples	`gca.SmartSweepMaximumIterations = 10 'Write` `iters = gca.SmartSweepMaximumIterations 'Read`
C++ Syntax	HRESULT get_SmartSweepMaximumIterations(int* pVal) HRESULT put_SmartSweepMaximumIterations(int newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

SmartSweepSettlingTime Property

Description	Set and read the amount of time SMART Sweep will dwell at the first point where the input power changes by the Backoff or X level. Learn more.
VB Syntax	*gca*.**SmartSweepSettlingTime** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(double) -** Settling time in seconds. Choose any positive value.
Return Type	Double
Default	0
Examples	`gca.SmartSweepSettlingTime = .01 'Write` `sTime = gca.SmartSweepSettlingTime 'Read`
C++ Syntax	HRESULT get_SmartSweepSettlingTime(double* pVal) HRESULT put_SmartSweepSettlingTime(double newVal)
Interface	IGainCompression

Last Modified:

21-Nov-2007	MX New topic

SmartSweepShowIterations Property

Description Set and read whether to show intermediate results for each iteration in SMART sweep.

VB Syntax *gca*.**SmartSweepShowIterations** = *value*

Variable **(Type) - Description**

gca A GainCompression **(object)**

value **(Boolean)** Choose from:

True Compression traces are updated after each iteration.

False Compression traces are updated after ALL iterations are complete.

Return Type Boolean

Default False

Examples

```
gca.SmartSweepShowIterations = True 'Write
```

```
SShow = gca.SmartSweepShowIterations 'Read
```

C++ Syntax HRESULT get_SmartSweepShowIterations(VARIANT_BOOL *pVal)

HRESULT put_SmartSweepShowIterations(VARIANT_BOOL newVal)

Interface IGainCompression

Last Modified:

21-Nov-2007 MX New topic

SmartSweepTolerance Property

Description	Set and read the acceptable range SMART Sweep will allow for the measured compression level.
VB Syntax	*gca*.**SmartSweepTolerance** = *value*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
value	**(double) -** Tolerance level in dB. Choose a value between .01 and 10
Return Type	Double
Default	.05
Examples	`gca.SmartSweepTolerance = .01 'Write`
	`tol = gca.SmartSweepTolerance 'Read`
C++ Syntax	HRESULT get_SmartSweepTolerance(double* pVal) HRESULT put_SmartSweepTolerance(double newVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

SmoothingAperture Property

Description Specifies or returns the amount of smoothing as a ratio of the number of data points in the measurement trace.

There is no COM command for specifying smoothing by number of aperture points.

VB Syntax *meas*.**SmoothingAperture** = *value*

Variable (Type) - Description

meas A Measurement **(object)**

value **(double)** - Smoothing Aperture. A ratio of (aperture points / trace points). Choose any number between **.01** and **.25**.

Return Type Double

Default .25

Examples

```
meas.SmoothingAperture = .10 'Write
```

```
saperture = meas.SmoothingAperture 'Read
```

C++ Syntax HRESULT get_SmoothingAperture(double *pVal)
HRESULT put_SmoothingAperture(double newVal)

Interface IMeasurement

Last modified:

Oct. 25, 2006 Fixed formula for smoothing

Smoothing Property

Description Turns ON and OFF data smoothing.

VB Syntax *meas*.**Smoothing** = *state*

Variable (Type) - Description

meas A Measurement **(object)**

state **(boolean)**
True - Turns smoothing ON

False - Turns smoothing OFF

Return Type Boolean

Default **False**

Examples

```
meas.Smoothing = False 'Write
```

```
smooth = meas.Smoothing 'Read
```

C++ Syntax HRESULT get_Smoothing(VARIANT_BOOL *pVal)
HRESULT put_Smoothing(VARIANT_BOOL newVal)

Interface IMeasurement

SnPFormat Property

Description	Specifies the format of .SnP files. Use either app.Save (saves data to file) or meas.GetSnPData (reads data into variant array).
VB Syntax	*pref*.**SnPFormat** = *value*
Variable	**(Type) - Description**
pref	A Preferences **(object)**
value	**(string)** - Format of the .S1P, .S2P, .S3P, .S4P data. Choose from: **"MA"** - Linear Magnitude / degrees **"DB"** - Log Mag / degrees **"RI" -** Real / Imaginary **"Auto"** - Format in which the trace is already displayed. If other than Log Mag, Linear Magnitude, or Real/Imag, then the format will be in Real/Imag.
Return Type	String
Default	"Auto"
Examples	`pref.SnPFormat = "MA" 'Write` `format = pref.SnPFormat 'Read`
C++ Syntax	HRESULT get_SnPFormat(BSTR *Format) HRESULT put_SnPFormat(BSTR Format)
Interface	IPreferences

SoundOnFail Property

Description Turns ON or OFF the audio indicator for limit failures.

VB Syntax *limitst*.**SoundOnFail** = *state*

Variable (Type) - Description

limitst A LimitTest **(object)**

state **(boolean)**

False - Turns the sound OFF
True - Turns the sound ON

Return Type Long Integer

Default **True**

Examples

```
Limttest.SoundOnFail = False 'Write
```

```
sound = Limttest.SoundOnFail 'Read
```

C++ Syntax HRESULT get_SoundOnFail(VARIANT_BOOL *pVal)
HRESULT put_SoundOnFail(VARIANT_BOOL newVal)

Interface ILimitTest

Read only

About PNA Options

SourceCount Property

Description Returns the number of sources in the remote PNA.

VB Syntax *value* = *cap*.**SourceCount**

Variable **(Type) - Description**

value (Long) - Variable to store the returned number of sources.

cap A Capabilities **(object)**

Return Type Long

Default Not Applicable

Examples

```
value = cap.SourceCount 'Read
```

C++ Syntax HRESULT get_SourceCount(long * sourceCount);

Interface ICapabilities

Read-only

SourcePort Property

Description	Returns the source port of measurement. To understand how this property is useful, see IMeasurement2 Interface.
VB Syntax	*value* = *meas*.**SourcePort**
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(Long)** - Variable to store the returned value
Return Type	Long Integer
Default	Not Applicable
Examples	`sp = meas.SourcePort`
C++ Syntax	HRESULT SourcePort([out, retval] Long* srcPort);
Interface	IMeasurement2

SourcePortCount Property

Description	Returns the number of ports that can output a signal. To learn more, see Remotely Specifying a Source Port.
VB Syntax	*value* = *cap*.**SourcePortCount**
Variable	**(Type) - Description**
value	(Long) - Variable to store the returned integer value of the number of source ports.
cap	A Capabilities **(object)**
Return Type	Long
Default	Not Applicable
Examples	`value = cap.SourcePortCount 'Read`
C++ Syntax	HRESULT get_SourcePortCount(long * count);
Interface	ICapabilities4

Last Modified:

14-Jan-2007 MX New topic

SourcePortMode Property

Description	Sets the state of the PNA source for the specified port.
VB Syntax	*chan*.**SourcePortMode** *(sourcePort)* = *value*
Variable	**(Type) - Description**
chan	**(object) -** A Channel object
sourcePort	**(long integer)** - The source port for which to make this setting. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.
value	**(enum)** - State of the source. Choose from: 0 - naSourcePortAuto Port power is turned on when required for a measurement. 1 - naSourcePortOn Port power is always ON, regardless of the measurement. 2 - naSourcePortOff Port power is always OFF, regardless of the measurement. **Note:** ON and OFF are valid only on PNA models with two sources.
Return Type	Enum
Default	0 - naSourcePortAuto
Examples	`chan.SourcePortMode(1) = naSourcePortOn 'Write` `state = chan.SourcePortMode(4) 'Read`
C++ Syntax	HRESULT get_SourcePortMode(long sourcePort, enum NASourcePortMode*); HRESULT put_SourcePortMode(long sourcePort, enum NASourcePortMode);
Interface	IChannel9

Last modified:

April 30, 2007	Edited for src strings
10/18/06	MQQ New topic

SourcePortNames Property

Description Returns the string names of ports that can output a signal.

The following is a list of string names for the PNA-X. Your PNA will NOT have all of these ports. Use GetPortNumber Method to return the correct port number for the specified port name.

- “Port 1”
- “Port 2”
- “Port 3”
- “Port 4”
- “Src2 Out1”
- “Src2 Out2”
- “Port 1 Src2”

This command also lists the External Sources that are currently configured and selected.

To learn more, see Remotely Specifying a Source Port.

VB Syntax *value* **=** *cap*.**SourcePortNames**

Variable **(Type) - Description**

value (Variant array) - Variable to store the returned integer value of the number of source ports.

cap A Capabilities **(object)**

Return Type Variant array of string names.

Default Not Applicable

Examples

```
value = cap.SourcePortNames 'Read
```

C++ Syntax HRESULT get_SourcePortNames(VARIANT *names);

Interface ICapabilities4

Last Modified:

23-Jul-2007	Clarification
14-Jan-2007	MX New topic

Source Property

Description	Sets or returns the source of triggering in the PNA.
VB Syntax	*trigSetup.***Source** = *value*
Variable	**(Type) - Description**
trigSetup	A TriggerSetup **(object)**
value	**(enum NATriggerSource)** - Choose from: **0 - naTriggerSourceInternal** - free run **1 - naTriggerSourceManual** - manual trigger source; use app.ManualTrigger to send a trigger signal. **2** - **naTriggerSouceExternal -** a trigger signal is generated when a trigger signal is sensed on the external trigger pin of the Aux IO connector. Use ExternalTriggerConnectionBehavior to configure the characteristics of the external trigger signal. This setting has implications on Calibration. Learn more.
Return Type	Long Integer
Default	naTriggerSourceInternal
Examples	`trigSetup.Source = naTriggerSourceInternal 'Write` `trigsource = trigSetup.Source 'Read`
C++ Syntax	HRESULT get_Source(tagNATriggerSource *pTrigger); HRESULT put_Source(tagNATriggerSource trigger);
Interface	ITriggerSetup

SourcePowerCalPowerOffset Property

Description	Sets or returns a power level offset from the PNA test port power. This can be a gain or loss value (in dB) to account for components you connect between the source and the reference plane of your measurement. For example, specify 10 dB to account for a 10 dB amplifier at the input of your DUT. Cal power is the sum of the test port power setting and this offset value. Following the calibration, the PNA power readouts are adjusted to the cal power. This property performs the same function as the power offset argument on SetCalInfoEx Method, except that this property can read the offset value.
VB Syntax	*chan*.**SourcePowerCalPowerOffset** *(sourcePort) = value*
Variable	**(Type) - Description**
chan	**(object) -** A Channel object
sourcePort	**(long integer)** - The source port for which to set this power offset value.
value	**(double)** - Gain or loss value in dB. Choose a value between -200 and 200.
Return Type	Double
Default	0 dB
Examples	`chan.SourcePowerCalPowerOffset(1) = 10 'Write` `offset = chan.SourcePowerCalPowerOffset(2) 'Read`
C++ Syntax	HRESULT get_SourcePowerCalPowerOffset(long sourcePort, double *pVal); HRESULT put_SourcePowerCalPowerOffset(long sourcePort, double newVal);
Interface	IChannel4

Last Modified:

1-May-2007	Modified link to EX method.

SourcePowerCorrection Property

Description Sets source power correction ON or OFF for a specific source port on this channel, or returns the current ON or OFF state of correction for that source port.

VB Syntax *chan*.**SourcePowerCorrection** *(srcPort) = value*

Variable **(Type) - Description**

chan **(object)** – A Channel object

srcPort **(long integer)** – Source port for which to set or return the ON or OFF state of source power correction.

Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.

value **(boolean)**

False – Turns source power correction OFF for the source port.

True – Turns source power correction ON for the source port.

Return Type Boolean

Default False - Source power correction will turn correction ON

Examples

```
chan.SourcePowerCorrection(1) = False 'Write
calOnPort2 = chan.SourcePowerCorrection(2) 'Read
```

C++ Syntax HRESULT put_SourcePowerCorrection(VARIANT_BOOL bState);

HRESULT get_SourcePowerCorrection(VARIANT_BOOL *bState);

Interface IChannel

Last Modified:

30-Apr-2007 Modified for src strings

SourcePowerOption Property

Description	Enables the source power to be set on individual sweep segments. This property must be set True **before** seg.TestPortPower = *value* is sent. Otherwise, the test port power command will be ignored.
VB Syntax	*segs*.**SourcePowerOption** = *state*
Variable	**(Type) - Description**
segs	A Segments collection **(object)**
state	**(boolean)** **True** - Enables variable TestPortPower to be set segment sweep **False** - Disables variable TestPortPower to be set segment sweep
Return Type	Boolean
Default	False
Examples	`segs.SourcePowerOption = True 'Write` `powerOption = SourcePowerOption 'Read`
C++ Syntax	HRESULT get_SourcePowerOption(VARIANT_BOOL *pVal) HRESULT put_SourcePowerOption(VARIANT_BOOL newVal)
Interface	ISegments

SourcePowerState Property

Description Turns Source Power ON and OFF.

See note about source power state with instrument state save and recall.

VB Syntax *app*.**SourcePowerState** = *state*

Variable **(Type) - Description**

app An Application **(object)**

state **(boolean)**

False - Turns Source Power OFF

True **-** Turns Source Power ON

Return Type Boolean

Default True

Examples

```
app.SourcePowerState = True 'Write
```

```
pwr = app.SourcePowerState 'Read
```

C++ Syntax HRESULT get_SourcePowerState(VARIANT_BOOL *pVal)
HRESULT put_SourcePowerState(VARIANT_BOOL newVal)

Interface IApplication

Span Property

Description Sets or returns the Span time of either Gating or Time Domain transform windows

VB Syntax *object*.**Span** = *value*

Variable (Type) - Description

object **(object)** As Gating
or
(object) As Transform

value **(double)** - Span time in seconds. Choose any number between: **2*[(number of points-1) / frequency span]** and **0**

Return Type Double

Default 20ns

Examples

```
Trans.Span = 4.5e-9 'sets the time span of a transform window -Write
Gate.Span = 4.5e-9 'sets the Span time of a gating window -Write

span = Trans.Span 'Read
```

C++ Syntax HRESULT get_Span(double *pVal)
HRESULT put_Span(double newVal)

Interface ITransform
IGating

Read-only

Span Property

Description	Returns the stimulus span of the measurement (stop-start data points). To understand how this property is useful, see IMeasurement2 Interface.
VB Syntax	*value* = *meas*.**Span**
Variable	**(Type) - Description**
value	**(Double)** - Variable to store the returned value.
meas	A Measurement **(object)**
Return Type	Double
Default	Not Applicable
Examples	`Print meas.Span 'prints the span of the measurement`
C++ Syntax	HRESULT get_Span(double * Val);
Interface	IMeasurement2

SSB_BalPortNegative Property

Description With a Single-ended - Single-ended - Balanced topology, returns the PNA port number that is connected to the Negative side of the DUT's Balanced Port.

Use SetSSBPorts Method to set the port mapping for a Single-Ended - Single-Ended - Balanced topology.

VB Syntax *var* = *balTopology*.**SSB_BalPortNegative**

Variable **(Type) - Description**

var (Long Integer) Variable to store the returned value.

balTopology A BalancedTopology **(object)**

Return Type Long Integer

Default Not Applicable

Examples

```
variable = balTopology.SSB_BalPortNegative  'Read
```

C++ Syntax HRESULT get_SSB_BalPortNegative(long *bVal)

Interface IBalancedTopology

SSB_BalPortPositive Property

Description	With a Single-ended - Single-ended - Balanced topology, returns the PNA port number that is connected to the Positive side of the DUT's Balanced Port. Use SetSSBPorts Method to set the port mapping for a Single-Ended - Single-Ended - Balanced topology.
VB Syntax	*var* = *balTopology*.**SSB_BalPortPositive**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTopology.SSB_BalPortPositive  'Read`
C++ Syntax	HRESULT get_SSB_BalPortPositive(long *bVal)
Interface	IBalancedTopology

SSB_SEPort1 Property

Description	With a Single-ended - Single-ended - Balanced topology, returns the PNA port number that is connected to the DUT's Logical Port 1. Use SetSSBPorts Method to set the port mapping for a Single-Ended - Single-Ended - Balanced topology.
VB Syntax	*var* = *balTopology*.**SSB_SEPort1**
Variable	**(Type) - Description**
var	(Long Integer) Variable to store the returned value.
balTopology	A BalancedTopology **(object)**
Return Type	Long Integer
Default	Not Applicable
Examples	`variable = balTopology.SSB_SEPort1  'Read`
C++ Syntax	HRESULT get_SSB_SEPort1(long *bVal)
Interface	IBalancedTopology

SSB_SEPort2 Property

Description With a Single-ended - Single-ended - Balanced topology, returns the PNA port number that is connected to the DUT's Logical Port 2.

Use SetSSBPorts Method to set the port mapping for a Single-Ended - Single-Ended - Balanced topology.

VB Syntax *var* = *balTopology*.**SSB_SEPort2**

Variable **(Type) - Description**

var (Long Integer) Variable to store the returned value.

balTopology A BalancedTopology **(object)**

Return Type Long Integer

Default Not Applicable

Examples

```
variable = balTopology.SSB_SEPort2  'Read
```

C++ Syntax HRESULT get_SSB_SEPort2(long *bVal)

Interface IBalancedTopology

SSBMeasurement Property

Description	Sets and returns the measurement for the Single-Ended - Single-Ended - Balanced topology.
VB Syntax	*balMeas*.**SSBMeasurement** = *value*
Variable	**(Type) - Description**
balMeas	A BalancedMeasurement **(object)**
value	**(String)** - Single-ended - Single-ended - Balanced Measurement parameter. Not case sensitive. Choose from:

Sss11	Sss12	Ssd13	Ssc13
Sss21	Sss22	Ssd23	Ssc23
Sds31	Sds32	Sdd33	Sdc33
Scs31	Scs32	Scd33	Scc33
Imb1	Imb2	CMRR1 (Sds31/Scs31)	CMRR2 (Sds32/Scs32)

Return Type String

Default Sss11

Examples

```
balMeas.SSBMeasurement = "Sss11" 'Write
variable = balMeas.SSBMeasurement  'Read
```

C++ Syntax

HRESULT get_SSBMeasurement(BSTR *pVal)

HRESULT put_SSBMeasurement(BSTR p newVal)

Interface IBalancedMeasurement

Stage1Coefficients Property

Description	Sets and returns the digital filter coefficients of stage1.
VB Syntax	*spm4*.**Stage1Coefficients** = *value*
Variable	**(Type) - Description**
spm4	A SignalProcessingModuleFour **(object)**
value	**(Variant Array)** Coefficients. An array of real values.
Return Type	Variant
Default	Stage dependent.
Examples	`spm4.Stage1Coefficients = 0,0.1,0.7,0.7,0.1 'Write` `mode = spm4.Stage1Coefficients 'Read`
C++ Syntax	HRESULT get_Stage1Coefficients(VARIANT* pCoefs); HRESULT put_Stage1Coefficients(VARIANT pCoefs);
Interface	ISignalProcessingModuleFour

Last Modified:

18-Jun-2007 MX New topic

Stage1Frequency Property

Description	Sets and returns the Numerically Controlled Oscillator (NCO) frequency of the Stage 1 filter. This command is only used when FilterMode Property is set to Manual.
VB Syntax	*spm4*.**Stage1Frequency** = *value*
Variable	**(Type) - Description**
spm4	A SignalProcessingModuleFour **(object)**
value	**(Double)** Stage 1 Frequency. Min value= 0 Hz, Max value= 15 MHz. Or programmatically use MinimumIFFrequency Property and MaximumIFFrequency Property to determine the range of settable values.
Return Type	Double
Default	9 MHz
Examples	`spm4.Stage1Frequency = 9E6 'Write` `mode = spm4.Stage1Frequency 'Read`
C++ Syntax	HRESULT get_Stage1Frequency(double *val); HRESULT put_Stage1Frequency(double val);
Interface	ISignalProcessingModuleFour

Last Modified:

18-Jun-2007 MX New topic

Stage1MaximumCoefficient Property

Description	Returns the maximum value of any single coefficient.
VB Syntax	*value* = *spm4*.**Stage1MaximumCoefficient**
Variable	**(Type) - Description**
value	**(Long)** Variable to store the returned Max coefficient.
spm4	A SignalProcessingModuleFour **(object)**
Default	Not Applicable
Examples	`mode = spm4.Stage1MaximumCoefficient 'Read`
C++ Syntax	HRESULT get_Stage1MaximumCoefficient(long* val);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007	MX New topic

Stage1MaximumCoefficientCount Property

Description	Returns the maximum number of coefficients for Stage1.
VB Syntax	*value* = *spm4*.**Stage1MaximumCoefficientCount**
Variable	**(Type) - Description**
value	**(Long)** Variable to store the returned Max coefficient count.
spm4	A SignalProcessingModuleFour **(object)**
Default	Not Applicable
Examples	`mode = spm4.Stage1MaximumCoefficientCount 'Read`
C++ Syntax	HRESULT get_Stage1MaximumCoefficientCount(long* val);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007	MX New topic

Stage1MaximumCoefficientSum Property

Description	Returns the maximum sum of all Stage1 coefficients.
VB Syntax	*value* = *spm4*.**Stage1MaximumCoefficientSum**
Variable	**(Type) - Description**
value	**(__int64* val)** Variable to store the returned Max sum of all coefficients.
spm4	A SignalProcessingModuleFour **(object)**
Default	Not Applicable
Examples	`mode = spm4.Stage1MaximumCoefficientSum 'Read`
C++ Syntax	HRESULT get_Stage1MaximumCoefficientSum(__int64* val);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Stage1MinimumCoefficientCount Property

Description	Returns the minimum number of coefficients for Stage1
VB Syntax	*value* = *spm4*.**Stage1MinimumCoefficientCount**
Variable	**(Type) - Description**
value	**(Long)** Variable to store the returned Min coefficient count.
spm4	A SignalProcessingModuleFour **(object)**
Default	Not Applicable
Examples	`mode = spm4.Stage1MinimumCoefficientCount 'Read`
C++ Syntax	HRESULT get_Stage1MinimumCoefficientCount(long* val);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Stage2Coefficients Property

Description	Sets and returns Stage2Coefficients.
VB Syntax	*spm4*.**Stage2Coefficients** = *value*
Variable	**(Type) - Description**
spm4	A SignalProcessingModuleFour **(object)**
value	**(Variant)** An array of real numbers. Filter coefficients
Return Type	Variant
Default	Not Applicable
Examples	`spm4.Stage2Coefficients =  'Write` `mode = spm4.Stage2Coefficients 'Read`
C++ Syntax	HRESULT get_Stage2Coefficients(VARIANT* pCoefs); HRESULT put_Stage2Coefficients(VARIANT pCoefs);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007	MX New topic

Stage2MaximumCoefficient Property

Description	Returns the maximum value of any single coefficient.
VB Syntax	*value* = *spm4*.**Stage2MaximumCoefficient**
Variable	**(Type) - Description**
value	**(Long)** Variable to store the returned Max coefficient.
spm4	A SignalProcessingModuleFour **(object)**
Default	Not Applicable
Examples	`mode = spm4.Stage2MaximumCoefficient 'Read`
C++ Syntax	HRESULT get_Stage2MaximumCoefficient(long* val);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Read-only   About PNA-X Pulsed Capabilities

Stage2MaximumCoefficientCount Property

Description	Returns the maximum number of coefficients for Stage2
VB Syntax	*value* = *spm4*.**Stage2MaximumCoefficientCount**
Variable	**(Type) - Description**
value	**(Long)** Variable to store the returned Max coefficient count.
spm4	A SignalProcessingModuleFour **(object)**
Default	Not Applicable
Examples	`mode = spm4.Stage2MaximumCoefficientCount 'Read`
C++ Syntax	HRESULT get_Stage2MaximumCoefficientCount(long* val);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007	MX New topic

Read-only

About PNA-X Pulsed Capabilities

Stage2MaximumCoefficientSum Property

Description	Returns the maximum sum of all Stage2 coefficients.
VB Syntax	*value* = *spm4*.**Stage2MaximumCoefficientSum**
Variable	**(Type) - Description**
value	**(__int64* val)** Variable to store the returned Max sum of all coefficients.
spm4	A SignalProcessingModuleFour **(object)**
Default	Not Applicable
Examples	`mode = spm4.Stage2MaximumCoefficientSum 'Read`
C++ Syntax	HRESULT get_Stage2MaximumCoefficientSum(__int64* val);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Stage2MinimumCoefficientCount Property

Description	Returns the minimum number of coefficients for Stage2
VB Syntax	*value* = *spm4*.**Stage2MinimumCoefficientCount**
Variable	**(Type) - Description**
value	**(Long)** Variable to store the returned Min coefficient count.
spm4	A SignalProcessingModuleFour **(object)**
Default	Not Applicable
Examples	`mode = spm4.Stage2MinimumCoefficientCount 'Read`
C++ Syntax	HRESULT get_Stage2MinimumCoefficientCount(long* val);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007	MX New topic

Stage3FilterType Property

Description	Sets and returns the Stage 3 filter type. This command is only used when FilterMode is set to Manual.
VB Syntax	*spm4*.**Stage3FilterType** = *value*
Variable	**(Type) - Description**
spm4	A SignalProcessingModuleFour **(object)**
value	(String) Filter type. Chose from: • **"RECT"** Rectangular Window Filter • **"TUKEY"** Tukey Filter • **"PWIN"** Pulse window filter
Default	TUKEY
Examples	`spm4.Stage3FilterType = "PWIN"` `mode = spm4.Stage3FilterType 'Read`
C++ Syntax	HRESULT get_Stage3FilterType(BSTR* pFType); HRESULT put_Stage3FilterType(BSTR GType);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Stage3FilterTypes Property

Description	Returns a list of strings for the currently supported filter types that can be used for the stage 3 filter. This command is only used when FilterMode is set to False (Manual). See Stage3FilterType for a list of currently supported filter types.
VB Syntax	*values*= *spm4*.**Stage3FilterTypes**
Variable	**(Type) - Description**
value	**(Variant)** Variable to store the returned filter types.
spm4	A SignalProcessingModuleFour **(object)**
Return Type	Variant Array
Default	Not Applicable
Examples	`mode = spm4.Stage3FilterTypes 'Read`
C++ Syntax	HRESULT get_Stage3FilterTypes(VARIANT* pTypes);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Stage3Parameter Property

Description	Sets and returns the Stage 3 filter parameters. Must first select the filter type using Stage3FilterType before setting these parameters Use Stage3Parameters to return a list of the available parameters for the currently selected filter type.
VB Syntax	*spm4*.**Stage3Parameter***(param) = value*
Variable	**(Type) - Description**
spm4	A SignalProcessingModuleFour **(object)**
param	**(String**) Filter parameter. Choose from: **"C" -** Tap count (Tukey, RECT, PWIN) **"P"** - Period (PWIN ONLY) **"D"** - Delay (PWIN ONLY) **"W"** - Width (PWIN ONLY) **"R" -** Ramp Count (PWIN ONLY)
value	**(String)** Parameter Value for the specified stage 3 parameter. Use Stage3ParameterMaximum and Stage3ParameterMinimum to return a range of values for the specified parameter.
Default	**RECT:** C = 1 **PWIN:** C=1E6, P=10ms, D=50us, W=50us, R=7 **TUKEY:** C=1
Examples	`spm4.Stage3Parameter("C") = 2` `mode = spm4.Stage3Parameter("pwin") 'Read`
C++ Syntax	HRESULT get_Stage3Parameter(BSTR pName, double* pVal); HRESULT put_Stage3Parameter(BSTR pName, double pVal);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Stage3ParameterMaximum Property

Description	Returns maximum parameter value for the current filter type.
VB Syntax	*values*= *spm4*.**Stage3ParameterMaximum** *(parameter)*
Variable	**(Type) - Description**
value	**(Variant)** Variable to store the maximum parameter value.
spm4	A SignalProcessingModuleFour **(object)**
parameter	**(String)** Parameter name. See Stage3Parameter Property for a list of parameters.
Return Type	Double
Default	Not Applicable
Examples	`mode = spm4.Stage3ParameterMaximum ("c") 'Read`
C++ Syntax	HRESULT get_Stage3ParameterMaximum(BSTR pName, double* pVal);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Read-only [About PNA-X Pulsed Capabilities]

Stage3ParameterMinimum Property

Description	Returns minimum parameter value for the current filter type.
VB Syntax	*values= spm4*.**Stage3ParameterMinimum** *(parameter)*
Variable	**(Type) - Description**
value	**(Variant)** Variable to store the minimum parameter value.
spm4	A SignalProcessingModuleFour **(object)**
parameter	**(String)** Parameter name. See Stage3Parameter Property for a list of parameters.
Return Type	Double
Default	Not applicable
Examples	`mode = spm4.Stage3ParameterMinimum ("c") 'Read`
C++ Syntax	HRESULT get_Stage3ParameterMinimum(BSTR pName, double* pVal);
Interface	ISignalProcessingModuleFour

Last Modified:

1-Jan-2007 MX New topic

Stage3Parameters Property

Description	Returns the names of parameters for the current filter type. Use Stage3FilterType Property to set the filter type.
VB Syntax	*values*= *spm4*.**Stage3Parameters**
Variable	**(Type) - Description**
value	**(Variant)** Variable to store the returned parameter names.
spm4	A SignalProcessingModuleFour **(object)**
Return Type	Variant
Default	Not Applicable
Examples	`mode = spm4.Stage3Parameters 'Read`
C++ Syntax	HRESULT get_Stage3Parameters(VARIANT* pNames);
Interface	ISignalProcessingModuleFour

Last Modified:

18-Jan-2007 MX New topic

Read-only

About Trace Statistics

StandardDeviation Property

Description	Returns the standard deviation of the measurement. To retreive all 3 statistics value at the same time, use meas.GetTraceStatistics
VB Syntax	*stdev* = *meas*.**StandardDeviation**
Variable	**(Type) - Description**
stdev	**(single)** - Variable to store standard deviation value
meas	A Measurement **(object)**
Return Type	Single
Default	Not applicable
Examples	`stdev = meas.StandardDeviation 'Read`
C++ Syntax	HRESULT get_StandardDeviation(float* stdDeviation)
Interface	IMeasurement

StandardForClass Property - Superseded

Description **Superseded** This command sets a **single** standard to a calibration class. Does NOT set or dictate the order for measuring the standards.

Use GetStandardForClass and SetStandardForClass. These commands allow up to seven standards to be assigned to a cal class.

VB Syntax *calKit*.**StandardForClass**(*class, portNum) = value*

Variable **(Type) - Description**

calKit A CalKit **(object).** Use calKit.GetCalStandard to get a handle to the standard.

class **(enum NACalClass)** Standard. Choose from:

1 - naClassA

2 - naClassB

3 - naClassC

4 - naClassD

5 - naClassE

6 - naReferenceRatioLine

7 - naReferenceRatioThru

SOLT Standards

1 - naSOLT_Open

2 - naSOLT_Short

3 - naSOLT_Load

4 - naSOLT_Thru

5 - naSOLT_Isolation

TRL Standards

1 - naTRL_Reflection

2 - naTRL_Line_Reflection

3 - naTRL_Line_Tracking

4 - naTRL_Thru

5 - naTRL_Isolation

portNum **(long) -** The port number the standard will be connected to. For example, you may have a 3.5mm connector designated for port 1, and Type N designated for port 2.

value **(long)** - Calibration class number. Choose a number between **1** and **8.** The *<value>* numbers are associated with the following calibration classes:

<*value*>	**Class**	**Description**
1	S11A	Reflection standard
2	S11B	Reflection standard
3	S11C	Reflection standard
4	S21T	Thru standard
5	S22A	Reflection standard
6	S22B	Reflection standard
7	S22C	Reflection standard
8	S21T	Thru standard

Return Type Long Integer

Default Not Applicable

Examples

```
calKit.StandardForClass(naSOLT_Short, 1) = 1
```

```
Kclass = calKit.StandardForClass(naSOLT_Short, 1)
```

C++ Syntax HRESULT put_StandardForClass (NACalClass item, long pNum);

HRESULT get_StandardForClass (NACalClass* item, long *pNum);

Interface ICalKit

Read-only | About Cal sets

StartFrequency (Cal Set) Property

Description	Returns the start frequency that is stored in the Cal Set.
VB Syntax	*value* = *CalSet*.**StartFrequency** *(range)*
Variable	**(Type) - Description**
value	**(double)** - returned Start frequency in Hertz.
CalSet	CalSet **(object)**
range	**(Long)** Choose from: 0 - Source and receiver frequency
Return Type	Double
Default	Not Applicable
Examples	`start = calset.StartFrequency(1)'Reads the start frequency stored in the cal set.`
C++ Syntax	HRESULT get_StartFrequency(double *pVal)
Interface	ICalSet3

Last modified:

Nov. 1, 2006	New command - split from ch.StartFreq

StartFrequency Property

Description Sets or returns the start frequency of the channel.

or

Sets or returns the start frequency of the segment.

or

Sets or returns the start frequency of the FOM Range.

See also Measurement2 interface

VB Syntax *object*.**StartFrequency** = *value*

Variable **(Type) - Description**

object Any of the following:

Channel **(object)**

Segment **(object)**

FOMRange **(object)**

value **(double)** - Start frequency in Hertz. Choose any number between the **minimum** and **maximum** frequencies of the analyzer.

Return Type Double

Default Channel - Minimum frequency of the analyzer

Segment - 0

FOMRange - Minimum frequency of the analyzer

Examples

```
chan.StartFrequency = 4.5e9 'sets the start frequency of a linear sweep for the channel object -Write
```

```
startfreq = Chan.StartFrequency 'Read
```

C++ Syntax HRESULT get_StartFrequency(double *pVal)

HRESULT put_StartFrequency(double newVal)

Interface IChannel

ISegment

IFOMRange

Last modified:

8-Mar-2007	Added FOMRange
Nov. 1, 2006	Removed Cal Set object. There is now a new cs.StartFreq

StartPower Property

Description Sets the start power of the analyzer when sweep type is set to Power Sweep. Frequency of the measurement is set with chan.CWFrequency.

VB Syntax *object*.**StartPower** = *value*

Variable **(Type) - Description**

object One of the following:

- Channel (object)
- CalSet (object) - Read-only property

value **(double)** - Start Power in dBm.

Note: The range of settable power values depends on the PNA model and if source attenuators are installed. To determine the range of values, use cap.MaximumSourceALCPower and cap.MinimumSourceALCPower

Auto attenuation is not allowed in Power Sweep.

Return Type Double

Default 0

Examples

```
Chan.StartPower = -10 'Write
```

```
strtpwr = Chan.StartPower 'Read
```

C++ Syntax HRESULT get_StartPower(double *pVal)
HRESULT put_StartPower(double newVal)

Interface IChannel

|CalSet3

Last Modified:

7-Jan-2008 Removed FOMRange

8-Mar-2007 Added FOMRange

Start Property

Description Sets or returns the start time of either Gating or Time Domain transform windows

VB Syntax *object*.**Start** = *value*

Variable **(Type) - Description**

object **(object)** As Gating
or
(object) As Transform

value **(double)** - Start time in seconds. Choose any number between:
± (number of points-1) / frequency span

Return Type Double

Default -10ns

Examples

```
Trans.Start = 4.5e-9 'sets the start time of a transform window -Write
Gate.Start = 4.5e-9 'sets the start time of a gating window - Write
```

```
strt = Trans.Start 'Read
```

C++ Syntax HRESULT get_Start(double *pVal)
HRESULT put_Start(double newVal)

Interface ITransform
IGating

Read-only

Start Property

Description	Returns the stimulus value of the first data point for the measurement. To understand how this property is useful, see IMeasurement2 Interface.
VB Syntax	*value* = *meas*.**Start**
Variable	**(Type) - Description**
value	**(Double)** - Variable to store the returned value
meas	A Measurement **(object)**
Return Type	Double
Default	Not Applicable
Examples	`Print meas.Start 'prints the stimulus value of the first data point`
C++ Syntax	HRESULT get_Start (double * Val);
Interface	IMeasurement2

Write/Read

State Property

Description Turns an Object ON and OFF.

VB Syntax *object*.**State** = *value*

Variable **(Type) - Description**

object Applies to any of the following objects:

FOM

Gating

InterfaceControl

LimitTest

Port Extension- Superseded (See Fixturing Object)

Segment

Transform

Equation

> **Notes:**
>
> - **LimitTest.State** - If using Global Pass/Fail status, trigger the PNA AFTER turning Limit testing ON.
> - **Segment.State** - At least ONE segment must be ON or Sweep Type is automatically set to **Linear**.

value **(boolean)** -

False - Turns *obj* OFF

True - Turns *obj* ON

Return Type Boolean

Default Depends on the object:

0 - FOM

0 - Gating

0 - InterfaceControl

0 - LimitTest

0 - Port Extension

1 - Segment

0 - Transform

0 - Equation

Examples

```
Seg.State = 1 'Turns the segment object ON -Write
```

```
tran = Trans.State 'returns the state of Transform -Read
```

C++ Syntax

HRESULT get_State(VARIANT_BOOL *pVal)
HRESULT put_State(VARIANT_BOOL newVal)

Interface

ISegment

IInterfaceControl

ITransform

IGating

ILimitTest

IPortExtension

IFOM

IEquation

IEmbeddedLO

Last Modified:

13-Apr-2007 Added EmbeddedLO

Write/Read

State Property

Description Turns the specified pulse generator ON and OFF.

VB Syntax *pulse.***State** *(n)* = *value*

Variable **(Type) - Description**

pulse A PulseGenerator **(object)**

n **(Integer)** Pulse generator number. Choose from 0 to 4.

0 is the generator that pulses the ADC.

value ON (or 1) - turns pulse output ON.

OFF (or 0) - turns pulse output OFF.

Return Type Boolean

Default OFF (0)

Examples

```
pulse.State(1) = True 'Write
```

```
value = pulse.State(4) 'Read
```

C++ Syntax HRESULT get_State(integer pulse, bool* on_off);

HRESULT put_State(integer pulse, bool on_off);

Interface IPulseGenerator

Last Modified:

2-Jan-2007 MX New topic

Statistics Range Property

Description	Sets the User Range number for calculating measurement statistics. Set the start and stop values for a User Range with chan.UserRangeMin and chan.UserRangeMax. There are 16 User Ranges per channel. User ranges are applied independently to any measurement.
VB Syntax	*meas*.**StatisticsRange** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(long integer)** - Range Number. Choose any number between 0 and 16 **0** is Full Span **1 - 16** are user-defined ranges
Return Type	Long Integer
Default	0
Examples	`meas.StatisticsRange = 2 'Write` `statrange = meas.StatisticsRange 'Read`
C++ Syntax	HRESULT get_StatisticsRange(long* rangeNumber) HRESULT put_StatisticsRange(long rangeNumber)
Interface	IMeasurement

StatusAsString Property

Description	Returns a string that describes the result of the last tuning sweeps.
VB Syntax	*value* = *embedLODiag*.**StatusAsString**
Variable	**(Type) - Description**
value	**(String)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
Return Type	**(String)**
Default	Not Applicable
Examples	`data= embedLO.StatusAsString 'read`
C++ Syntax	HRESULT get_StatusAsString(BSTR* status);
Interface	IEmbededLODiagnostic

Last Modified:

12-Apr-2007 MX New topic

StepRiseTime Property

Description	Sets or returns the Rise time of the stimulus in Low Pass Step Mode.
VB Syntax	*trans*.**StepRiseTime** = *value*
Variable	**(Type) - Description**
trans	A Transform **(object)**
value	**(double)** - Rise time in seconds. Choose any number between **5.0e-13** and **1.63e-14.**
Return Type	Double
Default	0

Examples	`trans.StepRiseTime = 1.0e-14 'sets the step rise time to 100 psec. -Write`
	
	`rt = trans.StepRiseTime 'Read`

C++ Syntax	HRESULT get_StepRiseTime(double *pVal) HRESULT put_StepRiseTime(double newVal)
Interface	ITransform

Read-only

About Embedded LO

StepData Property

Description Returns an array of data from the specified tuning sweep.

VB Syntax *value* = *embedLODiag*.**StepData** *(n)*

Variable (Type) - Description

value **(Variant Array)** Variable to store the returned data.

embedLODiag An EmbeddedLODiagnostic **(object)**

n (Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.

Default Not Applicable

Examples

```
data= embedLO.StepData 3 'read
```

C++ Syntax HRESULT StepData(long sweep,VARIANT* pArray);

Interface IEmbededLODiagnostic

Last Modified:

12-Apr-2007 MX New topic

StepTitle Property

Description	Returns the title of the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**StepTitle** *(n)*
Variable	**(Type) - Description**
value	**(String)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.StepTitle 3 'read`
C++ Syntax	HRESULT StepTitle (long sweep, BSTR * title);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

StimulusValues Property

Description	Returns multiple X-axis frequency arrays (source and response) needed by frequency offset measurements. The arrays contain one frequency value for each data point.
VB Syntax	*value* = *calSet*.**StimulusValues** *(range)*
Variable	**(Type) - Description**
calSet	CalSet **(object) -** Read-only property
range	**(Long)** Specify **0** to return source frequencies. Specify **1** to return response frequencies.
Return Type	1-dimensional variant array
Default	Not Applicable
Examples	`array = CalSet.StimulusValues 'Read`
C++ Syntax	HRESULT get_StimulusValues (long range, VARIANT* vals)
Interface	ICalSet3

Last Modified:

19-Oct-2007 Fixed title and syntax

StopFrequency Property

Description	Sets or returns the stop frequency of the channel **or** Sets or returns the stop frequency of the segment. **or** Sets or returns the stop frequency of the FOMRange. see also Measurement2 interface
VB Syntax	*object*.**StopFrequency** = *value*
Variable	**(Type) - Description**
object	Any of the following: Channel **(object)** Segment **(object)** FOMRange **(object)**
value	**(double)** - Stop frequency in Hertz. Choose any number between the **minimum** and **maximum** frequencies of the analyzer.
Return Type	Double
Default	Channel - Maximum frequency of the analyzer. Segment - 0 FOMRange - Maximum frequency of the analyzer.
Examples	`chan.StopFrequency = 4.5e9 'sets the stop frequency for the channel object -Write` `stopfreq = Chan.StopFrequency 'Read`
C++ Syntax	HRESULT get_StopFrequency(double *pVal) HRESULT put_StopFrequency(double newVal)
Interface	IChannel ISegment IFOMRange

Last modified:

8-Mar-2007	Added FOMRange
Nov. 1, 2006	Removed Cal Set object - created cs.stopfreq

StopFrequency (Cal Set) Property

Description	Returns the stop frequency that is stored in the Cal Set.
VB Syntax	*value* = *CalSet*.**StopFrequency** *(range)*
Variable	**(Type) - Description**
value	**(double)** - returned Stop frequency in Hertz.
CalSet	CalSet **(object)**
range	**(Long)** Choose from: 0 - Source and receiver frequency
Return Type	Double
Default	Not Applicable
Examples	`stop = calset.StopFrequency(1)'Reads the stop frequency stored in the cal set.`
C++ Syntax	HRESULT get_StopFrequency(double *pVal)
Interface	|CalSet3

Last modified:

Nov. 1, 2006 New command - split from ch.StopFreq

StopPower Property

Description Sets the Stop Power of the analyzer when sweep type is set to Power Sweep. Frequency of the measurement is set with chan.CWFrequency.

VB Syntax *object*.**StopPower** = *value*

Variable **(Type) - Description**

object One of the following:

- Channel (object)
- CalSet (object) - Read-only property

value **(double)** - Stop Power in dB. Start Power in dB.

Note: The range of settable power values depends on the PNA model and if source attenuators are installed. To determine the range of values, use cap.MaximumSourceALCPower and cap.MinimumSourceALCPower

Auto attenuation is not allowed in Power Sweep.

Return Type Double

Default 0

Examples

```
Chan.StopPower = -10 'Write
```

```
stppwr = Chan.StopPower 'Read
```

C++ Syntax HRESULT get_StopPower(double *pVal)
HRESULT put_StopPower(double newVal)

Interface IChannel

|CalSet3

Last Modified:

7-Jan-2008 Removed FOMRange

8-Mar-2007 Added FOMRange

About Time Domain

Write/Read

Stop Property

Description Sets or returns the Stop time of either Gating or Time Domain transform windows

VB Syntax *object*.**Stop** = *value*

Variable **(Type) - Description**

object **(object)** As Gating
or
(object) As Transform

value **(double)** - Start time in seconds. Choose any number between:
± (number of points-1) / frequency span

Return Type Double

Default 10 ns

Examples

```
Trans.Stop = 4.5e-9 'sets the stop time of a transform window -Write
Gate.Stop = 4.5e-9 'sets the stop time of a gating window -Write
```

```
stp = Trans.Stop 'Read
```

C++ Syntax HRESULT get_Stop(double *pVal)
HRESULT put_Stop(double newVal)

Interface ITransform
IGating

Read- only

Stop Property

Description	Returns the stimulus value of the last data point for the measurement. To understand how this property is useful, see IMeasurement2 Interface.
VB Syntax	*value* = *meas*.**Stop**
Variable	**(Type) - Description**
value	**(Double)** Variable to store the returned value
meas	A Measurement **(object)**
Return Type	Double
Default	Not Applicable
Examples	`Print meas.Stop 'prints the stimulus value of the last data point`
C++ Syntax	HRESULT get_Stop(double * Val);
Interface	IMeasurement2

strPort2Pdeembed_S2PFile Property

Description Sets and returns the 2 port De-embedding .S2P file name for the specified port number. Model is applied when both the file name is specified and **User** is specified using Port2PdeembedCktModel Property.

Learn more about S2P files.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**strPort2Pdeembed_S2PFile**(*port*) = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive circuit model.

value **(String)** Full path, file name, and extension (.s2P) of the de-embedding circuit.

Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents

Return Type String

Default Not Applicable

Examples

```
fixture.strPort2Pdeembed_S2PFile(2) = "C:\Program Files\Agilent\Network Analyzer\Documents\myFile.s2p" 'Write
```

```
value = fixture.strPort2Pdeembed_S2PFile(1) 'Read
```

C++ Syntax HRESULT get_strPort2Pdeembed_S2PFile(short port BSTR *bstrFile)

HRESULT put_strPort2Pdeembed_S2PFile(short port BSTR bstrFile)

Interface IFixturing

strPortMatch_S2PFile Property

Description Sets and returns the Port Matching 'S2P' file name for the specified port number. Model is applied when both the file name is specified and **User** is specified using PortMatchingCktModel Property.

Learn more about S2P files.

Note: This command affects ALL measurements on the channel.

VB Syntax *fixture*.**strPort2PMatch_S2PFile***(port)* = *value*

Variable **(Type) - Description**

fixture A Fixturing **(object)**

port **(Integer)** Port number to receive circuit model.

value **(String)** Full path, file name, and extension (.s2P) of the matching circuit.

Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents".

Return Type String

Default Not Applicable

Examples

```
fixture.strPort2PMatch_S2PFile(2) = "C:\Program Files\Agilent\Network Analyzer\Documents\myFile.s2p" 'Write
```

```
value = fixture.strPort2PMatch_S2PFile(1) 'Read
```

C++ Syntax HRESULT get_strPort2PMatch_S2PFile(short port BSTR *bstrFile)

HRESULT put_strPort2PMatch_S2PFile(short port BSTR bstrFile)

Interface IFixturing

Read/Write

SweepEndMode Property

Description Sets and reads the event that will cause the Sweep End line to go to a low state. The line will return to a high state after the appropriate calculations are complete.

Note: This line is connected to the following pins on the HANDLER IO connector and AUX IO connector in the PNA. Therefore, this command will affect both of these connectors in the same way.

VB Syntax *object*.**SweepEndMode** = *value*

Variable **(Type) - Description**

object **(object) -** A HandlerIO or AuxIO object

value (enum as NASweepEndMode) Choose from:

0 - naSweep - the line goes low when each sweep is complete

1 - naChannelSweep - the line goes low when all the sweeps for each channel is complete.

2 - naGlobalSweep - the line goes low when all sweeps for all triggerable channels are complete.

Return Type Long Integer

Default 0 - naSweep

Examples

```
HWAuxIO.PassFailMode = naSweep 'Write
value = HWAuxIO.PassFailMode 'Read
```

C++ Syntax HRESULT put_SweepEndMode (tagNASweepEndMode Mode);

HRESULT get_SweepEndMode (tagNASweepEndMode* Mode);

Interface IHWAuxIO

IHWMaterialHandlerIO

SweepHoldOff Property

Description	Returns a boolean that represents the state of SweepHoldoff line (pin2) of the External Test Set connector.
VB Syntax	*value* = *ExtIO*.**SweepHoldOff**
Variable	**(Type) - Description**
value	**(boolean)** - Variable to store the returned data
ExtIO	**(object) -** An External IO object
Return Type	Boolean **False** - indicates the line is being held at a TTL Low **True** - indicates the line is being held at a TTL High
Default	Not Applicable
Examples	`value = ExtIO.SweepHoldOff`
C++ Syntax	HRESULT get_SweepHoldOff(VARIANT_BOOL* bValue);
Interface	IHWExternaTestSetIO

SweepGenerationMode Property

Description Sets the method used to generate a sweep: continuous ramp (analog) or discrete steps (stepped).

VB Syntax *object*.**SweepGenerationMode** = *value*

Variable **(Type) - Description**

object Channel **(object)**

or

CalSet **(object) -** Read-only property

value **(enum NASweepGenerationModes)** - **Choose either:**

0 - naSteppedSweep - source frequency is CONSTANT during measurement of eah displayed point. More accurate than Analog. Dwell time can be set in this mode.

1 - naAnalogSweep - source frequency is continuously RAMPING during measurement of each displayed point. Faster than Stepped. Sweep time (not dwell time) can be set in this mode.

Return Type Long Integer

Default Analog

Examples

```
Chan.SweepGenerationMode = naAnalogSweep 'Write
```

```
swpgen = Chan.SweepGenerationMode 'Read
```

C++ Syntax HRESULT get_SweepGenerationMode(tagNASweepGenerationModes* pVal)
HRESULT put_SweepGenerationMode(tagNASweepGenerationModes newVal)

Interface IChannel

|CalSet3

SweepTime Property

Description Sets the Sweep time of the analyzer. If sweep time accuracy is critical, use ONLY the values that are attained using the up and down arrows next to the sweep time entry box. See Sweep Time.

VB Syntax *object*.**SweepTime** = *value*

Variable **(Type) - Description**

object Channel **(object)**

or

Segment **(object)** first set SweepTimeOption to true.

or

CalSet **(object) -** Read-only property

value **(double)** - Sweep time in seconds. The maximum sweep time of the PNA is 86400 seconds (1 day).

To set the fastest sweep speed possible, set this value to 0.

Return Type Double

Default 0

Examples

```
chan.SweepTime = 3e-3 'Write
```

```
swptme = chan.SweepTime 'Read
```

C++ Syntax HRESULT get_SweepTime(double *pVal)
HRESULT put_SweepTime(double newVal)

Interface IChannel

CalSet3

ISegment2

SweepTimeOption Property

Description	Enables the Sweep time or Dwell time to be set on individual sweep segments. This property must be set True **before** the sweep or dwell time commands are sent. Otherwise, those commands will be ignored.
VB Syntax	*segs*.**SweepTimeOption** = *state*
Variable	**(Type) - Description**
segs	A Segments collection **(object)**
state	**(boolean)** **True** - Enables Sweep or Dwell time to be set independently. **False** - Disables Sweep or Dwell time from being set independently.
Return Type	Boolean
Default	False
Examples	`segs.SweepTimeOption = True 'Write` `timeOption = SweepTimeOption 'Read`
C++ Syntax	HRESULT get_SweepTimeOption(VARIANT_BOOL *pVal) HRESULT put_SweepTimeOption(VARIANT_BOOL newVal)
Interface	ISegments3

Last modified:

9/29/06 MQQ New command

Write/Read [About Sweep Types]

SweepType Property

Description	Sets and returns the type of sweep.
VB Syntax	*object*.**SweepType** = *value*
Variable	**(Type) - Description**
object	One of the following: • Channel (object) • FOMRange (object) Must be an UNCOUPLED range. • CalSet (object) - Read-only property
value	**(enum NASweepTypes)** - Choose from: **0 - naLinearSweep** **1 - naLogSweep** **2 - naPowerSweep** **3 - naCWTimeSweep** **4 - naSegmentSweep** **Note**: Sweep type cannot be set to Segment sweep if there are no segments turned ON. A segment is automatically turned ON when a application is created.
Return Type	Long Integer
Default	naLinearSweep
Examples	`chan.SweepType = naPowerSweep 'Write` `swptyp = chan.SweepType 'Read`
C++ Syntax	HRESULT get_SweepType(tagNASweepTypes* pVal) HRESULT put_SweepType(tagNASweepTypes newVal)
Interface	IChannel |CalSet3 IFOMRange

Last Modified:

8-Mar-2007 Added FOMRange

Write/Read

About System Impedance

SystemImpedanceZ0 Property

Description	Sets and returns the impedance for the analyzer.
VB Syntax	*app*.**SystemImpedanceZ0** = *value*
Variable	**(Type) - Description**
app	An Application **(object)**
value	(double) Analyzer Impedance. Choose any number between 0 and 1000 ohms.
Return Type	Double
Default	50
Examples	`app.SystemImpedanceZ0 = 75 'Write` `z0 = app.SystemImpedanceZ0 'Read`
C++ Syntax	HRESULT get_SystemImpedanceZ0(double dSystemZ0) HRESULT put_SystemImpedanceZ0(double *pdSystemZ0)
Interface	IApplication

SystemName Property

Description	Returns the computer name of the PNA.
VB Syntax	*name* = *app*.**SystemName**
Variable	**(Type) - Description**
name	(String) Variable to store the returned computer name.
app	An Application **(object)**
Return Type	String
Default	Not Applicable
Examples	`name = app.SystemName`
C++ Syntax	HRESULT SystemName(BSTR* computerName)
Interface	IApplication

TargetValue Property

Description Sets the target value for the marker when doing Target Searches (SearchTargetLeft, SearchTarget, SearchTargetRight).

VB Syntax *mark*.**TargetValue** = *value*

Variable **(Type) - Description**

mark A Marker **(object)**

value **(single)** - Target value. Choose any number between: **-500** and **500**

Return Type Single

Default 0

Examples

```
mark.TargetValue = 10.5 'Write
```

```
target = mark.TargetValue 'Read
```

C++ Syntax HRESULT get_TargetValue(float *pVal)
HRESULT put_TargetValue(float newVal)

Interface IMarker

TestPortPower Property

Description Sets or returns the RF power level for the channel
or
Sets or returns the RF power level of the segment.

VB Syntax *object*.**TestPortPower**(*srcPort*) = *value*

Variable **(Type) - Description**

object A Channel **(object) -** to set coupled power, use chan.CouplePorts. If CouplePorts = False, then each port power can be set independently. Otherwise, chanTestPortPower (1) = value sets power level at both ports.
or
A CalSet **(object)**

or

A Segment **(object)**

srcPort **(long integer)** - Source Port number.

Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.

value **(double)** - RF Power in dBm.

Note: The range of settable power values depends on the PNA model and if source attenuators are installed. To determine the range of values, use cap.MaximumSourceALCPower and cap.MinimumSourceALCPower

Actual achievable leveled power depends on frequency.

Return Type Double

Default 0

Examples

```
chan.TestPortPower(1) = 5 'sets the port 1 RF power level for the channel object -Write
```

```
powerlev = Chan.TestPortPower(1) 'Read
```

C++ Syntax HRESULT get_TestPortPower(long port, double *pVal)
HRESULT put_TestPortPower(long port, double newVal)

Interface IChannel
ICalSet3
ISegment

Last Modified:

30-Apr-2007 Edited for src strings

TestSetType Property

Description	Returns the Test Set Type (model) that was used for the Cal Set.
VB Syntax	*TSType* = *calset*.**TestSetType**
Variable	**(Type) - Description**
TSType	(String) Variable to store the returned test set model.
calset	A Cal Set object.
Return Type	String
Default	Depends on the test set.
Example	`TSType = calset.TestSetType`
C++ Syntax	HRESULT get_OutputPorts(BSTR *mapping);
Interface	ICalset5

Last modified:

9/18/06	MQ Added for multiport

Text Property

Description Specifies an equation or expression to be used on the measurement.

VB Syntax *eq*.**Text** = *eqText*

Variable **(Type) - Description**

eq Equation **(object)**

eqText **(String)** - Any valid equation or expression.

Return Type String

Default Not Applicable

Examples

```
eq.Text =  "foo=S11/S21"
```

```
equation = eq.Text 'Read
```

C++ Syntax

HRESULT get_Text(BSTR *equation)
HRESULT put_Text(BSTR equation)

Interface IEquation

Read/Write

ThruCalMethod Property

Description	Sets and returns the method for performing the thru portion of the calibration.
VB Syntax	*obj*.**ThruCalMethod** = *value*
Variable	**(Type) - Description**
obj	SMCType (object) or VMCType (object)
value	(String) Specifies the Thru method. Case insensitive - include spaces. Choose from: "Default" "Flush Thru" **or** "FLUSH" "Unknown Thru" **or** "UNKN" "Adapter Removal" **or** "ADAP"
Return Type	String
Default	**Default**
Examples	`SMC.ThruCalMethod = "UNKN"`
C++ Syntax	HRESULT put_ThruCalMethod(enum NAThruCalMethod thruMethod); HRESULT get_ThruCalMethod(enum NAThruCalMethod *thruMethod);
Interface	SMCType VMCType

Read/Write

ThruCalMethod Property Superseded

Description	This command is replaced by PathThruMethod Property . Sets and returns the method for performing the Cal Method and the THRU portion of the calibration.
VB Syntax	*guidedCal* .**ThruCalMethod** = *value*
Variable	**(Type) - Description**
guidedCal	GuidedCalibration (object)
value	(Enum as NAThruCalMethod) Choose from: **0 - naDefaultCalMethod** - allow the PNA to choose the best possible method (from the following) depending on whether the device or ECal module is insertable or non-insertable and given the model number of the PNA. (default selection if omitted.) **1 - naAdapterRemoval** - Perform Adapter removal calibration. **2 - naFlushThru** - Perform Flush Thru calibration. **3 - naDefinedThru -** Perform Defined Thru calibration. If performing an ECal, this is the Thru standard in the ECal module. **4 - naUnknownThru** - Perform Unknown Thru calibration. **5 - naSOLT** - Perform SOLT calibration **6 - naTRL** - Perform TRL calibration **7 - naQSOLT** - Perform QSOLT calibration. Learn more about Cal Methods
Return Type	Enum
Default	0 - naDefaultCalMethod
Examples	`guided.ThruCalMethod = naDefinedThru`
C++ Syntax	HRESULT get_ThruCalMethod(enum NAThruCalMethod *thruMethod); HRESULT put_ThruCalMethod(enum NAThruCalMethod thruMethod);
Interface	IGuidedCalibration

Last Modified:

30-Apr-2007 MX Superseded

Read/Write

ThruPortList Property

Description

Note: Available only on PNA releases 5.0 and greater.

Sets and returns the thru connection port pairs for the calibration.

- For 3-port cals, specify at least two pairs.
- For 4-port cals, specify at least three pairs.
- For highest accuracy, specify more than the minimum pairs.
- For a 2-port cal, there is only one port pair. It is the only pair in the list and it is required.

Learn more about Thru method and port pairings.

See an example of a 4-port guided calibration using COM.

VB Syntax *guidedCal*.**ThruPortList** = *t1a, t1b, t2a, t2b, t3a, t3b*

Variable (Type) - Description

guidedCal GuidedCalibration (object)

t1a, t1b... **(Variant)** Port numbers in pairs - a one-dimensional array of Long integers.

t1a, t1b (Thru1 - port A and port B)

t2a, t2b (Thru2 - port A and port B)

t3a, t3b (Thru3 - port A and port B)

Return Type **Variant -** a one-dimensional array of Long integers.

Default Not Applicable

Example

```
thruList = Array(1,2,1,3,1,4)
guided.ThruPortList = thruList
'Sets the following three thru connections for a 4-port
calibration:
Thru 1 - ports 1 and 2
Thru 2 - ports 1 and 3
Thru 3 - ports 1 and 4
```

C++ Syntax

HRESULT get_ThruPortList(VARIANT* portList);

HRESULT put_ThruPortList(VARIANT portList);

Interface IGuidedCalibration

Title Property

Description Writes or reads a custom title for the window. Newer entries replace (not append) older entries.Turn the title ON and OFF with TitleState

VB Syntax *win*.**Title** = *string*

Variable **(Type) - Description**

win A NaWindow **(object)**

string **(long)** - Title limited to 50 characters.

Return Type String

Default Null

Examples

```
win.Title = "Hello World" 'Write
```

```
titl = win.Title 'Read
```

C++ Syntax HRESULT get_Title(BSTR *title)
HRESULT put_Title(BSTR title)

Interface INAWindow

TitleState Property

Description	Turns ON and OFF the window title. Write a window title with Title
VB Syntax	*win.***TitleState** = *state*
Variable	**(Type) - Description**
win	A NaWindow **(object)**
state	**(boolean)** **True** - Title ON **False** - Title OFF
Return Type	Boolean
Default	False
Examples	`win.TitleState = True 'Write` `titlestate = win.TitleState 'Read`
C++ Syntax	HRESULT get_TitleState(VARIANT_BOOL* bState) HRESULT put_TitleState(VARIANT_BOOL bState)
Interface	INAWindow

TotalNumberOfPoints Property

Description	Read the total number of points a complete GCA measurement will generate. • For 2D modes, this is Frequency * Power points • For SMART Sweep, this is Frequency points. The total can NOT exceed the PNA maximum. See Frequency and Power points.
VB Syntax	*value* = *gca*.**TotalNumberOfPoints**
Variable	**(Type) - Description**
value	**(integer)** Variable to store the returned total number of points
gca	A GainCompression **(object)**
Return Type	Integer
Default	5226 (201 * 26)
Example	`totPoints = gca.TotalNumberOfPoints 'Read`
C++ Syntax	HRESULT get_TotalNumberOfPoints(int* pVal)
Interface	IGainCompression

Last Modified:

11-Sep-2007 MX New topic

Touchscreen Property

Description Sets and reads the state of the PNA-X Touchscreen (ON and OFF).

This setting remains until changed again from the front-panel or remote command.

VB Syntax *app*.**Touchscreen** = *state*

Variable **(Type) - Description**

app An Application **(object)**

state **(boolean)**

False (0) - Disables use of Touchscreen

True (1) - Enables use of Touchscreen

Return Type Boolean

False - OFF

True - ON

Default **TRUE** when shipped from factory.

Examples

```
app.Touchscreen = True 'Write
```

```
coupl = app.Touchscreen 'Read
```

C++ Syntax HRESULT put_Touchscreen(VARIANT_BOOL bState)

HRESULT get_Touchscreen(VARIANT_BOOL *bState)

Interface IApplication12

Last Modified:

23-Feb-2007 MX New topic

TraceMath Property

Description	Performs math operations on the measurement object and the trace stored in memory. (There MUST be a trace stored in Memory to perform math. See Meas.DataToMemory method.)
VB Syntax	*meas*.**TraceMath** = *value*
Variable	**(Type) - Description**
meas	A measurement **(object)**
value	**(enum NAMathOperation)** - Choose from: **0** - naDataNormal **1** - naDataMinusMemory **2** - naDataPlusMemory **3** - naDataDivMemory **4** - naDataTimesMemory
Return Type	NAMathOperation
Default	Normal (0)
Examples	`meas.TraceMath = naDataMinusMemory 'Write` `mathOperation = meas.TraceMath 'Read`
C++ Syntax	HRESULT get_TraceMath(tagNAMathOperation* pMathOp) HRESULT put_TraceMath(tagNAMathOperation mathOp)
Interface	IMeasurement

Write/Read

About Trace Title

TraceTitle Property

Description	Writes and reads data for the trace title area. The trace title is embedded in the trace status field. The title is turned ON and OFF using TraceTitleState.
VB Syntax	*meas*.**TraceTitle** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(string)** - Title to be displayed. Any characters (no spaces), enclosed with quotes.
Return Type	String
Default	Not Applicable
Examples	`meas.TraceTitle = "My new s11 measurement"` `title = TraceTitle 'Read`
C++ Syntax	HRESULT get_TraceTitle(BSTR *title); HRESULT put_TraceTitle(BSTR title);
Interface	IMeasurement8

Last Modified:

16-Jan-2007 MX New topic

TraceTitleState Property

Description	Turns display of the Trace Title ON or OFF. When turned OFF, the previous trace title returns. Create a trace title using TraceTitle Property
VB Syntax	*meas*.**TraceTitleState** = *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(boolean)** - Choose from: **True** - Turns the trace title ON **False** - Turns the trace title OFF
Return Type	Boolean
Default	False
Examples	`meas.TraceTitleState = False` `title = TraceTitleState 'Read`
C++ Syntax	HRESULT get_TraceTitleState(VARIANT_BOOL *isTitleON); HRESULT put_TraceTitleState(VARIANT_BOOL isTitleON);
Interface	IMeasurement8

Last Modified:

18-Jun-2007 MX New topic

Tracking Property

Description This property, when on, executes the search function (marker.SearchFunction) every sweep.

In effect, turning Tracking ON is the same as executing one of the immediate, one-time, "Search..." methods (such as SearchMin, SearchMax) for every sweep.

VB Syntax *mark*.**Tracking** = *state*

Variable **(Type) - Description**

mark A Marker **(object)**

state **(boolean)** - Tracking state. Choose from:

False - Tracking OFF

True - Tracking ON

Return Type Boolean

Default False

Examples

```
mark.Tracking = False 'Write
```

```
markTracking = mark.Type 'Read
```

C++ Syntax HRESULT put_Tracking(VARIANT_BOOL bOn)
HRESULT get_Tracking(VARIANT_BOOL * pbOn)

Interface IMarker

TriggerDelay Property

Description Sets and reads the trigger delay for all measurements (GLOBAL). This delay is only applied while in app.Source = naTriggerSourceExternal and trigsetup.Scope = naGlobalTrigger . After an external trigger is applied, the start of the sweep is delayed for the specified delay value plus any inherent latency.

To apply a trigger delay for a channel only, use ExternalTriggerDelay Property.

VB Syntax *app*.**TriggerDelay** = *value*

Variable **(Type) - Description**

app An Application **(object)**

value **Double**- Trigger delay value in seconds. Range is from 0 to 107

Return Type Double

Default 0

Examples

```
app.TriggerDelay = .003  'Write
```

```
delay = app.TriggerDelay 'Read
```

C++ Syntax HRESULT get_TriggerDelay(double *delay);

HRESULT put_TriggerDelay(double delay)

Interface IApplication

TriggerInPolarity Property

Description Specifies the polarity of the trigger IN signal to which the PNA will respond.

VB Syntax *auxTrig*.**TriggerInPolarity** = *value*

Variable **(Type) - Description**

auxTrig An AuxTriger **(object)**

value **(enum NATriggerPolarity)** - Choose from:

naTriggerPositive PNA responds to leading edge or HIGH level

naTriggerNegative PNA responds to trailing edge or LOW level.

Set Edge or Level triggering using TriggerInType Property

Return Type Enum

Default NEGative

Exaamples

```
auxTrig.TriggerInPolarity = naTriggerPositive 'Write
```

```
value = auxTrig.TriggerInPolarity 'Read the value
```

C++ Syntax HRESULT get_TriggerInPolarity(enum NATriggerPolarity *val);
HRESULT put_TriggerInPolarity(enum NATriggerPolarity val);

Interface IAuxTrigger

Last Modified:

14-Dec-2006 MX New topic

TriggerInType Property

Description	Specifies the type of aux trigger input being supplied to the PNA.
VB Syntax	*auxTrig*.**TriggerInType** = *value*
Variable	**(Type) - Description**
auxTrig	An AuxTrigger **(object)**
value	**(**enum NATriggerSignalType) Choose from: **naTriggerEdge** PNA responds to the leading edge of a signal **naTriggerLevel** PNA responds to the level (HIGH or LOW) of a signal
Return Type	Enum
Default	
Exaamples	`auxTrig.TriggerInType = naTriggerEdge 'Write` `value = auxTrig.TriggerInType 'Read the value`
C++ Syntax	HRESULT get_TriggerInType(enum NATriggerSignalType *val); HRESULT put_TriggerInType(enum NATriggerSignalType val);
Interface	IAuxTrigger

Last Modified:

14-Dec-2006 MX New topic

TriggerOutDuration Property

Description	Specifies the width of the output pulse, which is the time that the Aux trigger output will be asserted.
VB Syntax	*auxTrig*.**TriggerOutDuration** = *value*
Variable	**(Type) - Description**
auxTrig	An AuxTrigger **(object)**
value	**(single)** - Duration value in seconds. Choose a value between 1E-6 and 1.
Return Type	Double
Default	1E-6 sec
Exaamples	`auxTrig.TriggerOutDuration = 1e-3 'Write` `value = auxTrig.TriggerOutDuration 'Read the value`
C++ Syntax	HRESULT get_TriggerOutDuration(double *val); HRESULT put_TriggerOutDuration(double val);
Interface	IAuxTrigger

Last Modified:

14-Dec-2006	MX New topic

TriggerOutInterval Property

Description Specifies how often a trigger output signal is sent.

VB Syntax *auxTrig*.**TriggerOutInterval** = *value*

Variable **(Type) - Description**

auxTrig An AuxTrigger **(object)**

value **(single)** - Choose from:

0 - naTriggerModePoint - a single data point is measured with each trigger signal the channel receives. Subsequent trigger signals continue to go to the channel in Point mode until the channel measurements are complete. This is effectively the same as trigger point mode.

1 - naTriggerModeMeasurement - entire traces are swept with a trigger signal. which and how many traces depends on the Scope setting.

Return Type Enum

Default **1 - naTriggerModeMeasurement**

Exaamples

```
auxTrig.TriggerOutInterval = naTriggerModeMeasurement 'Write
```

```
value = auxTrig.TriggerOutInterval 'Read the value
```

C++ Syntax HRESULT get_TriggerOutInterval(enum NATriggerMode *val);
HRESULT put_TriggerOutInterval(enum NATriggerMode val);

Interface IAuxTrigger

Last Modified:

14-Dec-2006 MX New topic

TriggerOutPolarity Property

Description	Specifies the polarity of the trigger output signal being supplied by the PNA.
VB Syntax	*auxTrig*.**TriggerOutPolarity** = *value*
Variable	**(Type) - Description**
auxTrig	An AuxTrigger **(object)**
value	**(enum NATriggerPolarity)** - Choose from: **naTriggerPositive** PNA sends positive going (active HIGH) pulse. **naTriggerNegative** PNA sends negative going (active LOW) pulse.
Return Type	Enum
Default	
Exaamples	`auxTrig.TriggerOutPolarity = naTriggerPositive 'Write` `value = auxTrig.TriggerOutPolarity 'Read the value`
C++ Syntax	HRESULT get_TriggerOutPolarity(enum NATriggerPolarity *val); HRESULT put_TriggerOutPolarity(enum NATriggerPolarity val);
Interface	IAuxTrigger

Last Modified:

14-Dec-2006 MX New topic

TriggerOutPosition Property

Description Specifies whether the Aux trigger out signal is sent Before or After the acquisition.

VB Syntax *auxTrig*.**TriggerOutPosition** = *value*

Variable **(Type) - Description**

auxTrig An AuxTrigger **(object)**

value (enum NATriggerPosition) Choose from:

naTriggerOutBeforeAcquire Use if the external device needs to be triggered before the data is acquired, such as a power meter.

naTriggerOutAfterAcquire Use if the external device needs to be triggered just after data has been acquired, such as an external source. This could be more efficient since it allows the external device to get ready for the next acquisition at the same time as the PNA.

Return Type Enum

Default **naTriggerOutAfterAcquire**

Exaamples

```
auxTrig.TriggerOutPosition = naTriggerOutAfterAcquire 'Write
```

```
value = auxTrig.TriggerOutPosition 'Read the value
```

C++ Syntax HRESULT get_TriggerOutPosition(enum NATriggerPosition *val);
HRESULT put_TriggerOutPosition(NATriggerPosition val);

Interface IAuxTrigger

Last Modified:

14-Dec-2006 MX New topic

TriggerOutputEnabled Property

Description	Enables the PNA to send trigger signals out the rear-panel TRIGGER OUT connector. For more information, see External triggering.
VB Syntax	*trigsetup*.**TriggerOutputEnabled** = *boolean*
Variable	**(Type) - Description**
trigsetup	A TriggerSetup2 **(object)**
boolean	Choose from: **False -** PNA does NOT send output trigger signals. **True -** PNA sends output trigger signals.
Return Type	Boolean
Default	False
Examples	`trigsetup.TriggerOutputEnabled = True 'Write` `atba = trigsetup.TriggerOutputEnabled 'Read`
C++ Syntax	HRESULT get_TriggerOutputEnabled(BOOL *pVal); HRESULT put_TriggerOutputEnabled(BOOL newVal);
Interface	ITriggerSetup2

TuningIFBW Property

Description Set the IF Bandwidth for Broadband and Precise tuning sweeps.

VB Syntax *embedLO*.**TuningIFBW** = *value*

Variable (Type) - Description

embedLO An EmbeddedLO **(object)**

value **(Double)** IF Bandwidth

Return Type **(Double)**

Default 30 kHz

Examples

```
embedLO.TuningIFBW = 10e3 'write
```

```
value = embedLO.TuningIFBW 'read
```

C++ Syntax HRESULT get_TuningIFBW(double* ifbw);
HRESULT put_TuningIFBW(double ifbw);

Interface IEmbededLO

Last Modified:

18-Apr-2007 MX New topic

TuningMode Property

Description Sets and returns the method used to determine the embedded LO Frequency.

VB Syntax *embedLO*.**TuningMode** = *value*

Variable **(Type) - Description**

embedLO An EmbeddedLO **(object)**

value **(Enum as NAEmbeddedLOTuningMode)**

Tuning mode. Choose from:

0 - naEmbeddedLOTuningMode_Broadband_And_Precise

1 - naEmbeddedLOTuningMode_Precise_Only

2 - naEmbeddedLOTuningMode_None

Return Type **(Enum)**

Default 0 - naEmbeddedLOTuningMode_Broadband_And_Precise

Examples

```
embedLO.TuningMode = naEmbeddedLOTuningMode_None 'write

value = embedLO.TuningMode 'read
```

C++ Syntax HRESULT get_TuningMode(enum NAEmbeddedLOTuningMode* mode);

HRESULT put_TuningMode(enum NAEmbeddedLOTuningMode mode);

Interface IEmbededLO

Last Modified:

13-Apr-2007 MX New topic

TuningSweepInterval Property

Description	Set how often a tuning sweep is performed.
VB Syntax	*embedLO*.**TuningSweepInterval** = *value*
Variable	**(Type) - Description**
embedLO	An EmbeddedLO **(object)**
value	**(Long)** Tuning sweep interval.
Return Type	**(Long)**
Default	1

Examples

```
embedLO.TuningSweepInterval = 3 'write .. tuning is performed every third measurement sweep
```

```
value = embedLO.TuningSweepInterval 'read
```

C++ Syntax

HRESULT get_TuningSweepInterval(long* interval);

HRESULT put_TuningSweepInterval(long interval);

Interface IEmbededLO

Last Modified:

18-Apr-2007 MX New topic

Write/Read | About Trigger Mode

TriggerMode Property

Description These settings determine what EACH signal will trigger.

Note: Setting Point and EverySweep mode forces Trigger.Scope = naChannelTrigger.

VB Syntax *chan.***TriggerMode** = *value*

Variable **(Type) - Description**

chan A Channel **(object)**

value **(enum NATriggerMode)** - Choose from:

0 - naTriggerModePoint - Each Manual or External trigger signal causes one data point to be measured.

1 - naTriggerModeMeasurement (superseded - still works but replaced with a more descriptive enum)

1 - naTriggerModeChannel - Each trigger signal causes **ALL traces** in that channel to be swept.

2 - **naTriggerModeEverySweep -** Each Manual or External trigger signal causes **ALL traces that share a source port** to be swept.

Return Type Long Integer

Default **1** - **naTriggerModeChannel**

Examples

```
chan.TriggerMode = naTriggerModePoint 'Write
```

```
trigtyp = chan.TriggerMode 'Read
```

C++ Syntax HRESULT get_TriggerMode (tagNATriggerMode *pMode)
HRESULT put_TriggerMode (tagNATriggerMode newMode)

Interface IChannel

Last Modified:

6-Nov-2007 Added new sweep mode

TriggerSignal Property - Superseded

Description	**Note**: This command has been replaced by Source Property Sets or returns the trigger source.
VB Syntax	*app.***TriggerSignal** = *value*
Variable	**(Type) - Description**
app	An Application **(object)**
value	**(enum NATriggerSignal)** - Choose from: **0 - naTriggerInternal** - free run **1 - naTriggerExternalPositive** - a trigger signal is generated when a TTL high is sensed on the external trigger pin of the Aux IO connector **2 - naTriggerExternalNegative** - a trigger signal is generated when a TTL low is sensed on the external trigger pin of the Aux IO connector. **3 - naTriggerManual** - manual trigger source; use `app.ManualTrigger` to send a trigger signal. **4** - **naTriggerExternalHigh -** a trigger signal is generated when a TTL high is sensed on the external trigger pin of the Aux IO connector **5** - **naTriggerExternalLow -** a trigger signal is generated when a TTL low is sensed on the external trigger pin of the Aux IO connector
Return Type	Long Integer
Default	naTriggerInternal
Examples	`app.TriggerSignal = naTriggerExternalPositive 'Write` `trigsign = app.TriggerSignal 'Read`
C++ Syntax	HRESULT get_TriggerSignal(tagNATriggerSignal *pSignal) HRESULT put_TriggerSignal(tagNATriggerSignal signal)
Interface	IApplication

TriggerType Property - Superseded

Description	**Note**: This property has been replaced with Scope Property. Sets or returns the trigger type which determines the scope of a trigger signal.
VB Syntax	*app*.**TriggerType** = *value*
Variable	**(Type) - Description**
app	An Application **(object)**
value	**(enum NATriggerType)** - Trigger type. Choose from: **0 - naGlobalTrigger** - a trigger signal is applied to all triggerable channels **1 - naChannelTrigger -** a trigger signal is applied to the current channel. The next trigger signal will be applied to the next channel; not necessarily channel 1-2-3-4.
Return Type	Long Integer
Default	naGlobalTrigger
Examples	`app.TriggerType = naGlobalTrigger 'Write` `trigtyp = app.TriggerType 'Read`
C++ Syntax	HRESULT get_TriggerType(tagNATriggerType *pTrigger) HRESULT put_TriggerType(tagNATriggerType trigger)
Interface	IApplication

Type (calstd) Property

Description	Sets and Returns the type of calibration standard.
VB Syntax	*calstd*.**Type** = *value*
Variable	**(Type) - Description**
calstd	A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.
value	**(enum** NACalStandardType**)** -Choose from: **0 - naOpen** **1 - naShort** **2 - naLoad** **3 - naThru**
Return Type	Long Integer
Default	Not Applicable

Examples	`calstd.Type = naOpen 'Write`
	
	`standardtype = calstd.Type 'Read`

C++ Syntax	HRESULT get_Type(tagNACalStandardType *pVal) HRESULT put_Type(tagNACalStandardType newVal)
Interface	ICalStandard

Type (testset) Property

Description	Returns the testset model number.
VB Syntax	*tset*.**Type** *model*
Variable	**(Type) - Description**
model	**(String)** Variable to return the Test set model
tset	A TestsetControl object. Obtained from the ExternalTestsets collection.
Return Type	String
Default	None
Examples	**`testset.type model`** `See External Testset Program`
C++ Syntax	HRESULT get_Type(BSTR *pType);
Interface	ITestsetControl

TZImag Property

Description Sets and Returns the TZImag value (the Imaginary Terminal Impedance value) for the calibration standard. Only applicable when "Type" is set to **naArbitraryImpedance.**

To set the other resistance values, use TZReal

VB Syntax *calstd*.**TZImag** = *value*

Variable **(Type) - Description**

calstd A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.

value **(single)** - Value for TZImag in Ohms

Return Type Single

Default Not Applicable

Examples

```
calstd.TZImag = 15 'Write the value of TZImag to 15 Ohms
```

```
imp0 = calstd.TZImag 'Read the value of TZImag
```

C++ Syntax HRESULT get_TZImag(float *pVal);
HRESULT put_TZImag(float newVal);

Interface ICalStandard2

TZReal Property

Description	Sets and Returns the TZReal value (the real Terminal Impedance value) for the calibration standard. Only applicable when "Type" is set to **naArbitraryImpedance.** To set the other resistance values, use TZImag
VB Syntax	*calstd*.**TZReal** = *value*
Variable	**(Type) - Description**
calstd	A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.
value	**(single)** - Value for TZReal in Ohms
Return Type	Single
Default	Not Applicable
Examples	`calstd.TZReal = 15 'Write the value of TZReal to 15 Ohms` `imp0 = calstd.TZReal 'Read the value of TZReal`
C++ Syntax	HRESULT get_TZReal(float *pVal); HRESULT put_TZReal(float newVal);
Interface	ICalStandard2

Read-only

UnusedChannelNumbers Property

Description	Returns an array of channel numbers that are NOT in use. An unused channel has NO measurements subscribed to it.
VB Syntax	*chanNumbers* = *chans*.**UnusedChannelNumbers** *(NumberOfChannels)*
Variable	**(Type) - Description**
chanNumbers	Variable array to store the returned channel numbers
chans	A Channel collection **(object)**
NumberOfChannels	**(Long Integer)** Number of channels that you are requesting.
Return Type	One-dimensional array of long integers. The size of the array is specified by the *NumberOfChannels* parameter.
Default	Not Applicable
Examples	`chanNumbers = chans.UnusedChannelNumbers(5)`
C++ Syntax	HRESULT get_UnusedChannelNumbers(long numberRequested,VARIANT* channelNumbers);
Interface	IChannels2

Read-only | About Source Power Cal

USBPowerMeterCatalog Property

Description Returns the ID string of power meters / sensors that are connected to the PNA USB. Use the list to select a power sensor for a source power cal.

VB Syntax *list* = *pwrCal*.**USBPowerMeterCatalog**

Variable **(Type) - Description**

list **(String)** Variable to store the returned list of USB power meters.

pwrCal **(object)** – A SourcePowerCalibrator (object)

Return Type Comma-delimited strings

Default Not Applicable

Examples

```
Set pwrCal = pna.SourcePowerCalibrator
list = pwrCal.USBPowerMeterCatalog'Read
```

C++ Syntax HRESULT get_USBPowerMeterCatalog(BSTR *pUSBList);

Interface ISourcePowerCalibrator6

Last Modified:

11-Jul-2007 MX New topic

Read/Write

UseCalWindow Property

Description	Turns Calibration window ON or OFF during a calibration. Learn more about this preference.
VB Syntax	*guidedCal*.**UseCalWindow** = *value*
Variable	**(Type) - Description**
guidedCal	GuidedCalibration (object)
value	**(Boolean)** **True** Show calibration window **False** Hide calibration window
Return Type	**Boolean**
Default	True
Example	`guided.UseCalWindow = True`
C++ Syntax	HRESULT get_UseCalWindow(VARIANT_BOOL* val); HRESULT put_UseCalWindow(VARIANT_BOOL newVal);
Interface	IGuidedCalibration

Last Modified:

12-Sep-2007	MX New topic

Read-only

UsedChannelNumbers Property

Description	Returns an array of channel numbers that are in use. A used channel has at least one measurement subscribed to it
VB Syntax	*chanNumbers* **=** *chans.***UsedChannelNumbers**
Variable	**(Type) - Description**
chanNumbers	Variable array to store the returned channel numbers
chans	A Channel collection **(object)**
Return Type	One-dimensional array of long integers
Default	Not Applicable
Examples	`chanNumbers = chans.UsedChannelNumbers`
C++ Syntax	HRESULT get_UsedChannelNumbers(VARIANT* channelNumbers);
Interface	IChannels2

UsePowerLossSegments Property

Description Specifies if subsequent calls to the AcquirePowerReadings method will make use of the loss table (PowerLossSegments).

VB Syntax *pwrCal*.**UsePowerLossSegments** = *value*

Variable (Type) - Description

pwrCal **(object)** – A SourcePowerCalibrator (object)

value **(boolean)**

False – Do not use loss table

True – Use loss table

Return Type Boolean

Default False

Examples

```
Set powerCalibrator = pna.SourcePowerCalibrator
powerCalibrator.UsePowerLossSegments = 1 'Write
lossTableState = powerCalibrator.UsePowerLossSegments 'Read
```

C++ Syntax HRESULT put_UsePowerLossSegments(VARIANT_BOOL bState);

HRESULT get_UsePowerLossSegments(VARIANT_BOOL *bState);

Interface ISourcePowerCalibrator

UsePowerSensorFrequencyLimits Property

Description Specifies if subsequent calls to the AcquirePowerReadings method will observe frequency values of the MinimumFrequency and MaximumFrequency properties.

VB Syntax *pwrCal*.**UsePowerSensorFrequencyLimits** = *value*

Variable **(Type) - Description**

pwrCal **(object)** – A SourcePowerCalibrator (object)

value **(boolean) -**

False – Do not use power sensor frequency limits. An acquisition will use just one power sensor for the entire sweep, regardless of frequency.

True – Use power sensor frequency limits. A requested acquisition will only succeed for those frequency points which fall between the MinimumFrequency and MaximumFrequency values of that PowerSensor. An acquisition will pause in mid-sweep if the frequency is about to exceed the MaximumFrequency value. When the sweep is paused in this manner, a sensor connected to the other channel input of the power meter can be connected to the measurement port in place of the previous sensor, and then the sweep completed by another call to AcquirePowerReadings. However, the MaximumFrequency specified for the second sensor would need to be sufficient for the sweep to complete.

Return Type Boolean

Default False

Examples

```
Set powerCalibrator = pna.SourcePowerCalibrator
powerCalibrator.UsePowerSensorFrequencyLimits = True'Write
FreqCheck = powerCalibrator.UsePowerSensorFrequencyLimits 'Read
```

C++ Syntax HRESULT put_UsePowerSensorFrequencyLimits(VARIANT_BOOL bState);

HRESULT get_UsePowerSensorFrequencyLimits(VARIANT_BOOL *bState);

Interface ISourcePowerCalibrator

UserRange Property

Description Assigns the marker to the specified User Range. This restricts the marker's x-axis travel to the User Range span, specified with Start and Stop values.

- Each channel has **16** user ranges.
- Markers and trace statistics can be restricted to any user range.
- More than one marker can occupy a user range.
- User ranges can overlap. For example:
  - User range 1 - 3GHz to 5GHz
  - User range 2 - 4GHz to 6GHz

Note: User ranges are especially useful in restricting marker searches to specific areas of the measurement.

VB Syntax *mark*.**UserRange** = *value*

Variable **(Type) - Description**

mark A Marker **(object)**

value **(long integer)** - User Range. Choose any number between 0 and 16 (0=Full Span)

Return Type Long Integer

Default 0 - Full Span

Examples

```
mark.UserRange = 1 'Write
```

```
UseRnge = mark.UserRange 'Read
```

C++ Syntax HRESULT get_UserRange(long *pRangeNumber)
HRESULT put_UserRange(long lRangeNumber)

Interface IMarker

UserRangeMax Property

Description	Sets the stimulus stop value for the specified User Range. This property uses different arguments for the channel and marker objects.
VB Syntax	*chan.***UserRangeMax(***domainType,Mnum***)** = *value* **or** *mark*.**UserRangeMax(***rnum***)** = *value*
Variable	**(Type) - Description**
chan	A Channel **(object)**
mark	A Marker **(object)** To assign a marker to a User Range, use the UserRange Property. **Note:** The Marker object does not require the "domainType" argument.
domainType	**(enum NADomainType)** - Choose from: **0 - naDomainFrequency** **1 - naDomainTime** **2 - naDomainPower**
Mnum	**(long integer)** - User Range number. Choose any number between 1 and 16 (0=Full Span)
value	**(double)** - Stop value. Choose any number within the full span of the channel
Return Type	Double
Default	The current stimulus setting for the channel

Examples	`mark.UserRangeMax(1) = 3e9 'Write`
	`chan.UserRangeMax(naDomainFrequency,1) = 3e9 'Write`
	
	`UseRngeMax = mark.UserRangeMax 'Read`
	`UseRngeMax = chan.UserRangeMax 'Read`

C++ Syntax	HRESULT put_UserRangeMax(tagNADomainType domain, long rangeNumber, double maxValue) HRESULT get_UserRangeMax(tagNADomainType domain, long rangeNumber, double *maxValue)
Interface	IChannel

UserRangeMin Property

Description Sets the stimulus start value for the specified User Range.

This property uses different arguments for the channel and marker objects.

VB Syntax *chan.***UserRangeMin(***domainType,range***)** = *value*
or
mark.**UserRangeMin(***range***)** = *value*

Variable (Type) - **Description**

chan A Channel **(object)**

mark A Marker **(object)**
To assign a marker to a User Range, use the UserRange Property.

Note: The Marker object does not require the domainType argument

domainType **(enum NADomainType)** Type of sweep currently implemented on the channel - Choose from:
0 - naDomainFrequency
1 - naDomainTime
2 - naDomainPower

range **(long)** - User Range number. Choose any number between **1** and **16** (0=Full Span)

value **(double)** - Start value. Choose any number within the full span of the analyzer

Return Type Double

Default The current stimulus setting for the channel

Examples

```
mark.UserRangeMin(1) = 3e9 'Write
chan.UserRangeMin(naDomainFrequency,1) = 3e9 'Write
```

```
UseRngeMin = mark.UserRangeMin 'Read
UseRngeMin = chan.UserRangeMin 'Read
```

C++ Syntax HRESULT put_UserRangeMin(tagNADomainType domain, long rangeNumber, double minValue)
HRESULT get_UserRangeMin(tagNADomainType domain, long rangeNumber, double *minValue)

Interface IChannel

UserPresetEnable Property

Description 'Checks' and 'clears' the enable box on the User Preset dialog box. This only affects subsequent Presets from the front panel user interface.

Regardless of the state of the User Preset Enable checkbox, the app.Preset command will always preset the PNA to the factory preset settings, and app.UserPreset will always perform a User Preset.

VB Syntax *app.***UserPresetEnable** = *state*

Variable **(Type) - Description**

app An Application **(object)**

state **(boolean)** Front Panel User Preset State. Choose from:

False – User Preset OFF

True – User Preset ON

Return Type Boolean

Default False

Examples

```
app.UserPresetEnable = True 'Write
```

```
upreset = app.UserPresetEnable 'Read
```

C++ Syntax HRESULT get_UserPresetEnable(VARIANT_BOOL *pVal)
HRESULT put_UserPresetEnable(VARIANT_BOOL newVal)

Interface IApplication6

Valid Property

Description Returns a boolean value to indicate if the current equation on the measurement is valid. For equation processing to occur, the equation must be valid and ON.

VB Syntax *IsValid* = *eq*.**Valid**

Variable **(Type) - Description**

good **(Boolean)** Variable to store the returned value.

True (1) - equation is valid

False (0) - equation is NOT valid

eq Equation **(object)**

Return Type Boolean

Default Not Applicable

Examples

```
IsValid = eq.Valid 'Read
```

C++ Syntax HRESULT get_Valid(Boolean *equation)

Interface IEquation

Last Modified:

18-Jun-2007 New topic

Read only

ValidConnectorTypes Property

Description Returns a list of connector types for which there are calibration kits.

VB Syntax *value* = *obj*.**ValidConnectorTypes**

Variable **(Type) - Description**

value (Variant) List of connector types

obj Any of the following:

GuidedCalibration (object)

SMCType (object)

VMCType (object)

Return Type Variant

Default Not Applicable

Examples

```
value = SMC.ValidConnectorTypes
```

C++ Syntax HRESULT get_ValidConnectorTypes(VARIANT* connectorTypes);

Interface IGuidedCalibration

SMCType

VMCType

Value Property

Description	Write or read a value (setting) for the current element. See a list of configurable elements and settings for various PNA models.
VB Syntax	*pathElement*.**Value** = *value*
Variable	**(Type) - Description**
pathElement	A PathElement **(object)**
value	**(String)** Value for the element. Use pathElement.Values to return a list of valid settings for this element.
Return Type	String
Default	Not Applicable

Examples	`' Set the "Combiner" element to value "Reversed"`
	`chan.PathConfiguration.Element("Combiner").Value = "Reversed"`
	`setting=pathElement.Value`

C++ Syntax	HRESULT get_Value(BSTR* pValue); HRESULT put_Value(BSTR value);
Interface	IPathElement

Last Modified:

14-Dec-2006 MX New topic

Values Property

Description	Returns an array of valid settings that can be used with the element object. See a list of configurable elements and settings for various PNA models.
VB Syntax	*values* = *pathElement*.**Values**
Variable	**(Type) - Description**
values	**(Variant array)** Variable to store the array of valid settings for the element.
pathElement	A PathElement **(object)**
Return Type	Variant array
Default	Not Applicable
Examples	`settings=pathElement.Values`
C++ Syntax	HRESULT Values(VARIANT* pValues);
Interface	IPathElement

Last Modified:

14-Dec-2006 MX New topic

VelocityFactor Property

Description Sets the velocity factor to be used with Electrical Delay, Port Extensions, and Time Domain marker distance calculations.

VB Syntax *app*.**VelocityFactor** = *value*

Variable (Type) - Description

app An Application **(object)**

value **(double)** - Velocity factor. Choose a number between: **0** and **10**
(.66 polyethylene dielectric; .7 teflon dielectric)

Return Type Double

Default 1

Examples

```
app.VelocityFactor = .66 'Write
```

```
RelVel = app.VelocityFactor 'Read
```

C++ Syntax HRESULT get_VelocityFactor(double *pVal)
HRESULT put_VelocityFactor(double newVal)

Interface IApplication

View Property

Description Sets (or returns) the type of trace displayed on the screen.

VB Syntax *meas*.**View** = *value*

Variable **(Type) - Description**

meas A measurement **(object)**

value **(enum NAView)** - Type of trace. Choose from:

0 - naData
1 - naDataAndMemory
2 - naMemory
3 - naNoTrace

Note: The **naData** trace may reflect the result of a TraceMath operation.

Return Type NAView

Default naData

Examples

```
meas.View = naData 'Write
```

```
trceview = meas.View 'Read
```

C++ Syntax HRESULT get_View(tagNAView* pView)
HRESULT put_View(tagNAView newView)

Interface IMeasurement

Write/Read

Visible Property

Description	Makes the Network Analyzer application visible or not visible. In the Not Visible state, the analyzer cycle time for making measurements can be significantly faster because the display does not process data.
VB Syntax	*app*.**Visible** = *state*
Variable	**(Type) - Description**
app	An Application **(object)**
state	**(boolean)** **False** - Network Analyzer application **NOT** visible **True** - Network Analyzer application **IS** visible
Return Type	Boolean
Default	True
Examples	`app.Visible = False 'Write` `vis = app.Visible 'Read`
C++ Syntax	HRESULT get_Visible(VARIANT_BOOL * bVisible) HRESULT put_Visible(VARIANT_BOOL bVisible)
Interface	IApplication

Write-Read

WGCutoffFreq Property

Description	Sets or returns the value of the waveguide cut off frequency.
VB Syntax	*meas*.**WGCutoffFreq =** *value*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
value	**(double)** - Frequency in Hertz.
Return Type	Double
Default	Not Applicable
Examples	`Print meas.WGCutoffFreq 'prints the value of the waveguide cut off frequency`
C++ Syntax	HRESULT get_WGCutoffFreq(double *pVal); HRESULT put_WGCutoffFreq(double newVal);
Interface	IMeasurement2

Width Property

Description	Sets the pulse width - the amount of time that the pulse is ON.
VB Syntax	*pulse*.**Width** *(n)* = *value*
Variable	**(Type) - Description**
pulse	A PulseGenerator **(object)**
n	**(Integer)** Pulse generator number. Choose from 0 to 4. 0 is the generator that pulses the ADC.
value	**(Double)** Pulse width in seconds. Choose a value from about 33ns to about 70 seconds.
Return Type	Double
Default	1e-4 sec
Examples	`pulse.Width = 1ms 'Write` `value = pulse.Width 'Read`
C++ Syntax	HRESULT get_Width (integer pulse, double* width); HRESULT put_Width (integer pulse, double width);
Interface	IPulseGenerator

Last Modified:

2-Jan-2007	MX New topic

Read-only

WindowNumber Property

Description Returns the window number. You might use this property to identify a particular window so that you can create a new Measurement in that window.

VB Syntax *value* = *win*.**WindowNumber**

Variable **(Type) - Description**

win A NAWindow (object)

value **(long integer) -** Variable to store the returned window number

Return Type Long Integer

Default Not Applicable

Examples

```
value = app.ActiveNAWindow.WindowNumber
```

C++ Syntax HRESULT (long* windowNumber);

Interface INAWindow

WindowState Property

Description Sets or returns the window setting of Maximized, Minimized, or Normal. To arrange all of the windows, use app.ArrangeWindows.

VB Syntax *object.***WindowState** = *value*

Variable **(Type) - Description**

object An Application (object) - main window
or
A NaWindow **(object)** - data windows

value **(enum NAWindowStates)** - The window state. Choose from:
0 - naMinimized - Minimizes the window to an Icon on the lower toolbar
1 - naMaximized - Maximizes the window
2 - naNormal - changes the window size to the user defined setting (between Max and Min).

Return Type Long Integer

Default naMaximized

Examples

```
app.WindowState = naMinimized 'changes the Network Analyzer application window to an icon. -Write
win.WindowState = naNormal 'changes the window defined by the win object variable to user defined settings. -Write
```

```
winstate = app.WindowState 'Read
```

C++ Syntax HRESULT get_WindowState(tagNAWindowStates *pVal)
HRESULT put_WindowState(tagNAWindowStates newVal)

Interface INAWindow
IApplication

XAxisAnnotation Property

Description	Returns the X-Axis annotation of the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**XAxisAnnotation** *(n)*
Variable	**(Type) - Description**
value	**(String)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.XAxisAnnotation 3 'read`
C++ Syntax	HRESULT XAxisAnnotation (long sweep, BSTR* annotation);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

XAxisPointSpacing Property

Description	Sets X-axis Point Spacing for the displaytraces measured with segment sweeps on the active channel.
VB Syntax	*chan*.**XAxisPointSpacing** = *value*
Variable	**(Type) - Description**
chan	A Channel **(object)**
value	**(Enum as naStates)** - Choose from: **0 - naOFF** - Turns X-axis Point Spacing OFF **1 - naON** - Turns X-axis Point Spacing ON
Return Type	Enum
Default	0 - naOFF
Examples	`chan.XAxisPointSpacing = naOFF 'Write` `xspac = chan.XAxisPointSpacing 'Read`
C++ Syntax	HRESULT get_XAxisPointSpacing (tagNAStates *pState); HRESULT put_XAxisPointSpacing (tagNAStates newState);
Interface	IChannel2

XAxisStart Property

Description	Returns the X-Axis start value of the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**XAxisStart** *(n)*
Variable	**(Type) - Description**
value	**(Double)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.XAxisStart 3 'read`
C++ Syntax	HRESULT XAxisStart (long sweep, double* start);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

XAxisStop Property

Description	Returns the X-Axis stop value of the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**XAxisStop** *(n)*
Variable	**(Type) - Description**
value	**(Double)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.XAxisStop 3 'read`
C++ Syntax	HRESULT XAxisStop (long sweep, double* start);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

Read-only [About Embedded LO](#)

YAxisAnnotation Property

Description	Returns the Y-Axis annotation of the specified tuning sweep.
VB Syntax	*value* = *embedLODiag*.**YAxisAnnotation** *(n)*
Variable	**(Type) - Description**
value	**(String)** Variable to store the returned data.
embedLODiag	An EmbeddedLODiagnostic **(object)**
n	(Long) Tuning sweep number. Use NumberOfSweeps to find the number of sweeps taken.
Default	Not Applicable
Examples	`data= embedLO.YAxisAnnotation 3 'read`
C++ Syntax	HRESULT YAxisAnnotation (long sweep, BSTR* annotation);
Interface	IEmbededLODiagnostic

Last Modified:

13-Apr-2007 MX New topic

YScale Property

Description	Sets or returns the Y-axis Per-Division value of the active trace.
VB Syntax	*trace*.**YScale** = *value*
Variable	**(Type) - Description**
trace	A Trace **(object)**
value	**(double)** - Scale /division number. Units and range depend on the current data format.
Return Type	Double
Default	10 (db)
Examples	`trac.YScale = 5 'Write` `yscl = trac.YScale 'Read`
C++ Syntax	HRESULT get_YScale(double *pVal) HRESULT put_YScale(double newVal)
Interface	ITrace

Z0 Property

Description	Sets and Returns the characteristic impedance for the calibration standard.
VB Syntax	*calstd*.**Z0** = *value*
Variable	**(Type) - Description**
calstd	A CalStandard **(object).** Use calKit.GetCalStandard to get a handle to the standard.
value	**(single)** -Impedance in Ohms
Return Type	Single
Default	Not Applicable
Examples	`calstd.Z0 = 50 'Write`
	`impedance = calstd.Z0 'Read`
C++ Syntax	HRESULT get_Z0(float *pVal) HRESULT put_Z0(float newVal)
Interface	ICalStandard

Write-only

About Triggering

Abort Method

Description	Ends the current measurement sweep on the channel.
VB Syntax	*chan.***Abort** [*sync*]
Variable	**(Type) - Description**
chan	**(object)** - A Channel object
sync	**(boolean)** - wait (or not) for the analyzer to stop before processing subsequent commands. Optional argument; if unspecified, value is set to False. Choose from: **True** - synchronize - the analyzer will not process subsequent commands until the current measurement is aborted. **False** - continue processing commands immediately
Return Type	None
Default	None
Examples	`chan.abort True` `chan.abort`
C++ Syntax	HRESULT Abort(VARIANT_BOOL bSynchronize);
Interface	IChannel

Write-only

About Source Power Cal

AbortPowerAcquisition Method

Description	Aborts a source power cal acquisition sweep that is currently in progress.
VB Syntax	*powerCalibrator*.**AbortPowerAcquisition**
Variable	**(Type) - Description**
powerCalibrator	**(object)** - A SourcePowerCalibrator object
Return Type	None
Default	Not Applicable
Examples	`powerCalibrator.AbortPowerAcquisition`
C++ Syntax	HRESULT AbortPowerAcquisition();
Interface	ISourcePowerCalibrator

Write-only

About Calibration Standards

AcquireCalStandard Method - Superseded

Description **Note**: This command has been replaced by AcquireCalStandard2 Method, which provides for acquisition of sliding load standards. All other functionality is identical.

VB Syntax *cal*.**AcquireCalStandard** *std[,index]*

Variable **(Type) - Description**

cal A Calibrator **(object)**

std **(enum NACalClass)** Standard to be measured. Choose from:

1 - naClassA

2 - naClassB

3 - naClassC

4 - naClassD

5 - naClassE

6 - naReferenceRatioLine

7 - naReferenceRatioThru

SOLT Standards

1 - naSOLT_Open

2 - naSOLT_Short

3 - naSOLT_Load

4 - naSOLT_Thru

5 - naSOLT_Isolation

TRL Standards

1 - naTRL_Reflection

2 - naTRL_Line_Reflection

3 - naTRL_Line_Tracking

4 - naTRL_Thru

5 - naTRL_Isolation

index **(long integer)** number of the standard. Optional argument - Used if there is more than one standard required to cover the necessary frequency range. If unspecified, value is set to 1.

Note The behavior has changed with PNA revisions as follows:

- Before 6.01: Accepted 0 and changed it to 1
- 6.01 to 6.04: Did NOT accept 0
- 6.04.11 and higher: Accepts 0 and changes it to 1

Return Type	None
Default	Not Applicable

Examples

```
Cal.AcquireCalStandard naSOLT_Thru 'Write
```

C++ Syntax	HRESULT AcquireCalStandard(tagNACalClass enumClass, short standardNumber)
Interface	ICalibrator

Last modified:

10/05/06	Modified Index argument.

AcquireCalStandard2 Method

Description Measures the specified standard from the selected calibration kit. The calibration kit is selected using app.CalKitType.

For 2-port calibration, it is also necessary to specify direction with AcquisitionDirection.

To omit Isolation from a 2-port calibration, do not Acquire a cal standard for naSOLT_Isolation.

For using two sets of standards, see Simultaneous2PortAcquisition Property.

Note: This command replaces AcquireCalStandard. This command provides for the acquisition of a sliding load cal. All other functionality is identical.

VB Syntax *cal*.**AcquireCalStandard2** *std[,index][,slide]*

Variable **(Type) - Description**

cal A Calibrator **(object)**

std **(enum NACalClass)** Standard to be measured. Choose from:

1 - naClassA

2 - naClassB

3 - naClassC

4 - naClassD

5 - naClassE

6 - naReferenceRatioLine

7 - naReferenceRatioThru

SOLT Standards

1 - naSOLT_Open

2 - naSOLT_Short

3 - naSOLT_Load

4 - naSOLT_Thru

5 - naSOLT_Isolation

TRL Standards

1 - naTRL_Reflection

2 - naTRL_Line_Reflection

3 - naTRL_Line_Tracking

4 - naTRL_Thru

5 - naTRL_Isolation

[index] **(long integer)** Number of the standard. Optional argument - Used if there is more than one standard required to cover the necessary frequency range. If unspecified, value is set to 1.

Note The behavior has changed with PNA revisions as follows:

- Before 6.01: Accepted 0 and changed it to 1
- 6.01 to 6.04: Did NOT accept 0
- 6.04.11 and higher: Accepts 0 and changes it to 1

[slide] (**enum** as NACalStandardSlidingState) Optional argument. State of the sliding load. The slide should be set a minimum of five times. Seven is the maximum that can be stored. Choose from:

0 - **naNotSlidingStd** - not using a sliding load - Default if not specified.

1 - **naSlideIsSet** - slide is set for acquisition

2 - **naSlideIsDone** - this next acquisition will be the last. Calculations will then be performed.

Return Type None

Default Not Applicable

Examples

```
Cal.AcquireCalStandard2 naSOLT_Thru
Cal.AcquireCalStandard2 naSOLT_Thru,2,naNotSlidingStd
'measures the second standard listed in the class of naSOLT_Thru
```

C++ Syntax HRESULT AcquireCalStandard2(NACalClass enumClass, long standardPosition, NACalStandardSlidingState slidingStandardState)

Interface ICalibrator

Last modified:

10/05/06 Modified Index argument.

AcquireCalConfidenceCheckECALEx Method

Description	This method replaces AcquireCalConfidenceCheckECAL Transfers confidence data from the specified ECal module into the measurement's memory trace. The data is transferred to the specified S-parameter on the same channel as this Calibrator object. The characterization within the ECal module that the confidence data will be read from is specified by **ECALCharacterizationEx.** The default value is 0.
VB Syntax	*cal*.**AcquireCalConfidenceCheckECALEx** *Sparam [,ecalModule]*
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
Sparam	**(String)** S-parameter to transfer confidence data to. This parameter must be present on the same channel as the calibrator object.
ecalModule	**(Integer) –** Optional argument. ECal module. Choose from modules **1** through **8** Use IsECALModuleFoundEx to determine the number of modules connected to the PNA Use GetECALModuleInfoEx to return the model and serial number of each module.
Return Type	None
Default	Not applicable
Examples	`Cal.AcquireCalConfidenceCheckECALEx "S11", 2`
C++ Syntax	HRESULT AcquireCalConfidenceCheckECALEx(BSTR strParameter, long moduleNumber = 1);
Interface	ICalibrator4

AcquirePowerReadingsEx Method

Description This command replaces AcquirePowerReadings Method

Initiates a source power cal acquisition.

VB Syntax *powerCalibrator*.**AcquirePowerReadingsEx** *calMethod, acqdevice [,sync]*

Variable **(Type) - Description**

powerCalibrator **(object)** - A SourcePowerCalibrator object

calMethod **(enum NASourcePowerCalMethod)** Selects the calibration method to be used for the source power cal acquisition.

0 – naPowerMeter Use power meter for all readings.

1 - naPowerMeterAndReceiver Power meter for the first iteration; then use the reference receiver for remaining readings if necessary.

2 - naReceiver Use PNA measurement receiver for all readings.

acqdevice **(String)** The specific acquisition device to be used. NOT case sensitive. Choose from:

If *calMethod* = **naPowerMeter** or **naPowerMeterAndReceiver**, choose from:

"ASEN" -- Sensor on power meter channel A.

"BSEN" -- Sensor on power meter channel B.

To use the sensor that currently corresponds to the frequency of interest, use the value from the PowerAcquisitionDevice property.

If *calMethod* = **naReceiver**, choose from the receiver names for your specific PNA using either physical receiver notation or logical receiver notation. For example, "a1" or "A".

[sync] **(boolean)** Optional argument. If not specified, value is set to False. Choose from:

True (1) – The method does not return until this acquisition has completed (the program calling this method is halted while waiting for the method to return).

False (0) – The method initiates an acquisition then returns immediately (while the acquisition still proceeds). The program calling this method can then perform other operations during the acquisition.

Return Type None

Default Not Applicable

Examples

```
powerCalibrator.AcquirePowerReadingsEx naPowerMeter, "asen",
True
powerCalibrator.AcquirePowerReadingsEx naReceiver, "b2"
```

C++ Syntax HRESULT AcquirePowerReadingsEx (tagNASourcePowerCalMethod enumCalMethod, BSTR bstrAcqDevice, VARIANT_BOOL bSync);

Interface ISourcePowerCalibrator4

Last modified:

9/12/06 MQ New command to accommodate receiver only SPC

Write-only

AcquireStep Method

Description	Acquire the measurement data for the specified step in the calibration process. **Note:** Guided Cal allows you to measure standards in any order. See an example.
VB Syntax	*obj*.**AcquireStep** *(n)*
Variable	**(Type) - Description**
obj	Any of the following: GuidedCalibration (object) SMCType (object) VMCType (object)
n	Step number in the calibration process. Use GenerateSteps to determine the total number of steps. Use GetStepDescription to read the description of each step.
Return Type	Not Applicable
Default	Not Applicable
Examples	`VMC.AcquireStep (3)`
C++ Syntax	HRESULT put_AcquireStep([in] long step);
Interface	SMCType VMCType IGuidedCalibration

Last Modified:

20-Jan-2007 Added any order note.

Write-only

Activate Method

Description	Makes an object the Active Object. When making a measurement active, the channel and window the measurement is contained in becomes the active channel and active window. In order to change properties on any of the active objects, you must first have a "handle" to the active object using the **Set** command. For more information, See Getting a Handle to an Object. You do not have to make an object "Active" to set or read its properties remotely. But an object must be "Active" to change its values from the front panel.
VB Syntax	*object.***Activate**
Variable	**(Type) - Description**
object	Measurement **(object)** **or** Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`meas.Activate` `mark.Activate`
C++ Syntax	HRESULT Activate()
Interface	IMeasurement IMarker

ActivateMarker Method

Description	Makes a marker the Active Marker. Use meas.ActiveMarker to read the number of the active marker.
VB Syntax	*meas*.**ActivateMarker(***Mnum***)**
Variable	**(Type) - Description**
meas	A Measurement **(object)**
Mnum	**(long integer)** - the number of the marker to make active. Choose any marker number from **1** to **9**.
Return Type	None
Default	Not Applicable
Examples	`meas.ActivateMarker(1)'Write`
C++ Syntax	HRESULT ActivateMarker(long lMarkerNumber)
Interface	IMeasurement
Remarks	Use ReferenceMarkerState to control the Reference marker.

ActivateWindow Method

Description	Makes a window object the Active Window. In order to change properties on any of the active objects, you must first have a "handle" to the active object using the **Set** command. For more information, See Programming the Analyzer Object Model. You do not have to make an object "Active" to set or read its properties remotely. But an object must be "Active" to change its values from the front panel.
VB Syntax	*app.***ActivateWindow** *n*
Variable	**(Type) - Description**
app	An Application **(object)**
n	**(long)** Number of the window to make active
Return Type	Window Object
Default	Not Applicable
Examples	`app.ActivateWindow 4`
C++ Syntax	HRESULT ActivateWindow(long WindowNumber)
Interface	IApplication

See the PNA Object Model

Add (channels) Method

Description	Creates a channel and returns a handle to it. If the channel already exists, it returns the handle to the existing channel.
VB Syntax	*chans.***Add** *(item)*
Variable	**(Type) - Description**
chans	A Channel collection **(object)**
item	**(variant)** - Channel number.
Return Type	Channel
Default	Not Applicable
Examples	`chans.Add 3 'Creates channel 3`
C++ Syntax	HRESULT Add(VARIANT numVal, IChannel** pChannel)
Interface	IChannels

Write-only

Add (measurement) Method

Description Adds a Measurement to the collection.

VB Syntax *meas.***Add** *channel,param,source[,window]*

meas A Measurements collection **(object)**

channel **(long)** - Channel number of the new measurement.

param **(string)** - New parameter. Case insensitive.

For S-parameters:

Any S-parameter that can be measured by your PNA.

Single-digit port numbers can be separated by "_" (underscore). For example: **"S21" or "S2_1"**

Double-digit port numbers MUST be separated by underscore. For example: **"S10_1"**

For Ratioed measurements:

Any two receivers in your PNA separated by "/". For example: **"A/R1"**

See the block diagram showing the receivers in YOUR PNA.

For Unratioed (absolute power) measurements:

Any receiver in the PNA. For example: **"A"**

See the block diagram showing the receivers in YOUR PNA

With PNA Rev 6.2, **Ratioed** and **Unratioed** measurements can also use **logical receiver notation** to refer to receivers. This notation makes it easy to refer to receivers with an external test set connected to the PNA. You do not need to know which physical receiver is used for each test port. Learn more.

For ADC measurements

Any ADC receiver in the PNA followed by a comma, then the source port.

For example: **"AI1_2"** indicates the Analog Input1 with source port of 2.

Learn more about ADC receiver measurements.

For Balanced S-parameter measurements:

"*topology:Sabxy*"

topology - Choose from:

- **sbal** - single-ended to balanced
- **ssb** - single-ended / single-ended to balanced
- **bbal** - balanced to balanced

*S**abxy*** -

Where

a - device output (receive) mode

b - device input (source) mode

(choose from the following for both a and b:)

- **d** - differential
- **c** - common
- **s** - single ended

x - device output (receive) logical port number

y - device input (source) logical port number

For example:"**sbal:sdd42"**

See an example program

For Imbalance and Common Mode Rejection measurements:

"*topology:parameter*" Choose from:

Choose this:	To get this:	
	Topology	**Parameter**
"SBAL:IMBSB"	single-ended to balanced	imbalance
"SBAL:CMRRSB1"	single-ended to balanced	common mode rejection (Sds21/Scs21)
"SBAL:CMRRSB2"	single-ended to balanced	common mode rejection (Ssd12/Ssc12)
"SSB:IMB1SSB"	single-ended / single-ended to balanced	imbalance 1
"SSB:IMB2SSB"	single-ended / single-ended to balanced	imbalance 2
"SSB:CMRRSSB1"	single-ended / single-ended to balanced	common mode rejection (Sds31/Scs31)
"SSB:CMRRSSB2"	single-ended / single-ended to balanced	common mode rejection (Sds32/Scs32)
"BBAL:IMB1BB"	balanced to balanced	imbalance 1

"BBAL:IMB2BB"	balanced to balanced	imbalance 2
"BBAL:CMRRBB"	balanced to balanced	common mode rejection (Sdd21/Scc21)

source **(long integer)** - Source port number; if unspecified, value is set to 1. Only used for non-s-parameter measurements; ignored if s-parameter.

window **(long integer) -** Optional argument. Window number of the new measurement. If unspecified, the S-Parameter will be created in the Active Window. Choose between 1and the maximum number of windows allowed on the PNA.. If unspecified, the measurement will be created in the Active Window.

See also Traces, Channels, and Windows on the PNA

Return Type None

Default None

Examples

```
meass.Add 3,"A/R1",1,1 'Adds A/R1 measurement to channel 3 in window 1
```

C++ Syntax HRESULT Add(long ChannelNum, BSTR strParameter, long srcPort, VARIANT_BOOL bNewWindow)

Interface IMeasurements

Last modified:

9/12/06 MQ Added logical receiver notation and number of windows.

Add (NAWindows) Method

Description	Add a window to the display. Does not add a measurement. The window number must not already exist.
VB Syntax	*wins.***Add** *[item]*
Variable	**(Type) - Description**
wins	A NAWindow collection **(object)**
item	**(variant)** - optional argument; Window number. Choose between 1and the maximum number of windows allowed on the PNA.. If unspecified, the measurement will be created in the Active Window. See also Traces, Channels, and Windows on the PNA
Return Type	Object
Default	Not Applicable
Examples	`wins.Add 3 'Creates a window number 3`
C++ Syntax	HRESULT Add(long windowNumber)
Interface	INAWindows

Last modified:

9/12/06 Modified for number of windows

Add (PowerLossSegment) Method

Description	Adds a PowerLossSegment to the PowerLossSegments collection. To ensure predictable results, it is best to remove all segments before defining a new list of segments. For each segment in the collection, do a seg.Remove.
VB Syntax	*segs*.**Add** *(item [size])*
Variable	**(Type) - Description**
segs	**(object) -** A PowerLossSegments collection (object)
item	**(variant)** - Number of the new segment. If it already exists, a new segment is inserted at the requested position.
size	**(long integer) -** Optional argument. The number of segments to add, starting with item. If unspecified, value is set to 1.
Return Type	None
Default	Not Applicable
Examples	`segs.Add 1, 4 'Adds segments 1,2,3 and 4`
C++ Syntax	HRESULT Add(VARIANT index, long size);
Interface	IPowerLossSegments

Add (PowerSensorCalFactorSegment) Method

Description	Adds a PowerSensorCalFactorSegment to the CalFactorSegments collection. To ensure predictable results, it is best to remove all segments before defining a new list of segments. For each segment in the collection, do a seg.Remove.
VB Syntax	*segs*.**Add** *(item [size])*
Variable	**(Type) - Description**
segs	**(object) -** A CalFactorSegments collection (object)
item	**(variant)** - Number of the new segment. If it already exists, a new segment is inserted at the requested position.
size	**(long integer) -** Optional argument. The number of segments to add, starting with item. If unspecified, value is set to 1.
Return Type	None
Default	Not Applicable
Examples	`segs.Add 1, 4 'Adds segments 1,2,3 and 4`
C++ Syntax	HRESULT Add(VARIANT index, long size);
Interface	ICalFactorSegments

Add (segment) Method

Description	Adds segments to the Segments collection, but does not turn the segments ON.
VB Syntax	*segs.***Add** *(item, [size])*
segs	A segments collection **(object)**
item	**(variant)** Number of the new segment. If it already exists, a new segment is inserted at the requested position.
size	**(long integer)** Optional argument. The number of segments to add, starting with *item*. If unspecified, value is set to 1.
Return Type	None
Default	None
Examples	`Segs.Add 1, 4 'Adds segments 1,2,3,and 4. (does NOT automatically turn segments ON)`
C++ Syntax	HRESULT Add(VARIANT index, long size);
Interface	ISegments
Remarks	To ensure predictable results, it is best to remove all segments before defining a segment list. For each segment in the collection, do a seg.Remove.

Add (Testset) Method

Description	Adds a testset to the ExternalTestsets Collection and loads the configuration file.
VB Syntax	*testsets.***Add** *(model,address)*
Variable	**(Type) - Description**
testsets	An ExternalTestsets (collection)
model	**(String)** Model of the testset to be added, NOT case-sensitive. There is no COM command to read a list of currently-supported test sets. However, the following SCPI command can be used with the following format: `string = SCPIStringParser.Execute ("SENSe:MULTiplexer:CATalog?")`
address	**(Integer)** Address of the testset to be added.
Return Type	Not Applicable
Default	Not Applicable
Examples	`testsets.Add("Z5623AK66",12) ' add Z5623AK66 test at address 12 to testsets collection` See an example program
C++ Syntax	HRESULT Add(BSTR typename, long address)
Interface	IExternalTestsets

AllowAllEvents Method

Description	Sets event filtering to monitor all events in the analyzer. This is the default setting when subscribing to events. This could slow the measurement speed of the analyzer significantly.
VB Syntax	*app*.**AllowAllEvents**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.AllowAllEvents`
C++ Syntax	HRESULT AllowAllEvents()
Interface	IApplication

AllowChannelToSweepDuringCalAcquisition Method

Description Specifies the channel to sweep during a Calibration.

When this command is sent, the *SwpChan* channel is 'flagged' to be swept during calibration. The flag is cleared when the channel is deleted or if the Measurement Class is changed. If the same channel number is recreated, this command must be sent again to sweep the channel during a calibration. The flag is NOT saved with an instrument state.

A Preset or Instrument State Recall deletes the channel.

VB Syntax *calMgr.***AllowChannelToSweepDuringCalAcquisition** *(CalChan, SwpChan, State)*

Variable **(Type) - Description**

calMgr **(object) -** A CalManager object

CalChan **(long)** - Channel to be calibrated.

SwpChan **(long)** - The channel to sweep when waiting to measure a standard.

This channel must already exist. If this channel is in continuous sweep mode, it must have the same attenuator settings and path configuration (PNA-X only).

state **(Boolean)** - Channel sweep state. Choose from:

True - Sweep the channel during calibration.

False - Do NOT sweep the channel during calibration.

Return Type Not Applicable

Default Not Applicable

Example

```
calMgr.AllowChannelToSweepDuringCalAcquisition 2,1,True
```

See example using this command

C++ Syntax HRESULT AllowChannelToSweepDuringCalAcquisition (long CalChannel, long SwpChannel, VARIANT_BOOL bVal);

Interface ICalManager5

Last Modified:

8-Nov-2007 MX New topic

AllowEventCategory Method

Description	Sets event filtering to monitor a category of event.
VB Syntax	*app*.**AllowEventCategory,** *category, state*
Variable	**(Type) - Description**
app	An Application **(object)**
category	Category to monitor. Choose from list in Working with the Analyzer's Events
state	**(boolean)** **True** - monitor **False** - do not monitor
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.AllowEventCategory`
C++ Syntax	HRESULT AllowEventCategory(tagNAEventCategory category, VARIANT_BOOL bAllow)
Interface	IApplication

AllowEventMessage Method

Description	Sets event filtering to monitor specific events.
VB Syntax	*app*.**AllowEventMessage** *event*
Variable	**(Type) - Description**
app	An Application **(object)**
event	Event to monitor. Refer to list in Working with the Analyzer's Events
state	**(boolean)** **True** - monitor **False** - do not monitor
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.AllowEventMessage`
C++ Syntax	HRESULT AllowEventMessage(tagNAEventID eventID, VARIANT_BOOL bAllow)
Interface	IApplication

AllowEventSeverity Method

Description	Sets event filtering to monitor levels of severity.
VB Syntax	*app*.**AllowEventSeverity** *severity,state*
Variable	**(Type) - Description**
app	An Application **(object)**
severity	**(enum naEventSeverity)** Choose from:naEventSeverityERROR naEventSeverityINFORMATIONAL naEventSeveritySUCCESS naEventSeverityWARNING
state	**(boolean)** **True** - monitor **False** - do not monitor
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.AllowEventSeverity`
C++ Syntax	HRESULT AllowEventSeverity(tagNAEventSeverity severity, VARIANT_BOOL bAllow)
Interface	IApplication

Write only

Apply Method

Description Applies the mixer setup to the mixer object and turns the channel ON. (Performs the same function as the Apply button on the mixer setup dialog box.)

VB Syntax *mxr*.**Apply**

Variable **(Type) - Description**

mxr Mixer Interface pointer to the Measurement (object)

Return Type Not Applicable

Default Not Applicable

Examples

```
mxr.Apply
```

C++ Syntax HRESULT Apply()

Interface IMixer3

Write-only

ApplyDeltaMatchFromCalSet Method

Description	Specifies a Cal Set as a source of delta match correction. If 'GUID' is not supplied then the Global Delta Match Cal Set is assumed. An error is returned if the specified Cal Set does not meet the following Delta Match criteria. The Global Delta Match Cal can ALWAYS be applied. • Must have been performed using ECal or as a guided mechanical cal (not Unguided). • Must have the same start freq, stop freq, and number of points as the channel being calibrated. • Must calibrate the ports that are required by the TRL or Unknown Thru Cal as indicated by PortsNeedingDeltaMatch Property. Learn more about Delta match calibration. See example of a complete Delta Match calibration.
VB Syntax	*guided*.**ApplyDeltaMatchFromCalSet** *[GUID]*
Variable	**(Type) - Description**
guided	GuidedCalibration (object)
GUID	Optional Argument. GUID of the Cal Set to use. If unspecified, the Global Delta Match Cal Set is used.
Return Type	Not Applicable
Default	Not Applicable
Examples	`guided.ApplyDeltaMatchFromCalSet "{2B893E7A-971A-11d5-8D6C-00108334AE96}"`
C++ Syntax	HRESULT ApplyDeltaMatchFromCalSet(BSTR calsetGUID);
Interface	IGuidedCalibration2

Write-only

About Source Power Cal

ApplyPowerCorrectionValuesEx Method

Description	This command replaces ApplyPowerCorrectionValues Method. Applies the array of power correction values to the channel memory and turns correction ON. Perform after completing a source power cal acquisition sweep. This command does NOT save the correction values. To save correction values, save an instrument / calibration state (*.cst file) after performing a source power cal. Optionally, as part of the source power calibration, perform calibration of the reference receiver used in the power calibration. Learn more.
VB Syntax	*powerCalibrator*.**ApplyPowerCorrectionValuesEX** *[rRec]*
Variable	**(Type) - Description**
powerCalibrator	**(object)** - A SourcePowerCalibrator object
rRec	(Enum as NASourcePowerApplyCorrectionOption) Optional argument. Choose from: **0 - naSourcePowerApplyCorrectionDefault** Do NOT perform and save a calibration of the reference receiver. (Default if not specified). **1 - naIncludeReferenceReceiverPowerCal** Perform and save a calibration of the reference receiver. The Cal Set, which includes only the reference receiver cal, is saved to the destination specified by RemoteCalStoragePreference.
Return Type	None
Default	Not Applicable

Examples	`powerCalibrator.ApplyPowerCorrectionValuesEX`
	
	`powerCalibrator.ApplyPowerCorrectionValuesEX (naIncludeReferenceReceiverPowerCal)`

C++ Syntax	HRESULT ApplyPowerCorrectionValuesEx(enum NASourcePowerApplyCorrectionOption option);
Interface	ISourcePowerCalibrator5

Last Modified:

23-Apr-2007 MX New topic

Write-only

About Source Power Calibration

ApplySourcePowerCorrectionTo Method

Description	Copies and applies an existing Source Power Calibration to another channel.
VB Syntax	*chan*.**ApplySourcePowerCorrectionTo** (*fromPortNum, targetChan, targetPortNum*);
Variable	**(Type) - Description**
chan	A Channel **(object)**
fromPortNum	(Long) Port number of the existing source power correction.
targetChan	(Long) Channel number to which the source power correction will be copied.
targetPortNum	(Long) Port number to which the source power correction will be applied.
Return Type	Not Applicable
Default	Not Applicable
Examples	`chan.ApplySourcePowerCorrectionTo 1,2,1`
C++ Syntax	HRESULT ApplySourcePowerCalibrationTo (long fromPortNumber, long otherChannelNumber, long portNumber);
Interface	IChannel11

Last Modified:

20-Jul-2007 MX New topic

Write-only

About Auto Port Extensions

AutoPortExtMeasure Method

Description	Measures either an OPEN or SHORT standard. When this command is sent, the PNA acquires the measurement with which to set automatic port extensions. Learn more about choosing which standard to measure.
VB Syntax	*fixture*.**AutoPortExtMeasure** *value*
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
value	(Enum as NAAutoPortExtMeasure) 0 - naAPEM_OPEN - Measure OPEN 1 - naAPEM_SHORT - Measure SHORT
Return Type	ENUM
Default	Not Applicable
Examples	`fixture.AutoPortExtMeasure naAPEM_OPEN`
C++ Syntax	HRESULT get_AutoPortExtMeasure(tagNAAutoPortExtMeasure *pVal);
Interface	IFixturing2

AutoPortExtReset Method

Description	Clears old port extension delay and loss data in preparation for acquiring new data. Send this command prior to sending a new series of measurements using AutoPortExtMeasure Method. If acquiring both OPEN and SHORT standards, do not send this command between those acquisitions.
VB Syntax	*fixture*.**AutoPortExtReset**
Variable	**(Type) - Description**
fixture	A Fixturing **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`fixture.AutoPortExtReset`
C++ Syntax	HRESULT AutoPortExtReset();
Interface	IFixturing2

Autoscale Method

Description	Trace Object - Autoscales only the **ONE** trace on which Autoscale is being called. NAWindow Object - Autoscales **ALL** of the traces in the Window on which Autoscale is being called.
VB Syntax	*object*.**Autoscale**
Variable	**(Type) - Description**
object	Trace **(object)** **or** NAWindow **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`Trac.Autoscale 'Autoscales the trace` `Win.Autoscale 'Autoscales all the traces in the window -Write`
C++ Syntax	HRESULT AutoScale()
Interface	INAWindow ITrace

Write-only

About Averaging

AveragingRestart Method

Description	Clears and restarts averaging of the measurement data.
VB Syntax	*chan*.**AveragingRestart**
Variable	**(Type) - Description**
chan	A Channel **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`chan.AveragingRestart`
C++ Syntax	HRESULT AveragingRestart()
Interface	IChannel

BuildHybridKit Method

Description	Use this method when you have different port connectors. This is a convenient way to combine two kits that match the connectors on your DUT.
VB Syntax	*app.***BuildHybridKit** *port1Kit,p1sex,port2Kit,p2sex,adapter,user kit*
Variable	**(Type) - Description**
app	An Application **(object)**
port1Kit *port2Kit*	**(enum NACalKit)** - Specifies the two kits to be used to build the hybrid kit. Choose from: naCalKit_85032F_N50 naCalKit_85033E_3_5 naCalKit_85032B_N50 naCalKit_85033D_3_5 naCalKit_85038A_7_16 naCalKit_85052C_3_5_TRL naCalKit_User7 naCalKit_User8 naCalKit_User9 naCalKit_User10
p1sex *p2sex*	**(enum NAPortSex)** - Specifies the sex of the connector at that port. Choose from: **naMale** **naFemale** **naDon'tCare**
adapter	**(enum NAAdapter)** -Choose from: **naUserkit -** the electrical length of the adapter in the userKit specifications **naZeroLength** - no adapter
userKit	**(enum NACalKit)** - The Hybrid kit - Choose from the previous list of kits
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.BuildHybridKit naCalKit_85033E_3_5,naMale,naCalKit_85038A_7_16 ,naFemale,naUserkit,naCalKit_User8`
C++ Syntax	HRESULT BuildHybridKit\(tagNACalKit port1Kit, tagNAPortSex port1Sex, tagNACalKit port2Kit, tagNAPortSex port2Sex, tagNAAdapter adapter, tagNACalKit userKit)
Interface	IApplication

CalculateErrorCoefficients Method

Description	This method is the final call in a calibration process. It calculates error-correction terms, turns error-correction ON and saves the error-correction terms to the channel's Cal Register or a User Cal Set. Do NOT use this command during an ECAL. **Note:** The destination (Cal Register or User Cal Set) is determined by the setting of the RemoteCalStoragePreference property.
VB Syntax	*cal*.**CalculateErrorCoeffiecients**
Variable	**(Type) - Description**
cal	Calibrator **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`Cal.CalculateErrorCoeffiecients`
C++ Syntax	HRESULT CalculateErrorCoefficients()
Interface	ICalibrator

Last Modified:

16-Apr-2007 MX Added link to Remote...

Write only

Calculate Method

Description Calculates the Input or Output frequencies of the mixer setup, applies the mixer setup to the mixer object, and turns the channel ON.

VB Syntax *mxr*.**Calculate** (*port*)

Variable **(Type) - Description**

mxr Mixer Interface pointer to the Measurement (object)

port (enum as MixerCalculation) Port of the mixer for which to calculate start and stop frequencies. Choose from:

	enum	1st or only stage requires:	In addition, 2nd stage requires:
0	mixCalculateINPUT	• Output Start and Stop frequencies • LO frequency • Output sideband (High or Low)	• IF Start and Stop frequencies • 2nd LO frequency • IF sideband (High or Low)
1	mixCalculateINPUT AndOUTPUT (2 stage mixers ONLY)	NA	• IF Start and Stop frequencies • Both LO frequencies
2	mixCalculateOUTPUT	• Input Start and Stop frequencies • LO frequency • Output sideband (High or Low)	• IF Start and Stop frequencies • 2nd LO frequency • IF sideband (High or Low)
3	mixCalculateLO1	• Input Start and Stop frequencies • Output frequency • Output sideband (High or Low)	• IF Start and Stop frequencies • 2nd LO frequency • IF sideband (High or Low)
4	mixCalculateLO2	NA	• Input Start and stop frequencies • 1st LO start and stop

	frequencies • Output frequency • IF sideband(High or Low • Output sideband(High or Low)

Return Type Not Applicable

Default Not Applicable

Examples `mxr.Calculate (mixCalculateOUTPUT)`

C++ Syntax HRESULT Calculate()

Interface IMixer

ChangeParameter Method

Description	Changes the parameter of the measurement.
VB Syntax	*meas*.**ChangeParameter**(*param*,*src*)
Variable	**(Type) - Description**
meas	A Measurement **(object)**
param	**(string)** - New parameter. Case insensitive.

For S-parameters:

Any S-parameter that can be measured by your PNA.

Single-digit port numbers can be separated by "_" (underscore). For example: **"S21" or "S2_1"**

Double-digit port numbers MUST be separated by underscore. For example: **"S10_1"**

For Ratioed measurements:

Any two receivers in your PNA separated by "/". For example: **"A/R1"**

See the block diagram showing the receivers in YOUR PNA.

For Unratioed (absolute power) measurements:

Any receiver in the PNA. For example: **"A"**

See the block diagram showing the receivers in YOUR PNA

With PNA Rev 6.2, **Ratioed** and **Unratioed** measurements can also use **logical receiver notation** to refer to receivers. This notation makes it easy to refer to receivers with an external test set connected to the PNA. You do not need to know which physical receiver is used for each test port. Learn more.

For ADC measurements

Any ADC receiver in the PNA.

For example: **"AI1"** indicates the Analog Input1.

Learn more about ADC receiver measurements.

For Balanced S-parameter measurements:

"*topology:Sabxy*"

topology - Choose from:

- **sbal** - single-ended to balanced
- **ssb** - single-ended / single-ended to balanced

- **bbal** - balanced to balanced

Sabxy -

Where

a - device output (receive) mode

b - device input (source) mode

(choose from the following for both a and b:)

- **d** - differential
- **c** - common
- **s** - single ended

x - device output (receive) logical port number

y - device input (source) logical port number

For example:"**sbal:sdd42"**

See an example program

For Imbalance and Common Mode Rejection measurements:

"*topology:parameter*" Choose from:

Choose this:	To get this: Topology	 Parameter
"SBAL:IMBSB"	single-ended to balanced	imbalance
"SBAL:CMRRSB1"	single-ended to balanced	common mode rejection (Sds21/Scs21)
"SBAL:CMRRSB2"	single-ended to balanced	common mode rejection (Ssd12/Ssc12)
"SSB:IMB1SSB"	single-ended / single-ended to balanced	imbalance 1
"SSB:IMB2SSB"	single-ended / single-ended to balanced	imbalance 2
"SSB:CMRRSSB1"	single-ended / single-ended to balanced	common mode rejection (Sds31/Scs31)
"SSB:CMRRSSB2"	single-ended / single-ended to balanced	common mode rejection (Sds32/Scs32)

"BBAL:IMB1BB"	balanced to balanced	imbalance 1
"BBAL:IMB2BB"	balanced to balanced	imbalance 2
"BBAL:CMRRBB"	balanced to balanced	common mode rejection (Sdd21/Scc21)

src **(long integer)**

- Ignored if *param* is an S-Parameter
- Source port if *param* is a ratioed or unratioed measurement (including ADC measurements).

Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.

Return Type Not Applicable

Default Not Applicable

Examples

```
meas.ChangeParameter "S11",2 '2 is the source port
meas.ChangeParameter "A/R1",2 '2 is the source port
meas.ChangeParameter "a1/b1",1 '1 is the source port
meas.ChangeParameter "R1",2 '2 is the source port
```

C++ Syntax HRESULT ChangeParameter(BSTR parameter, long lPort)

Interface IMeasurement

Last Modified:

30-Apr-2007 Modified for ADC and src strings

CheckPower Method

Description	Measures power at a specified frequency. Use this method to test power level before and/or after applying a source power calibration.
VB Syntax	*pow = pwrCal.***CheckPower** *(device, freq* [,*unit*])
Variable	**(Type) - Description**
pow	**(double)** Variable to store power value returned by this method.
pwrCal	A SourcePowerCalibrator **(object)**
device	**(enum NAPowerAcquisitionDevice)** The specific sensor on the power meter to be used for the acquisition. Choose from: **0** – naPowerSensor_A **1** – naPowerSensor_B To use the sensor that currently corresponds to the frequency of interest, use the value from the PowerAcquisitionDevice property.
freq	**(double)** Frequency (Hz) at which the sensor is to read the power.
unit	**(enum NAPowerUnit)** Optional argument. Choose from: **naDBM** – Returns the power in dBm.(default) **naWATT** – Returns the power in Watts.
Return Type	Double
Default	Not Applicable
Examples	`watt = powerCalibrator.CheckPower(naPowerSensor_A, 1E9, naWATT)`
C++ Syntax	HRESULT put_CheckPower(tagNAPowerAcquisitionDevice enumAcqDevice, double dFreq, tagNAPowerUnit enumPowerUnit, double *pdPower);
Interface	ISourcePowerCalibrator2

Clear Method

Description	Clears the current diagnostic information.
VB Syntax	*embedLODiag*.**Clear**
Variable	**(Type) - Description**
embedLODiag	An EmbeddedLODiagnostic **(object)**
Default	Not Applicable
Examples	`embedLO.Clear 'write`
C++ Syntax	HRESULT Clear();
Interface	IEmbededLODiagnostic

Last Modified:

12-Apr-2007 MX New topic

Write-only

About Cal Sets

CloseCalSet Method Superseded

Description	This command is no longer necessary. The CalSet.get... and put... commands that required this command have been replaced, Closes read/write access to the Cal Set. See OpenCalSet for an explanation of gaining access to the Cal Set. When you are finished reading and writing data from or to the Cal Set, close the Cal Set. Subsequent read/writes will require a new OpenCal Set call. Reading and writing Cal Set data is performed with the PutStandard, GetStandard, PutErrorTerm, GetErrorTerm method calls. These methods are provided by the ICal Set and ICalData2 interfaces.
VB Syntax	*CalSet*.**CloseCalSet**
Variable	**(Type) - Description**
CalSet	**(object) -** A Cal Set object
Return Type	Not Applicable
Default	Not Applicable
Examples	`CSet.CloseCalSet`
C++ Syntax	HRESULT CloseCalSet
Interface	ICalSet

ComputeErrorTerms Method

Description	Computes error terms for the caltype specified by a preceding OpenCal Set call. The Cal Set must first be opened using OpenCalSet. If this call has not been made, the following error is issued: E_NA_Cal Set_ACCESS_DENIED The standards data required for the CalType must be available in the Cal Set or this error will be returned: E_NA_STANDARD_NOT_FOUND. **Note:** Error term computation requires data for the actual calibration kit standards from the current kit definition. ComputeErrorTerms assumes that the standards were acquired using only one standard per class.
VB Syntax	*CalSet*.**ComputeErrorTerms**
Variable	**(Type) - Description**
CalSet	**(object) -** A Cal Set object
Return Type	Not Applicable
Default	Not Applicable
Examples	`CalSet.ComputeErrorTerms`
C++ Syntax	HRESULT ComputeErrorTerms( )
Interface	ICalSet

ConfigEnhancedNB2 Method

Description	**Note:** This command replaces [ConfigEnhancedNB Method].
	This subroutine determines, then returns, the proper configuration for pulsed measurements on the **PNA-X ONLY** using the spectral nulling technique. The configuration returned needs to be sent to the PNA and any other related external equipment.
	The routine will take a desired Pulse Repetition Frequency (PRF) and measurement IFBW and return a possibly modified PRF and IFBW for proper pulsed operation on the PNA.
VB Syntax	*Pulsed.***ConfigEnhancedNB2** *(PRF, BW, PhysicalIF, NCO, ClockFreq, Stage1TapArray, Stage2TapArray, Stage3TapArray, FixedPRF, GateDelay, GateWidth, SWGateDelay, SWGateWidth, SWGateRamp)*
Variable	**[(Type)] - Description**
Pulsed	**(interface)** An interface to the agilentpnapulsed.dll application interface.
PRF	**(Double)** The Pulse Repetition Frequency.
	[out] The pulse repetition frequency that has been optimized for use with the PNA. NOTE: This value may be different from the value requested.
	[in] The desired pulse repetition frequency.
BW	**(Long)** The PNA IF Bandwidth.
	[out] The PNA IF bandwidth that has been optimized for use with the PNA. NOTE: This value may be different from the value requested. Zero (0) is returned if no solution is found for the specified *PRF* and *BW*.
	[in] The desired PNA IF bandwidth.
PhysicalIF	**(Double)**
	[out] Returns physical intermediate frequency.
NCO	**(Double)**
	[out] Returns numeric controlled oscillator frequency.
ClockFreq	**(Double)**
	[out] Returns the clock frequency (in Hz) of the PNA-X.
Stage1TapArray	**(Long array)**
	[out] Returns the stage 1 filter coefficients
Stage2TapArray	**(Long array)**
	[out] Returns the stage 2 filter coefficients

Stage3TapArray	**(Long array)** **[out]** Returns the stage 3 filter coefficients
FixedPRF	**(Boolean)** **[in]** • **1 (True)** Signals the .DLL routine to NOT adjust the PRF value; rather adjust ONLY the IF Bandwidth. This is the default setting. • **0 (False)** Adjust both the PRF and IF Bandwidth values as necessary.
GateDelay	**(Double)** **[in]** Highest delay value in seconds used in any of the receiver gates.
GateWidth	**(Double)** **[in]** Widest pulse width value in seconds used in any of the receiver gates.
SWGateDelay	**(Double)** **[out]** Returns the SW gate delay in seconds.
SWGateWidth	**(Double)** **[out]** Returns the SW Gate width in seconds.
SWGateRamp	**(Long)** **[out]** Returns the SW Gate ramp
Return Type	Not Applicable
Default	Not Applicable
Example	See an example using this command.
C++ Syntax	HRESULT **ConfigEnhancedNB2**(double *pPRF, long *pBW, double *pIF, double *pNCO, double *clock, double *pStg1, double *pStg2, double *pStg3, VARIANT_BOOL fixPRF, double gateDelay, double gateWidth, double *SWgateDelay, double *SWgateWidth, long *SWgateRamp)
Interface	AgilentPNAPulsed.Application

Last Modified:

28-Mar-2007	MX New topic

ConfigEnhancedNBIFAtten Method

Description	Sets PNA-X receivers to auto gain setting.
VB Syntax	*Pulsed.***ConfigEnhancedNBIFAtten** *(PRF, RxWidth, IFAtten)*
Variable	**(Type) - Description**
Pulsed	**(interface)** An interface to the agilentpnapulsed.dll application interface.
PRF	**(Double)** **[in]** The Pulse Repetition Frequency.
RxWidth	**(Double)** **[in]** Receiver gate width.
IFAtten	**(Long Integer)** **[out]** IF attenuation value.
Return Type	Not Applicable
Default	Not Applicable
Example	See an example using this command.
C++ Syntax	HRESULT **ConfigEnhancedNBIFAtten**(double *pPRF, double *pWidth, long *pIF)
Interface	AgilentPNAPulsed.Application

Last Modified:

18-Jun-2007 MX New topic

ConfigNarrowBand3 Method

Description

Note: This method replaces ConfigNarrowBand2 Method. The BW argument now returns 0 if no solution is found for the specified PRF and BW. In addition, adjustments were made to the filter finder algorithm

This subroutine determines, then returns, the proper configuration for pulsed measurements on the PNA using the spectral nulling technique. The configuration returned needs to be sent to the PNA and any other related external equipment such as pulse generators. The routine will take a desired Pulse Repetition Frequency (PRF) and measurement IFBW and return a possibly modified PRF and IFBW for proper pulsed operation on the PNA. The routine will also return the Sample Rate, Number of Taps, and Offset that must be sent to the PNA to configure it in pulsed mode using the spectral nulling technique.

Although the example below uses COM programming to communicate with the PNA, these commands can be replaced with SCPI equivalents.

Note: The pulsed application may set the offset frequency (option 080) of the PNA to some value other than zero (the default value). If the stop frequency is set to the maximum of the PNA model, then an error message may appear on the PNA stating that the response frequency has exceeded the maximum allowed frequency. To fix this, set the stop frequency to a value that is at least 2 KHz less than the maximum allowed. For example, if you have a 20 GHz PNA, and the stop frequency is set to 20 GHz, and the error message appears, then set the stop frequency to 19.999998 GHz

VB Syntax

*Pulsed.***ConfigNarrowBand** *(PRF, NumTaps, BW, OffSet, SampleRate, Precision, FixedPRF, PG81110)*

Variable **(Type) - Description**

Pulsed **(interface)** An interface to the agilentpnapulsed.dll application interface.

PRF **(Double)** The Pulse Repetition Frequency.

[out] The pulse repetition frequency that has been optimized for use with the PNA. NOTE: This value may be different from the value requested.

[in] The desired pulse repetition frequency.

NumTaps **(Long)** The number of taps to send to the PNA for pulsed operation.

BW **(Long)** The PNA IF Bandwidth.

[out] The PNA IF bandwidth that has been optimized for use with the PNA. NOTE: This value may be different from the value requested. Zero (0) is returned if no solution is found for the specified *PRF* and *BW*.

[in] The desired PNA IF bandwidth.

Offset **(Double)** The offset value to send to the PNA for pulsed operation. The offset value is used to adjust the PNA for the two different possible sample rates that may be returned.

SampleRate	**(Double)** **[out]** The sample rate to send to the PNA for pulsed operation. **[in]** Passing a value of 6.2 us will make sure that the offset frequency is not shifted and therefore could be used with converter measurements. Otherwise enter 0.
Precision	**(Double)** The precision variables sets the precision that will be used to decrement the PRF when running the configuration routines. This variable can be set to the precision required by the external pulse generators so that the configuration routine will not return a PRF that is not within the precision limits of the pulse generators.
FixedPRF	**(Boolean)** **1 (True)** Signals the .DLL routine to NOT adjust the PRF value; rather adjust ONLY the IF Bandwidth. This is the default setting. **0 (False)** Adjust both the PRF and IF Bandwidth values as necessary.
PG81110	**(Boolean)** **1 (True)** You are using an Agilent 81110 as the pulse generator. This allows increased accuracy in adjustments for offset and PRF. **0 (False)** Not using an Agilent 81110.
Return Type	Not Applicable
Default	Not Applicable
Example	See an example using this command.
C++ Syntax	HRESULT ConfigNarrowBand(double *pPRF, long *pNumTaps, long *pBW, double *pOffset, double *pSampleRate, int Precision)
Interface	AgilentPNAPulsed.Application

Last Modified:

21-Sep-2007	Modified sample rate and

ConfigurationFile Method

Description	Recalls an Interface Control file from the hard drive into the analyzer.
VB Syntax	*IntControl.***ConfigurationFile** (*filename*)
Variable	**(Type) - Description**
IntControl	An InterfaceControl **(object)**
filename	**(string)** - Full path, file name, and extension (.xml) of the file to recall. Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents"
Return Type	Not Applicable
Default	Not Applicable
Examples	`IntControl.ConfigurationFile ("C:\Program Files\Agilent\Network Analyzer\Documents\MySettings.xml")`
C++ Syntax	HRESULT ConfigurationFile(BSTR bstrFile)
Interface	IInterfaceControl

Configurations Property

Description	Returns an array of stored configuration names that can be used with DeleteConfiguration Method and.LoadConfiguration Method
VB Syntax	*names = pathMgr.***Configurations**
Variable	**(Type) - Description**
names	**(Variant array)** Variable to store the returned configuration names.
pathMgr	PathConfigurationManager **(object)**
Return Type	Variant array
Default	Not Applicable
Examples	`names = path.Configurations`
C++ Syntax	HRESULT get_Configurations (VARIANT* configurations);
Interface	IPathConfigurationManager

Last Modified:

14-Dec-2006 MX New topic

Configure Method

Description	Restarts as an "N-port" PNA using the specified multiport test set. See other commands to configure multiport test sets.
VB Syntax	*app.***Configure** *(model, address)*
Variable	**(Type) - Description**
app	An Application **(object)**
model	**String** - Model of the test set with which to restart. Use **"Native"** to restart without a test set. To see a list of supported test sets, use
address	**Integer** - GPIB Address of the test set. Use 0 for native restart.
Return Type	Not Applicable
Default	Not Applicable
Examples	`See an example using this command.` **`app.Configure ("N44xx",18)`**
C++ Syntax	HRESULT Configure(BSTR model, long address);
Interface	IApplication9

Write-only

About Triggering

Continuous Method

Description	The channel continuously responds to trigger signals. **Note:** This command does **NOT** change TriggerSignal to Continuous.
VB Syntax	*chan*.**Continuous**
Variable	**(Type) - Description**
chan	A Channel **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`chan.Continuous`
C++ Syntax	HRESULT Continuous()
Interface	IChannel

Write-only [About Cal Sets](#)

Copy Method

Description	Creates a new Cal Set and copies the current Cal Set data into it. Therefore, you now have a clone Cal Set with a different ID. Use this command to manipulate data on a Cal Set without corrupting the original cal data.
VB Syntax	*CalSet*.**Copy**
Variable	**(Type) - Description**
CalSet	**(object) -** A Cal Set object
Return Type	Not Applicable
Default	Not Applicable

Examples

```
Dim mgr As CalManager
Dim ocalset As CalSet
Dim newcalset As CalSet
Set mgr = pna.GetCalManager
'Create a new (empty) Cal Set.
Set ocalset = mgr.CreateCalSet(1)
ocalset.Description = "original calset"
pna.Channel(1).SelectCalSet ocalset.GetGUID, True

'Launch the cal wizard and allow the user to perform the
calibration.
If pna.LaunchCalWizard(False) Then
'If the Launch returns true then the calibration finished.
ocalset.Save

'Copy the Cal Set to the new one.
Set newcalset = ocalset.Copy
newcalset.Description = "copy of original calset"

Else
'If the cal doesn't finish, delete the old Cal Set
'so it isn't taking up unnecessary memory.
mgr.DeleteCalSet ocalset.GetGUID
End If
```

As a result, the programmer can manipulate the data in the new Cal Set and always revert back to the old Cal Set as needed.

C++ Syntax	HRESULT Copy(ICalSet** pCalSet);
Interface	ICalSet

Write-only [About Copy Channels](#)

CopyToChannel Method

Description	Sets up another channel as a copy of this object's channel.
VB Syntax	chan.**CopyToChannel**(lChanNum)
Variable	**(Type) - Description**
chan	A Channel **(object)**
lChanNum	**(long integer)** – Number of the channel to become a copy of this channel.
Return Type	None
Default	Not Applicable
Examples	Dim chan As Channel Set chan = PNAapp.ActiveChannel Const lNEW_CHAN_NUM As Long = 2 chan.CopyToChannel(lNEW_CHAN_NUM)
C++ Syntax	HRESULT CopyToChannel(long lChanNum);
Interface	IChannel2

CreateSParameterEx Method

Description	Creates a new S-Parameter measurement in an existing or new window and specifies the load port for 3-port devices.
VB Syntax	*app*.**CreateSParameterEx** *chan,recvr,source[,loadPort][,window]*
Variable	**(Type) - Description**
app	Application **(object)**
chan	**(long integer)** - Channel number of the new measurement.
recvr	**(long integer)** - Port number of the test port receiver.
source	**(long integer)** - Port number of the source. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source. To learn more see Remotely Specifying a Source Port.
loadPort	**(long integer)** - Port number of the load. Required for reflection measurements of 3-port devices on multiport PNA models.
window	**(long integer)** - Optional argument. Choose between 1and the maximum number of windows allowed on the PNA.. See also Traces, Channels, and Windows on the PNA. If unspecified, the S-Parameter will be created in the Active Window.
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.CreateSParameterEx 1,2,1,1 'Creates a new S21 measurement in channel 1 and New window(1)` `app.CreateSParameterEx 2,1,1,3,1 'Creates a new S11 measurement on channel 2 with port 3 as the load. Create in the active window`
C++ Syntax	HRESULT CreateSParameterEx(long ChannelNum, long RcvPort, long SrcPort, long LoadPort, long windowNumber)
Interface	IApplication

Last modified:

9/12/06 Modified for number of windows

Write-only

About Cal Sets

CreateCalSet Method

Description	Creates a new Cal Set. The new cal set is initialized with the stimulus settings from the channel whose number is passed as the argument to this method. Stimulus settings include frequency, bandwidth, number of points, and so forth. Use this method when you want to manually upload data to the Cal Set using the returned ICal Set interface handle.. The channel number does not restrict the usage of this Cal Set on any other channel. It simply provides a link to the originating channel so that the stimulus values can be stored in the Cal Set. **Note:** Be sure to SAVE the CalSet you are creating. Use ICalSet::Save.
VB Syntax	*calMgr.***CreateCalSet** *(chan)*
Variable	**(Type) - Description**
calMgr	**(object) -** A CalManager object
chan	**(long)** - channel number of the new Cal Set.
Return Type	ICal Set Interface
Default	Not Applicable
Example	`calMgr.CreateCalSet 1`
C++ Syntax	HRESULT CreateCalSet(long ChannelNumber, ICal Set** pCal Set);
Interface	ICalManager

Write-only

CreateCustomCal Method

Description	Creates a custom cal object.
VB Syntax	*calmgr.***CreateCustomCal**(*CalType*)
Variable	**(Type) - Description**
calMgr	Cal Manager **(Object)**
CalType	**(String)** Name of the calibration. Choose from: **"VMC"** or **"VectorMixerCal.VMCType"** **"SMC"** or **"ScalarMixerCal.SMCType"** See Also SMCType Object VMCType Object
Return Type	Not Applicable
Default	Not Applicable

Examples	`Dim CalMgr As ICalManager2`
	`Dim SMC As ISMCType`
	`Set SMC = CreateCustomCal("SMC")`
	See SMC and VMC examples using this command.

C++ Syntax	HRESULT CreateCustomCal(BSTR CustomCal)
Interface	ICalManager2

Write-only

CreateCustomCalEx Method

Description	Create a custom calibration object for the specified channel.
	Note: Use CreateCustomCal Method to create FCA calibration objects.
VB Syntax	*calmgr.***CreateCustomCalEx** *(chan)*
Variable	**(Type) - Description**
calMgr	Cal Manager **(Object)**
chan	**(long integer)** Channel number in which to create the Cal object.
Return Type	Not Applicable
Default	Not Applicable
Examples	`dim GCA` `set GCA = CalMgr.CreateCustomCalEx(1)`

See Also

- Noise Figure example
- Gain Compression example

C++ Syntax	HRESULT CreateCustomCalEx(long channel, IDispatch** ppObject);
Interface	ICalManager5

Last Modified:

29-May-2007 MN New topic

Write-only

CreateCustomMeasurementEx Method

Description Creates a new custom measurement.

VB Syntax *app.***CreateCustomMeasurementEx** *chanNum,MeasClass,MeasName [,window]*

Variable **(Type) - Description**

app **(object) -** An Application object

chanNum **(long)** -Channel number used by the new measurement; can exist or be a new channel.

MeasClass **(string) -** Measurement class of the new custom measurement object. The new custom measurement must be installed and registered on the PNA.

Choose from the following:

- "Vector Mixer/Converter"
- "Scalar Mixer/Converter"
- "Gain Compression"
- "Noise Figure Cold Source"

MeasName **(variant)** Measurement names

MeasClass	Measurement Name	Description
Vector Mixer/Converter	**"S11"** **"VC21"** **"S22"**	Learn about VMC parameters
Scalar Mixer/Converter	**"S11"** **"SC21"** **"SC12"** **"S22"** **"Ipwr"** **"RevIPwr"** **"Opwr"** **"RevOPwr"**	Learn about SMC parameters
	"CompIn21"	Input power at the compression point.

Gain Compression Learn more	**"CompOut21"**	Output power at the compression point.
	"CompGain21"	Gain at the compression point.
	"CompS11"	Input Match at the compression point
	"RefS21"	Linear Gain
	"DeltaGain21"	CompGain21 -Linear Gain
Noise Figure Cold Source Learn more	**"NF"**	Noise figure
	"T-Eff"	Effective noise temperature.
	"DUTRNP"	DUT noise power ratio. (Noise power expressed in Kelvin divided by 290).
	"SYSRNP"	System noise power ratio
	"DUTNPD"	DUT noise power density. (Noise power expressed in dBm/Hz).
	"SYSNPD"	System noise power density.
	"OvrRng"	Indication that the noise receiver is being over powered.
	"T-Rcvr"	Temperature reading (in Kelvin) of the noise receiver board.
	"S11", "S21", "S12", "S22"	Standard S-parameters; measured with the port1 and port2 noise switches set for noise mode.
	"A,1", "A,2" and so forth	Unratioed parameters; with notation: "receiver, source port"

window **(long)** Optional argument. Number of the window the new custom measurement will be placed in. Choose between 1and the maximum number of windows allowed on the PNA.. If unspecified, the measurement is placed in the active window.

Return Type IMeasurement

Default Not Applicable

Examples

```
'To create a scalar mixer measurement in channel 2:
Dim MyMeas as Agilent835x.Measurement
Set MyMeas = app.CreateCustomMeasurementEx (2, "Scalar
Mixer/Converter", "SC21")
```

```
'To create a vector mixer measurement in channel 2:
Dim MyMeas as Agilent835x.Measurement
Set MyMeas = app.CreateCustomMeasurementEx (2, "Vector
Mixer/Converter", "VC21")
```

C++ Syntax HRESULT put_CreateCustomMeasurementEx (long ChannelNum, BSTR guid, VARIANT initData, long windowNumber, IMeasurement** ppMeasurement);

Interface IApplication3

Last Modified:

8-Nov-2007 Updated for NF and GCA

CustomCalConfiguration Method.htm

Last Modified:

10-Mar-2008 MX New topic

CreateMeasurement Method

Description Creates a new measurement.

VB Syntax *app.***CreateMeasurement** *chanNum,param,lPort[,window]*

Variable **(Type) - Description**

app Application **(object)**

chanNum **(long)** - Channel number of the new measurement; can exist or be a new channel

param **(string)** - New parameter. Case insensitive.

For S-parameters:

Any S-parameter that can be measured by your PNA.

Single-digit port numbers can be separated by "_" (underscore). For example: **"S21" or "S2_1"**

Double-digit port numbers MUST be separated by underscore. For example: **"S10_1"**

For Ratioed measurements:

Any two receivers in your PNA separated by "/". For example: **"A/R1"**

See the block diagram showing the receivers in YOUR PNA.

For Unratioed (absolute power) measurements:

Any receiver in the PNA. For example: **"A"**

See the block diagram showing the receivers in YOUR PNA

With PNA Rev 6.2, **Ratioed** and **Unratioed** measurements can also use **logical receiver notation** to refer to receivers. This notation makes it easy to refer to receivers with an external test set connected to the PNA. You do not need to know which physical receiver is used for each test port. Learn more.

For ADC measurements

Any ADC receiver in the PNA.

For example: **"AI1"** indicates the Analog Input1.

Learn more about ADC receiver measurements.

For Balanced S-parameter measurements:

"*topology:Sabxy*"

topology - Choose from:

- **sbal** - single-ended to balanced

- **ssb** - single-ended / single-ended to balanced
- **bbal** - balanced to balanced

Sabxy -

Where

a - device output (receive) mode

b - device input (source) mode

(choose from the following for both a and b:)

- **d** - differential
- **c** - common
- **s** - single ended

x - device output (receive) logical port number

y - device input (source) logical port number

For example:"**sbal:sdd42"**

See an example program

For Imbalance and Common Mode Rejection measurements:

"*topology:parameter*" Choose from:

Choose this:	To get this:	
	Topology	**Parameter**
"SBAL:IMBSB"	single-ended to balanced	imbalance
"SBAL:CMRRSB1"	single-ended to balanced	common mode rejection (Sds21/Scs21)
"SBAL:CMRRSB2"	single-ended to balanced	common mode rejection (Ssd12/Ssc12)
"SSB:IMB1SSB"	single-ended / single-ended to balanced	imbalance 1
"SSB:IMB2SSB"	single-ended / single-ended to balanced	imbalance 2
"SSB:CMRRSSB1"	single-ended / single-ended to balanced	common mode rejection (Sds31/Scs31)

"SSB:CMRRSSB2"	single-ended / single-ended to balanced	common mode rejection (Sds32/Scs32)
"BBAL:IMB1BB"	balanced to balanced	imbalance 1
"BBAL:IMB2BB"	balanced to balanced	imbalance 2
"BBAL:CMRRBB"	balanced to balanced	common mode rejection (Sdd21/Scc21)

lPort **(long)**

- **Ignored** if *param* is an S-Parameter, balanced, imbalance, or CMRR parameter.
- **Source port** if *param* is ratioed or unratioed (including ADC) measurements. Use cap.getPortNumber to get the number of named source. To learn more see Remotely Specifying a Source Port.

window **(long)** Optional argument. Window number of the new measurement. Choose between 1and the maximum number of windows allowed on the PNA.. If unspecified, the measurement will be created in the Active Window.

See also Traces, Channels, and Windows on the PNA

Return Type Not Applicable

Default Not Applicable

Examples

```
app.CreateMeasurement(1,"A/R1",1,0)
app.CreateMeasurement(1,"a1/b1",1,0)
app.CreateMeasurement(1,"bbal:Sdd21",1)
app.CreateMeasurement(1,"AI2",2)
```

See a Balanced Measurements example program.

C++ Syntax HRESULT CreateMeasurement(long ChannelNum, BSTR strParameter, long lPort, long windowNumber)

Interface IApplication

Last modified:

July 23, 2007	Added source port link
April 25, 2007	Updated for ADC measurements.
9/12/06	MQ Updated for logical receiver notation.

DataToMemory Method

Description	Stores the active measurement data into memory creating a memory trace. The memory can then be displayed or used in calculations with the measurement data.
VB Syntax	*meas.***DataToMemory**
Variable	**(Type) - Description**
meas	A Measurement **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`meas.DataToMemory`
C++ Syntax	HRESULT DataToMemory()
Interface	IMeasurement

Delete Method

Description	Deletes the measurement.
VB Syntax	*meas*.**Delete**
Variable	**(Type) - Description**
meas	The Measurement object to delete **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`meas.Delete`
C++ Syntax	HRESULT Delete()
Interface	IMeasurement

Write-only

About Markers

DeleteMarker Method

Description	Deletes a marker from the measurement.
VB Syntax	*meas.***DeleteMarker(***Mnum***)**
Variable	**(Type) - Description**
meas	A Measurement **(object)**
Mnum	**(long)** - Any existing marker number in the measurement
Return Type	Not Applicable
Default	Not Applicable
Examples	`meas.DeleteMarker(1)`
C++ Syntax	HRESULT DeleteMarker(long lMarkerNumber)
Interface	IMeasurement

Write-only

About Markers

DeleteAllMarkers Method

Description	Deletes all of the markers from the measurement.
VB Syntax	*meas*.**DeleteAllMarkers**
Variable	**(Type) - Description**
meas	**(object) -** The Measurement object from which markers will be deleted.
Return Type	Not Applicable
Default	Not Applicable
Examples	`meas.DeleteAllMarkers`
C++ Syntax	HRESULT DeleteAllMarkers()
Interface	IMeasurement

Write-only

About Cal Sets

DeleteCalSet Method

Description	Deletes a Cal Set from the set of available Cal Sets. This method immediately updates the Cal Set file on the hard drive. If the Cal Set is currently being used by a channel or does not exist, this request will be denied and an error is returned. Using the Cal Sets collection is a convenient way to manage Cal Sets.
VB Syntax	*calMgr.***DeleteCalSet** *(calset)*
Variable	**(Type) - Description**
calMgr	**(object) -** A CalManager object
calset	**(string)** - Cal Set to be deleted. Specify the Cal Set by **GUID** or **Name**. Use EnumerateCalSets to list the available Cal Sets by name.
Return Type	Not Applicable
Default	Not Applicable

Example	`Set pna=CreateObject("AgilentPNA835x.Application")`
	`Set cmgr = pna.GetCalManager`
	`cmgr.DeleteCalSet ("MyCalSet")`

C++ Syntax	HRESULT DeleteCalSet(BSTR strCalset);
Interface	ICalManager

Last Modified:

6-Mar-2008 Added Name argument

DeleteConfiguration Method

Description	Deletes the specified configuration name from the PNA. The factory configurations cannot be deleted. This is the only method of programmatically distinguishing a factory configuration from a user-named configuration.
VB Syntax	*pathMgr*.**DeleteConfiguration** *name*
Variable	**(Type) - Description**
pathMgr	PathConfigurationManager **(object)**
name	**(String)** Configuration name to be deleted.
Return Type	Not Applicable
Default	Not Applicable
Examples	`path.DeleteConfiguration "myMixer"`
C++ Syntax	HRESULT StoreConfiguration (long channelNum, BSTR configName);
Interface	IPathConfigurationManager

Last Modified:

14-Dec-2006 MX New topic

DeleteShortCut Method

Description	Removes a macro from the list of macros in the analyzer. Does not remove the file. **Note:** There are always 12 macro positions. They do not have to be sequential. For example, you can have number 7 but no numbers 1 to 6.
VB Syntax	*app*.**DeleteShortCut** *item*
Variable	**(Type) - Description**
app	An Application **(object)**
item	**(long integer)** number of the macro to be deleted.
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.DeleteShortCut 2`
C++ Syntax	HRESULT DeleteShortcut(long Number)
Interface	IApplication

DisallowAllEvents Method

Description	Sets event filtering to monitor NO eventst.
VB Syntax	*app*.**DisallowAllEvents**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.DisallowAllEvents`
C++ Syntax	HRESULT DisallowAllEvents()
Interface	IApplication

DisplayNAWindowDuringCalAcquisition Method

Description	Set and read the 'show' state of the window to be displayed during a calibration. When this command is sent, the specified window is 'flagged' to be shown during calibration. The flag is cleared when the window is closed. A Preset or Instrument State Recall also closes the window. If the same window number is reopened, this command must be sent again to show the window during a calibration. The flag is NOT saved with an instrument state. Send this command for each additional window to show during a calibration.
VB Syntax	*calMgr.***DisplayNAWindowDuringCalAcquisition** *(winNum, State)*
Variable	**(Type) - Description**
calMgr	**(object) -** A CalManager object
winNum	**(long)** - Window number to show during a calibration. The calibration window will also be shown with this window. The window must already be created. Use NaWindows.count or app.WindowNumber to read existing window numbers.
state	**(Boolean)** Window state. Choose from: **True** - Show the specified window during calibration. **False** - Do NOT show the specified window during calibration.
Return Type	Not Applicable
Default	Not Applicable
Example	`calMgr.DisplayNAWindowDuringCalAcquisition 2,True` See example using this command
C++ Syntax	HRESULT DisplayNAWindowDuringCalAcquisition(long WinNum, VARIANT_BOOL bVal);
Interface	ICalManager5

Last Modified:

8-Nov-2007 MX New topic

Write-only

About Cal Window

DisplayOnlyCalWindowDuringCalAcquisition Method

Description	Clears the flags for windows to be shown during calibrations other than the Cal Window. To flag a window to be shown see DisplayNAWindowDuringCalAcquisition
VB Syntax	*calMgr.***DisplayOnlyCalWindowDuringCalAcquisition**
Variable	**(Type) - Description**
calMgr	**(object) -** A CalManager object
Return Type	Not Applicable
Default	Not Applicable
Example	`calMgr.DisplayOnlyCalWindowDuringCalAcquisition` See example using this command
C++ Syntax	HRESULT DisplayOnlyCalWindowDuringCalAcquisition()
Interface	ICalManager5

Last Modified:

8-Nov-2007 MX New topic

Write-only

About Printing

DoPrint Method

Description	Prints the screen to the default Printer.
VB Syntax	*app*.**DoPrint**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.DoPrint`
C++ Syntax	HRESULT DoPrint()
Interface	IApplication

DoECAL1PortEx Method

Description	This method replaces DoECAL1Port Method. Does a 1-Port calibration using an ECAL module. You must first have a 1-port measurement active to perform the calibration. The characterization within the ECal module that will be used for the calibration is specified by **ECALCharacterizationEx.** The default value is 0.
VB Syntax	*cal.***DoECAL1PortEx** *[port][,module]*

Variable	**(Type) - Description**
cal	A Calibrator **(object)**
port	**(long integer)** Optional argument - Port number to calibrate. Choose from: 1 - Calibrate port 1 (default if unspecified) 2 - Calibrate port 2
module	**(long integer)** Optional argument. ECal module. Choose from modules **1** through **8** Use IsECALModuleFoundEx to determine the number of modules connected to the PNA Use GetECALModuleInfoEx to returns the model and serial number of each module.
Return Type	None
Default	Not Applicable

Examples

```
cal.DoECAL1PortEx,2,2
```

C++ Syntax	HRESULT DoECAL1PortEx(long port, long moduleNumber = 1);
Interface	ICalibrator4

DoECAL2PortEx Method

Description	This method replaces DoECAL2Port Method. Does a 2-port calibration using an ECal module. 2-port refers to the number of ports to calibrate; NOT to the number of ECal module ports. You must first have a measurement active to perform the calibration. The characterization within the ECal module that will be used for the calibration is specified by ECalCharacterizationEx. The default value is 0.
VB Syntax	*cal*.**DoECAL2PortEx** *[portA][,portB][,module]*
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
portA	**(long integer)** Optional argument - Number of the receive port to calibrate. Choose from: 1 - Calibrate port 1 (default, if unspecified) 2 - Calibrate port 2 3 - Calibrate port 3 And so forth for all available PNA / test set ports.
portB	**(long integer)** Optional argument - Number of the source port to calibrate. Choose from: 1 - Calibrate port 1 2 - Calibrate port 2 (default, if unspecified) 3 - Calibrate port 3 And so forth for all available PNA / test set ports.
module	**(long integer)** Optional argument. ECal module. Choose from modules **1** through **8** Use IsECALModuleFoundEx to determine the number of modules connected to the PNA Use GetECALModuleInfoEx to returns the model and serial number of each module.
Return Type	None
Default	Not Applicable
Examples	`cal.DoECAL2PortEx,1,2,3`
C++ Syntax	HRESULT DoECAL2PortEx(long portA = 1, long portB =2, long moduleNumber = 1);
Interface	ICalibrator4

Last Modified:

1-Jan-2007	Corrected Port B default

DoneCalConfidenceCheckECAL Method

Description	Concludes the Confidence Check and sets the ECal module back into the idle state.
VB Syntax	*cal*.**DoneCalConfidenceCheckECAL**
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
Return Type	None
Default	None
Examples	*cal*.DoneCalConfidenceCheckECAL
C++ Syntax	HRESULT DoneCalConfidenceCheckECAL( );
Interface	ICalibrator

DoReceiverPowerCal Method

Description	**Note**: This command replaces DataToDivisor, LogMagnitudeOffset, Normalization, InterpolateNormalization. Immediately performs a receiver power calibration. The connection to the receiver must be in place when this command is sent. A Receiver Power Cal requires that the active measurement be an Unratioed power measurement.
VB Syntax	*cal.***DoReceiverPowerCal***(param, srcPort [,pwrOffset])*
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
param	**(string)** – Receiver to be calibrated. Choose any receiver in your PNA. See a block diagram of your PNA. With PNA Rev 6.2, receivers can also be referred to using **logical receiver notation.** This notation makes it easy to refer to receivers with an external test set connected to the PNA. You do not need to know which physical receiver is used for each test port. Learn more.
srcPort	**(long integer)** – Number of the port which will supply source power to the receiver during this cal. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.
pwrOffset	**(double)** – Optional argument. Offset value in dB. Adjusts a receiver power cal to account for components or adapters that are added between the source port and receiver while performing this cal. Specify loss as a negative number; and gain as a positive number.
Return Type	None
Default	Not Applicable
Examples	`cal.DoReceiverPowerCal "B", 1, -10`
C++ Syntax	HRESULT DoReceiverPowerCal(BSTR parameter, long lSrcPort, double dPowerOffset);
Interface	ICalibrator5

Last Modified:

30-Apr-2007 Edited for src strings

Read-only

About Cal Sets

EnumerateCalSets Method

Description Returns an array of Cal Set names being stored on the PNA.

VB Syntax *value* = *calMgr.***EnumerateCalSets**

Variable (Type) - Description

value **(variant)** - Variable to store the returned Cal Set names

calMgr **(object) -** A CalManager object

Return Type VARIANT array

Default Not Applicable

Example

```
Dim pna
set
pna=CreateObject("AgilentPNA835x.Application")

Dim catalog
catalog=pna.getcalmanager.EnumerateCalSets
for i=lbound(catalog) to Ubound(catalog)
wscript.echo catalog(i)
next
```

C++ Syntax HRESULT EnumerateCalSets(VARIANT* names);

Interface ICalManager4

Read-only

Execute Method

Description	Allows the use of COM to send a SCPI command. This method can be used with :SYST:ERR? to convert scpi errors into text. See an example of how to return error information when using the Parse method.
VB Syntax	Scpi.**Execute** (*SCPI_Command*)
Variable	**(Type) - Description**
scpi	A ScpiStringParser **(Object)**
SCPI_Command	**(String)** - Any valid SCPI command
Return Type	String
Default	Not Applicable

Examples	`Dim scpi As ScpiStringParser`
	`Set scpi = app.ScpiStringParser`
	`scpi.Execute("SYST:PRES");`
	`ErrorString = scpi.Execute("SYST:ERROr?");`

C++ Syntax	Execute(BSTR SCPI_Command, BSTR * pQueryResponse);
Interface	IScpiStringParser2

ExecuteShortcut Method

Description	Executes a Macro (shortcut) stored in the analyzer. Use app.getShortcut to list existing macros. Use app.putShortcut to associate the macro number with the file.
VB Syntax	*app.***ExecuteShortcut** *index*
Variable	**(Type) - Description**
app	An Application **(object)**
index	**(long integer)** - Number of the macro stored in the analyzer.
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.ExecuteShortcut 1`
C++ Syntax	HRESULT ExecuteShortcut(long index)
Interface	IApplication

Write-only

GenerateGlobalDeltaMatchSequence Method

Description	Initiates a global delta match calibration. Learn more about Delta match calibration. See example of a complete Delta Match calibration.
VB Syntax	*numSteps* = *guided*.**GenerateGlobalDeltaMatchSequence** *conn,cKit*
Variable	**(Type) - Description**
numSteps	**Long Integer** - Variable to store the returned number of connection steps required by the Global Delta Match Cal.
guided	GuidedCalibration (object)
conn	**String** Connector Type for port 1.
cKit	**String** Cal Kit for all ports.
Return Type	Not Applicable
Default	Not Applicable
Examples	`guided.GenerateGlobalDeltaMatchSequence “APC 3.5 female”,"85052B"`
C++ Syntax	HRESULT GenerateGlobalDeltaMatchSequence(BSTR port_1_conn, BSTR cal_kit, long *num_steps);
Interface	IGuidedCalibration2

Write-only

GenerateErrorTerms Method

Description	Generates the error terms for the specified calibration type, stores the error terms in a Cal Set, saves the Cal Set, and returns the Cal Set GUID. If ALL the data for the cal type has NOT been acquired an error message is returned. **Note:** The manner in which the calibration is assigned to a Cal Set (Cal Register or User Cal Set) is determined by the setting of RemoteCalStoragePreference.
VB Syntax	*value* = *obj*.**GenerateErrorTerms**
Variable	**(Type) - Description**
value	(String) - Variable to store the returned GUID or error message.
obj	Any of the following: GuidedCalibration (object) SMCType (object) VMCType (object)
Return Type	String
Default	Not Applicable
Examples	`string = SMC.GenerateErrorTerms`
C++ Syntax	HRESULT put_GenerateErrorTerms(BSTR* calsetGUID);
Interface	IGuidedCalibration SMCType VMCType

About FCA Calibrations

Write-only

GenerateSteps Method

Description	Returns the number of steps required to complete the calibration type.
VB Syntax	*value* = *obj*.**GenerateSteps**
Variable	**(Type) - Description**
value	(long) - Variable to store the returned number of steps
obj	Any of the following: GuidedCalibration (object) SMCType (object) VMCType (object)
Return Type	Long
Default	Not Applicable
Examples	`value = SMC.GenerateSteps`
C++ Syntax	HRESULT put_GenerateSteps(long* steps);
Interface	IGuidedCalibration SMCType VMCType

GetAuxIO Method

Description	This method returns the IAuxIO interface.
VB Syntax	*app*.**GetAuxIO**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	IHWAuxIO
Default	Not Applicable

Example	`Dim app As AgilentPNA835x.Application`
	`Dim aux As HWAuxIO`
	`Set aux = app.GetAuxIO`

C++ Syntax	HRESULT GetAuxIO (IHWAuxIO **pAux);
Interface	IApplication

GetCalStandard Method

Description	Returns a handle to a calibration standard for modifying its definitions. To select a standard for performing a calibration (use Calibrator.AquireCalStandard).
VB Syntax	*calkit.***GetCalStandard***(index)*
Variable	**(Type) - Description**
calkit	A calKit **(object)**
index	**(long)** - Number of calibration standard. Choose **1** to **30;** (there are 30 cal standards in every kit).
Return Type	calStandard
Default	Not Applicable

Examples	`Dim short As CalStandard`
	`Set short = calKit.getCalStandard(1)`
	`short.label = "myShort"`

C++ Syntax	HRESULT GetCalStandard(long standardNumber, ICalStandard **pCalStd)
Interface	ICalKit

GetCalManager Method

Description	This method returns the ICalManager interface.
VB Syntax	*app*.**GetCalManager( )**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	ICalManager*
Default	Not Applicable

Example	`dim app as AgilentPNA835x.Application`
	`dim mgr as CalManager`
	`set mgr = app.GetCalManager()`

C++ Syntax	HRESULT GetCalManager(ICalManager **mgr);
Interface	IApplication

Last Modified:

30-Jan-2008 Added parenthesis

Read-only

About Cal Sets

Get CalSetByGUID Method

Description	Requests a Cal Set by GUID. Returns an ICal Set interface.
VB Syntax	*calMgr.***GetCalSetByGUID** *(GUID)*
Variable	**(Type) - Description**
calMgr	**(object) -** A CalManager object
GUID	**(string)** - GUID of the Cal Set being requested.
Return Type	Interface object
Default	Not Applicable
Example	`calMgr.GetCalSetByGUID (2B893E7A-971A-11d5-8D6C-00108334AE96)`
C++ Syntax	HRESULT GetCalSetByGUID(BSTR* strGUID, ICal Set* pCalSet);
Interface	ICalManager

GetCalSetCatalog Method - Superseded

Description	This method is replaced with EnumerateCalSets Returns a string containing a list of comma-separated GUIDs in the following format: {FD6F863E-9719-11d5-8D6C-00108334AE96}, {1B03B2CE-971A-11d5-8D6C-00108334AE96}, {2B893E7A-971A-11d5-8D6C-00108334AE96}
VB Syntax	*value* = *calMgr*.**GetCalSetCatalog**
Variable	**(Type) - Description**
value	**(string)** - Variable to store the returned GUID list
calMgr	**(object) -** A CalManager object
Return Type	String
Default	Not Applicable
Example	`value = calMgr.GetCalSetCatalog`
C++ Syntax	HRESULT GetCalSetCatalog(BSTR);
Interface	ICalManager

Last Modified:

6-Mar-2008	Superseded

Read-only　　About Cal Sets

GetCalSetUsageInfo Method

Description	Returns a string identifying the Cal Set currently in use by the specified channel. This method identifies the Cal Set being used by returning its GUID. This method also identifies the "Error Term set" within the Cal Set. Error term sets are identified by integers, with set 0 belonging to the original (non-interpolated) terms. As stimulus values for a channel are changed causing interpolation to be required, a new Error Term set is constructed within the Cal Set to hold the interpolated Error Terms. The sets are sequentially numbered 1, 2, 3, and so forth. These Error Term sets are destroyed when they are no longer being used. If there is no Cal Set in use for the given channel, the <GUID> argument is set to the empty string.
VB Syntax	*calMgr.***GetCalSetUsageInfo** (*chan, GUID, setNumber*)
Variable	**(Type) - Description**
calMgr	**(object) -** A CalManager object
chan	**(long [in]) -** channel of the Cal Set being requested
GUID	**(string [out])** - variable to store the GUID of the Cal Set being requested. If there is no Cal Set in use for the given channel, the <GUID> argument is set to the empty string.
setNumber	**(long [out]) -** variable to store the error term ID being requested. If the returned argument is greater than 0, the set is being interpolated.
Return Type	String , Long Integer
Default	Not Applicable
Example	`calMgr.GetCalSetUsageInfo (1, GUID, EtermID)`
C++ Syntax	HRESULT GetCalSetUsageInfo (long lChannel, BSTR* CalSetGUID, long* etermSetID);
Interface	ICalManager

Read only

GetCalTypes Method

Description	Returns a list of available calibration types known to the PNA. The Standard CalTypes are the same on all PNA's, but the Custom CalTypes are not necessarily the same. They are dependent on the custom measurement in the PNA. Learn more about applying Cal Types. See also CalibrationTypeID to apply a Cal Type containing in a Cal Set.
VB Syntax	*v* = *mgr*.**GetCalTypes**
Variable	**(Type) - Description**
mgr	A CalManager **(Object)**
v	Name/GuidPair that contains the calibration type name and associated GUID for each cal type known to the PNA.
Return Type	**(variant)** Two dimensional array.
Default	Not Applicable
Examples	`v =CalManager.GetCalTypes`
C++ Syntax	HRESULT GetCalTypes(VARIANT * NameGuidPair)
Interface	ICalManager2

GetComplex Method

Description Retrieves complex data from the specified location.

See also getNAComplex , getData , and getPairedData Methods

VB Syntax *measData*.**getComplex** *location, numPts, real(), imag()*

Variable **(Type) - Description**

measData An IArrayTransfer interface which supports the Measurement object

location **(enum NADataStore - IArrayTransfer)** - Where the data you want is residing. Choose from:

0 - naRawData

1 - naCorrectedData

2 - naMeasResult

3 - naRawMemory

4 - naMemoryResult

5 - naDivisor - When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.

numPts **(long integer)** - Number of data points requested
[out] - specifies number of data elements returned
[in] - specifies the data being requested or the capacity of the arrays

real **(single)** - Array to store the real values

imag **(single)** - Array to store the imaginary values

Return Type Single

Default Not Applicable

Examples

```
Dim real(201) AS Single
Dim imag(201) AS Single
Dim pts as Integer
Dim measData As IArrayTransfer
Set measData = app.ActiveMeasurement
measData.getComplex naCorrectedData, pts, real(0), imag(0)
```

C++ Syntax IArrayTransfer - HRESULT getComplex(tagNADataStore DataStore, long* pNumValues, float* pReal, float* pImag)

Interface IArrayTransfer

getDataByString Method

Description Retrieves variant data from the specified location in your choice of formats.

The PNA returns gather complex trace data which is ratioed if required by the measurement parameter, such as S11 or A/B. Otherwise it is raw receiver data, such as A or B.

VB Syntax *data* = *meas*.**getDataByString** *location, format*

Variable **(Type) - Description**

data **(variant)** - Array to store the data.

meas **(object) -** A Measurement object

location **(string)** – Name of the buffer to be read. Choose from:

"naRawData"

"naCorrectedData"

"naMeasResult"

"naRawMemory"

"naMemoryResult"

"naDivisor" - When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.

See Data Access Map

format **(enum NADataFormat)** - Format in which you would like the data. It does not have to be the displayed format. Choose from:

0 - naDataFormat_LinMag

1 - naDataFormat_LogMag

2 - naDataFormat_Phase

3 - naDataFormat_Polar

4 - naDataFormat_Smith

5 - naDataFormat_Delay

6 - naDataFormat_Real

7 - naDataFormat_Imaginary

8 - naDataFormat_SWR

9 - naDataFormat_PhaseUnwrapped

10 - naDataFormat_InverseSmith

11 - naDataFormat_Kelvin

12 - naDataFormat_Fahrenheit

13 - naDataFormat_Centigrade

Learn more about Data Format.

***** Specify **Smith** or **Polar** formats to obtain complex data pairs, which require a two-dimensional array **varData (numpts, 2)** to accommodate both real and imaginary data.

All scalar formats return a single dimension **varData(numpts).**

Return Type	Variant array
Default	Not Applicable
Examples	`meas.getDataByString “naMeasResult”, naDataFormat_Phase`
C++ Syntax	HRESULT getDataByString(BSTR location, tagDataFormat dataFormat, VARIANT * pData);
Interface	IMeasurement

Last Modified:

1-Oct-2007	Added temperature formats
19-Jul-2007	Corrected example

GetData Method

Description	Retrieves variant data from the specified location in your choice of formats. To get smoothed data from any of the specified locations, the format must be the same as the displayed format. The PNA returns gather complex trace data which is ratioed if required by the measurement parameter, such as S11 or A/B. Otherwise it is raw receiver data, such as A or B. This method returns a variant which is less efficient than methods available on the IArrayTransfer interface. If you plan to **Put** this data back into analyzer, putDataComplex (variant data) method requires complex, two-dimensional data. Therefore, request the data in **Polar** format.
VB Syntax	*data = meas.***GetData** *location, format*
Variable	**(Type) - Description**
data	Variant array to store the data.
meas	A Measurement **(object)**
location	**(enum NADataStore)** - Where the data you want is residing. See Data Access Map. Choose from: 0 - naRawData 1 - naCorrectedData 2 - naMeasResult 3 - naRawMemory 4 - naMemoryResult 5 - naDivisor When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.
format	**(enum NADataFormat)** - Format in which you would like the data. It does not have to be the displayed format. Choose from: 0 - naDataFormat_LinMag 1 - naDataFormat_LogMag 2 - naDataFormat_Phase **3 - naDataFormat_Polar*** **4 - naDataFormat_Smith*** 5 - naDataFormat_Delay 6 - naDataFormat_Real 7 - naDataFormat_Imaginary

8 - naDataFormat_SWR

9 - naDataFormat_PhaseUnwrapped

10 - naDataFormat_InverseSmith

11 - naDataFormat_Kelvin

12 - naDataFormat_Fahrenheit

13 - naDataFormat_Centigrade

Learn more about Data Format.

*** Specfiy Smith or Polar** formats to obtain complex data pairs, which require a two-dimensional array **varData (numpts, 2)** to accommodate both real and imaginary data.

All scalar formats return a single dimension **varData(numpts).**

naDataFormat_Phase and **naDataFormat_PhaseUnwrapped** returns degrees. However, putDataScalar method accepts data in radians (not degrees) and displays in degrees.

Return Type Variant array - automatically dimensioned to the size of the data

Default Not Applicable

Examples

```
Dim varData As Variant
varData = meas.GetData(naMeasResult,naDataFormat_Phase)
'Print Data
For i = 0 to chan.NumberOfPoints-1
 Print varData(i)
Next i
```

C++ Syntax HRESULT getData(tagNADataStore DataStore, tagDataFormat DataFormat, VARIANT *pData)

Interface IMeasurement

Last Modified:

1-Oct-2007 Added temperature formats

Read-only

GetECALModuleInfoEx Method

Description	This property replaces Get ECALModuleInfo Method. Returns the following information about the connected ECAL module: model number, serial number, connector type, calibration date, min and max frequency. The characterization within the ECal module that this information will be read from is specified by **ECALCharacterizationEx**. The default value is 0.
VB Syntax	*moduleInfo* = *cal*.**GetECALModuleInfoEx** *(module)*
Variable	**(Type) - Description**
moduleInfo	**(string)** - variable to store the module information
cal	A Calibrator **(object)**
module	**(long integer)** ECal module. Choose from modules **1** through **8** Use IsECALModuleFoundEx to determine the number of modules connected to the PNA
Return Type	String
Default	Not Applicable

Examples	`info = cal.GetECALModuleInfoEx(2)`
	Example return string:
	`ModelNumber: 85092-60007, SerialNumber: 01386, ConnectorType: N5FN5F, PortAConnector: Type N (50) female, PortBConnector: Type N (50) female, MinFreq: 30000, MaxFreq: 9100000000, NumberOfPoints: 250, Calibrated: July 4 2002`

C++ Syntax	HRESULT GetECALModuleInfoEx(long moduleNumber, BSTR* info);
Interface	ICalibrator4

GetErrorCorrection Method

Description	Reads the error correction state for the channel. Use ErrorCorrection Property to set this value. When this command returns true, some measurements on the channel MAY not have error correction ON. This is because the Cal Set currently in place may not contain the appropriate calibration data. To read the error correction state for a measurement, use Error Correction Property.
VB Syntax	*chan*.**GetErrorCorrection** *(boolean)*
Variable	**(Type) - Description**
chan	A Channel **(object)**
boolean	**(boolean)** Variable to store the returned value. **False** - Error correction has been set OFF **True** - Error correction has been set ON
Return Type	Boolean
Default	About Error Correction
Examples	`chan.GetErrorCorrection(value)`
C++ Syntax	HRESULT GetErrorCorrection (VARIANT_BOOL *bState)
Interface	IChannel8

GetErrorTerm Method - Superseded

Description

Note: This command is replaced by Get ErrorTermByString_Method

Retrieves error term data that is used for error correction. The data is complex pairs. Memory for the returned Variant is allocated by the server. The server returns a variant containing a two-dimensional safe Array.

This method returns a variant which is less efficient than getErrorTermComplex on the ICalData interface.

Learn about reading and writing Calibration data.

VB Syntax *data* = *cal*.**getErrorTerm** *term, rcv. src*

Variable **(Type) - Description**

data Variant array to store the data.

cal A Calibrator **(object)**

term **(enum As NaErrorTerm).** Choose from:

naErrorTerm_Directivity_Isolation
naErrorTerm_Match
naErrorTerm_Tracking

rcv **(long integer)** - Receiver Port

src **(long integer)** - Source Port

To get this	**Specify these parameters:**		
Error Term	*term*	*rcv*	*src*
Fwd Directivity	naET_Directivity Isolation	1	1
Rev Directivity	naET_Directivity Isolation	2	2
Fwd Isolation	naET_Directivity Isolation	2	1
Rev Isolation	naET_Directivity Isolation	1	2
Fwd Source Match	naErrorTerm_Match	1	1
Rev Source Match	naErrorTerm_Match	2	2
Fwd Load Match	naErrorTerm_Match	2	1
Rev Load Match	naErrorTerm_Match	1	2
Fwd Reflection Tracking	naErrorTerm_Tracking	1	1
Rev Reflection Tracking	naErrorTerm_Tracking	2	2

Fwd Trans Tracking	naErrorTerm_Tracking	2	1
Rev Trans Tracking	naErrorTerm_Tracking	1	2

Return Type Variant

Default Not Applicable

Examples

```
Dim varError As Variant
varError = cal.getErrorTerm(naErrorTerm_Tracking,2,1)
```

C++ Syntax HRESULT getErrorTerm(tagNAErrorTerm ETerm, long ReceivePort, long SourcePort, VARIANT* pData)

Interface ICalibrator

GetErrorTerm Method Superseded

Description	This command has been replaced with Get ErrorTermByString Returns error term data from the Cal Set. The returned data is complex pairs. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data
VB Syntax	*data = calSet.***getErrorTerm** *(setNumber, term, rcv, src)*
Variable	**(Type) - Description**
data	**(Variant)** Two-dimensional safe array to store the returned data. Memory for the returned Variant is allocated by the PNA and must be released by client. **Note:** See also getErrorTermComplex on the ICalData2 interface to avoid using the variant data type.
calSet	A Cal Set **(object)**
setNumber	**(Long)** There can be more than one set of error terms in a Cal Set. • SetNumber **0** contains the original set of error terms for a Cal Set. • SetNumbers **> 0** contain Interpolated error terms. Interpolated error terms are generated when interpolation is required and destroyed when no longer used. Learn about Interpolation. • To determine the SetNumber in use by a channel, see GetCalSetUsageInfo
term	**(enum As NaErrorTerm2).** Choose from: 0 - naET_Directivity (rcv = src) 1 - naET_SourceMatch (rcv = src) 2 - naET_ReflectionTracking (rcv = src) 3 - naET_TransmissionTracking (rcv ≠ src) 4 - naET_LoadMatch (rcv ≠ src) 5 - naET_Isolation (rcv ≠ src)
rcv	**(Long)** - Receiver Port
src	**(Long)** - Source Port
Return Type	Variant
Default	Not Applicable
Examples	`Dim varError As Variant` `varError = CalSet.getErrorTerm(0,naET_TransmissionTracking,2,1)`

C++ Syntax HRESULT getErrorTerm(long setID, tagNAErrorTerm2 ETerm, long ReceivePort, long SourcePort, VARIANT* pData)

Interface ICalSet

GetErrorTermByString Method

Description Returns error term data from the Cal Set by specifying the string name of the error term.

- Learn more about Reading and Writing Cal Data
- See examples of Reading and Writing Cal Set Data
- See GetCalSetUsageInfo to determine the setNumber.

VB Syntax *pdata* **=** *calset*.**GetErrorTermByString**(*setNumber*, *errorTerm*)

Variable **(Type) - Description**

pdata **(Variant)** Two-dimensional safe array to store the returned data. Memory for the returned Variant is allocated by the PNA and must be released by client.

Note: See also getErrorTermComplexByString on the ICalData3 interface to avoid using the variant data type.

calset A Cal Set **(object)**

setNumber **(Long)** Set number of the required Cal Set data.

See GetCalSetUsageInfo to determine the setNumber.

- SetNumber **0** contains the original "master" set of error terms for a Cal Set.
- SetNumbers **> 0** refers to the PNA channel number that contains the error terms. When retrieving channel error terms, Correction must be ON.

  New beginning PNA Rev 7.2: The channel error term data contains interpolation, fixturing, and port extension data if each is ON.

  - For Balanced Measurements, interpolation, fixturing, and port extensions can be ON independently.
  - For Standard S-parameters, to get port extension data, both fixturing and port extensions must be ON.

errorTerm **(String)** The string name used to identify a particular error term in the Cal Set. An example string for port 3 directivity in a full 2 port cal might be "Directivity(3,3)". To determine the string names of error terms, see GetErrorTermList2.

Return Type Variant

Default Not Applicable

Examples See an Example

C++ Syntax HRESULT GetErrorTermByString (long SetNumber, BSTR bufferName, VARIANT* pdata);

Interface ICalSet2

GetErrorTermComplex Method Superseded

Description	This command has been replaced by Get ErrorTermComplexByString
	Retrieves error term data from the error correction buffer. The data is in complex pairs.
	Learn more about reading and writing Cal Data using COM.
	This method exists on a non-default interface. If you cannot access this method, use the GetErrorTerm Method on ICalibrator.
VB Syntax	*eData*.**GetErrorTermComplex** *term, rcv, src, numPts, real(), imag()*
Variable	**(Type) - Description**
eData	An ICalData pointer to the Calibrator object
term	**(enum NAErrorTerm)** - The error term to be retrieved. Choose from: • **naErrorTerm_Directivity_Isolation** • **naErrorTerm_Match** • **naErrorTerm_Tracking**
rcv	**(long integer)** - Receiver Port
src	**(long integer)** - Source Port
numPts	**(long integer)** - on input, max number of data points to return; on output: indicates the actual number of data points returned.
real()	**(single)** - array to accept the **real** part of the error-term. One-dimensional for the number of data points.
imag()	**(single)** - array to accept the **imaginary** part of the error-term. One-dimensional for the number of data points.

To get this Error Term	Specify these parameters: *term*	*rcv*	*src*
Fwd Directivity	naET_Directivity Isolation	1	1
Rev Directivity	naET_Directivity Isolation	2	2
Fwd Isolation	naET_Directivity Isolation	2	1
Rev Isolation	naET_Directivity Isolation	1	2
Fwd Source Match	naErrorTerm_Match	1	1
Rev Source Match	naErrorTerm_Match	2	2
Fwd Load Match	naErrorTerm_Match	2	1
Rev Load Match	naErrorTerm_Match	1	2
Fwd Reflection Tracking	naErrorTerm_Tracking	1	1
Rev Reflection Tracking	naErrorTerm_Tracking	2	2
Fwd Trans Tracking	naErrorTerm_Tracking	2	1
Rev Trans Tracking	naErrorTerm_Tracking	1	2

Return Type Single

Default Not Applicable

Examples

```
ReDim rel(numpts)
ReDim img(numpts)
Dim eData As ICalData
Set eData = chan.Calibrator
eData.getErrorTermComplex naErrorTerm_Directivity_Isolation, 1,
1, 201, rel(0), img(0)
```

C++ Syntax HRESULT raw_getErrorTermComplex(tagNAErrorTerm ETerm, long ReceivePort, long SourcePort, long* pNumValues, float* pReal, float* pImag)

Interface ICalData

GetErrorTermComplex Method Superseded

Description This command is replaced with Get ErrorTermComplexByString

Returns error term data from the Cal Set. The data is in complex pairs.

Learn more about Reading and Writing Cal Data

See examples of Reading and Writing Cal Set Data

Note: This method exists on a non-default interface. If you cannot access this method, use the GetErrorTerm Method on ICal Set.

VB Syntax *iCalData2.***GetErrorTermComplex** *setNumber, term, rcv, src, numPts, real(), imag()*

Variable **(Type) - Description**

iCalData2 An ICalData2 pointer to the Cal Set object

setNumber **(Long)** There can be more than one set of error terms in a Cal Set.

- setNumber **0** contains the original set of error terms for a Cal Set.
- setNumbers **> 0** contain Interpolated error terms. Interpolated error terms are generated when interpolation is required and destroyed when no longer used. Learn about Interpolation.
- To determine the setNumber in use by a channel, see GetCalSetUsageInfo

term **(enum NAErrorTerm2)** - The error term to be retrieved. Choose from:

0 - naET_Directivity

1 - naET_SourceMatch

2 - naET_ReflectionTracking

3 - naET_TransmissionTracking

4 - naET_LoadMatch

5 - naET_Isolation

rcv **(Long)** - Receiver Port

src **(Long)** - Source Port

numPts **(Long)** An In/Out parameter.

On the way **in**, you specify the **max** number of values being requested.

On the way **out,** the PNA returns number of values actually returned.

real() **(single)** - array to accept the **real** part of the error-term. One-dimensional for the number of data points.

imag() **(single)** - array to accept the **imaginary** part of the error-term. One-dimensional for the number of data points.

Return Type Single

Default Not Applicable

Examples

```
dim numpts as long
numpts = ActiveChannel.NumberOfPoints
ReDim r(numpts)  ' real part
ReDim i(numpts)  ' imaginary part
Dim CalSet as CalSet
set CalSet = pna.GetCalManager.GetCal SetByGUID( txtGUID )
Dim eData As ICalData2
Set eData = CalSet
eData.getErrorTermComplex 0, naET_LoadMatch, 1, 2, numpts,
r(0),i (0)
```

C++ Syntax HRESULT getErrorTermComplex(long setID, tagNAErrorTerm2 ETerm, long ReceivePort, long SourcePort, long* pNumValues, float* pReal, float* pImag)

Interface ICalData2

GetErrorTermComplexByString Method

Description Returns error term data from the Cal Set by specifying the string name.

Learn more about Reading and Writing Cal Data

See examples of Reading and Writing Cal Set Data

Note: This method exists on a non-default interface. If you cannot access this method, use GetErrorTermByString

VB Syntax *ICalData3.***GetErrorTermComplexByString** *setNumber, errorTerm, numPoints, real(0), imag(0)*

Variable **(Type) - Description**

ICalData3 An ICalData3 pointer to a CalSet (Object)

setNumber **(Long)** There can be more than one set of error terms in a Cal Set.

- setNumber **0** contains the original set of error terms for a Cal Set.
- setNumbers **> 0** contain Interpolated error terms. Interpolated error terms are generated when interpolation is required and destroyed when no longer used. Learn about Interpolation.
- To determine the setNumber in use by a channel, see GetCalSetUsageInfo

errorTerm **(String)** The string name of error term in the Cal Set. An example string for port 3 directivity in a full 2 port cal might be "Directivity(3,3)".

For a list error term string names, use Get ErrorTermList2

numPoints **(Long)** An In/Out parameter.

On the way **in**, you specify the **max** number of values being requested.

On the way **out,** the PNA returns number of values actually returned.

real **(Single)** The real component of the complex data.

imag **(Single)** The imaginary component of the complex data.

Return Type Single

Default Not Applicable

Examples See example

C++ Syntax HRESULT GetErrorTermComplexByString(long etermSetID, BSTR bufferName, long* lnumPoints, single* real, single* imag);

Interface ICalData3

Read-only

About Cal Sets

GetErrorTermList Method Superseded

Description

Note: This command is replaced by CalSet.getErrorTermList2

Returns the list of Error Terms contained in this Cal Set for the CalType specified in the OpenCal Set method. Learn more about reading and writing Cal Data using COM.

The list is a comma separated, textual representation of the error terms with the term name followed by the port path in parentheses:

Term (n, n),
Term (m,n)

Before calling this method you must open the Cal Set with OpenCal Set.. If the Cal set is not open, this method returns E_NA_Cal Set_ACCESS_DENIED.

Use StringToNAErrorTerm2 to convert the list entrees to values that can be used with GetErrorTerm and PutErrorTerm.

Note: The port path designation (m n) indicates the ports that contribute to the error being compensated. Directivity, source match and reflection tracking are single port characteristics, designated in this list by (n n) where n equals the port being characterized.
Other terms characterize the interaction between ports. For example, the load match term is describing the match at port (m) while looking into port (n). Thus the notation (m n) indicates the two ports that contribute to the loadmatch error.

VB Syntax *CalSet*.**GetErrorTermList** (SetID, count, strList)

Variable **(Type) - Description**

CalSet **(object) -** A Cal Set object

SetID (long) - specifies the error term set to query. Use 0 for the master set.

count (long) - the number of error terms in the returned list

strList **(string) -** comma separated list of error terms found in Cal Set

Return Type Not Applicable

Default Not Applicable

Examples

```
dim count as Integer
dim list as string
OpenCalSet (naCalType_TwoPortSOLT 1, 2)
GetErrorTermList( 0, count, list)
CloseCalSet( )
```

Assuming the cal set contained the full set of error terms for this two-port Cal, the returned list would be:

```
"Directivity(1 1),SourceMatch(1 1),ReflectionTracking(1
1),TransmissionTracking(2 1),LoadMatch(2 1),Isolation(2
```

```
1),Directivity(2 2),SourceMatch(2 2),ReflectionTracking(2
2),TransmissionTracking(1 2),LoadMatch(1 2),Isolation(1 2)"
```

C++ Syntax HRESULT GetErrorTermList (long etermSetID, long* count, BSTR* strList);

Interface ICalSet

GetErrorTermList2 Method

Description Returns a list of error terms names found in the Cal Set containing the specified prefix.

Learn more about Reading and Writing Cal Data

See examples of Reading and Writing Cal Set Data

VB Syntax *list* = *CalSet*.**GetErrorTermList2**(*setNumber*, *calTypePrefix*)

Variable **(Type) - Description**

list **(Variant)** Variant containing a string array of error term names.

CalSet **(object) -** A CalSet object

setNumber **(Long)** There can be more than one set of error terms in a Cal Set.

- setNumber **0** contains the original set of error terms for a Cal Set.
- setNumbers **> 0** contain Interpolated error terms. Interpolated error terms are generated when interpolation is required and destroyed when no longer used. Learn about Interpolation.
- To determine the setNumber in use by a channel, see GetCalSetUsageInfo

caltypePrefix **(String)** The string used to identify Cal Set data as belonging to a specific Cal Type. This string is used as a filter so that only the error term names of interest are returned. If the prefix is empty, all terms are returned.

An example prefix for a two port cal on ports 2 and 3 might be: "Full 2 Port Cal (2,3)".

Return Type Variant

Default Not Applicable

Examples See an Example

C++ Syntax HRESULT GetErrorTermList2 (long SetNumber, BSTR caltypePrefix, VARIANT* list**)**

Interface ICalSet2

Write-only

GetExtendedCalInterface Method

Description	Returns an interface that exposes the properties of Noise Calibration.
VB Syntax	*Cal2.***GetExtendedCalInterface** *(interface)*
Variable	**(Type) - Description**
Cal2	An ICalibrate2 **(object)**
interface	(object) Returns a handle to the specified interface. Choose from ' "NoiseCal"
Return Type	
Default	
Example	`dim noiseCal` `dim noiseCalExtensions` `set noiseCal= Get Calmanager?.CreateCustomCalEx("NoiseCal")` `set noiseCalExtensions = noiseCal.GetExtendedCalInterface("INoiseCal")`
C++ Syntax	HRESULT GetExtendedCalInterface();
Interface	ICalibrate2

Last Modified:

29-May-2007 MN New topic

Get ExternalTestSetIO Method

Description This method returns the IExternalTestSetIO interface.

VB Syntax *app.***GetExternalTestSetIO**

Variable **(Type) - Description**

app An Application **(object)**

Return Type IHWExternalTestSetIO

Default Not Applicable

Example

```
Dim app As AgilentPNA835x.Application
Dim ets As HWExternalTestSetIO
Set ets = app.GetExternalTestSetIO
```

C++ Syntax HRESULT GetExternalTestSetIO (IHWExternalTestSetIO **ptestset);

Interface IApplication

GetFilterStatistics Method

Description	Returns all four Filter Statistics resulting from a SearchFilterBandwidth. To retrieve individual filter statistics, use meas.FilterCF, meas.FilterBW, meas.FilterLoss, meas.FilterQ properties.
VB Syntax	*meas.***GetFilterStatistics** *cf,bw,loss,q*
Variable	**(Type) - Description**
meas	A Measurement **(object)**
cf,bw,loss,q	Dimensioned variables to store the returned values
Return Type	**(double)** *cf* **(single)** *bw,loss,q*
Default	Not Applicable

Examples

```
'Dimension variables
Dim cf as Double
Dim bw as Single
Dim loss as Single
Dim q as Single

meas.GetFilterStatistics cf,bw,loss,q
```

C++ Syntax	HRESULT GetFilterStatistics(double* centerFreq, float* bw, float* loss, float* quality)
Interface	IMeasurement

Read-only [About Cal Sets]

GetGuid Method

Description	Returns a string containing the GUID identifying this Cal Set. Each Cal Set is assigned a GUID (global unique ID). GUIDs are used to retrieve and select Cal Sets on the PNA. Learn more about reading and writing Cal Data using COM.
VB Syntax	*value* = *CalSet*.**GetGuid**
Variable	**(Type) - Description**
value	**(string)** - Variable to store the returned GUID
CalSet	**(object) -** A Cal Set object
Return Type	String
Default	Not Applicable
Examples	`guid = CalSet.GetGuid 'Read`
C++ Syntax	HRESULT GetGUID(BSTR* pGUIDString);
Interface	ICalSet

get_InputVoltageEX Method

Description	This command replaces get InputVoltage Method Reads the ADC voltage from the specified location.
VB Syntax	*volts* = *AuxIO*.**get_InputVoltageEX** *loc*
Variable	**(Type) - Description**
volts	**(double) -** variable to store the return value
AuxIO	**(object) -** A Hardware Auxiliary Input / Output object
loc	**(Long)** Location from which to read data. **For PNA-X models:**, reads ADC voltages from the Power I/O connector. Choose from: **1** Reads voltage on Analog In 1 port (pin 7). **2** Reads voltage on Analog In 2 port (pin 8). **3** Reads voltage on GndSens (pin 6). **4** Reads voltage on Analog Out 1 port (pin 3). **5** Reads voltage on Analog Out 2 port (pin 4). **For all other PNA models:** **1** Reads voltage on the Analog IN (pin 14) of the AUX IO connector. **4** Reads voltage on Analog Out 1 port (pin 3). **5** Reads voltage on Analog Out 2 port (pin 2).
Return Type	Double
Default	Not Applicable

Examples

```
Dim aux as HWAuxIO
Set aux = PNA.getAuxIO
volts = aux.get_InputVoltageEX 1
'for PNA-X, read voltage on PowerI/O pin 7
'for all other models, reads voltage on Aux I/O Analog In
(pin 14)
```

C++ Syntax	HRESULT get_InputVoltageEX (long muxLoc, double* vtVoltage);
Interface	HWAuxIO2

Last Modified:

10-Jul-2007 MX New topic

get_Input1 Method

Description	Reads a hardware latch that captures high to low transitions on Input1 of the Material Handler IO. Reading the latch causes it to reset and is ready for the next transition. The hardware latch is only capable of capturing one transition per query. Additional transitions are ignored until after the next query. Momentarily driving Input1 high, then low, causes a transition to be detected and latched.
VB Syntax	*inp1* = *handlerIo*.**get_Input1**
Variable	**(Type) - Description**
inp1	**(variant) -** A variable to store the return value
handlerIo	**(object)** - A HandlerIO object
Return Type	Variant - **0 -** a high to low transition occurred at Input1 since the last time it was queried. **1** - no high to low transition occurred.
Default	Not Applicable
Examples	`input1 = handlerIo.get_Input1 'Read`
C++ Syntax	HRESULT get_Input1 (VARIANT* Data);
Interface	IHWMaterialHandlerIO

Read-only

GetIsolationPaths Method

Description Gets the list of paths (port pairings) for which isolation standards will be measured during calibration.

VB Syntax *value* = *obj*.**GetIsolationPaths**

Variable **(Type) - Description**

value (Variant) - Variable to store the returned port paths in pairs. One-dimensional array of Long Integers.

obj Any of the following:

GuidedCalibration (object)

Return Type Variant – Containing one-dimensional array of Long Integers.

Default No port pairs (empty Variant variable)

Examples

```
pathList = guidedCal.GetIsolationPaths
'displaying the paths separated by commas,
'with a dash (-) between the pair of port numbers comprising
each path

For i = LBound(portList) To UBound(portList) Step 2
 msg = msg + CStr(portList(i)) + "-" + CStr(portList(i+1))
 If i+1 < UBound(portList) Then msg = msg + ","
Next
MsgBox msg, 0, "List of isolation paths"
```

C++ Syntax HRESULT GetIsolationPaths(VARIANT* pathList);

Interface IGuidedCalibration

Last Modified:

16-Apr-2007 MX New topic

Read-only | About the MaterialHandler connector

Get MaterialHandlerIO Method

Description	This method returns the MaterialHandlerIO interface.
VB Syntax	*app*.**GetMaterialHandlerIO**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	IHWMaterialHandlerIO
Default	Not Applicable

Example	`Dim app As AgilentPNA835x.Application`
	`Dim hand As HWMaterialHandlerIO`
	`Set hand = app.GetMaterialHandlerIO`

C++ Syntax	HRESULT GetMaterialHandlerIO (IHWMaterialHandlerIO **phand);
Interface	IApplication

GetNAComplex Method

Description Retrieves complex data from the specified location.
See also getComplex and getData Method.

VB Syntax *measData*.**getNAComplex** *location, numPts, data*

Variable **(Type) - Description**

measData An IArrayTransfer interface which supports the Measurement object

location **(enum NADataStore)** - Where the data you want is residing. Choose from:

0 - naRawData

1 - naCorrectedData

2 - naMeasResult

3 - naRawMemory

4 - naMemoryResult

5 - naDivisor - When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.

numPts **(long integer)** - Number of data points requested
[out] - specifies number of data elements returned
[in] - specifies the data being requested or the capacity of the *dComplex* array

data **(NAComplex)** - A one-dimensional array of NaComplex to store the data.

Return Type NAComplex

Default Not Applicable

Examples

```
Dim dComplex(201) AS NaComplex
Dim measData As IArrayTransfer
Dim pts as Long
Set measData = app.ActiveMeasurement
measData.getNAComplex naCorrectedData, pts, dComplex(0)
```

Notes The data is stored as Real and Imaginary (**Re** and **Im**) members of the NaComplex user defined type. You can access each number individually by iterating through the array.

```
For i = 0 to NumPts-1
 dReal (i) = dcomplex (i).Re
 dImag (i) = dcomplex (i).Im
Next i
```

C++ Syntax HRESULT getNAComplex(tagNADataStore DataStore, long* pNumValues, TsComplex* pComplex)

Interface IArrayTransfer

GetNumberOfGroups Method

Description	Returns the number of groups a channel has yet to acquire. To set the number of groups for a channel, use Number Of Groups Method
VB Syntax	*value* = *chan*.**GetNumberOfGroups**
Variable	**(Type) - Description**
value	**(Long Integer)** - Number of groups
chan	Channel **(object)**
Return Type	**(Long Integer)**
Default	Not Applicable
Examples	`groups = chan.GetNumberOfGroups 'Read`
C++ Syntax	HRESULT GetNumberOfGroups(long* numberOfGroups);
Interface	IChannel3

get_Output Method

Description Type 1 and Type2 configurations: Returns the last value written to the selected output pin.

Type3 configuration: Returns the current state of the selected output pin. If an Input1 trigger occurs, the state may not be the same value as was written.

All configurations: Data is written using put_Output Method.

VB Syntax *data* = *handlerIo*.**get_Output** *(pin)*

Variable **(Type) - Description**

data **(variant) -** A variable to store the return value. The returned value will be one of the following:

0 - TTL Low

1 - TTL High

handlerIo **(object)** - A HandlerIO object

pin **(enum as NAMatHandlerOutput)** - output to read. Choose from:

naOutput1 (0)
naOutput1User (1)
naOutput2 (2)
naOutput2User (3)

Learn about User Output

Return Type Variant

Default Not Applicable

Examples

```
data = handlerIo.get_Output(naOutput1)
```

C++ Syntax HRESULT get_Output (tagNAMatHandlerOutput Output, VARIANT* Data);

Interface IHWMaterialHandlerIO

Read-only About the Aux I/O Connector

get_OutputVoltage Method

Description	**E836x and PNA-L**: Reads voltages on the DAC/Analog Output 1|2 of the Auxiliary IO connector. **PNA-X**: Reads voltage on the Power I/O connector AnalogOut1|2.
VB Syntax	*volts* = *AuxIO*.**get_OutputVoltage** *(output)*
Variable	**(Type) - Description**
volts	**(double) -** variable to store the return value
AuxIO	**(object) -** A Hardware Auxiliary Input / Output object
output	**(variant)** Number of the output DAC from which to read voltage. Choose from: **1** Output 1 (Aux I/O pin 3) and (Power I/O pin 3) **2** Output 2 (Aux I/O pin 2) and (Power I/O pin 4)
Return Type	Double
Default	Not Applicable

Examples	`Dim aux as HWAuxIO`
	`Set aux = PNA.getAuxIO`
	`volts = aux.get_OutputVoltage(1)`
	`'read voltage from Analog Out 1 (Aux I/O pin3) or (Power I/O pin 3)`

C++ Syntax	HRESULT get_OutputVoltage(VARIANT Output, double* Voltage);
Interface	IHWAuxIO

Last Modified:

10-Jul-2007 Added PNA-X capability

Read-only

get OutputVoltageMode Method

Description	This command returns the mode of the selected "Analog Out" line on the Auxiliary IO connector and Power I/O connector. The modes give the user the option to have the requested voltage applied immediately or not until the sweep is done. To set the mode, use put_OutputVoltageMode Method.
VB Syntax	*mode* = *auxIo*.**get_OutputVoltageMode** *(output)*
Variable	**(Type) - Description**
mode	**(enum NAOutputVoltageMode) -** variable to store the returned mode. **naWaitEOS** - While in this mode any voltage changes sent to the selected analog out will only get applied to the output between sweeps. **naNoWait** - While in this mode any voltage changes sent to the selected analog out will occur right away without waiting until the end of a sweep, the voltage gets applied immediately.
auxIo	**(object) -** A Hardware Auxiliary Input / Output object
output	(double) Analog Output. Choose from **1** or **2**
Return Type	enum as NAOutputVoltageMode
Default	naWaitEOS
Examples	`vOutMode = auxIo.get_OutputVoltageMode (1)`
C++ Syntax	HRESULT get_OutputVoltageMode(VARIANT Output, tagNAOutputVoltageMode* pMode);
Interface	IHWAuxIO

Last Modified:

10-Jul-2007 Added PNA-X capability

GetPairedData Method

Description Retrieves pairs of data from the specified location.

Note: This method exists on a non-default interface. If you cannot access this method, use the Get Data Method on IMeasurement.

VB Syntax *measData*.**getPairedData** *location, format, numPts, d1, d2*

Variable **(Type) - Description**

measData An IArrayTransfer interface which supports the Measurement object

location **(enum NADataStore)** - Where the data you want is residing. Choose from:

0 - naRawData

1 - naCorrectedData

2 - naMeasResult

3 - naRawMemory

4 - naMemoryResult

5 - naDivisor - When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.

See Data Access Map

format **(enum NAPairedDataFormat)** - Format in which you would like the Paired data. Choose from:

0 -naLogMagPhase - Log magnitude and phase

1 -naLinMagPhase - Linear magnitude and phase

2 -naRealImaginary - Real and Imaginary

Note: Selecting **naRealImaginary** format is the same as using the getComplex method

numPts **(long integer)** - Number of data points requested
[out] - specifies number of data elements returned
[in] - specifies the data being requested or the capacity of the *dPaired* array

d1 **(single)** - Array to store the magnitude / real values

d2 **(single)** - Array to store the phase / imaginary values

Return Type Two Single arrays

Default Not Applicable

Examples

```
Dim logm() As Single
Dim phase() As Single
Public measData As IArrayTransfer
```

```
Set measData = app.ActiveMeasurement
Dim numpts As Long
numPoints = app.ActiveChannel.NumberOfPoints
ReDim logm(numPoints)
ReDim phase(numPoints)

measData.getPairedData naCorrectedData, naLogMagPhase,
numPoints, logm(0), phase(0)

Print values(0), values(1)
```

C++ Syntax HRESULT getPairedData(tagNADataStore DataStore, tagNAPairedDataFormat PairFormat, long* pNumValues, float* pReal, float* pImag)

Interface IArrayTransfer

get_Port Method

Description Returns the value from the specified "readable" port.

VB Syntax *data* = *handlerIo*.**get_Port (port)**

Variable **(Type) - Description**

data **(variant) -** A variable to store the return value. The following table shows what the returned data represents:

Port	MSB...LSB 8..0
C	C3...C0
D	D3...D0
E	D3...D0 + C3...C0

handlerIo **(object)** - A HandlerIO object

port **(enum as NAMatHandlerPort)** - port to get data from. Choose from:

naPortC - (2)

naPortD - (3)

naPortE - (4)

Note: Reading data from the Write-only ports (A,B,F,G,H) will return an error.
Ports C and D must be put in Read mode before reading from C, D, or E using PortMode Property.

Return Type Variant

Default 0

Examples

```
data = handlerIo.get_Port(naPortC)
```

C++ Syntax HRESULT get_Port (tagNAMatHandlerPort Port, VARIANT* Data);

Interface IHWMaterialHandlerIO

get_PortCData Method

Description	Reads a 4-bit value from Port C of the Aux I/O connector (pins 22-25) and the Material Handler IO (pins 21-24 Anritsu) - (pins 22-25 Avantest). **Note**: These lines are connected to both the Handler IO and Aux IO in the PNA.
VB Syntax	*value* = *AuxIO*.**get_PortCData**
Variable	**(Type) - Description**
value	**(variant)** - Variable to store the returned data
AuxIO	**(object) -** A Hardware Auxiliary Input / Output object
Return Type	Integer
Default	None
Examples	`value = auxIo.get_PortCData 'Reading a value of 15 when in Positive Logic indicates Port C lines C0, C1, C2, C3 are High. If in Negative Logic they are Low.`
C++ Syntax	HRESULT get_PortCData(VARIANT* Data);
Interface	IHWAuxIO

GetPortNumber Method

Description	Returns the port number that is associated with the specified port name. These numbers are used with several commands to specify a PNA port. To learn more, see Remotely Specifying a Source Port.
VB Syntax	*value* = *cap*.**GetPortNumber** *PortName*
Variable	**(Type) - Description**
value	**(Long)** - Variable to store the returned Port Number integer value.
cap	A Capabilities **(object)**
PortName	**(String)** Name of the PNA port. • Use SourcePortNames Property to return a list of PNA port (string) names. • If an external source is selected, specify the external source name that is used in the Select an External Source dialog.
Return Type	Long Integer
Default	Not Applicable
Examples	`value = cap.GetPortNumber 'Read`
C++ Syntax	HRESULT GetPortNumber(BSTR name, long *number);
Interface	ICapabilities4

Last Modified:

April 30, 2007	Edited for Ext Source Control

GetRaw2DData Method

Description Returns raw 2D data at all frequency and power data points for the current Gain Compression measurement.

If correction is on, corrected data are returned. Otherwise, raw data are returned.

VB Syntax *data* = *gca*.**GetRaw2DData** *location, format, param*

Variable **(Type) - Description**

data Variant array in which to store returned measurement data.

gca A GainCompression **(object)**

location (enum NADataStore) - Where the data you want is residing. Choose from:

0 - naRawData

1 - naCorrectedData

format (enum NADataFormat) - Format in which you would like the data. It does not have to be the displayed format. Choose from:

0 - naDataFormat_LinMag

1 - naDataFormat_LogMag

2 - naDataFormat_Phase

3 - naDataFormat_Polar*

4 - naDataFormat_Smith*

5 - naDataFormat_Delay -- **Not valid for this command.**

6 - naDataFormat_Real

7 - naDataFormat_Imaginary

8 - naDataFormat_SWR

9 - naDataFormat_PhaseUnwrapped

10 - naDataFormat_InverseSmith

Learn more about Data Format.

* Specfiy Smith or Polar formats to obtain complex data pairs, which require a two-dimensional array varData (numpts, 2) to accommodate both real and imaginary data.

All scalar formats return a single dimension varData(numpts).

naDataFormat_Phase and naDataFormat_PhaseUnwrapped returns degrees.

param **(String)** Parameter of data to return. Not case-sensitive. The specified parameter need NOT be displayed.

Choose from:

- **"pin"** - input power at each data point.
- **"pout"** - output power at each data point.
- **"gain"** - device gain (S21) at each data point.
- **"inputmatch"** - input match (S11) at each data point.

Return Type	Variant Array
Default	Not Applicable
Examples	
C++ Syntax	HRESULT GetRaw2DData(tagNADataStore location, tagNADataFormat format, BSTR data_name, VARIANT* pData);
Interface	IGainCompression

Last Modified:

22-Oct-2007 MX New topic

GetDataIm Method

Description Reads the Imaginary part of the data acquired from a 2-dimensional sweep.

VB Syntax *data* = *gca*.**GetDataIm** *stim, dPoint, param*

Variable **(Type) - Description**

data Variant array in which to store returned measurement data.

gca A GainCompression **(object)**

stim **(NAGCAIndexSelect)**

- **naFrequencySelect** - for the specified frequency data point, returns all of the measured data for each power stimulus.
- **naPowerSelect** - for the specified power data point, returns all of the measured data for each frequency stimulus.

dPoint Data point (Frequency or Power) for which data is returned.

param Parameter of data to return. Not case-sensitive. Choose from:

- **"pin"** - input power at each data point.
- **"pout"** - output power at each data point.
- **"gain"** - device gain (S21) at each data point.
- **"inputmatch"** - input match (S11) at each data point.

Return Type Variant Array

Default Not Applicable

Examples For the fifth frequency data point, returns 'Power Output' imaginary (phase) data from all power stimulus values. If there are 30 power sweep points, 30 values are returned.

```
data = gca.GetDataIm naFrequencySelect, 5, "pout"
```

For the 30th stimulus power data point, returns 'Power Output' imaginary (phase) data from all frequency stimulus values. If there are 201 frequency sweep points, 201 values are returned.

```
data = gca.GetDataIm naPowerSelect, 30, "pout"
```

C++ Syntax HRESULT GetDataIm(tagNAGCAIndexSelect index_select, int index,BSTR data_name, VARIANT* pData);

Interface IGainCompression

Last Modified:

22-Oct-2007	MX New topic

GetDataRe Method

Description Reads the REAL part of the data acquired from a 2-dimensional sweep.

VB Syntax *data* = *gca*.**GetDataRe** *stim, dPoint, param*

Variable **(Type) - Description**

data Variant array in which to store returned measurement data.

gca A GainCompression **(object)**

stim **(NAGCAIndexSelect)**

- **naFrequencySelect** - for the specified frequency data point, returns all of the measured data for each power stimulus.
- **naPowerSelect** - for the specified power data point, returns all of the measured data for each frequency stimulus.

dPoint Data point (Frequency or Power) for which data is returned.

param Parameter of data to return. Not case-sensitive. Choose from:

- **"pin"** - input power at each data point.
- **"pout"** - output power at each data point.
- **"gain"** - device gain (S21) at each data point.
- **"inputmatch"** - input match (S11) at each data point.

Return Type Variant Array

Default Not Applicable

Examples For the fifth frequency data point, returns 'Power Output' REAL data from all power stimulus values. If there are 30 power sweep points, 30 values are returned.

```
data = gca.GetDataRe naFrequencySelect, 5, "pout"
```

For the 30th stimulus power data point, returns 'Power Output' REAL data from all frequency stimulus values. If there are 201 frequency sweep points, 201 values are returned.

```
data = gca.GetDataRe naPowerSelect, 30, "pout"
```

C++ Syntax HRESULT GetDataRe(tagNAGCAIndexSelect index_select, int index,BSTR data_name, VARIANT* pData);

Interface IGainCompression

Last Modified:

22-Oct-2007 MX New topic

GetReferenceMarker Method

Description	Returns a handle to the reference marker.
VB Syntax	*meas*.**GetReferenceMarker**
Variable	**(Type) - Description**
meas	A Measurement **(object)**
Return Type	Object
Default	Not Applicable
Examples	`meas.GetReferenceMarker`
C++ Syntax	HRESULT GetReferenceMarker(IMarker** refMarker)
Interface	IMeasurement

Write-only

GetRequiredEtermNames

Description	Returns an array of strings specifying the error terms required by the caltype's correction algorithm in order to correct the specified parameter. This function interrogates a specific caltype (caltypeGUID) for the list of error terms it would need in order to correct the specified parameter. All the standard S Parameter calibration types embed port specifiers in the error term name. The specific port information is gleaned from the passed parameter. For example, to query the error term requirements specific to a two port cal on ports 1 and 3, issue this with a parameter of S13 or S31. The buffer names returned will be formatted in this way: Full 1 Port SOLT(1,3):TransmissionTracking(3,1)
VB Syntax	**EtermNames = GetRequiredEtermNames**(CalTypeGUID As String, Parameter As String)
Variable	**(Type) - Description**
caltypeGUID:	[in] the GUID of the desired calibration type
parameter	[in] string specifying the parameter to be corrected
EtermNames	[out] array of strings containing the error term names. **Note**: In C++ Allocated by server. Must be freed by caller using SysFreeString.
Return Type	Not Applicable
Default	Not Applicable
Examples	enames = GetRequiredEtermNames(ctGUID, Parm)
C++ Syntax	HRESULT GetRequiredEtermNames(BSTR caltypeGUID, BSTR parameter, VARIANT* EtermNames)
Interface	ICalManager2

GetScalar Method

Description Retrieves scalar data (ONE number per data point) from the specified location.

Note: This method exists on a non-default interface. If you cannot access this method, use the Get Data Method on IMeasurement.

VB Syntax *measData*.**getScalar** *location, format, numPts, data*

Variable (Type) - Description

measData An IArrayTransfer interface which supports the Measurement object

location **(enum NADataStore)** - Where the data you want is residing. Choose from:

0 - naRawData

1 - naCorrectedData

2 - naMeasResult

3 - naRawMemory

4 - naMemoryResult

5 - naDivisor - When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.

format **(enum NADataFormat)** - Format in which you would like the data. Choose from:

0 - naDataFormat_LinMag

1 - naDataFormat_LogMag

2 - naDataFormat_Phase

3 - naDataFormat_Polar

4 - naDataFormat_Smith

5 - naDataFormat_Delay

6 - naDataFormat_Real

7 - naDataFormat_Imaginary

8 - naDataFormat_SWR

9 - naDataFormat_PhaseUnwrapped

10 - naDataFormat_InverseSmith

11 - naDataFormat_Kelvin

12 - naDataFormat_Fahrenheit

13 - naDataFormat_Centigrade

Note: Polar, Smith, and Inverse Smith are invalid formats for this command. See Get Complex Method.

[Learn more about Data Format.](#)

numPts **(long integer)** - Number of data points requested
[out] - specifies number of data elements returned
[in] - specifies the data being requested or the capacity of the *dScalar* array

data **(single)** - Array to store the scalar data.

Return Type Single

Default Not Applicable

Examples

```
Dim dScalar() As Single
Dim measData As IArrayTransfer
Set measData = app.ActiveMeasurement
Dim numpts as Long
numpts = app.ActiveChannel.NumberOfPoints
ReDim dScalar(numPoints)

measData.getScalar naCorrectedData, naDataFormat_LogMag, numpts,
dScalar(0)
Print dScalar(0), dScalar(1)
```

C++ Syntax HRESULT getScalar(tagNADataStore DataStore, tagNADataFormat DataFormat, long* pNumValues, float* pVals)

Interface IArrayTransfer

Last Modified:

1-Oct-2007 Added temperature formats

Read-only

GetShortcut Method

Description Returns the Title, Path, and optional argument strings, of the specified Macro (shortcut). Use this method to list the titles and paths of macros in the analyzer.

VB Syntax *app.***GetShortcut** *index, title, path, arguments*

Variable	(Type) - Description
app	An Application **(object)**
index	**(long)** - Number of the macro. Use a number between **1** and **12.**
title	**(string)** - **Title** of the specified macro. (Appears in the softkey label)
path	**(string)** - **Pathname** of the specified macro.
arguments	**(string)** - Arguments for the specified macro

Return Type String

Default Not Applicable

Example

```
Dim t As String
Dim p As String
Dim arg As String
Dim i As Integer
For i = 1 to 12
 app.GetShortcut i,t,p,arg
 Print t,p
Next
```

C++ Syntax HRESULT GetShortcut(long Number, BSTR* title, BSTR* pathname, BSTR* arguments)

Interface IApplication

Remarks Shortcuts can also be defined and accessed using the macro key on the front panel. However, the benefit of this feature is primarily for the interactive user

Read-only

GetSnPData Method Superseded

Description	**Note:** this command is replaced by Get SnpDataWithSpecifiedPorts Method. Reads SnP data from the selected measurement. Learn more about SnP that is returned from the PNA.
VB Syntax	*data* = *meas*.**GetSnPData** *type*
Variable	**(Type) - Description**
data	Variant array to store the data.
meas	A Measurement **(object)**
type	**(string)** - Type of SnP data to return. If unspecified, <n> is set to 2. Choose from: **"S1P"** returns data for the active measurement. **"S2P"** returns data for the current 2-port measurement (4 S-parameters). **"S3P"** returns data for the current 3 port measurement (9 S-parameters). Valid only on instruments with 3 ports or more. **"S4P"** returns data for the current 4 port measurement (16 S-parameters). Valid only on instruments with 4 ports or more. SnP data can be output using several data formatting options. See SnPFormat Property
Return Type	Variant array - automatically dimensioned to the size of the data
Default	Not Applicable
Examples	`snp = meas.GetSnPData("s1p")`
C++ Syntax	HRESULT GetSnPData(BSTR snptype, VARIANT * response)
Interface	IMeasurement3

Read-only

GetSnPDataWithSpecifiedPorts Method

Description

Note: This command replaces Get SnPData. This command is more explicit regarding the data to be returned, and works for PNAs with multiport test sets.

Reads SnP data for the measurement by specifying the PNA port numbers. Learn more about SnP that is returned from the PNA.

VB Syntax

*data = meas.***GetSnPDataWithSpecifiedPorts** *ports*

Variable

(Type) - Description

data

(Variant) array to store the data.

meas

A Measurement **(object)**

ports

(Variant Array) One-dimensional array containing the list of port numbers for which data is required.

Return Type

Variant array - automatically dimensioned to the size of the data.

Default

Not Applicable

Example

```
'This VBScript example can be pasted into a notepad file and run on the PNA as a macro. Learn how.
Dim pna
Dim meas
Dim param
Dim point
Dim snp
Dim ports
'List the port numbers for required data
ports = Array(3,4)
Set pna = CreateObject("AgilentPnA835x.application")
Set meas = pna.ActiveMeasurement
'limit amount of data to display
set chan=pna.ActiveChannel
chan.NumberOfPoints=2
snp = meas.GetSnPDataWithSpecifiedPorts (ports)
' returns a 3 dimensional array
' snp(param,point,data pair)
'-------------------------------------
```

```
' show me the data
For param = LBound(snp, 1) To UBound(snp, 1)
 MsgBox ("Parameter: " & (param + 1))
 For point = LBound(snp, 2) To UBound(snp, 2)
  MsgBox "Point:" & (point + 1) & " " & snp(param, point, 0) &
"," & snp(param, point, 1)
 Next
Next
```

C++ Syntax	HRESULT GetSnpDataWithSpecifiedPorts(VARIANT portsToMeasure,VARIANT* response);
Interface	IMeasurement7

Last modified:

9/18/06	MQ Added for multiport

getSourcePowerCalDataEx Method

Description

Note: This method replaces getSourcePowerCalData Method

Retrieves (as variant data type) source power calibration data, if it exists, from the channel.

If the channel is sweeping the source backwards, then the first data point is the highest frequency value; the last data point is the lowest. Use the Get X-Axis Values command to return the X-axis values in the displayed order.

Note: This method returns a variant which is less efficient than methods available on the ISourcePowerCalData interface

VB Syntax

data = *chan*.**getSourcePowerCalDataEx** (*buffer, sourcePort)*

Variable	(Type) - Description
data	**(variant)** – Array to store the data.
chan	**(object)** – A Channel object
buffer	**(enum NASourcePowerCalBuffer)** - The requested source power cal data buffer. **0 - naCorrectionValues** This is the only buffer currently available
sourcePort	**(long integer)** – The source port for which calibration data is being requested. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.

Return Type

Variant array – automatically dimensioned to the size of the data.

Default

Not Applicable

Examples

```
Dim varData As Variant
Const port1 As Long = 1
varData = chan.getSourcePowerCalDataEx (naCorrectionValues,
port1)
'Print the data
For i = 0 to chan.NumberOfPoints - 1
Print varData(i)
Next i
```

C++ Syntax

HRESULT getSourcePowerCalDataEx(tagNASourcePowerCalBuffer bufSelect, long sourcePort, VARIANT *pData);

Interface

IChannel4

Last Modified:

27-Jun-2007	Updated for PNA-X source port names

Read-only **About Source Power Cal**

getSourcePowerCalDataScalarEx Method

Description

Note: This method replaces getSourcePowerCalDataScalar Method

Retrieves (as scalar values) source power calibration data, if it exists, from this channel.

If the channel is sweeping the source backwards, then the first data point is the highest frequency value; the last data point is the lowest. Use the Get X-Axis Values2 command to return the X-axis values in the displayed order.

Note: This method exists on a non-default interface. If you cannot access this method, use the getSourcePowerCalDataEx Method on IChannel4.

VB Syntax *chanData*.**getSourcePowerCalDataScalarEx** *buffer, sourcePort, numValues, data*

Variable	(Type) - Description
chanData	**(interface)** – An ISourcePowerCalData2 interface on the Channel object.
buffer	**(enum NASourcePowerCalBuffer)** - The requested source power cal data buffer. **0 - naCorrectionValues** Currently this is the only buffer available.
sourcePort	**(long integer)** – The source port for which calibration data is being requested. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.
numValues	**(long integer)** – Number of data values. [out] – specifies number of data values returned. [in] – specifies number of values being requested (this must not be larger than the capacity of the data array).
data	**(single)** – Array to store the data.

Return Type Single

Default Not Applicable

Examples

```
Dim numValues As Long
Dim scalarCalValues() As Single
Dim chanData As ISourcePowerCalData2
Const port1 As Long = 1
numValues = app.ActiveChannel.NumberOfPoints
ReDim scalarCalValues(numValues)
Set chanData = app.ActiveChannel

chanData.getSourcePowerCalDataScalarEx naCorrectionValues,
port1, numValues, scalarCalValues(0)
```

```
'Print the data
For i = 0 to numValues - 1
Print scalarCalValues(i)
Next I
```

C++ Syntax HRESULT getSourcePowerCalDataScalarEx(tagNASourcePowerCalBuffer bufSelect, long sourcePort, long *pNumValues, float *pData);

Interface ISourcePowerCalData2

Last Modified:

27-Jun-2007 Updated for PNA-X source port names

GetStandard Method Superseded

Description

This command has been replaced with Get StandardByString

Returns standard acquisition data from the Cal Set. The returned data is complex pairs.

Learn more about Reading and Writing Cal Data

See examples of Reading and Writing Cal Set Data

VB Syntax

*data = CalSet.***getStandard** *(standard, rcv, src)*

Variable | **(Type) - Description**

data **(Variant)** Two-dimensional safe array to store the returned data. Memory for the returned Variant is allocated by the PNA and must be released by client.

Note: See also getStandardComplex on the ICalData2 interface to avoid using the variant data type.

CalSet A **Cal Set (object)**

standard **(enum NACalClass)** Standard data to be read. Choose from:

1 - naClassA

2 - naClassB

3 - naClassC

4 - naClassD

5 - naClassE

6 - naReferenceRatioLine

7 - naReferenceRatioThru

SOLT Standards

1 - naSOLT_Open

2 - naSOLT_Short

3 - naSOLT_Load

4 - naSOLT_Thru

5 - naSOLT_Isolation

TRL Standards

1 - naTRL_Reflection

2 - naTRL_Line_Reflection

3 - naTRL_Line_Tracking

4 - naTRL_Thru

5 - naTRL_Isolation

rcv **(long)** - Receiver Port

src **(long)** - Source Port

Return Type **(variant)**

Default Not Applicable

Examples

```
Dim varStd As Variant
Dim varStd2 As Variant

Cal Set.OpenCalSet( naCalType_TwoPortSOLT, 1, 2)
varStd = CalSet.getStandard(naSOLT_Thru,2,1)
varStd2 = Cal Set.getStandard(naSOLT_Thru,1,2)
Cal Set.CloseCalSet( )
```

C++ Syntax HRESULT getStandard(tagNACalClass stdclass, long ReceivePort, long SourcePort, VARIANT* pData)

Interface ICalSet

Read-only | About Cal Sets

GetStandardByString Method

Description	Returns standard acquisition data from the Cal Set. The returned data is complex pairs. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data
VB Syntax	*data* = *calSet*.**GetStandardByString**(*stdName*)
Variable	**(Type) - Description**
data	**(Variant)** Two-dimensional safe array to store the returned data. Memory for the returned Variant is allocated by the PNA and must be released by client. **Note:** See also Get StandardComplexByString on the ICalData2 interface to avoid using the variant data type.
calSet	A CalSet **(Object)**
stdName	**(String)** The string used to identify a particular standard in the Cal Set. An example string requesting the data for the Load standard in a full 2 port cal might be "S11C(3,3)".
Return Type	Variant
Default	Not Applicable
Examples	See an example
C++ Syntax	HRESULT GetStandardByString(BSTR bufferName, VARIANT* pdata)
Interface	ICalSet2

GetStandardComplex Method Superseded

Description	This command is replaced with Get StandardComplexByString Returns standard acquisition data from the Cal Set. The returned data is complex pairs. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data **Note:** This method exists on a non-default interface. If you cannot access this method, use the GetStandard Method on ICal Set
VB Syntax	*ICalData2.***getStandardComplex** *class, rcv, src, numPts, real(), imag()*
Variable	**(Type) - Description**
ICalData2	An ICalData2 pointer to the Cal Set object
class	**(enum NACalClass)** Standard data to be read. Choose from: 1 - naClassA 2 - naClassB 3 - naClassC 4 - naClassD 5 - naClassE 6 - naReferenceRatioLine 7 - naReferenceRatioThru **SOLT Standards** 1 - naSOLT_Open 2 - naSOLT_Short 3 - naSOLT_Load 4 - naSOLT_Thru 5 - naSOLT_Isolation **TRL Standards** 1 - naTRL_Reflection 2 - naTRL_Line_Reflection 3 - naTRL_Line_Tracking 4 - naTRL_Thru

5 - naTRL_Isolation

rcv **(long)** - Receiver Port

src **(long)** - Source Port

numPts **(Long)** An In/Out parameter.

On the way **in**, you specify the **max** number of values being requested.

On the way **out,** the PNA returns number of values actually returned.

real() **(single)** - array to accept the real part of the calibration data. One-dimensional for the number of data points.

imag() **(single)** - array to accept the imaginary part of the calibration data. One-dimensional for the number of data points.

Return Type **(single)**

Default Not Applicable

Examples

```
Dim numpts as long
numpts = ActiveChannel.NumberOfPoints
ReDim r(numpts)  ' real part
ReDim i(numpts)  ' imaginary part
Dim Cal Set as Cal Set
set Cal Set = pna.GetCalManager.GetCal SetByGUID( txtGUID )
Dim sData As ICalData2
Set sData = Cal Set
sdata.getStandardComplex naSOLT_Open, 1, 1, numpts, r(0), i(0)
```

C++ Syntax HRESULT getStandardComplex(tagNACalClass stdclass, long ReceivePort, long SourcePort, long* pNumValues, float* pReal, float* pImag)

Interface ICalData2

GetStandardComplexByString Method

Description Returns standard acquisition data from the Cal Set.

Learn more about Reading and Writing Cal Data

See examples of Reading and Writing Cal Set Data

VB Syntax *ICalData3*.**GetStandardComplexByString** *stdName, InumPoints, real(0), imag(0)*

Variable **(Type) - Description**

ICalData3 An ICalData3 pointer to a CalSet (**Object**)

stdName **(String)** The string used to identify a particular standard in the Cal Set. An example string requesting the data for the Load standard in a full 2 port cal might be "S11C(3,3)".

InumPoints **(Long)** An In/Out parameter.

On the way **in**, you specify the **max** number of values being requested.

On the way **out,** the PNA returns number of values actually returned.

real **(Single)** The real component of the complex data.

imag **(Single)** The imaginary component of the complex data.

Return Value Single

Default Not Applicable

Examples See example

C++ Syntax HRESULT GetStandardComplexByString(BSTR bufferName, long* InumPoints, float* real, float* imag);

Interface ICalData3

GetStandardsList Method Superseded

Description

Note: This command is replaced by CalSet.getStandardList2.

Returns the list of Standards contained in this Cal Set for the CalType specified in the OpenCal Set method. Learn more about reading and writing Cal Data using COM.

The list is a comma separated, textual representation of the error terms with the term name followed by the port path in parentheses.

Standard (n, n),
Standard (m, n)

Before calling this method you must open the Cal Set with OpenCal Set. If the Cal Set is not open, this method returns E_NA_Cal Set_ACCESS_DENIED.

Use StringToNACalClass to convert the list entrees to values that can be used with GetStandard and PutStandard.

Note: The port path designation (m n) indicates the receive and source ports for the measurement. Shorts, opens and loads are single port devices, designated in this list by (n n) where n equals the port to which the device is connected. These devices are all characterized by reflection measurements.
The dual port thru device is characterized by both transmission and reflection measurements in order to compensate for load match and tracking terms.
The notation (n n) indicates the reflection measurement for this device.
The notation (m n) indicates the transmission measurement, where the source and receive ports are different.

VB Syntax *CalSet*.**GetStandardsList** *(count, list)*

Variable **(Type) - Description**

CalSet **(object) -** A Cal Set object

count **(long [out])** - indicates the number of items returned in the list

list **(string)** - Variable to store the returned Comma separated list of items.

Return Type String

Default Not Applicable

Examples

```
dim count as Integer
dim list as string
OpenCalSet (naCalType_TwoPortSOLT, 1, 2)
GetStandardsList( count, list)
CloseCalSet( )
```

Assuming the Cal Set contained the full set of standards for this two port cal, the returned list would be:

```
"Open(1 1),
Short(1 1),
```

```
Load(1 1),
Thru(1 1),
Isolation(2 1),
Open(2 2),
Short(2 2),
Load(2 2),
Thru(2 2),
Isolation(1 2)
Thru(2 1),
Thru(1 2)"
```

C++ Syntax HRESULT GetStandardsList(long* count, BSTR* list);

Interface ICalSet

GetStandardList2 Method

Description	Returns a list of standards contained by this Cal Set for the specified Cal Type.
VB Syntax	*list* = *calset*.**GetStandardList2**(*calType*)
Variable	**(Type) - Description**
calset	**(object) -** A CalSet object
list	**(Variant)** Variant containing a string array of standards for the specified calType.
calType	**(String)** The string used to identify Cal Set data as belonging to a specific Cal Type. This string is used as a filter so that only the standard names of interest are returned. If the prefix is empty, all names are returned. An example prefix for a two port cal on ports 2 and 3 might be: "Full 2 Port Cal (2,3)".
Return Type	Variant
Default	Not Applicable
Examples	See an example
C++ Syntax	HRESULT GetStandardList2 (BSTR caltype, VARIANT* list)
Interface	ICalSet2

Read-only

GetStandardsForClass Method

Description Get the calibration standard numbers for a specified calibration class. To set the calibration number use SetStandardsForClass Method

VB Syntax *calkit*.**GetStandardsForClass** (*calclassorder, std1, std2, std3, std4, std5, std6, std7)*

Variable **(Type) - Description**

calKit A CalKit **(object)**

calclassorder **(enum NACalClassOrder)** Choose from:

0 - naRefl_1_S11

1 - naRefl_2_S11

2 - naRefl_3_S11

3 - naTran_1_S21

4 - naRefl_1_S22

5 - naRefl_2_S22

6 - naRefl_3_S22

7 - naTran_1_S12

8 - naRefl_1_S33

9 - naRefl_2_S33

10 - naRefl_3_S33

11 - naTran_1_S32

12 - naTran_1_S23

13 - naTran_1_S31

14 - naTran_1_S13

15 - naTRL_T

16 - naTRL_R

17 - naTRL_L

std1…std7 **(long)** Calibration Standard Number. Nominal values from **1** through **30**. **0** indicates that a standard number has not been selected.

Return Type Not applicable

Default Not applicable

Examples

```
calkit.GetStandardsForClass naRefl_3_S11, std1, std2, std3, std4,
std5, std6, std7
```

C++ Syntax HRESULT GetStandardsForClass(NACalClassOrder calclassorder, long std1, long std2, long std3, long std4, long std5, long std6, long std7)

Interface ICalKit

Read-only

GetStepDescription Method

Description	Returns the description of the specified step in the calibration process.
VB Syntax	*value* = *obj*.**GetStepDescription** *(n)*
Variable	**(Type) - Description**
value	(string) - Variable to store the returned number of steps.
obj	Any of the following: GuidedCalibration (object) SMCType (object) VMCType (object)
n	(Long) Step in the calibration process. Use GenerateSteps to determine the total number of steps.
Return Type	String
Default	Not Applicable
Examples	`value = SMC.GetStepDescription(5)`
C++ Syntax	HRESULT get_GetStepDescription(long step, BSTR* str);
Interface	IGuidedCalibration SMCType VMCType

Read-only About Source Ports

GetSupportedALCModes Method

Description	Returns the valid ALC Modes for the PNA. See ALCLevelingMode for a list of supported ALC Modes.
VB Syntax	*value* = *chan*.**GetSupportedALCModes** *(sourcePort)*
Variable	**(Type) - Description**
value	Variant Array variable to store the returned valid ALC Modes.
chan	**(object) -** A Channel object
sourcePort	**(long integer)** - Source port. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.
Return Type	Variant array
Default	Not Applicable
Examples	`modes = chan.GetSupportedALCModes(4) 'Read`
C++ Syntax	HRESULT get_GetSupportedALCModes(long port, VARIANT * ALCModes);
Interface	IChannel10

Last Modified:

30-Apr-2007	Edited for src strings
16-Jan-2007	MX New topic

GetTestResult Method

Description	Returns the result of limit line testing. There are three ways to use this command: • If neither optional parameter is specified, limit results for ALL data is returned. • If one parameter is specified (*start*), the limit result for that data point is returned. • If both parameters are specified, limit results are returned beginning with *start*, and ending with (*start+size*)-1
VB Syntax	*testRes* = *limts*.**GetTestResult [***start,size***]**
Variable	**(Type) - Description**
testRes	**(enum NALimitTestResult)** - A dimensioned variable to store test results. If a limit line is not tested, a PASS is returned. 0 - naLimitTestResult_None 1 - naLimitTestResult_Fail 2 - naLimitTestResult_Pass
limts	A LimitTest **(object)**
start	**(long)** - Optional argument. A start data point number to return limit test results.
size	**(long)** - Optional argument. Number of data points from *start* to return limit test results.
Return Type	Long Integer
Default	Not Applicable

Examples

```
Dim testRes As NALimitTestResult
testRes = limts.GetTestResult
Select Case testRes

Case 1
Print "Fails"

Case 2
Print "Pass"

End Select
```

C++ Syntax	HRESULT GetTestResult(long lStart, long lSize, tagNALimitTestResult *pVal)
Interface	ILimitTest

GetTraceStatistics Method

Description Returns all four Trace Statistics. To retreive individual Trace statistics, use Mean, PeakToPeak, StandardDeviation properties. Use ShowStatistics to display the statistics of the screen.

VB Syntax *meas.***GetTraceStatistics** *pp,mean,stdev*

Variable **(Type) - Description**

meas A Measurement **(object)**

pp,mean,stdev **(double)** - Dimensioned variables to store the returned values

Return Type Double

Default Not Applicable

Examples

```
'Dimension variables
Dim pp As Double
Dim mean As Double
Dim stdv As Double
meas.GetTraceStatistics pp, mean, stdv
```

C++ Syntax HRESULT GetTraceStatistics(double* pp, double* mean, double* stdDeviation)

Interface IMeasurement

Read-only

About Segment Sweep

GetXAxisValues2 Method

Description Returns the channel's X-axis values into a dimensioned Typed array. GetXAxisValues2 is a convenient method for determining the frequency of each point when the points are not linearly spaced - as in segment sweep.

Note: This method will fail if called using a scripting client such as VBScript or Agilent Vee, (see remarks)

Note: In Segment Sweep, chan.NumberofPoints will return the total number of data points for the combined segments.

VB Syntax *chan*.**GetXAxisValues2** *numPts,data*

Variable **(Type) - Description**

chan **(object)** - A Channel object

numPts **(long integer)** - Number of data points in the channel

data **(double)** Single dimensioned array of data matching the number of points in the channel.

Return Type double

Default Not applicable

Examples

```
Dim App As Application
Set App = New Application
Dim numPoints As Long
Dim values() As Double
numPoints = App.ActiveChannel.NumberOfPoints
ReDim values(numPoints)
App.ActiveChannel.GetXAxisValues2 numPoints, values(0)
Print values(0), values(1)
```

C++ Syntax HRESULT GetXAxisValues2(long* pNumValues, double* stimulus)

Interface IChannel

Remarks:

This method will fail if called using a scripting client such as VBScript or Agilent Vee. Use the GetXAxisValues method as a replacement for these COM environments.

This method also cannot be called using late-bound typing in Visual Basic. For instance, if, in the example above, the first line were replaced with "Dim App as Object", then this method would fail.

Read-only

GetXAxisValues Method

Description	Returns the stimulus values for the measurement. To understand how this property is useful, see IMeasurement2 Interface.
VB Syntax	*data* = *meas*.**GetXAxisValues**
Variable	**(Type) - Description**
data	**(Variant)** Array to store the data.
meas	A Measurement **(object)**
Return Type	Variant
Default	Not Applicable

Examples

```
Dim varData As Variant
Dim i As Integer
varData = meas.GetXAxisValues
'Print Data
For i = 0 To meas.NumberOfPoints - 1
Print varData(i)
Next i
```

See C++ example

C++ Syntax	HRESULT GetXAxisValues(VARIANT* xData);
Interface	IMeasurement2

Last Modified:

15-Oct-2007 Added link to C++ example

GetXAxisValues Method

Description Returns the channel's X-axis values. GetXAxisValues is a convenient method for determining the frequency of each point when the points are not linearly spaced - as in segment sweep.

See the Measurement2 Interface to learn how this method differs from meas.GetXAxisValues.

Note: This method returns a variant which is less efficient than GetXAxisValues2.

Note: In Segment Sweep, chan.NumberofPoints will return the total number of data points for the combined segments.

VB Syntax *data* = *chan*.**GetXAxisValues**

Variable **(Type) - Description**

data Variant array to store the data.

chan A Channel **(object)**

Return Type Variant

Default Not Applicable

Examples

```
Dim varData As Variant
Dim i As Integer
varData = chan.GetXAxisValues
'Print Data
For i = 0 To chan.NumberOfPoints - 1
 Print varData(i)
Next i
```

C++ Syntax HRESULT GetXAxisValues (VARIANT* xData)

Interface IChannel

Read-only **About Cal Sets**

HasCalType Method

Description	Verifies that the Cal Set object contains the error terms required to perform the specified correction (CalType) to an appropriate measurement. The argument list includes specifiers for up to 3 ports. The number of arguments required depends on the CalType specified. The value for each port is set to 0 if not specified.
VB Syntax	*check* = *CalSet*.**HasCalType** *(calType, p1, p2, p3)*
Variable	**(Type) - Description**
check	**(boolean) -** variable to store the returned value **TRUE (1) -** Cal Set has all of the error terms necessary to apply the specified correction CalType. **FALSE(0) -** Cal Set DOES NOT have all of the error terms necessary to apply the specified CalType.
CalSet	**(object) -** A Cal Set object
calType	(enum as naCalType) - type of correction to be applied. Choose from:

Caltype	**p arguments required**
0 - naCalType_Response_Open	p1
1 - naCalType_Response_Short	p1
2 - *naCalType_Response_Thru	p1 (rcv), p2 (src)
3 - *naCalType_Response_Thru_And_Isol	p1 (rcv), p2 (src)
4 - naCalType_OnePort	p1
5 - naCalType_TwoPort_SOLT	p1, p2
6 - naCalType_TwoPort_TRL	p1, p2
7 - naCalType_None	N/A
8 - naCalType_ThreePort_SOLT	p1, p2, p3
9 - Custom	N/A
10 - naCalType_FourPort_SOLT	p1, p2, p3 (port 4 is assumed)

* order of port arguments is significant for these CalTypes

p1 **(long)** - required. This argument must be specified.

This specifies either:

- the one significant port for an open/short response cal or a 1 port cal.

- or one of the ports involved in a 2, 3, or 4 port cal

- or the **receive** port for a thru response / thru-isolation cal.

p2 **(long) -** required for any CalType involving more than one port

This specifies either:

- one of the ports involved in a 2, 3, or 4 port cal (order independent)

- or the **source** port for a thru response / thru-isolation cal

p3 **(long) -** required for 3 and 4-port cal

This specifies one of the ports involved in a 3 or 4 port cal (order independent)

Return Type **VARIANT_BOOL**

Default Not Applicable

Examples

```
value = CalSet.HasCalType(naCalType_TwoPort_TRL, 1, 2)
```

C++ Syntax HRESULT HasCalType(tagNACalType, long port1, long port2, long port3, BOOL *pVal);

Interface ICalSet

Hold Method

Description	Puts the channel in Hold - not sweeping. See chans.Hold to put ALL channels in hold.
VB Syntax	*chan*.**Hold** *[sync]*
Variable	**(Type) - Description**
chan	A Channel **(object)**
[sync]	**(boolean)** - Optional argument - channel object ONLY. A variable set to either True or False. **True** - program control waits until the channel is in the Hold state. **False** - program control continues immediately. You are not guaranteed the channel is in Hold yet.
Return Type	Not Applicable
Default	Not Applicable
Examples	`wait = True` `chan.Hold wait`
C++ Syntax	HRESULT Hold(VARIANT_BOOL bWait)
Interface	IChannel

Hold (channels) Method

Description	Places ALL channels in hold mode. To resume all channels sweeping, use chans.Resume. (Must be the same instance of chans). To place a single channel in hold mode, use channel.Hold Method.
VB Syntax	*chans*.**Hold**
Variable	**(Type) - Description**
chans	A Channel collection **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`chans.Hold`
C++ Syntax	HRESULT Hold();
Interface	IChannels2

Write only

Initialize Method

Description Begins a calibration.

Note: *chan* must be the active channel.

VB Syntax *obj*.**Initialize** (*chan, useCalStorPref)*

Variable **(Type) - Description**

obj Any of the following:

GuidedCalibration (object)

SMCType (object)

VMCType (object)

chan (Long) Channel number to calibrate.

useCalStorPref (boolean)

True or **1** - Assignment of Cal Set will be based on the setting of the RemoteCalStoragePreference COM property.

False or **0** – If the channel currently has a selected Cal Set, the calibration will be stored to that Cal Set. Otherwise, the assignment of Cal Set is based upon the setting of the RemoteCalStoragePreference COM property.

Return Type Not Applicable

Default Not Applicable

Examples

```
smc.Initialize(2,True)
```

C++ Syntax HRESULT put_Initialize(long channelnumber, VARIANT_BOOL bCalPref);

Interface IGuidedCalibration

SMCType

VMCType

Write-only

Item Method

Description	Returns an object from the collection of objects.

Notes

- The order of objects within a collection cannot be assumed.
- Most, but not all, PNA Collections are '1-based'

VB Syntax *Object*[**.Item**]**(***n***)**

Variable **(Type) - Description**

Object Any of the following **(collections):**

- CalFactorSegments collection
- Cal Sets collection
- Channels collection
- E5091Testset collection
- ExternalTestsets collection
- FOM collection
- LimitTest collection
- Measurements collection
- NaWindows collection
- PowerLossSegments collection
- PowerSensors collection
- Segments collection
- Traces collection
- PowerMeterInterfaces Collection

Learn more about collections in the PNA

.Item Optional - Item is the default property of a collections object and therefore can be called implicitly. For example, the following two commands are equivalent:

```
Channels.Item(3).Averaging = 1
Channels(3).Averaging = 1
```

n **(variant)** - number of the item in the collection.

Note: The Measurements, Traces, and FOM collections allow you to specify the name of the measurement as a string. For example:
`measCollection("CH_S11_1").InterpolateMarkers`

Return Type **(Object)**

Default Not Applicable

Examples

```
For i = 1 to Traces.Count 1
 Traces.Item(i).YScale = .5dB
Next i
```

C++ Syntax HRESULT Item(VARIANT index, <interface>** pItem)

Interfaces All listed above.

LaunchCalWizard Method

Description	Launches the Cal Wizard on the PNA and does not return until the Cal Wizard is dismissed. **Note**: The Cal Wizard operates on the active measurement. Therefore, activate the measurement to be calibrated before launching the Cal Wizard.
VB Syntax	*success = app.***LaunchCalWizard** *(newCS)*
Variable	**(Type) - Description**
success	**(boolean) -** variable to store the returned value **True -** The Cal was completed **False -** The Cal was canceled without completing the calibration.
app	An Application **(object)**
newCS	**(boolean)** **True** - Cal will be performed on a new Cal Set. **False** - Cal will be performed using the existing Cal Set assigned to the channel. If no Cal Set is found, a new Cal Set will be created.
Return Type	Boolean
Default	Not Applicable
Example	see below

```
dim bSuccess as boolean
dim bNewCalset as boolean
bNewCalSet = false
bSuccess = app.LaunchCalWizard( bNewCalSet)
```

C++ Syntax	HRESULT LaunchCalWizard(VARIANT_BOOL bCalsuccess)
Interface	IApplication

Write-only

LaunchDialog Method

Description	Launches the specified dialog box.
VB Syntax	*app.***LaunchDialog** *dialog, [data]*
Variable	**(Type) - Description**
app	An Application **(object)**
dialog	**(String)** Dialog box to launch. Choose from: **"SourcePowerCal"** See this dialog. **"PowerMeterSettings"** See this dialog.
[data]	(Optional argument) Reserved for future use.
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.LaunchDialog "SourcePowerCal"`
C++ Syntax	LaunchDialog(BSTR dialog, [defaultvalue(0)] VARIANT dialogData)
Interface	IApplication10

See the PNA Object Model

Last Modified:

1-Jun-2007	Added optional argument
16-Feb-2007	MX New topic

LaunchPowerMeterSettingsDialog Method

Description	Launches the Power Meter Settings dialog on the PNA. Changing certain values from that dialog will change values of the corresponding properties on this COM object.
VB Syntax	*pwrCal*.**LaunchPowerMeterSettingsDialog**
Variable	**(Type) - Description**
pwrCal	A SourcePowerCalibrator **(object)**
Return Type	None
Default	Not Applicable
Examples	`powerCalibrator.LaunchPowerMeterSettingsDialog`
C++ Syntax	HRESULT put_LaunchPowerMeterSettingsDialog();
Interface	ISourcePowerCalibrator2

LoadConfiguration Method

Description	Loads the named configuration onto the specified channel. Use Configurations Method to return the configuration names that are stored on the PNA.
VB Syntax	*pathMgr*.**LoadConfiguration** *ch, name*
Variable	**(Type) - Description**
pathMgr	PathConfigurationManager **(object)**
ch	**(Long)** Channel number of the configuration to be saved.
name	**(String)** Configuration name. "Default" is the default factory configuration.
Return Type	Not Applicable
Default	Not Applicable
Examples	`path.LoadConfiguration 2, "myMixer"`
C++ Syntax	HRESULT LoadConfiguration (long channelNum, BSTR configName);
Interface	IPathConfigurationManager

Last Modified:

14-Dec-2006	MX New topic

Write-only

About ENR tables

LoadENRFile Method

Description	Loads an ENR file from disk into PNA memory. This file is typically provided by the manufacturer of the noise source.
VB Syntax	*enr.***LoadENRFile** *(filename)*
Variable	**(Type) - Description**
enr	An ENRFile **(object)**
filename	(String) - Absolute path and filename of the ENR file.
Return Type	Not Applicable
Default	Not Applicable
Examples	`See example program`
C++ Syntax	HRESULT LoadENRFile(BSTR filename);
Interface	IENRFile

Last Modified:

2-Aug-2007 MX New topic

Write only

LoadFile Method

Description	Loads a previously-configured mixer attributes file (.mxr)
VB Syntax	*mixer*.**LoadFile** *(filename)*
Variable	**(Type) - Description**
mixer	A IMixer Interface pointer to the Meas **(object)**
filename	(String) Full path, file name, and .mxr extension of the mixer attributes file. Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents".
Return Type	String
Default	Not Applicable
Examples	`mixer.LoadFile ("C:\Program Files\Agilent\Network Analyzer\Documents\myMixer.mxr")`
C++ Syntax	HRESULT put_LoadFile(BSTR newVal)
Interface	IMixer

Write-only

About Triggering

ManualTrigger Method

Description Triggers the analyzer when TriggerSetup.Source = `naTriggerManual`.

Note: An **SMC Fixed Output** measurement cannot be triggered using this command. For more information, see the example program.

VB Syntax *app*.**ManualTrigger** *[sync],[timeout]*

Variable **(Type) - Description**

app An Application **(object)**

[sync] **(boolean)** - Optional argument.
A variable set to either True or False.

True - The analyzer waits until the trigger is completed to process subsequent commands.
False - Subsequent commands are processed immediately (the default setting).

timeout **(long) -** Optional argument.
If *sync* is true, *timeout* sets the amount of time the PNA will wait until continuing program execution. Units are milliseconds. A value of -1 (the default setting) causes the PNA to wait indefinitely.

If sync is False, the timeout setting is ignored.

Return Type Not Applicable

Default Not Applicable

Examples

```
' After Manual trigger is executed, the PNA will wait 1 second
to continue program execution
Dim wait as Boolean
wait = True
app.ManualTrigger wait, 1000
```

C++ Syntax HRESULT ManualTrigger(VARIANT_BOOL bSynchronize, long timeout)

Interface IApplication

Last Modified:

12-Jul-2007 Modified link

Read-only

About Analyzer Events

MessageText Property

Description	Returns text for the specified eventID
VB Syntax	*app*.**MessageText,***eventID,message*
Variable	**(Type) - Description**
app	An Application **(object)**
enentID	**(enum naEventID)** Choose from the list in Working with the Analyzer's Events
message	**(string) -** variable to store the returned message
Return Type	String
Default	Not Applicable
Examples	`RFNA.MessageText naEventID_ARRANGE_WINDOW_EXCEED_CAPACITY, message`
C++ Syntax	HRESULT get_MessageText(tagNAEventID msgID, BSTR* message)
Interface	IApplication

NextIFBandwidth Method

Description A function that returns the Next higher IF Bandwidth value. Use to retrieve the list of available IFBandwidth settings.

VB Syntax *chan.***Next_IFBandwidth** *bw*

Variable **(Type) - Description**

chan A Channel **(object)**

bw **(double)** - The argument that you use to send an IFBandwidth. The function uses this argument to return the Next higher IFbandwidth.

Return Type Double

Default Not Applicable

Examples

```
Public pnbw As Double 'declare variable outside of procedure
```

```
pnBW = chan.IFBandwidth 'put the current IFBW in pnBW
chan.Next_IFBandwidth pnBW 'function returns the Next higher
IFBandwidth.
chan.IFBandwidth = pnBW 'set IFBW to the Next value
```

C++ Syntax HRESULT Next_IFBandwidth (double *pVal)

Interface IChannel

NumberOfGroups Method

Description	Sets the number of trigger signals the channel will receive. After the channel has received that number of trigger signals, the channel switches to Hold mode.
VB Syntax	*chan*.**NumberOfGroups** *num, sync*
Variable	**(Type) - Description**
chan	A Channel **(object)**
num	**(long integer)** Number of trigger signals the channel will receive. Choose any number between 1 and 2 million.
sync	**(boolean)** Variable set to either: **True -** subsequent commands are not processed until the groups are complete. Do not use with manual trigger. **False -** subsequent commands are processed immediately.
Return Type	Not Applicable
Default	Not Applicable
Examples	`chan.NumberOfGroups 5,False`
C++ Syntax	HRESULT NumberOfGroups(long count, VARIANT_BOOL bWait)
Interface	IChannel

OpenCalSet Method Superseded

Description

This command is no longer necessary. The CalSet.get... and put... commands that required this command have been replaced,

Open the Cal Set to read/write a particular **CalType.** Learn more about reading and writing Cal Data using COM.

This method is a prerequisite to several other Cal Set methods.

A Cal Set can contain more than one CalType. This method opens the Cal Set and allows access to a particular set of terms. Subsequent commands like getErrorTerm use this information to access the correct error terms in the Cal Set. For example:

```
cset.OpenCalSet (naCalType_TwoPortSOLT,3,2)
cset.PutErrorTerm(naDirectivity, 1, 1, Buffer)
```

The directivity error term for port 1 could belong to any number of caltypes: Full1Port (S11), Full2Port (12), Full2Port (13) or Full3Port (123). The **CalType and port** specifiers in OpenCalSet directs the uploaded directivity term to the correct set of error terms.

To close the Cal Set, see CloseCalSet.

VB Syntax *CalSet*.**OpenCalSet** *(CalType, p1, p2, p3)*

Variable **(Type) - Description**

CalSet **(object) -** A Cal Set object

CalType (enum as naCalType) - type of correction to be applied. Choose from:

Caltype	**p arguments required**
0 - naCalType_Response_Open	p1
1 - naCalType_Response_Short	p1
2 - *naCalType_Response_Thru	p1 (rcv), p2 (src)
3 - *naCalType_Response_Thru_And_Isol	p1 (rcv), p2 (src)
4 - naCalType_OnePort	p1
5 - naCalType_TwoPort_SOLT	p1, p2
6 - naCalType_TwoPort_TRL	p1, p2
7 - naCalType_None	N/A
8 - naCalType_ThreePort_SOLT	p1, p2, p3
9 - Custom	N/A

10 - naCalType_FourPort_SOLT	p1, p2, p3 (port 4 is assumed)

* order of port arguments is significant for these CalTypes

p1 **(long)** - required. This argument must be specified.

This specifies either:

- the one significant port for an open/short response cal or a 1 port cal.

- or one of the ports involved in a 2 or 3 port cal

- or the ***receive*** port for a thru response / thru-isolation cal.

p2 **(long) -** required for any caltype involving more than one port

This specifies either:

- one of the ports involved in a 2 or 3 port cal (order independent)

- or the ***source*** port for a thru response / thru-isolation cal

p3 **(long) -** required only for 3 port cal

This specifies either:

- one of the ports involved in a 3 port cal (order independent)

Return Type None

Default Not Applicable

Examples

```
CalSet.OpenCalSet naCalType_ThreePort_SOLT, 3,2,1
```

C++ Syntax HRESULT OpenCalSet (naCalType, port1, [optional] port2, [optional] port3);

Interface ICalSet

Parse Method

Description	Allows the use of COM to send a SCPI command. See a C++ example of how to return error information when using this command.
VB Syntax	*scpi.***Parse (***"SCPI command"***)**
Variable	**(Type) - Description**
scpi	A ScpiStringParser **(object)**
SCPI command	**(string)** - Any valid SCPI command
Return Type	String
Default	Not Applicable

Examples

```
Dim scpi As ScpiStringParser
Set scpi = app.ScpiStringParser
Dim startfreq As Double
startfreq = 100e6
'
scpi.Parse "Sens:Freq:Start " & startfreq'Write
```

```
Dim str As String
str = scpi.Parse ("Sens:Freq:Start?")'Read
```

C++ Syntax	HRESULT Parse(BSTR SCPI_Command, BSTR *pQueryResponse)
Interface	IScpiStringParser

Last Modified:

1-Jan-2007 Corrected example

Preset Method

Description	**Application Object**: Deletes all traces and windows. In addition, resets the analyzer to factory defined default settings and creates an S11 measurement named "CH1_S11_1" in window 1. **Channel Object:** Resets the channel (object) to factory defined default settings. Does NOT delete the current measurements or add a new measurement.
VB Syntax	*app.***Preset** *chan***.Preset**
Variable	**(Type) - Description**
app	An Application **(object)**
chan	A Channel **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.Preset`
C++ Syntax	HRESULT Preset()
Interface	IApplication IChannel

PreviousIFBandwidth Method

Description	A function that returns the previous IF Bandwidth value. Use to retrieve the list of available IFBandwidth settings.
VB Syntax	*chan.***Previous_IFBandwidth** *bw*
Variable	**(Type) - Description**
chan	A Channel **(object)**
bw	**(double)** - The argument that you use to send an IFBandwidth. The function uses this argument to return the previous IFbandwidth.
Return Type	Double
Default	Not Applicable
Examples	see below

```
Public pnbw As Double 'declare variable outside of procedure
```

```
PreBW = chan.IFBandwidth 'put the current IFBW in PreBW
chan.Previous_IFBandwidth PreBW 'function returns the Previous
IFBandwidth of the current one.
chan.IFBandwidth = PreBW 'set IFBW to the previous value
```

C++ Syntax	HRESULT Previous_IFBandwidth (double *pVal)
Interface	IChannel

PrintToFile Method

Description	Saves the screen image to a bitmap file.
VB Syntax	*app*.**PrintToFile** *filename*
Variable	**(Type) - Description**
app	An Application **(object)**
filename	**(string)** Full path, file name, and extension of the screen image file. Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents". Use one of the following extensions: • .bmp - not recommended due to large file size • .jpg - not recommended due to poor quality • **.png - recommended**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.PrintToFile "C:\Program Files\Agilent\Network Analyzer\Documents\myfile.png"`
C++ Syntax	HRESULT PrintToFile(BSTR bstrFile)
Interface	IApplication

PutComplex Method

Description Puts real and imaginary data into the specified location. This method forces the channel into Hold mode to prevent the input data from being overwritten. Learn more about reading and writing Cal Data using COM.

Data put in the raw data store will be **re-processed** whenever a change is made to the measurement attributes such as format or correction.

Data put in the measurement results store will be **overwritten** by any measurement attribute changes.

See also putNAComplex

VB Syntax *measData*.**putComplex** *location, numPts, real(), imag(),* [*format*]

Variable	**(Type) - Description**
measData	An IArrayTransfer interface which supports the Measurement object
location	**(enum NADataStore)** Where the Data will be put. Choose from: 0 - naRawData 1 - naCorrectedData 2 - naMeasResult 3 - naRawMemory 4 - naMemoryResult 5 - naDivisor - When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.
numPts	**(long integer)** - Number of data points in the channel
real()	**(single) -** Array containing real data values
imag()	**(single)** -Array containing imaginary data values
format	**(enum NADataFormat)** optional argument - display format of the real and imaginary data. Only used if destination is naMeasResult or naMemoryResult buffer. If unspecified, data is assumed to be in naDataFormat_Polar 0 - naDataFormat_LinMag 1 - naDataFormat_LogMag 2 - naDataFormat_Phase 3 - naDataFormat_Polar 4 - naDataFormat_Smith 5 - naDataFormat_Delay 6 - naDataFormat_Real

7 - naDataFormat_Imaginary

8 - naDataFormat_SWR

9 - naDataFormat_PhaseUnwrapped

10 - naDataFormat_InverseSmith

11 - naDataFormat_Kelvin

12 - naDataFormat_Fahrenheit

13 - naDataFormat_Centigrade

Learn more about Data Format.

Return Type	Not Applicable
Default	Not Applicable

Examples	`Dim measData As IArrayTransfer`
	`Set measData = app.ActiveMeasurement`
	
	`measData.putComplex naMemoryResult, 201,`
	`real(0),imag(0),naDataFormat_SWR`

C++ Syntax	HRESULT putComplex(tagNADataStore DataStore, long lNumValues, float* pReal, float* pImag, tagDataFormat displayFormat)
Interface	IArrayTransfer

Last Modified:

1-Oct-2007 Added temperature formats

PutDataComplex Method

Description Puts complex data into the specified location. This method forces the channel into Hold mode to prevent the input data from being overwritten.

VB Syntax *meas*.**putDataComplex** *location, data*

Variable **(Type) - Description**

meas A measurement **(object)**

location **(enum NADataStore)** Where the Data will be put. Choose from:

0 - naRawData

1 - naCorrectedData

2 - naMeasResult

3 - naRawMemory

4 - naMemoryResult

5 - naDivisor - When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.

- Data put in 0 - naRawData will be re-processed whenever a change is made to the measurement attributes such as format or correction.
- Data put in 2 - naMeasResult will be overwritten by any measurement attribute changes.
- When putting data into 3 - naRawMemory:
  1. Put the analyzer in hold mode
  2. Call DataToMemory to initialize a memory buffer
  3. Call putDataComplex(naRawMemory, data)

This ensures that the memory buffer is appropriately initialized before receiving new data.

data **(variant)** - A **two-dimensional** variant array.

Note: All buffers except naMeasResult and naMemoryResult require Complex data

Return Type Not Applicable

Default Not Applicable

Examples

```
' Put 201 points worth of raw (complex) data into the
measurement
' Note that an array of complex numbers is represented by a 2-D
```

```
array where the first rank is the number of points, and the 2nd
rank is always size 2 (max index 1) representing the Real and
Imag parts of the complex number.

' complex array of data (2nd dimension of size 2 represents
Re/Im
Dim data(200,1) )
For i = 0 to 200
' Set Real part of data point i
data(i,0) = i/200;
' Set Imag part of data point i
data(i,1) = i/200;
Next
app.ActiveMeasurement.putDataComplex naRawData, data
```

C++ Syntax HRESULT putDataComplex(tagNADataStore DataStore, VARIANT complexData)

Interface IMeasurement

Write-only

About ENR tables

PutENRData Method

Description	Write ENR calibration data to PNA memory. All of the frequency and ENR data must be sent at the same time.
VB Syntax	*enr*.**PutENRData** *(vData)*
Variable	**(Type) - Description**
enr	An ENRFile **(object)**
vData	(Variant array) -ENR data. Frequency value in Hz, followed by corresponding ENR value in dB. Enter as many data pairs as necessary.
Return Type	Not Applicable
Default	Not Applicable
Examples	`See example program`
C++ Syntax	HRESULT PutENRData(VARIANT vdata);
Interface	IENRFile

Last Modified:

2-Aug-2007 MX New topic

Write-only

Data Access Map

PutErrorTerm Method - Superseded

Description	**Note**: This command is replaced by PutErrorTermByString Puts variant error term data into the error-correction buffer. Learn about reading and writing Calibration data.
VB Syntax	*cal*.**putErrorTerm**(*term*,*rcv*, *src*, *data*)
Variable	**(Type) - Description**
cal	A Calibrator **(object)**
term	**(enum As NaErrorTerm)** naErrorTerm_Directivity_Isolation naErrorTerm_Match naErrorTerm_Tracking
rcv	**(long integer)** - Receiver Port
src	**(long integer)** - Source Port
data	**(variant)** Error term data in a two-dimensional array (0:1, 0:numpts-1).

To get this	Specify these parameters:		
Error Term	*term*	*rcv*	*src*
Fwd Directivity	naET_Directivity Isolation	1	1
Rev Directivity	naET_Directivity Isolation	2	2
Fwd Isolation	naET_Directivity Isolation	2	1
Rev Isolation	naET_Directivity Isolation	1	2
Fwd Source Match	naErrorTerm_Match	1	1
Rev Source Match	naErrorTerm_Match	2	2
Fwd Load Match	naErrorTerm_Match	2	1
Rev Load Match	naErrorTerm_Match	1	2
Fwd Reflection Tracking	naErrorTerm_Tracking	1	1
Rev Reflection Tracking	naErrorTerm_Tracking	2	2
Fwd Trans Tracking	naErrorTerm_Tracking	2	1
Rev Trans Tracking	naErrorTerm_Tracking	1	2

Fwd Trans Tracking	naErrorTerm_Tracking	2	1

Return Type Not Applicable

Default Not Applicable

Examples

```
Dim varError As Variant
varError = cal.putErrorTerm (naErrorTerm_Tracking,2,1,VarData)
```

C++ Syntax HRESULT putErrorTerm(tagNAErrorTerm ETerm, long ReceivePort, long SourcePort, VARIANT varData)

Interface ICalibrator

PutErrorTerm Method Superseded

Description	This command is replaced with PutErrorTermByString Puts error term data into the Cal Set. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data
VB Syntax	*CalSet.***putErrorTerm** (*term, rcv, src, data*)
Variable	**(Type) - Description**
CalSet	**(Object)** A CalSet Object
term	**(enum As NaErrorTerm2)** Error Term. Choose from: 0 - naET_Directivity (src = rcv) 1 - naET_SourceMatch (src = rcv) 2 - naET_ReflectionTracking (src = rcv) 3 - naET_TransmissionTracking (src ≠ rcv) 4 - naET_LoadMatch (src ≠ rcv) 5 - naET_Isolation (src ≠ rcv)
rcv	**(long integer)** - Receiver Port
src	**(long integer)** - Source Port
data	**(variant)** Error term data in a two-dimensional array (0:1, 0:numpts-1). The data must be complex pairs. **Note:** See also PutErrorTermComplex on the ICalData2 interface to avoid using the variant data type.
Return Type	Not Applicable
Default	Not Applicable
Examples	See an Example
C++ Syntax	HRESULT putErrorTerm(tagNAErrorTerm2 ETerm, long ReceivePort, long SourcePort, VARIANT varData)
Interface	ICalSet

PutErrorTermByString

Description Puts error term data into the Cal Set.

Learn more about Reading and Writing Cal Data

See examples of Reading and Writing Cal Set Data

VB Syntax *calSet.***PutErrorTermByString**(*errorName, vdata*)

Variable **(Type) - Description**

calSet **(Object)** A CalSet Object

errorName **(String)** The string name used to identify a particular error term in the Cal Set. An example string for port 3 directivity in a full 2 port cal might be "Directivity(3,3)". To determine the string names of error terms, see GetErrorTermList2.

vdata **(Variant)** This data array is usually two dimensional. Each element is a type single. The two elements represent the real and imaginary parts of a complex pair.

Note: This structure is compatible with scripting clients who can only use variants. For alternative methods that use typed arrays, see ICalData3.

Return Type Not Applicable

Default Not Applicable

Examples See an Example

C++ Syntax HRESULT PutStandardByString(BSTR bufferName, VARIANT vardata)

Interface ICalSet2

PutErrorTermComplex Method Superseded

Description **Note:** This command is replaced by PutErrorTermComplexByString

Puts error term data into the error-correction data buffer. Learn more about reading and writing Cal data using COM

VB Syntax *data.***putErrorTermComplex** *term, rcv, src, numPts, real(), imag()*

Variable **(Type) - Description**

data An ICalData pointer to the Calibrator object

term **(enum NAErrorTerm)** - The error term to be retrieved. Choose from:

- **naErrorTerm_Directivity_Isolation**
- **naErrorTerm_Match**
- **naErrorTerm_Tracking**

rcv **(long integer)** - Receiver Port

src **(long integer)** - Source Port

numPts **(long integer) -** number of data points in the array

real() **(single)** - array containing the **real** part of the calibration data. One-dimensional: the number of data points.

imag() **(single)** - array containing the **imaginary** part of the calibration data. One-dimensional: the number of data points.

To get this	Specify these parameters:		
Error Term	*term*	*rcv*	*src*
Fwd Directivity	naET_Directivity Isolation	1	1
Rev Directivity	naET_Directivity Isolation	2	2
Fwd Isolation	naET_Directivity Isolation	2	1
Rev Isolation	naET_Directivity Isolation	1	2
Fwd Source Match	naErrorTerm_Match	1	1
Rev Source Match	naErrorTerm_Match	2	2
Fwd Load Match	naErrorTerm_Match	2	1
Rev Load Match	naErrorTerm_Match	1	2

Fwd Reflection Tracking	naErrorTerm_Tracking	1	1
Rev Reflection Tracking	naErrorTerm_Tracking	2	2
Fwd Trans Tracking	naErrorTerm_Tracking	2	1
Rev Trans Tracking	naErrorTerm_Tracking	1	2
Fwd Trans Tracking	naErrorTerm_Tracking	2	1

Return Type Not Applicable

Default Not Applicable

Examples

```
Dim eData As ICalData
Set eData = chan.Calibrator
eData.putErrorTermComplex naErrorTerm_Directivity_Isolation, 1,
1, 201, rel(0), img(0)
```

C++ Syntax HRESULT putErrorTermComplex(tagNAErrorTerm ETerm, long ReceivePort, long SourcePort, long* pNumValues, float* pReal, float* pImag)

Interface ICalData

PutErrorTermComplex Method Superseded

Description	This command is replaced with PutErrorTermComplexByString Puts error term data into the Cal Set. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data
VB Syntax	*data.***putErrorTermComplex** *term, rcv, src, numPts, real(), imag()*
Variable	**(Type) - Description**
data	An ICalData2 pointer to a Cal Set object
term	**(enum NAErrorTerm2)** - The error term to be written. Choose from: 0 - naET_Directivity 1 - naET_SourceMatch 2 - naET_ReflectionTracking 3 - naET_TransmissionTracking 4 - naET_LoadMatch 5 - naET_Isolation
rcv	**(long)** - Receiver Port
src	**(long)** - Source Port
numPts	**(long) -** number of data points in the real and imaginary arrays.
real()	**(single)** - array containing the **real** part of the calibration data. One-dimensional: the number of data points.
imag()	**(single)** - array containing the **imaginary** part of the calibration data. One-dimensional: the number of data points.
Return Type	Not Applicable
Default	Not Applicable

Examples	`Dim eData As ICalData2`
	`Set eData = app.GetCalManager.Cal Sets.Item(1)`
	`eData.putErrorTermComplex naET_LoadMatch, 1, 2, numpts, rel(0), img(0)`

C++ Syntax	HRESULT putErrorTermComplex(tagNAErrorTerm2 ETerm, long ReceivePort, long SourcePort, long* pNumValues, float* pReal, float* pImag)

Interface ICalData2

PutErrorTermComplexByString Method

Description	Puts error term data into the Cal Set. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data
VB Syntax	*ICalData3.***PutErrorTermComplexByString** *errorName, lnumPoints, real(0), imag(0)*
Variable	**(Type) - Description**
ICalData3	An ICalData3 pointer to a Cal Set object.
errorName	**(String)** The string name used to identify a particular error term in the Cal Set. An example string for port 3 directivity in a full 2 port cal might be "Directivity(3,3)". To determine the string names of error terms, see GetErrorTermList2.
lnumPoints	**(Long)** The number of data points in the real and imaginary arrays.
real	**(Single)** The real component of the complex data.
imag	**(Single)** The imaginary component of the complex data. **Note**: The size of the real and imaginary arrays should be the same.
Return Value	Not Applicable
Default	Not Applicable
Examples	See example
C++ Syntax	HRESULT PutErrorTermComplexByString(BSTR bufferName, long lnumPoints, float* real, float* imag);
Interface	ICalData3

Write-only

Data Access Map

PutScalar Method

Description Puts Scalar data in the Measurement Result buffer. The putScalar array is not processed by the analyzer; it is just displayed. Any change to the measurement state (changing the format, for example) will cause the putScalar data to be overwritten with the data processed from the raw data buffer.

VB Syntax *measData*.**putScalar**, *format, numPts, data*

Variable **(Type) - Description**

measData An IArrayTransfer interface which supports the Measurement object.

format **(enum NADataFormat)** Format of the data. Choose from:

0 - naDataFormat_LinMag

1 - naDataFormat_LogMag

2 - naDataFormat_Phase

3 - naDataFormat_Polar

4 - naDataFormat_Smith

5 - naDataFormat_Delay

6 - naDataFormat_Real

7 - naDataFormat_Imaginary

8 - naDataFormat_SWR

9 - naDataFormat_PhaseUnwrapped

10 - naDataFormat_InverseSmith

11 - naDataFormat_Kelvin

12 - naDataFormat_Fahrenheit

13 - naDataFormat_Centigrade

Learn more about Data Format.

Note: Smith, InverseSmith, and Polar formats are not allowed.

numPts **(integer)** - Number of values. Usually the number of points in the trace (chan.NumberOfPoints).

data **(single)** - A one-dimensional array of Scalar data matching the number of points in the current measurement.

Return Type Not Applicable

Default Not Applicable

Examples

```
Dim measData As IArrayTransfer
Set measData = app.ActiveMeasurement

measData.putScalar naDataFormat_LogMag, 201, dScalar(0)
```

C++ Syntax HRESULT putScalar\(tagDataFormat eFormat, long lNumValues, float* pArrayOfScalar)

Interface IArrayTransfer

Last Modified:

1-Oct-2007 Added temperature formats

PutNAComplex Method

Description Puts complex data into the specified location. This method forces the channel into Hold mode to prevent the input data from being overwritten. The data is processed and displayed.

Data put in the naRawData store will be **re-processed** whenever a change is made to the measurement attributes such as format or correction.

Data put in the naMeasResult store will be **overwritten** by any measurement attribute changes (such as moving a marker).

Note: This method uses NAComplex which is a user-defined data type. If you cannot or prefer not to use this data type, use the putComplex method.

VB Syntax *measData*.**putNAComplex** *location, numPts, data,* [*format*]

Variable **(Type) - Description**

measData An IArrayTransfer interface which supports the Measurement object

location **(enum NADataStore)** Where the Data will be put. Choose from:

0 - naRawData

1 - naCorrectedData

2 - naMeasResult

3 - naRawMemory

4 - naMemoryResult

5 - naDivisor - When reading data from, or writing data to, the normalization divisor, you must first create a divisor trace using DataToDivisor Method.

numPts **(long integer)** - Number of data points in the channel

data **(NAComplex)** - A one-dimensional array of Complex data matching the number of points in the current measurement.

format **(enum NADataFormat) -** Optional argument. Format of the data. If unspecified, naDataFormat_Polar is assumed. Only used when the destination store is naMeasResult or naMemoryResult.

0 - naDataFormat_LinMag

1 - naDataFormat_LogMag

2 - naDataFormat_Phase

3 - naDataFormat_Polar

4 - naDataFormat_Smith

5 - naDataFormat_Delay

6 - naDataFormat_Real

7 - naDataFormat_Imaginary

8 - naDataFormat_SWR

9 - naDataFormat_PhaseUnwrapped

10 - naDataFormat_InverseSmith

11 - naDataFormat_Kelvin

12 - naDataFormat_Fahrenheit

13 - naDataFormat_Centigrade

Learn more about Data Format.

Return Type	Not Applicable
Default	Not Applicable

Examples	`Dim measData As IArrayTransfer`
	`Set measData = app.ActiveMeasurement`
	
	`measData.putNAComplex naMemoryResult, 201, dRawComplex(0)`

C++ Syntax	HRESULT putNAComplex(tagNADataStore DataStore, long lNumValues, TsComplex* pArrayOfComplex, tagDataFormat displayFormat)
Interface	IArrayTransfer

Last Modified:

1-Oct-2007 Added temperature formats

put_Output Method

Description	Writes a TTL HI or TTL Low to output pins 3 or 4 of the Material Handler IO connector. Each pin also has a latched output which is written to with USER. With the latched (USER) outputs, the value is not applied to the associated pin until a positive edge is detected at INPUT1 (pin 2).
VB Syntax	*handlerIo*.**put_Output** *(pin*) = *value*
Variable	**(Type) - Description**
handlerIo	**(object)** - A HandlerIO object
pin	**(enum as NAMatHandlerOutput)** - pin to write data to. Choose from: **naOutput1 - (0) -** pin3 **naOutput1User (1) -** pin3 latched (applied to pin 3 on positive edge of Input1-pin2) **naOutput2 (2) -** pin4 **naOutput2User (3) -** pin4 latched (applied to pin 4 on positive edge of Input1-pin2)
value	**(Variant)** Value to write to the selected pin. Choose from **0** - TTL LOW **1** - TTL HIGH
Return Type	Not Applicable
Default	0
Examples	`handlerIo.put Output(naOutput1)= 1`
C++ Syntax	HRESULT put_Output (tagNAMatHandlerOutput Output, VARIANT Data);
Interface	IHWMaterialHandlerIO

Write-only

About the Aux I/O Connector

put_OutputVoltage Method

Description	**E836x and PNA-L:** Sets voltages on the DAC/Analog Output 1|2 of the Auxiliary IO connector. **PNA-X:** Sets voltage on the Power I/O connector AnalogOut1|2. Read output voltages using get OutputVoltage Method.
VB Syntax	*AuxIO*.**put_OutputVoltage** *output, voltage*
Variable	**(Type) - Description**
AuxIO	**(object) -** A Hardware Auxiliary Input / Output object
output	**(variant)** Number of the output DAC to write voltage to. Choose from: **1** Output 1 (Aux I/O pin 3) and (Power I/O pin 3) **2** Output 2 (Aux I/O pin 2) and (Power I/O pin 4)
voltage	**(double)** Voltage to write to the output DAC. Choose a voltage from -10 to 10
Return Type	None
Default	None
Examples	`HWAuxIO.put_OutputVoltage 1,9 'set Analog Out1 to +9v`
C++ Syntax	HRESULT put_OutputVoltage (VARIANT Output, double Voltage);
Interface	IHWAuxIO

Last Modified:

10-Jul-2007 Added PNA-X capability

Write-only

put_OutputVoltageMode Method

Description This command sets the mode of the selected "Analog Out" line on the Auxiliary IO connector and Power I/O connector. The modes give the user the option to have the requested voltage applied immediately or not until the sweep is done. To read the mode on each output use get_OutputVoltageMode Method.

VB Syntax *auxIo*.**put_OutputVoltageMode** *(output, mode)*

Variable **(Type) - Description**

auxIo **(Object)** An AuxIO object

output Analog Output to receive mode setting. Choose from **1** or **2**

mode **(enum NAOutputVoltageMode)**

naWaitEOS - While in this mode any voltage changes sent to the selected analog out will only get applied to the output between sweeps.

naNoWait - While in this mode any voltage changes sent to the selected analog out will occur right away without waiting until the end of a sweep, the voltage gets applied immediately.

Return Type NAOutputVoltageMode

Default naWaitEOS

Examples

```
auxIo.put_OutputVoltageMode 1, naWaitEOS   'Write
```

C++ Syntax HRESULT put_OutputVoltageMode(VARIANT Output, tagNAOutputVoltageMode dNewMode);

Interface IHWAuxIO

Last Modified:

10-Jul-2007 Added PNA-X capability

put Port Method

Description	Writes a value to the specified port. Use the get_Port Method to read the settings from the "readable" ports (C, D, E).
VB Syntax	*handlerIo*.**put_Port** *(port***) =** *value*
Variable	**(Type) - Description**
handlerIo	**(object)** - A HandlerIO object
port	**(enum as NAMatHandlerPort)** - port to put data into. Choose from: **naPortA - (0)** **naPortB - (1)** **naPortC - (2)** **naPortD - (3)** **naPortE - (4)** **naPortF - (5)** **naPortG - (6)** **naPortH - (7)**
value	The number of the data bits to set. The following table shows what the *value* represents: **Note**: When writing to port G, port C must be set to output mode When writing to port H, both port C and port D must be set to output mode. Use Port Mode Property

Port	Max allowable <num>	MSB..LSB 23..0	
A	255	A7...A0	Write-only
B	255	B7...B0	Write-only
C	15	C3...C0	Read-Write
D	15	D3...D0	Read-Write
E	255	D3...D0 + C3...C0	Read-Write
F	65535	B7...B0 + A7...A0	Write-only

G	1048575	C3...C0 + B7...B0 + A7...A0	Write-only
H	16777215	D3...D0 + C3...C0 + B7...B0 + A7...A0	Write-only

Return Type Not Applicable

Default Not Applicable

Examples

```
handlerIo.put Port(naPortB)= 15
```

C++ Syntax HRESULT put_Port (tagNAMatHandlerPort Port, VARIANT Data);

Interface IHWMaterialHandlerIO

About the Aux I/O Connector

put_PortCData Method

Description Writes a 4-bit value to Port C on the Aux I/O connector (pins 22-25) and the Material Handler IO (pins 21-24 Anritsu) - (pins 22-25 Avantest).

Note: These lines are connected to both the Handler IO and Aux IO in the PNA. Therefore, this command will affect both of these connectors in the same way.

VB Syntax *AuxIO*.**put_PortCData** *num*

Variable **(Type) - Description**

AuxIO **(object) -** A Hardware Auxiliary Input / Output object

num **(variant)** - 4 bit binary value. Choose from 0-15

Return Type None

Default None

Examples

```
HWAuxIO.put_PortCData 15  'If Positive Logic, Port C lines C0, C1, C2, C3 go High. If Negative Logic, they go Low.
```

C++ Syntax HRESULT put_PortCData(VARIANT Data);

Interface IHWAuxIO

PutDataScalar Method

Description Puts formatted variant scalar data into the measurement result buffer. The data will be immediately processed and displayed. Subsequent changes to the measurement state will be reflected on the display.

Always precede this command by setting the format on the measurement to be consistent with the format of the data being sent to the analyzer. In this way, the display annotation will be correct.

Execution of this command does not change the display format.

VB Syntax *meas*.**putDataScalar** *format, data*

Variable **(Type) - Description**

meas A measurement **(object)**

format **(enum NADataFormat)** Format of the data. **This value is presently ignored by the PNA.** Data is always presented in the current format.

Choose from:

0 - naDataFormat_LinMag

1 - naDataFormat_LogMag

2 - naDataFormat_Phase

3 - naDataFormat_Polar

4 - naDataFormat_Smith

5 - naDataFormat_Delay

6 - naDataFormat_Real

7 - naDataFormat_Imaginary

8 - naDataFormat_SWR

9 - naDataFormat_PhaseUnwrapped

10 - naDataFormat_InverseSmith

11 - naDataFormat_Kelvin

12 - naDataFormat_Fahrenheit

13 - naDataFormat_Centigrade

Notes:

- The getData (variant) method includes a "format" argument, which allows scalar (one-dimensional) data. To put data back into the "raw" data buffer using this (putDataComplex) method, specify **Polar** format when using the getData method.
- **Phase** format accepts data in radians (not degrees) and displays in degrees. To convert to degrees: radians * (57.29577951308233) = degrees. The getData method returns degrees if the request is for phase data.

data **(variant)** - A 1-dimension array of single precision floating point numbers.

Return Type Not Applicable

Default Not Applicable

Examples

```
' Put 201 points worth of scalar data into the measurement
' 200 is max index, so 0 to 200 is 201 points
Dim data(200) ' array of 201 (scalar) data points
' Fill the array
For i = 0 to 200
data(i) = i/200;
Next
app.ActiveMeasurement.putDataScalar 0, data
```

C++ Syntax HRESULT putDataScalar(tagNADataStore DataStore, VARIANT scalarArray)

Interface IMeasurement

Last Modified:

1-Oct-2007 Added temperature formats

PutShortcut Method

Description	Defines a Macro (shortcut) file in the analyzer. This command links a file name and path to the Macro file. The file must be put in the PNA at the location indicated by this command.
VB Syntax	*app.*__PutShortcut__ *index,title,path*
Variable	**(Type) - Description**
app	An Application **(object)**
index	**(long)** - Number of the macro to be stored in the analyzer. If the index number already exists, the existing macro is replaced with the new macro.
title	**(string)** - The name to be assigned to the macro
path	**(string)** - Full path, file name, and extension of the existing macro "executable" file.
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.PutShortcut 1,"Test","C:\Automation\MyTest.vbs"`
C++ Syntax	HRESULT PutShortcut(long Number, BSTR title, BSTR pathname)
Interface	IApplication

putSourcePowerCalDataEx Method

Description	**Note**: This method replaces putSourcePowerCalData Method Inputs source power calibration data (as variant data type) to this channel for a specific source port. If the channel is sweeping the source backwards, then the first data point is the highest frequency value; the last data point is the lowest. Use the Get X-Axis Values command to return the X-axis values in the displayed order. The calibration is not valid if the current number of points on the channel is not equal to the number of values that were input. **Note:** This method sends variant data which is less efficient than methods available on the ISourcePowerCalData interface.
VB Syntax	*chan*.**putSourcePowerCalDataEx** *buffer, sourcePort, data*
Variable	**(Type) - Description**
chan	**(object)** – A Channel object
buffer	**(enum NASourcePowerCalBuffer)** - The source power cal data buffer to write to. **0 - naCorrectionValues** This is the only data buffer currently available.
sourcePort	**(long integer)** – The source port for which calibration data is being requested. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.
data	**(variant)** – Array of source power cal data being input.
Return Type	None
Default	Not Applicable
Examples	`chan.putSourcePowerCalDataEx naCorrectionValues, 1, varData`
C++ Syntax	HRESULT putSourcePowerCalDataEx(tagNASourcePowerCalBuffer bufSelect, long sourcePort, VARIANT varData);
Interface	IChannel4

Last Modified:

27-Jun-2007 Updated for PNA-X source port names

putSourcePowerCalDataScalarEx Method

Description	**Note:** This method replaces putSourcePowerCalDataScalar Method Inputs source power calibration data (as scalar values) to this channel for a specific source port. If the channel is sweeping the source backwards, then the first data point is the highest frequency value; the last data point is the lowest. Use the Get X-Axis Values2 command to return the X-axis values in the displayed order.
VB Syntax	*chanData*.**putSourcePowerCalDataScalarEx** *buffer, sourcePort, numValues, data*
Variable	**(Type) - Description**
chanData	**(interface)** – An ISourcePowerCalData2 interface on the Channel (object)
buffer	**(enum NASourcePowerCalBuffer)** - The source power cal data buffer to write to. **0 - naCorrectionValues** This is the only buffer currently available.
sourcePort	**(long integer)** – The source port for which calibration data is being input. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.
numValues	**(long integer)** – Number of data values being input. **Note:** If this does not equal the current number of points on the channel, the calibration will not be valid.
data	**(single)** – Array of source power cal data being input.
Return Type	None
Default	Not Applicable

Examples	`Dim chanData As ISourcePowerCalData2`
	`Set chanData = app.ActiveChannel`
	`chanData.putSourcePowerCalDataScalarEx naCorrectionValues, 1, 201, scalarCalValues(0)`

C++ Syntax	HRESULT putSourcePowerCalDataScalarEx(tagNASourcePowerCalBuffer bufSelect, long sourcePort, long numValues, float *pData);
Interface	ISourcePowerCalData2

PutStandard Method Superseded

Description This command is replaced with PutStandardByString

Puts standard acquisition data into the Cal Set.

Learn more about Reading and Writing Cal Data

See examples of Reading and Writing Cal Set Data.

VB Syntax *CalSet.***putStandard** *class, rcv, src*, *data*

Variable **(Type) - Description**

CalSet **(object) -** A Cal Set object

class **(enum NACalClass)** Standard. Choose from:

1 - naClassA

2 - naClassB

3 - naClassC

4 - naClassD

5 - naClassE

6 - naReferenceRatioLine

7 - naReferenceRatioThru

SOLT Standards

1 - naSOLT_Open

2 - naSOLT_Short

3 - naSOLT_Load

4 - naSOLT_Thru

5 - naSOLT_Isolation

TRL Standards

1 - naTRL_Reflection

2 - naTRL_Line_Reflection

3 - naTRL_Line_Tracking

4 - naTRL_Thru

5 - naTRL_Isolation

rcv	**(long)** - Receiver Port
src	**(long)** - Source Port
data	**(variant)** Error term data in a two-dimensional array (0:1, 0:numpts-1). The data must be complex pairs. **Note:** See also Put Standard Complex on the ICalData2 interface to avoid using the variant data type.
Return Type	Not Applicable
Default	Not Applicable
Examples	See an Example
C++ Syntax	HRESULT putStandard(tagNACalClass stdclass, long ReceivePort, long SourcePort, VARIANT varData)
Interface	ICalSet

PutStandardByString

Description	Puts standard acquisition data into the Cal Set. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data.
VB Syntax	**PutStandardByString**(*stdName*, *vdata*)
Variable	**(Type) - Description**
stdName	**(String)** The string used to identify a particular standard in the Cal Set. An example string requesting the data for the Load standard in a full 2 port cal might be "S11C(3,3)".
vdata	**(Variant)** The variant containing a safearray of variants. This data is usually two dimensional. **Note:** The vardata array is a safearray of variants wrapped in a variant. This structure is compatible with scripting clients who can only use variants. For alternative methods that used typed arrays, see ICalData3.
Return Type	Not Applicable
Default	Not Applicable
Examples	See an Example
C++ Syntax	HRESULT PutStandardByString(BSTR bufferName, VARIANT vardata);
Interface	ICalSet2

PutStandardComplex Method Superseded

Description	This command is replaced with PutStandardComplexByString Puts standards acquisition data into the Cal Set. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data
VB Syntax	*ICalData2.***putStandardComplex** *class, rcv, src, numPts,real(),imag()*
Variable	**(Type) - Description**
ICalData2	An ICalData2 pointer to the Cal Set object
class	**(enum NACalClass)** Standard. Choose from:

1 - naClassA

2 - naClassB

3 - naClassC

4 - naClassD

5 - naClassE

6 - naReferenceRatioLine

7 - naReferenceRatioThru

SOLT Standards

1 - naSOLT_Open

2 - naSOLT_Short

3 - naSOLT_Load

4 - naSOLT_Thru

5 - naSOLT_Isolation

TRL Standards

1 - naTRL_Reflection

2 - naTRL_Line_Reflection

3 - naTRL_Line_Tracking

4 - naTRL_Thru

5 - naTRL_Isolation

rcv	**(long)** - Receiver Port
src	**(long)** - Source Port
numPts	**(long) -** The number of data points in the real and imaginary arrays.
real()	**(single)** - one-dimensional array containing the **real** part of the acquisition data. (0:points-1)
imag()	**(single)** - one-dimensional array containing the **imaginary** part of the acquisition data. (0:points-1)

Return Type Not Applicable

Default Not Applicable

Examples

```
Dim sdata As ICalData2
Set sdata = calmanager.CreateCal Set( 1 )
sdata.putStandardComplex naSOLT_Open, 1, 1, numpts, rel(0),
img(0)
```

C++ Syntax HRESULT putStandardComplex(tagNACalClass stdclass, long ReceivePort, long SourcePort, long lNumValues, float* pReal, float* pImag)

Interface ICalData2

PutStandardComplexByString

Description	Puts standard acquisition data into the Cal Set. Learn more about Reading and Writing Cal Data See examples of Reading and Writing Cal Set Data.
VB Syntax	*ICalData3.***PutStandardComplexByString**(*stdName, lnumPoints , real(o) , imag(0)*)
Variable	**(Type) - Description**
ICalData3	An ICalData3 pointer to a Cal Set object.
stdName	**(String)** The string used to identify a particular standard in the Cal Set. An example string requesting the data for the Load standard in a full 2 port cal might be "S11C(3,3)".
lnumpoints	**(long) -** The number of data points in the real and imaginary arrays.
real	**(Single)** The real component of the complex data.
imag	**(Single)** The imaginary component of the complex data.
Return Value	Single
Default	Not Applicable
Examples	See an Example
C++ Syntax	HRESULT PutStandardComplexByString(BSTR bufferName, long lnumPoints, float* real, float* imag);
Interface	ICalData3

Write-only

Quit Method

Description	Terminates the Network Analyzer application.
VB Syntax	*app*.**Quit**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.Quit`
C++ Syntax	HRESULT Quit()
Interface	IApplication
Remarks	Under the rules of COM, the server should not exit until all references to it have been released. This method is a brute force way of terminating the application. Be sure to release all references (or terminate the client program) before attempting to restart the Network Analyzer application. An alternate approach to terminating the application is to make the application invisible (app.Visible = False) and release all references. The server will shutdown.

ReadData Method

Description	Reads a 13-bit data word from the specified address. Data is read using the AD0 through AD12 lines of the external test set connector. The instrument generates the appropriate timing signals. It automatically controls timing signals LDS, LAS and RLW to strobe the address, and then read the data, from the external test set. See the timing diagram for Address and Data I/O read.
VB Syntax	*value* = *ExtIO*.**ReadData** *(address)*
Variable	**(Type) - Description**
value	**(variant)** - Variable to store the returned data
ExtIO	**(object) -** An ExternalTestSetIO object
address	**(variant)** - address to read data from.
Return Type	Variant
Default	Not Applicable
Examples	`value = ExtIO.ReadData (15)`
C++ Syntax	HRESULT ReadData (VARIANT Address, VARIANT* Data);
Interface	IHWExternaTestSetIO

ReadRaw Method

Description

Reads a 16-bit value from the external test set. The 16-bit value is comprised of lines AD0 - AD12, Sweep Holdoff In and Interrupt In (inverted).

When this command is used the analyzer does NOT generate the appropriate timing signals; it simply reads the lines. The user needs to first use the WriteRaw method to do the initial setup. The RLW line (pin25) must be set to the appropriate level in order to read the test set connected.

Below is the format of data that is read with ReadRaw:

Pin	Bit	Signal name
22	0	AD0*
23	1	AD1*
11	2	AD2*
10	3	AD3*
9	4	AD4*
21	5	AD5*
20	6	AD6*
19	7	AD7*
6	8	AD8*
5	9	AD9*
4	10	AD10*
17	11	AD11*
3	12	AD12*
2	13	Sweep Holdoff In
13	14	Interrupt In (inverted internally)
na	15	Always Zero, grounded internally

*These lines are dependent on the state of RLW (pin25).
Writing a 0(low) to RLW will set lines AD0-AD12 to write mode.
Writing a 1(high) to RLW will set lines AD0-AD12 to read mode.

VB Syntax	*value* = *ExtIO*.**ReadRaw** *(address)*
Variable	**(Type) - Description**
value	**(variant)** - Variable to store the returned data
ExtIO	**(object) -** An External IO object
address	**(variant)** - Address to read data from
Return Type	Real
Default	Not Applicable
Examples	`value = ExtIO.ReadRaw (address)`
C++ Syntax	HRESULT ReadRaw(VARIANT* Input);
Interface	IHWExternalTestSetIO

Recall Method

Description Recalls a measurement state, calibration state, or both, from the hard drive into the analyzer.

Use app.Save to save files.

VB Syntax *app*.**Recall** (*filename.ext*)

Variable **(Type) - Description**

app An Application **(object)**

filename.ext **(string)** - Full path, file name, and extension, of the file.

Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents"
Use one of the following extensions:

- .sta - Instrument State
- .cal - Calibration file
- .cst - Both Instrument State and Calibration reference
- .cti - Citifile (data will always be formatted. See Recalling Citifiles Using the PNA)
- .csa - Instrument state and calibration data (not a reference pointer).

Return Type Not Applicable

Default Not Applicable

Examples

```
app.Recall ("C:\Program Files\Agilent\Network
Analyzer\Documents\MyState.cst") 'Recalls "mystate.cst" from the
specified folder
```

C++ Syntax HRESULT Recall(BSTR bstrFile)

Interface IApplication

Recall Kits Method

Description	Recalls the calibration kits definitions that were stored with the SaveKits command.
VB Syntax	*app*.**RecallKits**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.RecallKits`
C++ Syntax	HRESULT RecallKits()
Interface	IApplication

Write-only

Remove Method

Description Removes an item from a collection of objects.

VB Syntax *Object*.**Remove** *item*

Variable **(Type) - Description**

Object Any of the following **(objects)**

- CalFactorSegments collection
- Cal Sets collection
- Measurements collection
- NAWindows collection
- PowerLossSegments collection
- Segments collection

Note: Segments, **CalFactorSegments**, and **PowerLossSegments** have an OPTIONAL argument [size] referring to the number of segments to remove, starting with the *item* parameter.

Note: Segments - When ALL segments are deleted, SweepType is automatically set to Linear because there are no segments to sweep.

item **(variant)** - Item number to be removed

Return Type Not Applicable

Default Not Applicable

Examples

```
Measurements.Remove 3 'Removes measurement 3
segments.Remove 2,20 'Removes 20 segments (2 - 21)
```

C++ Syntax

HRESULT Remove(VARIANT index); //Measurements

HRESULT Remove(VARIANT index); //Cal Sets

HRESULT Remove(long windowNumber); //NAWindows

HRESULT Remove(VARIANT index, long size); //Segments

HRESULT Remove(VARIANT index, long size); //CalFactorSegments

HRESULT Remove(VARIANT index, long size); //PowerLossSegments

Interface IMeasurements

INAWindows

ISegments

ICalFactorSegments
ICal Sets

IPowerLossSegments

Reset Method

Description	Removes all existing windows and measurements from the application. (Unlike Preset, does not create a new measurement.)
VB Syntax	*app*.**Reset**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.Reset`
C++ Syntax	HRESULT Reset()
Interface	IApplication

ResetLOFrequency Method

Description	Resets the LO Delta Frequency to 0 (zero) Hz.
VB Syntax	*embedLO*.**ResetLOFrequency**
Variable	**(Type) - Description**
embedLO	An EmbeddedLO **(object)**
Default	Not Applicable
Examples	`embedLO.ResetLOFrequency 'write`
C++ Syntax	HRESULT ResetLOFrequency();
Interface	IEmbededLO

Last Modified:

18-Jun-2007 MX New topic

ResetTuningParameters Method

Description	Resets the tuning parameters to their default values.
VB Syntax	*embedLO*.**ResetTuningParameters**
Variable	**(Type) - Description**
embedLO	An EmbeddedLO **(object)**
Default	Not Applicable
Examples	`embedLO.ResetTuningParameters 'write`
C++ Syntax	HRESULT ResetTuningParameters();
Interface	IEmbededLO

Last Modified:

13-Apr-2007 MX New topic

RestoreCalKitDefaults Method

Description Restores the original properties of the specified Cal Kit, overwritting the last definition with the factory defaults.

NOTE: ONLY works with PNA releases 1.0 through 1.6.

VB Syntax *app*.**RestoreCalKitDefaults** (*calKit*)

Variable **(Type) - Description**

app An Application **(object)**

calKit **(enum NACalKit)** - Calibration Kit to restore. Choose from:

1 - naCalKit_85032F_N50
2 - naCalKit_85033E_3_5
3 - naCalKit_85032B_N50
4 - naCalKit_85033D_3_5
5 - naCalKit_85038A_7_16
6 - naCalKit_85052C_3_5_TRL
7 - naCalKit_User7
8 - naCalKit_User8
9 - naCalKit_User9
10 - naCalKit_User10

Return Type Not Applicable

Default Not Applicable

Examples

```
app.RestoreCalKitDefaults naCalKit_MechKit10
```

C++ Syntax HRESULT RestoreCalKitDefaults\(tagNACalKit kit)

Interface IApplication

Write-only

About Modifying Cal Kits

RestoreCalKitDefaultsAll Method

Description	Restores the original properties of ALL of the Cal Kits, overwritting the last definitions with the factory defaults. **NOTE**: ONLY works with PNA releases 1.0 through 1.6.
VB Syntax	*app.***RestoreCalKitDefaultsAll**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.RestoreCalKitDefaultsAll`
C++ Syntax	HRESULT RestoreCalKitDefaultsAll()
Interface	IApplication

Resume Method

Description	Resumes the trigger mode of all channels that was in effect before sending the channels.Hold method. Channels.Hold must be sent before channels.Resume, using the same instance of the Channels object.
VB Syntax	*chans*.**Resume**
Variable	**(Type) - Description**
chans	A Channel collection **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`chans.Resume`
C++ Syntax	HRESULT Resume();
Interface	IChannels2

Save Method

Description	Saves the appropriate content to the hard drive depending on the extension that is provided. Some saved files can be recalled using app.Recall. depending on the content.
VB Syntax	*app*.**Save**(*filename.ext*)
Variable	**(Type) - Description**
app	An Application **(object)**
filename.ext	**(string)** - Full path, file name, and extension of the file. Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents" Use one of the following extensions: • **.cst** - Saves both Instrument State and Cal Set reference - Recalls a calibrated measurement. (Recallable) • **.sta** - Saves Instrument State only - recalls the instrument state without calibration. (Recallable) • **.cal** - Calibration file – saves the active Cal Sets currently in use by any channel. Use this mode for archival purposes only. All Cal Sets are saved to a Cal Set data file. This mode provides a method of safeguarding calibration data. This data can be restored to the list of Cal Sets available in the instrument. (Recallable) • **.csa** - Saves both instrument state AND actual calibration data, not a reference pointer to the Cal Set. • **.prn** - Saves active trace in comma-separated format (not recallable) • **.bmp** - Saves a Bitmap of the screen (not recallable) • **.s1p** - Saves 1-port measurement data (not recallable) • **.s2p** - Saves 2-port measurement data (not recallable) • **.s3p** - Saves 3-port measurement data (not recallable) • **.s4p** - Saves 4-port measurement data (not recallable)
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.Save("C:\Program Files\Agilent\Network Analyzer\Documents\Newfolder\MyState.cst") 'Saves "mystate.cst" to the specified folder`

C++ Syntax	HRESULT Save(BSTR bstrFile)
Interface	IApplication

Last Modified:

26-Jun-2007	Corrected example

Save Method

Description	Saves the current Cal Set to disk. This is the recommended method for saving a Cal Set. Learn more about reading and writing Cal data using COM
VB Syntax	*CalSet*.**Save**
Variable	**(Type) - Description**
CalSet	**(object) -** A CalSet object
Return Type	Not Applicable
Default	Not Applicable
Examples	`myCalSet.Save` See Copy Method for an example application of this command.
C++ Syntax	HRESULT Save();
Interface	ICalSet

SaveCalSets Method Superseded

Description	This command is replaced by ICalSet::Save which saves the data for **only** the current Cal Set to the disk.
	Writes new or changed Cal Sets to disk. All Cal Sets are saved in a single file. This file is updated at the following times: • When a Cal Set has been deleted. • When a calibration has been performed through the front panel interface. • When this method is called. • When ICalSet::Save is called. Learn more about reading and writing Cal data using COM
VB Syntax	*object*.**SaveCalSets**
Variable	**(Type) - Description**
object	**(object) -** A CalManager object or a Calibrator object
Return Type	None
Default	Not Applicable
Example	`calMgr.SaveCalSets`
C++ Syntax	HRESULT SaveCalSets( );
Interface	ICalManager ICalibrator

SaveCitiDataData Method

Description	Saves UNFORMATTED trace data to .cti file. Learn more about citifiles.
VB Syntax	*app*.**SaveCitiDataData**(*filename.cti*)
Variable	**(Type) - Description**
app	An Application **(object)**
filename.cti	**(string)** - Full path, file name, and .cti extension of the file. Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents".
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.SaveCitiDataData ("C:\Program Files\Agilent\Network Analyzer\Documents\myDDCitifile.cti") 'Saves "myDDCitifile.cti" to the specified folder`
C++ Syntax	HRESULT SaveCitiDataData (BSTR bstrFile)
Interface	IApplication5

SaveCitiFormattedData Method

Description	Saves FORMATTED trace data to .cti file. Learn more about citifiles.
VB Syntax	*app*.**SaveCitiFormattedData**(*filename.cti*)
Variable	**(Type) - Description**
app	An Application **(object)**
filename.cti	**(string)** - Full path, file name, and .cti extension of the file. Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents"
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.SaveCitiFormattedData ("C:\Program Files\Agilent\Network Analyzer\Documents\Newfolder\myFDCitifile.cti") 'Saves "myFDCitifile.cti" to the specified folder`
C++ Syntax	HRESULT SaveCitiFormattedData (BSTR bstrFile)
Interface	IApplication5

Write-only

About ENR tables

SaveENRFile Method

Description	Saves an ENR table to disk.
VB Syntax	*enr*.**SaveENRFile** *(filename)*
Variable	**(Type) - Description**
enr	An ENRFile **(object)**
filename	(String) - Absolute path and filename of the ENR file.
Return Type	Not Applicable
Default	Not Applicable
Examples	`See example program`
C++ Syntax	HRESULT SaveENRFile(BSTR filename);
Interface	IENRFile

Last Modified:

2-Aug-2007	MX New topic

Write only

SaveFile Method

Description	Saves the mixer/converter test setup to a mixer attributes (.mxr) file.
VB Syntax	*mixer*.**SaveFile** *(filename)*
Variable	**(Type) - Description**
mixer	An IMixer Interface pointer to a measurement **(object)**
filename	(String) Full path, file name, and .mxr extension of the file. Files are typically stored in "C:\Program Files\Agilent\Network Analyzer\Documents".
Return Type	String
Default	Not Applicable
Examples	`mixer.SaveFile ("C:\Program Files\Agilent\Network Analyzer\Documents\myMixer.mxr")`
C++ Syntax	HRESULT put_SaveFile(BSTR newVal)
Interface	IMixer

Write-only | About Modifying Cal Kits

SaveKits Method

Description	Saves the cal kits, typically after modifying a calibration kit. To load a cal kit into the analyzer from the hard drive, use app.RecallKits.
VB Syntax	*app*.**SaveKits**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.SaveKits`
C++ Syntax	HRESULT SaveKits()
Interface	IApplication

SearchFilterBandwidth Method

Description	Searches the measurement data with the current BandwidthTarget (default is -3). To continually track the filter bandwidth, use BandwidthTracking. This feature uses markers 1-4. If not already, they are activated. To turn off these markers, either turn them off individually or DeleteAllMarkers. The bandwidth statistics are displayed on the analyzer screen. To get the bandwidth statistics, use either GetFilterStatistics or FilterBW, FilterCF , FilterLoss ,or FilterQ. The analyzer screen will show either Bandwidth statistics OR Trace statistics; not both. To search a UserRange with the bandwidth search, first activate marker 1 and set the desired UserRange. Then send the SearchFilterBandwidth command. The user range used with bandwidth search only applies to marker 1 searching for the max value. The other markers may fall outside the user range.
VB Syntax	*meas*.**SearchFilterBandwidth**
Variable	**(Type) - Description**
meas	A Measurement **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`meas.SearchFilterBandwidth`
C++ Syntax	HRESULT SearchFilterBandwidth()
Interface	IMeasurement

SearchMax Method

Description	Searches the marker domain for the maximum value.
VB Syntax	*mark*.**SearchMax**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SearchMax`
C++ Syntax	HRESULT SearchMax()
Interface	IMarker

SearchMin Method

Description	Searches the marker domain for the minimum value.
VB Syntax	*mark*.**SearchMin**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SearchMin`
C++ Syntax	HRESULT SearchMin()
Interface	IMarker

SearchNextPeak Method

Description	Searches the marker's domain for the next peak value.
VB Syntax	*mark*.**SearchNextPeak**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SearchNextPeak`
C++ Syntax	HRESULT SearchNextPeak()
Interface	IMarker

SearchPeakLeft Method

Description	Searches the marker's domain for the next **VALID** peak to the left of the marker.
VB Syntax	*mark.***SearchPeakLeft**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SearchPeakLeft`
C++ Syntax	HRESULT SearchPeakLeft()
Interface	IMarker

Write-only

About Marker Search

SearchPeakRight Method

Description	Searches the marker's domain for the next **VALID** peak to the right of the marker.
VB Syntax	*mark*.**SearchPeakRight**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SearchPeakRight`
C++ Syntax	HRESULT SearchPeakRight()
Interface	IMarker

SearchTarget Method

Description	Searches the marker's domain for the target value (specified with mark.TargetValue). Searches to the right; then at the end of the search domain, begins again at the start of the search domain.
VB Syntax	*mark*.**SearchTarget**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SearchTarget`
C++ Syntax	HRESULT SearchTarget()
Interface	IMarker

SearchTargetLeft Method

Description	Moving to the left of the marker position, searches the marker's domain for the target value (specified with mark.TargetValue).
VB Syntax	*mark*.**SearchTargetLeft**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SearchTargetLeft`
C++ Syntax	HRESULT SearchTargetLeft()
Interface	IMarker

SearchTargetRight Method

Description	Moving to the right of the marker position, searches the marker's domain for the target value (specified with mark.TargetValue).
VB Syntax	*mark*.**SearchTargetRight**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SearchTargetRight`
C++ Syntax	HRESULT SearchTargetRight()
Interface	IMarker

tWrite-only

SelectCalSet Method

Description	Selects and applies a Cal Set to the specified channel. **Note:** Error Correction is not automatically applied as a result of this command being issued. If there is more than one Cal Type in the Cal Set, you must explicitly choose the Cal Type you want to apply. (See meas.Caltype)I
VB Syntax	*channel.***SelectCalSet** *calSet, restore*
Variable	**(Type) - Description**
channel	**(object) -** A Channel object
calSet	**(string)** - Cal Set to make active. Specify the Cal Set by GUID or Name. Use EnumerateCalSets to list the available Cal Sets.
restore	**(boolean)** - **True (1)** - The stimulus stored with the cal set will be applied to the channel. **False (0)** - If a conflict is detected between the existing channel settings and the Cal Set stimulus settings, then the following will occur: If interpolation is ON, then interpolation will be attempted. This may fail if the channel frequency is outside the range of the Cal Set. If interpolation is OFF, the selection will be abandoned and an error is returned: E_NA_CAL_STIMULUS_VALUES_EXCEEDED
Return Type	Not Applicable
Default	Not Applicable
Example	`channel.SelectCalSet GUID, 1` `chan.SelectCalSet "MyCalSet", 0`
C++ Syntax	HRESULT SelectCalSet (BSTR strCset, bool bRestore);
Interface	IChannel

Last Modified:

29-Nov-2007	Modified to accept name

SetAllSegments Method

Description Uploads a segment table to the PNA replacing any existing segment table.

Segments must be ascending in frequency and non-overlapping. If they are not, the segments are 'adjusted' as they are from the User Interface control. The total number of points for all segments cannot exceed the PNA maximum number of points for a sweep.

VB Syntax *Segs*.**SetAllSegments** (*segdata*)

Variable (Type) - Description

segs A Segments **(Collections)**

segdata (Variant) A 2-dimensional array of Segment data:

- dimension 0 is the number of elements in each segment.
- dimension 1 is the number of segments that will be used.

The following is a list of dimension 0 elements for each segment:

Note: All elements must be **dimensioned** as either ALL Double or ALL Variant.

- 0 = Segment state (Boolean True or False)
- 1 = Number of Points in this segment (Integer)
- 2 = Start Freq (Double)
- 3 = Stop Freq (Double)
- 4 = IFBW (Double)
- 5 = Dwell Time (Double)
- 6 = Power (Double) - see table below.

The IFBandwidthOption and SweepTimeOption settings do NOT affect the array size and order-of-element interpretation. The array must always contain elements that contain IFBW and Sweep Time values. The value is ignored if the corresponding 'option' is set to False.

The number of dimension 0 elements depends on the following two settings:

1. SourcePowerOption = True allows segments to have independent power levels.
2. CouplePorts = False allows different power levels for each test port.

CouplePorts	SourcePowerOption	Number of Elements
False	False	Each port has its own channel-wide power setting, which is set using TestPortPower. Supply exactly 7 elements per segment. The last element (power) is ignored.
False	True	Supply 6 + total number of ports. The first 7 elements are still interpreted the same. The remaining elements (in-order) are interpreted as the power levels to set on that segment for Ports 2 through N, where N is the total number of ports currently enabled for the PNA or for a PNA with multiport external test set.
True	False	Supply exactly 7 elements per segment. The last element (power) is ignored.
True	True	Supply exactly 7 elements per segment. The last element (power) is honored.

Return Type Not Applicable

Default Not Applicable

Examples See a VB example using this command

See a C++ example using this command

C++ Syntax SetAllSegments (VARIANT Segments);

Interface ISegments2

Last Modified:

15-Oct-2007 Major edits and link to C++ example

SetBBPorts Method

Description For a Balanced - Balanced device type, maps the PNA ports to the DUT ports.

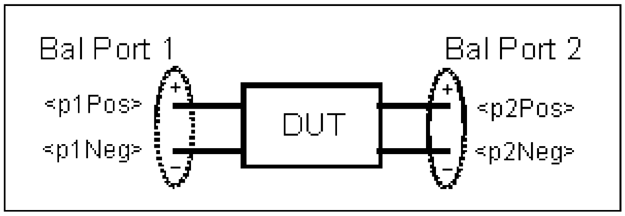
Set the Balanced device type using the DUTTopology Property

VB Syntax *balTopology*.**SetBBPorts** *p1Pos, p1Neg, p2Pos, p2Neg*

Variable **(Type) - Description**

balTopology A BalancedTopology **(object)**

p1Pos, p1Neg, p2Pos, p2Neg **(Long Integer)** PNA port number that connects to each of the following DUT ports:



Return Type Not applicable - To read port mappings, use the BalancedTopology properties.

Default Not Applicable

Examples

```
balTop.SetBBPorts 1,2,3,4
```

C++ Syntax HRESULT SetBBPorts (long p1Pos, long p1Neg, long p2Pos, long p2Neg)

Interface IBalancedTopology

SetCalInfo Method

Description Specifies the type of Unguided calibration. This method should be the first method called on the calibrator object. It prepares the internal state for the rest of the calibration.

Note: You can NOT perform a 3 or 4-port cal using SetCalInfo even though there is enumCalTypes. You must use the GuidedCalibration object.

Learn more about reading and writing Cal data using COM

The analyzer can measure both ports simultaneously, assuming you have two of each standard type. For a 2-port cal, See cal.Simultaneous2PortAcquisition

VB Syntax *cal*.**SetCalInfo** *(type,rcvPort,srcPort)*

Variable **(Type) - Description**

cal A Calibrator **(object)**

type **(enum NACalType)** - Calibration type. Choose from:

0 - naCalType_Response_Open

1 - naCalType_Response_Short

2 - naCalType_Response_Thru

3 - naCalType_Response_Thru_And_Isol

4 - naCalType_OnePort

5 - naCalType_TwoPort_SOLT

6 - naCalType_TwoPort_TRL

7 - naCalType_None

8 - naCalType_ThreePort_SOLT

9 - Custom

10 - naCalType_FourPort_SOLT

Note: For 1-port cals, the source port = receiver port. For 2, 3,4-port SOLT and TRL, it doesn't matter which port is specified as source and receiver

rcvPort **(long integer)** - Receiver Port

srcPort **(long integer)** - Source Port

Return Type NACalType

Default **7- naCalType_None**

Examples

```
cal.setCalInfo(naCalType_Response_Open,1,1)
```

C++ Syntax	HRESULT SetCalInfo(tagNACalType calType,long portA, long portB)
Interface	ICalibrator

SetCalInfoEx Method (for source power cals)

Description	This command replaces SetCalInfo2 Method. Specifies the channel and the source port to be used for the source power calibration about to be performed.
VB Syntax	*powerCalibrator*.**SetCalInfoEx** *channel, sourcePort, [powerOffset,] [display]*
Variable	**(Type) - Description**
powerCalibrator	**(object)** - A SourcePowerCalibrator object
channel	**(long integer) -** Number of the PNA channel (not power meter channel) on which the source power cal will be performed. If the channel does not already exist, it will be created.
sourcePort	**(long integer) -** Port number on which the source power cal will be performed. Use GetPortNumber to return the port number of a source that only has a string name, such as an External Source.
[powerOffset]	**(double) -** Optional argument. Sets or returns a power level offset from the PNA test port power. This can be a gain or loss value (in dB) to account for components you connect between the source and the reference plane of your measurement. For example, specify 10 dB to account for a 10 dB amplifier at the input of your DUT. Following the calibration, the PNA power readouts are adjusted by this value. This argument performs the same function as chan.SourcePowerCalPowerOffset Property
[display]	**(boolean)** Optional argument. Enables and disables the display of power readings on the PNA screen. After the source power cal data is acquired, this setting is reset to ON. If unspecified, value is set to ON. **True** - Display of power readings is ON **False** - Display of power readings is OFF
Return Type	None
Default	Not Applicable
Examples	`powerCalibrator.SetCalInfoEx 1, 1, -10, True`
C++ Syntax	HRESULT SetCalInfoEx(long Channel, long SourcePort, double PowerOffset = 0., VARIANT_BOOL bDisplay = VARIANT_TRUE);
Interface	ISourcePowerCalibrator4

Last Modified:

30-Apr-2007	Edited for src strings

SetCenter Method

Description	Changes the center stimulus to the stimulus value of the marker. The start stimulus stays the same and the stop is adjusted. This command does not work with channels that are in CW or Segment Sweep mode.
VB Syntax	*mark*.**SetCenter**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SetCenter`
C++ Syntax	HRESULT SetCenter()
Interface	IMarker

 About Marker Functions

SetCW Method

Description	Changes the analyzer to sweep type CW mode and sets the CW frequency to the marker's frequency. Does not change anything if current sweep type is other than a frequency sweep.
VB Syntax	*mark*.**SetCW**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SetCW`
C++ Syntax	HRESULT SetCW()
Interface	IMarker

Write-only

About Marker Functions

SetElectricalDelay Method

Description	Changes the measurement's electrical delay to the marker's delay value.
VB Syntax	*mark*.**SetElectricalDelay**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SetElectricalDelay`
C++ Syntax	HRESULT SetElectricalDelay()
Interface	IMarker

SetFailOnOverRange Method

Description When set TRUE, configures the analyzer to report outOfRange conditions with an **error** code. Any overrange error will return **E_NA_LIMIT_OUTOFRANGE_ERROR**.

Note: This method is for the benefit of VB clients. The analyzer automatically adjusts overrange conditions to the closest acceptable setting. The VB user will not See that an overrange occurred because the HRESULT is not returned if it has a success code. For more information, See Events/OverRange.

VB Syntax *app*.**SetFailOnOverRange** *state*

Variable **(Type) - Description**

app An Application **(object)**

state **(boolean)** -
True (1) - Overrange conditions report an error code
False (0) - Overrange conditions report a success code

Return Type Not Applicable

Default False (0)

VB Example

```
app.SetFailOnOverRange TRUE
On Error Goto ERRHANDLER

'the following overrange will cause ERRHANDLER to be invoked

channel.StartFrequency = 9.9 GHZ
exit
```

```
ERRHANDLER:
  print "something failed"
```

C++ Syntax HRESULT put_SetFailOnOverRange(VARIANT_BOOL mode)

Interface IApplication

Write only

SetIsolationPaths Method

Description Adjusts the list of paths (port pairings) for which isolation standards will be measured during calibration.

VB Syntax *guidedCal.***SetIsolationPaths** *specifier, pathList*

Variable **(Type) - Description**

obj Any of the following:

GuidedCalibration (object)

specifier **(Enum)** - Choose from:

0 - naPathsAll - Measure isolation on all pairings of the ports that are to be calibrated.

1 - naPathsNone - Do not measure isolation on any pairing of the ports to be calibrated.

2 - naPathsAdd - Add one or more specific pairings of ports to the list of port pairings for which isolation will be measured.

3 - naPathsRemove - Remove one or more specific pairings of ports from the list of port pairings for which isolation will be measured.

pathlist **(Variant)** port numbers in pairs. One-dimensional array of Long Integers.

Note: *pathList* is evaluated only when *specifier* is **naPathsAdd** or **naPathsRemove**. For **naPathsAll** and **naPathsNone**, *pathList* is ignored.

Return Type Not Applicable

Default Not Applicable

Examples

```
Dim pathList
'selecting to measure isolation on all possible paths for the
ports about to be calibrated
guidedCal.SetIsolationPaths naPathsAll, pathList

'now removing the paths 1-to-2, 2-to-3 and 2-to-4 from the set
of all paths
pathList = Array(1,2,2,3,2,4)
guidedCal.SetIsolationPaths naPathsRemove, pathList
```

C++ Syntax HRESULT SetIsolationPaths(enum NAPortPathSpecifier specifier, VARIANT pathList);

Interface IGuidedCalibration3

Last Modified:

16-Apr-2007 MX New topic

SetPowerAcquisitionDevice Method

Description	Sets the power sensor channel (A or B) to be used. This performs the same function as the **Use this sensor only** checkbox in the Power Sensor Settings dialog. **Note:** This method is only necessary when performing an SMC calibration.
VB Syntax	*pwrCal* **. SetPowerAcquisitionDevice** *sensor*
Variable	**(Type) - Description**
pwrCal	(Object) A SourcePowerCalibrator object
sensor	(**enum NAPowerAcquisitionDevice**) The power sensor channel. Choose from: 0 – naPowerSensor_A 1 – naPowerSensor_B
Default	Not Applicable
Examples	`pwrCal.PowerAcquisitionDevice naPowerSensor_A`
C++ Syntax	HRESULT SetPowerAcquisitionDevice(tagNAPowerAcquisitionDevice enumAcqDevice);
Interface	ISourcePowerCalibrator3

SetFrequencyLowPass Method

Description	Set the start frequencies when **trans.Mode = LowPass**.
VB Syntax	*trans.***SetFrequencyLowPass**
Variable	**(Type) - Description**
trans	A Transform **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`trans.SetFrequencyLowPass`
C++ Syntax	HRESULT SetFrequencyLowPass(void)
Interface	ITransform

SetPortMap Method

Description	Set the DUT-to-PNA port mapping for the Gain Compression measurement.
VB Syntax	*gca*.**SetPortMap** *in,out*
Variable	**(Type) - Description**
gca	A GainCompression **(object)**
in	PNA port which is connected to the DUT input.
out	PNA port which is connected to the DUT output.
Return Type	Not Applicable
Default	1,2
Examples	`gca.SetPortMap 2,1`
C++ Syntax	HRESULT SetPortMap(long input_port,long output_port);
Interface	IGainCompression

Last Modified:

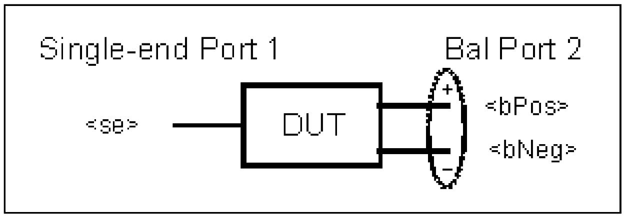
29-Nov-2007 MX New topic

SetReferenceLevel Method

Description	Changes the measurement's reference level to the marker's Y-axis value.
VB Syntax	*mark*.**SetReferenceLevel**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SetReferenceLevel`
C++ Syntax	HRESULT SetReferenceLevel()
Interface	IMarker

SetSBPorts Method

Description	For a Single-ended - Balanced device type, maps the PNA ports to the DUT ports. Set the Single-ended - Balanced device type using the DUTTopology Property
VB Syntax	*balTopology*.**SetSBPorts** *se, bPos, bNeg*
Variable	**(Type) - Description**
balTopology	A BalancedTopology **(object)**
se, bPos, bNeg	PNA port number that connects to each of the following DUT ports:



Return Type	Not applicable - To read port mappings, use the BalancedTopology properties.
Default	Not Applicable
Examples	`balTop.SetSBPorts 1,2,3`
C++ Syntax	HRESULT SetSBPorts (long se, long bPos, long bNeg)
Interface	IBalancedTopology

SetSSBPorts Method

Description For a Single-ended - Single-ended - Balanced device type, maps the PNA ports to the DUT ports.

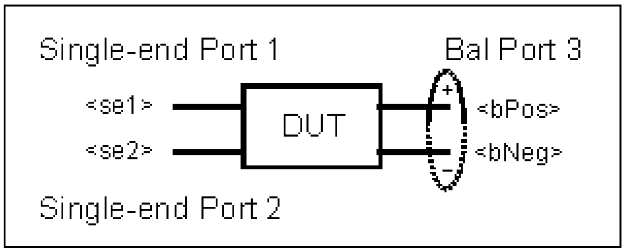
Set the Single-ended - Single-ended - Balanced device type using the DUTTopology Property

VB Syntax *balTopology*.**SetSSBPorts** *se, se2, bPos, bNeg*

Variable **(Type) - Description**

balTopology A BalancedTopology **(object)**

se, se2, bPos, bNeg PNA port number that connects to each of the following DUT ports:



Return Type Not applicable - To read port mappings, use the BalancedTopology properties.

Default Not Applicable

Examples

```
balTop.SetSSBPorts 1,2,3,4
```

C++ Syntax HRESULT SetSSBPorts (long se, long se2, long bPos, long bNeg)

Interface IBalancedTopology

SetupMeasurementsForStep Method

Description	Show the Cal Window, and optionally one or more other specific windows, before acquiring a Cal standard. This command will cause the Cal Window to display the specific measurements that are to be made for that particular Cal standard. See custom Cal window commands.
VB Syntax	*guidedCal*.**SetupMeasurementsForStep** *(n)*
Variable	**(Type) - Description**
guidedCal	A GuidedCalibration (object)
n	Step number in the calibration process. Use GenerateSteps to determine the total number of steps. Use GetStepDescription to read the description of each step.
Return Type	Not Applicable
Default	Not Applicable
Examples	`guidedCal.SetupMeasurementsForStep 3` See example using this command
C++ Syntax	HRESULT SetupMeasurementsForStep(long step);
Interface	IGuidedCalibration4

Last Modified:

8-Nov-2007 MX New topic

Write-only

SetStandardsForClass Method

Description Set the calibration standard numbers for a specified calibration class. To read the cal standard numbers use GetStandardsForClass Method

VB Syntax *calKit*.**SetStandardsForClass** *(calclassorder, std1, std2, std3, std4, std5, std6, std7)*

Variable **(Type) - Description**

calKit A CalKit **(object)**

calclassorder **(enum NACalClassOrder)** Cal Class. Choose from:

0 - naRefl_1_S11

1 - naRefl_2_S11

2 - naRefl_3_S11

3 - naTran_1_S21

4 - naRefl_1_S22

5 - naRefl_2_S22

6 - naRefl_3_S22

7 - naTran_1_S12

8 - naRefl_1_S33

9 - naRefl_2_S33

10 - naRefl_3_S33

11 - naTran_1_S32

12 - naTran_1_S23

13 - naTran_1_S31

14 - naTran_1_S13

15 - naTRL_T

16 - naTRL_R

17 - naTRL_L

std1…std7 **(long)** Calibration Standard Number. Choose from **1** through **30**. Std2 through Std7 are optional

Return Type Not applicable

Default Not applicable

Examples **calkit.SetStandardsForClass** naRefl_3_S11, 3, 5, 6

calkit.SetStandardsForClass naTran_1_S21, 4

C++ Syntax HRESULT SetStandardsForClass(NACalClassOrder calclassorder, long std1, long std2, long std3, long std4, long std5, long std6, long std7)

Interface ICalKit

SetStart Method

Description	Changes the start stimulus to the stimulus value of the marker. The stop stimulus stays the same and the span is adjusted. This command does not work with channels that are in CW or Segment Sweep mode.
VB Syntax	*mark*.**SetStart**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SetStart`
C++ Syntax	HRESULT SetStart()
Interface	IMarker

SetStop Method

Description	Changes the stop stimulus to the stimulus value of the marker. The start stimulus stays the same and the span is adjusted. This command does not work with channels that are in CW or Segment Sweep mode.
VB Syntax	*mark*.**SetStop**
Variable	**(Type) - Description**
mark	A Marker **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`mark.SetStop`
C++ Syntax	HRESULT SetStop()
Interface	IMarker

ShowMarkerReadout Method

Description	Shows and Hides the Marker readout for the active marker in the upper-right corner of the window.
VB Syntax	*win*.**ShowMarkerReadout** *state*
Variable	**(Type) - Description**
win	A NAWindow **(object)**
state	**(boolean)** - **True (1)** - Show the Marker readout **False (0)** - Hide the Marker readout
Return Type	Not Applicable
Default	Not Applicable
Examples	`win.ShowMarkerReadout True`
C++ Syntax	HRESULT ShowMarkerReadout(VARIANT_BOOL bState)
Interface	INAWindow

ShowStatusBar Method

Description Shows and Hides the Status Bar. The Status Bar is located across the bottom of the display. The following information is shown for the active measurement:

- Channel number
- Parameter
- Correction On or Off
- Remote or Local operation

VB Syntax *app*.**ShowStatusBar** *state*

Variable **(Type) - Description**

app An Application **(object)**

state **(boolean) -**
True (1) - Show the Status Bar
False (0) - Hide the Status Bar

Return Type Not Applicable

Default Not Applicable

Examples

```
app.ShowStatusBar True
```

C++ Syntax HRESULT ShowStatusBar (VARIANT_BOOL bState)

Interface IApplication

ShowStimulus Method

Description	Shows and Hides the Stimulus (X-axis) information located at the bottom of the display. The start and stop stimulus values are shown for the active measurement.
VB Syntax	*app*.**ShowStimulus** *state*
Variable	**(Type) - Description**
app	An Application **(object)**
state	**(boolean)** - **True (1)** - Show the Stimulus information **False (0)** - Hide the Stimulus information
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.ShowStimulus True`
C++ Syntax	HRESULT ShowStimulus(VARIANT_BOOL bState)
Interface	IApplication

ShowTable Method

Description	Shows or Hides the specified table for the window's active measurement in the lower part of the window.
VB Syntax	*win*.**ShowTable** *value*
Variable	**(Type) - Description**
win	A NAWindow **(object)**
value	**(enum naTable)** - The table to show or hide. Choose from: 0 - naTable_None 1 - naTable_Marker 2 - naTable_Segment 3 - naTable_Limit
Return Type	Not Applicable
Default	Not Applicable
Examples	`win.ShowTable naTable_limit`
C++ Syntax	HRESULT ShowTable (tagNATableType table)
Interface	INAWindow

ShowTitleBars Method

Description	Shows and Hides the Title Bars. The Title Bars are across the top of the Network Analyzer Window and each of the measurement windows. The Window name is shown in the Title Bar.
VB Syntax	*app*.**ShowTitleBars** *state*
Variable	**(Type) - Description**
app	An Application **(object)**
state	**(boolean)** **True (1)** - Show the Title Bars **False (0)** - Hide the Title Bars
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.ShowTitleBars True`
C++ Syntax	HRESULT ShowTitleBars\(VARIANT_BOOL bState)
Interface	IApplication

ShowToolbar Method

Description Shows and Hides the specified Toolbar.

VB Syntax *app.***ShowToolbar** *toolbar,state*

Variable **(Type) - Description**

app An Application **(object)**

toolbar **(enum NAToolbarType)** - The toolbar to show or hide. Choose from:

0 - naToolbar_None
1 - naToolbar_ActiveEntry
2 - naToolbar_Markers
3 - naToolbar_Measurement
4 - naToolbar_Stimulus
5 - naToolbar_SweepControl

state **(boolean)** -
True (1) - Show the specified toolbar
False (0) - Hide the specified toolbar

Return Type Not Applicable

Default 1 - naToolbar_ActiveEntry showing; all others hiding.

Examples

```
app.ShowToolbar 1,1 'shows the active entry toolbar
```

C++ Syntax HRESULT ShowToolbar(tagNAToolbarType toolbar, VARIANT_BOOL bState)

Interface IApplication

Single Method

Description	Sets the trigger count to 1, which will cause the channel to respond to exactly one trigger signal from an Internal or External trigger source. If trigger source is set to Manual: • with *sync* = **True**, trigger source is automatically changed to Internal which sends AND allows one trigger signal, then changed back to Manual. • with *sync* = **False**, a trigger signal must also be sent using app.ManualTrigger Method. This setting has implications on Calibration. Learn more.
VB Syntax	*chan*.**Single** *[sync]*
Variable	**(Type) - Description**
chan	A Channel **(object)**
[sync]	**(boolean)** -Optional argument. **True** - The PNA waits until the trigger is completed to process subsequent commands. **False** - Subsequent commands are processed immediately (default setting).
Return Type	Not Applicable
Default	Not Applicable
Examples	`sync = True` `chan.Single sync`
C++ Syntax	HRESULT Single(VARIANT_BOOL bWait)
Interface	IChannel

Last Modified:

10-Jul-2007 Corrected for manual mode with sync = True

Store Method

Description	Saves the path configuration currently associated with channel (ch) to the specified configuration name. This command is identical to PathConfigurationManager.StoreConfiguration Method
VB Syntax	*pathMgr*.**StoreConfiguration** *ch, name*
Variable	**(Type) - Description**
pathMgr	PathConfigurationManager **(object)**
ch	**(Long)** Channel number of the configuration to be saved.
name	**(String)** Configuration name. Factory configurations can NOT be overwritten. Specifying the name of a pre-defined factory configuration will result in an error.
Return Type	Not Applicable
Default	Not Applicable
Examples	`path.StoreConfiguration(2) "myMixer"`
C++ Syntax	HRESULT StoreConfiguration(long channelNum, BSTR configName);
Interface	IPathConfigurationManager

Last modified:

Dec.12, 2006 MX New Command

StoreConfiguration Method

Description	Saves the path configuration currently associated with channel (ch) to the specified configuration name.
VB Syntax	*pathMgr*.**StoreConfiguration** *ch, name*
Variable	**(Type) - Description**
pathMgr	PathConfigurationManager **(object)**
ch	**(Long)** Channel number of the configuration to be saved.
name	**(String)** Configuration name. Factory configurations can NOT be overwritten. Specifying the name of a pre-defined factory configuration will result in an error.
Return Type	Not Applicable
Default	Not Applicable
Examples	`path.StoreConfiguration(2) "myMixer"`
C++ Syntax	HRESULT StoreConfiguration(long channelNum, BSTR configName);
Interface	IPathConfigurationManager

Last Modified:

14-Dec-2006	MX New topic

StringToNACalClass Method

Description Converts the returned strings from GetStandardsList into the enumeration (NACalClass) and the port numbers required for PutStandard and GetStandard methods that transmit data in and out of the Cal Set.

Learn more about reading and writing Cal data using COM

VB Syntax *CalSet*.**StringToNACalClass** (*list*, *std, rcv, src)*

Variable **(Type) - Description**

CalSet **(object) -** A Cal Set object

list **(string)** - a string containing the textual description of the standard.

std **(enum NACalClass)** Choose from:

1 - naClassA

2 - naClassB

3 - naClassC

4 - naClassD

5 - naClassE

6 - naReferenceRatioLine

7 - naReferenceRatioThru

SOLT Standards

1 - naSOLT_Open

2 - naSOLT_Short

3 - naSOLT_Load

4 - naSOLT_Thru

5 - naSOLT_Isolation

TRL Standards

1 - naTRL_Reflection

2 - naTRL_Line_Reflection

3 - naTRL_Line_Tracking

4 - naTRL_Thru

5 - naTRL_Isolation

rcv	**(long)** - port number of the receiver
src	**(long)** - port number of the source
Return Type	Not Applicable
Default	Not Applicable
Examples	`guid = CalSet.StringToNACalClass(list, std, rcv, src)`
C++ Syntax	HRESULT StringtoNACalClass (BSTR* str, NACalClass* item, long *rcv, long *src);
Interface	ICalSet

StringtoNAErrorTerm2 Method

Description	Converts the returned strings from GetErrorTermList into the enumeration (NAErrorTerm2) and the port numbers required for PutErrorTerm and GetErrorTerm methods that transmit data in and out of the Cal Set. Learn more about reading and writing Cal data using COM
VB Syntax	*Cal Set*.**StringToNAErrorTerm2** (*list, eterm, rcv, src*)
Variable	**(Type) - Description**
Cal Set	**(object) -** A Cal Set object
list	**(string)** - a string containing the textual description of the error term.
eterm	**(enum As NaErrorTerm2).** Choose from: 0 - naET_Directivity (rcv = src) 1 - naET_SourceMatch (rcv = src) 2 - naET_ReflectionTracking (rcv = src) 3 - naET_TransmissionTracking (rcv != src) 4 - naET_LoadMatch (rcv != src) 5 - naET_Isolation (rcv != src)
rcv	**(long)** - port number of the receiver
src	**(long)** - port number of the source
Return Type	Not Applicable
Default	Not Applicable
Examples	`CalSet.StringToNAErrorTerm2 str, term, rcv, src`
C++ Syntax	HRESULT StringToNAErrorTerm2 (BSTR* str, NAErrorTerm2* item, long *rcv, long *src);
Interface	ICalSet

SweepOnlyCalChannelDuringCalAcquisition Method

Description	Clears ALL flags for channels to sweep during calibration except the Cal channel. To flag a channel, see AllowChannelToSweepDuringCalAcquisition Method
VB Syntax	*calMgr.***SweepOnlyCalChannelDuringCalAcquisition**
Variable	**(Type) - Description**
calMgr	**(object) -** A CalManager object
Return Type	Not Applicable
Default	Not Applicable
Example	`calMgr.SweepOnlyCalChannelDuringCalAcquisition` See example using this command
C++ Syntax	HRESULT SweepOnlyCalChannelDuringCalAcquisition()
Interface	ICalManager5

Last Modified:

8-Nov-2007 MX New topic

TestsetCatalog Method

Description	Returns a list of supported testsets.
VB Syntax	*data* = *Tsets*.**TestsetCatalog**
Variable	**(Type) - Description**
data	**(variant array)** - Variable to store the returned data.
Tsets	**(object) -** An ExternalTestSets collection
Return Type	Variant
Default	Not Applicable
Examples	`value = Tsets.TestsetCatalog`
C++ Syntax	HRESULT TestsetCatalog (VARIANT* Data);
Interface	IExternaTestSets

UserPreset Method

Description	Performs a User Preset. There must be an active User Preset state file (see UserPresetLoadFile and UserPresetSaveState) or an error will be returned. Regardless of the state of the User Preset Enable checkbox, the app.Preset command will always preset the PNA to the factory preset settings, and app.UserPreset will always perform a User Preset.
VB Syntax	*app*.**UserPreset**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.UserPreset`
C++ Syntax	HRESULT UserPreset()
Interface	IApplication6

UserPresetLoadFile Method

Description	Loads an existing instrument state file (.sta or .cst) to be used for User Preset. Subsequent execution of app.UserPreset will cause the PNA to assume this instrument state. Regardless of the state of the User Preset Enable checkbox, the app.Preset command will always preset the PNA to the factory preset settings, and app.UserPreset will always perform a User Preset.
VB Syntax	*app.***UserPresetLoadFile** *(file)*
Variable	**(Type) - Description**
app	An Application **(object)**
file	**(String)** Full path, name, and extension of the file to be loaded.
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.UserPresetLoadFile ("C:\Program Files\Agilent\Network Analyzer\Documents\10MHzto20GHz.sta")`
C++ Syntax	HRESULT UserPresetLoadFile (BSTR bstrFile)
Interface	IApplication6

Write-only

About User Preset

UserPresetSaveState Method

Description	Saves the current instrument settings as UserPreset.sta. Subsequent execution of app.UserPreset will cause the PNA to assume this instrument state. Regardless of the state of the User Preset Enable checkbox, the app.Preset command will always preset the PNA to the factory preset settings, and app.UserPreset will always perform a User Preset.
VB Syntax	*app*.**UserPresetSaveState**
Variable	**(Type) - Description**
app	An Application **(object)**
Return Type	Not Applicable
Default	Not Applicable
Examples	`app.UserPresetSaveState`
C++ Syntax	HRESULT UserPresetSaveState()
Interface	IApplication6

WriteData Method

Description	Writes a 13-bit value to the specified address using the AD0 through AD12 lines of the external test set connector. The PNA generates the appropriate timing signals. It automatically controls timing signals LDS, LAS and RLW to strobe the address, then the data, to the external test set. See the timing diagram for Address and Data I/O read.
VB Syntax	*ExtIO*.**WriteData** *(address)* = *value*
Variable	**(Type) - Description**
ExtIO	**(object) -** An External IO object
address	**(variant)** - Address to be written to.
value	**(variant)** - 13-bit word to write
Return Type	Not Applicable
Default	Not Applicable
Examples	`ExtIO.WriteData (15) = 12`
C++ Syntax	HRESULT WriteData(VARIANT Address, VARIANT Data);
Interface	IHWExternaTestSetIO

WriteRaw Method

Description

Writes a 16-bit value to the external test set connector lines AD0 - AD12, RLW, LAS and LDS. The analyzer does NOT generate the appropriate timing signals. The user has control of all 16 lines using this write method.

Note: When RLW (pin25) is set to 1 (high) it causes lines AD0 - AD12 to float. It disables their output latches and sets the hardware for reading. LDS and LAS are not affected by this behavior.

Below is the format of data that is written with WriteRaw:

* This Output will float if RLW (bit-13) is set high

Pin	Bit	Signal name
22	0	AD0*
23	1	AD1*
11	2	AD2*
10	3	AD3*
9	4	AD4*
21	5	AD5*
20	6	AD6*
19	7	AD7*
6	8	AD8*
5	9	AD9*
4	10	AD10*
17	11	AD11*
3	12	AD12*
25	13	RLW
24	14	LDS
8	15	LAS

VB Syntax	*ExtIO*.**WriteRaw** *value*
Variable	**(Type) - Description**
ExtIO	**(object) -** An External IO object
value	**(variant)** - Data to be written
Return Type	Not Applicable
Default	Not Applicable
Examples	`ExtIO.WriteRaw 12`
C++ Syntax	HRESULT WriteRaw(VARIANT Output);
Interface	IHWExternalTestSetIO

Write-only

WriteSnpFileWithSpecifiedPorts Method

Description	**Note:** This command replaces app.Save (.snp). This command is more explicit regarding the data to be saved, and works for PNAs with multiport test sets. Saves SnP data to the specified file. Learn more about SnP data.
VB Syntax	*data = meas.***WriteSnpFileWithSpecifiedPorts** *ports, filename*
Variable	**(Type) - Description**
data	**(Variant)** array to store the data.
meas	A Measurement **(object)**
ports	**(Variant Array)** One dimensional array containing a list of port numbers for which snp data is requested.
filename	**(string)** - Full path, filename, and suffix to store the data. The suffix is not checked for accuracy. If saving 2 ports, specify "filename.s2p"; If saving 3 ports, specify "filename.s3p." and so forth. SnP data can be output using several data formatting options. See SnPFormat Property
Return Type	Variant array - automatically dimensioned to the size of the data.
Default	Not Applicable

Examples

```
'This VBScript example can be pasted into a notepad file and run on the PNA as a macro. Learn how.
Set pna = CreateObject("AgilentPnA835x.application")
Set meas = pna.ActiveMeasurement
'List the port numbers for required data
ports = Array(1,2,4)
'specify where to save the data
filename="C:\Program Files\Agilent\Network Analyzer\Documents\MyData.s3p"
meas.WriteSnpFileWithSpecifiedPorts ports,filename
```

C++ Syntax	HRESULT WriteSnpFileWithSpecifiedPorts(VARIANT portsToMeasure,BSTR filename);
Interface	IMeasurement7

Last modified:

9/18/06 MQ Added for multiport

About Analyzer Events

OnCalEvent

Description	Triggered by a calibration event. See a list of CAL Events. **Note:** Some Severe Events are also used as Error Messages
VB Syntax	Sub *app*_**OnCalEvent**(ByVal *eventID* As Variant, ByVal *chanNum* As Variant, ByVal *measNum* As Variant)
Variable	**(Type) - Description**
app	An Application **(object)**
eventID	Code number of the event which occurred
chanNum	Channel Number of the event
measNum	Measurement Number of the event
Return Type	Not Applicable
Default	Not Applicable

Examples

```
Sub pna_OnCalEvent(ByVal eventID As Variant, ByVal
channelNumber As Variant, ByVal measurementNumber As Variant)
'
MsgBox ("A Calibration event has occured")
End Sub
```

C++ Syntax	HRESULT OnCalEvent(VARIANT eventID, VARIANT channelNumber, VARIANT measurementNumber)
Interface	IApplication

Selected Cal Events

512 naEventID_CAL_QUESTIONABLE

513 naEventID_CAL_STD_NEEDED

514 naEventID_CAL_STATE_NOT_HW_COMPATIBLE

515 naEventID_CAL_REQUIRED

516 naEventID_CAL_CORRECTION_TURNED_OFF

517 naEventID_CAL_CORRECTION_TURNED_OFF_INTERPOLATION_OFF

518 naEventID_CAL_CORRECTION_RESTORED

519 naEventID_CAL_CORRECTION_TURNED_OFF_FREQRANGE_EXCEEDED

520 naEventID_CAL_CALTYPE_SET_TO_NONE

521 naEventID_CAL_CORRECTION_TURNED_OFF_NOT_AN_SPARAM

524 naEventID_SOURCE_POWER_CAL_COMPLETED

592 naEventID_SOURCE_POWER_CAL_NOT_PRESENT

593 naEventID_SOURCE_POWER_CAL_NOT_COMPLETE

594 naEventID_SOURCE_POWER_CAL_REMOVE_TRACE

595 naEventID_SOURCE_POWER_CAL_REMOVE_MEAS

596 naEventID_SOURCE_POWER_CAL_POWER_CHANGED

598 naEventID_INSUFFICIENT_SLIDE_MOVEMENT

613 naEventID_CALSET_NOT_FOUND

615 naEventID_CALSET_CREATED

617 naEventID_CALSET_FILE_NOT_VALID

634 naEventID_CALSET_LOAD_FAILED

635 naEventID_CALSET_SAVE_FAILED

636 naEventID_CALSET_DELETED

637 naEventID_CALSET_FILE_NOT_COMPATIBLE

639 naEventID_NEW_CALSET_FILE_CREATED

640 naEventID_CAL_SET_IN_USE

644 naEventID_CAL_COULD_NOT_TURN_ON

693 naEventID_ERROR_FIXTURING_S2PFILE_CANNOT_OPEN

696 naEventID_ERROR_FIXTURING_TURNED_OFF

701 naEventID_MORE_THRU_PATHS_NEEDED

See Also

Errors and the SCPIStringParser Object

Last modified:

Nov. 6, 2006 Added events

About Analyzer Events

OnChannelEvent

Description	Triggered by a channel event.
VB Syntax	Sub *app*_**OnChannelEvent**(ByVal *eventID* As Variant, ByVal *chanNum* As Variant)
Variable	**(Type) - Description**
app	An Application **(object)**
eventID	Code number of the event which occurred
chanNum	Channel Number of the event
Return Type	Not Applicable
Default	Not Applicable

Examples

```
Sub pna_OnChannelEvent(ByVal eventID As Variant, ByVal
channelNumber As Variant)
  If eventID=naEventID_CHANNEL_CREATED then
MsgBox "Channel" + chanelNumber + "was created"
End If
End Sub
```

C++ Syntax	HRESULT OnChannelEvent(VARIANT eventID, VARIANT channelNumber)
Interface	IApplication

Selected Channel Events

1792 naEventID_CHANNEL_SWEEP_COMPLETE

1793 naEventID_CHANNEL_TRIGGER_COMPLETE

1796 naEventID_SET_CHANNEL_DIRTY

1797 naEventID_CLEAR_CHANNEL_DIRTY

1801 naEventID_ALL_SWEEPS_COMPLETED_AND_PROCESSED

1805 naEventID_CHANNEL_CREATED

1806 naEventID_CHANNEL_DELETED

1876 naEventID_NO_SOURCE_ATTEN

1879 naEventID_FREQ_OFFSET_OVERRANGE_SO_TURNED_OFF

1883 naEventID_PORT_NUMBER_OUT_OF_RANGE

See Also

Errors and the SCPIStringParser Object

Last modified:

March 2, 2007	Added channel create and delete
Nov. 6, 2006	Added events

[About Analyzer Events]

OnDisplayEvent

Description	Triggered by a display event.
VB Syntax	Sub *app*_**OnDisplayEvent**(ByVal *eventID* As Variant, ByVal *winNum* As Variant, ByVal *traceNum* As Variant)

Variable	**(Type) - Description**
app	An Application **(object)**
eventID	Code number of the event which occurred
winNum	Window Number of the event
traceNum	Trace Number of the event
Return Type	Not Applicable
Default	Not Applicable

Examples

```
Sub pna_OnDisplayEvent(ByVal eventID As Variant, ByVal
windowNumber As Variant, ByVal traceNumber As Variant)
MsgBox ("A Display event has occured")
End Sub
```

C++ Syntax	HRESULT OnDisplayEvent(VARIANT eventID, VARIANT windowNumber, VARIANT traceNumber)
Interface	IApplication

Selected Display Events

1541 naEventID_PRINT_SETUP_FAILURE

1542 naEventID_PRINT_CANCELED

See Also

Errors and the SCPIStringParser Object

Last modified:

Nov. 6, 2006 Added events

About Analyzer Events

OnHardwareEvent

Description	Triggered by a hardware event. See a list of Hardware Events
	Note: Some Severe Events are also used as Error Messages
VB Syntax	Sub *app*_**OnHardwareEvent**(ByVal *eventID* As Variant)
Variable	**(Type) - Description**
app	An Application **(object)**
eventID	Code number of the event which occurred
Return Type	Not Applicable
Default	Not Applicable

Examples

```
Private Sub pna_OnHardwareEvent(ByVal eventID As Variant)
MsgBox ("A Hardware event has occured")
End Sub
```

C++ Syntax	HRESULT OnHardwareEvent(VARIANT eventID)
Interface	IApplication

Selected Hardware Events

848 naEventID_PHASELOCK

852 naEventID_RFPOWEROFF

853 naEventID_RFPOWERON

855 naEventID_UNLEVELED

857 naEventID_OVERLOAD

914 naEventID_TRIGGER_REQUIRES_EDGE_LEVEL_TRIGGER

915 naEventID_TRIGGER_REQUIRES_TRIGGER_OUT

See Also

Errors and the SCPIStringParser Object

Last modified:

Nov. 6, 2006 Added events

About Analyzer Events

OnMeasurementEvent

Description	Triggered by a measurement event.
VB Syntax	Sub *app*_**OnMeasurementEvent**(ByVal *eventID* As Variant, ByVal *measNum* As Variant)
Variable	**(Type) - Description**
app	An Application **(object)**
eventID	Code number of the event which occurred
measNum	Measurement Number of the event
Return Type	Not Applicable
Default	Not Applicable

Examples

```
Private Sub pna_OnMeasurementEvent(ByVal eventID As Variant, ByVal
measurementNumber As Variant)

MsgBox ("A Measurement event has occured")

End Sub
```

C++ Syntax	HRESULT OnMeasurementEvent(VARIANT eventID, VARIANT measurementNumber)
Interface	IApplication

Selected Measurement Events

1024 naEventID_NO_VALID_MEMORY_TRACE

1028 naEventID_LIMIT_FAILED

1029 naEventID_LIMIT_PASSED

1034 naEventID_MEMORY_NOT_SAVED

1035 naEventID_SET_AVERAGE_COMPLETE

1036 naEventID_CLEAR_AVERAGE_COMPLETE

1111 naEventID_MARKER_BANDWIDTH_NOT_FOUND

1112 naEventID_PEAK_NOT_FOUND

1113 naEventID_TARGET_VALUE_NOT_FOUND

See Also

[Errors and the SCPIStringParser Object]

Last modified:

Nov. 6, 2006	Added events

About Analyzer Events

OnSCPIEvent

Description	Triggered by a SCPI event. **Note:** Some Severe Events are also used as Error Messages
VB Syntax	Sub *app*_**OnSCPIEvent**(ByVal *eventID* As Variant)

Variable	**(Type) - Description**
app	An Application **(object)**
eventID	Code number of the event which occurred
Return Type	Not Applicable
Default	Not Applicable

Examples

```
Private Sub pna_OnSCPIEvent(ByVal eventID As Variant)
MsgBox ("A SCPI event has occured")
End Sub
```

C++ Syntax	HRESULT OnSCPIEvent(VARIANT eventID)
Interface	IApplication

Selected SCPI Parser Events

1281 naEventID_NOTHING_TO_SAY

1284 naEventID_SCPI_STATUS_BYTE_CHANGE

1360 naEventID_BAD_SCPI_EXECUTE

1375 naEventID_CALC_MEASUREMENT_SET_TO_NONE

See Also

Errors and the SCPIStringParser Object

Last modified:

Nov. 6, 2006 Added events

About Analyzer Events

OnSystemEvent

Description	Triggered by a system event. See a list of System Events, also known as general events. See also EnableSourceUnleveledEvents Property **Note:** Some Severe Events are also used as Error Messages
VB Syntax	Sub *app*_**OnSystemEvent**(ByVal *eventID* As Variant)
Variable	**(Type) - Description**
app	An Application **(object)**
eventID	Code number of the event which occurred
chanNum	Channel Number of the event
Return Type	Not Applicable
Default	Not Applicable

Examples

```
Private Sub pna_OnSystemEvent(ByVal eventID As Variant)
MsgBox ("A System event has occured")
End Sub
```

C++ Syntax	HRESULT OnSystemEvent(VARIANT eventID)
Interface	IApplication

Selected System Events

2048 naEventID_OPTION_NOT_INSTALLED

2049 naEventID_FEATURE_NOT_AVAILABLE

2050 naEventID_FEATURE_NOT_VALID

2051 naEventID_SAVEFILE_OK

2063 naEventID_RECALLFILE_SUCCESS

2130 naEventID_PRINTER_TROUBLE

2133 naEventID_TRIGGERDENIED

2134 naEventID_MACRO_FAILED

2144 naEventID_NO_LICENSE

2163 naEventID_PRESET

2166 naEventID_TRIGGERFAILED

See Also

Errors and the SCPIStringParser Object

Last modified:

Nov. 6, 2006	Added events

About Analyzer Events

OnUserEvent

Description	Reserved for future use.
VB Syntax	Sub app_**OnUserEvent**

Reading Cal Set Data using COM

This example iterates over the entire collection of Cal Sets that currently reside in the PNA. It reads the entire list of error term strings from each Cal Set and queries the data for each term. It then does the same for the standards data.

Learn more about Reading and Writing Calibration data using COM.

Learn more about Cal Sets.

See Other COM Example Programs

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save on the PNA hard drive as CalSets.vbs. Learn how to setup and run the macro.

```
Dim pna
Dim cset
Dim calsets

' create the pna object
' to run on a remote PC,  substitute 'name' for the full computer name of your PNA
' to run as a macro on the PNA, remove ,"name"
Set pna = CreateObject("AgilentPNA835x.Application", "name")
wscript.echo pna.IDString
' obtain the calset collection
Set calsets = pna.GetCalManager.calsets

' loop thru the calsets
Dim c
For c = 1 To calsets.count
Set cset = calsets.Item(c)

'   wscript.echo prints values to a message box
wscript.echo "calset = ", cset.GetGUID, cset.Description

'   iterate through error terms data
Dim vterms
vterms = cset.GetErrorTermList2(0, "")
if (Not IsEmpty(vterms)) then
For i = LBound(vterms) To UBound(vterms)
wscript.echo vterms(i)
vdata = cset.GetErrorTermByString(0,vterms(i) )
wscript.echo vdata(1,0), vdata(1,1)
Next
end if

'   iterate through standards data
vterms = cset.GetStandardList2("")
if (Not IsEmpty(vterms)) then
For i = LBound(vterms) To UBound(vterms)
```

```
wscript.echo vterms(i)
vdata = cset.GetStandardByString( vterms(i) )
wscript.echo vdata(1,0), vdata(1,1)
Next
end if
Next
```

[Intro to Examples](#)

Getting Trace Data from the Analyzer

This Visual Basic program:

- Retrieves Scalar Data from the Analyzer and plots it.
- Retrieves Paired Data from the Analyzer and plots it.
- Retrieves Complex Data from the Analyzer and plots it.

To use this code, prepare a form with the following:

- Two MSCharts named **MSChart1** and **MSChart2**
- Three buttons named **GetScalar, GetPaired, GetComplex**

Note: You can get MSChart in Visual Basic by clicking **Project / Components / Microsoft Chart Control**

```
'Put this in a module
Public dlocation As NADataStore
Public numpts As Long
Public fmt As NADataFormat
Public app As Application
Public measData As IArrayTransfer
Public chan As Channel
```

```
Sub Form_Load()
'Change analyzerName to your analyzer's full computer name
Set app = CreateObject("AgilentPNA835x.Application", "analyzerName")
```

```
Set measData = app.ActiveMeasurement
Set chan = app.ActiveChannel

'To pick a location to get the data from remove the comment from one of these
dlocation = naRawData
'dlocation = naCorrectedData
'dlocation = naMeasResult
'dlocation = naRawMemory
'dlocation = naMemoryResult

'setup MSChart1 and MSChart2
'right click on the chart and select:
' - line chart
' - series in rows
End Sub
```

```
Sub GetComplex_Click()
ReDim Data(numpts) As NAComplex
Dim Real(201) AS Single
Dim Imag(201) AS Single
numpts = chan.NumberOfPoints
```

```
'You cannot change the format of Complex Data
Call trigger
'get data
measData.GetNAComplex dlocation, numpts, Data(0)
'plot data
Dim i As Integer

For i = 0 To numpts - 1
 Real(i) = Data(i).Re
 Imag(i) = Data(i).Im
Next i
MSChart1 = Real()
MSChart2.Visible = True
MSChart2 = Imag()
Call Sweep
End Sub
```

```
Sub GetPaired_Click()
ReDim Real(numpts) As Single
ReDim Imag(numpts) As Single
numpts = chan.NumberOfPoints
```

```
' To pick a format, remove the comment from one of these
fmt = naLogMagPhase
'fmt = naLinMagPhase
Call trigger
'Get data
measData.getPairedData dlocation, fmt, numpts, Real(0), Imag(0)
'Plot Scalar
MSChart1 = Real()
MSChart2.Visible = True
MSChart2 = Imag()
Call Sweep
End Sub
```

```
Sub GetScalar_Click()
ReDim Data(numpts) As Single
```

```
numpts = chan.NumberOfPoints
'To pick a format remove the comment from one of these
fmt = naDataFormat_LogMag
'fmt = naDataFormat_LinMag
'fmt = naDataFormat_Phase
'fmt = naDataFormat_Delay
'fmt = naDataFormat_Real
'fmt = naDataFormat_Imaginary
Call trigger
'Get data
measData.GetScalar dlocation, fmt, numpts, Data(0)
'Plot Data
```

```
MSChart1 = Data()
MSChart2.Visible = False
Call Sweep
End Sub

Sub trigger()
'The analyzer sends continuous trigger signals
app.TriggerSignal = naTriggerInternal
'The channel will only accept one, then go into hold
'Sync true will wait for the sweep to complete
sync=True
chan.Single sync
End Sub

Sub Sweep()
'The channel goes back to accepting all triggers
chan.Continuous
End Sub
```

Perform a Guided Calibration using COM

This example uses the GuidedCalibration interface to perform either a 2-port or 4-port calibration.

Learn more about Reading and Writing Calibration data using COM.

See Other COM Example Programs

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save on the PNA hard drive as Calibrate.vbs. Learn how to setup and run the macro.

```
Set pna = CreateObject("AgilentPNA835x.Application")
Set calMgr = pna.GetCalManager
Set guidedCal = calMgr.GuidedCalibration
Set chan = pna.ActiveChannel
chanNum = chan.ChannelNumber
' Initialize guided cal to be performed on the active channel.
' The boolean argument of True indicates to store the cal only
' in the channel's calibration register.  If instead you wish
' to create a new calset that the new cal will get stored to,
' comment out this next line and uncomment the three lines below it.
guidedCal.Initialize chanNum, True
'Set calset = calMgr.CreateCalSet(chanNum)
'chan.SelectCalSet calset.GetGUID, True
'guidedCal.Initialize chanNum, False

' To perform 2-port cal, Uncomment the following
' Then comment the 4-port cal

' Do 2-port cal
' TwoPortGuidedCal

' Do 4-port cal
FourPortGuidedCal


Sub TwoPortGuidedCal()
' Select the connectors
guidedCal.ConnectorType(1) = "APC 3.5 female"
guidedCal.ConnectorType(2) = "APC 3.5 male"
For i = 3 To pna.NumberOfPorts
guidedCal.ConnectorType(i) = "Not used"
Next
value = MsgBox("Connectors defined for Ports 1 and 2")
' Select the Cal Kit for each port being calibrated.
guidedCal.CalKitType(1) = "85052D"
guidedCal.CalKitType(2) = "85052D"
```

```
' To use an ECal module instead, comment out the above two lines
' and uncomment the following two lines.
' Replace N4691-60004 with your own ECAL model followed by 'ECal'.
' Your ECal module must already be connected to a PNA USB port.
'guidedCal.CalKitType(1) = "N4691-60004 ECal"
'guidedCal.CalKitType(2) = "N4691-60004 ECal"
value = MsgBox("Cal kits defined for Ports 1 and 2")
' Initiate the calibration and query the number of steps
numSteps = guidedCal.GenerateSteps
' Measure the standards, compute and apply the cal
MeasureAndComplete(numSteps)
End Sub

Sub FourPortGuidedCal()
' Select the connectors
guidedCal.ConnectorType(1) = "APC 3.5 female"
guidedCal.ConnectorType(2) = "APC 3.5 female"
guidedCal.ConnectorType(3) = "APC 3.5 female"
guidedCal.ConnectorType(4) = "APC 3.5 female"
' If a PNA which has more than 4 ports
For i = 5 To pna.NumberOfPorts
guidedCal.ConnectorType(i) = "Not used"
Next
value = MsgBox("Connectors defined for Ports 1 to 4")
' Select the Cal Kit for each port being calibrated.
guidedCal.CalKitType(1) = "85052D"
guidedCal.CalKitType(2) = "85052D"
guidedCal.CalKitType(3) = "85052D"
guidedCal.CalKitType(4) = "85052D"
' To use an ECal module instead, comment out the above four lines
' and uncomment the following four lines.
' Replace N4691-60003 with your own ECAL model followed by 'ECal'.
' Your ECal module must already be connected to a PNA USB port.
'guidedCal.CalKitType(1) = "N4431-60003 ECal"
'guidedCal.CalKitType(2) = "N4431-60003 ECal"
'guidedCal.CalKitType(3) = "N4431-60003 ECal"
'guidedCal.CalKitType(4) = "N4431-60003 ECal"
value = MsgBox("Cal kits defined for Ports 1 to 4")
' Initiate the calibration
guidedCal.GenerateSteps
' If your selected cal kit is not a 4-port ECal module which can
' mate to all 4 ports at once, then you may want to choose which
' thru connections to measure for the cal.  You must measure at
' least 3 different thru paths for a 4-port cal (for greatest
' accuracy you can choose to measure a thru connection for all 6
' pairings of the 4 ports).  If you omit this command, the default
' is to measure from port 1 to port 2, port 1 to port 3, and
' port 1 to port 4.   For this example we select to measure
' from port 1 to port 2, port 2 to port 3, and port 2 to port 4.
portList = Array(1,2,2,3,2,4)
guidedCal.ThruPortList = portList
' Re-generate the connection steps to account for the thru changes
```

```
numSteps = guidedCal.GenerateSteps
' Measure the standards, compute and apply the cal
MeasureAndComplete(numSteps)
End Sub

Sub MeasureAndComplete(ByVal numSteps)
value = MsgBox("Number of steps is " + CStr(numSteps))

' Measure the standards
'The following series of commands shows that standards
'can be measured in any order. These steps acquire
'measurement of standards in reverse order.
'It is easiest to iterate through standards using
'a For-Next Loop.
For i = NumSteps To 1
step = "Step " + CStr(i) + " of " + CStr(numSteps)
strPrompt = guidedCal.GetStepDescription(i)
value = MsgBox(strPrompt, vbOKOnly, step)
guidedCal.AcquireStep i
Next

' Conclude the calibration
guidedCal.GenerateErrorTerms
MsgBox ("Cal is done!")
End Sub
```

Last Modified:

20-Jan-2007	Added any order to steps.

Perform an ECal using COM

This example uses the GuidedCalibration interface to perform a 2-port ECal calibration.

Learn more about Reading and Writing Calibration data using COM.

See Other COM Example Programs

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save on the PNA hard drive as ECal.vbs. Learn how to setup and run the macro.

```
Set pna = CreateObject("AgilentPNA835x.Application")
Set calMgr = pna.GetCalManager
Set guidedCal = calMgr.GuidedCalibration
Set chan = pna.ActiveChannel
chanNum = chan.ChannelNumber
' Initialize guided cal to be performed on the active channel.
' The boolean argument of True indicates to create a new calset
guidedCal.Initialize chanNum, True
' To perform 3-port cal, Uncomment the following
' Then comment the 2-port cal

' Do 2-port cal
TwoPortGuidedCal

' Do 3-port cal
' ThreePortGuidedCal


Sub TwoPortGuidedCal()
'Change the following to match the connectors on your ECal module
guidedCal.ConnectorType(1) = "APC 3.5 female"
guidedCal.ConnectorType(2) = "APC 3.5 female"
For i = 3 To pna.NumberOfPorts
guidedCal.ConnectorType(i) = "Not used"
Next
value = MsgBox("Connectors defined for Ports 1 and 2")
' Select the ECal module for each port being calibrated.
' Replace N4691-60004 with your own ECAL model followed by 'ECal'.
' Your ECal module must already be connected to a PNA USB port.

guidedCal.CalKitType(1) = "85092-60010 ECal"
guidedCal.CalKitType(2) = "85092-60010 ECal"

value = MsgBox("ECal Module defined for Ports 1 and 2")
' Initiate the calibration and query the number of steps
numSteps = guidedCal.GenerateSteps
' Measure the standards, compute and apply the cal
MeasureAndComplete(numSteps)
End Sub
```

```
Sub ThreePortGuidedCal()
''Change the following to match the connectors on your ECal module
guidedCal.ConnectorType(1) = "APC 3.5 female"
guidedCal.ConnectorType(2) = "APC 3.5 female"
guidedCal.ConnectorType(3) = "APC 3.5 female"

' Select the ECal module for each port being calibrated.
' Replace N4691-60003 with your own ECAL model followed by 'ECal'.
' Your ECal module must already be connected to a PNA USB port.
guidedCal.CalKitType(1) = "N4431-60003 ECal"
guidedCal.CalKitType(2) = "N4431-60003 ECal"
guidedCal.CalKitType(3) = "N4431-60003 ECal"

value = MsgBox("Cal kits defined for Ports 1 to 3")
' Initiate the calibration
numSteps = guidedCal.GenerateSteps
' Measure the standards, compute and apply the cal
MeasureAndComplete(numSteps)
End Sub

Sub MeasureAndComplete(ByVal numSteps)
value = MsgBox("Number of steps is " + CStr(numSteps))
' Measure the standards
For i = 1 To numSteps
step = "Step " + CStr(i) + " of " + CStr(numSteps)
strPrompt = guidedCal.GetStepDescription(i)
value = MsgBox(strPrompt, vbOKOnly, step)
guidedCal.AcquireStep i
Next

' Conclude the calibration
guidedCal.GenerateErrorTerms
MsgBox ("Cal is done!")
End Sub
```

Perform a Source Power Cal using COM

This program can be run in either Visual Basic 6 or as a VBScript program. The PNA can run *.vbs programs as macros.

This program demonstrates:

- Performing a source power calibration of Port 2 for Channel 1.
- Reading the calibration data.

Learn more about Power Calibrations

See an example that Uploads a Source Power Cal

See Other COM Example Programs

To run this program, you need:

- One of the following power meters connected to the PNA through GPIB: E4416A, E4417A, E4418A/B, E4419A/B, 437B, 438A, EPM-441A, EPM-442A

Note: If your power meter is other than these, you can create your own Power Meter Driver using our template.

- Your PC and PNA both connected to a LAN (for communicating with each other).

To make this program work in VBS, save the following code in a text editor file such as Notepad and save as *.vbs.

To make this program work in Visual Basic 6:

1. Create a new project
2. Click **Project**, **Add New Module**, click **Open**.
3. Paste the following code into the code window.
4. Delete the first two lines (comment and Main)
5. Click **Project, Properties**. Under **Startup Object**, select **Sub Main**
6. Click **Project, References**, and select the Agilent PNA Series Type Library.

```
' Run the Main subroutine
Main
Public Sub Main()
Dim PNA, chan, pwrcal                                   ' PNA COM objects
Const naPowerMeter = 0, naPowerMeterAndReceiver = 1 ' enum NASourcePowerCalMethod
Const naPowerSensor_A = 0                               ' enum NAPowerAcquisitionDevice
Const naCorrectionValues = 0                            ' enum NASourcePowerCalBuffer
```

```
Const port = 2                                          ' PNA port #2 as source port
Const offset = 0                                        ' cal power offset value
Const bDisplay = True                                   ' whether to display data during
acquire
Dim stimulus, calvalues, strResult

' Instantiate our PNA COM objects
Set PNA = CreateObject("AgilentPNA835x.Application")
Set chan = PNA.Channels(1)
Set pwrcal = PNA.SourcePowerCalibrator

' Set the number of sweep points to 21 on Channel 1.
chan.NumberOfPoints = 21

' Specify the GPIB address of the power meter
' that will be used in performing the calibration.
pwrcal.PowerMeterGPIBAddress = 13

' Turn use of the loss table OFF (this assumes there is
' virtually no loss in the RF path to the power sensor
' due to a splitter, coupler or adapter).
pwrcal.UsePowerLossSegments = False

' Turn frequency checking OFF (so one power sensor is used for the entire cal
' acquisition sweep regardless of frequency span).
pwrcal.UsePowerSensorFrequencyLimits = False

' Specify a nominal power accuracy tolerance (IterationsTolerance) in dB for the
' calibration, and the maximum number of iterations to adjust power at each point,
' attempting to achieve within tolerance of the desired power.  If at any stimulus
' point the power fails to reach within the set tolerance of the desired power
' after the maximum number of iterations, the power at that point will be set to the
' value determined by the last iteration (the Source Power Cal dialog box will
' indicate the FAIL, but we can still apply the cal if desired when it's complete).
' Each iteration is based upon a SETTLED power reading (see comments preceding the
' next two properties below).
pwrcal.IterationsTolerance = 0.1
pwrcal.MaximumIterationsPerPoint = 3

' The worst-case window of power uncertainty (for a calibration which meets
' tolerance) is the sum of the iteration tolerance and the power meter settling
' tolerance (which is described below).
' At each stimulus point, the PNA takes power meter readings and determines when
' they have settled by comparing the magnitude difference between consecutive
' readings versus a nominal dB tolerance limit (ReadingsTolerance) on that magnitude
' difference.  When consecutive readings are within tolerance of each other, or
' if they are not within tolerance but we've taken a maximum number of readings
' (ReadingsPerPoint), the PNA does a weighted average of the readings taken at that
' stimulus point and that is considered our settled power reading.
pwrcal.ReadingsTolerance = 0.1
pwrcal.ReadingsPerPoint = 5
```

```
' Setup of information pertaining to this specific cal acquisition.  Includes the
' method (type of devices) that will be used to perform the cal -- choose either
' naPowerMeter or naPowerMeterAndReceiver.  naPowerMeterAndReceiver uses the power
' meter for the first iteration of each point and the PNA's reference receiver for
' subsequent iterations, so is much faster than using power meter only
 naPowerMeter).
' But the power meter accounts for compression when calibrating at the output of an
' active device, whereas the reference receiver cannot unless it is coupled to the
' cal reference plane (on a PNA which allows direct access to the receivers).
' 'offset' specifies if the cal power level is offset (positive value for a gain,
' negative value for a loss) from the PNA port power setting on the channel when
' no source power cal is active.  This is to account for components between the PNA
' test port and cal reference plane.  In this example, we will calibrate at the PNA
' test port, so there is no offset (it is zero).
' 'bDisplay' indicates whether to display the source power cal dialog during the
' source power cal acquisition (the dialog will chart the corrected power readings).
pwrcal.SetCalInfo2 naPowerMeter, chan.channelNumber, port, offset, bDisplay

' Perform synchronous source power cal acquisition sweep using the sensor attached
' to Channel A of the power meter.  This assumes that the power sensor is already
' connected to Port 2 of the PNA.
pwrcal.AcquirePowerReadings naPowerSensor_A, True

' Conclude the calibration.  This applies the cal data to PNA channel memory,
' and turns the correction ON for Port 2 on Channel 1, but does NOT save the
' calibration.
pwrcal.ApplyPowerCorrectionValues

' At this point, if you choose to save the instrument state as a ".CST" file,
' the calibration will be saved with the instrument state in that file.
' Read the stimulus values from Channel 1.
stimulus = chan.GetXAxisValues

' Read the source power correction data.
calvalues = chan.getSourcePowerCalDataEx(naCorrectionValues, port)

' Print the data using a message box (here, Chr returns the ASCII characters
' for Tab (9) and Linefeed (10)).
strResult = "Stimulus" & Chr(9) & Chr(9) & "Cal Value" & Chr(10)
For i = 0 To UBound(stimulus)
strResult = strResult & stimulus(i) & Chr(9) & calvalues(i) & Chr(10)
Next
MsgBox strResult
End Sub
```

Perform an Unguided Cal using COM

This example uses the ICalibrator interface to do the following:

- perform a two port calibration
- retrieve the error term data
- retrieve the standard data (cal acquisition data)

Learn more about Reading and Writing Calibration data using COM.

See Other COM Example Programs

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save on the PNA hard drive as Calibrate.vbs. Learn how to setup and run the macro.

```
dim pna
' To run from an external PC, substitute your PNA Name and use the following
command.
' set pna = CreateObject("AgilentPNA835x.Application", "PNA Name")
set pna = CreateObject("AgilentPNA835x.Application")
dim calibrator
set calibrator=pna.activechannel.calibrator

wscript.echo "setcalinfo for two port cal"
calibrator.setcalinfo 5,1, 2

' only have one set of standards
calibrator.Simultaneous2PortAcquisition = false

'first acquire forward reflection standards, then reverse
dim p
for p = 1 to 2

if (p = 1) then
calibrator.AcquisitionDirection = 0
else
calibrator.AcquisitionDirection = 1
end if

wscript.echo "connect open to port ", p
calibrator.acquirecalstandard 1

wscript.echo "connect short to port ", p
calibrator.acquirecalstandard 2
```

```
wscript.echo "connect load to port ", p
calibrator.acquirecalstandard 3

next

wscript.echo "connect a thru1"
calibrator.acquirecalstandard 4

'Optional - perform isolation
wscript.echo "connect loads to both ports"
calibrator.acquirecalstandard 5

wscript.echo "calculating"
calibrator.CalculateErrorCoefficients

'Calibration complete
' Now read error terms and standard data

dim termName
termName= Array("Directivity","SourceMatch","ReflectionTracking")
dim vardata

' iterate over error terms
dim t
for t = 0 to 2   ' per error term
for p = 1 to 2  ' per port
wscript.echo "Requesting ",termName(t),p,p
vardata = calibrator.GetErrorTerm( t, p, p)
next
next

' now get the path terms:  iterator each one request
termName = Array("Isolation", "LoadMatch", "TransmissionTracking")
for t = 0 to 2

wscript.echo "Requesting Forward term",termName(t),1,2
vardata = calibrator.GetErrorTerm( t, 1,2)
wscript.echo "Requesting Reverse Term",termName(t),2,1
vardata = calibrator.GetErrorTerm( t, 2,1)
next

dim stdname
stdname= Array("","Open","Short","Load","Thru","Isolation")

' iterate over the port standards
for t = 1 to 3
for p = 1 to 2
' request the standard term for each port of interest
wscript.echo "Requesting",stdname(t),p,p

vardata = calibrator.GetStandard( t, p, p)
```

```
next
next

' now get the path standards: iterator each one request
for t = 4 to 5

wscript.echo "Requesting Forward",stdname(t),1,2
vardata = calibrator.GetStandard( t, 1,2)

wscript.echo "Requesting Reverse",stdname(t),2,1
vardata = calibrator.GetStandard( t, 2,1)

next
```

Perform an Unknown Thru or TRL Cal

The following program performs either a 2-port SOLT Unknown Thru Cal or a 2-port TRL Cal. The 85052C Cal Kit used in this program contains both types of standards. This program can be run on 2-port or 4-port PNAs. When run on a multiport (4 or more ports) PNA, which does not have a reference receiver per port, a Delta Match Cal is required. See example of Delta Match Cal.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Unknown.vbs. Learn how to setup and run the macro.

```
PerformUnknownThruOrTRLCal
Sub PerformUnknownThruOrTRLCal()
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
' Get the cal manager object
Set calMgr = app.GetCalManager
' Get the guided cal object
Set guidedCal = calMgr.GuidedCalibration
Set chan = app.ActiveChannel
chanNum = chan.ChannelNumber

' Initialize guided cal to be performed on the active channel.
' The boolean argument of True specifies the creation of a new calset
' for storing the new calibration.
guidedCal.Initialize chanNum, True

' Specify connectors for Ports 1 and 2
guidedCal.ConnectorType(1) = "APC 3.5 female"
guidedCal.ConnectorType(2) = "APC 3.5 male"

' If your PNA has more than 2 ports, uncomment one or both of
'  these next two lines, to explicitly specify this is
'  just a 2-port cal.
'guidedCal.ConnectorType(3) = "Not used"
'guidedCal.ConnectorType(4) = "Not used"

' Specify cal kit for Ports 1 and 2
guidedCal.CalKitType(1) = "85052C"
guidedCal.CalKitType(2) = "85052C"

' Since the 85052C cal kit contains SOLT standards and also TRL
' standards, these next lines determine whether the cal becomes
' unknown thru (SOLT), or TRL.
' Specify cal and Thru method
guidedCal.PathCalMethod (1,2) = "SOLT"
guidedCal.PathThruMethod (1,2) = "Undefined Thru"

' To set up the cal as TRL, comment the previous line and uncomment this next line.
The Thru method is set by default.
guidedCal.PathCalMethod (1,2) = "TRL"
```

```
' Initiate the calibration and query the number of steps
numSteps = guidedCal.GenerateSteps
MsgBox "Number of steps is " + CStr(numSteps)

' Query the list of ports that need delta match
portList = guidedCal.PortsNeedingDeltaMatch
' If portList contains just one element and it's value is 0, then that indicates
' none of the ports being calibrated require delta match data.
' If each testport on the PNA has it's own reference receiver (R channel),
' then delta match is never needed, so portList will always be just 0.
lowerBound = LBound(portList)
If (UBound(portList) <> lowerBound) Or (portList(lowerBound) <> 0) Then
 ' Delta match data is required for at least one port.
' For this example, we assume a Global Delta Match Cal has previously been
' performed so the Global Delta Match CalSet exists.
' Supplying an empty string to ApplyDeltaMatchFromCalSet indicates to use
' the Global Delta Match CalSet.
 MsgBox "here"
guidedCal.ApplyDeltaMatchFromCalSet ""
End If

' Measure the standards
For i = 1 To numSteps
step = "Step " + CStr(i) + " of " + CStr(numSteps)
strPrompt = guidedCal.GetStepDescription(i)
retVal = MsgBox(strPrompt, vbOKCancel, step)
If retVal = vbCancel Then Exit Sub
guidedCal.AcquireStep i
Next

' Conclude the calibration
guidedCal.GenerateErrorTerms
MsgBox "Cal is done!"

End Sub
```

Perform Global Delta Match Cal

The following program performs a Global Delta Match Calibration. This is required when performing an Unknown Thru cal or TRL cal on PNAs without a reference receiver for each test port. See example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Delta.vbs. Learn how to setup and run the macro.

```
Sub PerformGlobalDeltaMatchCal()
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
' Get cal manager object
Set calMgr = app.GetCalManager
' Get guided cal object
Set guidedCal = calMgr.GuidedCalibration

' Initiate a Global Delta Match calibration, choosing connector and cal kit
numSteps = guidedCal.GenerateGlobalDeltaMatchSequence("APC 3.5 female", "85033D/E")
MsgBox "Number of steps is " + CStr(numSteps)

' Measure the standards
For i = 1 To numSteps
 step = "Step " + CStr(i) + " of " + CStr(numSteps)
 strPrompt = guidedCal.GetStepDescription(i)
 retVal = MsgBox(strPrompt, vbOKCancel, step)
 If retVal = vbCancel Then Exit Sub
 guidedCal.AcquireStep i
Next

' Conclude the calibration
guidedCal.GenerateErrorTerms
MsgBox "Cal is done!"

End Sub
```

Writing Cal Set Data using COM

This example creates a Cal Set and then writes data to the Cal Set.

Learn more about Reading and Writing Calibration data using COM.

Learn more about Cal Sets.

See Other COM Example Programs

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save on the PNA hard drive as CalSetsWrite.vbs. Learn how to setup and run the macro.

```
dim pna
dim v
Set pna=CreateObject("AgilentPNA835x.Application")
InitPhonyData
PutPhonyData
' This sub creates phony data
Sub InitPhonyData()
Dim i
Dim numpts
wscript.echo "init phony"
numpts = pna.ActiveChannel.NumberOfPoints
ReDim v(numpts - 1, 1)
For i = 0 To numpts - 1
v(i, 0) = i
v(i, 1) = 0
Next
End Sub

' This sub creates a Cal Set, then writes the phony data to it
Sub PutPhonyData()
Dim cmgr
Dim cset
wscript.echo "putphony"
Set cmgr = pna.GetCalManager
Set cset = cmgr.CreateCalSet(1)
cset.OpenCalSet naCalType_OnePort, 1
const directivity = 0
const sourcematch=1
const reflectiontracking =2
cset.putErrorTerm directivity,1, 1, v
cset.putErrorTerm sourcematch,1, 1, v
cset.putErrorTerm reflectiontracking ,1, 1, v
cset.CloseCalSet
cset.Description = "Phony One Port"
cset.save
```

```
End Sub
```

Upload a Source Power Cal using COM

This program can be run in either Visual Basic 6 or as a VBScript program. The PNA can run *.vbs programs as macros.

This program demonstrates:

- Uploading a source power calibration of Port 2 for Channel 1.
- Reading the calibration data.

Learn more about Power Calibrations

See Other COM Example Programs

To run this program you need:

- Your PC and PNA both connected to a LAN (for communicating with each other).

To make this program work in VBS, save the following code in a text editor file such as Notepad and save as *.vbs.

To make this program work in Visual Basic 6:

1. Create a new project
2. Click **Project**, **Add New Module**, click **Open**.
3. Paste the following code into the code window.
4. Delete the first two lines (comment and Main)
5. Click **Project, Properties**. Under **Startup Object**, select **Sub Main**
6. Click **Project, References**, and select the Agilent PNA Series Type Library.

```
' Run the Main subroutine
Main
Public Sub Main()
Dim PNA, chan                   ' PNA COM objects
Const naCorrectionValues = 0 ' enum NASourcePowerCalBuffer
Const port = 2                  ' PNA port #2 as source port
Dim stimulus, calvalues
Dim power, calpower, strResult
' Instantiate our PNA COM objects
Set PNA = CreateObject("AgilentPNA835x.Application")
Set chan = PNA.Channels(1)
```

```
' Set the number of sweep points to 2 on Channel 1.
chan.NumberOfPoints = 2

' Ensure there's currently no source power cal on for this channel and port.
chan.SourcePowerCorrection(port) = False

' Specify if the cal power level is offset (positive value for a gain, negative
' value for a loss) from the PNA port power setting on the channel when
' no source power cal is active.  This is to account for components
' between the PNA test port and cal reference plane.
' In this example, let's set up our calibration
' at the output of an amplifier with 15 dB gain.
chan.SourcePowerCalPowerOffset(port) = 15

' Send our source power correction data to the PNA.  For purpose of simplicity
' in this example, we'll set up for no correction (0) at our start stimulus and
' 0.5 dB at our stop stimulus (recall that our sweep currently has just 2 points).
calvalues = Array(0, 0.5)
chan.putSourcePowerCalDataEx naCorrectionValues, port, calvalues

' Set the number of sweep points to 21 on Channel 1.
chan.NumberOfPoints = 21

' Read the fixed power level for this port on Channel 1.
power = chan.TestPortPower(port)

' Turn the source power cal on.
chan.SourcePowerCorrection(port) = True

' Again read the fixed power level for this port on Channel 1
' (with our calibration turned on, this should now include the 15 dB offset
' we indicated our power amplifier provides).
calpower = chan.TestPortPower(port)

' Read the stimulus values from Channel 1.
stimulus = chan.GetXAxisValues

' Read back the source power correction data, now interpolated for 21 points
calvalues = chan.getSourcePowerCalDataEx(naCorrectionValues, port)

' Print the data using a message box (here, Chr returns the ASCII characters
' for Tab (9) and Linefeed (10)).
strResult = "PNA port power = " & power & Chr(10)
strResult = strResult & "Power at reference plane = " & calpower & Chr(10) & hr(10)
strResult = strResult & "Stimulus" & Chr(9) & Chr(9) & "Cal Value" & Chr(10)
For i = 0 To UBound(stimulus)
strResult = strResult & stimulus(i) & Chr(9) & calvalues(i) & Chr(10)
Next
MsgBox strResult
End Sub
```

Upload Segment Table

This example program uses the SetAllSegments Method to do the following:

- creates a 2-dimensional array (7 x 10) 7 data elements that define each segment x 10 segments
- uploads the data to the PNA

This program does not make sweep type = segment or show the segment table.

The comments indicate the order in which the segment elements are specified: Index 0 - segment state, Index 4 is IFBW, and so forth.

See Other COM Example Programs

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save on the PNA hard drive as *.vbs. Learn how to setup and run the macro.

```
' Create the application instance, and preset the application
Set app = CreateObject("AgilentPNA835x.Application")
app.Preset

Dim chan
Set chan = app.ActiveChannel
chan.sweeptype = 4

Dim segs
Set segs = chan.Segments

Dim win
Set win = app.NAWindows(1)
win.ShowTable 2


' Multipliers
kHz = 1000
MHz = kHz*1000
GHz = MHz*1000
' Create segments from 10MHz to 3GHz
StartFreq = 10 * MHz
StopFreq  =  3 * GHz
'*
'*  Create 10 segments between StartFreq and StopFreq
'*
' Create a 2-D array of segments.
' 1st dimension is size 7 (6 is max index)
' to hold all the data per segment.
' 2nd dimension is size 10 (9 is max index)
```

```
' to hold 10 total segments.
Dim segdata(6, 9)
' Width of frequency segment, used below
SegmentWidth = (StopFreq-StartFreq)/10
' Fill up all 10 segments (indicies 0 to 9) with data
For i = 0 To 9
' element 0=segment state (on or off)
segdata(0, i) = True

' element 1=Num Points in this segment
segdata(1, i) = 500

' element 2=Start Freq
segdata(2, i) = StartFreq + i * SegmentWidth

' element 3=Stop Freq
segdata(3, i) = segdata(2, i) + SegmentWidth

' element 4=IFBW
segdata(4, i) = 35000

' element 5=Dwell Time
segdata(5, i) = 0

' element 1=Power
segdata(6, i) = 0

Next

' Configure Independent segment settings
segs.IFBandwidthOption = 1
segs.SourcePowerOption = 1

' Push the segment data into the PNA's Active Channel
segs.SetAllSegments segdata
```

Create and Cal an SMC Measurement

This example creates and calibrates an SMC measurement. To run this example without modification you need the following:

- A Mixer setup file saved on the PNA: C:\Program Files\Agilent\Network Analyzer\Documents\Mixer\MyMixer.mxr.
- If the mixer file uses an external LO source, it must be connected and configured.
- An ECal module that covers the frequency range of the measurement.
- A power meter must be connected to the PNA using GPIB.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save on the PNA hard drive as SMC.vbs. Learn how to setup and run the macro.

See Other COM Example Programs

```
Dim App
Set App = CreateObject("AgilentPNA835x.Application")
Dim Meas
Set Meas = App.ActiveMeasurement
Meas.Delete

App.CreateCustomMeasurementEx 1, "Scalar Mixer/Converter","SC21"
'Other valid strings that can be specified to create a measurement with a parameter
'other than'"SC21" are: "S11", "S22", "IPwr", and "OPwr"

Set Meas = App.ActiveMeasurement
'You can perform mixer setup here or
'recall a previous mixer setup from the PNA Hard drive
Dim mix
Set mix = Meas

'Load your own SMC measurement from the PNA Hard drive.
Meas.LoadFile "C:\Program Files\Agilent\Network
Analyzer\Documents\Mixer\MyMixer.mxr"


Dim CalMgr
Set CalMgr = App.GetCalManager
Dim SMC
Set SMC = CalMgr.CreateCustomCal("SMC")
SMC.Initialize 1, 1
SMC.Do2PortEcal = 1 'specify 0 for mechanical cal, 1 for ecal
'use Factory Characterization
SMC.ECALCharacterization(1) = 0
```

```
'only specify the ThruCalMethod if you have a non-insertable DUT
'SMC.ThruCalMethod = "Adapter Removal"
'If you specify Adapter Removal or Unknown Thru calibration
'then you need to specify the connector types of your DUT.
'Specify a connector that is the same type as your selected
'ECAL characterization. The characterization selected in
'this case is APC 2.4 female APC 2.4 male so the connectors
'specified for my DUT have to be APC 2.4 but can be any sex.
'SMC.ConnectorType(1) = "APC 2.4 female"
'SMC.ConnectorType(2) = "APC 2.4 female"
SMC.OmitIsolation = 1
SMC.AutoOrient = 1
' 1- forward, 2-reverse, or Both
SMC.CalibrationPort = "1"

Dim steps
steps = SMC.GenerateSteps
For i = 1 To steps
MsgBox SMC.GetStepDescription(i)
SMC.AcquireStep i
Next

Dim calset
calset = SMC.GenerateErrorTerms
Msgbox("SMC Cal Complete!")
```

Last Updated: June 13, 2006

Create and Cal a VMC Measurement

The following VMC calibration options are presented in **VB Script** examples:

- Full 2-port ECAL
- For Mixer Characterization ONLY
- Mechanical Calibration

Note: Each of the following programs load a mixer setup file.
Substitute "Mixer009.mxr" with your own .mxr file.

Full 2-port ECAL

```
Dim App
Set App = CreateObject("AgilentPNA835x.Application")
Dim Meas
Set Meas = App.ActiveMeasurement
Meas.Delete

App.CreateCustomMeasurementEx ( 2, "Vector Mixer/Converter", "VC21" )
'Other valid strings that can be specified to create a measurement with a parameter
other than"VC21" are: "S11", and "S22"
Set Meas = App.ActiveMeasurement

Meas.LoadFile "C:\\Program Files\\Agilent\\Network
Analyzer\\Documents\\mixer\\Mixer009.mxr"

Dim CalMgr
Set CalMgr = App.GetCalManager
Dim VMC
Set VMC = CalMgr.CreateCustomCal("VMC")
VMC.Initialize 1, 1
VMC.Do2PortEcal = 1
VMC.Do1PortEcal = 1
VMC.ECALCharacterization(1, 1) = 0 'APC 2.4 male APC 2.4 female
VMC.ECALCharacterization(1, 0) = 0
' could be Default, Flush Thru, Unknown Thru, or Adapter Removal
VMC.ThruCalMethod = "Adapter Removal"
VMC.OmitIsolation = 1
VMC.AutoOrient = 1
VMC.EcalOrientation1Port(1) = "A1"
VMC.CharacterizeMixerOnly = 0
VMC.LoadCharFromFile = 0
' to load mixer characterization from file, specify LoadCharFromFile = 1,
' then VMC.CharFileName = "C:\\Program Files\\Agilent\\Network
' Analyzer\\Documents\\YourFile.s2p" (specify your own .s2P filename)

VMC.ConnectorType(1) = "APC 2.4 female"
```

```
VMC.ConnectorType(2) = "APC 2.4 female"

Dim steps
steps = VMC.GenerateSteps
For i = 1 To steps
MsgBox VMC.GetStepDescription(i)
VMC.AcquireStep i
Next

Dim calset
calset = VMC.GenerateErrorTerms
```

Mixer Characterization ONLY

```
Dim App
Set App = CreateObject("AgilentPNA835x.Application")
Dim Meas
Set Meas = App.ActiveMeasurement
Meas.Delete
app.CreateCustomMeasurementEx ( 2, "Vector Mixer/Converter", "VC21" )
'Other valid strings that can be specified to create a measurement with a parameter
other than "VC21" are: "S11", and "S22"

Set Meas = App.ActiveMeasurement
Meas.LoadFile "C:\\Program Files\\Agilent\\Network
Analyzer\\Documents\\mixer\\Mixer009.mxr"

Dim CalMgr
Set CalMgr = App.GetCalManager
Dim VMC
Set VMC = CalMgr.CreateCustomCal("VectorMixerCal.VMCType")
VMC.Initialize 1, 1
VMC.Do2PortEcal = 1
VMC.Do1PortEcal = 1
VMC.ECALCharacterization(1, 1) = 0
VMC.ECALCharacterization(1, 0) = 0
VMC.ThruCalMethod = "Default"
VMC.OmitIsolation = 1
VMC.AutoOrient = 1
VMC.EcalOrientation1Port(1) = "A1"
VMC.CharacterizeMixerOnly = 1
VMC.LoadCharFromFile = 0
VMC.CharFileName = "C:\\Program Files\\Agilent\\Network
Analyzer\\Documents\\MyMixerChar.s2p"

Dim steps
steps = VMC.GenerateSteps
For i = 1 To steps
MsgBox VMC.GetStepDescription(i)
VMC.AcquireStep i
Next
```

```
Dim calset
calset = VMC.GenerateErrorTerms
MsgBox VMC.CharFileName
```

Mechanical Calibration

```
Dim App
Set App = CreateObject("AgilentPNA835x.Application")
Dim Meas
Set Meas = App.ActiveMeasurement
Meas.Delete
app.CreateCustomMeasurementEx ( 2, "Vector Mixer/Converter", "VC21" )
'Other valid strings that can be specified to create a measurement with a parameter
other than "VC21" are: "S11", and "S22"

Set Meas = App.ActiveMeasurement
Meas.LoadFile "C:\\Program Files\\Agilent\\Network
Analyzer\\Documents\\mixer\\Mixer009.mxr"
Dim CalMgr
Set CalMgr = App.GetCalManager
Dim VMC
Set VMC = CalMgr.CreateCustomCal("VectorMixerCal.VMCType")
VMC.Initialize 1, 1
VMC.Do2PortEcal = 1
VMC.Do1PortEcal = 0
VMC.ECALCharacterization(1, 1) = 0
VMC.ThruCalMethod = "Default"
VMC.OmitIsolation = 1
VMC.AutoOrient = 1
VMC.CharacterizeMixerOnly = 0
VMC.LoadCharFromFile = 0
VMC.ConnectorType(1) = "APC 3.5 female"
VMC.ConnectorType(2) = "APC 3.5 male"
VMC.CalKitType(1) = "85033D/E"
VMC.CalKitType(2) = "85033D/E"

Dim steps
steps = VMC.GenerateSteps
For i = 1 To steps
MsgBox VMC.GetStepDescription(i)
VMC.AcquireStep i
Next

Dim calset
calset = VMC.GenerateErrorTerms
```

Create an SMC Fixed Output Measurement with COM

This VBScript example creates a calibrated SMC fixed output measurement using a controlled LO. Then a single sweep is taken and data is retrieved.

Fixed output measurements are only supported on SMC (not VMC) measurements. Fixed output measurements require that an external LO source be sweeping and synchronized with the PNA source. FCA can perform this synchronization using the external source configuration settings. The fastest, and recommended, method of controlling the LO source is Hardware List (BNC) triggering mode. However, in this mode, FCA channels will not respond to manual triggers. Therefore, the following example uses the "Single" IChannel::Single mechanism to trigger a sweep.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as SMC.vbs. Learn how to setup and run the macro.

```
option explicit
dim app
set app = createobject("agilentpna835x.application")
app.preset

' Put the channel in hold (highly recommended)
app.ActiveChannel.Hold 1

' Delete the standard measurement
app.ActiveMeasurement.Delete

' Create an SC21 measurement
app.CreateCustomMeasurementEx 1, "Scalar Mixer/Converter","SC21"

' Set the number of points to 11
app.ActiveChannel.NumberOfPoints = 11

' Setup the mixer parameters for a swept LO, fixed output measurement

dim mixer
set mixer = app.ActiveMeasurement
mixer.InputStartFrequency = 200e6
mixer.InputStopFrequency = 700e6
mixer.LORangeMode(1) = 0  ' 0 = Swept mode
mixer.OutputFixedFrequency = 3.4e9
mixer.InputPower = -17
mixer.LOPower(1) = 10

' The CALC method calculates the LO frequency from the other parameters,
' It also applies ALL mixer parameters to the channel.
mixer.Calculate 3 ' Calculate the LO range

' Create an S11 in the same channel
app.CreateCustomMeasurementEx 1, "Scalar Mixer/Converter","S11"
dim S11Meas
set S11Meas = app.ActiveMeasurement
```

```
' Create an IPwr in the same channel
app.CreateCustomMeasurementEx 1, "Scalar Mixer/Converter","S22"

' Create an OPwr in the same channel
app.CreateCustomMeasurementEx 1, "Scalar Mixer/Converter","OPwr"

' Perform a single sweep synchronously.
app.ActiveChannel.Single 1
function ToString(complexDataArray)
dim dataAsString
dim point
for point = 0 to UBound(data)
dataAsString = dataAsString & "(" & data(point,0) & "," & data(point,1) & ") "
next
ToString = dataAsString
end function

' Retrieve the SC21 data
dim data
'Get the calibrated real/imaginary values
data = mixer.GetData(1,3)
wscript.echo ToString(data)

' Retrieve the S11 data
'Get the calibrated real/imaginary values
data = S11Meas.GetData(1,3)
wscript.echo ToString(data)
```

Last Modified:

June 13, 2006	Last updated

Create a Pulsed Measurement

Note: This example applies only to the E836x Opt H11. For PNA-X see PNA-X Create a Narrowband Pulsed Measurement.

The following example demonstrates how to create a narrowband pulsed measurement using the Pulsed Application DLL. It first gets valid configuration settings and then uses those settings to configure the PNA and external pulsed generators.

To run this program, you need:

- Pulsed Application (Option H08)
- External Pulse Generators
- External Pulse Modulator / Pulse Bias

See Also

- Learn how to install and register the pulsed .dll on your PC
- See the ConfigureNarrowBand3 Method for sending and returning parameters to the .dll.
- See the documentation for the following COM IF Configuration commands.
- See the SCPI IF Configuration commands.
- Learn about the Pulsed Application.

```
'Interfaces
Dim OApp As AgilentPNA835x.Application
Dim OIF As AgilentPNA835x.IFConfiguration
```

```
'Pulsed parameters
Dim DPRF As Double
Dim DOffset As Double
Dim DSampleRate As Double
Dim LNumTaps As Long
Dim LBW As Long
Dim IPrecision as Integer
Dim BPG81110 As Boolean
Dim BFixedPRF As Boolean
```

```
'pulsed DLL interface
Dim OPulsed As New AgilentPNAPulsed.Application
DPRF=5123 'Hz
LBW=100 'Hz
BPG81110=True 'Using the Agilent 81110A Pulse Generator
BFixedPRF=True 'Do not change the PRF during filter alignment.  Only adjust the
IFBW.
```

```
'Calculate precision of pulse generators so that the config function returns the
correct precision with the right filter. For example, DPRF=5000 Hz with a pulse
```

```
generator that will only take a total of four numeric values
' (5.123 kHz)
'->log10(DPRF)=3.709
'->int(3.709)=3
'->3-3=0
```

```
'The algorithm will use a 10^x value for decrementing the PRF for null computation.
 This means that the first numeric digit from the right should be the one that is
decremented by the pulsed algorithm (i.e. 5.122 kHz) to compute the filter nulls.
This ensures that the pulse generators receive a PRF that is within their precision
with the associated nulling IFBW.
IPrecision = Int(Flog10(CSng(DPRF))) - 3
```

```
'Send desired pulsed parameters to the pulsed configuration DLL. The DLL will return
a new set of pulse parameters that provide the proper filter nulling.
OPulsed.ConfigNarrowBand3 DPRF, LNumTaps, LBW, DOffset, DSampleRate, IPrecision,
BFixedPRF,BPG81110
```

```
'Send configuration to PNA
```

```
'Connect to the PNA application
Set OApp = CreateObject("AgilentPNA835x.Application")
Set OIF = OApp.ActiveChannel.IFConfiguration
```

```
'Set PNA IFBW close to that returned by pulsed algorithm.  This ensures that the
proper settling time is set on the PNA.
```

```
OApp.ActiveChannel.IFBandwidth = LBW
OIF.IFFilterSamplePeriodMode = naMANUAL
OIF.IFFilterSamplePeriod = DSampleRate
OIF.IFFilterSource = naIFFilterSourceManual
OIF.IFFilterSampleCount = LNumTaps
OIF.IFGateEnable = True
OApp.ActiveChannel.FrequencyOffsetState = naON
OApp.ActiveChannel.FrequencyOffsetFrequency = DOffset
```

```
'Set receivers to medium gain setting
```

```
OIF.IFGainMode("ALL") = naMANUAL
OIF.IFGainLevel("A") = 1
OIF.IFGainLevel("B") = 1
OIF.IFGainLevel("R1") = 1
OIF.IFGainLevel("R2") = 1
```

```
Public Function Flog10(SGNum As Single) As Single
Flog10 = Log(SGNum) / Log(10)
End Function
```

```
'Enter Code here to send configuration to external pulse generators
```

Create a Balanced Measurement using COM

The following program creates several Balanced measurements in separate windows, generates markers, calculates statistics, and sets limit lines and queries results.

Note: By their nature, balanced measurements are extremely sensitive to phase differences between the two RF paths that make up the balanced port, especially at higher frequencies. A good calibration (not performed in this example) is critical to achieving good balanced measurement results.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as BalancedCOM.vbs. Learn how to setup and run the macro.

```
' PNA application object
Dim app

' Channel 1 object
Dim chan1

' start of marker/limit testing range
Dim minTestStimulus

' end of marker/limit testing range
Dim maxTestStimulus

' Set to true if you want additional balanced measurements.
Dim AdditionalMeasurements
AdditionalMeasurements = 1

' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
' Preset the instrument
app.Preset
' Get the Channel 1 object
Set chan1 = app.Channels(1)
' Stop data taking for now.
chan1.Hold true
' Set up the start / stop frequency for Channel 1 sweep.
MHZ = 1000000
GHZ = 1000*MHZ
chan1.StartFrequency = 10  *MHZ
chan1.StopFrequency  = 1   *GHZ
chan1.NumberOfPoints = 801
' Define our test frequency range
minTestStimulus = 100*MHZ
maxTestStimulus = 900*MHZ
' This example uses DUT topology Bal-Bal -
' a DUT with a balanced input and balanced output.
'
' Port mapping for our DUT:
' logical port 1 = physical ports 1 and 4
```

```
' logical port 2 = physical ports 2 and 3
' The default is:
' logical port 1 = physical ports 1 and 2
' logical port 2 = physical ports 3 and 4
'
'  logical 1             logical 2
'          ___________
' 1 ------|           |------ 2 +
'         |    DUT    |
' 4 ------|___________|------ 3 -

chan1.BalancedTopology.SetBBPorts 1, 4, 2, 3

' Now we create some Bal-Bal measurements.
' By creating Bal-Bal measurements ("BBAL:..."),
' the channel is set to Bal-Bal topology,
' so it is not necessary to do this explicitly
' with the BalancedTopology.DUTTopology command.
' We do it here just for clarity:

chan1.BalancedTopology.DUTTopology = 2
' 0 == SE-Bal, 1 == SE-SE-Bal, 2 == Bal-Bal

' Create four windows, each showing one category of balanced measurement:
' Create Forward Transmission Measurements in Bal-Bal topology on Channel 1, window
1

' differential mode transmission
app.CreateMeasurement 1, "BBAL:SDD21",1,1
Set sdd21_1 = app.ActiveMeasurement

' differential to common mode conversion
app.CreateMeasurement 1, "BBAL:SCD21",1,1
Set scd21_1 = app.ActiveMeasurement

' common to differential mode conversion
app.CreateMeasurement 1, "BBAL:SDC21",1,1
Set sdc21_1 = app.ActiveMeasurement

' common mode transmission
app.CreateMeasurement 1, "BBAL:SCC21",1,1
Set scc21_1 = app.ActiveMeasurement

' Optionally create some additional measurements
If AdditionalMeasurements Then

' Create (logical) Port 1 reflection measurements, channel 1, window 2
app.CreateMeasurement 1, "BBAL:SDD11",1,2 ' differential mode reflection
app.CreateMeasurement 1, "BBAL:SDC11",1,2 ' C to D mode conversion reflection
app.CreateMeasurement 1, "BBAL:SCD11",1,2 ' D to C mode conversion reflection
app.CreateMeasurement 1, "BBAL:SCC11",1,2 ' common mode reflection
```

```
' Create Reverse Transmission Measurements, channel 1, window 3
app.CreateMeasurement 1, "BBAL:SDD12",1,3 ' differential mode transmission
app.CreateMeasurement 1, "BBAL:SCD12",1,3 ' differential to common mode conversion
app.CreateMeasurement 1, "BBAL:SDC12",1,3 ' common to differential mode conversion
app.CreateMeasurement 1, "BBAL:SCC12",1,3 ' common mode transmission

' Create (logical) Port 2 reflection measurements in window 4
app.CreateMeasurement 1, "BBAL:SDD22",1,4 ' differential mode reflection
app.CreateMeasurement 1, "BBAL:SDC22",1,4 ' C to D mode conversion reflection
app.CreateMeasurement 1, "BBAL:SCD22",1,4 ' D to C mode conversion reflection
app.CreateMeasurement 1, "BBAL:SCC22",1,4 ' common mode reflection
End If

' Set up some limit lines to verify a minimum differential insertion loss
sdd21_1.LimitTest(1).BeginStimulus = minTestStimulus
sdd21_1.LimitTest(1).EndStimulus   = maxTestStimulus
sdd21_1.LimitTest(1).BeginResponse = -2
sdd21_1.LimitTest(1).EndResponse   = -2
sdd21_1.LimitTest(1).Type = 2 ' minimum limit
sdd21_1.LimitTest.State = 1
' Limit lines for maximum common mode to differential conversion
sdc21_1.LimitTest(1).BeginStimulus = minTestStimulus
sdc21_1.LimitTest(1).EndStimulus   = maxTestStimulus
sdc21_1.LimitTest(1).BeginResponse = -20
sdc21_1.LimitTest(1).EndResponse   = -20
sdc21_1.LimitTest(1).Type = 1 ' maximum limit
sdc21_1.LimitTest.State = 1
' Take a (synchronous) single sweep on channel 1
chan1.Single true

' Show differential forward transmission statistics.
sdd21_1.ShowStatistics = true

' Set up user range 1 to limit marker's search range.
chan1.UserRangeMin(0,1) = minTestStimulus
chan1.UserRangeMax(0,1) = maxTestStimulus

' Find/Show max common mode to differential conversion, and read back the frequency.
sdc21_1.MarkerState(1) = true
' Set marker 1 to use user range 1
sdc21_1.Marker(1).UserRange = 1
sdc21_1.Marker(1).SearchMax

' Find/Show max differential mode insertion loss, and read back the frequency.
sdd21_1.MarkerState(1) = true
' Set marker 1 to use user range 1
sdd21_1.Marker(1).UserRange = 1
sdd21_1.Marker(1).SearchMin
If sdd21_1.LimitTestFailed Then
Wscript.Echo "Differential insertion loss failed: " & sdd21_1.Marker(1).Stimulus
/MHZ & "MHz, " & _sdd21_1.Marker(1).Value(1) & " dB"
End If
```

```
If sdc21_1.LimitTestFailed Then
Wscript.Echo "Common to differential conversion failed: " &
sdc21_1.Marker(1).Stimulus/MHZ & "MHz, " & _sdc21_1.Marker(1).Value(1) & " dB"
End If
```

ECAL Confidence Check

This Visual Basic program:

- Initializes the PNA objects.
- Performs a complete ECAL confidence check

Before using this code:

- The active channel must contain an S11 measurement with a 1-port or N-port calibration
- Prepare a form with two buttons named **cmdRun** and **cmdQuit**

```
Private oPNA As AgilentPNA835x.Application
Private oChan As Channel
Private oCal As Calibrator
Private oMeas As Measurement

Private Sub cmdRun_Click()
Dim iMeasIndex As Integer

Set oPNA = CreateObject("AgilentPNA835x.Application", "MachineName")
Set oChan = oPNA.ActiveChannel
Set oCal = oChan.Calibrator

iMeasIndex = 1

' Loop through measurements until an S11 on the active channel
' is found, or the end of the measurement collection is reached.
Do
   Set oMeas = oPNA.Measurements(iMeasIndex)
   If oMeas.Parameter = "S11" And _
      oMeas.channelNumber = oChan.channelNumber Then Exit Do
   iMeasIndex = iMeasIndex + 1
   If iMeasIndex > oPNA.Measurements.Count Then
      MsgBox "No S11 measurement found on the active channel." _
             & " Create an S11 measurement, then try again."
      Exit Sub
   End If
```

```
Loop

' Set up trace view so we are viewing only the data trace.
oMeas.View = naData
' Acquire the S11 confidence check data from ECal Module A
' into the memory buffer.
oCal.AcquireCalConfidenceCheckECALEx "S11", 1
' Turn on trace math so the trace shows data divided by memory.
' You can be confident the S11 calibration is reasonably good if
' the displayed trace varies no more than a few tenths of a dB
' from 0 dB across the entire span.
oMeas.TraceMath = naDataDivMemory
End Sub

Sub cmdQuit_Click()
' Turn off trace math
' in case someone clicks Quit without having clicked Run
If oMeas <> Nothing Then oMeas.TraceMath = naDataNormal
' Conclude the confidence check to set the ECal module
' back to it's idle state.
If oCal <> Nothing Then oCal.DoneCalConfidenceCheckECAL
' End the program
   End
End Sub
```

Intro to Examples

Limit Line Testing with COM

This Visual Basic program:

- Turns off existing Limit Lines
- Establishes Limit Lines with the following settings:
  - Frequency range - 4 GHz to 8 GHz
  - Maximum value - (10dB)
  - Minimum value - (-30dB)
- Turns on Lines, Testing, and Sound

If using Global Pass/Fail to report limit results, trigger the PNA after configuring and enabling Limit lines.

```
Public limts As LimitTest
Set limts = meas.LimitTest
'All Off
For i = 1 To 20
 limts(i).Type = naLimitSegmentType_OFF
Next i

'Set up Limit Lines
limts(1).Type = naLimitSegmentType_Maximum
limts(1).BeginResponse = 10
limts(1).EndResponse = 10
limts(1).BeginStimulus = 4000000000#
limts(1).EndStimulus = 8000000000#
limts(2).Type = naLimitSegmentType_Minimum
limts(2).BeginResponse = -30
limts(2).EndResponse = -30
limts(2).BeginStimulus = 4000000000#
limts(2).EndStimulus = 8000000000#

'Turn on Lines, Testing, and Sound
limts.LineDisplay = 1
limts.State = 1
limts.SoundOnFail = 1
```

E5091Testset Control

The following VB Script example exercises the COM commands used to control the E5091A testset.

For a description of each command, see E5091Testsets collection.

```
Sub Main()
Set pna = CreateObject("AgilentPNA835x.Application")
Dim testsets As E5091Testsets
Set testsets = pna.E5091Testsets
Dim tset1 As E5091Testset
Set tset1 = testsets(1)
tset1.OutputPort(1, 3) = naE5091PortR2
tset1.ControlLines(1) = 5
tset1.ShowProperties = True
tset1.Enabled = True
MsgBox tset1.ID
MsgBox tset1.Enabled
MsgBox tset1.ShowProperties
' NumberOfPorts property returns 0 when testset not connected
MsgBox tset1.NumberOfPorts
MsgBox tset1.OutputPort(1, 3)
MsgBox tset1.ControlLines(1)

Dim tset2 As E5091Testset
Set tset2 = testsets(2)
tset2.Enabled = True
tset2.ShowProperties = True
MsgBox tset2.Enabled
MsgBox tset2.ShowProperties
End Sub
```

Errors and the SCPIStringParser Object

This C++ program uses the SCPIStringParser.Parse command to detect the failed HRESULT and interrogate the errorInfo object for more details.

```
// scpierrors.cpp : Defines the entry point for the console application.
//

#include <iostream>
#include "afx.h"
#include "atlbase.h"
#import "C:\program files\common files\agilent\pna\835x.tlb" raw_interfaces_only,
no_namespace, named_guids
using namespace std;
HRESULT SendScpiCommand( IScpiStringParser* parser, CComBSTR& cmd, CComBSTR&
response)
{
	CComBSTR bstr;
	HRESULT hr = parser->Parse(CComBSTR(cmd), &response);
	if (FAILED(hr))
	{
		// see if this interface supports ErrInfo
		CComPtr<ISupportErrorInfo> spSupportsErrInfo;
		if (SUCCEEDED(parser->QueryInterface(&spSupportsErrInfo)))
		{
			// it does, so let's get the errorinfo object
			CComPtr<IErrorInfo> spErrorInfo;
			if (SUCCEEDED(GetErrorInfo(0, &spErrorInfo)))
			{
				CComBSTR errStr;
				spErrorInfo->GetDescription(&errStr);
				std::cout << "ERROR: " << CString(errStr) << std::endl;
			}
		}
	}
	return hr;
}
```

```
int main()
{
          CoInitialize(NULL);
          {
               CComBSTR response;
               CComPtr<IApplication> spPNA;
               CComPtr<IScpiStringParser> spSCPI;
               if (SUCCEEDED(spPNA.CoCreateInstance(CLSID_Application)))
               {
                    spPNA->get_ScpiStringParser(&spSCPI);
                    SendScpiCommand(spSCPI, CComBSTR("SYSTEM:PRESET"), response);
                    SendScpiCommand(spSCPI, CComBSTR("CALC:PAR:CAT?"), response);
                    std::cout << CString(response) << std::endl;
                    SendScpiCommand(spSCPI, CComBSTR("THIS:IS:A:SYNTAX:ERROR"),
                    response);
               }
               }
               CoUninitialize();
     return 0;
}
```

External Testset Control

The following VB Script example exercises the COM commands used to control the Z5623AK64 testset.

For a description of each command, see TestsetControl Object

See Other COM Example Programs

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save on the PNA hard drive as Testset.vbs. Learn how to setup and run the macro.

```
' Demonstrate some COM commands for external testsets.
Dim pna
Set pna = CreateObject("AgilentPNA835x.Application")
Sub DemoTestset(na)
Dim testsets, tset1
Dim portNum
Dim chNum, address
Set testsets = na.ExternalTestsets
chNum = 1

' Load a configuration file.
' NOTE: the K64 testset is only compatible with 4-port analyzers.
address = 0
testsets.Add "Z5623AK64", address

' Get the testset object
' in the testsets collection.
Set tset1 = testsets(1)

' Show the selections available for each port.
For portNum = 1 To 4
MsgBox("Port " & CStr(portNum) & " catalog: " & tset1.PortCatalog(portNum))
Next

' Set port mappings on channel 1.
tset1.OutputPorts(chNum) = "5 ext R,2 int R,3 int R,6 int R"
```

```
' Set control lines.
tset1.ControlLines(chNum) = 85

' Set label.
tset1.Label(chNum) = "Some label"

' Enable external testset control. This automatically enables status bar display
as well.
tset1.Enabled = True
End Sub
' The testset used in this demo is only usable on 4-port analyzers
If (pna.NumberOfPorts <> 4) Then
MsgBox("This program only runs on 4-port analyzers.")
Else
DemoTestset(pna)
End If
```

PathConfiguration Example

Note: These commands are accessible only for PNA-X models.

This Visual Basic Program exercises various commands on the:

- PathConfigurationManager Object
- PathConfiguration Object
- PathElement Object

```
' Create / Get the PNA application
Dim app
Set app = CreateObject("AgilentPNA835x.Application")
' Preset the instrument
app.Preset
' Get a channel interface on which to operate
Dim chan
Set chan = App.ActiveChannel
' Modify the Default configuration, and save it as "My Config"
chan.PathConfiguration = "Default"
' Set the "Combiner" element to value "Reversed"
chan.PathConfiguration.Element("Combiner").Value = "Reversed"
' Set the "Src1" element to value "High Power"
chan.PathConfiguration.Element("Src1").Value = "High Power"
' Change the description text
chan.PathConfiguration.DescriptionText = "Connect J8 to J9."
' Store the modified configuration
chan.PathConfiguration.Store("My Config")
' Set the instrument's path config back to the default (req. 8)
chan.PathConfiguration = "Default"
' Load a previously saved configuration onto channel 2
App.PathConfigurationManager.Load 2, "My Config"
```

COM Events Example

This Visual Basic program shows how to monitor the end of sweep.
The program will set sweep time to various amounts and BEEPs when sweep is completed. This method allows other processes to continue while waiting for end-of-sweep. This program stops after 10 loops.

Note: To avoid **Permission Denied** problems, this should be run on the PNA and not a PC. To run it from a PC both units must be "trusted" and on the same domain/workgroup.

```
Option Explicit
Dim na As AgilentPNA835x.Application
Dim WithEvents naEvnt As AgilentPNA835x.Application
Dim ch As AgilentPNA835x.Channel
Dim sweepComplete As Boolean

Private Sub Form_Load()

Dim N As Integer
Set na = CreateObject("AgilentPNA835x.application")
na.preset
Set ch = na.ActiveChannel
na.DisallowAllEvents            ' Turn off all events
Set naEvnt = na                 ' Enable event interrupts
Do
N = N + 1                     ' Loop counter
ch.sweepTime = 1 + (Rnd * 9)  ' Set random sweep-time from 1-10 sec
sweepComplete = False
ch.Single False               ' Trigger sweep
naEvnt.AllowEventCategory naEventCategory_CHANNEL, True  ' Enable Channel event
Do
DoEvents                    ' Allows other processes to continue
Loop Until sweepComplete = True
naEvnt.AllowEventCategory naEventCategory_CHANNEL, False  ' Disable event until
ready for next one
Beep                          ' Do end-of-sweep processing here;

Loop Until N > 10
End

End Sub

Private Sub naEvnt_OnChannelEvent(ByVal eventID As Variant, ByVal chNumber As
Variant)
' In this example we don't care about the channel info
If eventID = naEventID_CHANNEL_TRIGGER_COMPLETE Then sweepComplete = True
End Sub
```

Configure for COM-DCOM Programming

Before developing or running a COM program, you should first establish communication between your PC and the analyzer. This process is referred to as gaining **Access** to the analyzer. You should then register the PNA type library on your PC.

DCOM (Distributed Component Object Model) refers to accessing the PNA from a remote PC.

COM refers to accessing the PNA application from the analyzer PC.

- **Access Concepts**
- **Access Procedures**
- **Register the PNA Type Library on Your PC**
- **Problems?**

Note: After performing a Firmware Upgrade you must copy the new type library to your development PC to get access to new COM commands. See Register the analyzer on your PC.

Other Topics about COM Concepts

For detailed information on this subject, see http://na.tm.agilent.com/pna/DCOMSecurity.html

Access Concepts

PNAs are shipped from the factory such that **Everyone** has permission to launch and access the PNA application via COM/DCOM. The term **Everyone** refers to a different range of users depending on whether the PNA is a member of a **Domain** or **Workgroup** (it must be one or the other; not both). By default, the PNA is configured as members of a workgroup. Therefore, **Everyone** includes only those users who have been given logon accounts on the PNA.

Workgroup

A workgroup is established by the **PNA administrator** declaring the workgroup name and declaring the PNA as a member of the workgroup. A workgroup does not require a network administrator to create it or control membership.

Everyone includes only those users who have been given logon accounts on the PNA.

By default, the PNA is configured as members of a workgroup named WORKGROUP.

Note: To setup a logon account for a new user, see Additional Users.
The easiest method of gaining DCOM access, is to make the user's account name and password on the PNA to EXACTLY match their PC logon account name and password.

Domain

A domain is typically a large organizational group of computers. Network administrators maintain the domain and control which machines have membership in it.

Everyone includes those people who have membership in the domain. In addition, those with logon accounts can also access the analyzer.

Summary

- A **Workgroup** requires no maintenance, but allows DCOM access to only those users with a log-on account for the PNA.
- A **Domain** requires an administrator, but all members of the domain and those with logons to the analyzer are allowed DCOM access to the PNA.

The following section "Access Procedures" provides a tighter level of security allowing only **selected** (not **Everyone**) domain and workgroup users DCOM **Access** and **Launch** capability of the PNA.

Access Procedures

Perform this procedure for the following reasons:

- To allow only selected users (not everyone) remote Access and remote Launch capability to the PNA. Launch capability is starting the PNA application if it is not already open.
- To verify that you have DCOM access to the analyzer.

Note: Before doing this procedure, you must first have a logon account on the PNA. See PNA User Accounts

The following procedure grants specific users DCOM access and launch capability of the PNA application:

To perform this procedure, you must first minimize the PNA application.

How do I know which Operating System I have?

Windows 2000	Windows XP
On the PNA, click the Windows **Start** button	On the PNA, click the Windows **Start** button
Click **Run**	Click **Run**
In the **Open:** box, type **dcomcnfg**	In the **Open:** box, type **dcomcnfg**
Click **OK**	Click **OK**
In the Distributed COM Configuration Properties window, Click on **Agilent PNA Series** in the Applications list. Then click **Properties...**	Open the following folder sequence: Component Services Window Component Services Computers My Computer DCOM Config Right click **Agilent PNA Series**

	Click **Properties**
Click the **Security** tab	Click the **Security** tab
Click **Use custom access permissions** then click **Edit**	Under **Access Permissions**, click **Customize**, then click **Edit**
In **Registry Value Permissions**, select **Everyone,** then click **Remove**	Select **Everyone**, then click **Remove**
Click **Add**	Click **Add**
You could either select one or more of these groups to have access to the PNA, or specific users. To give specific users access, click **Show users** or **Members**, then select the name from the list.	Type a group name or user account name
Click **Add,** then click **OK**	Click **OK**
Launch Permission	
Click **Use custom launch permissions**, then click **Edit**	Under **Launch Permissions**, click **Customize**, then click **Edit**
In Registry Value Permissions, select **Everyone** then click **Remove**	Select **Everyone**, then click **Remove**
Click **Add**	Click **Add**
You could either select one or more of these groups to have launch permission of the PNA, or specific users. • To give groups launch permission, select the group from the list. • To give specific users launch permission, click **Show users** or **Members**, then select the name from the list.	Type a group name or user account name
Click **Add,** then click **OK**	Click **OK**

Register the PNA Type Library on Your PC

The type library contains the PNA object model. On your PC, there is a Registry file that keeps track of where object models are located. Therefore, you must register the type library on the PC that will be used to develop code and run the program. It is much more efficient to have the type library registered at design time (BEFORE running your COM program).

Do the following two items before proceeding:

1. Connect your PC and the PNA to LAN.
2. Either map a drive to the analyzer or copy the type library files on a floppy disk or other media. See Drive Mapping.

Note: To register the type library on your PC, you must be logged on as an administrator of your PC. Learn about User Accounts.

This procedure will do the following:

- Register the Network Analyzer application on your PC.
- Copy and register the proxystub (835xps.DLL) onto the PC.
- Copy and register the PNA type library (835x.tlb) onto the PC.
- Copy and register the FCA type library (fca.tlb) onto the PC.

1. Using Windows Explorer on your PC, find the Analyzer's C: drive. The drive will not be named "C:" on your PC, but a letter you assigned when mapping the drive.
2. Navigate to **Program Files \ Agilent** \ **Network Analyzer \ Automation**
3. Double-click **pnaproxy.exe** and follow the prompts to Install PNA Proxy. If the installation offers a choice of Modify, Repair, or Remove, then select **Remove**. Then double-click on **pnaproxy.exe** again.
4. When prompted, type the Computer name of the PNA (Learn how to find this).
5. After the install program runs, the PNA and FCA type library should be registered on your PC.
6. Your programming environment may require you to set a reference to the PNA type library now located on your PC. In Visual Basic, click **Project, References**. Then browse to **C:\Program Files\Common Files\Agilent\PNA** Select **835x.tlb**

Problems?

- These procedures will fail if there are any programs using the PNA type library (for example: Visual basic, VEE, Visual Studio, or any other application program that may communicate with the PNA).
- Perform the following procedure if the previous procedure did not return an error, but you cannot connect to the PNA.
- If you received an error, check that both the account name and password used on both the PNA and PC match EXACTLY.
- If you still get errors, see http://na.tm.agilent.com/pna/DCOMSecurity.html.

1. Map a drive from your remote PC to the PNA. Note the drive letter your PC assigns to the PNA. Substitute this drive letter for **PNA** in the following procedure.
2. On your PC, go to a DOS prompt c:>

3. Type **PNA:** (for example **o:**)
4. Type **cd program files\agilent\network analyzer\automation**
5. Type **copy 835xps.dll c:\program files\common files\agilent\pna**
6. Type **copy 835x.tlb c:\program files\common files\agilent\pna**

If you will NOT be using FCA commands, skip steps 7,.8, and 9.

7. Type **cd..**
8. Type **cd extensions\fca**
9. Type **copy fca.tlb c:\program files\common files\agilent\pna**
10. If it is not already there, copy **regtlib.exe** from **PNA**:\WINNT to your C:\<windows>\system32 directory (<windows> is OS-dependent- it is either windows or WINNT)
11. Type **regtlib C:\program files\common files\agilent\pna\835x.tlb**
12. Type **regsvr32 C:\program files\common files\agilent\pna\835xps.dll**
13. Type **regtlib C:\program files\common files\agilent\pna\fca.tlb**

Perform the Access Procedure after doing these steps.

COM Fundamentals

The following terms are discussed in this topic:

- Objects
- Interfaces
- Collections
- Methods
- Properties
- Events
- Visual Basic Syntax

Note: The information contained in this topic is intended to help an experienced SCPI programmer transition to COM programming. This is NOT a comprehensive tutorial on COM programming.

Other Topics about COM Concepts

Visual Basic Syntax

The examples in PNA Help use Visual Basic as the programming environment for COM, which uses 'dot' notation.

To set a property, follow the object reference with:

- a period (**.**)
- property or method
- an equal sign (=)
- the new value

For example:

```
object.property = value 'This Green text following an apostrophe (') is a comment.
```

To read a property, a variable to contain the returned value is followed with:

- an equal sign (=)
- an object, or reference to an object
- a period (**.**)
- property

For example:

```
variable = object.property
```

To execute a method, an object, or reference to an object is followed with:

- a period (.)
- the method
- a blank space
- any required parameters

For example:

```
object.method parameters
```

Some methods return values, such as methods that return data. To return data from a method, a variable to contain the returned data is followed with:

- an equal sign (=)
- an object, or reference to an object
- a period (.)
- the method
- any required parameters enclosed in parenthesis

```
variable = object.method (parameters)
```

Objects

The objects of the Network Analyzer (Application) are arranged in a hierarchical order. The PNA object model lists the objects and their relationship to one another.

In SCPI programming, you must first select a measurement before making settings. With COM, you first get a handle to the object (or collection) and refer to that object in order to change or read settings (properties).

For more information on working with objects, see Getting a Handle to an Object.

Interfaces

A COM Interface is the connection to an object. When you get a handle to an object, you are actually using an interface to an object. This is important if you are developing PNA code that will run on multiple code versions. For more information, see PNA Interfaces.

Collections

A collection is an object that contains several other objects of the same type. For example, the **Channels** collection contains all of the channel objects.

Note: In the following examples, the collections are referred to as a variable. Before using a collection object, you must first get an instance of that object. For more information, see Getting a Handle to an Object

Generally, items in a collection can be identified by **number** or by **name**. The order for objects in a collection cannot be assumed. They are always unordered and begin with 1. For example, in the following procedure, chans(1) is used to set averaging on the **first** channel in the Channels collection (not necessarily channel 1).

```
Sub SetAveraging()
  chans(1).AveragingFactor = 10
End Sub
```

The following procedure uses the measurement string name to set the display format for a measurement in the measurements collection.

```
meass("CH1_S11_1").Format = 1
```

You can also manipulate an entire collection of objects if the objects share common methods. For example, the following procedure sets the dwell time on all of the segments in the collection.

```
Sub setDwell()
For Each seg In segs
segs.DwellTime = 0.03
Next
End Sub
```

Methods

A method is an action that is performed on an object. For example, **CreateSParameter** is a method on the Application object. The following procedure uses that method to create a new S21 measurement in channel 1 in a new window.

```
Sub CreatMeas
app.CreateSParameter 1,2,1,1
End Sub
```

Properties

A property is an attribute of an object that defines one of the object's characteristics, such as size, color, or screen location. A property can also change an aspect of the object's behavior, such as whether the object is visible. In either case, to change the characteristics of an object, you change the values of its properties.

For example, the following statement sets the IF Bandwidth of a channel to 1 KHz.

```
Chan.IFBandwidth = 1e3
```

You can also read the current value of a property. The following statement reads the current IF Bandwidth of a channel into the variable **Ifbw.**

```
Ifbw = Chan.IFBandwidth
```

Some properties cannot be set and some cannot be read. The Help topic for each property indicates if you can:

- Set and read the property (Write/Read)
- Only read the property (Read-only)
- Only set the property (Write-only)

Events

A COM event is an action recognized by an object, such as clicking the mouse or pressing a key. Using events, your program can respond to a user action, program code, or triggered by the analyzer.

The SCPI equivalent of an event is a Service Request (SRQ).

For example:

```
OnChannelEvent
```

For more information, see Working with the Analyzer's Events.

Getting a Handle to an Object

The following are discussed in this topic:

- **What Is a Handle**
- **Declaring an Object Variable**
- **Assigning an Object Variable**
- **Navigating the Object Hierarchy**
- **Getting a Handle to a Collection**

Other Topics about COM Concepts

What Is a Handle

In SCPI programming, you must first select a measurement before changing or reading settings. With COM, you first get a handle to the object (or collection) and refer to that object to change or read its settings. The following analogy illustrates this:

A CAR could be called an object. More precisely, CAR is a class of objects. For example, one of the properties of the CAR class is "**Color**". You can read (by looking) or set (by painting) the color property of A car object. In other words, you can only read or set properties of a specific car object; not the entire car class. Therefore, to read or set a property, you need to get "a handle", or an instance of the object.

This process is also called "accessing an object", "getting an instance of an object", "returning an object". or "referring to an object". You can have handles to many instances of an object at the same time.

Accessing PNA Objects

The PNA Application object is the highest object in the PNA object model hierarchy. Because of that, it is the only object that must be 'created' before it, or any other objects, can be accessed and used. During the creation process, the application object assigned to a variable name, or handle. Throughout your program, that object is used by referring to that variable. All PNA objects can be assigned to a variable, and subsequently referred to, in this same manner.

The following example shows how to create the PNA Application object, as well as illustrate the general steps of get a handle to an object.

There are two steps in the process of getting a handle to analyzer objects:

1. Declaring a Variable
2. Assigning an Object to the Variable

1. Declaring a Variable

Note: The examples in these topics use the Visual Basic Programming Language. See the short section regarding Visual Basic syntax.

Use the Dim statement or one of the other declaration statements (Public, Private, or Static) to declare a variable.

The type of variable that refers to an object must be a Variant, an Object, or a specific type of object. Some programming languages, such as VBScript and Agilent VEE, do not allow you to specify variable types.

The following examples ALL declare the variable **pna**. Each subsequent statement is more specific than the previous:

- `Dim pna 'Variant data type.`
- `Dim pna As Object 'Object data type.`
- `Dim pna As AgilentPNA835x.Application ' Specific Application type`
- `Dim pna As AgilentPNA835x.IApplication ' Interface type`

1. If you use a variable without declaring it first, the data type of the variable is Variant. If you don't care about using automatic type checking, and willing to run code less efficiently, this method is very safe and is useable on all programming environments.
2. If you know the specific object type, and your programming environment allows it, you can declare the variable as an object.
3. Declaring a specific object type provides automatic type checking (Intellisense), faster code, and improved readability.
4. Declaring the interface is the most specific way and is beneficial when developing code for multiple firmware revisions. Learn more about Interfaces.

2. Assigning an Object to a Variable

To assign an object instance to a variable, use the **Set** keyword before the object variable that was declared previously. In the following line of code, we SET the current AgilentPNA835x Application to "pna".

```
Set pna = AgilentPNA835x.Application
```

As mentioned earlier, the AgilentPNA835x object is unique because it is the highest level of object in the PNA object model hierarcy. Therefore, we must use the **CreateObject** keyword with the (*classname,server name*) parameters.

- The ***classname*** for the analyzer object is always "AgilentPNA835x.Application".
- To find your analyzer's ***server name***, see View or change full computer name

The following statements create an instance of the Analyzer object.

```
Dim pna AS AgilentPNA835x.Application
Set pna = CreateObject("AgilentPNA835x.Application", "Analyzer46")
```

Note: These statements will start the PNA application if it is not already running on your instrument.

Navigating the Object Hierarchy

Once an instance of the PNA Application is "created", you access all of the PNA objects by navigating the object hierarchy. Navigating the object model hierarchy can be tricky. In addition, you also need to know how to refer to a specific instance of that object. For example, if you have three measurements present on the PNA, how do you refer to the channel 1 measurement? Each object on the PNA Object Model image is linked to an object page. At the top of each object page is a **Description** section and another called "**Accessing the ... Object".** These sections together explain how to navigate the PNA hierarchy to access a specific instance of that object.

From the previous discussion, you may think that you must always declare and assign variables to an object before setting or reading its properties. While this method is best for objects that you will continue to reuse, such as a measurement, it is not always necessary. You can also refer to an object directly.

The TriggerSetup object, which is a child of the Application object. Because we will only need to refer to this object once to set a couple of properties, and it is easy to access, we will refer to it directly. From the previous example, we already have a handle to the Application object in the variable **pna**. The following example uses Visual basic 'dot" notation to refer to the TriggerSetup object, and then the Scope property.

```
pna.TriggerSetup.Scope = naChannelTrigger
```

By referring to the TriggerSetup object directly, we must type the same path whenever we refer to properties on the TriggerSetup object. The following method assigns the pna.TriggerSetup object to a variable that can be reused.

```
Dim trig As Object
Set trig = pna.TriggerSetup
```

Once created, you can treat an object variable exactly the same as the object to which it refers. For example:

```
trig.Scope = naChannelTrigger
trig.Source = naTriggerSourceInternal
```

Getting a Handle to a Collection

The analyzer has several collections of objects which provide a convenient way of setting or reading all of the objects in the collection with a single procedure. Also, there are objects (limit lines for example) that can only be accessed through the collection.

To get a handle to an item in a collection, you can refer to the object by item number or sometimes by name. However, you first have to get a handle to the collection. To assign the collection to a variable, use the same two step process (1. declare the variable, 2. assign the variable using 'Set').

```
Dim meass As Measurements
```

```
Dim meas As Measurement
```

You can then iterate through the entire collection of measurements to read or set properties

```
Sub setFormat()
For Each meas In meass
meas.Format = naDataFormat_LinMag
Next
End Sub
```

Or you can read or set a property on an individual object in the collection:

```
meass(1).Format = naLinMag
```

Note: Each object and collection has its own unique way of dealing with item names, and numbers. Refer to the Analyzer Object Model for details.

Collections in the Analyzer

Collections are a gathering of similar objects. They are a convenience item used primarily to iterate through the like objects in order to change their settings. Collections generally provide the following generic methods and properties:

```
Item(n)
Count
Add(n)
Remove(n)
```

where **(n)** represents the number of the item in the collection. Some collections may have unique capabilities pertinent to the objects they collect.

[Other Topics about COM Concepts]

Collections are Dynamic

A collection does not exist until you ask for it. When you request a Channels object (see Getting a Handle to an Object / Collection), handles to each of the channel objects are gathered and placed in an array.

For example, if channels 2 and 4 are the only channels that exist, then the array will contain only 2 items. The command 'channels.Count' will return the number 2, and:

- Channels(1) will contain the channel 2 object.
- Channels(2) will contain the channel 4 object.

The ordering of objects within the collection should not be assumed. If you add a channel to the previous example, as in:

```
Pna.Channels.Add(3)
```

'channels.Count' will now return 3 and:

- Channels(1) will contain the channel 2 object.
- Channels(2) will contain the channel 3 object.
- Channels(3) will contain the channel 4 object.

Primarily, collections are useful for making this type of iteration possible:

```
Dim ch as Channel
For each ch in pna.Channels
  Print ch.Number
  Print ch.StartFrequency
  Print ch.StopFrequency
Next ch
```

As soon as this for-each block has been executed, the Channels object goes out of scope.

COM Data Types

The PNA uses several data types to communicate with the host computer. Before using a variable, it is best to declare the variable as the type of data it will store. It saves memory and is usually faster to access. The following are the most common data types:

- **Long Integer**
- **Single Precision (Real)**
- **Double Precision (Real)**
- **Boolean**
- **String**
- **Object**
- **Enumeration**
- **Variant**

Other Topics about COM Concepts

Long (long integer) variables are stored as signed 32-bit (4-byte) numbers ranging in value from -2,147,483,648 to 2,147,483,647.

Double (double-precision floating-point) variables are stored as IEEE 64-bit (8-byte) floating-point numbers ranging in value from -1.79769313486232E308 to -4.94065645841247E-324 for negative values and from 4.94065645841247E-324 to 1.79769313486232E308 for positive values.

Single (single-precision floating-point) variables are stored as IEEE 32-bit (4-byte) floating-point numbers, ranging in value from -3.402823E38 to -1.401298E-45 for negative values and from 1.401298E-45 to 3.402823E38 for positive values.

Boolean variables are stored as 16-bit (2-byte) numbers, but they can only be True or False. Use the keywords True and False to assign one of the two states to Boolean variables.

When other numeric types are converted to Boolean values, 0 becomes False and all other values become True. When Boolean values are converted to other data types, False becomes 0 and True becomes -1.

In PNA release 5.26, the following properties were changed to return True rather than 1 to conform with this definition. This change may affect the functionality of your COM program:

- Bandwidth Tracking Property
- ErrorCorrection Property
- IFGateEnable Property

- Interpolate Correction Property
- LimitTestFailed Property

String variables hold character information. A String variable can contain approximately 65,535 bytes (64K), is either fixed-length or variable-length, and contains one character per byte. Fixed-length strings are declared to be a specific length. Variable-length strings can be any length up to 64K, less a small amount of storage overhead.

Object variables are stored as 32-bit (4-byte) addresses that refer to objects within the analyzer or within some other application. A variable declared as Object is one that can subsequently be assigned (using the Set statement) to refer to any actual analyzer object.

Enumerations (Enum) are a set of named constant values. They allow the programmer to refer to a constant value by name instead of by number. For example:

```
Enum DaysOfWeek
  Sunday = 0
  Monday = 1
  Tuesday = 2
  Wednesday = 3
  Thursday = 4
  Friday = 5
  Saturday = 6
End Enum
```

Given this set of enumerations, the programmer can then pass a constant value as follows:

```
SetTheDay(Monday)
```

rather than

```
SetTheDay(1)
```

where the reader of the code has no idea what the value 1 refers to.

However, the analyzer RETURNS a long integer, not the text.

```
Day = DaysofWeek(today) 'Day = 1
```

Variant - If you don't declare a data type ("typed" data) the variable is given the Variant data type. The Variant data type is like a chameleon — it can represent many different data types in different situations.

The PNA provides and receives Variant data because there are programming languages that cannot send or receive "typed" data. Variant data transfers at a slower rate than "typed" data.

PNA Interfaces

A COM interface is the connection to an object. When you get a handle to an object, you are actually using an interface to an object. This subtle distinction is relevant to the COM programmer for the following two reasons:

- **Interface Inheritance (Coding for Multiple PNA Versions)**
- **Custom Interfaces.**

Other Topics about COM Concepts

Interface Inheritance (Coding for Multiple PNA Versions)

The PNA continues to evolve and release new firmware / software versions that provide more functionality and features. New commands are added to existing objects, and with them new interfaces are added to support those commands. For example, new commands were added to the Measurement object in PNA release 3.0. These commands are accessible from the new IMeasurement2 interface. This can be important if you develop code using the type library in release 3.0, and run the code on a PNA with an older release, such as 2.0

When you use a command that was new with release 3.0, and you run that code on a PNA with release 2.0 firmware, errors will occur because that PNA does not recognize the new commands. However, even if you do NOT utilize new commands, errors can still occur. The following example shows how this occurs and how to avoid it.

The following Visual Basic statement dimensions the **meas** variable as an object.

```
Dim meas As Measurement
```

When the program compiles, Visual Basic figures out what interface to use to access that object. When dimensioning as an object, VB will use the default interface. As new interfaces are added to an object, they become the default interface. If this program was developed and compiled using the PNA 3.0 type library, the default Interface of the Measurement Object was IMeasurement2. However, if this program is run on an instrument with PNA 2.0 firmware, there was no IMeasurement2 Interface, and an E_NOINTERFACE error will occur.

Therefore, the more robust approach would be to specify the interface instead of the object when declaring a variable.

```
Dim meas As IMeasurement
```

This code will ONLY use the IMeasurement interface; not the default interface.

However, regardless of how you declare a variable, errors will always occur if you use new commands, and run the code on an older instrument.

Custom Interfaces

The PNA object model contains three "custom" interfaces use "typed" variables, which is more efficient than using variant type variables. However, these interfaces are only usable from VB6, C, & C++. All other programming languages must use the other standard interfaces.

The custom interfaces are:

- IArrayTransfer - Measurement object
- ICalData - Calibrator object

- ISourcePowerCalData - Channel object

Working with Events

- What are Events?
- Using the Analyzer's Events
- Event ID's
- Filtering Events
- List of Events
- Out of Range Errors
- Troubleshooting Problems with Events

See Also

Events Example

Errors and the SCPIStringParser Object

Other Topics about COM Concepts

What are Events?

Windows applications work from user-initiated events such as mouse moves and mouse clicks. A mouse-click produces an event that the programmer can either ignore or "handle" by providing an appropriate subroutine like this:

```
Sub DoThis_onClick
 Perform something
End Sub
```

If this subroutine were in your program and the mouse-click event occurs on your PC, it would generate a "Callback" to the client and interrupt whatever it was doing and handle the event.

A more practical example of an event in the analyzer is Limit test. If limit test is on and the measurement fails, the analyzer produces a '"Limit-failed" event. If the measurement passed, the analyzer produces a "Limit-succeeded" event.

The Analyzer has a very sophisticated Event structure. Your program **CAN** be notified when one or more events occur. However, it may not be necessary.

For example, the analyzer has an event that will notify your program when a sweep is complete. A simpler alternative is to use a synchronous command which waits for the sweep to complete.

```
sync = True
app.ManualTrigger sync
chan.StartFrequency = 4.5E6
```

This would NOT work if you want the controller to do other things while waiting, like setup a power meter or sort some data. In this case you would like a "callback" from the analyzer to let your program know that the sweep has completed. For an example of this see Events Example.

Another reason to use events is when you want to be notified of several conditions when they occur, such as errors or source unlock conditions. It would not be practical to routinely poll these conditions while executing your program.

Using Events

If you decide to use the COM events to get a callback, your program must do two things:

1. Subscribe to events:

All events in the analyzer are a child of the Application object through the INetworkAnalyzerEvents Interface. You must tell the Application object that you are interested in receiving event callbacks. This process is called subscription.

In Visual Basic, this is done by including "WithEvents" in the declaration statement. The declaration below dimensions an Application object (myPNA) and subscribes to the events produced by the Application.

```
Dim WithEvents myPNA as AgilentPNA835x.Application
```

In C++, this is a bit more involved. You must queryInterface for the IconnectionPointContainer interface, locate the InetworkAnalyzerEvents interface via a call to FindConnectionPoint and call Advise().

2. Implement the Event Handler

When an event occurs, the Application object will "callback" to the client through the InetworkAnalyzerEvents interface.

In VB, click on the object window (upper left pane). Find the Application object and click it. The event interfaces will appear in the upper right pane. As you click on them, VB supplies the first line of code. You fill in the rest of the handler routine to service the event. The following is an example of a event handler subroutine.

Note: In C++, you must type the callback.

```
Private Sub OnChannelEvent( eventID as Variant, channelNumber as Variant)
Select Case (eventID)
 Case naEventID_CHANNEL_TRIGGER_COMPLETE:
  GetData( channelNumber )
 Case naEventID_CHANNEL_TRIGGER_ABORTED:
  MsgBox( "Hey don't touch the front panel!")
End Select
End Sub
```

When the trigger is complete, the application object "fires" the event by making a callback to the event handler `Sub` OnChannelEvent`( )`.

Event IDs

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Sev		**C**	**R**	**Facility**											**Code**																

Filtering Events

There are over 140 different events that you subscribe to when you "Dim WithEvents..." (or the equivalent in your programming language). Monitoring all of these conditions slows the speed of the analyzer significantly. The following methods allow you to filter the events so that you only monitor specific conditions.

- AllowEventMessage - monitor a specific event
- AllowAllEvents - monitor ALL events
- DisallowAllEvents - monitor NO events
- AllowEventCategory - monitor specific event categories (discussed later)
- AllowEventSeverity - monitor events having one or more of the following severity levels associated with them.

Code	Severity Enumeration
00	naEventSeveritySUCCESS - the operation completed successfully
01	naEventSeverityINFORMATIONAL - events that occur without impact on the measurement integrity
10	naEventSeverityWARNING - events that occur with potential impact on measurement integrity
11	naEventSeverityERROR - events that occur with serious impact on measurement integrity

List of Events

The following is a list of categories and the general types of events they include. Click the link view the event details.

Category Enumeration	Callback
naEventCategory_PARSER	OnSCPIEvent
naEventCategory_MEASURE	OnMeasurementEvent
naEventCategory_CHANNEL	OnChannelEvent
naEventCategory_HW	OnHardwareEvent
naEventCategory_CAL	OnCalEvent
naEventCategory_USER	OnUserEvent
naEventCategory_DISPLAY	OnDisplayEvent
naEventCategory_GENERAL	OnSystemEvent

Note: Use the MessageText Method to get a text message describing the event.

Out of Range Errors

When you attempt to set a value on an active function that is beyond the range (min or max) of the allowable values, the analyzer limits that value to an appropriate value (min or max) and sets the function to the limited value. From the front panel controls this is visually evident by the limited value in the edit box or by the annotation on the display. An example would be attempting to set the start frequency below 300kHz. The edit control doesn't allow the number to fall below 300kHz.

When the automation user programs a setting (such as start frequency below the allowable limits) the same behavior takes place. The analyzer accepts the limited value. However, in order to learn what setting took place, you have to read the HRESULT.

All automation calls return HRESULTs. By default the HRESULT returned when an overlimit occurs is S_NA_LIMIT_OUTOFRANGE. This value is a success code, meaning that bit 31 in this 32 value is 0. Programmers should check the return code from all automation calls to determine success or failure.

Some C++ macros (like SUCCEEDED(hr) or FAILED(hr)) only check bit 31. So if you are interested in trapping this outOfRange error you will have to check for S_NA_LIMIT_OUTOFRANGE explicity.

Alternatively, you can configure the analyzer to report outOfRange conditions with an error code. Use the method: App.SetFailOnOverRange (true). With this method set TRUE, any overrange error will return E_NA_LIMIT_OUTOFRANGE_ERROR.

This method is provided for the benefit of VB clients. VB users can't detect specific success codes because the VB runtime strips off the HRESULT and only raises a run time error if bit 31 is set, indicating a fail code.

Troubleshooting Problems with Callbacks

When you do callbacks, the client PC becomes the server and the analyzer (server) becomes the client. Callbacks can only take place when both server and client are in the same workgroup or in the same domain. See Configure for COM.

Read and Write Calibration Data using COM

Calibration data in the PNA is stored in Cal Sets. Learn more about Cal Sets

You can read or write two types of Calibration data:

- **Error Terms** - calculated data using standard measurement data and the algorithms for the specified cal type.
- **Standard Measurement data** -raw data resulting from the measurement of a calibration standard.

Each of these data are available in the PNA in either variant data or typed data. Learn more about variant and typed data

Other Topics about COM Concepts

Calibration / Cal Set Interfaces

There are several interfaces associated with Calibration.

ICalibrator

This interface is the original interface provided with the first version of the PNA. It provides remote access to the "Unguided" Calibration wizard. This interface can perform 1 and 2 port calibrations as well as response cals.

This interface can also read and write error terms from/to a Cal Set. However, ICalibrator is NOT recommended for this purpose. The ICalSet2 Interface is better suited for reading and writing error terms.

See a vbscript example of how to perform a 2-port Cal and read the cal data.

IGuidedCalibration

This interface provides the methods and properties used by the Guided Calibration wizard. With this interface you can perform multi-port calibrations (1 to 4 port cals), but no response cals.

ICalSet2 and ICalData3

These interfaces provide access to the Cal Set contents. You can read and write error terms with both of these interfaces.

- ICalSet2 uses Variant data, which means it is usable from vbscript.
- ICalData3 uses "typed" data, which means it can be used from any automation engine that can read the type library (VEE, VB, C++, etc.). Typed arguments (such as float or single) are more efficient than variants, so use the ICalData3 interface where better performance is needed.

See a vbscript example of how to read Cal Set data.

ICalSet3

This interface provides access to the stimulus attributes of the Cal data: frequency, power, number of points. These are the stimulus conditions under which the Cal Set was created.

Programming the PNA with C++

The programming information contained in this Help system is aimed at the Visual Basic programmer. VB does a lot of work for the programmer when it comes to managing and accessing components. Using a lower level language like C++ requires a more thorough understanding of the underlying tenets of COM. It is not the intent of this section to teach COM programming. The following is intended to acquaint you with some of the basic concepts you need to know in order to program against COM.

- Initializing COM
- Importing the Type Library
- Creating the Application Object
- Errors
- Events
- Additional Reading
- Example

Note: The information in this section assumes development on a Windows OS using Microsoft tools.

Other Topics about COM Concepts

Initializing COM

The first thing you must do before performing any COM transactions is to initialize the COM library. You can do this in a number of ways. The most basic of these is a call to **CoInitialize( )** or **CoIntializeEx( )**. Alternatively you can use the MFC (Microsoft Foundation Classes) **AfxOleInit( )**.

Conversely, before your program exits you must uninitialize COM. You can accomplish this with **CoUninitialize( )** or the MFC routine **AfxOleTerm( )**.

Importing the Type Library

To make a component available to the client, the server exports what is called the type library. For the PNA, this file is 835x.tlb. It is located on the PNA's hard drive at **C:\Program Files\ Agilent\ Network Analyzer\ Automation**. See Configure for COM-DCOM Programming.

The type library can be read and deciphered using another COM interface called ITypeLib. VB uses this interface to present, for example, its object browser. Visual C++ can also read type libraries. This is done by importing the type library into your project with a compiler directive:

```
#import "C:\Program Files\Common Files\Agilent\Pna\835x.tlb", named_guids
```

When you compile your program with this statement in it, the compiler creates two other files: **835x.tlh** and **835x.tli**. The first is a header file that contains the type definitions for the PNA's COM interfaces and their methods. The second file contains inline functions that wrap the PNA's interface methods. The wrappers are beneficial in that they contain error reporting for each of the method calls.

The .tlh file defines a smart pointer which you can use to access the PNA's objects. The smart pointer definition looks like this:

```
 _com_smartptr_typedef(Iapplication,  _uuidof(Iapplication))
```

A smart pointer is a term used for a C++ object that encapsulates a pointer used to refer to a COM object. All COM objects derive from the interface IUnknown. This interface has three methods: QueryInterface( ), AddRef( ), and Release( ). The function of the AddRef and Release methods is to maintain a reference count on the object and thus control the object's lifetime. Anytime you copy or create a reference to a COM object, you are responsible for incrementing its reference count. And likewise, when you are finished using that reference, it is your responsibility to Release it. Smart pointers do this work for you, as shown in the example program. In addition, smart pointers will also perform the QueryInterface call when required. QueryInterface is a method that requests a specific interface from an object. In the example program we gain access to the IArrayTransfer interface of the Measurement object. In the ReadMethod routine, we see this:

```
PTransferData = pMeas;
```

The assignment operator is overloaded for the smart pointer and in reality, this simple statement does this:

```
HRESULT hr = pMeas->QueryInterface( IID_IArrayTransfer,(void**)&pTransferData);
```

Using the existing interface pointer (pMeas) to the object, this call asks the object if it supports the IArrayTransfer interface, and if so to return a pointer to it in pTransferData. Smart pointer makes life easier for the C++ programmer. Read more about smart pointers in Microsoft Developer's Network Library *(MSDN).*

Creating the Application Object

The only createable object exported by the PNA is the Application object. Typically this would be done with a call to CoCreateInstance:

```
STDAPI CoCreateInstance(
  CLSID__IApplication, //Class identifier (CLSID) of the object
  NULL, //Pointer to controlling IUnknown
  CLS_CTX_SERVER, //Context for running executable code
  IID_IApplication, //Reference to the IID of the interface
  (void**)&pNA //Address of output variable that receives
  // the interface pointer requested in riid
);
```

With the smart pointer, this is taken care of with the following call:

```
IApplicationPtr pNA; // declare the smart pointer
pNA = IApplicationPtr("AgilentPNA835x.Application.1");
```

Errors

All COM method calls are required to return an HRESULT. This is 32 bit long with a specific format.

- The most significant bit indicates success(0) or failure(1).
- The lower 16 bits indicate the specific failure.

Visual Basic strips off the returned HRESULT and raises an error object for non-successful returns. The C++ programmer must himself be diligent about handling errors. You must check the return value of each COM call to ensure its success.

Events

The Application object sources the INetworkAnalyzerEvents interface. This object is the source for all events. To use events in C++, you must do two things:

1. Implement the INetworkAnalyzerEvents interface - derive an object from INetworkAnalyzerEvents and implement the methods described there.
2. Subscribe to the IconnectionPoint interface of the Application object. - obtain a pointer to the IConnectionPointContainer interface of the Application object and making the following request:

```
FindConnectionPoint( IID_InetworkAnalyzerEvents, &pConnection );
```

A successful call to this interface will return a valid pointer in pConnection. Use this pointer to subscribe to the Application object:

```
pConnect->Advise( IUnknown* punk, DWORD dwCookie);
```

This call provides the server object with a callback address. The Iunkown pointer in this call is the IUnkown pointer of the object that implements the INetworkAnalyzerEvents interface. This is the event sink. The application object needs a pointer to this object in order to call your interface when an event occurs. The **dwCookie** is your subscription key. Use it to unsubscribe (see Unadvise( )).

Additional Reading

"MSDN" - Microsoft Developer's Network Library

"Learning DCOM", by Thuan L. Thai, published by O'Reilly(1999)

"Inside COM", by Dale Rogerson, published by Microsoft Press (1997)

"Understanding ActiveX and OLE", by David Chappell, also published by Microsoft Press (1996)

"Beginning ATL COM Programming", published by Wrox Press (1998)

Example

The example uses the smart pointer created by Microsoft Visual Studio. The calls to CoInitialize and CoUninitialize open and close the COM libraries. In the example, notice that the pointers local to the main routine are explicitly released. When smart pointers go out of scope, they will perform this duty implicitly. However, we are calling CoUninitialize before they have the chance to be destroyed, so we are obliged to release them.

See the example program.

Using COM from .NET

To communicate with the PNA from Microsoft .NET enabled languages such as C# and Visual Basic.NET perform the following steps:

1. Configure your PC and PNA for COM-DCOM Programming.
2. Reference the type library within the development environment (see the following exception for managed C++ projects.) In the process of referencing the type library, a .NET assembly is created that wraps the PNA type library with a .NET friendly interface. This .NET assembly is called an Interop Assembly.

To run a .NET program on the PNA, you will need to install the .NET framework on the PNA. This can be done by running the dotnetfx.exe program, located at: http://www.microsoft.com/downloads/details.aspx?FamilyID=262d25e3-f589-4842-8157-034d1e7cf3a3&DisplayLang=en

If you only intend to run .NET programs on a remote computer, then it is not necessary to install the .NET framework on the PNA."

Exception for managed C++ projects: To generate the Interop Assembly for managed C++ projects, you must use the tlbimp.exe utility. This utility is described in the MSDN documentation. On your PC, click Start then Run then type: tlbimp.exe 835x.tlb and click OK. After doing this you can use the #using directive to include the Interop Assembly on managed C++ projects.

Registering the PNA Primary Interop Assembly (PIA) (OPTIONAL)

The PIA is NOT necessary to communicate with the PNA. The following procedure is useful only when there are two .NET programs that want to share the same PNA interface definitions. Without the PIA, each .NET application would use its own Interop Assembly.

To register the PIA on a machine, you need to have the common language runtime (CLR) installed. This is included with Visual Studio.NET. Then perform the following steps:

Note: In the following steps, replace <local directory> with the full path name of the specified file on your PC.

1. Run the PNAProxy.exe program as described in Configure for COM-DCOM Programming.
2. On the PNA, copy **C:\Program Files\Agilent\Network Analyzer\Automation\AgilentPNA835x.dll** to a local directory on your PC. Make a note of this directory.
3. On your PC, click **Start**, then **Run**, then type: **regasm** <local directory> **\AgilentPNA835x.dll** and click **OK** to register the dll.
4. Again, click **Start**, then **Run**, then type: **gacutil /i** <local directory> **\AgilentPNA835x.dll** and click **OK** to add the assembly to the Global Assembly Cache (GAC).

To **Uninstall the PIA**, perform the following:

1. On your PC, click **Start**, then **Run**, then type: **gacutil /u** <local directory> **\AgilentPNA835x.exe** and click **OK** to remove the assembly from the GAC.
2. On your PC, click **Start**, then **Run**, then type: **regasm /unregsiter** <local directory> **\ agilentpna835x.dll** and click **OK** to unregister the assembly.

3. To uninstall PNA Proxy.exe use the **Add/Remove Programs** utility in the control panel.

SCPI Command Tree

See Also

- Example Programs
- IEEE- 488.2 Common Commands
- Local Lockout
- New See Calibrating the PNA Using SCPI
- Synchronizing the PNA and Controller

ABORt	Stops all sweeps
+ CALCulate	Click to hide and show CALC branches
:CORRection	Electrical Delay and Phase Offset
:CUSTom	Custom measurements
:DATA	Sends and queries data.
:EQUation	Equation Editor
:FILTer	Time domain gating
:FORMat	Display format
:FSIMulator	Balanced measurements and Fixturing
:FUNCtion	Trace Statistics
:GCData	Read Gain compression data
:LIMit	Limit lines for pass / fail testing
:MARKer	Marker settings
:MATH	Math / Memory
:MIXer	X-axis display for FCA measurments
:NORMalize	Receiver power cal (Obsolete)
:OFFSet	Mag and Phase offset
:PARameter	Create and delete measurements
:RDATa?	Queries receiver data
:SMOothing	Point-to-point smoothing
:TRANsform	Time domain transform

CONTrol	Interface control and Rear-panel connector control.
DISPlay	Display settings
FORMat	Format for data transfer
HCOPy	Hardcopy printing
INITiate	Continuous or manual triggering
MMEMory	Saves and recalls instrument states
OUTPut	Turns RF power ON and OFF
ROUTe	Controls internal switch to reference receiver. (Opt 81)

+ SENSe Click to hide and show SENSe branches

:AVErage	Sweep Averaging
:BANDwidth	IF Bandwidth
:CORRection	Calibration and other correction settings
:COUPle	Chopped or Alternate sweep
:FOM	Frequency Offset (opt 080)
:FREQuency	Frequency sweep settings
:GCSetup	Gain Compression App (opt 086)
:IF	IF Access settings
:IF (PNA-X)	IF Access settings
:MIXer	FCA measurements (opts 082 and 83)
:MULTiplexer	Controls external test sets.
:NOISe (PNA-X)	Noise Figure (opt 029)
:PATH	Provides access to hardware configuration
:POWer	Receiver attenuation and overpower protection
:PULSe (PNA-X)	Configure internal pulse generators
:ROSCillator	Returns the source of the reference oscillator.
:SEGMent	Segment sweep settings.
:SWEep	Sweep types
:X:VALues	Returns X-axis values

SOURce	Source power to the DUT
SOURce:POWer:CORR	Source power Calibration
STATus	Reads the PNA status registers
SYSTem	Misc PNA capabilities
TRIGger	Trigger measurements

IEEE 488.2 Common Commands

See Also

- Example Programs
- Synchronizing the PNA and Controller
- SCPI Command Tree

---

*CLS - Clear Status

Clears the instrument status byte by emptying the error queue and clearing all event registers. Also cancels any preceding *OPC command or query. See Status Commands and Reading the Analyzer's Status Registers.

---

*ESE - Event Status Enable

Sets bits in the standard event status enable register. See Status Commands and Reading the Analyzer's Status Registers.

---

*ESE? - Event Status Enable Query

Returns the results of the standard event enable register. The register is cleared after reading it. See Status Commands and Reading the Analyzer's Status Registers.

---

*ESR - Event Status Enable Register

Reads and clears event status enable register. See Status Commands and Reading the Analyzer's Status Registers.

---

*IDN? - Identify

Returns a string that uniquely identifies the analyzer. The string is of the form "Agilent Technologies",<model number>,<serial "number>,<software revision>" .

Note: Beginning with Rev 6.01, this command now returns the software revision with 6 digits instead of 4. For example, A.06.01.02.

---

*OPC - Operation complete command

Generates the OPC message in the standard event status register when all pending overlapped operations have been completed (for example, a sweep, or a Default). See Understanding Command Synchronization.

---

*OPC? - Operation complete query

Returns an ASCII "+1" when all pending overlapped operations have been completed. See Understanding Command Synchronization

---

*OPT? - Identify Options Query

Returns a string identifying the analyzer option configuration.

---

*RST - Reset

Executes a device reset and cancels any pending *OPC command or query, exactly the same as a SYSTem:PRESet. The contents of the analyzer's non-volatile memory are not affected by this command.

---

*SRE - Service Request Enable

Before reading a status register, bits must be enabled. This command enables bits in the service request register. The current setting is saved in non-volatile memory. See Status Commands and Reading the Analyzer's Status Registers.

---

*SRE? - Service Request Enable Query

Reads the current state of the service request enable register. The register is cleared after reading it. The return value can be decoded using the table in Status Commands. See also Reading the Analyzer's

Status Registers.

---

*STB? - Status Byte Query

Reads the value of the instrument status byte. The register is cleared only when the registers feeding it are cleared. See Status Commands and Reading the Analyzer's Status Registers.

---

*TST? - Result of Self-test Query

Returns the result of a query of the analyzer hardward status. An **0** indicates no failures found. Any other value indicates one or more of the following conditions exist. The value returned is the Weight (or sum of the Weights) of the existing conditions. For example:

- If **4** is returned from *TST?, an **Overpower** condition exists.
- If **6** is returned, both **Unleveled** and **Overpower** conditions exists.

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
0	1	Phase Unlock	The source has lost phaselock. This could be caused by a reference channel open or a hardware failure.
1	2	Unleveled	The source power is unleveled. This could be a source is set for more power than it can deliver at the tuned frequency. Or it could be caused by a hardware failure.
2	4	Not used	
3	8	EE Write Failed	An attempted write to the EEPROM has failed. This is possibly caused by a hardware failure.
4	16	YIG Cal Failed	The analyzer was unable to calibrate the YIG. Either the phaselock has been lost or there has been a hardware failure.
5	32	Ramp Cal Failed	The analyzer was unable to calibrate the analog ramp generator due to a possible hardware failure.
6	64	Not used	

---

*WAI - Wait

Prohibits the instrument from executing any new commands until all pending overlapped commands have been completed. See Understanding Command Synchronization

About Triggering

Abort Command

ABORt

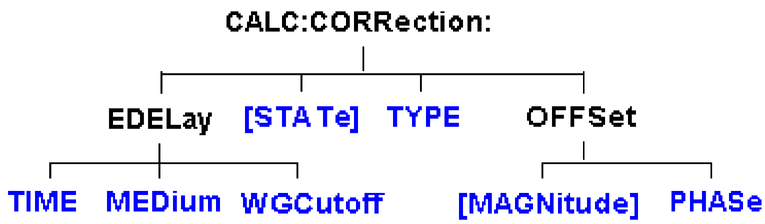
(Write-only) Stops all sweeps - then resume per current trigger settings. This command is the same as INITtiate:IMMediate (restart) except if a channel is performing a single sweep, ABORt will stop the sweep, but not initiate another sweep.

Learn about Synchronizing the PNA and Controller

Examples	`ABOR` `abort`
Query Syntax	Not applicable
Default	Not applicable

Calculate:Correction Commands

Controls error correction functions.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- New Calibrating the PNA Using SCPI
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:CORRection:EDELay:MEDium <char>

(Read-Write) Sets the media used when calculating the electrical delay.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<num>	Choose from: **COAX** for coaxial medium, **WAVE**guide for waveguide medium.
Examples	`CALC:CORR:EDEL:MED COAX` `calc3:corr:edelay:medium waveguide`
Query Syntax	CALCulate<cnum>:CORRection:EDELay:MEDium?
Return Type	Character
Default	**COAX**

CALCulate<cnum>:CORRection:EDELay:TIME <num>

(Read-Write) Sets the electrical delay for the selected measurement.
See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Electrical delay in seconds. Choose any number between**:** **-10.00** and **10.00** Use SENS:CORR:RVEL:COAX <num> to set Velocity factor. This parameter supports MIN and MAX as arguments. Learn more.
Examples	`CALC1:CORR:EDEL:TIME 1NS` `calculate2:correction:time 0.5e-12`
Query Syntax	CALCulate:CORRection:EDELay:TIME?
Return Type	Numeric
Default	0 seconds

CALCulate<cnum>:CORRection:EDELay:WGCutoff <num>

(Read-Write) Sets the waveguide cutoff frequency used when the electrical delay media is set to WAVEguide. (See CALCulate:CORRection:EDELay:MEDium <char>.)

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<num>	Waveguide cutoff frequency used with the electrical delay calculation. This parameter supports MIN and MAX as arguments. Learn more.

Examples	`CALC:CORR:EDEL:WGC 18.067 GHz`
	
	`calculate3:correction:edelay:wgcutoff 14.047 ghz`

Query Syntax	CALCulate<cnum>:CORRection:EDELay:WGCutoff?
Return Type	Numeric
Default	45 MHz

CALCulate<cnum>: CORRection:[STATe] <bool>

(Read-Write) Turns error correction ON or OFF for the selected measurement on the specified channel.

To turn error correction ON or OFF for a channel, use SENS:CORR:STATe.

See Critical Note

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<bool>	Correction state. Choose from: **0** - Correction OFF **1** - Correction ON
Examples	`CALC:CORR ON` `calculate:correction:state off`
Query Syntax	CALCulate<cnum>: CORRection: STATe?
Return Type	Boolean
Default	Not Applicable

CALCulate<cnum>:CORRection:TYPE <string>

(Read-Write) Sets the Cal Type for the selected measurement on the specified channel. This is used when a Cal Set is applied. Learn more about applying Cal Types.

- Use SENS:CORR:TYPE:CAT? to list the Cal Types in the PNA.
- Use SENS:CORR:CSET:TYPE:CAT? to list the Cal Types contained in the active Cal Set for the channel.
- Use SENS:CORR:COLL:METH to set the Cal type to perform a new calibration,

See Critical Note

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<string>	**(String)** Cal type. Case sensitive. Use one of the following:

For Full Calibrations:

This command does not distinguish between TRL and SOLT. The same number of error terms is applied for both Cal Types.

"Full n Port(x,y,z...)"

where

n = the number of ports to calibrate

x,y,z = the port numbers to calibrate

For example:

```
"Full 7 Port(2,3,4,5,6,7,8)"
```

For Response Calibrations:

"Response(param)" OR

"ResponseAndIsolation(param)"

Where param =

- S-parameter. For example"
  - `"Response(S21)"`
  - `"ResponseAndIsolation(A/R)"`
- Single or ratioed receivers using either logical receiver notation or physical receiver notation. For example:
  - `"Response(A)"`
  - `"ResponseAndIsolation(a3/b4)"`

For FCA Calibrations:

- "Scalar Mixer Cal"
- "SMC with NO Output Match Correction"
- "SMC with NO Input Match Correction"
- "SMC with NO Match Correction"
- "Vector Mixer Cal"
- "Characterize Mixer Only"

For Gain Compression Cal

where r = receive port; s = source port

- "GCA 2P (r,s)" - full 2-port cal
- "GCA Enh Resp (r,s)" - Enhanced Response Cal

Use a ClassID or GUID.

For example:

- CLSID - "VectorMixerCal.VCMCType"
- GUID - "{2061767B-0FE2-4F6F-86D0-9AB332B18DA5}"

Examples	`CALC:CORR:TYPE "Vector Mixer Cal"`
Query Syntax	CALCulate<cnum>:CORRection:TYPE?
Return Type	String
Default	Not Applicable

CALCulate<cnum>:CORRection:OFFSet[:MAGNitude] <num> Superseded

Note: This command is replaced with SENS:CORR:RPOWer:OFFSet[:AMPLitude].
To set data trace magnitude offset, use CALC:OFFS:MAGN
This command does NOT function for FCA measurements.

See an example of a Receiver Power Calibration.

(Read-Write)
For Receiver Power Calibration, specifies the power level to which the selected (unratioed) measurement data is to be adjusted. This command applies only when the selected measurement is of unratioed power.

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Cal power level in dBm. No limits are enforced on this value, but the PNA receivers themselves have maximum and minimum power specifications (that may differ between PNA models) which this value must comply with for a valid receiver power cal.
Examples	`CALC:CORR:OFFS 10DBM` `calculate1:correction:offset:magnitude maximum`

Query Syntax	CALCulate<cnum>:CORRection:OFFSet[:MAGNitude]?
Return Type	Numeric
Default	0dBm

CALCulate<cnum>:CORRection:OFFSet:PHASe <num>[<char>] Superseded

Note: This command is replaced with CALC:OFFS:PHASe

(Read-Write) Sets the phase offset for the selected measurement.

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Offset phase value. Choose any number between: **-360** and **360**
<char>	Units for phase. OPTIONAL. Choose either: **DEG** - Degrees (default) **RAD** - Radians
Examples	`CALC:CORR:OFFS:PHAS 10` `calculate:correction:offset:phase 20rad`
Query Syntax	CALCulate:CORRection:OFFSet:PHASe?
Return Type	Numeric, returned value always in degrees
Default	0 degrees

Last modified:

12-Feb-2008	Fixed typo
9/12/06	MQ Modified Calc:Corr for multiport.

Calculate:Custom Commands

Provides capability to create and modify the following measurements:

- Frequency Converter Application (opt 082 and 083)
- Noise Figure Application (opt 029) measurements
- Gain Compression Application (opt 086)

CALCulate:CUSTom:
DEFine
MODify

See Also

- Example Programs
- Synchronizing the PNA and Controller
- SCPI Command Tree

CALCulate<cnum>:CUSTom:DEFine <Mname>, <type> [,param]

(Write-only) Creates a custom measurement. The custom measurement is not automatically displayed. You must also do the following:

- Use DISP:WIND:STATe to create a window if it doesn't already exist.·
- Use DISP:WIND:TRAC:FEED to display the measurement
- Select the measurement (CALC:PAR:SEL) before making additional settings.

See an example using this command to create a VMC and SMC measurement

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1.
<Mname>	Name of the measurement. Any non-empty, unique string, enclosed in quotes.
<type>	String. The type of custom measurement. Choose from: • "Vector Mixer/Converter" • "Scalar Mixer/Converter" • "Noise Figure Cold Source" • "Gain Compression"

[param] String. Optional parameter specifies the measurement parameter to create.

ID	Measurement Name	Description
Vector Mixer/Converter	**"S11"** **"VC21"** **"S22"**	Learn about VMC parameters
Scalar Mixer/Converter	**"S11"** **"SC21"** **"SC12"** **"S22"** **"Ipwr"** **"RevIPwr"** **"Opwr"** **"RevOPwr"**	Learn about SMC parameters
Gain Compression Learn more	**"CompIn21"**	Input power at the compression point.
	"CompOut21"	Output power at the compression point.
	"CompGain21"	Gain at the compression point.
	"CompS11"	Input Match at the compression point
	"RefS21"	Linear Gain
	"DeltaGain21"	CompGain21 -Linear Gain
	"NF"	Noise figure
	"T-Eff"	Effective noise temperature.
	"DUTRNP"	DUT noise power ratio. (Noise power expressed in Kelvin divided by 290).
	"SYSRNP"	System noise power ratio

Noise Figure Cold Source [Learn more]	**"DUTNPD"**	DUT noise power density. (Noise power expressed in dBm/Hz).
	"SYSNPD"	System noise power density.
	"OvrRng"	Indication that the noise receiver is being over powered.
	"T-Rcvr"	Temperature reading (in Kelvin) of the noise receiver board.
	"S11", "S21", "S12", "S22"	Standard S-parameters; measured with the port1 and port2 noise switches set for noise mode.
	"A,1","A,2" ...and so forth	Unratioed parameters; with notation: "receiver, source port"

Examples

```
CALC:CUST:DEF 'My VC21', 'Vector Mixer/Converter','S22'
calculate2:custom:define 'MyNF', 'NoiseFigure', 'NF'
```

Query Syntax Not applicable

Overlapped? No

Default Not applicable

CALCulate<cnum>:CUSTom:MODify <param>

(Write-only) Changes the selected custom measurement to a different parameter.

See an example using this command for a VMC and SMC measurement

Parameters

<cnum>	Channel of the custom measurement to be changed. First, select the measurement using CALC:PAR:SEL.
<param>	Parameter to change the custom measurement to. Select a parameter that is valid for the type of measurement. Choose from the same arguments as Calc:Cust:Def.

Examples

```
SYST:PRES
CALC2:CUST:DEF 'My VC21', 'Vector Mixer/Converter'
CALC:PAR:SEL 'My VC21'
CALC2:CUST:MOD 'S22'
```

Query Syntax Not applicable

Overlapped? No

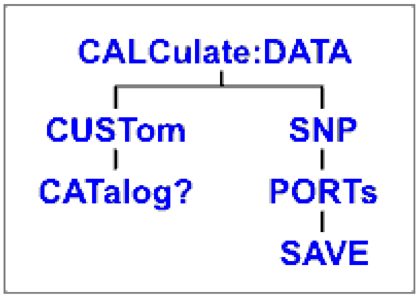
Default Not applicable

Last Modified:

23-Aug-2007 Added Noise and GC Arguments

Calculate:Data Commands

Controls writing and reading PNA measurement data.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Data Access Map
- Synchronizing the PNA and Controller
- To read receiver data, use CALC:RDATA?
- To read error terms, use SENS:CORR:CSET:DATA
- To read SnP measurement data, use CALC:DATA:SNP?
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

(Write) **CALCulate<cnum>:DATA <char>,<data>**

(Read) **CALCulate<cnum>:DATA? <char>**

Reads or writes Measurement data, Memory data, or Normalization Divisor data from the Data Access Map location.

- For Measurement data, use FDATA or SDATA
- For Memory data, use FMEM or SMEM. When querying memory, you must first store a trace into memory using CALC:MATH:MEMorize.
- For Normalization Divisor (Receiver Power Cal error term) data, use SDIV

- For write operations, data type depends on FORM:DATA command.

Note: The Calc:Data SCORR command to read / write error terms is **Superseded** with SENS:CORR:CSET:DATA. SCORR commands do NOT accommodate greater than 12 error terms.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.	
<char>	**FDATA**	Formatted **measurement** data to or from Data Access Map location **Display** (access point 2)**.** • Corrected data is returned when correction is ON. • Uncorrected data is returned when correction is OFF. • Returns TWO numbers per data point for Polar and Smith Chart format. • Returns one number per data point for all other formats. • Format of the read data is same as the displayed format.
	SDATA	Complex measurement data. **Writes** data to Data Access Map location **Raw Measurement** (access point 0). • When writing corrected data, and correction is ON, it will be corrected again, resulting in meaningless data. **Reads** data from **Apply Error Terms** (access point 1). • Returns TWO numbers per data point. • Corrected data is returned when correction is ON. • Uncorrected data is returned when correction is OFF.
	FMEM	Formatted memory data to or from Data Access Map location **Memory result** (access point 4). • Returns TWO numbers per data point for Polar and Smith Chart format. • Returns one number per data point for all other formats. • Format of the read data is same as the displayed format. • Returned data reflects the correction level (On|OFF) when the data was

stored into memory.

SMEM Complex measurement data to or from Data Access Map location **Memory** (access point 3).

- Returns TWO numbers per data point.
- Returned data reflects the correction level (On|OFF) when the data was stored into memory.
- Returned data reflects the correction level (On|OFF) when the data was stored into memory.

SDIV Complex data from Data Access Map location **Normalization (5)**.

- Returns TWO numbers per data point.
- If normalization interpolation is ON and the number of points changes after the initial normalization, the divisor data will then be interpolated.
- When querying the normalization divisor, you must first store a divisor trace using CALC:NORMalize[:IMMediate].

The following Calc:Data SCORR command to read / write error terms is **Superseded** with SENS:CORR:CSET:DATA. These SCORR commands do NOT accommodate greater than 12 error terms.

For 2-Port SOLT and TRL calibrations	**Specify this <char>**	**to get or put this Error Term...**
	SCORR1	Forward Directivity
	SCORR2	Forward Source Match
	SCORR3	Forward Reflection Tracking
	SCORR4	Forward Isolation
	SCORR5	Forward Load Match
	SCORR6	Forward Transmission Tracking
	SCORR7	Reverse Directivity
	SCORR8	Reverse Source Match
	SCORR9	Reverse Reflection Tracking
	SCORR10	Reverse Isolation
	SCORR11	Reverse Load Match
	SCORR12	Reverse Transmission Tracking

EXAMPLE

```
CALC:DATA FDATA,Data(x)
calculate2:data sdata,data(r,i)
```

See another example using this command.

Return Type: Block data

Default - Not Applicable

CALCulate<cnum>:DATA:CUSTom <name>,<data>

(Read-Write) Reads or writes data from a custom-named measurement buffer.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<name>	Name of the buffer to be read or written
<data>	Data to be read or written to the custom buffer. Format as one number per data point.
Examples	`CALC:DATA:CUST 'VectorResult0',0,1,2,3,4,5 'Write` `CALC:DATA:CUST? 'VectorResult0' 'Read`
Query Syntax	CALCulate:DATA:CUSTom? <name>
Return Type	Depends on Form:Data
Default	Not Applicable

CALCulate<cnum>:DATA:CUSTom:CATalog?

(Read-only) Reads the list of buffer names (comma separated list of string values) available from the selected parameter. Specify the measurement using CALCulate:PARameter:SELect.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
Examples	`CALC:DATA:CUST:CAT?` `calculate:data:custom:catalog?`
Return Type	String
Default	Not Applicable

CALCulate<cnum>:DATA:SNP? <n> Superseded

Note: This command has been replaced by CALC:DATA:SNP:PORTs?

(Read-only) Reads SnP data from the selected measurement. Learn more about SnP data.

Note: This command returns SNP data without header information, and in columns, not in rows as .SnP files. This means that the data returned from this command sends all frequency data, then all Sx1 magnitude data, then all Sx1 phase data, and so forth.

See Critical Note

Parameters

<cnum> Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.

<n> Amount of data to return. If unspecified, <n> is set to 2. The number you specify must be less than or equal to the number of available ports on the PNA.

Choose from:

1 (S1P) returns data for the active measurement.

2 (S2P) returns data for the 2 port parameters associated with the current measurement. Default.

3 (S3P) returns data for the 3 port parameters associated with the current measurement.

4 (S4P) returns data for the 4 port parameters associated with the current measurement.

SnP data can be output using several data formatting options. See MMEM:STORe:TRACe:FORMat:SNP.

See also MMEM:STOR <file>.<snp>

Examples

```
CALC:PAR:DEF “MyMeasurement”, S11

CALC:PAR:SEL “MyMeasurement”

CALC:DATA:SNP? 1
```

Return Type Depends on FORMat:DATA

Default Not Applicable

CALCulate<cnum>:DATA:SNP:PORTs? <"x,y,z".>

Note: This command replaces CALC:DATA:SNP?. This command is more explicit regarding the data to be returned, and works for PNAs with multiport test sets.

(Read-only) Reads SNP data from the selected measurement for the specified ports. Learn more about SnP data.

Note: This command returns SNP data without header information, and in columns, not in rows as .SnP files. This means that the data returned from this command sends all frequency data, then all Sx1 magnitude data, then all Sx1 phase data, and so forth.

See Critical Note

Parameters

<cnum> Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.

<"x,y,z"> Comma or space delimited port numbers for which data is requested, enclosed in quotes.

SnP data can be output using several data formatting options. See MMEM:STORe:TRACe:FORMat:SNP.

Examples

```
CALC:DATA:SNP:PORTs? "1,2,4,5,7" 'read data for these ports
```

Return Type Depends on FORMat:DATA

Default Not Applicable

CALCulate<cnum>:DATA:SNP:PORTs:SAVE <"x,y,z">,<filename>

Note: This command replaces MMEM:STOR sNp. This command is more explicit regarding the data to be saved, and works for PNAs with multiport test sets.

(Write-only) Saves sNp data from the selected measurement for the specified ports.

Learn more about SNP data.

See Critical Note

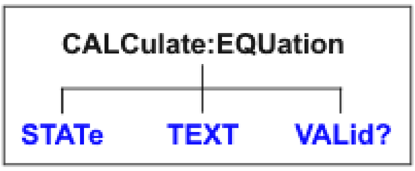
Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<"x,y,z">	**String** Comma or space delimited port numbers for which data is requested, enclosed in quotes.
<filename>	**String** Path, filename, and suffix of location to store the sNp data. The suffix is not checked for accuracy. If saving 2 ports, specify "filename.s2p"; If saving 4 ports, specify "filename.s4p.", and so forth. SnP data can be output using several data formatting options. See MMEM:STORe:TRACe:FORMat:SNP.
Examples	`CALC:DATA:SNP:PORTs:Save '1,2,4','C:/Program Files/Agilent/Network Analyzer/Documents/MyData.s3p'`
Return Type	Depends on FORMat:DATA
Default	Not Applicable

Last modified:

April 26, 2007	Added clarification to Calc:Data SDATA
9/18/06	MQ Added two SNP Ports commands for multiport

Calculate:Equation Commands

Controls Equation Editor capabilities.



Click on a blue keyword to view the command details.

See Also

- [Example Programs]
- [Learn about Equation Editor]
- [Synchronizing the PNA and Controller]
- [SCPI Command Tree]

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using [Calc:Par:Select]

CALCulate<cnum>:EQUation:STATe <bool>

(Read-Write) Turns ON and OFF the equation on selected measurement for the specified channel. If the equation is not valid, then processing is not performed. Use [CALC:EQUation:VALid?] to ensure that the equation is valid.

[See Critical Note]

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<bool>	**ON** (or 1) - turns equation ON. **OFF** (or 0) - turns equation OFF.
Examples	`CALC:EQU:STAT 1` `calculate2:equation:state 0`
Query Syntax	CALCulate<cnum>:EQUation:STATe?

Return Type Boolean

Default OFF (0)

CALCulate<cnum>:EQUation:TEXT <string>

(Read-Write) Specifies an equation or expression to be used on the selected measurement for the specified channel.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<string>	Any valid equation or expression. See Equation Editor.

Examples

```
'Equation (includes '=')

CALC:EQU:TEXT "foo=S11/S21"

'Expression
calculate2:equation:text "S11/S21"
```

Query Syntax CALCulate<cnum>:EQUation:TEXT?

Return Type String

Default Not Applicable

CALCulate<cnum>:EQUation:VALid?

(Read-Write) Returns a boolean value to indicate if the current equation on the selected measurement for the specified channel is valid. For equation processing to occur, the equation must be valid and ON (CALC:EQU:STAT 1).

See Critical Note

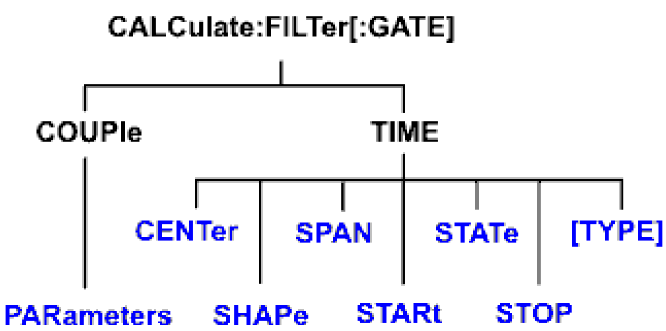
Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.

Examples	`CALC:EQU:VAL?`
	
	`calculate2:equation:valid?`

Return Type	Boolean 1 - equation is valid 0 - equation is NOT valid
Default	Not Applicable

Calculate:Filter Commands

Controls the gating function used in time domain measurements. The gated range is specified with either (start / stop) or (center / span) commands.



Click on a blue keyword to view the command details.

see Also

- Example Programs
- Learn about Gating
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:FILTer[:GATE]:COUPle:PARameters <num>

(Read-Write) Specifies the time domain gating parameters to be coupled. The settings for those parameters will be copied from the selected measurement to all other measurements on the channel.

- To enable Trace Coupling, use SENS:COUP:PAR
- To specify Transform parameters to couple, use CALC:TRAN:COUP:PAR

Learn more about Time Domain Trace Coupling

See Critical Note

Parameters

<cnum> Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.

<num> (Numeric) Parameters to couple. To specify more than one parameter, add the numbers.

1 - Gating Stimulus (Start, Stop, Center, and Span TIME settings.)

2 - Gating State (ON / OFF)

4 - Gating Shape (Minimum, Normal, Wide, and Maximum)

8 - Gating Type (Bandpass and Notch)

Examples

```
'To couple all parameters:

CALC:FILT:COUP:PAR 15

'To couple Stimulus and Type:
calculate2:filter:gate:couple:parameters 9
```

Query Syntax CALCulate<cnum>:FILTer:GATE:COUPle:PARameters?

Return Type Numeric

Default 13 (All parameters except **2** - Gating State)

CALCulate<cnum>:FILTer[:GATE]:TIME:CENTer <num>

(Read-Write) Sets the gate filter center time.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Center time in seconds; Choose any number between: ± (number of points-1) / frequency span **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:FILT:GATE:TIME:CENT -5 ns` `calculate2:filter:time:center maximum`
Query Syntax	CALCulate<cnum>:FILTer[:GATE]:TIME:CENTer?
Return Type	Numeric
Default	0

CALCulate<cnum>:FILTer[:GATE]:TIME:SHAPe <char>

(Read-Write) Sets the gating filter shape when in time domain.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	Choose from **MAXimum -** the widest gate filter available **WIDE -** **NORMal -** **MINimum -** the narrowest gate filter available
Examples	`CALC:FILT:GATE:TIME:SHAP MAX` `calculate2:filter:time:shape normal`
Query Syntax	CALCulate<cnum>:FILTer[:GATE]:TIME:SHAPe?
Return Type	Character
Default	NORMal

CALCulate<cnum>:FILTer[:GATE]:TIME:SPAN <num>

(Read-Write) Sets the gate filter span time.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Time span in seconds; Choose any number between: **0** and 2* [(number of points-1) / frequency span] **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:FILT:GATE:TIME:SPAN 5 ns` `calculate2:filter:time:span maximum`
Query Syntax	CALCulate<cnum>:FILTer[:GATE]:TIME:SPAN?
Return Type	Numeric
Default	20 ns

CALCulate<cnum>:FILTer[:GATE]:TIME:STATe <boolean>

(Read-Write) Turns gating state ON or OFF.

See Critical Note

Note: Sweep type must be set to LInear Frequency in order to use Transform Gating.

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<boolean>	**ON** (or 1) - turns gating ON. **OFF** (or 0) - turns gating OFF.
Examples	`CALC:FILT:TIME:STAT ON` `calculate2:filter:gate:time:state off`
Query Syntax	CALCulate<cnum>:FILTer[:GATE]:TIME:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

CALCulate<cnum>:FILTer[:GATE]:TIME:STARt <num>

(Read-Write) Sets the gate filter start time.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Start time in seconds; any number between: ± (number of points-1) / frequency span **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:FILT:TIME:STAR 1e-8` `calculate2:filter:gate:time:start minimum`
Query Syntax	CALCulate<cnum>:FILTer[:GATE]:TIME:STARt?
Return Type	Numeric
Default	10 ns

CALCulate<cnum>:FILTer[:GATE]:TIME:STOP <num>

(Read-Write) Sets the gate filter stop time.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Stop time in seconds; any number between: ± (number of points-1) / frequency span **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:FILT:TIME:STOP -1 ns` `calculate2:filter:gate:time:stop maximum`
Query Syntax	CALCulate<cnum>:FILTer[:GATE]:TIME:STOP?
Return Type	Numeric
Default	10 ns

CALCulate<cnum>:FILTer[:GATE]:TIME[:TYPE] <char>

(Read-Write) Sets the type of gate filter used.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	Choose from: **BPASs -** Includes (passes) the range between the start and stop times. **NOTCh** - Excludes (attenuates) the range between the start and stop times.
Examples	`CALC:FILT:TIME BPAS` `calculate2:filter:gate:time:type notch`
Query Syntax	CALCulate<cnum>:FILTer[:GATE]:TIME[:TYPE]?
Return Type	Character
Default	BPAS

Calculate:Format Command

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

See Also

- Example using this command.
- Learn About Data Format
- Synchronizing the PNA and Controller

CALCulate<cnum>:FORMat <char>

(Read-Write) Sets the display format for the measurement.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	Choose from:

- MLINear
- MLOGarithmic
- PHASe
- UPHase 'Unwrapped phase
- IMAGinary
- REAL
- POLar
- SMITh
- SADMittance 'Smith Admittance
- SWR
- GDELay 'Group Delay
- KELVin
- FAHRenheit
- CELSius

Examples

```
CALC:FORM MLIN
calculate2:format polar
```

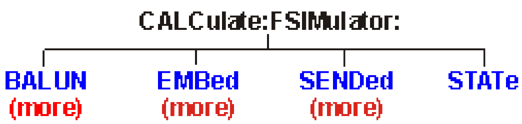
Query Syntax	CALCulate<cnum>:FORMat?
Return Type	Character
Default	MLINear

Last Modified:

1-Oct-2007	Added temperature formats

Calculate:FSimulator Commands

Specifies settings and fixturing for Balanced Measurements.



Click a **blue** keyword to view the command details.

See Also

- Example Programs
- SCPI Command Tree

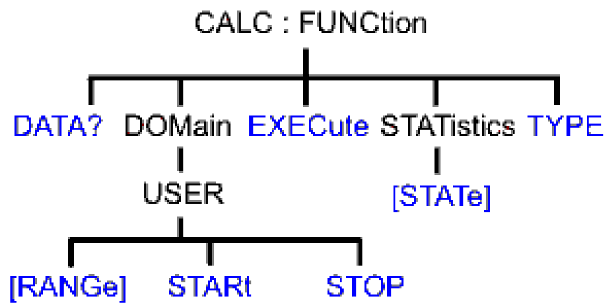
CALCulate<cnum>:FSIMulator:STATe <bool>

(Read-Write) Turns all three fixturing functions (de-embedding, port matching, impedance conversion) ON or OFF for all ports on the specified channel. Does not affect port extensions.

Note: This command affects ALL measurements on the specified channel.

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<bool>	Choose from: **ON or 1 -** Turns Fixturing ON **OFF or 0 -** Turns Fixturing OFF
Examples	`CALC:FSIM:STAT 1` `calculate2:fsimulator:state 0`
Query Syntax	CALCulate<cnum>:FSIMulator:STATe?
Return Type	Boolean
Default	OFF

Calculate:Function Commands



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Trace Statistics
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:FUNCtion:DATA?

(Read-only) Returns the trace statistic data for the selected statistic type for the specified channel. Select the type of statistic with CALC:FUNC:TYPE.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
Return Type	Depends on FORM:DATA
Example	`CALCulate2:FUNCtion:DATA?`
Default	Not applicable

CALCulate<cnum>:FUNCtion:DOMain:USER[:RANGe] <range>

(Read-Write) Sets the range used to calculate trace statistics. Each channel has 16 user ranges. The x-axis range is specified with the CALC:FUNC:DOM:USER:START and STOP commands.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<range>	Range number. Choose from: **0** to **16** **0** is Full Span of the current x-axis range **1 to 16** are user-specified ranges
Examples	`CALC:FUNC:DOM:USER 4` `calculate2:function:domain:user:range 0`
Query Syntax	CALCulate<cnum>:FUNCtion:DOMain:USER[:RANGe]?
Return Type	Numeric
Default	0 - Full Span

CALCulate<cnum>:FUNCtion:DOMain:USER:STARt <range>, <start>

(Read-Write) Sets the start of the specified user-domain range.

To apply this range, use CALC:FUNC:DOM:USER

To set the stop of the range, use CALC:FUNC:DOM:USER:STOP.

See Critical Note

Note: This command does the same as CALC:MARK:FUNC:DOM:USER:STAR

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<range>	Range number that will receive the start value. Choose an integer between **1** and **16**
<start>	Start value of the specified range. Choose a real number between: the analyzer's **Minimum** and **Maximum** x-axis value.
Examples	`CALC:FUNC:DOM:USER:STAR 1,1e9` `calculate2:function:domain:user:start 2,2e9`

Query Syntax	CALCulate<cnum>:FUNCtion:DOMain:USER:STARt? <range>
Return Type	Numeric
Default	The analyzer's **Minimum** x-axis value

CALCulate<cnum>:FUNCtion:DOMain:USER:STOP <range>, <stop>

(Read-Write) Sets the stop value of the specified user-domain range.

To apply this range, use CALC:FUNC:DOM:USER.

To set the start of the range, use CALC:FUNC:DOM:USER:START

See Critical Note

Note: This command does the same as CALC:MARK:FUNC:DOM:USER:STOP

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<range>	Range number that will receive the stop value. Choose an integer between **1** and **16**
<stop>	Stop value of the specified range. Choose a real number between: the analyzer's **Minimum** and **Maximum** x-axis value.
Examples	`CALC:FUNC:DOM:USER:STOP 4,5e9` `calculate2:function:domain:user:stop 3,8e9`
Query Syntax	CALCulate<cnum>:FUNCtion:DOMain:USER:STOP? <range>
Return Type	Numeric
Default	The analyzer's **Maximum** x-axis value

CALCulate<cnum>:FUNCtion:EXECute

(Write-only) For the active trace of specified channel, executes the statistical analysis specified by the CALC:FUNC:TYPE command.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
Examples	`CALC:FUNC:EXEC` `calculate2:function:execute`
Query Syntax	Not Applicable
Default	Not Applicable

CALCulate<cnum>:FUNCtion:STATistics[:STATe] <ON|OFF>

(Read-Write) Displays and hides the trace statistics (peak-to-peak, mean, standard deviation) on the screen.

The analyzer will display either measurement statistics or Filter Bandwidth statistics; not both.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON|OFF>	ON - Displays trace statistics OFF - Hides trace statistics
Examples	`CALC:FUNC:STAT ON` `calculate2:function:statistics:state off`
Query Syntax	CALCulate<cnum>:FUNCtion:STATistics[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF (0)

CALCulate<cnum>:FUNCtion:TYPE <char>

(Read-Write) Sets statistic TYPE that you can then query using CALC:FUNCtion:DATA?.

Note: In PNA releases 4.2 and prior, this command applied the statistic type to all measurements. Now, this command affects only the selected measurement on the specified channel.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	Choose from: **PTPeak** - the difference between the max and min data points on the trace. **STDEV** - standard deviation of all data points on the trace **MEAN -** mean (average) of all data points on the trace **MIN** - lowest data point on the trace **MAX** - highest data point on the trace
Examples	`CALC:FUNC:TYPE PTP` `calculate2:function:type stdev`
Query Syntax	CALCulate<cnum>:FUNCtion:TYPE?
Return Type	Character
Default	PTPeak

Calc:GCDate Commands

Reads 2-dimensional Gain Compression data.

CALCulate:GCData:
DATA
IMAG
REAL

Click on a blue keyword to view the command details.

Other Gain Compression commands

The calibration commands listed in this topic are supplemental to the Guided Cal commands. See an example: **?????**

- CALC:CUSTom:DEFine - creates a gain compression measurement.
- SENS:GCSetup - Most Gain Compression settings.
- Calibrate a GCA measurement
- Gain compression data can also be saved to a *.csv file. Learn how.

See Also

- Example Programs
- Learn about Gain Compression Application
- Synchronizing the PNA and Controller
- SCPI Command Tree

CALCulate<ch>:GCData:DATA? <param>

(Read-Only) Returns measurement data at all frequency and power data points for the current Gain Compression channel.

The format of the data is the same as the format of the measurement that you select using Calc:Par:Select. If the measurement is scalar, than one number is returned per data point. If complex (such as Smith Chart format) than both real and imaginary numbers are returned.

If correction is on, corrected data are returned. Otherwise, raw data are returned.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<param>	(String) Parameter to read. NOT Case-sensitive. The specified parameter need NOT be displayed or selected. Choose from: • **"pin"** - input power at specified compression level. • **"pout"** - output power at specified compression level. • **"gain"** - device gain (S21) at specified compression level. • **"inputmatch"** - input match (S11)at specified compression level.
Examples	`data = CALC:GCD:DATA? "pin"` `data = calculate:gcdata:data? "pout"`
Return Type	Array of data
Default	Not Applicable

CALCulate<ch>:GCData:IMAG? <char>, <dpoint>, <param>

(Read-Only) Returns the imaginary part of the specified Gain Compression data. If correction is on, corrected data are returned. Otherwise, raw data are returned.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<char>	Choose from: • **FREQuency** - for the specified frequency data point, returns all of the measured data for each power stimulus. • **POWer** - for the specified power data point, returns all of the measured data for each frequency stimulus.
<dPoint>	Data point (FREQ or POWer) for which data is returned.
<param>	**(**String) Parameter to read. NOT Case-sensitive. The specified parameter need NOT be displayed. • **"pin"** - input power at each data point. • **"pout"** - output power at each data point. • **"gain"** - device gain (S21) at each data point. • **"inputmatch"** - input match (S11) at each data point.

Examples	For the fifth frequency data point, returns 'Power Output' imaginary (phase) data from all power stimulus values. If there are 30 power sweep points, 30 values are returned.
	`data = CALC:GCD:IMAG? FREQ,5,"pout"`
	For the 30th stimulus power data point, returns 'Power Output' imaginary (phase) data from all frequency stimulus values. If there are 201 power sweep points, 201 values are returned.
	`data = calculate:gcdata:imag? power,30,"pout"`

Return Type	Array of data
Default	Not Applicable

CALCulate<ch>:GCData:REAL? <char>, <dpoint>, <param>

(Read-Only) Returns the real part of the specified Gain Compression data. If correction is on, corrected data are returned. Otherwise, raw data are returned.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<char>	Choose from: • **FREQuency** - for the specified frequency data point, returns all of the measured data for each power stimulus. • **POWer** - for the specified power data point, returns all of the measured data for each frequency stimulus.
<dPoint>	Data point (FREQ or POWer) for which data is returned.
<param>	(String) Parameter to read. NOT Case-sensitive. The specified parameter need NOT be displayed. • **"pin"** - input power at each data point. • **"pout"** - output power at each data point. • **"gain"** - device gain (S21) at each data point. • **"inputmatch"** - input match (S11) at each data point.

Examples	For the fifth frequency data point, returns 'Power Output' real data from all power stimulus values. If there are 30 power sweep points, 30 values are returned.
	`data = CALC:GCD:REAL? FREQ,5,"pout"`
	For the 30th stimulus power data point, returns 'Power Output' real data from all frequency stimulus values. If there are 201 power sweep points, 201 values are returned.
	`data = calculate:gcdata:real? power,30,"pout"`

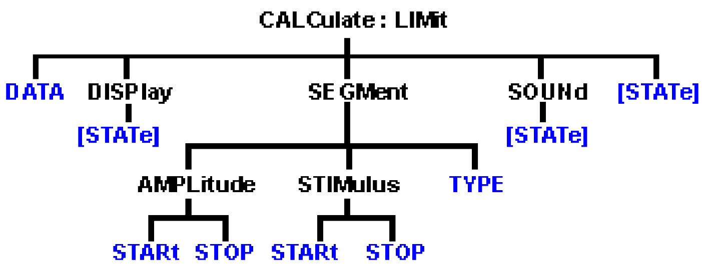
Return Type	Array of data
Default	Not Applicable

Last Modified:

18-Oct-2007 MX New topic

Calc:Limit Commands

Controls the limit segments used for pass / fail testing.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Limit Lines
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:LIMit:DATA <block>

(Read-Write) Sets data for limit segments.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<block>	Data for all limit segments in REAL,64 format. The following is the data format for 1 segment: **Type,BegStim, EndStim, BegResp,EndResp**

Type	Type of limit segment. Choose from 0 - Off 1 - Max 2 - Min
BegStim	Start of X-axis value (freq, power, time)
EndStim	End of X-axis value
BegResp	Y-axis value that corresponds with Start of X-axis value
EndResp	Y-axis value that corresponds with End of X-axis value

Examples

The following writes three max limit segments for a bandpass filter.

```
"CALC:LIM:DATA 1,3e5,4e9,-60,0,1,4e9,7.5e9,0,0,1,7.5e9,9e9,0,-30"
```

Query Syntax CALCulate<cnum>:LIMit:DATA?

Return Type Depends on FORM:DATA - All 100 predefined limit segments are returned.

Default 100 limit segments - all values set to 0

CALCulate<cnum>:LIMit:DISPlay[:STATe] <ON | OFF>

(Read-Write) Turns the display of limit segments ON or OFF (if the data trace is turned ON).

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON | OFF>	**ON** (or 1) - turns the display of limit segments ON. **OFF** (or 0) - turns the display of limit segments OFF.

Examples

```
CALC:LIM:DISP:STAT ON
calculate2:limit:display:state off
```

Query Syntax CALCulate<cnum>:LIMit:DISPlay[:STATe]?

Return Type Boolean (1 = ON, 0 = OFF)

Default ON

CALCulate<cnum>:LIMit:SEGMent<snum>AMPLitude:STARt <num>

(Read-Write) Sets the start (beginning) of the Y-axis amplitude (response) value.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<snum>	Segment number; if unspecified, value is set to 1.
<num>	Choose any number between: **-500** and **500** Display value is limited to the Maximum and Minimum displayed Y-axis values.
Examples	`CALC:LIM:SEGM1:AMPL:STAR 10` `calculate2:limit:segment2:amplitude:start 10`
Query Syntax	CALCulate<cnum>:LIMit:SEGMent<snum>AMPLitude:STARt?
Return Type	Numeric
Default	0

CALCulate<cnum>:LIMit:SEGMent<snum>AMPLitude:STOP <num>

(Read-Write) Sets the stop (end) of the Y-axis amplitude (response) value.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<snum>	Segment number; if unspecified, value is set to 1.
<num>	Choose any number between: **-500** and **500** Display value is limited to the Maximum and Minimum displayed Y-axis values.
Examples	`CALC:LIM:SEGM1:AMPL:STOP 10` `calculate2:limit:segment2:amplitude:stop 10`
Query Syntax	CALCulate<cnum>:LIMit:SEGMent<snum>AMPLitude:STOP?
Return Type	Numeric
Default	0

CALCulate<cnum>:LIMit:SEGMent<snum>STIMulus:STARt <num>

(Read-Write) Sets the start (beginning) of the X-axis stimulus value.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<snum>	Segment number; if unspecified, value is set to 1.
<num>	Choose any number within the X-axis span of the analyzer.
Examples	`CALC:LIM:SEGM1:STIM:STAR 10` `calculate2:limit:segment2:stimulus:start 10`
Query Syntax	CALCulate<cnum>:LIMit:SEGMent<snum>STIMulus:STARt?
Return Type	Numeric
Default	0

CALCulate<cnum>:LIMit:SEGMent<snum>STIMulus:STOP <num>

(Read-Write) Sets the stop (end) of the X-axis stimulus value.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<snum>	Segment number; if unspecified, value is set to 1.
<num>	Choose any number within the X-axis span of the analyzer.
Examples	`CALC:LIM:SEGM1:AMPL:STOP 10` `calculate2:limit:segment2:stimulus:stop 10`
Query Syntax	CALCulate<cnum>:LIMit:SEGMent<snum>STIMulus:STOP?
Return Type	Numeric
Default	0

CALCulate<cnum>:LIMit:SEGMent<snum>:TYPE <char>

(Read-Write) Sets the type of limit segment.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<snum>	Segment number. Choose any number between: **1** and **100** If unspecified, value is set to 1.
<char>	Choose from: **LMAX** - a MAX limit segment. Any response data exceeding the MAX value will fail. **LMIN** - a MIN limit segment. Any response data below the MIN value will fail. **OFF** - the limit segment (display and testing) is turned OFF.
Examples	`CALC:LIM:SEGM:TYPE LMIN` `calculate2:limit:segment3:type lmax`
Query Syntax	CALCulate<cnum>:LIMit:SEGMent<snum>:TYPE?
Return Type	Character
Default	OFF

CALCulate<cnum>:LIMit:SOUNd[:STATe] <ON | OFF>

(Read-Write) Turns limit testing fail sound ON or OFF.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON | OFF>	**ON** (or 1) - turns sound ON. **OFF** (or 0) - turns sound OFF.
Examples	`CALC:LIM:SOUN ON` `calculate2:limit:sound:state off`
Query Syntax	CALCulate<cnum>:LIMit:SOUNd[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

CALCulate<cnum>:LIMit:STATe <ON | OFF>

(Read-Write) Turns limit segment **testing** ON or OFF.

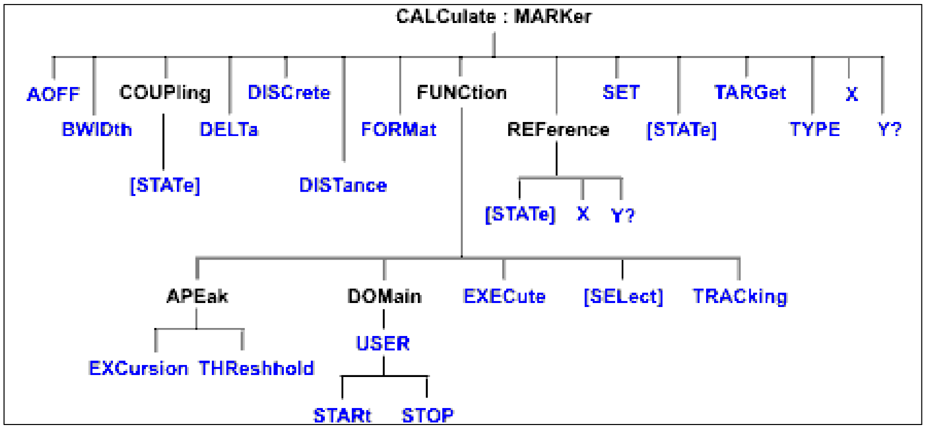
- Use CALC:LIM:DISP to turn ON and OFF the **display** of limit segments.
- If using Global Pass/Fail status, trigger the PNA AFTER turning Limit testing ON.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON | OFF>	**ON** (or 1) - turns limit testing ON. **OFF** (or 0) - turns limit testing OFF.
Examples	`CALC:LIM:STAT ON` `calculate2:limit:state off`
Query Syntax	CALCulate<cnum>:LIMit:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

Calculate:Marker Commands

Controls the marker settings used to remotely output specific data to the computer.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- See Marker Readout number and size commands.
- Learn about Markers
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

Note: The Reference Marker is Marker Number 10

CALCulate<cnum>:MARKer:AOFF

(Write-only) Turns all markers off for selected measurement.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
Examples	`CALC:MARK:AOFF` `calculate2:marker:aoff`
Query Syntax	Not applicable
Default	Not applicable

CALCulate<cnum>:MARKer:BWIDth <num>

(Read-Write) Turns on and sets markers 1 through 4 to calculate filter bandwidth. The <num> parameter sets the value below the maximum bandwidth peak that establishes the bandwidth of a filter. For example, if you want to determine the filter bandwidth 3 db below the bandpass peak value, set <num> to -3.

This feature activates markers 1 through 4. To turn off these markers, either turn them off individually or turn them All Off.

The analyzer screen will show either Bandwidth statistics OR Trace statistics; not both.

To search a User Range with the bandwidth search, first activate marker 1 and set the desired User Range. Then send the CALC:MARK:BWID command. The user range used with bandwidth search only applies to marker 1 searching for the max value. The other markers may fall outside the user range.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Target value below filter peak. Choose any number between :**-500** and **500**
Examples	`CALC:MARK:BWID -3` `calculate2:marker:bwidth -2.513`
Query Syntax	CALCulate<cnum>:MARKer:BWIDth? Returns the results of bandwith search:

Return Type Numeric - Four Character values separated by commas: bandwidth, center Frequency, Q, loss.

Default -3

CALCulate<cnum>:MARKer<mkr>:COUPling[:STATe]<ON|OFF>

(Read-Write) Sets and Reads the state of Coupled Markers (ON and OFF)

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any existing marker number from 1 to 10; if unspecified, value is set to 1.
<ON|OFF>	**False (0**) - Turns Coupled Markers OFF **True (1)** - Turns Coupled Markers ON

Examples

```
CALC:MARK:COUP ON
calculate2:marker8:coupling off
```

Query Syntax CALCulate<cnum>:MARKer<mkr>:COUPling:[STATe]?

Return Type Boolean (1 = ON, 0 = OFF)

Default OFF

CALCulate<cnum>:MARKer<mkr>:DELTa <ON|OFF>

(Read-Write) Specifies whether marker is relative to the Reference marker or absolute.

Note: The reference marker must already be turned ON with CALC:MARK:REF:STATE.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any existing marker number from 1 to 10; if unspecified, value is set to 1.
<ON|OFF>	**ON** (or 1) - Specified marker is a Delta marker **OFF** (or 0) - Specified marker is an ABSOLUTE marker
Examples	`CALC:MARK:DELT ON` `calculate2:marker8:delta off`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:DELTa?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

CALCulate<cnum>:MARKer<mkr>:DISCrete <ON|OFF>

(Read-Write) Makes the specified marker display either a calculated value between data points (interpolated data) or the actual data points (discrete data).

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any existing marker number from 1 to 10; if unspecified, value is set to 1.
<ON|OFF>	**ON** (or 1) - Specified marker displays the actual data points **OFF** (or 0) - Specified marker displays calculated data between the actual data points.
Examples	`CALC:MARK:DISC ON` `calculate2:marker8:discrete off`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:DISCrete?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

CALCulate<cnum>:MARKer<mkr>:DISTance <num>

(Read-Write) Set or query marker distance on a time domain trace.

The Write command moves the marker to the specified distance value. Once moved, you can read the Y axis value or read the X-axis time value. (Distance is calculated from the X-axis time value.)

The Read command reads the distance of the marker.

If the marker is set as delta, the WRITE and READ data is relative to the reference marker.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any existing marker number from 1 to 10; if unspecified, value is set to 1.
<num>	Marker distance in the unit of measure specified with CALC:TRAN:TIME:MARK:UNIT
Examples	`CALC:MARK:DIST .1` `calculate2:marker8:distance 5`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:DISTance?
Return Type	Numeric
Default	Not Applicable

CALCulate<cnum>:MARKer<mkr>:FORMat <char>

(Read-Write) Sets the format of the data that will be returned in a marker data query CALC:MARK:Y? and the displayed value of the marker readout. The selection does not have to be the same as the measurement's display format.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1
<char>	Choose from: **DEFault** - The format of the selected measurement

MLINear - Linear magnitude

MLOGarithmic - Logarithmic magnitude

IMPedance - (R+jX)

ADMittance - (G+jB)

PHASe - Phase

IMAGinary - Imaginary part (Im)

REAL - Real part (Re)

POLar - (Re, Im)

GDELay - Group Delay

LINPhase - Linear Magnitude and Phase

LOGPhase - Log Magnitude and Phase

KELVin - temperature

FAHRenheit - temperature

CELSius - - temperature

Examples	`CALC:MARK:FORMat MLIN` `calculate2:marker8:format Character`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:FORMat?
Return Type	Character
Default	DEFault

CALCulate<cnum>:MARKer<mkr>:FUNCtion:APEak:EXCursion <num>

(Read-Write) Sets amplitude peak excursion for the specified marker. The Excursion value determines what is considered a "peak". This command applies to marker peak searches (Next peak, Peak Right, Peak Left).

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any existing marker number from 1 to 10; if unspecified, value is set to 1.
<num>	Excursion value. Choose any number between **-500** and **500.**
	Note: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:MARK:FUNC:APE:EXC 10` `calculate2:marker8:function:apeak:excursion maximum`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:FUNCtion:APEak:EXCursion?
Return Type	Numeric
Default	3

CALCulate<cnum>:MARKer<mkr>:FUNCtion:APEak:THReshold <num>

(Read-Write) Sets peak threshold for the specified marker. If a peak (using the criteria set with :EXCursion) is below this reference value, it will not be considered when searching for peaks. This command applies to marker peak searches (Next peak, Peak Right, Peak Left).

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1
<num>	Threshold value.Choose any number between **-500** and **500.**
	Note: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:MARK:FUNC:APE:THR -40` `calculate2:marker8:function:apeak:threshold -55`

Query Syntax	CALCulate<cnum>:MARKer<mkr>:FUNCtion:APEak:THReshold?
Return Type	Numeric
Default	-100

CALCulate<cnum>:MARKer<mkr>:FUNCtion:DOMain:USER <range>

(Read-Write) Assigns the specified marker to a range number. The x-axis travel of the marker is constrained to the range's span. The span is specified with the CALC:MARK:FUNC:DOM:USER:START and STOP commands, unless range 0 is specified which is the full span of the analyzer.

Each channel has **16** user ranges. (Trace statistics use the same ranges.) More than one marker can use a domain range.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1
<span>	User span. Choose any Integer from **0 to 16** **0** is Full Span of the analyzer **1 to 16** are available for user-defined x-axis span
Examples	`CALC:MARK:FUNC:DOM:USER 1` `calculate2:marker8:function:domain:user 1`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:FUNCtion:DOMain:USER? Returns the user span number that the specified marker is assigned to.
Return Type	Numeric
Default	0 - Full Span

CALCulate<cnum>:MARKer<mkr>:FUNCtion:DOMain:USER:STARt <start>

(Read-Write) Sets the start of the span that the specified marker's x-axis span will be constrained to.

Use CALC:MARK:FUNC:DOM:USER<range> to set range number

Use CALC:MARK:FUNC:DOM:USER:STOP to set the stop value.

Note: If the marker is assigned to range 0 (full span), the USER:STARt and STOP commands generate an error. You cannot set the STARt and STOP values for "Full Span".

Note: This command does the same as CALC:FUNC:DOM:USER:STAR

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1
<start>	The analyzer's **Minimum** x-axis value
Examples	`CALC:MARK:FUNC:DOM:USER:START 500E6` `calculate2:marker8:function:domain:user:start 1e12`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:FUNCtion:DOMain:USER:STARt?
Return Type	Numeric
Default	The analyzer's **Minimum** x-axis value

CALCulate<cnum>:MARKer<mkr>:FUNCtion:DOMain:USER:STOP <stop>

(Read-Write) Sets the stop of the span that the marker's x-axis travel will be constrained to.

Use CALC:MARK:FUNC:DOM:USER<range> to set range number

Use CALC:MARK:FUNC:DOM:USER:STARt to set the stop value.

Note: If the marker is assigned to range 0 (full span), the USER:STARt and STOP commands generate an error. You cannot set the STARt and STOP values for "Full Span".

Note: This command does the same as CALC:FUNC:DOM:USER:STOP

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1.
<stop>	Stop value of x-axis span; Choose any number between the analyzer's **MINimum** and **MAXimum** x-axis value.
Examples	`CALC:MARK:FUNC:DOM:USER:STOP 500e6` `calculate2:marker8:function:domain1:user:stop 1e12`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:FUNCtion:DOMain:USER:STOP?
Return Type	Numeric
Default	The analyzer's **MAXimum** x-axis value.

CALCulate<cnum>:MARKer<mkr>:FUNCtion:EXECute [<func>]

(Write-only) Immediately executes (performs) the specified search function. If no function is specified, executes the selected function. Select the function with CALC:MARK:FUNCtion:SEL.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1.
<func>	Optional argument. The function that is to be performed. Choose from:

- **MAXimum** - finds the highest value
- **MINimum** - finds the lowest value
- **RPEak** - finds the next valid peak to the right
- **LPEak -** finds the next valid peak to the left
- **NPEak** - finds the next highest value among the valid peaks
- **TARGet** - finds the target value to the right, wraps around to the left
- **LTARget** - finds the next target value to the left of the marker
- **RTARget** - finds the next target value to the right of the marker

Examples	`CALC:MARK:FUNC:EXEC` `calculate2:marker2:function:execute maximum`
Query Syntax	Not applicable
Default	Not applicable

CALCulate<cnum>:MARKer<mkr>:FUNCtion[:SELect] <char>

(Read-Write) Sets the search function that the specified marker will perform when executed. To execute (or perform) the function, use:
CALC:MARK:FUNC:EXEC **or**
CALC:MARK:FUNC:TRAC ON to automatically execute the search every sweep.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1.
<char>	Marker function. Choose from:

- **MAXimum** - finds the highest value
- **MINimum** - finds the lowest value
- **RPEak** - finds the next valid peak to the right
- **LPEak -** finds the next valid peak to the left
- **NPEak** - finds the next highest value among the valid peaks
- **TARGet** - finds the target value to the right, wraps around to the left
- **LTARget** - finds the next target value to the left of the marker
- **RTARget** - finds the next target value to the right of the marker

Examples	`CALC:MARK:FUNC MAX` `calculate2:marker8:function:select ltarget`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:FUNCtion[:SELect]?
Return Type	Character
Default	MAX

CALCulate<cnum>:MARKer<mkr>:TARGet <num>

(Read-Write) Sets the target value for the specified marker when doing Target Searches with CALC:MARK:FUNC:SEL <TARGet | RTARget | LTARget>

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1.
<num>	Target value to search for; Units are NOT allowed.
Examples	`CALC:MARK:TARG 2.5` `calculate2:marker8:target -10.3`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:TARGet?
Return Type	Numeric
Default	0

CALCulate<cnum>:MARKer<mkr>:FUNCtion:TRACking <ON | OFF>

(Read-Write) Sets the tracking capability for the specified marker. The tracking function finds the selected search function every sweep. In effect, turning Tracking ON is the same as doing a CALC:MARK:FUNC:EXECute command every sweep.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1.
<ON | OFF>	**ON** (or 1) - The specified marker will "Track" (find) the selected function every sweep. **OFF** (or 0) - The specified marker will find the selected function **only** when the CALC:MARK:FUNC:EXECute command is sent.
Examples	`CALC:MARK:FUNC:TRAC ON` `calculate2:marker8:function:tracking off`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:FUNCtion:TRACking?

Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

CALCulate<cnum>:MARKer:REFerence[:STATe] <ON | OFF>

(Read-Write) Turns the reference marker (marker 10) ON or OFF. When turned OFF, existing Delta markers revert to absolute markers.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON | OFF>	**ON** (or 1) - turns reference marker ON **OFF** (or 0) - turns reference marker ON
Examples	`CALC:MARK:REF ON` `calculate2:marker:reference:state OFF`
Query Syntax	CALCulate<cnum>:MARKer:REFerence[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

CALCulate<cnum>:MARKer:REFerence:X <num>

(Read-Write) Sets and returns the absolute x-axis value of the reference marker (marker 10).

See Critical Note

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	X-axis value. Choose any number within the operating domain of the reference marker.

Examples	`CALC:MARK:REF:X 1e9`
	
	`calculate2:marker:reference:x 1e6`

Query Syntax	CALCulate<cnum>:MARKer:REFerence:X?
Return Type	Numeric

Default	If the first Marker, turns ON in the middle of the X-axis span. If not, turns ON at the position of the active marker.

CALCulate<cnum>:MARKer:REFerence:Y?

(Read-only) Returns the absolute Y-axis value of the reference marker.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
Examples	`CALC:MARK:REF:Y?` `calculate2:marker:reference:y?`
Return Type	Character
Default	Not applicable

CALCulate<cnum>:MARKer<mkr>:TYPE <char>

(Read-Write) Sets the type of the specified marker.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1
<char>	Choose from: • **NORMal** - a marker that stays on the assigned X-axis position unless moved or searching. • **FIXed** - a marker that will not leave the assigned X or current Y-axis position.
Examples	`CALC:MARK:TYPE NORM` `calculate2:marker2:type fixed`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:TYPE?
Return Type	Character

Default NORMal

CALCulate<cnum>:MARKer<mkr>:SET <char>

(Write-only) Sets the selected instrument setting to assume the value of the specified marker.

Marker Functions CENT, SPAN, STARt, and STOP do not work with channels that are in CW or Segment Sweep mode.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1
<char>	Choose from:

- **CENTer -** changes center frequency to the value of the marker
- **SPAN -** changes the sweep span to the span that is defined by the delta marker and the marker that it references. Unavailable if there is no delta marker.
- **STARt -** changes the start frequency to the value of the marker
- **STOP -** changes the stop frequency to the value of the marker
- **RLEVel** - changes the reference level to the value of the marker
- **DELay** - changes the line length at the receiver input to the phase slope at the active marker stimulus position.

Examples

```
CALC:MARK:SET CENT
calculate2:marker8:set span
```

Query Syntax Not Applicable

Default Not Applicable

CALCulate<cnum>:MARKer<mkr>[:STATe] <ON|OFF>

(Read-Write) Turns the specified marker ON or OFF. **Marker 10 is the Reference Marker**. To turn all markers off, use CALC:MARK:AOFF.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1.
<ON|OFF>	**ON** (or 1) - turns marker ON. **OFF** (or 0) - turns marker OFF.
Examples	`CALC:MARK ON` `calculate2:marker8 on`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	Off

CALCulate<cnum>:MARKer<mkr>:X <num>

(Read-Write) Sets the marker's X-axis value (frequency, power, or time). If the marker is set as delta, the SET and QUERY data is relative to the reference marker.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1.
<num>	Any X-axis position within the measurement span of the marker.
	Note: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:MARK:X 100Mhz` `calculate2:marker8:x maximum`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:X?
Return Type	Numeric
Default	First Marker turns ON in the middle of the X-axis span. Subsequent markers turn ON at the position of the active marker.

CALCulate<cnum>:MARKer<mkr>:Y?

(Read-only) Reads the marker's Y-axis value. The format of the value depends on the current CALC:MARKER:FORMAT setting. If the marker is set as delta, the data is relative to the reference marker. The query always returns two numbers:

- Smith and Polar formats - (Real, Imaginary)
- LINPhase and LOGPhase - (Real, Imaginary)
- All other formats - (Value,0)

Note: To accurately read the marker Y-axis value with trace smoothing applied, the requested format must match the displayed format. Otherwise, the returned value is un-smoothed data. For example, to read the smoothed marker value when measuring group delay, both the display format and the marker format must be set to (Group) Delay.

See Critical Note

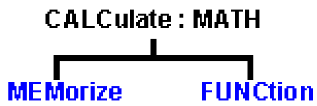
Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<mkr>	Any marker number from 1 to 10; if unspecified, value is set to 1.
Examples	`CALC:MARK:Y?` `calculate2:marker3:y?`
Query Syntax	CALCulate<cnum>:MARKer<mkr>:Y?
Return Type	Numeric
Default	Not applicable

Last modified:

1-Oct-2007	Added temperature formats
March 27, 2007	Corrected Set?
Dec. 4, 2006	Added smoothing note to Y?

Calculate:Math Commands

Controls math operations on the currently selected measurement and memory.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Math Operations
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:MATH:FUNCtion <char>

(Read-Write) Sets math operations on the currently selected measurement and the trace stored in memory. (There MUST be a trace stored in Memory. See CALC:MATH MEM)

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	The math operation to be applied. Choose from the following:

NORMal	Trace data only
ADD	Data + Memory
SUBTract	Data - Memory
MULTiply	Data * Memory
DIVide	Data / Memory

Examples	`CALC:MATH:FUNC NORM` `calculate2:math:function subtract`
Query Syntax	CALCulate<cnum>:MATH:FUNCtion?
Return Type	Character
Default	NORMal

CALCulate<cnum>:MATH:MEMorize

(Write-only) Puts the currently selected measurement trace into memory. (Data-> Memory).

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
Examples	`CALC:MATH:MEM` `calculate2:math:memorize`
Query Syntax	Not applicable
Default	Not applicable

Calculate:Mixer Command

CALCulate<ch>:MIXer:XAXis <char>

(Read-Write) Sets or returns the swept parameter to display on the X-axis for the selected FCA measurement. Learn more about X-axis display.

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<char>	Parameter to display on the X-axis. Choose from: **INPUT** - Input frequency span **OUTPUT** - Output frequency span **LO_1** - First LO frequency span **LO_2** - Second LO frequency span

Examples	`CALC:MIX:XAX INPUT`
	`calc2:mixer:xaxis output`
	
	See an example that creates, selects, and calibrates an SMC and VMC measurement using SCPI.

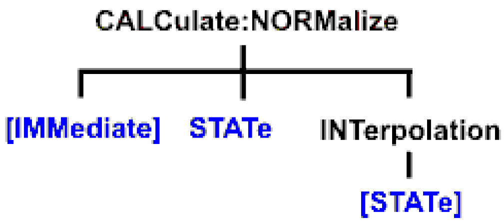
Query Syntax	CALCulate<ch>:MIXer:XAXis?
Return Type	Character
Default	OUTPUT

Calculate:Normalize Commands

Specifies the normalization features used for a receiver power calibration.

These commands are Superseded (Sept 2004).

See the replacement commands in a new Receiver Power Cal example.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Receiver Cal
- SCPI Command Tree

Save and recall your receiver power calibration (which use .CST file commands):

- SENS:CORR:CSET:SAVE
- SENS:CORR:CSET[:SEL]

Or use these two commands and specify either .STA or .CST file extensions:

- MMEM:LOAD
- MMEM:STOR

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:NORMalize[:IMMediate] Superseded

Note: This command is replaced with SENS:CORR:COLL:METH RPOWer and SENS:CORR:COLL[:ACQ] POWer

See an example of a Receiver Power Calibration.

(Write only) Stores the selected measurement's data to that measurement's "divisor" buffer for use by the Normalization data processing algorithm. This command is not compatible with ratioed measurements such as S-parameters. It is intended for receiver power calibration when the selected measurement is of an unratioed power type.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
Examples	`CALC:NORM` `calculate1:normalize:immediate`
Query Syntax	Not Applicable
Default	Not Applicable

CALCulate<cnum>:NORMalize:STATe <ON | OFF> Superseded

Note: This command is replaced with SENS:CORR[:STATe] ON|OFF

(Read-Write) Specifies whether or not normalization is applied to the measurement. Normalization is enabled only for measurements of unratioed power where it serves as a receiver power calibration.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON | OFF>	**ON (or 1)** - normalization is applied to the measurement. **OFF (or 0)** – normalization is NOT applied to the measurement.
Examples	`CALC:NORM:STAT ON` `calculate2:normalize:state off`
Query Syntax	CALCulate<cnum>:NORMalize:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

CALCulate<cnum>:NORMalize:INTerpolate[:STATe] <ON | OFF> Superseded

Note: This command is replaced with SENS:CORR:INT[:STATe] ON|OFF

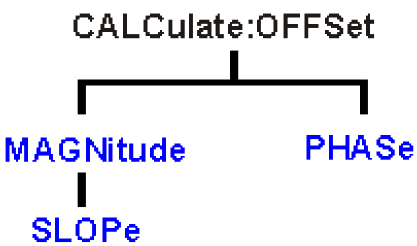
(Read-Write) Turns normalization interpolation ON or OFF. Normalization is enabled only for measurements of unratioed power, where it serves as a receiver power calibration.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON | OFF>	**ON (or 1**) – turns interpolation ON. **OFF (or 0) –** turns interpolation OFF.
Examples	`CALC:NORM:INT ON` `calculate2:normalize:interpolate:state off`
Query Syntax	CALCulate<cnum>:NORMalize:INTerpolate[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

Calculate:Offset Commands

Allows the data trace magnitude and phase to be offset.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Magnitude Offset
- Learn about Phase Offset
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:OFFSet:MAGNitude <num>

(Read-Write) Offsets the data trace magnitude by the specified value.
To offset the data trace magnitude to a slope value that changes with frequency, use
CALC:OFFS:MAGN:SLOP
See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Offset value in dB.
Examples	`CALC:OFFS:MAGN:4` `calculate1:offset:magnitude -2`
Query Syntax	CALCulate<cnum>:OFFSet:MAGNitude?
Return Type	Numeric
Default	0

CALCulate<cnum>:OFFSet:MAGNitude:SLOPe <num>

(Read-Write) Offsets the data trace magnitude to a value that changes linearly with frequency. The offset slope begins at 0 Hz.
See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Offset slope value in dB/ 1GHz.
Examples	`CALC:OFFS:MAGN:SLOP 1 'Offset slope set to 1dB/GHz` `calculate1:offset:magnitude:slope -2 'Offset slope set to -2dB/GHz`
Query Syntax	CALCulate<cnum>:OFFSet:MAGNitude:SLOPe?
Return Type	Numeric
Default	0

CALCulate<cnum>:OFFSet:PHASe <num>[<char>]

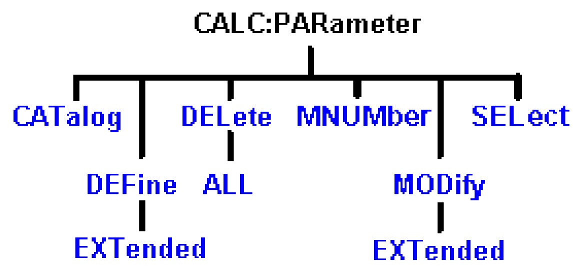
(Read-Write) Sets the phase offset for the selected measurement.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Offset phase value. Choose any number between: **-360** and **360**
<char>	Units for phase. OPTIONAL. Choose either: **DEG** - Degrees (default) **RAD** - Radians
Examples	`CALC:OFFS:PHAS 10` `calculate:offset:phase 20rad`
Query Syntax	CALCulate:OFFSet:PHASe?
Return Type	Numeric, returned value always in degrees
Default	0 degrees

Calculate:Parameter Commands

Lists, creates, selects and deletes measurements.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Measurement Parameters
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:PARameter:CATalog?

(Read-only) Returns the names and parameters of existing measurements for the specified channel.

Note: For Balanced Measurements: CALC:PAR:CAT? may have an unexpected behavior. Learn more.

See Critical Note

Parameters	
<cnum>	Channel number of the measurements to be listed. If unspecified, <cnum> is set to 1.
Examples	**`CALC:PAR:CAT?`** **`calculate2:parameter:catalog?`**
Return Type	String - "<measurement name>,<parameter>,[<measurement name>,<parameter>...]"

Default "CH1_S11_1,S11"

CALCulate<cnum>:PARameter:DEFine <Mname>,<param>[,port] Superseded

Note: This command is replaced with CALC:PAR:DEFine:EXTended. This command will continue to work for up to 4 port parameters.

(Write-only) Creates a measurement but does NOT display it.

There is no limit to the number of measurements that can be created. However, there is a limit to the number of measurements that can be displayed. See Traces, Channels, and Windows on the PNA.

- Use DISP:WIND:STATe to create a window if it doesn't already exist.
- Use DISP:WIND<wnum>:TRAC<tnum>:FEED <Mname> to display the measurement.

For FCA Measurements see CALC:CUST:DEF

You must select the measurement (CALC<cnum>:PAR:SEL <mname>) before making additional settings.

See Critical Note

Parameters

<cnum> Channel number of the new measurement. If unspecified, value is set to 1.

<Mname> Name of the measurement. Any non-empty, unique string, enclosed in quotes.

<param> **For S-parameters:**

Any S-parameter available in the PNA

For ratioed measurements:

Any two receivers that are available in the PNA. (See the block diagram showing the receivers in YOUR PNA.)

For example: AR1 (this means A/R1)

For non-ratioed measurements:

Any receiver that is available in the PNA. (See the block diagram showing the receivers in YOUR PNA.)

For example: A

For Balanced Measurements:

First create an S-parameter measurement, then change the measurement using CALC:FSIM:BAL commands. See an example.

For FCA Measurements see CALC:CUST:DEF

[port]	Optional argument; For multi-port reflection S-parameter measurements: specifies the PNA port which will provide the load for the calibration. This argument is ignored if a transmission S-parameter is specified. For all non S-parameter measurements: specifies the source port for the measurement.

Examples	`CALC4:PAR:DEF 'ch4_S33',S33,2 'Defines an S33 measurement with a load on port2 of the analyzer.`
	
	`calculate2:parameter:define 'ch1_a', a, 1 'unratioed meas`
	
	`calculate2:parameter:define 'ch1_a', ar1,1 'ratioed meas`

Query Syntax	Not Applicable; see Calc:Par:Cat?
Default	Not Applicable

CALCulate<cnum>:PARameter:DEFine:EXTended <Mname>,<param>

Note: This command replaces CALC:PAR:DEF as it allows the creating of measurements using external multiport testsets.

(Write-only) Creates a measurement but does NOT display it.

There is no limit to the number of measurements that can be created. However, there is a limit to the number of measurements that can be displayed. See Traces, Channels, and Windows on the PNA.

- Use DISP:WIND:STATe to create a window if it doesn't already exist.
- Use DISP:WIND<wnum>:TRAC<tnum>:FEED <Mname> to display the measurement.

You must select the measurement (CALC<cnum>:PAR:SEL <mname>) before making additional settings.

See Critical Note

Parameters

<cnum>	Channel number of the new measurement. If unspecified, value is set to 1.
<Mname>	**(String)** Name of the measurement. Any non-empty, unique string, enclosed in quotes.
<param>	**(String)** Measurement Parameter to create. Case sensitive.

For S-parameters:

Any S-parameter available in the PNA

Single-digit port numbers CAN be separated by "_" (underscore). For example: **"S21" or "S2_1"**

Double-digit port numbers MUST be separated by underscore. For example: **"S10_1"**

For ratioed measurements:

Any two PNA physical receivers separated by forward slash '/' followed by comma and source port.

For example: **"A/R1, 3"**

Learn more about ratioed measurements

See a block diagram showing the receivers in YOUR PNA.

For non-ratioed measurements:

Any PNA physical receiver followed by comma and source port.

For example: **"A, 4"**

Learn more about unratioed measurements.

See the block diagram showing the receivers in YOUR PNA.

With PNA Rev 6.2, **Ratioed** and **Unratioed** measurements can also use **logical receiver notation** to refer to receivers. This notation makes it easy to refer to receivers with an external test set connected to the PNA. You do not need to know which physical receiver is used for each test port. Learn more.

For ADC measurements:

Any ADC receiver in the PNA followed by a comma, then the source port.

For example: **"AI1,2"** indicates the Analog Input1 with source port of 2.

[Learn more about ADC receiver measurements.]

For Balanced Measurements:

First create an S-parameter measurement, then change the measurement using CALC:FSIM:BAL "define" commands. See an example.

Examples

```
CALC4:PAR:DEF:EXT 'ch4_S33', 'S33' 'Defines an S33 measurement
```

```
calculate2:parameter:define:extended 'ch1_a', 'b9, 1' 'logical receiver notation for unratioed meas of test port 9 receiver with source port 1.
```

```
calculate2:parameter:define:extended 'ch1_a', 'b9/a10,1' 'logical receiver notation for ratioed meas of test port 9 receiver divided by the reference receiver for port 10 using source port 1
```

Query Syntax Not Applicable; see Calc:Par:Cat?

Default Not Applicable

CALCulate<cnum>:PARameter:DELete[:NAME] <Mname>

(Write-only) Deletes the specified measurement.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<Mname>	String - Name of the measurement

Examples

```
CALC:PAR:DEL 'TEST'
calculate2:parameter:delete 'test'
```

Query Syntax Not Applicable

Default Not Applicable

CALCulate:PARameter:DELete:ALL

(Write-only) Deletes all measurements on the PNA.

See Critical Note

Parameters	
Examples	`CALC:PAR:DEL:ALL`
Query Syntax	Not Applicable
Default	Not Applicable

CALCulate<cnum>:PARameter:MNUMber?

(Read-only) Returns the measurement number of the selected measurement. This is useful when needing to identify a measurement by number, such as with Status:Ques:Lim or Status:Oper:Aver commands.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. If unspecified, <cnum> is set to 1.
Examples	`CALC:PAR:MNUM?` `calculate2:parameter:mnumber?`
Return Type	Numeric
Default	Not Applicable

CALCulate<cnum>:PARameter:MODify <param> Superseded

Note: This command is replaced with CALC:PAR:MOD:EXT. This command will continue to work for up to 4 port parameters.

(Write-only) Modifies a standard measurement using the same arguments as CALC:PAR:DEF. To modify an FCA measurement, use CALC:CUST:MOD.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. The selected measurement on that channel will be changed. If unspecified, <cnum> is set to 1.
<param>	Measurement parameter to change to. Use the same <param> arguments as CALC:PAR:DEF.
Examples	`SYST:PRESET`

```
CALC:PAR:DEF "MyMeas", S11

CALC:PAR:SEL "MyMeas"

CALC:PAR:MOD AR1 'changes the selected S11 measurement to an A/R1 measurement
```

Query Syntax Not Applicable

Default Not Applicable

CALCulate<cnum>:PARameter:MODify:EXTended <param>

Note: This command replaces CALC:PAR:MOD as it allows modification of measurements using external multiport testsets.

(Write-only) Modifies a standard measurement using the same arguments as CALC:PAR:DEF:EXT. To modify an FCA measurement, use CALC:CUST:MOD.

See Critical Note

Parameters

<cnum> Channel number of the measurement. The selected measurement on that channel will be changed. If unspecified, <cnum> is set to 1.

<param> **(String)** New measurement parameter. Use the same <param> arguments as CALC:PAR:DEF:EXT.

Examples

```
SYST:PRESET

CALC:PAR:DEF:EXT "MyMeas", "S10_1"

CALC:PAR:SEL "MyMeas"

CALC:PAR:MOD:EXT "a4b4,1" 'changes the selected S10_1 measurement to an a4/b4 measurement with source port 1
```

Query Syntax Not Applicable

Default Not Applicable

CALCulate<cnum>:PARameter:SELect <Mname>

(Read-Write) Sets the selected measurement. Most CALC: commands require that this command be sent before a setting change is made. One measurement on each channel can be selected at the same time. To obtain a list of currently named measurements, use CALC:PAR:CAT?

Parameters	
<cnum>	Channel number of the measurement to be selected. If unspecified, <cnum> is set to 1.
<Mname>	String - Name of the measurement. (Do NOT include the parameter name.)
Examples	`CALC:PAR:SEL 'TEST'` `calculate2:parameter:select 'test'`
Query Syntax	CALCulate:PARameter:SELect?
Return Type	String
Default	The preset measurement name is "CH1_S11_1"

Last modified:

April 19, 2007	MX Added ADC meas
9/12/06	MQ New Extended commands.

Calculate:RData? Command

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

CALCulate<cnum>:RDATA? <char>

(Read-only) Returns receiver data for the selected measurement. To query measurement data, see CALC:DATA?

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	Choose from any physical receiver in the PNA. For example: **"A"** Also, **REF -** returns data for either R1 or R2 data depending on the source port of the selected measurement. See the block diagram showing the receivers in YOUR PNA. **Note:** Logical receiver notation is NOT allowed with this command. Learn more.

Example	`GPIB.Write "INITiate:CONTinuous OFF"`
	`GPIB.Write "INITiate:IMMediate;*wai"`
	`GPIB.Write "CALCulate:RDATA? A"`
	
	`GPIB.Write "CALCulate:RDATA? REF"`

Return Type	Depends on FORM:DATA - Two numbers per data point
Default	Not Applicable

Notes:

Generally when you query the analyzer for data, you expect that the number of data values returned will be consistent with the number of points in the sweep.

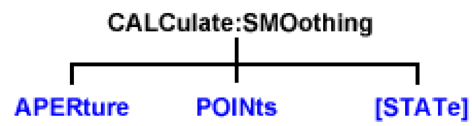
However, if you query **receiver** data while the instrument is sweeping, the returned values may contain zeros. For example, if your request for receiver data is handled on the 45th point of a 201 point sweep, the first 45 values will be valid data, and the remainder will contain complex zero.

This can be avoided by synchronizing this request with the end of a sweep or putting the channel in hold mode.

Learn about Unratioed Measurements

Calculate:Smoothing Commands

Controls point-to-point smoothing. Smoothing is a noise reduction technique that averages adjacent data points in a measurement trace. Choose the amount of smoothing by specifying either the number of points or the aperture. Smoothing is not the same as CALC:AVERage which averages each data point over a number of sweeps.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Smoothing
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

CALCulate<cnum>:SMOothing:APERture <num>

(Read-Write) Sets the amount of smoothing as a percentage of the number of data points in the channel.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Percentage value. Choose any number between: **1** and **25**
Examples	`CALC:SMO:APER 2` `calculate2:smoothing:aperture 20.7`
Query Syntax	CALCulate<cnum>:SMOothing:APERture?
Return Type	Numeric

Default 1.5

CALCulate<cnum>:SMOothing:POINts <num>

(Read-Write) Sets the number of adjacent data points to average.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Number of points from 1 point to maximum of 25% of data points in the channel. For example: if number of points in a data trace = 401, the maximum value for points = 100. The points value is always rounded to the closest odd number.
Examples	`CALC:SMO:POIN 50` `calculate2:smoothing:points 21`
Query Syntax	CALCulate<cnum>:SMOothing:POINts?
Return Type	Numeric
Default	3

CALCulate<cnum>:SMOothing[:STATe] <ON | OFF>

(Read-Write) Turns data smoothing ON or OFF.

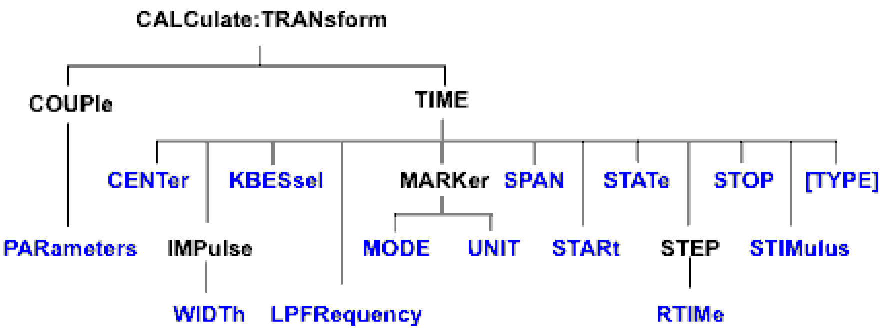
See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON | OFF>	**ON** (or 1) - turns smoothing ON. **OFF** (or 0) - turns smoothing OFF.
Examples	`CALC:SMO ON` `calculate2:smoothing:state off`
Query Syntax	CALCulate<cnum>:SMOothing[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

Calculate:Transform Commands

Specifies the settings for time domain transform.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Time Domain
- Synchronizing the PNA and Controller
- SCPI Command Tree

Critical Note: CALCulate commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

CALCulate<cnum>:TRANsform:COUPle:PARameters <num>

(Read-Write) Specifies the time domain transform parameters to be coupled. The settings for those parameters will be copied from the selected measurement to all other measurements on the channel.

- To turn coupling ON and OFF, use SENS:COUP:PAR
- To specify Gating parameters to couple, use CALC:FILT:COUP:PAR

Learn more about Time Domain Trace Coupling

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	(Numeric) Parameters to couple. To specify more than one parameter, add the

numbers.

1 - Transform Stimulus (Start, Stop, Center, and Span TIME settings.)

2 - Transform State (ON / OFF)

4 - Transform Window (Kaiser Beta / Impulse Width)

8 - Transform Mode (Low Pass Impulse, Low Pass Step, Band Pass)

16 - Transform Distance Marker Units

Examples

```
'To couple all parameters:

CALC:TRAN:COUP:PAR 31

'To couple Stimulus and Mode:
calculate2:transform:couple:parameters 9
```

Query Syntax CALCulate<cnum>:TRANsform:COUPle:PARameters?

Return Type Numeric

Default 29 (All parameters except **2** - Transform State)

CALCulate<cnum>:TRANsform:TIME:CENTer <num>

(Read-Write) Sets the center time for time domain measurements.

See Critical Note

Parameters

<cnum> Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.

<num> Center time in seconds; any number between:
± (number of points-1) / frequency span

Note: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
CALC:TRAN:TIME:CENT 1e-8
calculate2:transform:time:center 15 ps
```

Query Syntax CALCulate<cnum>:TRANsform:TIME:CENTer?

Return Type Numeric

Default 0

CALCulate<cnum>:TRANsform:TIME:IMPulse:WIDTh <num>

(Read-Write) Sets the impulse width for the transform window.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Impulse width in seconds; Choose any number between: **.6 / frequency span** and **1.39 / frequency span**
Examples	`CALC:TRAN:TIME:IMP:WIDTh 10` `calculate2:transform:time:impulse:width 13`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:IMPulse:WIDTh?
Return Type	Numeric
Default	.98 / Default Span

CALCulate<cnum>:TRANsform:TIME:KBESsel <num>

(Read-Write) Sets the parametric window for the Kaiser Bessel window.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Window width for Kaiser Bessel in seconds; Choose any number between: **0.0** and **13.0**
Examples	`CALC:TRAN:TIME:KBES 10` `calculate2:transform:time:kbessel 13`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:KBESsel?
Return Type	Numeric
Default	6

CALCulate<cnum>:TRANsform:TIME:LPFREQuency

(Write-only) Sets the start frequencies in LowPass Mode.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
Examples	`CALC:TRAN:TIME:LPFR` `calculate2:transform:time:lpfrequency`
Query Syntax	Not applicable
Default	Not applicable

CALCulate<cnum>:TRANsform:TIME:MARKer:MODE <char>

(Read-Write) Specifies the measurement type in order to determine the correct marker distance.

- Select Auto for S-Parameter measurements.
- Select Reflection or Transmission for arbitrary ratio or unratioed measurements.

This setting affects the display of ALL markers for only the ACTIVE measurement.

Learn more about Distance Markers.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	Choose from: **AUTO** If the active measurement is an S-Parameter, automatically chooses reflection or transmission. If non S-Parameter measurements, reflection is chosen. **REFLection** Displays the distance from the source to the receiver divided by two (to compensate for the return trip.) **TRANsmission** Displays the distance from the source to the receiver.
Examples	`CALC:TRAN:TIME:MARK:MODE REFL` `calculate2:transform:time:marker:mode auto`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:MARKer:MODE?

Return Type Character

Default Auto

CALCulate<cnum>:TRANsform:TIME:MARKer:UNIT <char>

(Read-Write) Specifies the unit of measure for the display of marker distance values. This settings affects the display of ALL markers for only the ACTIVE measurement (unless Distance Maker Units are coupled using CALC:TRAN:COUP:PAR.

Learn more about Distance Markers.

See Critical Note

Parameters

<cnum> Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.

<char> Choose from:

METRs

FEET

INCHes

Examples

```
CALC:TRAN:TIME:MARK:UNIT INCH
calculate2:transform:time:marker:unit feet
```

Query Syntax CALCulate<cnum>:TRANsform:TIME:MARKer:UNIT?

Return Type Character

Default METRs

CALCulate<cnum>:TRANsform:TIME:SPAN <num>

(Read-Write) Sets the span time for time domain measurements.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Span time in seconds; any number between: **0** and 2* [(number of points-1) / frequency span]
	Note: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:TRAN:TIME:SPAN 1e-8` `calculate2:transform:time:span maximum`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:SPAN?
Return Type	Numeric
Default	20 ns

CALCulate<cnum>:TRANsform:TIME:STARt <num>

(Read-Write) Sets the start time for time domain measurements.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Start time in seconds; any number between: ± (number of points-1) / frequency span
	Note: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:TRAN:TIME:STAR 1e-8` `calculate2:transform:time:start minimum`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:STARt?
Return Type	Numeric
Default	-10 ns

CALCulate<cnum>:TRANsform:TIME:STATe <ON | OFF>

(Read-Write) Turns the time domain transform capability ON or OFF.

See Critical Note

Note: Sweep type must be set to Linear Frequency in order to use Time Domain Transform.

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<ON|OFF>	**ON** (or 1) - turns time domain ON. **OFF** (or 0) - turns time domain OFF.
Examples	`CALC:TRAN:TIME:STAT ON` `calculate2:transform:time:state off`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

CALCulate<cnum>:TRANsform:TIME:STOP <num>

(Read-Write) Sets the stop time for time domain measurements.

See Critical Note

Parameters	
<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Stop time in seconds; any number between: ± (number of points-1) / frequency span **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`CALC:TRAN:TIME:STOP 1e-8` `calculate2:transform:time:stop maximum`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:STOP?
Return Type	Numeric
Default	10 ns

CALCulate<cnum>:TRANsform:TIME:STEP:RTIMe <num>

(Read-Write) Sets the step rise time for the transform window.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<num>	Rise time in seconds; Choose any number between: **.45 / frequency span** and **1.48 / frequency span**
Examples	`CALC:TRAN:TIME:STEP:RTIM 1e-8` `calculate2:transform:time:step:rtime 15 ps`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:STEP:RTIMe?
Return Type	Numeric
Default	.99 / Default Span

CALCulate<cnum>:TRANsform:TIME:STIMulus <char>

(Read-Write) Sets the type of simulated stimulus that will be incident on the DUT.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	Choose from: **STEP -** simulates a step DUT stimulus **IMPulse -** simulates a pulse DUT stimulus STEP can ONLY be used when CALC:TRAN:TIME:TYPE is set to LPASs (Lowpass). (STEP **cannot** be used with TYPE = BPASs.) **:STIM STEP** will set :TYPE to **LPASs** **:TYPE BPASs** will set :STIM to **IMPulse**
Examples	`CALC:TRAN:TIME:STIM STEP` `calculate2:transform:time:stimulus impulse`
Query Syntax	CALCulate<cnum>:TRANsform:TIME:STIMulus?
Return Type	Character

Default IMPulse

CALCulate<cnum>:TRANsform:TIME[:TYPE] <char>

(Read-Write) Sets the type of time domain measurement.

See Critical Note

Parameters

<cnum>	Channel number of the measurement. There must be a selected measurement on that channel. If unspecified, <cnum> is set to 1.
<char>	Type of measurement. Choose from: **LPASs** - Lowpass; Must also send CALC:TRAN:TIME:LPFRequency before calibrating. **BPASs** - Bandpass; BPASs can **only** be used when CALC:TRAN:TIME:STIM is set to IMPulse. (BPASs **cannot** be used with :STIM = STEP) :STIM **STEP** will set :TYPE to **LPASs** :TYPE **BPASs** will set :STIM to **IMPulse**
Examples	`CALC:TRAN:TIME LPAS` `calculate2:transform:time:type bpas`
Query Syntax	CALCulate<cnum>:TRANsform:TIME[:TYPE]?
Return Type	Character
Default	BPAS

Control Commands

Specifies the settings to remotely control the rear panel connectors and ECAL Module state.

CONTrol

AUXiliary - More Commands

CHANnel:INTerface:CONTrol:

| CONFig:RECall

| [STATe]

ECAL:MODule:

| PATH:

| COUNt?

| STATe

| STATe

EXTernal:TESTset - More Commands

HANDler - More Commands

NOISe:SOURce[:STATe]

SIGNal:

| TRIGger

| ATBA

| OUTP

Click on a **blue** keyword to view the command details.

Red command is superseded.

See Also

- Example Programs
- Synchronizing the PNA and Controller

- SCPI Command Tree
- See a pinout and detailed description of the rear panel connectors:
    - Auxilliary IO connector
    - External Test Set IO connector
    - Material Handler IO connector

CONTrol:CHANnel:INTerface:CONTrol:CONFig:RECall <string>

(Write-only) Recalls an Interface Control configuration file. Learn more about Interface Control.

Parameters	
<string>	File name and extension (.xml) of the configuration file to recall. Files are typically stored in the default folder "C:/Program Files/Agilent/Network Analyzer/Documents". To recall from a different folder, specify the full path name.

Examples	`CONT:CHAN:INT:CONT:CONF:REC 'MyConfigFile.xml'`
	
	`control:channel:interface:control:config:recall 'C:/Program Files/Agilent/Network Analyzer/Documents/MyFile.xml'`

Query Syntax	Not Applicable
Default	Not Applicable

CONTrol:CHANnel:INTerface:CONTrol[:STATe] <bool>

(Read-Write) Enables and disables ALL Interface Control settings. To send data, the individual interfaces must also be enabled. Learn more about Interface Control.

Parameters	
<bool>	Boolean **False (0)** - Interface Control is disabled;NO control data is sent. **True (1)** - Interface Control is enabled.

Examples	`CONT:CHAN:INT:CONT 1`
	
	`control:channel:interface:control:state 0`

Query Syntax	CONTrol:CHANnel:INTerface:CONTrol[:STATe]?
Return Type	Boolean

Default False (0)

CONTrol:ECAL:MODule[num]:PATH:COUNt? <name>

(Read-only) Returns the number of unique states that exist for the specified path name on the selected ECal module.

This command performs exactly the same function as SENS:CORR:CKIT:ECAL:PATH:COUNt?

Use the CONT:ECAL:MOD:PATH:STAT command to set the module into one of those states.

Use SENS:CORR:CKIT:ECAL:PATH:DATA? to read the data for a state.

Parameters

[num] Optional argument. USB number of the ECal module. If unspecified (only one ECal module is connected to the USB), <num> is set to 1. If two or more modules are connected, use SENS:CORR:CKIT:ECAL:LIST? to determine how many, and SENS:CORR:CKIT:ECAL:INF? to verify their identities.

<name> Name of the path for which to read number of states. Choose from:

Reflection paths

- **A**
- **B**
- **C** (4-port modules)
- **D** (4-port modules)

Transmission paths

- **AB**
- **AC** (4-port modules)
- **AD** (4-port modules)
- **BC** (4-port modules)
- **BD** (4-port modules)
- **CD** (4-port modules)

Note: For each transmission path, the first of the available states is the through state, the second is the confidence (attenuator) state.

Examples	`CONT:ECAL:MOD:PATH:COUNt? A` `control:ecal:module2:path:count? cd`
Return Type	Integer
Default	Not Applicable

CONTrol:ECAL:MODule[num]:PATH:STATe <path>, <stateNum>

(Write-only) Sets the internal state of the selected ECAL module. This command supersedes CONT:ECAL:MOD:STAT.

- Use CONT:ECAL:MOD:PATH:COUN? to read the number of unique states that exist for the specified path name on the module.
- Use SENS:CORR:CKIT:ECAL:PATH:DATA? to read the data for a state (from the module memory) corresponding to the stimulus values of a channel.

Parameters

[num] Optional argument. USB number of the ECal module. If unspecified (only one ECal module is connected to the USB), <num> is set to 1. If two or more modules are connected, use SENS:CORR:CKIT:ECAL:LIST? to determine how many, and SENS:CORR:CKIT:ECAL:INF? to verify their identities.

<path> Path name for which to set a state.

Note: The impedance paths are not independent. For example, changing the impedance presented on path A will cause a change to the impedance on path B.

Choose from:

Reflection paths

- **A**
- **B**
- **C** (4-port modules)
- **D** (4-port modules)

Transmission paths

- **AB**
- **AC** (4-port modules)

- **AD** (4-port modules)
- **BC** (4-port modules)
- **BD** (4-port modules)
- **CD** (4-port modules)

<stateNum> Number of the state to set. Refer to the following table to associate the <stateNum> with a state in your ECal module.

In addition, CONT:ECAL:MOD:PATH:COUNt? returns the number of states in the specified ECal module.

<stateNum>	N4432A and N4433A States	N4431A States	N469x States**	8509x States
One-Port Reflection States				
1	Open	Open	Impedance 1	Open
2	Short	Short	Impedance 2	Short
3	Impedance 1	Impedance 1	Impedance 3	Impedance 1
4	Impedance 2	Impedance 2	Impedance 4	Impedance 2
5			Impedance 5	
6			Impedance 6	
7			Impedance 7	
Two-Port Transmission States				
1	Thru	Thru	Thru	Thru
2	Confidence	Confidence	Confidence	Confidence

** The following modules have only FOUR Impedance states (1, 2, 3, 4): N4690B ,N4691B ,N4692A ,N4696B.

Examples

```
CONT:ECAL:MOD:PATH:STATe A,5
control:ecal:module2:state BC,1
```

Query Syntax Not Applicable

Default Not Applicable

CONTrol:ECAL:MODule[num]:STATe <value> Superseded

This command is replaced with CONT:ECAL:MOD:PATH:STATe.

(Write-only) Sets the internal state of the selected ECAL module.

Parameters

[num] Optional argument. USB number of the ECal module. If unspecified (only one ECal module is connected to the USB), <num> is set to 1. If two or more modules are connected, use SENS:CORR:COLL:CKIT:INF? to verify their identity.

<value> Integer code for switching the module. The following are codes for Agilent ECal modules.

Agilent 8509x Modules		
State	**Port A**	**Port B**
Open	0	0
Short	43	43
Load	33	33
Mismatch	4	16
Thru	84	
Confidence	20	

Agilent N469x Modules		
State	**Port A**	**Port B**
Open	36	33
Short	39	45
Load	37	37
Mismatch (Offset short)	53	53
Impedance 5 (Offset open)	5	5
Impedance 6 (Offset short)	21	21

Impedance 7 (Offset short)	38	41
Thru	42	
Confidence	40	

Agilent N4431A Modules				
State	**Port A**	**Port B**	**Port C**	**Port D**
Open	-1398	-1384	-2774	-2654
Short	-1350	-1381	-2582	-2642
Load	26985	-26986	-26986	26985
Mismatch	-26986	26985	26985	-26986
Path	**Thru**		**Confidence**	
AB Path	-2590		-598	
AC Path	-4011		85	
AD Path	-2517		16042	
BC Path	-1650		-598	
BD Path	-4011		85	
CD Path	-1352		16042	

Agilent N4432A and N4433A Modules				
State	**Port A**	**Port B**	**Port C**	**Port D**
Open	-6971	-11835	-14895	-14876
Short	-14395	-12859	-14899	-14905
Load	-14907	-14907	-14907	-14907
Offset Short	-9787	-6459	-14874	-14887
Path	**Thru**		**Confidence**	
AB Path	13765		30069	
AC Path	-10519		-2327	
AD Path	-10538		-2346	
BC Path	-5655		-1559	
BD Path	-5674		-1578	
CD Path	-15051		30069	

Examples

```
CONT:ECAL:MOD:STAT 36
control:ecal:module2:state 38
```

Query Syntax	Not Applicable
Default	Not Applicable

CONTrol:NOISe:SOURce[:STATe] <bool>

(Read-Write) Set and read the noise source ON | OFF state. For Noise Figure measurements.

Parameters	
<bool>	Boolean **False (0)** - Noise Source OFF **True (1)** - Noise Source ON

Examples	`CONT:NOIS:SOUR 1`
	
	`control:noise:source:state 0`

Query Syntax	CONTrol:NOISe:SOURce[:STATe]?
Return Type	Boolean
Default	False (0)

CONTrol:SIGNal <conn>,<char>

(Read-Write) Configures external triggering in the PNA.

- To control BNC1 and BNC2 with this command, then you **MUST** have TRIG:PREF:AIGLobal = **True**. Learn more about this setting.
- Trigger:Sequence:Source is automatically set to External when **CONTrol:SIGNal** is sent.
- Edge triggering is only available on some Microwave PNA models.
- For more information, see External Triggering in the PNA.

Parameters	
<conn>	Rear Panel connector to send or receive trigger signals. Choose from: **BNC1** Trigger IN from rear-panel Trigger IN BNC connector **AUXT** Trigger IN from AUX IO connector Pin 19 **Note**: Only one of the input connectors is active at a time. When a command is sent to one, the PNA automatically makes the other INACTIVE.

BNC2 Trigger OUT to rear-panel Trigger OUT BNC connector.

MATHtrigger - Trigger IN from rear-panel Material Handler connector Pin 18

<char> **INACTIVE -** Disables the specified connector <conn>.

Choose from ONLY the following when <conn> is set to **BNC1** or **AUXT** or **MATHtrigger**:

TIENEGATIVE - (Trigger In Edge Negative) - Triggers the PNA when receiving a negative going signal

TIEPOSITIVE - (Trigger In Edge Positive) - Triggers the PNA when receiving a positive going signal

TILLOW - (Trigger In Level Low) - Triggers the PNA when receiving a low level signal

TILHIGH - (Trigger In Level High) - Triggers the PNA when receiving a High-level signal

Choose from ONLY the following when <conn> is set to **BNC2**:

Use CONTrol:SIGNal:TRIGger:OUTP to enable the BNC2 output.

The following selections send a positive or negative pulse before or after each trigger acquisition. This normally occurs each sweep unless a channel is in point trigger mode.

TOPPAFTER - (Trigger Out Pulse Positive After) - Sends a POSITIVE going TTL pulse at the END of each trigger acquisition.

TOPPBEFORE - (Trigger Out Pulse Positive Before) - Sends a POSITIVE going TTL pulse at the START of each trigger acquisition.

TOPNAFTER - (Trigger Out Pulse Negative After) - Sends a NEGATIVE going TTL pulse at the END of each trigger acquisition.

TOPNBEFORE - (Trigger Out Pulse Negative Before) - Sends a NEGATIVE going TTL pulse at the START of each trigger acquisition.

Examples

```
CONT:SIGN BNC1,TIENEGATIVE
control:signal bnc2,toppbefore
```

Query Syntax CONTrol:SIGNal? <conn>

In addition to the arguments listed above, the following is also a possible returned value:

NAVAILABLE - This feature is not available on this PNA

Return Type Character

Default At Preset:

BNC1 = INACTIVE
BNC2 = INACTIVE
AUXT = TILHIGH

When Output is enabled:

BNC1 = INACTIVE
BNC2 = TOPPAFTER
AUXT = TILHIGH

CONTrol:SIGNal:TRIGger:ATBA <bool>

(Read-Write) **Accept Trigger Before Armed** Determines what happens to an EDGE trigger signal if it occurs before the PNA is ready to be triggered. (LEVEL trigger signals are always ignored.) For more information, see External triggering.

Parameters

<bool> Boolean

False (0) - A trigger signal is ignored if it occurs before the PNA is ready to be triggered.

True (1) - A trigger signal is remembered and then used when the PNA becomes armed (ready to be triggered). The PNA remembers only one trigger signal.

Examples

```
CONT:SIGN:TRIG:ATBA 0
control:signal:trigger:atba true
```

Query Syntax CONTrol:SIGNal:TRIGger:ATBA?

Return Type Boolean

Default False

CONTrol:SIGNal:TRIGger:OUTP <bool>

(Read-Write) **Output Enabled** The PNA can be enabled to send trigger signals out the rear-panel TRIGGER OUT BNC connector. Use CONTrol:SIGNal to configure for output triggers.

For more information, see External triggering.

Parameters	
<bool>	Boolean False (0) - PNA does NOT output trigger signals. True (1) - PNA DOES output trigger signals.
Examples	`CONT:SIGN:TRIG:OUTP 1` `control:signal:trigger:outp false`
Query Syntax	CONTrol:SIGNal:TRIGger:OUTP?
Return Type	Boolean
Default	False

Last Modified:

25-Feb-2008	Clarified CONT:SIGN
30-Jan-2008	Added ECal states note
22-Aug-2007	Added noise command
18-Jan-2007	Fixed count? example

Display Commands

Controls the settings of the front panel screen.

```
DISPlay
├ ANNotation
│  ├ FREQuency:[STATe]
│  ├ MESSage: STATe
│  └ STATus
├ ARRange
├ CATalog?
├ ENABle
├ FSIGn
├ TILE
└ WINDow
   ├ ANNotation
   │  ├ TRACe:STATe
   │  └ MARKer
   │     ├ SINGle:[STATe]
   │     ├ SIZE
   │     └ STATe
   ├ CATalog?
   ├ ENABle
   ├ SIZE
   ├ [STATe]
   ├ TABLe
   ├ TITLE
   │  ├ DATA
   │  └ [STATe]
   ├ TRACe
   │  ├ DELete
   │  ├ FEED
   │  ├ MEMory:[STATe]
   │  ├ SELect
   │  ├ [STATe]
   │  ├ TITLe: STATe
   │  │   └ DATA
   │  └ Y:[SCALe]
   │     ├ AUTO
   │     ├ PDIVision
   │     ├ RLEVel
   │     └ RPOSition
   └ VISible
```

Click on a blue keyword to view the command details.

See Also

- See an example using some of these commands
- Synchronizing the PNA and Controller
- Learn about Screen Setup
- SCPI Command Tree

DISPlay:ANNotation:FREQuency[:STATe] <ON | OFF>

(Read-Write) Turns frequency information on the display title bar ON or OFF for all windows.

Parameters	
<ON | OFF>	**ON** (or 1) - turns frequency annotation ON. **OFF** (or 0) - turns frequency annotation OFF.
Examples	`DISP:ANN:FREQ ON` `display:annotation:frequency:state off`
Query Syntax	DISPlay:ANNotation:FREQuency[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	**ON (1)**

DISPlay:ANNotation:MESSage:STATe <ON | OFF>

(Read-Write) Enables and disables error pop-up messages on the display.

Parameters	
<ON | OFF>	**ON** (or 1) - enables error pop-up messages **OFF** (or 0) - disables error pop-up messages
Examples	`DISP:ANN:MESS:STAT ON` `display:annotation:message:state off`
Query Syntax	DISPlay:ANNotation:MESSage:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	**ON (1)**

DISPlay:ANNotation:STATus <ON | OFF>

(Read-Write) Turns the status bar at the bottom of the screen ON or OFF. The status bar displays information for the active window.

Parameters	
<ON | OFF>	**ON** (or 1) - turns status bar ON. **OFF** (or 0) - turns status bar OFF.
Examples	`DISP:ANN:STAT ON` `display:annotation:status off`
Query Syntax	DISPlay:ANNotation:STATus?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	Last state that was set

DISPlay:ARRange <char>

(Write-only) Places EXISTING measurements into pre-configured window arrangements. Overlay, Stack(2), Split(3), and Quad(4) creates new windows. To learn more, see Arrange Existing Measurements.

Parameters	
<char>	Window arrangement. Choose from: • TILE - tiles existing windows • CASCade - overlaps existing windows • OVERlay - all traces placed in 1 window • STACk - 2 windows • SPLit - 3 windows • QUAD - 4 windows
Examples	`DISP:ARR CASC` `display:arrange cascade`
Query Syntax	Not Applicable
Default	TILE

DISPlay:CATalog?

(Read-only) Returns the existing Window numbers.

Return Type	String of Character values, separated by commas
Example	Two windows with numbers 1 and 2 returns: **"1,2"**
Default	Not applicable

DISPlay:ENABLE <ON | OFF>

(Read-Write) Specifies whether to disable or enable all analyzer display information **in all windows** in the analyzer application. Marker data is not updated. More CPU time is spent making measurements instead of updating the display.

Parameters	
<ON | OFF>	**ON** (or 1) - turns the display ON. **OFF** (or 0) - turns the display OFF.
Examples	`DISP:ENAB ON` `display:enable off`
Query Syntax	DISPlay:ENABle?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

DISPlay:FSIGn <ON | OFF>

(Read-Write) Shows or hides the window which displays global pass/fail results.

Parameters	
<ON | OFF>	**ON** (or 1) - displays the pass/fail dialog **OFF** (or 0) **-** hides the pass/fail dialog
Examples	`DISP:FSIG ON` `display:fsign off`
Query Syntax	DISPlay:FSIGn?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

DISPlay[:TILE] - Superseded

This command is replaced by DISP:ARRange

(Write-only) Tiles the windows on the screen.

Examples	`DISP` `display:tile`
Default	Not Applicable

DISPlay:WINDow<wnum>:ANNotation:MARKer:SINGle[:STATe] <bool>

(Read-Write) Either shows marker readout of only the active trace or other traces simultaneously.

See other SCPI Marker commands. Learn more about Marker readout.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<bool>	**ON** (or 1) - Shows the readout of only the active marker for each trace. **OFF** (or 0) - Shows up to 5 marker readouts per trace, up to 20 total readouts.
Examples	`DISP:WIND:ANN:MARK:SING ON` `display:window:annotation:marker:single off`
Query Syntax	DISPlay:WINDow:ANNotation:MARKer:SINGle?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

DISPlay:WINDow<wnum>:ANNotation:MARKer:SIZE <char>

(Read-Write) Specifies the size of the marker readout text. See other SCPI Marker commands. Learn more about Marker readout.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<char>	Readout text size. Choose from:**NORMal | LARGe**
Examples	`DISP:WIND:ANN:MARK:SIZE LARG` `display:window:annotation:marker:size normal`
Query Syntax	DISPlay:WINDow:ANNotation:MARKer:SIZE?
Return Type	Character
Default	NORMal

DISPlay:WINDow<wnum>:ANNotation:MARKer:STATe <ON | OFF>

(Read-Write) Specifies whether to show or hide the Marker readout (when markers are ON) on the selected window. See other SCPI Marker commands. Learn more about Marker readout.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<ON | OFF>	**ON** (or 1) - turns marker readout ON. **OFF** (or 0) - turns marker readout OFF.
Examples	`DISP:WIND:ANN:MARK:STAT ON` `display:window:annotation:marker:state off`
Query Syntax	DISPlay:WINDow:ANNotation:MARKer:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

DISPlay:WINDow<wnum>:ANNotation:TRACe:STATe <ON | OFF>

(Read-Write) Specifies whether to show or hide the Trace Status buttons on the left of the display.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<ON | OFF>	**ON** (or 1) - turns the buttons ON. **OFF** (or 0) - turns the buttons OFF.
Examples	`DISP:WIND:ANN:TRAC:STAT ON` `display:window:annotation:trace:state off`
Query Syntax	DISPlay:WINDow:ANNotation:TRACe:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

DISPlay:WINDow<wnum>:CATalog?

(Read-only) Returns the trace numbers for the specified window.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.

Example	Window 1 with four traces:
	`DISPlay:WINDow1:CATalog?`
	`Returns:`
	`"1,2,3,4"`

Return Type	String of Character values separated by commas
Default	Not applicable

DISPlay:WINDow<wnum>:ENABle <ON | OFF>

(Read-Write) Specifies whether to disable or enable all analyzer display information **in the specified window**. Marker data is not updated. More CPU time is spent making measurements instead of updating the display.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<ON | OFF>	**ON** (or 1) - turns the display ON. **OFF** (or 0) - turns the display OFF.
Examples	`DISP:WIND:ENABle ON` `display:window1:enable off`
Query Syntax	DISPlay:WINDow<wnum>:ENABle?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

DISPlay:WINDow<wnum>:SIZE <char>

(Read-Write) Sets or returns the window setting of Maximized, Minimized, or Normal. To arrange all of the windows, use DISP:ARR.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1
<char>	Window size. Choose from: **MIN | MAX | NORM**
Examples	`DISP:WIND:SIZE MAX` `display:window:size norm`
Query Syntax	DISPlay:WINDow:SIZE?
Default	Not Applicable

DISPlay:WINDow<wnum>[:STATe] <ON | OFF>

(Read-Write) Write to create or delete a window on the screen or Read whether a window is present.

Parameters	
<wnum>	Window number to create; choose any integer between **1** and the maximum number of windows allowed in the PNA.
<ON | OFF>	**ON** (or 1) - The window <wnum> is created. **OFF** (or 0) - The window <wnum> is deleted.
Examples	`DISP:WIND ON` `display:window2:state off`
Query Syntax	DISPlay:WINDow<wnum>[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	Window number "1" **ON**

DISPlay:WINDow<wnum>:TABLe <char>

(Read-Write) Write to show the specified table at the bottom of the analyzer screen or Read to determine what table is visible.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1
<char>	Table to show. Choose from: **OFF | MARKer | LIMit | SEGMent**
Examples	`DISP:WIND:TABLe SEGM` `display:window:table off`
Query Syntax	DISPlay:WINDow:TABLe?
Default	OFF

DISPlay:WINDow<wnum>:TITLe:DATA <string>

(Read-Write) Sets data in the window title area. The title is turned ON and OFF with DISP:WIND:TITL:STAT OFF.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<string>	Title to be displayed. Any characters, enclosed with quotes. If the title string exceeds 50 characters, an error will be generated and the title not accepted. Newer entries replace (not append) older entries.
Examples	`DISP:WIND:TITL:DATA 'hello'` `display:window2:title:data 'hello'`
Query Syntax	DISPlay:WINDow<wnum>:TITLe:DATA?
Return Type	String
Default	NA

DISPlay:WINDow<wnum>:TITLe[:STATe] <ON | OFF>

(Read-Write) Turns display of the title string ON or OFF. When OFF, the string remains, ready to be redisplayed when turned back ON.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns the title string ON. **OFF** (or 0) - turns the title string OFF.
Examples	`DISP:WIND:TITL ON` `Display:window1:title:state off`
Query Syntax	DISPlay:WINDow<wnum>:TITLe[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

DISPlay:WINDow<wnum>:TRACe<tnum>:DELete

(Write-only) Deletes the specified trace from the specified window. The measurement parameter associated with the trace is not deleted.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	The number of the trace to be deleted; if unspecified, value is set to 1
Examples	`DISP:WIND:TRAC:DEL` `display:window2:trace2:delete`
Query Syntax	Not applicable
Default	NA

DISPlay:WINDow<wnum>:TRACe<tnum>:FEED <name>

(Write-only) Creates a new trace <tnum> and associates (feeds) a measurement <name> to the specified window<wnum>. This command should be executed immediately after creating a new measurement with CALC:PAR:DEF<name>,<parameter>.

To feed the same measurement to multiple traces, create another measurement with the same <name>,<parameter> using the CALC:PAR:DEF command. The analyzer will collect the data only once.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Trace number to be created. Choose any Integer between **1** and **8**
<name>	Name of the measurement that was defined with CALC:PAR:DEF**<name>**,<parameter>
Examples	`DISP:WIND:TRAC:FEED 'test'` `display:window2:trace2:feed 'test'`
Query Syntax	Not applicable
Default	"CH1_S11"

DISPlay:WINDow<wnum>:TRACe<tnum>MEMory[:STATe] <ON | OFF>

(Read-Write) Turns the memory trace ON or OFF.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Any existing trace number; if unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns the memory trace ON. **OFF** (or 0) - turns the memory trace OFF.
Examples	`DISP:WIND:TRAC:MEM ON` `display:window2:trace2:memory:state off`
Query Syntax	DISPlay:WIND<wnum>:TRACe<tnum>:MEMory[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

DISPlay:WINDow<wnum>:TRACe<tnum>:SELect

(Write-only) Activates the specified trace in the specified window for front panel use.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Any existing trace number; if unspecified, value is set to 1
Examples	`DISP:WIND:TRAC:SEL` `display:window2:trace2:select`
Query Syntax	Not applicable
Default	NA

DISPlay:WINDow<wnum>:TRACe<tnum>[:STATe] <ON | OFF>

(Read-Write) Turns the display of the specified trace in the specified window ON or OFF. When OFF, the measurement behind the trace is still active.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Any existing trace number; if unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns the trace ON. **OFF** (or 0) - turns the trace OFF.
Examples	`DISP:WIND:TRAC ON` `display:window2:trace2:state off`
Query Syntax	DISPlay:WIND<wnum>:TRACe<tnum>[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

DISPlay:WINDow<wnum>:TRACe<tnum>TITLe:DATA <string>

(Read-Write) Writes and read data to the trace title area. The trace title is embedded in the trace status field. Learn more.

Newer entries replace (not append) older entries. The title is turned ON and OFF with DISP:WIND:TRAC:TITL:STAT.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Trace number of the specified window. If unspecified, value is set to 1. The trace number displayed in trace status is the trace number of the channel; not the window. Use Display:Cat? to read the window numbers. Use Disp:Window:Cat? to read the trace numbers of the specified window.
<string>	Title to be displayed. Any characters (not spaces) enclosed with quotes.
Examples	`DISP:WIND:TRAC:TITL:DATA 'MyNewMeas'` `display:window2:trace3:title:data 'hello'`
Query Syntax	DISPlay:WINDow<wnum>:TRACe<tnum>TITLe:DATA?
Return Type	String
Default	Not Applicable

DISPlay:WINDow<wnum>:TRACe<tnum>TITLe:STATe <bool>

(Read-Write) Turns display of the Trace Title ON or OFF. When turned OFF, the previous trace title returns. Set a new trace title using DISP:WIND:TRAC:TITL:DATA

Learn more about Trace Titles

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1
<tnum>	Trace number of the specified window. If unspecified, value is set to 1. The trace number displayed in trace status is the trace number of the channel; not the window. Use Display:Cat? to read the window numbers. Use Disp:Window:Cat? to read the trace numbers of the specified window.
<bool>	**ON** (or 1) - turns the title ON. **OFF** (or 0) - turns the title OFF.
Examples	`DISP:WIND:TRAC:TITL ON` `Display:window2:trace3:title:state off`
Query Syntax	DISPlay:WINDow<wnum>:TRACe<tnum>:TITLe[:STATe]?

Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

DISPlay:WINDow<wnum>:TRACe<tnum>:Y[:SCALe]:AUTO

(Write-only) Performs an **Autoscale** on the specified trace in the specified window, providing the best fit display. Autoscale is performed only when the command is sent; it does NOT keep the trace autoscaled indefinitely.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Any existing trace number; if unspecified, value is set to 1
Examples	`DISP:WIND:TRAC:Y:AUTO` `display:window2:trace2:y:scale:auto`
Query Syntax	Not applicable
Default	Not applicable

DISPlay:WINDow<wnum>:TRACe<tnum>:Y[:SCALe]:PDIVision <num>

(Read-Write) Sets the Y axis **Per Division** value of the specified trace in the specified window.

Parameters	
<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Any existing trace number; if unspecified, value is set to 1
<num>	Units / division value. The range of acceptable values is dependent on format and domain. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`DISP:WIND:TRAC:Y:PDIV 1` `display:window2:trace2:y:scale:pdivision maximum`
Query Syntax	DISPlay:WINDow<wnum>:TRACe<tnum>:Y[:SCALe]:PDIVision?
Return Type	Numeric
Default	10

DISPlay:WINDow<wnum>:TRACe<tnum>:Y[:SCALe]:RLEVel <num>

(Read-Write) Sets the Y axis Reference Level of the specified trace in the specified window.

Parameters

<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Any existing trace number; if unspecified, value is set to 1
<num>	Reference level value. The range of acceptable values is dependent on format and domain. **Note:** This command will accept MIN or MAX instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
DISP:WIND:TRAC:Y:RLEV 0
display:window2:trace2:y:scale:rlevel minimum
```

Query Syntax DISPlay:WINDow<wnum>:TRACe<tnum>:Y[:SCALe]:RLEVel?

Return Type Numeric

Default NA

DISPlay:WINDow<wnum>:TRACe<tnum>:Y[:SCALe]:RPOSition <num>

(Read-Write) Sets the **Reference Position** of the specified trace in the specified window

Parameters

<wnum>	Any existing window number. If unspecified, value is set to 1.
<tnum>	Any existing trace number; if unspecified, value is set to 1
<num>	Reference position on the screen measured in horizontal graticules from the bottom. The range of acceptable values is dependent on format and domain. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
DISP:WIND:TRAC:Y:RPOS 0
display:window2:trace2:y:rposition maximum
```

Query Syntax DISPlay:WINDow<wnum>:TRACe<tnum>:Y[:SCALe]:RPOSition?

Return Type Numeric

Default 5

DISPlay:VISible <ON | OFF>

(Read-Write) Makes the PNA application visible or not visible. In the Not Visible state, the analyzer cycle time for making measurements, and especially data transfer, can be significantly faster because the display does not process data.

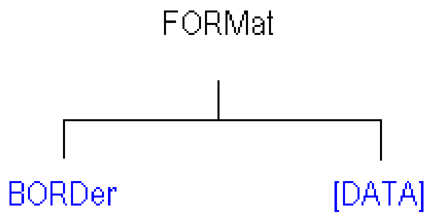
Parameters	
<ON | OFF>	**ON** (or 1) - PNA app is visible **OFF** (or 0) - PNA app is NOT visible
Examples	`DISP:VIS ON` `display:visible off`
Query Syntax	DISPlay:VISible?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

Last modified:

9/12/06	Modified for number of windows.

Format Commands

Specifies the way that data will be transferred when moving large amounts of data. These commands will affect data that is transferred with the CALC:DATA and CALC:RDATA commands.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Synchronizing the PNA and Controller
- SCPI Command Tree

FORMat:BORDer <char>

(Read-Write) Set the byte order used for GPIB data transfer. Some computers read data from the analyzer in the reverse order. This command is only implemented if FORMAT:DATA is set to :REAL. If FORMAT:DATA is set to :ASCII, the swapped command is ignored.

Parameters

<char>	Choose from: **NORMal** - Use when your controller is anything other than an IBM compatible computers **SWAPped -** for IBM compatible computers Note: Use **NORMal** if you are using drivers like VISA or development environments like VEE, LabView, or T&M Tool kit.
Examples	`FORM:BORD SWAP` `format:border normal`
Query Syntax	FORMat:BORDer?
Return Type	Character

Default Normal

FORMat[:DATA] <char>

(Read-Write) Sets the data format for data transfers.

To transfer measurement data, use CALC:DATA.

To transfer Cal Set data, use

To transfer Source Power correction data, use
SOURce:POWer:CORRection:COLLect:TABLe:DATA
SOURce:POWer:CORRection:COLLect:TABLe:FREQuency

SOURce:POWer:CORRection:DATA

Parameters

<char> Choose from:

REAL,32 - (default value for REAL) Best for transferring large amounts of measurement data.

REAL,64 - Slower but has more significant digits than REAL,32. Use REAL,64 if you have a computer that doesn't support REAL,32.

ASCii,0 - The easiest to implement, but very slow. Use if small amounts of data to transfer.

Note: The **REAL,32** and **REAL,64** arguments transfer data in block format as explained in Transferring Measurement Data.

Examples

```
FORM REAL,64
format:data ascii
```

Query Syntax FORMat:DATA?

Return Type Character,Character

Default **ASCii,0**

Hardcopy Command

Learn about Printing

SCPI Command Tree

HCOPy:FILE <filename>

(Write-only) Saves the screen image to a file.

Parameters	
<filename>	Name of the file to save the screen to. The file is saved to the current working directory unless a valid full path name is specified. Use one of the following suffixes: .bmp - not recommended due to large file size .jpg - not recommended due to poor quality .png - recommended

Examples	`HCOPY:FILE "myFile.png"`
	
	`hcopy:file "c:\data\myfile.png"`

Query Syntax	Not Applicable
Default	Not Applicable

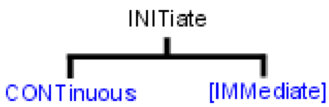
HCOPy[:IMMediate]

(Write-only) Prints the screen to the default printer.

Examples	`HCOP` `hcopy:immediate`
Query Syntax	Not applicable
Default	Not Applicable

Initiate Commands

Controls triggering signals



Click on a blue keyword to view the command details.

See Also

- **Example** Triggering the PNA
- Learn about Triggering
- Synchronizing the PNA and Controller
- SCPI Command Tree

INITiate:CONTinuous <boolean>

(Read-Write) Specifies whether the PNA trigger source is set to Internal (continuous) or Manual.

This command is a subset of TRIG:SEQ:SOURce, which can also set the trigger source to External.

To set how a channel responds to trigger signals, use SENS:SWE:MODE.

See a map of user interface to SCPI triggering commands.

For more information on triggering, see the PNA Trigger Model.

See the Example program: Triggering the PNA using SCPI.

Parameters	
<boolean>	**ON** (or 1) - Internal (continuous) trigger. **OFF** (or 0) - Manual sweep. Use INIT:IMMediate to send a trigger signal
Examples	`INIT:CONT ON` `initiate:continuous off`
Query Syntax	INITiate:CONTinuous?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

INITiate<cnum>[:IMMediate]

(Write-only) Stops the current sweeps and immediately sends a trigger. (Same as Trigger! on the PNA front panel).

See the Example program: Triggering the PNA using SCPI

Note: An **SMC Fixed Output** measurement cannot be triggered using this command. For more information, see the example program.

This command requires Trigger:Source to be set to Manual. This causes ONE trigger signal to be SENT each time INIT:IMM is issued.

Sens<ch>:Sweep:Mode sets the number of trigger signals each channel will ACCEPT (Continuous - unlimited, Groups - a specific number, or HOLD - none.)

To trigger ALL channels in turn:

Set ALL channels to Sens<ch>:Sweep:Mode Continuous. The <ch> argument in INIT<ch>:IMM is ignored.

Then…

- TRIG:SCOP ALL triggers ALL channels (in sequence) each time Init:Imm is sent.
- TRIG:SCOP CURRent triggers ONLY the NEXT channel each time Init:Imm is sent.

To trigger ONLY a specified channel:

1. Set ALL channels to Sens<ch>:Sweep:Mode HOLD
2. Send TRIG:SCOP CURRent
3. Send Init<ch>:Imm where <ch> is the channel to be triggered.

Advanced Situations that require some channels to be in CONT and others in HOLD are rare. The following describes the behavior of the Init:Imm command in these situations:

When Trigger:Scope = Global:

- If the SPECIFIED <cnum> channel is in hold mode, it is put in single trigger (accepts 1 trigger signal) and goes to the end of the queue of channels to be triggered. The other 'non-hold' channels are triggered. The next Init:Imm triggers the specified channel first.

  For example: ch1 is in Hold, ch2 and ch3 are in CONT and we send INIT1:IMM

- On the first INIT:IMM, ch2 and ch3 is triggered.
- next INIT:IMM, ch1, ch2, ch3 is triggered.
- next INIT:IMM, ch2 and ch3 is triggered.
- next INIT:IMM, ch1, ch2, ch3 is triggered, and so forth.

When Trigger:Scope = Channel

- Only ONE channel is triggered for each issued INIT<ch>:IMM command.
- If the specified channel is in hold, it is put in single trigger (accepts 1 trigger signal) and goes the end of the queue of channels to be triggered as in the 'Global' example.

This is one of the PNA overlapped commands. Learn more.

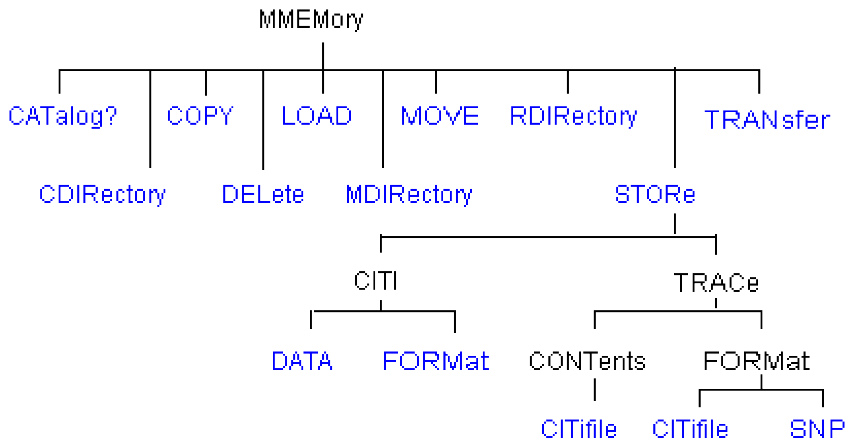
Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
Examples	**INIT** **initiate2:immediate**
Query Syntax	Not applicable
Default	Not applicable

Last modified:

April 23, 2007 Updated Init:Imm

Memory Commands

The memory commands control saving and loading instrument states and measurement trace data to the hard drive. To read and write trace data in GPIB format, see CALC:DATA.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Save / Recall and File Types
- Synchronizing the PNA and Controller
- SCPI Command Tree

Specifying Path Names

The MMEM commands use the following rules to specify path names:

- The default folder is "C:\Program Files\Agilent\Network Analyzer\Documents"
- You can change the active directory using MMEMory:CDIRectory.
- Specify only the file name if using the active directory.
- You can also use an absolute path name to specify the folder and file.

MMEMory:CATalog[:<char>]? [<folder>]

(Read-only) Returns a comma-separated string of file names that are in the specified folder. If there are no files of the specified type, "NO CATALOG" is returned. Learn about File Types

Parameters

<char>	The type of files to list. Choose from: • **STATe** - Instrument states (.sta) • **CORRection** - Calibration Data (.cal) • **CSARchive** - Instrument state and calibration data (.csa) • **CSTate** - Instrument state and link to Calibration data (.cst) If unspecified then ALL file types (even unknown types) are listed.
<folder>	String - Any existing folder name. See Specifying Path Names
Examples	`MMEM:CAT? 'lists all files from the current folder` `mmemory:catalog:correction? 'C:\Program Files\Agilent\Network Analyzer\Documents' 'lists .cal files from the specified folder`
Default	Not applicable

MMEMory:CDIRectory <folder>

(Read-Write) Changes the folder name.

Parameters

<folder> Any drive and folder name that already exists.
If the same level as "C:\Program Files\Agilent\Network Analyzer\Documents", then no punctuation is required

```
MMEM:CDIR Service
```

If the new folder is at a different level than "C:\Program Files\Agilent\Network Analyzer\Documents", use a slash (\) before the folder name and enclose in quotes.

```
mmemory:cdirectory '\automation' 'changes default directory up one level.
```

You can use an absolute path to specify the new folder.

```
mmemory:cdirectory 'c:\automation\service'
```

Query Syntax MMEMory:CDIRectory? 'Returns the current folder name

Return Type	String
Default	'C:\Program Files\Agilent\Network Analyzer\Documents'

MMEMory:COPY <file1>,<file2>

(Write-only) Copies file1 to file2. Extensions must be specified.

Parameters	
<file1>	String - Name of the file to be copied. See Specifying Path Names
<file2>	String - Name of the file to be created from file1.
Examples	`MMEM:COPY 'MyFile.cst','YourFile.cst'`
Query Syntax	Not applicable
Default	Not applicable

MMEMory:DELete <file>

(Write-only) Deletes file. Extensions must be specified.

Parameters	
<file>	String - Name of the file to be deleted. See Specifying Path Names
Examples	`MMEM:DEL 'MyFile.cst'`
Query Syntax	Not applicable
Default	Not applicable

MMEMory:LOAD[:<char>] <file>

(Write-only) Loads the specified file. Learn about File Types

Parameters

<char> The type of file to load. Choose from:

- **STATe** - Instrument states (.sta)
- **CORRection** - Calibration Data (.cal)
- **CSARchive** - Instrument state and calibration data (.csa)
- **CSTate** - Instrument state and link to Calibration data (.cst)
- **ENR** - Excess Noise Source data (Noise Figure App only)

If <char> is unspecified, the extension must be included in the filename.

If an extension is specified in <file> that does not agree with <char> then no action is taken.

<file> String - Name of the file to be loaded. See Specifying Path Names

Examples

```
MMEM:LOAD 'MyFile.cst'
mmemory:load:state 'MyInstState'
```

Query Syntax Not applicable

Default Not applicable

MMEMory:MDIRectory <folder>

(Write-only) Makes a folder.

Parameters

<folder> String - Name of the folder to make. See Specifying Path Names

Examples

```
MMEM:MDIR 'MyFolder'
mmemory:mdirectory 'c:\NewFolder'
```

Query Syntax Not applicable

Default Not applicable

MMEMory:MOVE <file1>,<file2>

(Write-only) Renames <file1> to <file2>. File extensions must be specified.

Parameters	
<file1>	String - Name of the file to be renamed. See Specifying Path Names
<file2>	String - Name of the new file.
Examples	`MMEM:MOVE 'MyFile.cst','YourFile.cst'`
Query Syntax	Not applicable
Default	Not applicable

MMEMory:RDIRectory <folder>

(Write-only) Removes the specified folder.

Parameters	
<folder>	String - Name of the folder to remove. See Specifying Path Names
Examples	`MMEM:RDIR 'MyFolder'`
Query Syntax	Not applicable
Default	Not applicable

MMEMory:STORe[:<char>] <file>

(Write-only) Stores the specified file (.sta, .cal, .csa, .cst, prn).

- To save snp files, use Calc:Data:SNP:PORTs:SAVE.
- To save *.cti files, use MMEM:STOR:CIT:DATA or MMEM:STOR:CIT:FORM.

Parameters

<char> The type of file to store. Choose from:

- **STATe** - Instrument states (.sta)
- **CORRection** - Calibration Data (.cal)
- **CSARchive** - Instrument state and calibration data (.csa)
- **CSTate** - Instrument state and link to Calibration data (.cst)
- **ENR** - Excess Noise Source data (Noise Figure App only)

No <char> is specified for prn.

If <char> is unspecified, then the extension must be included in the filename.

If an extension is specified in <file> that does not agree with <char> then no action is taken.

Learn about File Types

<file> String - Name of any valid file that is not already in existence. See Specifying Path Names

Examples

```
MMEM:STOR:STAT 'myState'
mmemory:store 'c:\bin\myState.sta'

MMEM:STOR 'MyData.prn'
```

Query Syntax Not applicable

Default Not applicable

MMEMory:STORe:CITifile:DATA <filename>

(Write only) Saves UNFORMATTED trace data to .cti file. Learn more.

Parameters

<filename> Any drive and folder name that already exists.
If the same level as "C:\Program Files\Agilent\Network Analyzer\Documents", then no punctuation is required

```
MMEM:STOR:CIT:DATA MYCTIFile
```

If the new folder is at a different level than "C:\Program Files\Agilent\Network Analyzer\Documents", use a slash (\) before the folder name and enclose in quotes.

```
mmemory:cdirectory '\automation' 'changes default directory up one level.
```

You can use an absolute path to specify the new folder.

```
mmemory:cdirectory 'c:\automation\service'
```

Query Syntax Not Applicable

Default C:\Program Files\Agilent\Network Analyzer\Documents'

MMEMory:STORe:CITifile:FORMat <filename>

(Write only) Saves FORMATTED trace data to .cti file. Learn more.

Parameters

<filename> Any drive and folder name that already exists.
If the same level as "C:\Program Files\Agilent\Network Analyzer\Documents", then no punctuation is required

```
MMEM:STOR:CIT:DATA MYFile
```

If the new folder is at a different level than "C:\Program Files\Agilent\Network Analyzer\Documents", use a slash (\) before the folder name and enclose in quotes.

```
mmemory:cdirectory '\automation' 'changes default directory up one level.
```

You can use an absolute path to specify the new folder.

```
mmemory:cdirectory 'c:\automation\service'
```

Query Syntax Not Applicable

Default C:\Program Files\Agilent\Network Analyzer\Documents'

MMEMory:STORe:TRACe:CONTents:CITifile <char>

(Read-Write) Specifies the contents of subsequent citifile save statements. (See Data Define Saves)

Parameters

<char> Choose from:

SING - Single trace

DISP - All displayed traces

AUTO - All displayed traces

Examples

```
MMEM:STOR:TRAC:CONT:CIT SING
```

Query Syntax MMEMory:STORe:TRACe:CONTents?

Return Type Character

Default Auto

MMEMory:STORe:TRACe:FORMat:CITifile <char>

(Read-Write) Specifies the format of subsequent citifile save statements. (See Data Define Saves)

Parameters

<char> Format in which the citifile will be saved with subsequent MMEMory:STORe:CIT:FORMat statements. Choose from:

MA - Linear Magnitude / degrees

DB - Log Magnitude / degrees

RI - Real / Imaginary

AUTO - Format in which the trace is already displayed. If other than Log Mag, Linear Magnitude, or Real/Imag, then the format will be in Real/Imag.

Examples

```
MMEM:STOR:TRAC:FORM:CIT MA
```

Query Syntax MMEMory:STORe:TRACe:FORMat:CITifile?

Return Type Character

Default Auto'

MMEMory:STORe:TRACe:FORMat:SNP <char>

(Read-Write) Specifies the format of subsequent .s1p, .s2p, .s3p; s4p save statements. (See Data Define Saves).

Parameters

<char> Choose from:

MA - Linear Magnitude / degrees

DB - Log Magnitude / degrees

RI - Real / Imaginary

AUTO - data is output in currently selected trace format. If other than LogMag, LinMag, or Real/Imag, then output is in Real/Imag.

Examples

```
MMEM:STOR:TRAC:FORM:SNP MA
```

Query Syntax MMEMory:STORe:TRACe:FORMat:SNP?

Return Type Character

Default Auto'

MMEMory:TRANsfer <fileName>,<dataBlock>

(Read-Write) Transfers data between the PNA and an external controller. Other MMEM commands transfer data between the PNA application and the PNA hard drive. If <fileName> already exists, it will be overwritten. The file must be no larger than 20MB.

To read **trace data** from the PNA in block format, use CALC:DATA.

Parameters	
<fileName>	String - File name. See Specifying Path Names
<dataBlock>	Block Data - The contents of the file. The data block is a block of binary data. Use the following syntax: #**<num digits><byte count>**<data bytes><NL><END> where: **<num_digits>** specifies how many digits are contained in <byte_count> **<byte_count>** specifies how many data bytes will follow in <data bytes>
Example	See example program
Query Syntax	MMEMory:TRANsfer? <fileName> Reads block data from the specified file location.
Default	Not applicable

Last modified:

30-Jul-2007	Added noise keywords to load and store.
9/12/06	MQ Store command has reference to PORTS Snp.

Output Commands

Controls two output functions: RF power and Noise Source.

OUTPut:

| MANual:NOISe[:STATe]

| [:STATe]

Click on a blue keyword to view the command details.

See Also

- Example Programs
- Synchronizing the PNA and Controller
- SCPI Command Tree

OUTPut:MANual:NOISe[:STATe] <bool>

(Read-Write) Sets and reads the noise source state ON or OFF. For Noise Figure measurements.

Parameters	
<bool>	**True (1)** - Noise source ON **False (0)** - Noise source OFF
Examples	`OUTP:MAN:NOIS 0` `output:manual:noise:state 1`
Query Syntax	OUTPut:MANual:NOISe[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	False (0)

OUTPut[:STATe] <ON | OFF>

(Read-Write) Turns RF power from the source ON or OFF.

See note about source power state with instrument state save and recall.

Parameters	
<ON | OFF>	**ON** (or 1) - turns RF power ON **OFF** (or 0) - turns RF power OFF
Examples	`OUTP ON` `output:state off`
Query Syntax	OUTPut[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

Last Modified:

22-Aug-2007 Added noise command

Route Command

[Learn about Frequency Offset]

[SCPI Command Tree]

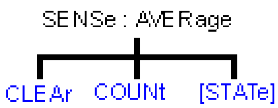
ROUTe<cnum>:PATH:LOOP[:R1] <char>

(Read-Write) Throws internal switch to reference receiver when the specified channel is measured. This feature is only available on PNA models with Option 081 - external reference switch. See block diagram of the reference switch.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Position of the switch. Choose from: **INTernal** - bypass R1 Loop. Connects the port 1 source directly to the R1 receiver. **EXTernal** - flow through R1 Loop. Allows direct access to the R1 receiver through the Reference 1 front-panel connectors.
Examples	`ROUT:PATH:LOOP INT` `route2:path:loop:r1 external`
Query Syntax	ROUTe<cnum>:PATH:LOOP:R1?
Return Type	Character
Default	INTernal

Sense:Average Commands

Sets sweep-to-sweep averaging parameters. Averaging is a noise reduction technique that averages each data point over a user-specified number of sweeps. Averaging affects all of the measurements in the channel.



Click on a blue keyword to view the command details.

See Also

- Example using some of these commands.
- Learn about Averaging
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:AVERage:CLEar

(Write-only) Clears and restarts averaging of the measurement data. Must also set SENS:AVER[:STATe] ON

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
Examples	`SENS:AVER:CLE` `sense2:average:clear`
Query Syntax	Not applicable
Default	Not applicable

SENSe<cnum>:AVERage:COUNt <num>

(Read-Write) Sets the number of measurement sweeps to combine for an average. Must also set SENS:AVER[:STATe] ON

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<num>	Number of measurement sweeps to average. Choose any number between **1** and **65536** (2^16).
Examples	`SENS:AVER:COUN 999` `sense2:average:count 73`
Query Syntax	SENSe<cnum>:AVERage:COUNt?
Return Type	Numeric
Default	1

SENSe<cnum>:AVERage[:STATe] <ON | OFF>

(Read-Write) Turns trace averaging ON or OFF.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<ON | OFF>	**ON** (or 1) - turns averaging ON. **OFF** (or 0) - turns averaging OFF.
Examples	`SENS:AVER ON` `sense2:average:state off`
Query Syntax	SENSe<cnum>:AVERage[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	Off

Sense:Bandwidth Commands

SENSe:BANDwidth:

RESolution <num>

TRACk <bool>

See Also

- Example Programs
- Learn about IF Bandwidth
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:BANDwidth | BWIDth[:RESolution] <num>

(Read-Write) Sets the bandwidth of the digital IF filter to be used in the measurement. (Use either **Sense:Bandwidth** or **Sense:Bwidth**)

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	IF Bandwidth in Hz. The list of valid IF Bandwidths is different depending on the PNA model. (Click to see the lists.) If an invalid number is specified, the analyzer will round up to the closest valid number. This parameter supports MIN and MAX as arguments. Learn more.
Examples	`SENS:BWID 1KHZ` `sense2:bandwidth:resolution 1000`
Query Syntax	SENSe<cnum>:BANDwidth | BWIDth[:RESolution]?
Return Type	Numeric
Default	See Preset IFBW for your PNA model.

SENSe<cnum>:BANDwidth | BWIDth:TRACk <bool>

(Read-Write) Sets and returns the state of the Reduce IF BW at Low Frequencies feature.

(Use either **Sense:Bandwidth:Track** or **Sense:Bwidth:Track**).

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<bool>	Choose from: **ON** or **1 -** Reduce IF BW at Low Frequencies is set ON **OFF** or **0 -** Reduce IF BW at Low Frequencies is set OFF
Examples	`SENS:BWID:TRAC OFF` `sense2:bandwidth:track 1`
Query Syntax	SENSe<cnum>:BANDwidth | BWIDth:TRACk?
Return Type	Boolean
Default	ON

Last Modified:

15-Jan-2008	MIN and MAX added

Sense:Correction Commands

Performs and applies calibration and other error correction features.

To perform Guided Calibration, see Sens:Corr Coll:GUIDed.

SENSe:CORRection
- **CCHeck**
  - | **[ACQuire]**
  - | **DONE**
  - | **PARameter**
- **CKIT - More Commands**
- **COLLect**
  - | **[ACQuire]**
  - | **APPLy**
  - | **CKIT - More Commands**
  - | **DISPlay:WINDow**
    - | **AOFF**
    - | **[STATe]**
  - | **GUIDed - More Commands**
  - | **ISOLation**
    - | **AVERage**
      - | **INCRement**
    - | **ECAL**
      - | **[STATe]**
  - | **METHod**
  - | **SAVE**
  - | **SESSion - More Commands**
  - | **SWEep:CHANnel**
    - | **AOFF**
    - | **[STATe]**
  - | **WINDow[:STATe]**
- **CSET - More Commands**
- **ENR:CALibration:TABLe**
  - | **DATA**
  - | **ID:DATA**
  - | **SERial:DATA**
- **EXTension - More Commands**
- **GCSetup:POWer**
- **IMPedance:INPut**
  - | **MAGNitude**

INTerpolate

| **[STATe]**

ISOLation

| **[STATe]**

PREFerence

| **CSET**

| **SAVE**

| **SAVUser**

| **ECAL**

| **ORIentation**

| **PMAP**

| **SIMCal**

| **TRIG**

| **FREE**

RPOWer:OFFSet

| **[AMPLitude]**

RVELocity

| **COAX**

SFOWard

| **[STATe]**

[STATe]

TCOLd:USER:VALue

TSTandards

| **[STATe]**

TYPE

| **CATalog?**

Click on a blue keyword to view the command details.

Red commands are superseded.

See Also

- Example Programs
- New See Calibrating the PNA Using SCPI
- Learn about Measurement Calibration
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:CORRection:CCHeck[:ACQuire] <mod>[,char]

(Write-only) Reads the 'confidence data' associated with the specified ECal module and puts it into memory. The measurement is selected using SENS:CORR:CCH:PAR. This command is compatible with *OPC.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<mod>	ECAL Module that contains the confidence data. Choose from: **ECAL1** ..through.. **ECAL8**
[char]	Optional argument. Specifies which characterization within the ECal module that the confidence data will be read from. **CHAR0** Factory characterization (data that was stored in the ECal module by Agilent). Default if not specified. **CHAR1** User characterization #1 **CHAR2** User characterization #2 **CHAR3** User characterization #3 **CHAR4** User characterization #4 **CHAR5** User characterization #5

Examples	`SENS:CORR:CCHeck ECAL2`
	
	`sense2:correction:ccheck:acquire ecal1,char1`

Query Syntax	Not applicable
Default	Not applicable

SENSe<cnum>:CORRection:CCHeck:DONE

(Write-only) Concludes the Confidence Check and sets the ECal module back into the idle state.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1

Examples

```
SENS:CORR:CCH:DONE
sense2:correction:ccheck:done
```

Query Syntax Not applicable

Default Not applicable

SENSe<cnum>:CORRection:CCHeck:PARameter <Mname>

(Read-Write) Specifies an existing measurement to be used for the Confidence Check.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<Mname>	Name of the measurement you are selecting for the confidence check. The measurement must already exist.

Examples

```
SENS:CORR:CCH:PAR 'TEST'
'selects the measurement "test" on channel 1 for the confidence check

sense2:correction:ccheck:parameter 'test'
'selects the measurement "test" on channel 2 for the confidence check
```

Query Syntax SENSe<cnum>:CORRection:CCHeck:PARameter?

Returns the name of the selected measurement on channel <cnum>.

Return Type String

Default Not applicable

SENSe<cnum>:CORRection:COLLect[:ACQuire] <class>[,subclass]

(Write-only) For UNGUIDED calibration, measures the specified standards from the selected calibration kit. The calibration kit is selected using the Sense:Correction:Collect:CKIT command.

For using two sets of standards, see SENS:CORR:TST.

Note: Before using this command you must select two items:
1. Select a calibration method using SENS:CORR:COLL:METH
2. Select a measurement using CALC:PAR:SEL. You can select one measurement for each channel.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<class> **Measures the standards associated with these class labels.** Choose from:

Label	Forward	Reverse
STAN1	S11A	S22A
STAN2	S11B	S22B
STAN3	S11C	S22C
STAN4	S21T	S12T
STAN5	Generic Isolation; not associated with calibration kit definition.	
ECAL1 through **ECAL8**	ECAL modules	
POWer	Take a receiver power cal sweep and turn correction ON	
SLSET	Sets 'sliding load type', and increments the "number of slides" count. The total number of slides is critical to the correct calculation of the sliding load algorithm. See a sliding load cal example.	
SLDONE	Computes the sliding load using a circle fit algorithm.	

[subclass] Optional argument. For mechanical calibration kits, choose from the following to specify the standard to be acquired from the SENS:CORR:COLL:CKIT:ORDer list. If not specified, subclass is set to **SST1**.

SST1 First standard in the order list

SST2 Second standard in the order list

SST3 Third standard in the order list

SST4 Fourth standard in the order list

SST5 Fifth standard in the order list

SST6 Sixth standard in the order list

SST7 Seventh standard in the order list

If an ECAL module (1 through 8) is specified for <class>, choose one of the following for specifying which characterization within the ECal module will be used for the acquire. If not specified, the default is **CHAR0**.

CHAR0 Factory characterization (data that was stored in the ECal module by Agilent)

CHAR1 User characterization #1

CHAR2 User characterization #2

CHAR3 User characterization #3

CHAR4 User characterization #4

CHAR5 User characterization #5

Examples

```
SENS:CORR:COLL STAN1


'If SENS:CORR:COLL:CKIT:ORDer2 5,3,7
was specified, the following command measures standard 3 (the
second in the order list)
sense1:correction:collect:acquire stan3,sst2

SENS:CORR:COLL ECAL4

sense2:correction:collect:acquire ecal2,char1
```

Query Syntax Not applicable

Default Not applicable

SENSe<cnum>:CORRection:COLLect:APPLy

(Write-only) Applies error terms to the measurement that is selected using Calc:Par:Select.

Note: Before using this command you must select a measurement using CALC:PAR:SEL. You can select one measurement for each channel.

Note: This command is only necessary if you need to modify error terms. If you do not need to modify error terms, SENSe<cnum>:CORRection:COLLect:SAVE calculates and then automatically applies error terms after you use SENS:CORR:COLL:ACQuire to measure cal standards.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

Example

```
1. CALCulate2:PARameter:SELect S21_2 'select the measurement to
   apply terms to

2. SENSe2:CORRection:COLLect:METHod SPARSOLT 'set type of cal
   method.

3. CALCulate2:DATA? SCORR1 'download the error term of interest

4. 'Modify the error term here

5. CALCulate2:DATA SCORR1 'upload the error term of interest

6. SENSe2:CORRection:COLLect:APPLy 'applies the error terms to
   the measurement
```

Query Syntax Not applicable

Default Not applicable

SENSe:CORRection:COLLect:DISPlay:WINDow:AOFF

(Write-only) Clears the flags for windows to be shown during calibrations. To flag a window to be shown see SENS:CORR:COLL:DISP:WIND.

Examples

```
SENS:CORR:COLL:DISP:WIND:AOFF

sense:correction:collect:display:window:aoff
```

See an example using this command.

Query Syntax Not Applicable

Default Not Applicable

SENSe:CORRection:COLLect:DISPlay:WINDow<wNum>[:STATe] <bool>

(Read-Write) Set and read the 'show' state of the window to be displayed during a calibration. Learn more.

When this command is sent, the specified window is 'flagged' to be shown during calibration. The flag is cleared when the window is closed. A Preset or Instrument State Recall also closes the window. If the same window number is reopened, this command must be sent again to show the window during a calibration. The flag is NOT saved with an instrument state.

Send this command for each additional window to show during a calibration.

Parameters	
<wNum>	Window number to show during a calibration. The calibration window will also be shown with this window. The window must already be created. Use DISPlay:CATalog? to read all existing window numbers.
<bool>	Window state. Choose from: **ON** (or 1) - Show the specified window during calibration. **OFF** (or 0) - Do NOT show the specified window during calibration.

Examples	`SENS:CORR:COLL:DISP:WIND1 1`
	
	`sense:correction:collect:display:window2:state off`
	
	See an example using this command.

Query Syntax	SENSe:CORRection:COLLect:DISPlay:WINDow<wnum>[:STATe]?
Return Type	Boolean
Default	OFF

SENSe:CORRection:COLLect:ISOLation:AVERage:INCRement <num>

(Read-Write) Specifies amount to increment (increase) the channel averaging factor during isolation measurement of the ECal module during an unguided ECal calibration.

Note: if the channel currently has averaging turned OFF and <num> is greater than 1, averaging will be turned ON only during the isolation measurements and with the averaging factor equal to <num>.

Parameters	
<num>	Incremental Averaging factor. The maximum averaging factor is 65536 (2^16).
Examples	`SENS:CORR:COLL:ISOL:AVER:INCR 16` `sense:correction:collect:isolation:average:increment 0`
Query Syntax	SENSe:CORRection:COLLect:ISOLation:AVERage:INCRement?
Return Type	Numeric
Default	8 - If this command is NOT sent, but ECal isolation is measured, then averaging will be turned ON with factor set to 8 during the isolation measurement.

SENSe<cnum>:CORRection:COLLect:ISOLation:ECAL:[:STATe] <bool>

(Read-Write) Specifies whether or not the isolation state of the ECal module will be measured as part of an unguided ECal calibration.

An unguided calibration is performed using the SENS:CORR:COLL:METH and SENS:CORR:COLL:ACQ commands.

Note: The inherent isolation of the PNA is better than that attained with this command. ONLY use this command when using an external test set, and ONLY using a 8509x ECal module.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<bool>	**ON** (or 1) - isolation is measured during the unguided ECal calibration. **OFF** (or 0) isolation is NOT measured during the unguided ECal calibration.
Examples	`SENS1:CORR:COLL:ISOL:ECAL ON` `sense2:correction:collect:isolation:ecal:state 0`
Query Syntax	SENSe:CORRection:COLLect:ISOLation:ECAL:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

SENSe<cnum>:CORRection:COLLect:METHod <char>

(Read-Write) For UNGUIDED calibration, sets the calibration method (also known as 'Calibration Type' on calibration dialog box.) To select a Cal Type from a Cal Set, use CALC:CORR:TYPE.

Note: Before using this command you must select a measurement using CALC:PAR:SEL. You can select one measurement for each channel.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<char> Choose from:

Method	**Description**
NONE	No Cal method
REFL1OPEN	Response Open
REFL1SHORT or **REFL1**	Response Short
REFL3	Full 1 port
RPOWer	Receiver Power Cal
TRAN1	Response Thru
TRAN2	Response Thru and Isolation
SPARSOLT	Full SOLT 2 port
SPARTRL	TRL Cal (not available on all PNAs.)

Examples

```
SENS:CORR:COLL:METH REFL1
sense2:correction:collect:method sparsolt
```

Query Syntax SENSe<cnum>:CORRection:COLLect:METHod?

Return Type Character

Default Not Applicable

SENSe<cnum>:CORRection:COLLect:SAVE

(Write-only) For UNGUIDED calibrations ONLY. This command does the following:

- calculates the error terms using the selected :METHod
- applies the error terms to the selected measurement (turns error correction ON.)
- saves the calibration error-terms to the channels Cal Register or a User Cal Set.

The Cal Register or User Cal Set is determined by the setting of the SENS:CORR:PREFerence:CSET:SAVE command.

Do NOT use this command during an ECAL. When performing an ECAL calibration using SENS:CORR:COLL:ACQuire, this SAVE operation is performed automatically before the completion of a successful ACQuire.

Before using this command you must select a measurement using CALC:PAR:SEL. You can select one measurement for each channel.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
Examples	**SENS:CORR:COLL:SAVE** **sense2:correction:collect:save**
Query Syntax	Not applicable
Default	Not applicable

SENSe:CORRection:COLLect:SWEep:CHANnel:AOFF

(Write-only) Clears ALL flags for channels to sweep during calibration. To flag a channel, see SENS:CORR:COLL:SWE:CHAN.

Examples	**SENS:CORR:COLL:SWE:CHAN:AOFF** **sense:correction:collect:sweep:channel:aoff** See an example using this command.
Default	Not applicable

SENSe<cnum>:CORRection:COLLect:SWEep:CHANnel<cnum2>[:STATe] <bool>

(Read-Write) Specifies the channel to sweep during a Calibration.

When this command is sent, the <cnum2> channel is 'flagged' to be swept during calibration. The flag is cleared when the channel is deleted or if the Measurement Class is changed. If the same channel number is recreated, this command must be sent again to sweep the channel during a calibration. The flag is NOT saved with an instrument state.

A Preset or Instrument State Recall deletes the channel.

Parameters	
<cnum>	The channel to be calibrated. If unspecified, value is set to 1.
<cnum2>	The channel to sweep when waiting to measure a standard. This channel must already exist. If this channel is in continuous sweep mode, it must have the same attenuator settings and path configuration (PNA-X only).
<bool>	Channel sweep state. Choose from: **ON** (or 1) - Sweep the channel during calibration. **OFF** (or 0) - Do NOT sweep the channel during calibration.

Examples	`SENS:CORR:COLL:SWE:CHAN2 1`
	
	`sense2:correction:collect:sweep:channel3:state off`
	
	See an example using this command.

Query Syntax	SENSe<cnum>:CORRection:COLLect:SWEep:CHANnel<cnum2>[:STATe]?
Return Type	Boolean
Default	OFF

SENSe:CORRection:ENR:CALibration:TABLe:DATA <freq, value, freq, value...>

(Read-Write) Set and read the ENR calibration data. All of the frequency and ENR data must be sent at the same time. Use MMEM:LOAD and MMEM:SAVE to load and save ENR table data from disk. Learn more about Noise Source ENR files.

Parameters	
<freq, value>	(Numeric) ENR data. Frequency value in Hz followed by a ENR noise value in dB. Enter as many pairs as necessary.
Examples	`SENS:CORR:ENR:CAL:TABL:DATA 1.0E9,14.37,2.5E9,15.28` `sense:correction:enr:calibration:table:data 1.0E9,14.37,2.5E9,15.28`
Query Syntax	SENSe:CORRection:ENR:CALibration:TABLe:DATA?
Return Type	Comma separated numeric values
Default	Not Applicable

SENSe:CORRection:ENR:CALibration:TABLe:ID:DATA <id>

(Read-Write) Sets and returns ID of ENR table. While this is for informational purposes only, it can be used to record the model of the noise source. Learn more about ENR files.

Parameters	
<id>	(String) Identifier for the ENR table.
Examples	`SENS:CORR:ENR:CAL:TABL:ID:DATA "346C"` `sense:correction:enr:calibration:table:id:data "ENR Table"`
Query Syntax	SENSe:CORRection:ENR:CALibration:TABLe:ID:DATA?
Return Type	String
Default	Not Applicable

SENSe:CORRection:ENR:CALibration:TABLe:SERial:DATA <sn>

(Read-Write) Sets and returns the serial number of noise source. This is for informational purposes only to identify the specific noise source for which the data pertains. Learn more about ENR files.

Parameters

<sn>	Serial number of the noise source for which the data applies, enclosed in quotes.
Examples	`SENS:CORR:ENR:CAL:TABL:SER:DATA "ABCD1234"` `sense:correction:enr:calibration:table:serial:data "ABCD1234"`
Query Syntax	SENSe:CORRection:ENR:CALibration:TABLe:SERial:DATA?
Return Type	String
Default	Not Applicable

SENSe<ch>:CORRection:GCSetup:POWer <num>

(Read-Write) Set and read the power level at which to perform the Source Power Cal portion of a Gain Compression (Opt 086) Calibration. Learn more about this setting.

Parameters

<num>	Power level in dB. Choose a value from +30 to (-30).
Examples	`SENS:CORR:GCS:POW 0` `sense:correction:gcsetup:power 5`
Query Syntax	SENSe:CORRection:GCSetup:POWer?
Return Type	Numeric
Default	0

SENSe:CORRection:IMPedance:INPut:MAGNitude <num>

(Read-Write) Sets and returns the system impedance value for the analyzer.

Parameters

<num>	System Impedance value in ohms. Choose any number between 0 and 1000 ohms.
Examples	`SENS:CORR:IMP:INP:MAGN 75` `sense:correction:impedance:input:magnitude 50.5`
Query Syntax	SENSe:CORRection:IMPedance:INPut:MAGNitude?
Return Type	Numeric
Default	50

SENSe<cnum>:CORRection:INTerpolate[:STATe] <ON | OFF>

(Read-Write) Turns correction interpolation ON or OFF.

Note: Before using this command you must select a measurement using CALC:PAR:SEL. You can select one measurement for each channel.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns interpolation ON. **OFF** (or 0) - turns interpolation OFF.
Examples	`SENS:CORR:INT ON` `sense2:correction:interpolate:state off`
Query Syntax	SENSe<cnum>:CORRection:INTerpolate[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

SENSe<cnum>:CORRection:ISOLation[:STATe] <ON | OFF> OBSOLETE

This command no longer works beginning in the PNA 5.2 release. To perform isolation as part of an unguided calibration, you must explicitly measure the isolation standard using SENS:CORR:COLL:ACQ Stan5. See Example program.

To measure isolation as part of an ECal, use SENS:CORR:COLL:ISOL:ECAL.

(Read-Write) Turns isolation cal ON or OFF during Full 2-port calibration. If this command is not sent, the default state is to **disable** Isolation.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns isolation ON. **OFF** (or 0) - turns isolation OFF.
Examples	`SENS:CORR:ISOL ON` `sense2:correction:isolation:state off`
Query Syntax	SENSe<cnum>:CORRection:ISOLation[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF - (Isolation disabled)

SENSe:CORRection:PREFerence:CSET:SAVE <char>

Important Notes:

- This command replaces SENS:CORR:PREF:CSET:SAVU
- With 6.0 we implemented a change that defaults to saving completed calibrations to Cal Registers instead of User Cal Sets. To revert to the old behavior, send this command with the USER argument.

(Read-Write) Specifies the default manner in which calibrations that are performed using SCPI or COM are to be stored. Cal data is ALWAYS stored to the channel Cal Register regardless of this setting.

This setting survives instrument preset and reboot. It remains until changed by another execution of this command.

Note: Cal Set arguments used with commands such as SENS:CORR:COLL:GUID:INIT, SENS:CORR:COLL:GUID:SAVE and SENS:CORR:COLL:GUID:SAVE:CSET will override of any of these default preference settings.

Learn about Cal Registers and User Cal Sets.

Parameters		
	<char>	**CALRegister** - Cal is saved ONLY to the channel Cal Register. **USER** - Cal is saved to a new User Cal Set file when performing a SCPI calibration. The Cal Set name is automatically generated. To change the name, send SENS:CORR:CSET:NAME after the cal is complete. This reverts to pre-6.0 behavior. **REUSe** - The cal is saved to the Cal Set that is currently selected on the specified channel, which could be the channel Cal Register. If the channel does not yet have a selected Cal Set, the cal will be saved to a new User Cal Set with an automatically-generated name.
Examples		`SENS:CORR:PREF:CSET:SAVE USER` `sense:correction:preference:cset:save reuse`
Query Syntax		SENSe:CORRection:PREFerence:CSET:SAVE?
Return Type		Character
Default		CALRegister

SENSe:CORRection:PREFerence:CSET:SAVUser <bool> Superseded

This command is replace with SENS:CORR:PREF:CSET:SAVE

NOTE: With 6.0 we implemented a change that defaults to saving completed calibrations to Cal Registers instead of User Cal Sets. To revert to the old behavior, send this command as ON (1). For UI and COM use, this can be done from the GPIB console.

(Read-Write) Specifies whether cal data is automatically saved to a User Cal Set file after performing a SCPI calibration. Cal data is always saved to a Cal Register regardless of this setting.

This setting survives instrument preset and reboot. It remains until changed by another execution of this command.

Learn about Cal Registers and User Cal Sets.

Parameters	
<bool>	**ON** or **1** - Cal is automatically saved to a User Cal Set file when performing a SCPI calibration. The Cal Set name is automatically generated. To change the name, send SENS:CORR:CSET:NAME after the cal is complete. Reverts to pre-6.0 behavior. **OFF** or **0** - Cal is NOT automatically saved to a User Cal Set. To save a calibration to a User Cal Set, use SENS:CORR:COLL:GUID:INIT.
Examples	`SENS:CORR:PREF:CSET:SAVU 1` `sense:correction:preference:cset:savuser 0`
Query Syntax	SENSe:CORRection:PREFerence:CSET:SAVUser?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF (0)

SENSe:CORRection:PREFerence:ECAL:ORIentation[:STATe] <ON|OFF>

(Read-Write) Specifies whether or not the PNA should perform orientation of the ECal module during calibration. Orientation is a technique by which the PNA automatically determines which ports of the module are connected to which ports of the PNA. Orientation begins to fail at very low power levels or if there is much attenuation in the path between the PNA and the ECal module. If orientation is turned OFF, the SENS:CORR:PREF:ECAL:PMAP command must be used to specify the port connections before performing a cal.

Note: For 3-port or 4-port measurements, when orientation is OFF, you are not allowed to specify how the ECAL module is connected. Instead, the PNA determines the orientation. Use SENS:CORR:COLL:GUID:DESC? to query the orientation. The PNA does not verify that you made the connection properly.

This setting remains until the PNA is restarted or this command is sent again.

Parameters

<bool> ECAL orientation state. Choose from:

ON or **1** - PNA performs orientation of the ECal module.

OFF or **0** - PNA does NOT performs orientation of the ECal module.

Examples

```
SENS:CORR:PREF:ECAL:ORI OFF

sense:correction:preference:ecal:orientation:state on
```

Query Syntax SENSe:CORRection:PREFerence:ECAL:ORIentation[:STATe]?

Return Type Boolean (1 = ON, 0 = OFF)

Default ON (1)

SENSe:CORRection:PREFerence:ECAL:PMAP <module>,<string>

(Read-Write) When ECal module orientation is turned OFF (SENS:CORR:PREF:ECAL:ORI), this command specifies the port mapping (which ports of the module are connected to which ports of the PNA) prior to performing ECal calibrations.

This setting remains until the PNA is restarted or this command is sent again.

Parameters

<module> Specifies which ECal module this port map is being applied to. Choose from:

ECAL1

.through.

ECAL8

<string>	Format this parameter in the following manner: Aw,Bx,Cy,Dz where • A, B, C, and D are literal ports on the ECAL module • w,x,y, and z are substituted for PNA port numbers to which the ECAL module port is connected. Ports of the module which are not used are omitted from the string. For example, on a 4-port ECal module with port A connected to PNA port 2 port B connected to PNA port 3 port C not connected port D connected to PNA port 1 the string would be: A2,B3,D1 If either the receive port or source port (or load port for 2-port cal) of the CALC:PAR:SELected measurement is not in this string and orientation is OFF, an attempt to perform an ECal calibration will fail.
Examples	`SENS:CORR:PREF:ECAL:PMAP ECAL2, 'A1,B2'` `sense:correction:preference:ecal:pmap ecal3, 'a2,b1,c3'`
Query Syntax	SENSe:CORRection:PREFerence:ECAL:PMAP? <module>
Return Type	String
Default	Null string ()

SENSe:CORRection:PREFerence:SIMCal <bool>

(Read-Write) Sets and returns a preference for the Unguided Cal behavior described below. This setting persists until it is changed.

This preference can also be set True by executing the script on the PNA at C:/Program Files/Agilent/Network Analyzer/System/wincal32.reg.

Parameters

<bool> Boolean - Choose from:

0 - False - Reverts to new (preferred) behavior. An error is returned if standard data is not acquired before sending SENS:CORR:COLL:SAVE.

1 - True - (WinCal compatible) Prevents SENS:CORR:COLL:SAVE from failing when standard data has not, and will not, be acquired.

Learn more about old and new behaviors.

Examples

```
SENS:CORR:PREF:SIMC 0

sense:correction:preference:simcal 1
```

Query Syntax SENSe:CORRection:PREFerence:SIMCal?

Return Type Boolean

Default 0

SENSe:CORRection:PREFerence:TRIG:FREE <char>, <bool>

(Read-Write) Sets and returns the preference for the trigger behavior during a calibration. This setting persists until it is changed.

Note: If TRIGger:SOURce = Manual, during a calibration the PNA ALWAYS switches to Internal for one trigger, then back to Manual, regardless of this preference command.

Parameters

<char> Character **-** Calibration type. Choose from:

GUIDed - preference setting pertains to a Guided calibration.

UNGuided - preference setting pertains to an Unguided calibration.

<bool> Boolean - Choose from:

0 - False - The trigger behavior during the specified calibration type DOES respect the setting of the TRIGger:SOURce command. For example,when Trigger source = External, the single trigger method will wait for the External trigger signal and then allow only one sweep.

1 - True - (Pre-6.0 behavior) The trigger behavior during the specified calibration type does NOT respect the setting of the TRIGger:SOURce command. For example, when Trigger source = External, during calibration the PNA switches to Internal sweep, responds to one trigger signal to measure the standard, then switches back to External.

Examples

```
SENS:CORR:PREF:TRIG:FREE GUID,1

sense:correction:preference:trig:free unguided,0
```

Query Syntax SENSe:CORRection:PREFerence:TRIG:FREE? <char>

Return Type Boolean

Default False for both calibration types.

SENSe<cnum>:CORRection:RPOWer:OFFSet[:AMPLitude] <num>

(Read-Write) Adjusts a receiver power cal to account for components or adapters that are added between the source port and receiver while performing this cal. For more information, see Receiver Cal.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<num> Offset Value in dB. Specify loss as a negative number; and gain as a positive number. Choose a number between -200 and 200.

Examples

```
SENS:CORR:RPOW:OFFS .5
sense2:correction:rpower:offset:amplitude .-5
```

Query Syntax SENSe<cnum>:CORRection:RPOWer:OFFSet[:AMPLitude]?

Return Type Numeric

Default 0

SENSe<cnum>:CORRection:RVELocity:COAX <num>

(Read-Write) Sets the velocity factor to be used with Electrical Delay and Port Extensions.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Velocity factor. Choose a number between **0** and **10** (.66 polyethylene dielectric; .7 teflon dielectric)
Examples	`SENS:CORR:RVEL:COAX .66` `sense2:correction:rvelocity:coax .70`
Query Syntax	SENSe<cnum>:CORRection:RVELocity:COAX?
Return Type	Numeric
Default	1

SENSe<cnum>:CORRection:SFORward[:STATe] <boolean>

(Read-Write) Sets the direction a calibration will be performed when only one set of standards is used.

Use SENSe:CORRection:TSTandards[:STATe] **OFF** to specify that only one set of standards will be used.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<boolean>	**ON (1)** - FORWARD direction of a 2-port calibration will be performed **OFF (0)** - REVERSE direction of a 2-port calibration will be performed

Examples	`SENS:CORR:SFOR 1`
	`sense2:correction:sforward:state 0`
	
	`See an example using this command`

Query Syntax	SENSe<cnum>:CORRection:SFORward[:STATe]?
Return Type	Boolean
Default	ON

SENSe<cnum>:CORRection[:STATe] <ON | OFF>

(Read-Write) Turns error correction ON and OFF for the specified channel.

Note: Before using this command you must select a measurement using CALC:PAR:SEL. You can select one measurement for each channel.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - correction is applied to the channel. **OFF** (or 0) - correction is NOT applied to the channel.
Examples	`SENS:CORR ON` `sense2:correction:state off`
Query Syntax	SENSe<cnum>:CORRection[:STATe]? To query the error correction state for a measurement, use CALC:CORR:STATe?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

SENSe<cnum>:CORRection:TCOLd:USER:VALue <num>

(Read-Write) Sets and returns the temperature of the noise source connector. Learn more about Noise Figure Calibration.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<num>	Noise source temperature in Kelvin.

Examples	`SENS:CORR:TCOL 295`
	
	`sense2:correction:tcold 298`
	
	See an example using this command

Query Syntax	SENSe<cnum>:CORRection:TCOLd:USER:VALue?
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:CORRection:TSTandards[:STATe] <boolean>

(Read-Write) Specifies the acquisition of calibration data using ONE or TWO sets of standards.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1.
<boolean>	**ON (1)** - TWO identical sets of standards will be used to simultaneously calibrate two ports (for both Forward and Reverse parameters). **OFF (0)**- ONE set of standards will be used to perform a full 2-port calibration, one port at a time. When specifying ON (use two sets), the SENS:CORR:COLL:ACQuire command uses the same standard index for each calibration class. To specify the calibration standard gender for each port, you must first ensure that the order of calibration class accurately reflects the configuration of your DUT. For example, for a DUT with a male connector on port 1 and a female connector on port 2, order the devices within the S11 classes (A, B, and C) such that the MALE standards are first in the list. Then order the S22 classes specifying the FEMALE standards as the first in the list.

Examples

```
SENS:CORR:TST 1
sense2:correction:tstandard:state 0

See an example using this command
```

Query Syntax SENSe<cnum>:CORRection:TSTandards[:STATe]?

Return Type Boolean

Default ON

SENSe:CORRection:TYPE:CATalog? <char>

(Read-Write) Lists the Cal Types in the PNA by either GUID or registered name. Learn more about applying Cal Type using SCPI.

Note: Before using this command you must select a measurement using CALC:PAR:SEL. You can select one measurement for each channel.

Parameters	
<char>	Specifies the type of list. Choose from: **GUID -** the registered GUID of the Cal Type **NAME -** the registered name of the Cal Type
Examples	`SENS:CORR:TYPE:CAT? GUID`
Query Syntax	SENSe<cnum>:CORRection:TYPE:CATalog? <char>
Return Type	Comma-separated string
Default	Not Applicable

Last modified:

6-Mar-2008	Added Noise TCOLd
19-Sep-2007	Added missing <cnum> arguments
July 30, 2007	Added ENR commands
April 14, 2007	Addd ECal isolation commands
Oct 30, 2006	Modified SavUser command

Sense:Correction:Collect:Guided Commands

Performs and applies a SmartCal (Guided) calibration and other error correction features.

SENSe:CORRection:COLLect:GUIDed:

- **ACQuire**
- **ADAPter**
  - | **COUNt?**
  - | **CREate?**
  - | **DELay**
  - | **DESCription**
  - | **PATHs**
- **CKIT:PORT**
  - | **CATalog?**
  - | **[SELect]**
- **CONNector**
  - | **CATalog?**
  - | **PORT**
    - | **[SELect]**
- **DESCription**
- **DMATch**
  - | **APPLy**
    - | **[IMMediate]**
    - | **PORTs?**
  - | **[INITiate]**
- **ETERms:LOAD**
  - | **[CSET]**
- **INITiate**
- **ISOLation**
  - | **AVERage**
    - | **INCRement**
  - | **PATHs**
- **METHod**
- **PACQuire**
- **PATH**
  - | **CMEThod**
  - | **TMEThod**
- **SAVE**
  - | **CSET**

STEPS?
THRU

Click on a blue keyword to view the command details.

See Also

- Examples using these commands.
- New Calibrating the PNA Using SCPI
- Learn about Measurement Calibration
- Synchronizing the PNA and Controller

SENSe:CORRection:COLLect:GUIDed:ACQuire <std>

(Write-only) Initiates the measurement of the specified calibration standard. Executing this command with an unnecessary standard has no affect.

The measured data is stored and used for subsequent calculations of error correction coefficients. All standards must be measured before a calibration can be completed. Any measurement can be repeated until the SENS:CORR:COLL:GUID:SAVE command is executed.

Query the user prompt description using SENS:CORR:COLL:GUID:DESC?

Query the required calibration steps using SENS:CORR:COLL:GUID:STEP?

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<std>	Choose from:STAN1, STAN2, STAN3, through STAN40
Examples	`SENS:CORR:COLL:GUID:ACQ STAN1` `sense:correction:collect:guided:acquire stan1`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:CORRection:COLLect:GUIDed:ADAPter:CREate? <conn1>, <conn2>

(Read-only) Specifies the use of a THRU adapter to be used during the Guided Cal Unknown THRU and Adapter Removal Cal. Returns an adapter index <n> which is used to refer to the adapter in several related commands. See Cal Thru Methods. While the choice of which end of the adapter is <conn1> and <conn2> is arbitrary, it is necessary to remember which will be used on each test port.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<conn1>	Adapter port 1 connector type. Use SENS:CORR:COLL:GUID:CONN:CAT? to return a list of valid connector types.
<conn2>	Adapter port 2 connector type.
Examples	See example using this command.
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:CORRection:COLLect:GUIDed:ADAPter:COUNt?

(Read-Only) Returns the number of THRU adapters that have been created for this calibration using SENS:CORR:COLL:GUID:ADAP:CREate?

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
Examples	`See example using this command.`
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:CORRection:COLLect:GUIDed:ADAPter<n>:DELay <coax>, [w phase, wdelay]

(Write-only) Specifies the adapter delay. and optionally waveguide delay and optional phase offset (degrees) of adapter <n>.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<n>	Adapter index number that was returned from SENS:CORR:COLL:GUID:ADAP:CREate?
<coax>	Delay value of coax adapter <n> in seconds. If the adapter has no coax connector, enter 0.
<wphase>	Waveguide phase offset in degrees. If the adapter has no waveguide connector, do not enter a value.
<wdelay>	Waveguide delay in seconds. If the adapter has no waveguide connector, do not enter a value.
Examples	`See example using this command.`
Default	Not Applicable

SENSe<cnum>:CORRection:COLLect:GUIDed:ADAPter<n>:DESCription <string>

(Write-only) Specifies the adapter description for use as the guided cal connection prompts.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<n>	Adapter index number that was returned from SENS:CORR:COLL:GUID:ADAP:CREate?
<string>	Adapter description.
Examples	`See example using this command.`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:CORRection:COLLect:GUIDed:ADAPter<n>PATHs <port pairs>

(Write-only) Specifies the port pairs for which the adapter will be used for a THRU connection.

For example, for a 3-port cal on channel 1 using ports 1,2,and 3), to use adapter 1 between the ports (1 to 2) and (1 to 3) the following command is used: SENS1:CORR:COLL:GUID:ADAP1:PATH 1,2,1,3.

The adapter must have the same DUT connectors as the ports that are already specified for these ports.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<n>	Adapter index number that was returned from SENS:CORR:COLL:GUID:ADAP:CREate?
<port pair>	Ports for which the adapter will be used. The orientation is not critical, as the PNA will align the connector types as necessary. The minimum number of Thru connections required is the number of ports to calibrated -1.
Examples	See example using this command.
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:CKIT:PORT<pnum>:CATalog?

(Read-only) Returns a comma-separated list of valid kits for each port. In addition to mechanical calibration kits, this will include applicable characterizations found within ECal modules currently connected to the PNA.

If two or more identical ECal modules are connected to the PNA, the returned list will include the serial numbers to distinguish the ECal modules.

Use items in the list to select the kit to be used with the SENS:CORR:COLL:GUID:CKIT:PORT command.

Parameters

<pnum> Any existing port number. If unspecified, value is set to 1

Examples

```
SENS:CORR:COLL:GUID:CKIT:PORT1:CAT?
'When "Type N (50) male" is specified for connector type,
returns:

"85054D, 85032F"

'When two identical ECal modules are connected for the connector
type,
'the return string includes serial numbers
```

```
"85092-60010 ECal 10675, 85092-60010 ECal 00758"
```

Return Type	String
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:CKIT:PORT<pnum>[:SELect] <kit>

(Read-Write) Specifies the calibration kit for each port to be used during a guided calibration. An unused port does NOT need to have a specified Cal Kit.

If two or more identical ECal modules are connected to the PNA, the serial number must be included in the <kit> string to distinguish the ECal modules. See SENS:CORR:COLL:GUID:CKIT:PORT:CAT?

Note: Sliding loads are not fully supported from Sens:Corr:Coll:Guided... The **Measure** button must be manually pressed.

1. Specify the connector type for the port with SENS:CORR:COLL:GUID:CONN:PORT.

2. Query the valid available kits for the connector on each port with SENS:CORR:COLL:GUID:CKIT:PORT:CAT?

3. Specify the kit using this command.

4. Perform a query of this command. If the <kit> parameter was incorrectly entered, an error will be returned.

Parameters

<pnum>	Any existing port number. If unspecified, value is set to 1
<kit>	Calibration kit to be used for the specified port.

Examples

```
SENS:CORR:COLL:GUID:CKIT:PORT1 '85055A'
'The following includes a serial number when two or more ECal mods are connected
sense:correction:collect:guided:ckit:port2:select '85092-60010 ECal 10685'
```

Query Syntax	SENSe:CORRection:COLLect:GUIDed:CKIT:PORT<pnum>[:SELect]?
Return Type	String - If the <kit> parameter was incorrectly entered while writing, an error will be returned.
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:CONNector:CATalog?

(Read only) Returns a list of valid connectors based on the connector descriptions of the available cal kits. Use an item from the returned list to specify a connector for SENS:CORR:COLL:GUID:CONN:PORT

Examples

```
SENS:CORR:COLL:GUID:CONN:CAT?
Returns:

Type N (50) female, Type N (50) male, APC 7 (50), 3.5 mm (50)
male, 3.5 mm (50) female, User Connector A
```

Return Type Comma separated string values

Default Not Applicable

SENSe:CORRection:COLLect:GUIDed:CONNector:PORT<pnum>[:SELect] <conn>

(Read-Write) Specifies a connector type for every port during the Guided Calibration procedure. Valid connector names are stored within calibration kits. Some cal kits may include both male and female connectors. Therefore, specifying connector gender may be required.

The PNA remembers previous Guided Cal settings. Therefore, for completeness, unused ports should be defined as "Not used". See Guided Cal examples.

- A single port with a valid <conn> name indicates a 1-Port calibration will be performed.
- Two ports with valid <conn> names indicate either a 2-Port SOLT or TRL calibration will be performed depending on the standards definition found within the cal kit and the capability of the PNA.
- Three ports with valid <conn> names indicate a 3-Port calibration will be performed, and so forth.

The following steps could be followed to ensure port connectors are specified correctly:

1. Use SENS:CORR:COLL:GUID:CONN:CAT? to query available connectors before specifying the port connector.
2. Select a connector type using this command.
3. Perform a query of this command. If the <conn> parameter was incorrectly entered, an error will be returned.
4. Specify the cal kit to use for each port with SENS:CORR:COLL:GUID:CKIT:PORT

Parameters

<pnum>	Any existing port number. If unspecified, value is set to 1
<conn>	String - DUT connector type to connect with PNA port <pnum>

Examples

```
'Specifying a 2-port cal (1 & 2) on a 4-port PNA

SENS:CORR:COLL:GUID:CONN:PORT1 'Type N (50) female'
SENS:CORR:COLL:GUID:CONN:PORT2 'Type N (50) male'
SENS:CORR:COLL:GUID:CONN:PORT3 'Not Used'
SENS:CORR:COLL:GUID:CONN:PORT4 'Not Used'
```

Query Syntax SENSe:CORRection:COLLect:GUIDed:CONNector:PORT<pnum>[:SELect]?

Return Type String

Default Not Applicable

SENSe:CORRection:COLLect:GUIDed:DESCription? <step>

(Read-only) Returns the connection description for the specified calibration step.

Parameters

<step> A number from 1 to the number of steps required to complete the calibration (Use SENS:CORR:COLL:GUID:STEP? to query the number of steps)

Examples

```
SENS:CORR:COLL:GUID:DESC? 10

'Returns:
Connect APC 7 Open to port3
```

Return Type String

Default Not Applicable

SENSe:CORRection:COLLect:GUIDed:DMATch:APPLy[:IMMediate] [<CalSetGUID>]

(Write-only) Specifies a Cal Set as a source of delta match correction.

If CalSetGUID is not specified, then the Global Delta Match Cal Set is assumed. An error is returned if the **specified** Cal Set does not meet the following Delta Match criteria. The Global Delta Match Cal can ALWAYS be applied.

- Must have been performed using ECal or as a guided mechanical cal (not Unguided).
- Must have the same start freq, stop freq, and number of points as the channel being calibrated.
- Must calibrate the ports that are required by the TRL or Unknown Thru cal as indicated by SENS:CORR:COLL:GUID:DMATch:APPLy:PORTs?.

Learn more about Delta match calibration.

See example of a complete Delta Match calibration.

Parameters	
<CalSetGUID>	Optional. GUID of the Cal Set to use. If unspecified, the Global Delta Match Cal Set is used.
Examples	`SENS:CORR:COLL:GUID:DMAT:APPL` `sense:correction:collect:guided:dmatch:apply:immediate "{2B893E7A-971A-11d5-8D6C-00108334AE96}"`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:DMATch:APPLy:PORTs?

(Read-only) Returns the port numbers for which delta match correction is required. 0 (zero) is returned if the Cal does NOT require Delta Match correction for one of the following reasons:

- The Cal does NOT involve Unknown THRU or TRL. You specify this using SENS:CORR:COLL:GUID:METH <UNKN | TRL>.
- The Cal DOES involve Unknown THRU or TRL, but the delta match data can be calculated by the Unknown Thru or TRL Cal. Learn how this is possible. However, you can force the Cal to use the Delta Match data from a Cal Set.

Learn more about Delta match calibration.

See example of a complete Delta Match calibration.

Parameters	

Examples	`SENS:CORR:COLL:GUID:APPL:PORT?`
	
	`'Returns:`
	`1,2,3`

Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:DMATch[:INITiate] <conn>,<cKit>

(Write-only) Initiates a global delta match calibration.

Learn more about Global Delta Match calibration.

See example of a complete Delta Match calibration.

Parameters	
<conn>	**String**. Connector type for port 1. All other ports are set automatically.
<cKit>	**String** Cal Kit for all ports. If incorrectly entered while writing, an error is returned.
Examples	`SENS:CORR:COLL:GUID:DMAT APC 3.5 female,"85052B"`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:ETERms:LOAD[:CSET] <cset>,<calPort> [,csPort]

(Write-only) Loads 1-port error terms from a Cal Set into the current Guided Cal sequence. When the Cal steps are recomputed, connection steps are removed due to the loading of the error terms.

See example of how to use this command.

Parameters	
<cset>	**String** Name of User Cal Set in which the error terms reside.
<pnum>	**Integer** Port number of the current cal to receive error terms.
[csPort]	**Integer** Optional argument. Port number associated with the error terms in the Cal Set. If unspecified, the same port number as <calPort> is used.
Examples	See example
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:CORRection:COLLect:GUIDed:INITiate [cal set name or GUID [,bool]]

(Write-only) Initiates a guided calibration.

- The PNA determines the measurements needed to perform the calibration using the settings specified from the SENS:CORR:COLL:GUID:CONN:PORT and SENS:CORR:COLL:GUID:CKIT:PORT commands.
- After this command is executed, subsequent commands can be used to query the number of measurement steps, issue the acquisition commands, query the connection description strings, and subsequently complete a guided calibration.

Parameters	
<cnum>	Channel to be calibrated. Must be the active channel. Use Calc:Par:Sel to activate any measurement on the channel.
<cal set name or GUID>	**(String)** Optional argument. If specified, choose an **existing** Cal Set, either by name or by GUID. If NOT specified, behavior depends on the SENS:CORR:PREFerence:CSET:SAVE setting. • By Cal Set name: include quotes. • By Calset GUID in the form: "{GUID}"; including quotes and curly brackets. • Query all Cal Set GUIDs with SENS:CORR:CSET:CAT? An error is reported if the Cal Set is not found. The Cal Set is either supplemented or overwritten depending on the method, connectors, and ports selected. Learn more about Cal Sets.
<bool>	Optional argument. **False (0)** If Cal Set stimulus settings differ from the existing channel, do not change channel stimulus settings. The Cal Set is save to the current setting of the SENS:CORR:PREF:CSET:SAVE command. This is the default setting if not specified. **True (1)** If cal set stimulus settings differ from the existing channel, change the channel stimulus settings to match the Cal Set settings.
Examples	`SENS:CORR:COLL:GUID:INIT "{2B893E7A-971A-11d5-8D6C-00108334AE96}",1` `sense2:correction:collect:guided:initiate 'myCalSet'`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:ISOLation:AVERage:INCRement <num>

(Read-Write) Specifies amount to increment (increase) the channel's averaging factor during measurement of isolation standards in a guided calibration.

Note: If the channel has averaging turned OFF and the value of <num> is greater than 1, averaging will be turned ON only during the isolation measurements and with the averaging factor equal to <num>.

Parameters	
<num>	Amount to increment the averaging factor for the isolation measurement. The maximum averaging factor for the channel is 65536 (2^16).

Examples	`'Measure isolation on all paths for the cal`
	`SENS:CORR:COLL:GUID:ISOL ALL`
	`'Remove the port pairs 1-to-2 and 1-to-3 from the list of paths on which to measure isolation`
	`sense:correction:collect:guided:isolation:paths REMove,1,2,1,3`

Query Syntax	SENSe:CORRection:COLLect:GUIDed:ISOLation:PATHs? **Note:** if isolation is not measured, the query returns 0.
Return Type	Numeric
Default	8 - If this command is NOT sent, but isolation is measured, then averaging will be turned ON with factor set to 8 during the isolation measurements.

SENSe:CORRection:COLLect:GUIDed:ISOLation[:PATHs] <char>[,<p1a, p1b, p2a, p2b,…>]

(Read-Write) Specifies the paths (port pairs) to make isolation measurements on during a guided calibration.

Parameters

<char>	**ALL** – Measure isolation on all pairings of the ports that are to be calibrated. **NONE** – Do not measure isolation on any pairing of the ports to be calibrated. (Default behavior). **ADD** – Add one or more specific pairings of ports to the list of port pairings for which isolation will be measured. **REMove** – Remove one or more specific pairings of ports from the list of port pairings for which isolation will be measured. If many paths are to be measured, it may be easier to first send ALL, then REMove and specify the paths to remove.
<p1a, p2a...>	For use when <char> is **ADD** or **REMove**. Specify Port numbers in pairs: • For 3-port cals, specify up to 3 pairs. • For 4-port cals, specify up to 6 pairs. p1a, p1b (Path1 - port A and port B) p2a, p2b (Path2 - port A and port B) p3a, p3b (Path3 - port A and port B)

Examples

```
'Measure isolation on all paths for the cal

SENS:CORR:COLL:GUID:ISOL ALL

'Remove the port pairs 1-to-2 and 1-to-3 from the list of paths
on which to measure isolation

sense:correction:collect:guided:isolation:paths REMove,1,2,1,3
```

Query Syntax SENSe:CORRection:COLLect:GUIDed:ISOLation:PATHs?

Note: if isolation is not be measured on any of the paths, the query returns 0

Return Type Numeric

Default 0 - Isolation not measured on any paths.

SENSe:CORRection:COLLect:GUIDed:METHod <char> Superseded

This command is replaced with SENS:CORR:COLL:GUID:PATH:CMEThod and SENS:CORR:COLL:GUID:PATH:TMEThod.

(Read-Write) Selects from one of several algorithms available for performing the THRU portion of a guided calibration. Learn more about THRU methods.

Parameters	
<char>	**DEFAULT** - Informs guided calibrations to use the default algorithm when computing the number of needed standards acquisition steps. (default selection if omitted.) **ADAP** - Use the adapter removal algorithm **FLUSH** - Use with insertable devices. **UNKN** - Use the Unknown THRU algorithm with calibrations for non-insertable devices. **DEFined** - Use the THRU definition that you stored in the cal kit file, or ECal module. **TRL** - Select TRL Cal Type for guided cals. Valid for "TRL ready" Cal Kits with properly assigned TRL cal classes. **SOLT** - Select SOLT Cal Type for guided cals. Valid for any kit with properly assigned SOLT cal classes.
Examples	`SENS:CORR:COLL:GUID:METH ADAP` `sense:correction:collect:guided:method unkn`
Query Syntax	SENSe:CORRection:COLLect:GUIDed:METHod?
Return Type	Character
Default	DEFAULT

SENSe:CORRection:COLLect:GUIDed:PACQuire <std>

(Read-Write) Show the Cal Window, and optionally one or more other specific windows before acquiring a Cal standard. This command will cause the Cal Window to display the specific measurements that are to be made for that particular Cal standard.

Parameters	
<std>	Choose from:STAN1, STAN2, STAN3, through STAN40.

Examples	`SENS:CORR:COLL:GUID:PACQuire STAN2`
	`sense:correction:collect:guided:pacquire STAN5`
	
	See an example that uses this command.

Query Syntax	SENSe:CORRection:COLLect:GUIDed:PACQuire?
Return Type	Character
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:PATH:CMEThod <port1>,<port2>,<caltype1[,caltype2]>

Note: This command replaces SENS:CORR:COLL:GUID:METH.

(Read-Write) Specifies the calibration method for each port pair.

Note: Before using this command, first do the following:

- Set the connector types: SENS:CORR:COLL:GUID:CONN:PORTn
- Set cal kit: SENS:CORR:COLL:GUID:CKIT:PORT
- Set or query the thru path pairs: SENS:CORR:COLL:GUID:THRU:PORT

After sending or querying this command, send the Thru method: SENS:CORR:COLL:GUID:PATH:TMEThod

Parameters	
<port1>	First port of the pair to be calibrated.
<port2>	Second port of the pair to be calibrated.
<caltype1[caltype2]>	(String) Cal types for 1st and 2nd ports of the pair, enclosed in a single pair of quotes. NOT case-sensitive. **caltype1** Cal type for the pair if caltype2 is not specified. Otherwise, Cal type for port 1. Choose from:

- “TRL”
- “SOLT”
- “QSOLT**N**”
- “EnhResp**N**

For the last two arguments, replace **N** with the port to be used as the source port, which MUST be one of the port pair.

caltype2 Optional argument. Use only when performing an adapter removal cal on the pair. This argument specifies the Cal type on the second port. Caltype1 then specifies the Cal type of the first port.

Choose from the same arguments as caltype1.

Examples

```
SENS:CORR:COLL:GUID:PATH:CMEThod 2,3,"QSOLT2"

sense:correction:collect:guided:path:cmethod 2,3,"solt,trl"
```

Query Syntax SENSe:CORRection:COLLect:GUIDed:PATH:CMEThod? <port1>,<port2>

If only one caltype is returned then it’s NOT adapter removal.

Return Type String

Default Not Applicable

SENSe:CORRection:COLLect:GUIDed:PATH:TMEThod <port1>,<port2>,<thruType1[,thruType2]>

Note: This command replaces SENS:CORR:COLL:GUID:METH.

(Read-Write) Specifies the calibration **THRU** method for each port pair.

Note: Before using this command, first do the following:

- Set the connector types: SENS:CORR:COLL:GUID:CONN:PORTn
- Set cal kit: SENS:CORR:COLL:GUID:CKIT:PORT
- Set or query the thru path pairs: SENS:CORR:COLL:GUID:THRU:PORT
- Set or query the Cal Type: SENS:CORR:COLL:GUID:PATH:CMEThod

Learn more about thru methods.

Parameters

<port1>	First port of the port pair to be calibrated.
<port2>	Second port of the port pair to be calibrated.
<thruType1[,thruType2]>	(String) Thru methods for 1st and 2nd ports of the pair, enclosed in a single pair of quotes. NOT case-sensitive. **thruType1** Calibration thru method for the pair if thruType2 is not specified. Otherwise, thru method for port 1. Choose from: • **"Defined Thru"** A thru type for which there is a stored definition in the Cal Kit. • **"Zero Thru"** Zero length thru, also known as flush-thru. • **"Undefined Thru"** A thru type for which there is NOT a stored definition in the Cal Kit. Also known as Unknown Thru. Valid ONLY for SOLT cal type. • **"Undefined Thru using a Defined Thru"** Using an ECal module, measure the internal thru using the "Undefined Thru" method. **thruType2** Optional argument. Use only when performing an adapter removal cal on the pair as determined by SENS:CORR:COLL:GUID:PATH:CMEThod. The only valid arguments for ThruType1&2 is "Defined Thru, Defined Thru".
Examples	`SENS:CORR:COLL:GUID:PATH:TMEThod 2,3,"Zero Thru"` `sense:correction:collect:guided:path:tmethod 2,3,"Defined Thru,Defined Thru"`
Query Syntax	SENSe:CORRection:COLLect:GUIDed:PATH:TMEThod <port1>,<port2>? Always returns two parts: If the second part of the string is empty, adapter removal is NOT being performed. If the string is "Defined Thru, Defined Thru", adapter removal IS being performed.
Return Type	String
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:SAVE [bool]

(Write-only) Completes the guided cal by computing the error correction terms, turning Correction ON, and saving the calibration to a Cal Set.

If all of the required standards have not been measured, the calibration will not complete properly.

Parameters	
[bool]	Optional argument. If unspecified, the default behavior is the current PNA preference setting of SENSe:CORRection:PREFerence:CSET:SAVE **False (0)** Save cal data ONLY to a Cal Register. **True (1)** Save cal data to a Cal Register and a User Cal Set. The filename is automatically generated.
Examples	`SENS:CORR:COLL:GUID:SAVE` `sense2:correction:collect:guided:save 0`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:SAVE:CSET <cal set name or guid>

(Write-only) Completes the guided cal by computing the error correction terms, turning Correction ON, and saving the calibration to the specified Cal Set. This command performs the same function as SENSe:CORRection:COLLect:GUIDed:SAVE, but this command allows the name or GUID of the Cal Set to be specified.

- Use this command instead of the optional name or GUID argument in SENS:CORR:COLL:GUID:INIT.
- Use SENS:CORRection:CSET commands to get names or GUIDs of existing Cal Sets.
- The cal data is also saved to the channel Cal Register.
- If all of the required standards have not been measured, the calibration will not complete properly.

Parameters	
<cal set name or guid>	**String -** Name or GUID of an existing Cal Set to be overwritten. If specifying a GUID, curly brackets must be included.

Examples	`SENS:CORR:COLL:GUID:SAVE:CSET "{2B893E7A-971A-11d5-8D6C-00108334AE96}"`
	
	`sense:correction:collect:guided:save:cset "MyCalSet"`

Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:STEPs?

(Read-only) Returns the number of measurement steps required to complete the current guided calibration. This command is sent after the SENS:CORR:COLL:GUID:INIT, SENS:CORR:COLL:GUID:CONN:PORT and SENS:CORR:COLL:GUID:CKIT:PORT commands.

Examples	`SENS:CORR:COLL:GUID:STEP?` `sense2:correction:collect:guided:steps?`
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:GUIDed:THRU:PORTs <t1a, t1b, t2a, t2b, t3a, t3b...>

(Read-Write) For calibrating more than 2-ports ONLY. Specifies the port pairs for the thru connections of the calibration.

Use the query to learn the port pairs that the PNA suggests.

Use the set command to override these thru pairs.

Parameters

<t1a,...> Specify Port numbers in pairs:

- For 3-port cals, specify two or three pairs.
- For 4-port cals, specify from three up to six pairs.

t1a, t1b (Thru1 - port A and port B)

t2a, t2b (Thru2 - port A and port B)

t3a, t3b (Thru3 - port A and port B)

...and so forth up to six pairs.

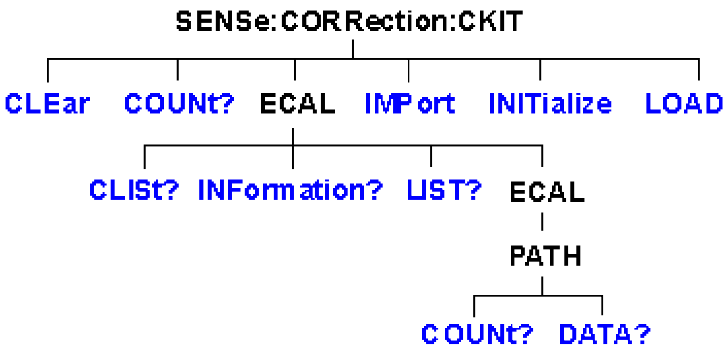
Examples	`SENS:CORR:COLL:GUID:THRU:PORT 1,2,1,3,1,4 '4-port measurement` `sense:correction:collect:guided:thru:ports 1,2,2,3 '3-port measurement`
Query Syntax	SENSe:CORRection:COLLect:GUIDed:THRU:PORTs?
Return Type	Numeric
Default	Port pairings that were used in the previous cal.

Last modified:

1-Nov-2007	Added PAcquire command
April 14, 2007	Added Cal Set by name and isolation commands
8-Mar-2007	Added CMethod and TMethod
23-Oct-2006	Fixed wording in Conn:Port:Sel

Sense:Correction:CKIT Commands

Manages the list of cal kits that are installed in the PNA.



- Click on a blue keyword to view the command details.
- New See Calibrating the PNA Using SCPI
- Learn about Modifying Cal Kits
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe:CORRection:CKIT:CLEar[:IMMediate]

(Write-only) Deletes ALL installed cal kits.

Examples	`SENS:CORR:CKIT:CLE`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:CKIT:COUNt?

(Read-only) Returns the number of installed cal kits.

Examples	`SENS:CORR:CKIT:COUNt?`
Query Syntax	SENS:CORR:CKIT:COUNt?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:CKIT:ECAL<mod>:CLISt?

(Read-only) Returns a list of characterizations stored in the specified ECal module.

Parameters

<mod> ECal module from which to read user characterization numbers. If unspecified, value is set to 1.

Examples

```
Module 1 contains User Characterizations 1 and 3.

SENSe:CORRection:CKIT:ECAL:CLIST?

'Returns the following (0 always indicates the factory
characterization):

0,1,3
```

Return Type Numeric list, separated by commas.

Default Not Applicable

SENSe:CORRection:CKIT:ECAL<mod>:INFormation? [<char>]

(Read-only) Reads the user-characterization information from the specified ECal module. This command returns the same values as SENS:CORR:COLL:CKIT:INF?

Parameters

<mod> ECal module to read characterizations from. Choose from:

1 through 8. If unspecified, value is set to 1.

<char> Optional argument. Specifies which characterization within the ECal module to read information from. If not specified, value is set to CHAR0.

Choose from:

- CHAR0 Factory characterization (data that was stored in the ECal module by Agilent)
- CHAR1 User characterization #1
- CHAR2 User characterization #2
- CHAR3 User characterization #3
- CHAR4 User characterization #4
- CHAR5 User characterization #5

Examples

```
SENS:CORR:CKIT:ECAL2:INFormation? char5
```

```
'Example return string:

ModelNumber: 85092-60007, SerialNumber: 01386, ConnectorType:
N5FN5F, PortAConnector: Type N (50) female, PortBConnector: Type
N (50) female, MinFreq: 30000, MaxFreq: 9100000000,
NumberOfPoints: 250, Calibrated: July 4 2002
```

Return Type Character

Default Not Applicable

SENSe:CORRection:CKIT:ECAL:LIST?

(Read-only) Returns a list of index numbers to be used for referring to the ECal modules that are currently attached to the PNA.

Examples

```
SENS:CORR:CKIT:ECAL:LIST?

'If 2 modules are attached to the PNA
'then the returned list will be:

1,2
```

Return Type Numeric list, separated by commas.

Default Not Applicable

SENSe:CORRection:CKIT:ECAL[num]:PATH:COUNt? <path>

(Read-only) Returns the number of unique states that exist for the specified path name on the selected ECal module.

This command performs exactly the same function as CONT:ECAL:MOD:PATH:COUNt?

Use the CONT:ECAL:MOD:PATH:STAT command to set the module into one of those states.

Use SENS:CORR:CKIT:ECAL:PATH:DATA? to read the data for a state.

Parameters

[num] Optional argument. USB number of the ECal module. If unspecified (only one ECal module is connected to the USB), <num> is set to 1. If two or more modules are connected, use SENS:CORR:CKIT:ECAL:LIST? to determine how many, and SENS:CORR:CKIT:ECAL:INF? to verify their identities.

<path> Name of the path for which to read number of states. Choose from:

Reflection paths

- **A**
- **B**
- **C** (4-port modules)
- **D** (4-port modules)

Transmission paths

- **AB**
- **AC** (4-port modules)
- **AD** (4-port modules)
- **BC** (4-port modules)
- **BD** (4-port modules)
- **CD** (4-port modules)

Examples	`CONT:ECAL:MOD:PATH:COUNt?` `control:ecal:module2:path:count?`
Return Type	Integer
Default	Not Applicable

SENSe<ch>:CORRection:CKIT:ECAL[num]:PATH:DATA? <path>, <stateNum>|,<char>|

(Read-only) Returns the data for a state from the memory of the selected ECal module. The returned data is interpolated if necessary to have the same stimulus values as the specified channel <ch>.

- For a reflection path state, the data is reflection S-parameter data. The number of values equals the number of stimulus points on the channel multiplied by 2 (because they are complex numbers).
- For a transmission path state, the data is all 4 S-parameters of the state. The number of values returned is 4 times that of a reflection state.

The data is returned in the same format as CALC:DATA:SNP?

Note: This command returns SNP data without header information, and in columns, not in rows as .SnP files. This means that the data returned from this command sends all frequency data, then all Sx1 magnitude data, then all Sx1 phase data, and so forth.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.

[num] Optional argument. USB number of the ECal module. If unspecified (only one ECal module is connected to the USB), <num> is set to 1. If two or more modules are connected, use SENS:CORR:CKIT:ECAL:LIST? to determine how many, and SENS:CORR:CKIT:ECAL:INF? to verify their identities.

<path> Name of the path for which to read number of states. Choose from:

Reflection paths

- **A**
- **B**
- **C** (4-port modules)
- **D** (4-port modules)

Transmission paths

- **AB**
- **AC** (4-port modules)
- **AD** (4-port modules)
- **BC** (4-port modules)
- **BD** (4-port modules)
- **CD** (4-port modules)

<stateNum> Number of the state to set. Refer to the following table to associate the <stateNum> with a state in your ECal module.

In addition, CONT:ECAL:MOD:PATH:COUNt? returns the number of states in the specified ECal module.

<stateNum>	N4432A and N4433A States	N4431A States	N469x States**	8509x States
One-Port Reflection States				
1	Open	Open	Impedance 1	Open
2	Short	Short	Impedance 2	Short
3	Impedance 1	Impedance 1	Impedance 3	Impedance 1
4	Impedance 2	Impedance 2	Impedance 4	Impedance 2
5			Impedance 5	
6			Impedance 6	
7			Impedance 7	
Two-Port Transmission States				
1	Thru	Thru	Thru	Thru
2	Confidence	Confidence	Confidence	Confidence

****** The following modules have only FOUR Impedance states (1, 2, 3, 4): N4690B ,N4691B ,N4692A ,N4696B.

<char> Optional argument. Specifies which characterization within the ECal module to read information from. If not specified, value is set to CHAR0.

Choose from:

- **CHAR0** Factory characterization (data that was stored in the ECal module by Agilent)
- **CHAR1** User characterization #1
- **CHAR2** User characterization #2
- **CHAR3** User characterization #3
- **CHAR4** User characterization #4
- **CHAR5** User characterization #5

Examples	`SENS:CORR:CKIT:ECAL1:PATH:DATA?`
Return Type	S1P or S2P
Default	Not Applicable

SENSe:CORRection:CKIT:IMPort <string>

(Write-only) Imports the specified cal kit (.ckt file) and appends the imported kit to the end of the list of kits whenever the file import succeeds.

Parameters	
<string>	Path and cal kit name.
Examples	`SENSe:CORRection:CKIT:IMPort "C:/Program Files/Agilent/Network Analyzer/Documents/85033D.ckt"`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:CKIT:INITialize[:IMMediate]

(Write-only) Restores all default factory installed cal kits.

Parameters	
Examples	`SENS:CORR:CKIT:INITialize` `sense:correction:ckit:initialize`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:CKIT:LOAD <string>

(Write-only) Loads the specified collection of cal kits from a .wks file. You can make your own collection of cal kits from the Advanced Modify Cal Kit menu.

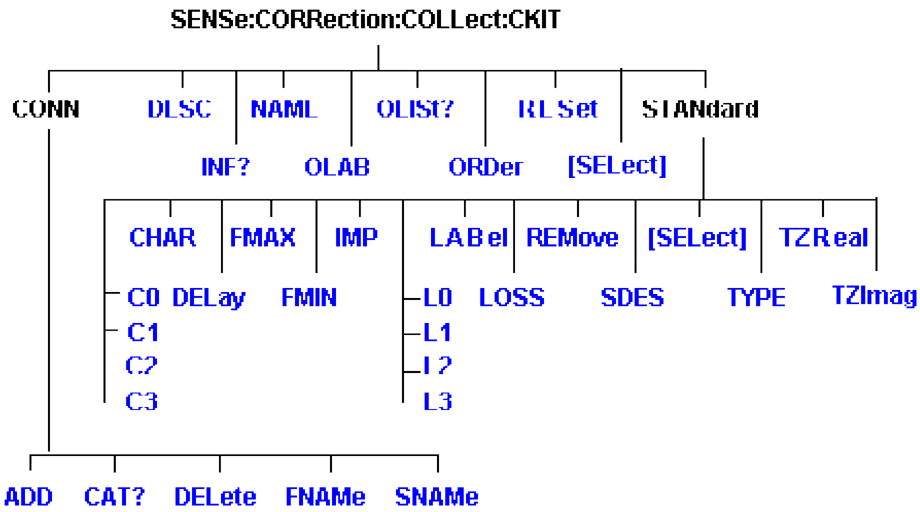
Parameters	
<string>	Path and file name of the cal kit collection.
Examples	`sense:correction:ckit:load "C:/Program Files/Agilent/Network Analyzer/PnaCalKits/factory/wMyCalKits.wks`
Query Syntax	Not Applicable
Default	Not Applicable

Last modified:

10/16/06 Modified Ecal:Data to include <ch>

Sense:Correction:Collect:Ckit Commands

Use to change the definitions of calibration kit standards.



Click on a blue keyword to view the command details.

Most of these commands act on the currently selected standard from the currently selected calibration kit.

- To select a Calibration kit, use SENS:CORR:COLL:CKIT:SEL.
- To select a Calibration standard, use SENS:CORR:COLL:CKIT:STAN:SEL
- See an **example** program that CREATES a New Cal Kit
- See an **example** program that MODIFIES an Existing Cal Kit
- Learn about Modifying Cal Kits
- Synchronizing the PNA and Controller
- SCPI Command Tree

Note: You should provide data for every definition field - for every standard in your calibration kit. If a field is not set, the default value may not be what you expect.

SENSe:CORRection:COLLect:CKIT:CONNector:ADD <family>,<start>,<stop>,<z0>,<gender>,<media>,<cutoff>

(Write only) Creates a new connector. The connector is automatically added to the list of available connectors for the currently selected cal kit. If a connector includes both male and female connectors, each connector must be added separately.

Parameters

<family>	(String) Name of connector family. Limited to 50 characters.
<start>	Start frequency
<stop>	Stop frequency
<z0>	Characteristic Impedance of the connector in ohms.
<gender>	Connector gender. Choose from: MALE FEMALE NONE
<media>	Media of the connector. Choose from: **COAX** - coaxial **WAVE** - waveguide
<cutoff>	Cutoff frequency of the connector (waveguide only).

Examples

```
SENS:CORR:COLL:CKIT:CONN:ADD "PSC 1.8 mm",0 HZ,999.9 GHZ,50,FEMALE,COAX,0.0
SENS:CORR:COLL:CKIT:CONN:ADD "PSC 1.8 mm",0 HZ,999.9 GHZ,50,MALE,COAX,0.0
```

Query Syntax Not applicable

Default Not Applicable

SENSe:CORRection:COLLect:CKIT:CONNector:CATalog?

(Read-only) Returns a comma-separated list of all connectors defined within the currently selected cal kit. The returned string includes the connector family name followed by the connector gender, if any. Kits may include a primary connector family name and additional connector family names.

Connector family names are case sensitive. A connector family named "PSC 2.4" is different from a connector family named "psc 2.4".

Learn more about Connector Family Name

Examples

```
SENS:CORR:COLL:CKIT:CONN:CAT?
'Returned string
"Type-N (50) male, Type-N (50) female"
```

Default Not Applicable

SENSe:CORRection:COLLect:CKIT:CONNector:DELete

(Write-only) Deletes the primary connector family name from the selected kit. The PNA allows multiple connector families for each kit. If a kit includes multiple connector families, only the first listed (primary) connector family name is deleted.

Once the connector family is deleted, the connector may not be assigned to any new or existing standard within the kit.

The previously defined standards retain their association to the deleted connector name. To reassign standards to a new connector family name, use SENS:CORR:COLL:CKIT:CONN:SNAMe.

Examples	`SENS:CORR:COLL:CKIT:CONN:DEL`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:CONNector:FNAME <name>

(Read-Write) Replaces the primary connector family name from the selected kit with a new connector family name. The connector family name is replaced in all standards in the kit that share that name. The PNA allows multiple connector families for each kit. If a kit includes multiple connector families, only the first listed (primary) connector family name is replaced. Use the query form of this command to return the name of the primary connector family.

Parameters	
<name>	New connector family name. Limited to 50 characters.
Examples	`SENS:CORR:COLL:CKIT:CONN:FNAM 'MYPSC35'` `Sense:correction:collect:ckit:connector:name 'My Type N'`
Query Syntax	SENSe:CORRection:COLLect:CKIT:CONNector:FNAMe?
Return Type	String
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:CONNector:SNAMe <family>,<gender>,<port>

(Read-Write) Assigns a family name to the currently selected standard from the currently selected kit. Specify each port of a 2-port standard individually. Use the query form of this command to read the connector family name assigned to the current standard. The name is not assigned unless the connector family name is previously defined within the selected kit.

Parameters	
<family>	String. Connector family name.
<gender>	Connector gender. Choose from: MALE FEMALE NONE
<port>	Number of the connector port to be assigned the connector family name. 2-port standards such as a thru line must be assigned separately. It is not relevant which connector is port 1 or port 2. **1** Specifies a 1-port standard or the first port of a 2-port standard. **2** Specifies the second port of a 2-port standard.
Examples	`SENS:CORR:COLL:CKIT:CONN:SNAMe "Type-N (50)",MALE,1`
Query Syntax	SENSe:CORRection:COLLect:CKIT:CONNector:SNAMe?
Return Type	String
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:DESCription <string>

(Read-Write) Modifies the cal kit description field of the selected kit. This description appears in the Edit PNA Cal Kit dialog box.

Parameters	
<string>	Description of the cal kit. Limited to 50 characters.
Examples	`SENS:CORR:COLL:CKIT:DESC "My New CalKit"`
Query Syntax	SENSe:CORRection:COLLect:CKIT:DESCription?
Return Type	String
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:INFormation? <module>[,char]

(Read Only) Reads characterization information from an ECal module.

Parameters

<module> Specifies which ECal module to read from. Choose from:

ECAL1

.through.

ECAL8

[char] Optional argument.

Specifies which characterization within the ECal module to read information from. If this argument is not used, the default is **CHAR0**. **CHAR1** through **CHAR5** are for user characterizations that may have been written to the module by the User Characterization feature on the PNA. Choose from:

CHAR0 Factory characterization (data that was stored in the ECal module by Agilent)

CHAR1 User characterization #1

CHAR2 User characterization #2

CHAR3 User characterization #3

CHAR4 User characterization #4

CHAR5 User characterization #5

Examples

```
SENS:CORR:COLL:CKIT:INF? ECAL4
sense:correction:collect:ckit:information? ecal2,char1
```

Example return string:

```
ModelNumber: 85092-60007, SerialNumber: 01386, ConnectorType:
N5FN5F, PortAConnector: Type N (50) female, PortBConnector: Type
N (50) female, MinFreq: 30000, MaxFreq: 9100000000,
NumberOfPoints: 250, Calibrated: July 4 2002
```

Return Type Character

Default Not Applicable

SENSe:CORRection:COLLect:CKIT:NAME <name>

(Read-Write) Sets a name for the selected calibration kit.

Parameters

<name>	Calibration Kit name. Any string name, can include numerics, period, and spaces; any length (although the dialog box display is limited to about 30 characters).
Examples	`SENS:CORR:COLL:CKIT:NAME 'MYAPC35'` `sense:correction:collect:ckit:name 'mytypen'`
Query Syntax	SENSe:CORRection:COLLect:CKIT:NAME?
Return Type	String
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:OLABel<class> <name>

(Read-Write) Sets the label for the calibration class designated by <class>. The label is used in the prompts for connecting the calibration standards associated with that <class>.

Parameters

<class> Number of the calibration class. Choose a number between: 1 and 18. The <class> numbers are associated with the following calibration Classes:

	Class	Description
1	S11A	Reflection standard
2	S11B	Reflection standard
3	S11C	Reflection standard
4	S21T	Thru/Delay standard
5	S22A	Reflection standard
6	S22B	Reflection standard
7	S22C	Reflection standard
8	S12T	Thru/Delay standard
	3-port analyzers only	
9	S33A	Reflection standard
10	S33B	Reflection standard
11	S33C	Reflection standard
12	S32T	Thru/Delay standard

13	S23T	Thru/Delay standard
14	S31T	Thru/Delay standard
15	S13T	Thru/Delay standard
	TRL Calibrations	
16	TRL "T"	Thru standard
17	TRL "R"	Reflect standard
18	TRL "L"	Line standard

<name> Label for the calibration class. Must be enclosed in quotes. Any string between 1 and 12 characters long. Cannot begin with a numeric.

Examples

```
SENS:CORR:COLL:CKIT:OLAB3 'LOADS'
sense:correction:collect:ckit:olabel4 'Thru'
```

Return Type String

Default Not Applicable

SENSe:CORRection:COLLect:CKIT:OLIST[class]?

(Read-only) Returns seven values of standards that are assigned to the specified class.

Parameters

<class> Number of the calibration class to be queried. The <class> numbers are associated with the following calibration Classes:

	Class	Description
1	S11A	Reflection standard
2	S11B	Reflection standard
3	S11C	Reflection standard
4	S21T	Thru/Delay standard
5	S22A	Reflection standard
6	S22B	Reflection standard
7	S22C	Reflection standard
8	S12T	Thru/Delay standard

3-port analyzers ONLY

4-port analyzers use S11 and S22 classes (see example program)

9	S33A	Reflection standard
10	S33B	Reflection standard
11	S33C	Reflection standard
12	S32T	Thru/Delay standard
13	S23T	Thru/Delay standard
14	S31T	Thru/Delay standard
15	S13T	Thru/Delay standard
	TRL Calibrations	
16	TRL "T"	Thru standard
17	TRL "R"	Reflect standard
18	TRL "L"	Thru standard

Examples	**`SENS:CORR:COLL:CKIT:OLIST8?`** Always returns 7 standard numbers. Unassigned standards return 0
Return Type	Numeric; returns the <class> number of the selected standard.
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:ORDer<class> <std> [,<std>] [,<std>] [,<std>] [,<std>] [,<std>] [,<std>]

(Read-Write) Sets a standard number to a calibration class. Does **NOT** set or dictate the order for measuring the standards. For more information, see Assigning Standards to a Calibration Class

Parameters

<class> Number of the calibration class that is assigned to <standard>. Choose a number between: **1** and **18.** The <class> numbers are associated with the following calibration Classes:

	Class	Description
1	S11A	Reflection standard
2	S11B	Reflection standard
3	S11C	Reflection standard
4	S21T	Thru/Delay standard
5	S22A	Reflection standard
6	S22B	Reflection standard
7	S22C	Reflection standard
8	S12T	Thru/Delay standard
	3-port analyzers ONLY	
	4-port analyzers use S11 and S22 classes (see example program)	
9	S33A	Reflection standard
10	S33B	Reflection standard
11	S33C	Reflection standard
12	S32T	Thru/Delay standard
13	S23T	Thru/Delay standard
14	S31T	Thru/Delay standard
15	S13T	Thru/Delay standard
	TRL Calibration	
16	TRL "T"	Thru standard
17	TRL "R"	Reflect standard
18	TRL "L"	Line standard

<std>	Standard number to be assigned to the class; Choose a standard between 1 and 8. One standard is mandatory; up to six additional standards are optional.
Examples	Assigns standard 3 to S11A class: **`SENS:CORR:COLL:CKIT:ORD1 3`** Assigns standard 2 and 5 to S21T class class: **`sense:correction:collect:ckit:order4 2,5`**
Query Syntax	SENSe:CORRection:COLLect:CKIT:ORDer<class>? 'Returns only the first standard assigned to the specified class. To query the remaining standards, use SENSe:CORRection:COLLect:CKIT:OLIST[1-15]?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:RESet <num> - Superseded

This command is replaced by Sens:Corr:Ckit:Init.

(Write-only) Resets the selected calibration kit to factory default definition values.

Parameters	
<num>	The number of the calibration kit to be reset. Choose any integer between: **1** and **8**
Examples	**`SENS:CORR:COLL:CKIT:RESet 1`** **`sense:correction:collect:ckit:reset 4`**
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:CORRection:COLLect:CKIT[:SELect] <num>

(Read-Write) Selects (makes active) a calibration kit for **performing** a calibration or for **modifying** standards. All subsequent "CKIT" commands that are sent apply to this selected calibration kit. Select a calibration standard using SENS:CORR:COLL:CKIT:STAN <num>

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1.

<num> The number of the calibration kit. Choose from:

Use SENSe:CORRection:COLLect:CKIT:RESet to restore Cal Kits to default values.

	Name
1	User Defined 1
2	User Defined 2
3	User Defined 3
	"
	"
48	User Defined 48
49	User Defined 49
50	User Defined 50
99	ECAL module

Examples

```
SENS:CORR:COLL:CKIT 2
sense2:correction:collect:ckit:select 7
```

Query Syntax SENSe<cnum>:CORRection:COLLect:CKIT?

Return Type Numeric

Default Last kit selected

SENSe:CORRection:COLLect:CKIT:STANdard:C0 <num>

(Read-Write) Sets the C0 value (the first capacitance value) for the selected standard. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

Parameters

<num>	Value for C0 in femtofarads (1E-15)

Examples	**The following commands set C0=15 femtofarads:**
	`SENS:CORR:COLL:CKIT:STAN:C0 15`
	`sense:correction:collect:ckit:standard:c0 15`

Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:C0?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:C1 <num>

(Read-Write) Sets the C1 value (the second capacitance value) for the selected standard. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

Parameters

<num>	Value for C1.

Examples	The following two commands set C1=15:
	`SENS:CORR:COLL:CKIT:STAN:C1 15`
	`sense:correction:collect:ckit:standard:c1 15`

Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:C1?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:C2 <num>

(Read-Write) Sets the C2 value (the third capacitance value) for the selected standard. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

Parameters

<num>	Value for C2.
Examples	The following two commands set C2: **`SENS:CORR:COLL:CKIT:STAN:C2 15`** **`sense:correction:collect:ckit:standard:c2 15`**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:C2?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:C3 <num>

(Read-Write) Sets the C3 value (the fourth capacitance value) for the selected standard. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

Parameters

<num>	Value for C3.
Examples	The following two commands set C3 **`SENS:CORR:COLL:CKIT:STAN:C3 15`** **`sense:correction:collect:ckit:standard:c3 15`**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:C3?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:CHARacter <char>

(Read-Write) Sets the media type of the selected calibration standard.

Parameters

<char>	Media type of the standard. Choose from: **Coax** - Coaxial Cable **Wave** - Waveguide
Examples	`SENS:CORR:COLL:CKIT:STAN:CHAR COAX` `sense:correction:collect:ckit:standard:character wave`
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:CHARacter?
Return Type	Numeric
Default	Coax

SENSe:CORRection:COLLect:CKIT:STANdard:DELay <num>

(Read-Write) Sets the electrical delay value for the selected standard.

Parameters

<num>	Electrical delay in picoseconds

Examples	`The following two commands set delay to 50 picoseconds`
	`SENS:CORR:COLL:CKIT:STAN:DEL 50e-12`
	`sense2:correction:collect:ckit:standard:delay 50ps`

Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:DELay?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:FMAX <num>

(Read-Write) Sets the maximum frequency for the selected standard.

Parameters

<num>	Maximum frequency in Hertz.
Examples	**`SENS:CORR:COLL:CKIT:STAN:FMAX 9e9`** **`sense:correction:collect:ckit:standard:fmax 9Ghz`**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:FMAX?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:FMIN <num>

(Read-Write) Sets the minimum frequency for the selected standard.

Parameters

<num>	Minimum frequency in Hertz.
Examples	**`SENS:CORR:COLL:CKIT:STAN:FMIN 1e3`** **`sense:correction:collect:ckit:standard:fmin 1khz`**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:FMIN?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:IMPedance <num>

(Read-Write) Sets the characteristic impedance for the selected standard.

Parameters

<num>	Impedance in Ohms
Examples	**`SENS:CORR:COLL:CKIT:STAN:IMP 75`** **`sense:correction:collect:ckit:standard:impedance 50.3`**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:IMPedance?
Return Type	Numeric
Default	50

SENSe:CORRection:COLLect:CKIT:STANdard:L0 <num>

(Read-Write) Sets the L0 value (the first inductance value) for the selected standard. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

Parameters

<num>	Value for L0 in femtohenries (1E-15)
Examples	The following two commands set L0=15 femtohenries: **SENS:CORR:COLL:CKIT:STAN:L0 15** **sense:correction:collect:ckit:standard:l0 15**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:L0?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:L1 <num>

(Read-Write) Sets the L1 value (the second inductance value) for the selected standard. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

Parameters

<num>	Value for L1.
Examples	The following two commands set L1=15: **SENS:CORR:COLL:CKIT:STAN:L1 15** **sense:correction:collect:ckit:standard:l1 15**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:L1?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:L2 <num>

(Read-Write) Sets the L2 value (the third inductance value) for the selected standard. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

Parameters

<num>	Value for L2.
Examples	The following two commands set L2=15: **SENS:CORR:COLL:CKIT:STAN:L2 15** **sense:correction:collect:ckit:standard:l2 15**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:L2?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:L3 <num>

(Read-Write) Sets the L3 value (the fourth inductance value) for the selected standard. For a detailed discussion of this value, search for App Note 8510-5B at www.Agilent.com.

Parameters

<num>	Value for L3.
Examples	The following two commands set L3=15: **SENS:CORR:COLL:CKIT:STAN:L3 15** **sense:correction:collect:ckit:standard:l3 15**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:L3?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:LABel <name>

(Read-Write) Sets the label for the selected standard. The label is used to prompt the user to connect the specified standard.

Parameters

<name>	Label for the standard; Must be enclosed in quotes. Any string between **1** and **12** characters long. Cannot begin with a numeric.
Examples	`SENS:CORR:COLL:CKIT:STAN:LAB 'OPEN'` `sense:correction:collect:ckit:standard:label 'Short2'`
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:LABel?
Return Type	String
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:LOSS <num>

(Read-Write) Sets the insertion loss for the selected standard.

Parameters

<num>	Insertion loss in Gohms / sec. (GigaOhms per second of electrical delay)
Examples	`SENS:CORR:COLL:CKIT:STAN:LOSS 3.5e9` `sense:correction:collect:ckit:standard:loss 3`
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:LOSS?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:REMove

(Write only) Deletes the selected standard from the selected cal kit.

Examples	`SENS:CORR:COLL:CKIT:STAN:REMove`
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:SDEScription <string>

(Read-Write) Modifies the description of the selected standard of the selected kit. This description appears in the edit kit dialog box.

Parameters

<string>	Description of the standard.
Examples	`SENS:CORR:COLL:CKIT:STAN:SDES "My New Standard"`
Query Syntax	SENSe:CORRection:COLLect:STANdard:SDEScription?
Return Type	String
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard[:SELECT] <num>

(Read-Write) Selects the calibration standard. All subsequent "CKIT" commands to modify a standard will apply to the selected standard. Select a calibration kit using SENS:CORR:COLL:CKIT:SEL

Parameters

<num>	Number of the standard. Choose any number between: **1** and **30**
Examples	`SENS:CORR:COLL:CKIT:STAN 3` `sense:correction:collect:ckit:standard:select 8`
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard[:SELect]?
Return Type	Numeric
Default	1

SENSe:CORRection:COLLect:CKIT:STANdard:TYPE <char>

(Read-Write) Sets the type for the selected standard.

Parameters	
<char>	Choose from: **OPEN** **SHORT** **LOAD** **SLOAD** (sliding load) **THRU** (through) **ARBI**(arbitrary)
Examples	`SENS:CORR:COLL:CKIT:STAN:TYPE LOAD` `sense:correction:collect:ckit:standard:type short`
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:TYPE?
Return Type	Character
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:TZReal <num>

(Read-Write) Sets the TZReal component value of the Terminal Impedance for the selected standard.

Note: Only applicable when the Standard Type is set to **ARBI**

Parameters	
<num>	Value for TZReal in Ohms

Examples	**The following commands set TZReal=15 Ohms:**
	`SENS:CORR:COLL:CKIT:STAN:TZReal 15`
	`sense:correction:collect:ckit:standard:TZReal 15`

Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:TZReal?
Return Type	Numeric
Default	Not Applicable

SENSe:CORRection:COLLect:CKIT:STANdard:TZImag <num>

(Read-Write) Sets the TZImag component value of the Terminal Impedance for the selected standard.

Note: Only applicable when the Standard Type is set to **ARBI**

Parameters	
<num>	Value for TZImag in Ohms
Examples	The following two commands set TZImag=15 Ohms: **`SENS:CORR:COLL:CKIT:STAN:TZImag 15`** **`sense:correction:collect:ckit:standard:TZImag 15`**
Query Syntax	SENSe:CORRection:COLLect:CKIT:STANdard:TZImag?
Return Type	Numeric
Default	Not Applicable

Last Modified:

19-Sep-2007 Added missing <cnum> argument

Sense:Correction:Cset Commands

Performs actions on calibration sets.

SENSe:CORRection:CSET
ACTivate
CATalog?
COPY
CREate
DATA
DELete
DESCription
ETERm
GUID
NAME
[SELect]
SAVE
STANdard
TSET
| ALLPorts?
| TYPE?
TYPE
| CATalog?

Click on a blue keyword to view the command details.

See Also

- Creating Cal Sets

- Example Programs
- Learn about Cal Sets
- Synchronizing the PNA and Controller

SENSe<cnum>:CORRection:CSET:ACTivate <string>, <bool>

This command replaces SENS:CORR:CSET:GUID

(Read-Write) Selects and applies a Cal Set to the specified channel.

Use SENS:CORR:CSET:CAT? to list the Cal Sets.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<string> Cal Set to make active. Specify the Cal Set by **GUID** or **Name**. Use SENS:CORR:CSET:CAT? to list the available Cal Sets in either format.

<bool> Should the Cal Set stimulus values be applied to the channel. Choose from:

ON (1) Apply the Cal Set stimulus values to the channel.

OFF (0) Do NOT apply the Cal Set stimulus values. If the Cal Set stimulus values do not match the channel stimulus values, then the following will occur:

- If interpolation is ON, then interpolation will be attempted. This may fail if the channel frequency is outside the range of the Cal Set.
- If interpolation is OFF, the selection will be abandoned and an error is returned:

Examples

```
SENS:CORR:CSET:ACT "My2Port",1

sense:correction:cset:activate? name
'returns
"My2Port"
```

Query Syntax SENSe<cnum>:CORRection:CSET:ACTivate? [GUID|NAME]

Returns the name of the Cal Set that is applied to the specified channel. Choose from **GUID** or **NAME** to specify which string is returned. If unspecified, the GUID of the Cal Set is returned. If no Cal Set is applied to the specified channel, then "No Calset Selected" is returned.

Return Type String

Default Not Applicable

SENSe:CORRection:CSET:CATalog? [char]

(Read-only) Returns a list of Cal Sets.

Parameters

<char> Optional argument. The list is returned in one of the following formats. Both return comma-separated string lists.

GUID Cal Sets are listed by GUID (Default if unspecified).

NAME Cal Sets are listed by Name

Examples

```
SENS:CORR:CSET:CAT?

'Returns:
{FD6F863E-9719-11d5-8D6C-00108334AE96},{1B03B2CE-971A-11d5-8D6C-
00108334AE96}

sense2:correction:cset:catalog? name
```

Default Not Applicable

SENSe<cnum>:CORRection:CSET:COPY <string>

(Write-only) Creates a new Cal Set and copies the current Cal Set data into it. Use this command to manipulate data on a Cal Set without corrupting the original cal data.

Parameters

<cnum> Channel number using the Cal Set to be copied. If unspecified, value is set to 1

<string> Name of the new Cal Set.

Examples

```
SENS2:CORR:CSET:COPY 'My2Port'
```

Query Syntax Not Applicable

Default Not Applicable

SENSe<cnum>:CORRection:CSET:CREate [name]

(Write-only) Creates an empty Cal Set and attaches it to the specified channel. This command is ONLY necessary before remotely filling the Cal Set with error term data. (For Advanced Users).

A Cal Set is automatically created, applied to the channel, and saved at the completion of a guided cal according to the preference setting SENS:CORR:PREF:CSET:SAVE.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
[name]	Optional argument. Name of the Cal Set. Spaces or punctuation are NOT allowed. If unspecified, a unique name is chosen in the form "Calset_N" where N is a unique number.
Examples	`SENS:CORR:CSET:CRE 'My2Port'`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:CORRection:CSET:DATA <eterm, portA, portB,>[<param>,] <block>

(Read-Write) Read or Write a specific error term from/to the Cal Set currently attached to the specified channel. (For Advanced Users). The command can be used only for the error terms listed. See SENS:CORR:CSET:ETERM to get and put error term data using a string argument for all error terms..

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<eterm, portA, portB> **Error Term, Port pair of the specified error term.**

Although not all error terms use two port numbers, two are required by the PNA in all cases. Each port number must be between 1 and the number of ports on the PNA.

EDIR - directivity

portA: the port at which directivity is measured.

portB: Not used, but must be a valid PNA port number.

ESRM - source match

portA: the port at which source match is measured.

portB: Not used, but must be a valid PNA port number.

ERFT - reflection tracking

portA: the port at which reflection tracking is measured.

portB: Not used, but must be a valid PNA port number.

ELDM - load match

portA: the port at which load match is measured.

portB: the source port.

Load match is measured with a cable connected between the measured port (portA) and the source port (portB).

The cal system requires that the complete matrix of loadmatch arrays be filled. In most cases you can measure loadmatch once at a port, driven by any other port. Then use that data for all variations of the receive port. (The exception is the 3-port PNA models, which requires the loadmatch-measured port to be driven by every other port.)

For example: Measure the loadmatch at port2 while driving port1. Then upload this same data to the following arrays:

ELDM,2,1,<data>

ELDM,2,3,<data>

ELDM,2,4,<data>

ETRT - transmission tracking

portA: the receive port

portB: the source port for this measurement

EXTLK - crosstalk

portA: the receive port

portB: the source port for this measurement

ERSPT - response tracking.

portA: Not used, but must be a valid PNA port number.

portB: Not used, but must be a valid PNA port number.

ERSPI - response isolation.

portA: Not used, but must be a valid PNA port number.

portB: Not used, but must be a valid PNA port number.

<param> **<string>** - required ONLY when Eterm is response tracking **(ERSPT)** or response isolation **(ERSPI)**. Specify the S-parameter, ratio, or unratioed measurement for which the Eterm applies.

Logical receiver notation is allowed. Ratioed measurements do not require source port to be specified.

A full 4-port calibration requires the following terms be uploaded:

		PORT B			
		1	**2**	**3**	**4**
PORT A	**1**	EDIR,1,1 ERFT,1,1 ESRM,1,1	ELDM,1,2 ETRT,1,2 EXTLK,1,2	ELDM,1,3 ETRT,1,3 EXTLK,1,3	ELDM,1,4 ETRT,1,4 EXTLK,1,4
	2	ELDM,2,1 ETRT,2,1 EXTLK,2,1	EDIR,2,2 ERFT,2,2 ESRM,2,2	ELDM,2,3 ETRT,2,3 EXTLK,2,3	ELDM,2,4 ETRT,2,4 EXTLK,2,4
	3	ELDM,3,1 ETRT,3,1 EXTLK,3,1	ELDM,3,2 ETRT,3,2 EXTLK,3,2	EDIR,3,3 ERFT,3,3 ESRM,3,3	ELDM,3,4 ETRT,3,4 EXTLK,3,4
	4	ELDM,4,1 ETRT,4,1 EXTLK,4,1	ELDM,4,2 ETRT,4,2 EXTLK,4,2	ELDM,4,3 ETRT,4,3 EXTLK,4,3	EDIR,4,4 ERFT,4,4 ESRM,4,4

Reflection terms

Transmission terms

Examples

```
SENS:CORR:CSET:DATA EXTLK,3,1 'cross talk between port 3 receiver
and port 1 source.

SENS:CORR:CSET:DATA ERSPT,1,1, "a3/b4" 'response tracking term
for ratioed measurement of port 4 test receiver over port 3
reference receiver.
```

Query Syntax	SENSe<cnum>:CORRection:CSET:DATA? <eterm,portA, portB>
Return Type	Block data
Default	Not Applicable

SENSe:CORRection:CSET:DELete <string>

(Write-only) Deletes a Cal Set from the set of available Cal Sets. This method immediately updates the Cal Set file on the hard drive. If the Cal Set is currently being used by a channel or does not exist, this request will be denied and an error is returned.

Parameters	
<string>	Cal Set to be deleted. Specify the Cal Set by **GUID** or **Name**. Use SENS:CORR:CSET:CAT? to list the available Cal Sets in either format.
Examples	`SENS:CORR:CSET:DEL '{2B893E7A-971A-11d5-8D6C-00108334AE96}'` `sense2:correction:cset:delete 'MyCalSet'`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:CORRection:CSET:DESCription <string>

(Read-Write) Sets or returns the descriptive string assigned to the selected Cal Set. Change this string so that you can easily identify each Cal Set. Apply and select the Cal Set using SENS:CORR:CSET:ACT.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<string>	The descriptive string associated with the currently-selected Cal Set
Examples	`SENS:CORR:CSET:DESC 'MyCalSet'` `sense2:correction:cset:description 'thisCalSet'`
Query Syntax	SENSe<cnum>:CORRection:CSET:DESCription?
Return Type	String
Default	Not Applicable

SENSe<cnum>:CORRection:CSET:ETERm <string>,<r, i [r,i]...>

(Read-Write) Sets or returns error term data for all PNA measurements.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<string> (String) Error term to read or write. The error term is specified using the EXACT case-sensitive string displayed in the Cal Set Viewer utility. See SENS:CORR:CSET:DATA for a description of port numbers.

The following Noise figure error terms are listed for convenience:

- **RcvNoiseCorr_m_n** Noise correlation matrix of the noise receiver (a 2x2 complex matrix). The row and column indices m and n range from 1 to 2.
- **RcvT_m_n** T-matrix of the noise receiver (a 2x2 complex matrix). The row and column indices m and n range from 1 to 2.
- **GammaTuner_n** Reflection coefficient for impedance state n of the embedded noise tuner (Ecal module) in the port 1 source path. For the Agilent 4691 family of Ecal modules, n can range from 1 to 7.

<r,i> Real and Imaginary data pairs.

Examples

```
SENS:CORR:CSET:ETERM "Directivity(1,1)", 0.237,-1.422, 0.513,
0.895  ' set directivity(source error term for 2 points
SENS:CORR:CSET:ETERM? "Directivity(1,1)"  'read
```

Query Syntax SENSe<cnum>:CORRection:CSET:ETERm? <string>

Return Type Block data

Default Not Applicable

SENSe<cnum>:CORRection:CSET:GUID <string> Superseded

This command is replaced by SENS:CORR:CSET:ACTivate.

(Read-Write) Selects the Cal Set identified by the string parameter (GUID) and applies it to the specified channel.

- A Cal Set cannot be selected for a channel which is not ON.
- If the stimulus settings of the selected Cal Set differ from those of the selected channel, the instrument will automatically change the channel's settings to match the Cal Set.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<string>	GUID of the desired Cal Set. The curly brackets and hyphens must be included.
Examples	`SENS:CORR:CSET:GUID '{2B893E7A-971A-11d5-8D6C-00108334AE96}'` `sense2:correction:cset:guid '{2B893E7A-971A-11d5-8D6C-00108334AE96}'`
Query Syntax	SENSe<cnum>:CORRection:CSET:GUID? Returns the GUID of the currently-selected Cal Set for the specified channel.
Return Type	String
Default	Not Applicable

SENSe<cnum>:CORRection:CSET:NAME <string>

(Read-Write) Sets or queries the name of the Cal Set currently applied to the specified channel.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<string>	Name of the Cal Set. Spaces or punctuation NOT allowed.
Examples	`SENS:CORR:CSET:NAME 'MyCalSet'` `sense2:correction:cset:name 'thisCalSet'`
Query Syntax	SENSe<cnum>:CORRection:CSET:NAME?
Return Type	String
Default	Not Applicable

SENSe<cnum>:CORRection:CSET[:SELect] <char> Superseded

This command is replaced by MMEM:LOAD

(Read-Write) Restores a state file from memory. The file name is "**CSET*x*.cst"** where x is the user number assigned to <char>, and .cst specifies a cal set and instrument state. This is not the same syntax as a file saved through the default choices from the front panel, which is "**at00*x*.cst**". For more information on the file naming syntax, see the MMEMory subsystem. Learn more about Instrument/Cal States.

Note: This command does NOT select a Cal Set for a channel. To select a Cal Set, use SENS:CORR:CSET:ACTivate

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Choose from: **DEF** - Presets the analyzer **USER01** - Restores User01 calibration data **USER02 -** Restores User02 calibration data through... **USER10 -** Restores User10 calibration data
Examples	`SENS:CORR:CSET DEF` `sense2:correction:cset:select user02`
Query Syntax	SENSe<cnum>:CORRection:CSET[:SELect]?
Return Type	Character
Default	DEF

SENSe<cnum>:CORRection:CSET:SAVE <char>

This command is NOT necessary after completion of a calibration. A Cal Set is automatically created, applied to the channel, and saved at the completion of a guided cal according to the preference setting SENS:CORR:PREF:CSET:SAVE.

(Read Write)

Saves the channel's Cal Set to the PNA hard drive. For example, use this command after writing data to a Cal Set using SENS:CORR:CSET:DATA (For Advanced Users).

The file name is saved as "**CSET*x*.cst"** where x is the user number assigned to <char>, and .cst specifies a Cal Set and instrument state. This is not the same syntax as a file saved through the default choices from the front panel, which is "**at00*x*.cst**". For more information on the file naming syntax, see the MMEMory subsystem. Learn more about Instrument/Cal States.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Choose from: USER01 USER02... USER10
Examples	**SENS:CORR:CSET:SAVE USER03** **sense2:correction:cset:save user09**
Query Syntax	SENSe<cnum>:CORRection:CSET:SAVE? Queries the last correction set saved.
Return Type	Character
Default	Not applicable

SENSe<cnum>:CORRection:CSET:STANdard <string>

(Read-Write) Sets or returns standard data. Standard data is available for Unguided Cals ONLY.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<string>	(String) Cal standard acquisition data to read or write. The standard is specified using the EXACT case-sensitive string displayed in the Cal Set Viewer utility. See SENS:CORR:CSET:DATA for a description of port numbers.
Examples	`SENS:CORR:CSET:STAN 'S11C(1,1)'` `SENS:CORR:CSET:STAN? "S11C(1,1)"  'Read data`
Query Syntax	SENSe<cnum>:CORRection:CSET:STANdard? (string)
Return Type	Block data
Default	Not Applicable

SENSe:CORRection:CSET:TSET:ALLPorts? <cset>

(Read-only) Reads the port mapping used for the specified Cal Set. The returned values are the physical ports. The POSITION of the returned values corresponds to the logical ports.

For example, with an N44xx test set, if the returned string is "PNA 1,TS 2,PNA 2, TS 4" this means:

- PNA 1 is assigned to logical port 1
- TS 2 is assigned to logical port 2
- PNA 2 is assigned to logical port 3
- TS 4 is assigned to logical port 4

Parameters	
<cset>	**(String)** Name or GUID of the Cal Set. Use SENS:CORR:CSET:CAT? to read the list of available Cal Set names or GUIDs.
Examples	`SENS:CORR:CSET:TSET:ALLP? "MyCalSet"` `sens:correction:cset:tset:allports? "{2B893E7A-971A-11d5-8D6C-00108334AE96}"`
Return Type	String
Default	Not Applicable

SENSe:CORRection:CSET:TSET:TYPE? <cset>

(Read-only) Reads the test set type (model) used for the specified Cal Set.

Parameters	
<cset>	**(String)** Name or GUID of the Cal Set. Use SENS:CORR:CSET:CAT? to read the list of available Cal Set names or GUIDs.

Examples	`SENS:CORR:CSET:TSET:TYPE? "MyCalSet"`
	`'returns "N44xx"`
	`sens:correction:cset:tset:type? "{2B893E7A-971A-11d5-8D6C-00108334AE96}"`

Return Type	String
Default	Not Applicable

SENSe<ch>:CORRection:CSET:TYPE:CATalog? [format]

(Read-only) Query the Cal Types available in the selected Cal Set. The output is a comma separated list of Guids or a Cal Type names. Learn more about applying Cal Types using SCPI.

Use CALC:CORR:TYPE to apply a Cal Type.

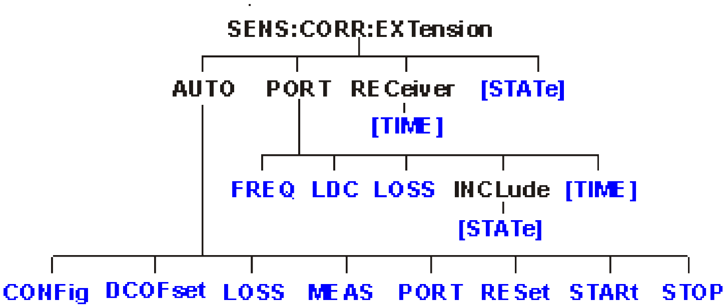
Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
[format]	(Optional) Format of the output of cal types. choose from: **NAME** - (default) returns a list of cal type string names. **GUID -** returns a list of cal type GUIDs
Examples	`SENS:CORR:CSET:TYPE:CAT? NAME` `SENS2:CORRection:CSET:TYPE:CAT?`
Return Type	String
Default	Not Applicable

Last modified:

6-Mar-2008	Added CSET Delete by Name (8.0)
5-Mar-2008	Added Noise ETerm and Std commands (8.0)
9/12/06	MQ Added TSET commands for multiport.

Sense:Correction:Extension Commands

Performs and applies Port Extensions.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Port Extensions
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:CORRection:EXTension:AUTO:CONFig <char>

(Read-Write) Sets the frequencies used to calculate Automatic Port Extension. Learn more about calculating Automatic Port Extension.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Frequencies to be used: **CSPN** Use current frequency span. **AMKR** - Use active marker frequency. **USPN** - Use custom user span. Use SENS:CORR:EXT:AUTO:STAR and SENS:CORR:EXT:AUTO:STOP to specify start and stop frequency.

Examples

```
SENS:CORR:EXT:AUTO:CONF CSPN
sense2:correction:extension:auto:config amkr
```

Query Syntax SENSe<cnum>:CORRection:EXTension:AUTO:CONFig ?

Return Type	Character
Default	CSPN

SENSe<cnum>:CORRection:EXTension:AUTO:DCOFfset <bool>

(Read-Write) Specifies whether or not to include DC Offset as part of automatic port extension. Learn more about Automatic DC Offset. Only allowed when SENS:CORR:EXT:AUTO:LOSS is set to ON.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<bool>	ON (or 1) - Includes DC Offset correction.
	OFF (or 0) - Does NOT include DC Offset correction.
Examples	`SENS:CORR:EXT:AUTO:DCOF 1` `sense2:correction:extension:auto:dcoffset off`
Query Syntax	SENSe<cnum>:CORRection:EXTension:AUTO:DCOFfset?
Return Type	Boolean
Default	OFF (0)

SENSe<cnum>:CORRection:EXTension:AUTO:LOSS <bool>

(Read-Write) Specifies whether or not to include loss correction as part of automatic port extension. Learn more about Loss Compensation in port extension.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<bool>	ON (or 1) - Includes Loss correction.
	OFF (or 0) - Does NOT include Loss correction.
Examples	`SENS:CORR:EXT:AUTO:LOSS 1` `sense2:correction:extension:auto:loss off`
Query Syntax	SENSe<cnum>:CORRection:EXTension:AUTO:LOSS?
Return Type	Boolean
Default	OFF (0)

SENSe<cnum>:CORRection:EXTension:AUTO:MEASure <char>

(Write-only) Measures either an OPEN or SHORT standard. When this command is sent, the PNA acquires the measurement with which to set automatic port extensions. Learn more about which standard to measure.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Standard to be measured. Choose from: **OPEN** Measure OPEN standard **SHORt** Measure SHORT standard
Examples	`SENS:CORR:EXT:AUTO:MEAS OPEN` `sense2:correction:extension:auto:measure short`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:CORRection:EXTension:AUTO:PORT<n> <bool>

(Read-Write) Enables and disables automatic port extensions on the specified port.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<n>	PNA Port number to enable or disable for automatic port extensions.
<bool>	ON (or 1) - Enable OFF (or 0) - Disable
Examples	`SENS:CORR:EXT:AUTO:PORT2 0` `sense2:correction:extension:auto:port4 on`
Query Syntax	SENSe<cnum>:CORRection:EXTension:AUTO:PORT<n>?
Return Type	Boolean
Default	All ports ON (enabled)

SENSe<cnum>:CORRection:EXTension:AUTO:RESet

(Write-only) Clears old port extension delay and loss data in preparation for acquiring new data. Send this command prior to sending a new series of SENS:CORR:EXT:AUTO:MEAS. If acquiring both OPEN and SHORT standards, do not send this command between those acquisitions.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:CORR:EXT:AUTO:RES` `sense2:correction:extension:auto:reset`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:CORRection:EXTension:AUTO:STARt <value>

(Read-Write) Set the start frequency for custom user span. Learn more about User Span.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<value>	User span start value. Must be within the frequency range of the active channel and less than the value set by SENS:CORR:EXT:AUTO:STOP.
Examples	`SENS:CORR:EXT:AUTO:STAR 1E9` `sense2:correction:extension:auto:start 200e6`
Query Syntax	SENSe<cnum>:CORRection:EXTension:AUTO:STARt <value>?
Return Type	Numeric
Default	Start frequency of the current active channel.

SENSe<cnum>:CORRection:EXTension:AUTO:STOP <value>

(Read-Write) Set the stop frequency for custom user span. Learn more about User Span.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<value>	User span stop value. Must be within the frequency range of the active channel and greater than the value set by SENS:CORR:EXT:AUTO:STARt
Examples	`SENS:CORR:EXT:AUTO:STOP 1E9` `sense2:correction:extension:auto:stop 200e6`
Query Syntax	SENSe<cnum>:CORRection:EXTension:AUTO:STOP <value>?
Return Type	Numeric
Default	Stop frequency of the current active channel.

SENSe<cnum>:CORRection:EXTension:PORT<pnum>:FREQ<n> <value>

(Read-Write) Sets and returns the frequency "Use" number (1|2) for the specified port number.

Learn about Loss Compensation values.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<pnum>	Port Number that will receive the freq/loss settings. If unspecified, value is set to 1.
<n>	Frequency "Use" number. Choose from 1 or 2. If unspecified, value is set to 1.
<value>	Frequency value. Choose a frequency within the frequency span of the PNA.
Examples	`SENS:CORR:EXT:PORT1:FREQ1 10E9` `sense2:correction:extension:port2:freq2:2E10`
Query Syntax	SENSe<cnum>:CORRection:EXTension:PORT<pnum>:FREQ<n>?
Return Type	Numeric
Default	1 GHz

SENSe<cnum>:CORRection:EXTension:PORT<pnum>:INCLude<n>:STATe <bool>

(Read-Write) Sets and returns the ON/OFF state for the use of the Loss and Freq values for the specified port number.

Learn about Loss Compensation values.

Note: This command affects ALL measurements on the specified channel.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<pnum>	Port Number that will receive the Freq/Loss settings. If unspecified, value is set to 1.
<n>	Freq and Loss pair. Choose from 1 or 2. If unspecified, value is set to 1.
<value>	State of Freq and Loss values for port extension. **0 or OFF** Specified Freq and Loss values are OFF **1 or ON** Specified Freq and Loss values are ON
Examples	`SENS:CORR:EXT:PORT:INCL 0` `sense2:correction:extension:port2:include:state on`
Query Syntax	SENSe<cnum>:CORRection:EXTension:PORT<pnum>:INCLude:STATe?
Return Type	Boolean
Default	OFF

SENSe<cnum>:CORRection:EXTension:PORT<pnum>:LDC <value>

(Read-Write) Sets and returns the Port Loss at DC value for the specified port number.

Learn about Loss Compensation values.

Note: This command affects ALL measurements on the specified channel.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<pnum>	Port number to receive Loss value. If unspecified, value is set to 1.
<value>	Loss in dB. Choose a value between -90 and 90

Examples	`SENS:CORR:EXT:PORT:LDC 1.5`
	
	`sense2:correction:extension:port2:ldc .1`

Query Syntax	SENSe<cnum>:CORRection:EXTension:PORT<pnum>:LDC?

Return Type Numeric

Default 0

SENSe<cnum>:CORRection:EXTension:PORT<pnum>:LOSS<n> <value>

(Read-Write) Sets and returns the Loss value for the specified port number.

Learn about Loss Compensation values.

Note: This command affects ALL measurements on the specified channel.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<pnum>	Port Number that will receive the Freq/Loss settings. If unspecified, value is set to 1.
<n>	Loss "Use" number. Choose from 1 or 2. If unspecified, value is set to 1.
<value>	Loss in dB. Choose a value between -90 and 90
Examples	`SENS:CORR:EXT:PORT:LOSS1 1` `sense2:correction:extension:port2:loss2 .1`
Query Syntax	SENSe<cnum>:CORRection:EXTension:PORT<pnum>:LOSS<n>?
Return Type	Numeric
Default	0

SENSe<cnum>:CORRection:EXTension:PORT<pnum>[:TIME] <num>

(Read-Write) Sets the extension value at the specified port. Must also set SENS:CORR:EXT ON.

Note: This command affects ALL measurements on the specified channel.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<pnum> Port Number that will receive the extension. If unspecified, value is set to 1.

<num> The port extension in seconds; may include suffix. Choose a number between: -1E18 and 1E18

Examples

```
SENS:CORR:EXT:PORT 2MS
sense2:correction:extension:port2 .00025
```

Query Syntax SENSe<cnum>:CORRection:EXTension:PORT<pnum> [:TIME]?

Return Type Numeric

Default 0

SENSe<cnum>:CORRection:EXTension:RECeiver<Rnum>[:TIME] <num> OBSOLETE

(Read-Write) This command has NO replacement and no longer works.

Sets the extension value at the specified receiver. Must also set SENS:CORR:EXT ON.

Note: Before using this command you must select a measurement using CALC:PAR:SEL. You can select one measurement for each channel.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<Rnum> Number of the receiver that will receive the extension. If unspecified, value is set to 1
Choose from:

1 for Receiver A

2 for Receiver B

<num> The electrical length in seconds; may include suffix. Choose a number between:
-10 and **10**

Examples

```
SENS:CORR:EXT:REC 2MS
sense2:correction:extension:receiver2:time .00025
```

Query Syntax SENSe<cnum>:CORRection:EXTension:RECeiver<Rnum> [:TIME]?

Return Type Numeric

Default 0

SENSe<cnum>:CORRection:EXTension[:STATe] <ON | OFF>

(Read-Write) Turns port extensions ON or OFF.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns port extensions ON. **OFF** (or 0) - turns port extensions is OFF.

Examples

```
SENS:CORR:EXT ON
sense2:correction:extension:state off
```

Query Syntax SENSe<cnum>:CORRection:EXTension[:STATe]?

Return Type Boolean (1 = ON, 0 = OFF)

Default OFF

Sense:Correction:Collect:Session Commands

The commands in this topic are common to perform both SMC and VMC calibrations. A calibration session is a term used to describe an instance of a SMC or VMC calibration. For more commands, see SESS:SMC and SESS:VMC.

Notes:

- Commands to read (STEP?) and describe (DESC?) each step are provided to facilitate a remote user interface.
- To perform a **NON** - SMC or VMC calibration, use either Guided or Mechanical commands.
- It is now possible to perform a remote Source Power Calibration for external FCA LO sources.

```
SENSe:CORRection:COLLect:SESSion
        ├ACQuire
        ├CKIT:PORT
        │  ├CATalog?
        │  └[SELect]
        ├CONNector:PORT
        │  └[SELect]
        ├DESCription?
        ├DONE
        ├INITiate
        ├SMC (More)
        ├SAVE
        ├STEPs?
        └VMC (More)
```

Click on a blue keyword to view the command details.

See Also

- SCPI SMC and VMC calibration examples.
- Learn about SMC and VMC calibrations
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<ch>:CORRection:COLLect:SESSion<n>:ACQuire <step>

(Write only) Acquire a calibration measurement.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	Session number. Choose from 1 to 16.
<step>	Step number to acquire. Use SENS:CORR:COLL:SESS:STEPS? to find the number of steps required for the calibration.
Examples	`SENSe2:CORR:COLL:SESS6:ACQ 5`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:CKIT:PORT<p>:CATalog?

(Read only) Returns a list of cal kits that are compatible with the connector on port <p>. The port connector type is set with SENS:CORR:COLL:SESS:CONN:PORT

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	Session number. Choose from 1 to 16.
<p>	Port number of connector to query for compatible cal kits. 1 - Input port of the mixer under test. 2 - Output port of the mixer under test. 3 - Output port of the calibration mixer. See the user interface (UI) equivalent of this command.
Examples	`SENS2:CORR:COLL:SESS6:CKIT:PORT2:CAT?`
Return Type	Comma separated string values
Default	Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:CKIT:PORT<p>[:SELect] <calkit>

(Read-Write) Set or return the Cal Kit for the specified port. Use SENS:CORR:COLL:SESS:CKIT:PORT:CAT? to list compatible Cal Kits.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16.
<p>	Port number for which to set cal kit. **1** - Input port of the mixer under test. **2** - Output port of the mixer under test. **Output port of MUT +1** - Output port of the calibration mixer. Generally this is 3. See the user interface (UI) equivalent of this command.
<calkit>	Cal Kit Name
Examples	`SENS:CORR:COLL:SESS:CKIT:PORT:SEL 85091A` `SENS2:CORR:COLL:SESS6:CKIT:PORT2:SEL?`
Query Syntax	SENS<ch>:CORR:COLL:SESS<n>:CKIT:PORT<p>[:SEL] ?
Return Type	String
Default	Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:CONN:PORT<p>[:SEL] <conn>

(Read-Write) Set the connector type and sex for the specified port number. Catalog valid connector types using SENS:CORR:COLL:GUID:CONN:CAT?

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16.
<p>	Port number for which to specify a connector type.
<conn>	Name of the connector type
Examples	`SENS2:CORR:COLL:SESS6:CONN:PORT1:SEL "N Type"`
Query Syntax	SENS<ch>:CORR:COLL:SESS<n>:CONN:PORT<p>[:SEL] ?
Return Type	String

Default Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:DESC? <step>

(Read-only) Returns the connection prompt for the step. List the number of steps in the calibration using SENS:CORR:COLL:SESS:STEPS?.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16.
<step>	Step number
Examples	`SENS1:CORR:COLL:SESS6:DESC?3`
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:DONE

(Write only) Ends the calibration sessions. Use SAVE? to calculate error terms and save the CalSet.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16.
Examples	`SENS1:CORR:COLL:SESS6:DONE`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:INITiate <string>

(Write only) Initiates an SMC or VMC calibration session. Use the session number for subsequent SMC or VMC commands.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. If the session number already exists it will be terminated and a new session initiated.
<string>	Name of the calibration. Choose from: **"VMC"** or **"VectorMixerCal.VMCType"** **"SMC"** or **"ScalarMixerCal.SMCType"**
Examples	`SENS1:CORR:COLL:SESS6:INITiate "VectorMixerCal.VMCType"`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:SAVE?

(Read only) Finish the SMC or VMC calibration, compute error terms, populate and save the CalSet, and return the GUID of the Cal Set.

Note: The destination (Cal Register or User Cal Set) is determined by the setting of the SENS:CORR:PREFerence:CSET:SAVE command.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16.
Examples	`SENS1:CORR:COLL:SESS6:SAVE?`
Return Type	String specifying the GUID of the CalSet produced by this session.
Default	Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:STEPs?

(Read-only) Returns the number of steps required by the Calibration.

To ensure this query always completes successfully, first send the write command: SENS:CORR:COLL:SESS:STEP, then send the query.

Parameters

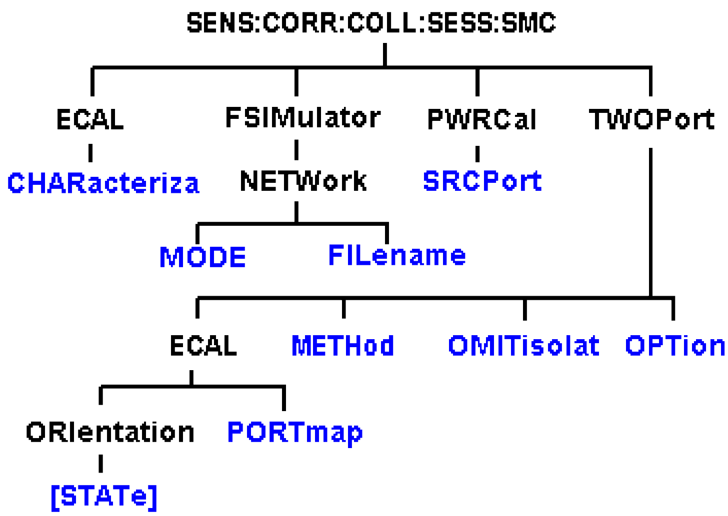
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16.
Examples	**`SENS1:CORR:COLL:SESS6:STEPs?`**
Return Type	Numeric
Default	Not Applicable

Last Modified:

11-Dec-2007	Now can do external source LO cal
13-Aug-2007	New image and detail for <port> argument.

Sense:Correction:Collect:Session:SMC Commands

Performs scalar (SMC) calibration on a frequency converting device.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about FCA Calibrations
- Synchronizing the PNA and Controller
- SCPI Command Tree

NOTE: To configure a power meter and sensor see SOURce:POWer: commands.

SENSe<ch>:CORRection:COLLect:SESSion<n >:SMC:ECAL:CHARacteriza <mod> ,<char>

(Read-Write) Specifies the ECal module and characterization to be used for the SMC calibration.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<mod>	**1** - Electronic Calibration Module
<char>	Specifies which characterization within the ECal module from which to read the confidence data. **0** Factory characterization (data that was stored in the ECal module by Agilent). Default if not specified. **1** User characterization #1 **2** User characterization #2 **3** User characterization #3 **4** User characterization #4 **5** User characterization #5
Examples	`SENS:CORR:COLL:SESS:SMC:ECAL:CHAR 1,2`
Query Syntax	SENS:CORR:COLL:SESS:SMC:ECAL:CHAR?
Return Type	Numeric
Default	1,0

SENSe<ch>:CORRection:COLLect:SESSion<n> :SMC:FSIMulator:NETWork<x>:MODE <char>

(Read-Write) Allows you to embed (add) or de-embed (remove) circuit network effects on the input and output of your mixer measurement. Learn more.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<x>	Apply network to input or output of mixer. Choose from: **1 -** Input of mixer **2 -** Output of mixer
<char>	Choose from: **NONE** - Do nothing with effects of S2P file. **EMBed** - Add effects of S2P file from the measurement results. **DEEMbed** - Remove effects of S2P file from the measurement results.
Examples	`SENS:CORR:COLL:SESS:SMC:FSIM:NETW1:MODE EMB`
Query Syntax	SENS<ch>:CORRection:COLLect:SESSion<n> :SMC:FSIMulator:NETWork<x>:MODE?
Return Type	Character
Default	NONE

SENSe<ch>:CORRection:COLLect:SESSion<n> :SMC:FSIMulator:NETWork<x>:FILename <string>

(Read-Write) Specifies the S2P filename to embed or de-embed on the input or output of your mixer measurement. Learn more.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<x>	Apply network to input or output of mixer. Choose from: **1 -** Input of mixer **2 -** Output of mixer
<string>	Filename of the S2P used for embedding or de-embedding. Use the full path name, file name, and .S2P suffix, enclosed in quotes.
Examples	`SENS:CORR:COLL:SESS:SMC:FSIM:NETW1:FIL "C:\Program Files\Agilent\Network Analyzer\Documents\WaveguideAdapt.S2P"`
Query Syntax	SENS<ch>:CORRection:COLLect:SESSion<n> :SMC:FSIMulator:NETWork<x>:FILename?
Return Type	String
Default	Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n>:SMC:PWRCal:SRCPort <string> Obsolete

(Read-Write) Specifies which port to calibrate.

Note: Beginning with Rev 6.0, this command is no longer necessary. Learn more. Because of improved calibration techniques, **Both** is always selected although a power meter measurement is performed only on port 1.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<char>	**'1'** Source port 1 (SMC forward direction) **'2'** Source port 2 (SMC reverse direction **'BOTH'** (both forward and reverse directions)
Examples	`SENS:CORR:COLL:SESS:SMC:PWRC:SRCP 'both'` `SENSe2:CORRection:COLLection:SESSion6:SMC:PWRCal:SRCPort '2'`
Query Syntax	SENS:CORR:COLL:SESS:SMC:PWRC:SRCP?

Return Type	String
Default	1

SENSe<ch>:CORRection:COLLect:SESSion<n>:SMC:TWOPort:ECAL:ORIentation[:STATe] <bool>

(Read-Write) Sets ECAL Auto-Orientation ON or OFF. If setting auto-orientation OFF, you must manually specify the orientation of the ECAL module with SENS:CORR:COLL:SESS:SMC:TWOP:ECAL:PORTmap.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<bool>	**0** = Orientation OFF **1** = Orientation ON
Examples	`SENS:CORR:COLL:SESS:SMC:TWOP:ECAL:ORI 1`
Query Syntax	SENS:CORR:COLL:SESS:SMC:TWOP:ECAL:ORI?
Return Type	Boolean
Default	1

SENSe<ch>:CORRection:COLLect:SESSion<n>:SMC:TWOPort:ECAL:PORTmap <mod>, <string>

(Read-Write) Specifies the manual orientation (which ports of the module are connected to which ports of the PNA) when auto-orientation is OFF.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<mod>	**1 -** Electronic Calibration Module
<string>	Format in the following manner:

Aw,Bx,Cy,Dz

where

- A, B, C, and D are literal ports on the ECAL module

- w,x,y, and z are substituted for PNA port numbers to which the ECAL module port is connected.

Ports of the module which are not used are omitted from the string.

For example, on a 4-port ECal module with

- port A connected to PNA port 2
- port B connected to PNA port 3
- port C not connected
- port D connected to PNA port 1

the string would be: A2,B3,D1

If either the receive port or source port (or load port for 2-port cal) of the CALC:PAR:SELected measurement is not in this string and orientation is OFF, an attempt to perform an ECal calibration will fail.

Examples	`SENS:CORR:COLL:SESS:SMC:TWOP:ECAL:PORTmap 1,'A1,B2'`
Query Syntax	SENS:CORR:COLL:SESS:SMC:TWOP:ECAL:PORTmap?
Return Type	String
Default	"A1,B2"

SENSe<ch>:CORRection:COLLect:SESSion<n >:SMC:TWOPort:METHod <string>

(Read-Write) Specifies the guided ECal method for performing the thru portion of the calibration.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<string>	ECAL Method: Choose from: **'DEFAULT'** - Default **'ADAP'** - Adapter removal **'FLUSH'** - Flush Through **'UNKN'** - Unknown Thru
Examples	`SENS:CORR:COLL:SESS:SMC:TWOPort:METH 'default'`
Query Syntax	SENS:CORR:COLL:SESS:SMC:TWOPort:METH?
Return Type	String
Default	DEFAULT

SENSe<ch>:CORRection:COLLect:SESSion<n >:SMC:TWOPort:OMITisolat <bool>

(Read-Write) Select to omit or perform the isolation portion of the ECAL.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<bool>	**1** - Omit isolation **0** - Perform isolation
Examples	`SENS:CORR:COLL:SESS:SMC:TWOPort:OMIT 1`
Query Syntax	SENS:CORR:COLL:SMC:TWOPort:OMIT?
Return Type	Boolean
Default	1

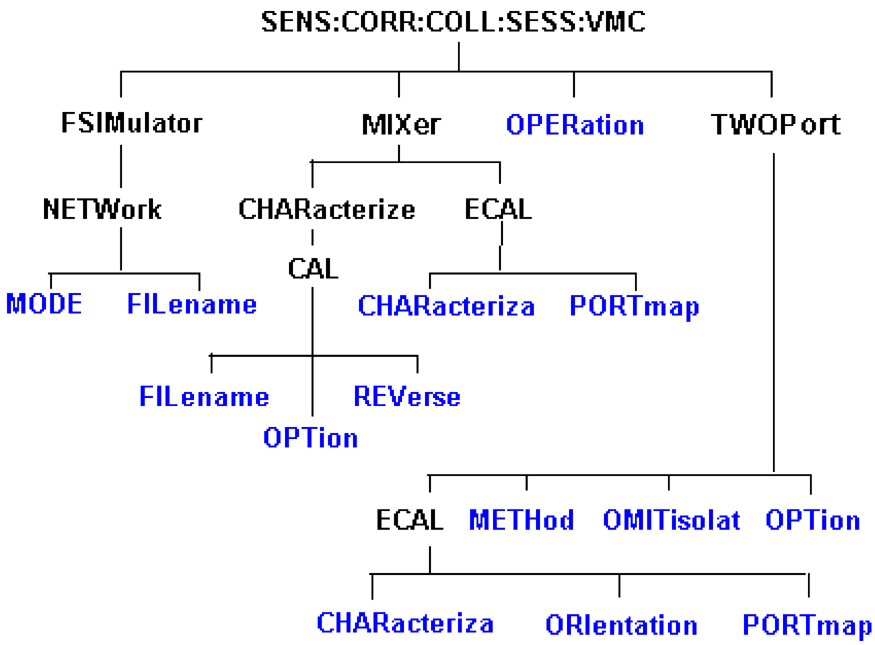
SENSe<ch>:CORRection:COLLect:SESSion<n >:SMC:TWOPort:OPTion <string>

(Read-Write) Sets the SMC calibration to ECAL or MECHanical

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<char>	Choose from: **'ECAL'** Electronic Calibration Module **'MECH'** Mechanical Calibration Kit
Examples	`SENS:CORR:COLL:SESS:SMC:TWOPort:OPTion 'ECAL'`
Query Syntax	SENS:CORR:COLL:SESS:SMC:TWOPort:OPTion?
Return Type	String
Default	ECAL

Sense:Correction:Collect:Session:VMC Commands

Performs a vector (VMC) calibration on a frequency converting device.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about VMC Calibration
- Synchronizing the PNA and Controller

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:FSIMulator:NETWork<x>:MODE <char>

(Read-Write) Allows you to embed (add) or de-embed (remove) circuit network effects on the input and output of your mixer measurement. Learn more.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<x>	Apply network to input or output of mixer. Choose from: **1 -** Input of mixer **2 -** Output of mixer
<char>	Choose from: **NONE** - Do nothing with effects of S2P file. **EMBed** - Add effects of S2P file from the measurement results. **DEEMbed** - Remove effects of S2P file from the measurement results.
Examples	`SENS:CORR:COLL:SESS:VMC:FSIM:NETW1:MODE EMB`
Query Syntax	SENS<ch>:CORRection:COLLect:SESSion<n> :VMC:FSIMulator:NETWork<x>:MODE?
Return Type	Character
Default	NONE

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:FSIMulator:NETWork<x>:FILename <string>

(Read-Write) Specifies the S2P filename to embed or de-embed on the input or output of your mixer measurement. Learn more.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<x>	Apply network to input or output of mixer. Choose from: **1 -** Input of mixer **2 -** Output of mixer
<string>	Filename of the S2P used for embedding or de-embedding. Use the full path name, file name, and .S2P suffix, enclosed in quotes.

Examples `SENS:CORR:COLL:SESS:VMC:FSIM:NETW1:FIL "C:/Program Files/Agilent/Network Analyzer/Documents/WaveguideAdapt.S2P"`

Query Syntax SENS<ch>:CORRection:COLLect:SESSion<n> :VMC:FSIMulator:NETWork<x>:FILename?

Return Type String

Default Not Applicable

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:MIXer:CHARacterize:CAL:FILename <string>

(Read-Write) Specifies the .S2P filename used for mixer characterization. Use the VMC:MIXer:CHARacterize:CAL: OPTion command to load the file for mixer characterization. Once loaded, use this command to query the current filename or set a new filename.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<string>	Filename of the S2P used for mixer characterization. Use the full path name, file name, and .S2P suffix, enclosed in quotes.

Examples `SENS2:CORR:COLL:SESS4:VMC:MIXer:CHAR:CAL:FIL "C:/Program Files/Agilent/Network Analyzer/Documents/MyMixer.S2P"`

Query Syntax SENS:CORR:COLL:SESS:VMC:MIX:CHAR:CAL:FIL?

Return Type String

Default C:/Program Files/Agilent/Network Analyzer/Documents/default.s2p

---

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:MIXer:CHARacterize:CAL: OPTion <char>

(Read-Write) Sets the mixer characterization method to ECal, Mechanical, or read from a file.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<char>	**ECAL -** Electronic Calibration Module **MECH -** Mechanical Calibration Kit **FILE, <filename> -** Retrieve a mixer characterization file. Also specify the filename of the S2P used for mixer characterization. Use the full path name, file name, and .S2P suffix. Use the VMC:CHARacterize:CAL:FILename command to query the filename..

Examples

```
SENS:CORR:COLL:SESS:VMC:MIX:CHAR:CAL:OPT ECAL
'or
SENS:CORR:COLL:SESS6:VMC:MIX:CHAR:CAL:OPT FILE,'C:/Program Files/Agilent/Network Analyzer/Documents/Mixer001.s2p'"
file = "SENS:CORR:COLL:SESS6:VMC:MIXer:CHAR:CAL:FIL?" 'Read back the filename
```

Query Syntax SENS:CORR:COLL:SESS:VMC:MIX:CHAR:CAL:OPT?

Return Type String

Default MECH

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:MIXer:CHARacterize:CAL: REVerse <bool>

(Read-Write) Specifies the direction in which to characterize the calibration mixer. Learn more about the calibration mixer.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<bool>	**False (0)** - Characterize the calibration mixer in the SAME direction as that specified in the mixer setup. **True (1)** - Characterize the calibration mixer in the REVERSE direction as that specified in the mixer setup.

Examples

```
SENS:CORR:COLL:SESS:VMC:MIX:CHAR:CAL:REV 1
```

Query Syntax SENS:CORR:COLL:SESS:VMC:MIX:CHAR:CAL:REV?

Return Type Boolean

Default False

SENSe<ch>:CORRection:COLLect:SESSion<n > :VMC:MIXer:ECAL:CHARacteriza <mod> ,<char>

(Read-Write) Specifies the ECal module and characterization to be used for the mixer characterization portion of the calibration.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<mod>	**1** - Electronic Calibration Module
<char>	Characterization number in the specified ECAL module. Choose from: **0** Factory characterization (data that was stored in the ECal module by Agilent). Default if not specified. **1** User characterization #1 **2** User characterization #2 **3** User characterization #3 **4** User characterization #4 **5** User characterization #5

Examples `SENS:CORR:COLL:SESS:VMC:MIX:ECAL:CHAR 1,0`

Query Syntax SENS:CORR:COLL:SESS:VMC:MIX:ECAL:CHAR?

Return Type Numeric

Default 1,0

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:MIXer:ECAL:PORTmap <mod>, <string>

(Read-Write) Sets the port mapping for the mixer characterization with ECal. This command is required if SENS:CORR:COLL:SESS:VMC:MIX:CHAR:CAL:OPT **ECAL** is specified.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<mod>	**1** - Electronic Calibration Module
<string>	Choose from: **"A1"** - ECAL module port A is connected to PNA port 1 **"B1"** - ECAL module port B is connected to PNA port 1
Examples	`SENS:CORR:COLL:SESS:VMC:MIX:ECAL:PORT?` `SENS2:CORR:COLL:SESS:VMC:MIXer:ECAL:PORTmap 1,"A1"`
Query Syntax	SENS:CORR:COLL:SESS:VMC:MIX:ECAL:PORTmap?
Return Type	String
Default	"A1"

SENSe<ch>:CORRection:COLLect:SESSion<n>:VMC:OPERation <string>

(Read-Write) Perform either full VMC calibration or mixer characterization only.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<string>	**'CAL'** - full calibration and mixer characterization **'CHAR'** - mixer characterization only (no reference mixer required) - Saves an .S2P file with the filename specified in SENS<ch>:CORR:COLL:SESSion<n>:VMC:CHARacterize:CAL:FILename <filename> . If none is specified, a filename is automatically generated and can be queried using the filename command.
Examples	`SENS:CORR:COLL:SESS:VMC:OPER 'CAL'`
Query Syntax	SENS:CORR:COLL:SESS:VMC:OPER?
Return Type	String
Default	CAL

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:TWOPort:ECAL:CHARacteriza <mod> ,<char>

(Read-Write) Specifies the ECal module and characterization to be used for the VMC calibration.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<mod>	**1** - Electronic Calibration Module
<char>	Characterization number in the specified ECAL module. Choose from: **0** Factory characterization (data that was stored in the ECal module by Agilent). Default if not specified. **1** User characterization #1 **2** User characterization #2 **3** User characterization #3 **4** User characterization #4 **5** User characterization #5
Examples	`SENS:CORR:COLL:SESS:VMC:TWOP:ECAL:CHAR 1,1`
Query Syntax	SENS:CORR:COLL:SESS:VMC:TWOP:ECAL:CHAR?
Return Type	Integer
Default	1,0

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:TWOPort:ECAL:ORIentation[:STATe] <bool>

(Read-Write) Sets ECAL orientation for the VMC ECal.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<bool>	**1** = ON **0** = OFF
Examples	`SENS:CORR:COLL:SESS:VMC:TWOP:ECAL:ORI 1`
Query Syntax	SENS:CORR:COLL:SESSion:VMC:TWOPort:ECAL:ORIentation[:STATe]?
Return Type	Integer
Default	ON

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:TWOPort:ECAL:PORTmap <mod>, <string>

(Read-Write) Specifies the manual orientation (which ports of the module are connected to which ports of the PNA) when orientation is turned off.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1

<n> Session number. Choose from 1 to 16. Learn about Cal sessions.

<mod> **1** - Electronic Calibration Module

<string> Port Map, formatted in the following manner:

Aw,Bx,Cy,Dz

where:

- A, B, C, and D are literal ports on the ECAL module.
- w,x,y, z are substituted for PNA port numbers to which the ECAL module port is connected.
- Ports of the module which are not used are omitted from the string.

For example, on a 4-port ECal module with:

- port A connected to PNA port 2
- port B connected to PNA port 3
- port C not connected
- port D connected to PNA port 1

the string would be: A2,B3,D1

If either the receive port or source port (or load port for 2-port cal) of the measurement is not in this string and orientation is OFF, an attempt to perform an ECal will fail.

Examples

```
SENS:CORR:COLL:SESS:VMC:TWOP:ECAL:PORTmap 1,"A2,B1"
```

Query Syntax SENS:CORR:COLL:SESS:VMC:TWOP:ECAL:PORTmap?

Return Type string

Default "A1,B2"

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:TWOPort:METHod <string>

(Read-Write) Specifies the guided ECal method for performing the thru portion of the calibration.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1

<n> Session number. Choose from 1 to 16. Learn about Cal sessions.

<char> **'DEFAULT' -** Default

'ADAP' - Adapter removal

'FLUSH' - Flush Through

'UNKN' - Unknown Thru

Examples

```
SENS:CORR:COLL:SESS:VMC:TWOP:METH 'ADAP'
SENSe2:CORR:COLL:SESSion6:VMC:TWOPort:METHod 'FLUSH'
```

Query Syntax SENS:CORR:COLL:SESS:VMC:TWOP:METH?

Return Type String

Default DEFAULT

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:TWOPort:OMITisolat <bool>

(Read-Write) Select to omit or perform the isolation portion of the ECAL.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<bool>	1 - omit isolation 0 - perform isolation
Examples	`SENS:CORR:COLL:SESS:VMC:TWOP:OMIT 1`
Query Syntax	SENS:CORR:COLL:SESS:VMC:TWOP:OMIT?
Return Type	Numeric
Default	1

SENSe<ch>:CORRection:COLLect:SESSion<n> :VMC:TWOPort:OPTion <string>

(Read-Write) Sets the 2-port calibration option to ECAL or MECHanical

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Session number. Choose from 1 to 16. Learn about Cal sessions.
<char>	**Choose from:** **'ECAL'** Electronic Calibration Module **'MECH'** Mechanical Calibration Kit
Examples	`SENS:CORR:COLL:SESS:VMC:TWOP:OPT 'MECH'` `SENSe2:CORR:COLL:SESSion6:VMC:TWOPort:OPTion 'ECAL'`
Query Syntax	SENS:CORR:COLL:SESS:VMC:TWOP:OPT?
Return Type	String
Default	"MECH"

Last Modified:

29-Aug-2007 Edited Char:Cal:Opt File argument

Sense:Couple Commands

SENSe:COUPle
|
PARameter
|
[STATe]

Click on a blue keyword to view the command details.

See Also

- Example Programs
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:COUPle <ALL | NONE>

(Read-Write) Sets the sweep mode as Chopped or Alternate.

Learn about Alternate Sweep

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<ALL | NONE>	**ALL** - Sweep mode set to Chopped - reflection and transmission measured on the same sweep. **NONE** - Sweep mode set to Alternate - reflection and transmission measured on separate sweeps. Improves Mixer bounce and Isolation measurements. Increases sweep time
Examples	`SENS:COUP ALL` `sense2:couple none`
Query Syntax	SENSe<cnum>:COUPle?
Return Type	Character
Default	ALL

SENSe<cnum>:COUPle:PARameter[:STATe] <bool>

(Read-Write) Turns ON and OFF Time Domain Trace Coupling. All of the measurements in the specified channel are coupled.

- To select Transform parameters to couple, use CALC:TRAN:COUP:PAR
- To select Gating parameters to couple, use CALC:FILT:COUP:PAR

Learn more about Time Domain Trace Coupling.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<bool>	**ON (or 1) -** Turns ON Time Domain Trace Coupling. **OFF (or 0) -** Turns OFF Time Domain Trace Coupling.
Examples	`SENS:COUP:PAR 0` `sense2:couple:parameter:state on`
Query Syntax	SENSe<cnum>:COUPle:PARameter[:STATe]?
Return Type	Boolean
Default	ON (or 1)

Sense:FOM (Frequency Offset) Commands

Controls the frequency offset settings which cause stimulus and response frequencies to be different.

Note: These commands replace the previous FOM commands. Although the old commands will continue to work, they can NOT be mixed with these new commands.

```
SENSe:FOM
 ├[STATe]
 ├CATalog?
 ├COUNt?
 ├DISPlay
 │  └SELect
 ├RNUM?
 └RANGe
     ├COUPled
     ├FREQuency
     │  └CW  DIVisor  MULTiplier  OFFSet  STARt  STOP
     ├NAME?
     ├SEGMent (More Commands)
     └SWEep
        └TYPE
```

Click on a blue keyword to view the command details.

See Also

- FOM Example Program
- Learn about Frequency Offset
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:FOM[:STATe] <bool>

(Read-Write) Turns Frequency Offset ON and OFF. Frequency offset settings are not enabled until this setting is ON.

Send this command (FOM ON) AFTER sending other FOM settings to avoid 'out-or-range' errors.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<bool>	ON (or 1) - turns FOM ON. OFF (or 0) - turns FOM OFF.
Examples	`SENS:FOM 1` `sense2:fom:state on`
Query Syntax	SENSe<cnum>:FOM:STATe?
Return Type	Boolean
Default	OFF

SENSe<cnum>:FOM:CATalog?

(Read-only) Returns a comma-separated list of available range names in the PNA.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.

Examples	`SENS:FOM:CAT?`
	`'returns`
	`"Primary, Source, Receivers"`

Return Type	String
Default	Not Applicable

SENSe<cnum>:FOM:COUNt?

(Read-only) Returns the number of valid ranges in the PNA.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
Examples	`SENS:FOM:COUN?` `sense2:fom:count?`
Query Syntax	SENSe<cnum>:FOM:COUNt?
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:FOM:DISPlay:SELect <string>

(Read-Write) Select the range to be displayed on the PNA x-axis. All traces in the channel have this same x-axis scaling.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<string>	Range name. Case insensitive. Use SENSe:FOM:CAT? to see a list of available frequency range names.
Examples	`SENS:FOM:DISPlay:SELect "source2"` `sense2:fom:display:select "source"`
Query Syntax	SENSe<cnum>:FOM:DISPlay:SELect?
Return Type	String
Default	Receivers

SENSe<cnum>:FOM:RNUM? <string>

(Read-only) Returns the number of a specified range name.

The FOM range items are typically numbered as follows:

1. Primary
2. Source
3. Receivers
4. Source2 (if present)

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<string>	Range name for which a number is being queried. Case insensitive. Use SENSe:FOM:CAT? to see a list of available range names.
Examples	`SENS:FOM:RNUM? "receivers"` `sense2:fom:rnum? "Source2"`
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:FOM:RANGe<n>:COUPled <bool>

(Read-Write) Sets and returns the state of coupling (ON or OFF) of the specified range to the primary range.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number to couple to primary range. An error is returned when attempting to couple to the Primary range (1).
<bool>	**ON** (or 1) - Couple range to primary range. **OFF** (or 0) - Do NOT couple to primary range.
Examples	`SENS:FOM:RANG:COUP 1` `sense2:fom:range2:coupled 0`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:COUPled?
Return Type	Boolean
Default	ON (or 1) Coupled

SENSe<cnum>:FOM:RANGe<n>:FREQuency:CW <num>

(Read-Write) Sets and returns the CW frequency.

This setting is valid for the primary range, or if the specified range is already uncoupled from the primary range and if the sweep type is CW.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<num>	CW frequency value in Hz. Choose any frequency within the range of the PNA.
Examples	`SENS:FOM:RANG:FREQ:CW 1e9` `sense2:fom:range2:frequency:cw 10000000`
Query Syntax	SENSe<cnum>:FOM:RANGe:<n>:FREQuency:CW?
Return Type	Numeric
Default	Center frequency of the PNA.

SENSe<cnum>:FOM:RANGe<n>:FREQuency:DIVisor <num>

(Read-Write) Sets and returns the divisor value.

This setting is valid only if the specified range is coupled to the primary range.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<num>	Divisor value (unitless).
Examples	`SENS:FOM:RANG:FREQ:DIV 3` `sense2:fom:range2:frequency:divisor 0`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:FREQuency:DIVisor?
Return Type	Numeric
Default	1

SENSe<cnum>:FOM:RANGe<n>:FREQuency:MULTiplier <num>

(Read-Write) Sets and returns the multiplier value to be used when coupling this range to the primary range.

This setting is valid only if the specified range is coupled to the primary range.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<num>	Multiplier value. (Unitless)
Examples	`SENS:FOM:RANG:FREQ:MULT 1` `sense2:fom:range2:frequency:multiplier 2`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:FREQuency:MULTplier?
Return Type	Numeric
Default	1

SENSe<cnum>:FOM:RANGe<n>:FREQuency:OFFSet <num>

(Read-Write) Sets and returns the offset value to be used when coupling this range to the primary range. Learn more about offset value.

This setting is valid only if the specified range is coupled to the primary range.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<num>	Offset value. (Unitless)
Examples	`SENS:FOM:RANG:FREQ:OFFS 1E9` `sense2:fom:range2:frequency:offset 10000000`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:FREQuency:OFFSet?
Return Type	Numeric
Default	0

SENSe<cnum>:FOM:RANGe<n>:FREQuency:STARt <num>

(Read-Write) Sets and returns the Start value of frequency range. Also specify Stop frequency.

This setting is valid for the primary range, or if the specified range is already uncoupled from the primary range and if the sweep type is LOG or LINear.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<num>	Start value in Hz. Choose any frequency within the range of the PNA.

Examples

```
SENS:FOM:RANG:FREQ:STAR 1GHz
sense2:fom:range2:frequency:start 100000000
```

Query Syntax SENSe<cnum>:FOM:RANGe<n>:FREQuency:STARt?

Return Type Numeric

Default Minimum frequency of the PNA.

SENSe<cnum>:FOM:RANGe<n>:FREQuency:STOP <num>

(Read-Write) Sets and returns the Stop value of frequency range. Also specify Start frequency.

This setting is valid for the primary range, or if the specified range is already uncoupled from the primary range and if the sweep type is LOG or LINear.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<num>	Stop value in Hz. Choose any frequency within the range of the PNA.

Examples

```
SENS:FOM:RANG:FREQ:STOP 1e12
sense2:fom:range2:frequency:stop 10000000000
```

Query Syntax SENSe<cnum>:FOM:RANGe<n>:FREQuency:STOP?

Return Type Numeric

Default Maximum frequency of the PNA.

SENSe<cnum>:FOM:RANGe<n>:NAME?

(Read-only) Returns the name of range<n>.

The FOM range items are typically named as follows:

1. Primary
2. Source
3. Receivers
4. Source2 (if present)

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
Examples	`SENS:FOM:RANG:NAME?` `sense2:fom:range2:name?`
Return Type	String
Default	Not Applicable

SENSe<cnum>:FOM:RANGe<n>:SWEep:TYPE <char>

(Read-Write) Sets and returns the sweep type to be used with the specified range.

This setting is valid only if the specified range is already uncoupled from the primary range.

Learn about Unsupported Sweep Type combinations.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<char>	Sweep type. Choose from: **CW** - Also specify CW frequency. **LINear** - Also specify frequency Start/Stop or Center/Span **LOG** - Also specify frequency Start/Stop or Center/Span **POWer** - Also specify power Start/Stop or Center/Span **SEGMent** - Also specify segment sweep settings.

Examples	**`SENS:FOM:RANG:SWE:TYPE LOG`** **`sense2:fom:range2:sweep:type linear:`**
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:SWEep:TYPE?
Return Type	Character
Default	Linear

Last Modified:

5-Jul-2007	Fixed state link
8-Mar-2007	MQX New topic

Sense:FOM:Range:Segment Commands

Constructs a segment table for a specified UNCOUPLED FOM range.

Note: Do NOT use Sens:Segment commands for FOM segment sweep.

```
SENSe:FOM:RANGe:SEGMent
 ├ ADD
 ├ BWIDth
 │   └ [RESolution]
 │       └ CONTrol
 ├ COUNt?
 ├ DELete
 │   └ ALL
 ├ FREQuency
 │   └ CENTer  SPAN  STARt  STOP
 ├ POWer
 │   └ [LEVel]
 │       └ CONTrol
 ├ [STATe]
 └ SWEep
     └ POINts  TIME
                 └ CONTrol
```

Click on a blue keyword to view the command details.

See Also

- Other SENSe:FOM Commands
- Example Programs
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:ADD

(Write-only) Adds a segment.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number to add. If unspecified, value is set to 1. Segment numbers must be sequential. If a new number is added where one currently exists, the existing segment and those following are incremented by one.
Examples	Two Segments exist (1 and 2). The following command will add a new segment (1). The existing (1 and 2) will become (2 and 3) respectively. `sense2:fom:range2:segment:add`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:BWIDth[:RESolution] <num>

(Read-Write) Sets the IF Bandwidth for the specified segment. First set SENS:FOM:RANGe:SEGM:BWIDth:CONTrol ON. All subsequent segments that are added assume the new IF Bandwidth value.

Valid either for Receiver range or for Primary range when coupled to Receiver.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number for which to set independent IF Bandwidth.
<num>	IF Bandwidth in Hz. The list of valid IF Bandwidths is different depending on the PNA model. See the list of valid IFBW values. If an invalid number is specified, the analyzer will round up to the closest valid number.
Examples	`SENS:FOM:RANG:SEGM:BWIDth 100` `sense2:fom:range2:segment4:bwidth:resolution 1e3`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:BWIDth[:RESolution]?
Return Type	Numeric
Default	See Preset IFBW for your PNA model.

SENSe<cnum>:FOM:RANGe<n>:SEGMent:BWIDth[:RESolution]:CONTrol <bool>

(Read-Write) Specifies whether the IF Bandwidth resolution can be set independently for each segment. When set, each segment added after this will be set to ON automatically.

Valid either for Receiver range or for Primary range. Primary range value is ignored unless Receiver is coupled to Primary.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<bool>	**ON** (or 1) - turns Bandwidth control ON. Bandwidth can be set for each segment **OFF** (or 0) - turns Bandwidth control OFF. Use the channel IF bandwidth setting instead.
Examples	`SENS:FOM:RANG:SEGM:BWIDth:CONT 0` `sense2:fom:range2:segment:bwidth:resolution:control 1`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:SEGMent:BWIDth[:RESolution]:CONTrol?
Return Type	Boolean
Default	OFF

SENSe<cnum>:FOM:RANGe<n>:SEGMent:COUNt?

(Read-only) Returns the number of segments that exist for the specified range.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
Examples	`SENS:FOM:RANG:SEGM:COUN?` `sense2:fom:range2:segment:count?`
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:DELete

(Write-only) Deletes the specified sweep segment.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Number of the segment to delete. If unspecified, value is set to 1.
Examples	`SENS:FOM:RANG:SEGM3:DEL` `sense2:fom:range2:segment4:delete`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:FOM:RANGe<n>:SEGMent:DELete:ALL

(Write-only) Deletes all sweep segments in the specified range.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
Examples	`SENS:FOM:RANG:SEGM:DEL:ALL` `sense2:fom:range2:segment:delete:all`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:FREQuency:CENTer <num>

(Read-Write) Sets and returns the center frequency for the specified sweep segment. Also specify segment frequency span.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number to modify. Choose any existing segment number.
<num>	Center Frequency in Hz. Choose any number between the minimum and maximum frequency of the analyzer.

Examples

```
SENS:FOM:RANG:SEGM:FREQ:CENT 1GHz
sense2:fom:range2:segment4:frequency:center 1e9
```

Query Syntax SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:FREQuency:CENTer?

Return Type Numeric

Default Stop Frequency of the previous segment. If first segment, start frequency of the analyzer.

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:FREQuency:SPAN <num>

(Read-Write) Sets and returns the span frequency for the specified sweep segment. Also specify segment center frequency.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number to modify. Choose any existing segment number.
<num>	Frequency span in Hz. Choose any number between the minimum and maximum frequency of the analyzer.

Examples

```
SENS:FOM:RANG:SEGM:FREQ:SPAN 1GHz
sense2:fom:range2:segment4:frequency:span 1e9
```

Query Syntax SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:FREQuency:SPAN?

Return Type Numeric

Default	If first segment, frequency span of the analyzer. Otherwise 0.

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:FREQuency:STARt <num>

(Read-Write) Sets and returns the start frequency for the specified sweep segment. Also specify segment stop frequency.

All other segment Start and Stop Frequency values that are larger than this frequency are changed to this frequency.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number to modify. Choose any existing segment number.
<num>	Start frequency in Hz. Choose any number between the minimum and maximum frequency of the analyzer.
Examples	`SENS:FOM:RANG:SEGM:FREQ:STAR 1GHz` `sense2:fom:range2:segment4:frequency:start 1e9`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:FREQuency:STARt?
Return Type	Numeric
Default	Stop Frequency of the previous segment. If first segment, start frequency of the analyzer.

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:FREQuency:STOP <num>

(Read-Write) Sets and returns the stop frequency for the specified sweep segment. Also specify segment start frequency.

All other segment Start and Stop Frequency values that are larger than this frequency are changed to this frequency.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number to modify. Choose any existing segment number.
<num>	Stop frequency in Hz. Choose any number between the minimum and maximum frequency of the analyzer.
Examples	`SENS:FOM:RANG:SEGM:FREQ:STOP 1GHz` `sense2:fom:range2:segment4:frequency:stop 1e9`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:FREQuency:STOP?
Return Type	Numeric
Default	Stop Frequency of the previous segment. If first segment, start frequency of the analyzer.

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:POWer<p>[:LEVel] <num>

(Read-Write) Sets the Port Power level for the specified sweep segment. First set SENS:FOM:RANG:SEGM:POW:CONTrol ON.

When port power is Coupled, setting port power for one port will apply port power for all source ports.

All subsequent segments that are added assume the new Power Level value.

Valid either for Source ranges or for Primary range when coupled to the source.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number to modify. Choose any existing segment number.
<p>	Port number of the source. If unspecified, value is set to 1.
<num>	Power level in dBm.

Note: The range of settable power values depends on the PNA model and if source attenuators are installed. To determine the range of values, send SOUR:POW? MAX and SOUR:POW? MIN. (SOUR:POW:ATT:AUTO must be set to ON).

Actual achievable leveled power depends on frequency.

Examples

```
SENS:FOM:RANG:SEGM:POW -5
sense2:fom:range2:segment4:power2:level 5
```

Query Syntax SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:POWer<p>[:LEVel]?

Return Type Numeric

Default 0

SENSe<cnum>:FOM:RANGe<n>:SEGMent:POWer[:LEVel]:CONTrol <bool>

(Read-Write) Specifies whether Power Level is to be set independently for each segment.

Valid either for Source ranges or for Primary range. Primary range value is ignored unless Source is coupled to Primary.

Parameters

<cnum> Any existing channel number; if unspecified, value is set to 1.

<n> Range number. If unspecified, value is set to 1.

<bool> ON (or 1) - Power level will be set for each segment.

OFF (or 0) - Use the channel power level setting.

Examples

```
SENS:FOM:RANG:SEGM:POW:CONT 0
sense2:fom:range2:segment:power:control on
```

Query Syntax SENSe<cnum>:FOM:RANGe<n>:SEGMent:POWer[:LEVel]:CONTrol?

Return Type Boolean

Default OFF (or 0)

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>[:STATe] <bool>

(Read-Write) Turns the specified sweep segment ON or OFF.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number to be turned ON or OFF. Choose any existing segment number.
<bool>	ON (or 1) - turns segment ON. OFF (or 0) - turns segment OFF.

Examples

```
SENS:FOM:RANG:SEGM 0
sense2:fom:range2:segment4:state on
```

Query Syntax SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>[STATe]?

Return Type Boolean

Default OFF (or 0)

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:SWEep:POINts <num>

(Read-Write) Sets the number of data points for the specified sweep segment.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number to modify. Choose any existing segment number.
<num>	Number of points in the segment. The total number of points in all segments cannot exceed 20001. A segment can have as few as 1 point.

Examples

```
SENS:FOM:RANG:SEGM:SWE:POIN 101
sense2:fom:range2:segment4:sweep:points 201
```

Query Syntax SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:SWEep:POINts?

Return Type Numeric

Default 21

SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:SWEep:TIME <num>

(Read-Write) Sets the time the PNA takes to sweep the specified segment.

Valid ONLY for receiver ranges.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<s>	Segment number for which to set sweep time.
<num>	Sweep time in seconds. Choose a number between 0 and 100
Examples	`SENS:FOM:RANG:SEGM:SWE:TIME 1` `sense2:fom:range2:segment3:sweep:time .1`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:SEGMent<s>:SWEep:TIME?
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:FOM:RANGe<n>:SEGMent:SWEep:TIME:CONTrol <bool>

(Read-Write) Specifies whether Sweep Time can be set independently for each sweep segment.

Valid either for Receiver ranges or for Primary range. Primary range value is ignored unless Receiver is coupled to Primary.

Parameters

<cnum>	Any existing channel number; if unspecified, value is set to 1.
<n>	Range number. If unspecified, value is set to 1.
<bool>	**ON** (or 1) - Sweep time will be set for each segment. **OFF** (or 0) - Use the channel sweep time setting.
Examples	`SENS:FOM:RANG:SEGM:SWE:TIME:CONT 1` `sense2:fom:range2:segment:sweep:time:control off`
Query Syntax	SENSe<cnum>:FOM:RANGe<n>:SEGMent:SWEep:TIME:CONTrol?
Return Type	Boolean

Default OFF

Last Modified:

21-Jun-2007 Increased max number of points

Sense:Frequency Commands

Sets the frequency sweep functions of the analyzer.

Click on a blue keyword to view the command details.

See Also

- Example using some of these commands.
- Learn about Frequency Sweep
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:FREQuency:CENTer <num>

(Read-Write) Sets the center frequency of the analyzer.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Center frequency. Choose any number between the **minimum** and **maximum** frequency limits of the analyzer. Units are Hz. This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples	`SENS:FREQ:CENT 1000000`
	`sense2:frequency:center 1mhz`
	`sense2:frequency:center 1e6`

Query Syntax	SENSe<cnum>:FREQuency:CENTer?
Return Type	Numeric
Default	Center of the analyzer's frequency span

SENSe<cnum>:FREQuency[:CW |:FIXed] <num>

(Read-Write) Sets the Continuous Wave (or Fixed) frequency. Must also send SENS:SWEEP:TYPE CW to put the analyzer into CW sweep mode.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	CW frequency. Choose any number between the **minimum** and **maximum** frequency limits of the analyzer. Units are Hz. This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
SENS:FREQ 1000000
SENS:FREQ:CW MIN
sense2:frequency:fixed 1mhz
```

Query Syntax SENSe<cnum>:FREQuency[:CW | :FIXed]?

Return Type Numeric

Default 1 GHz

SENSe<cnum>:FREQuency:SPAN <num>

(Read-Write) Sets the frequency span of the analyzer.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Frequency span in Hz. Choose any number between **0** (minimum) and the **maximum** frequency span of the analyzer. This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
SENS:FREQ:SPAN 1000000
sense2:frequency:span max
```

Query Syntax SENSe<cnum>:FREQuency:SPAN?

Return Type Numeric

Default Maximum frequency span of the analyzer

SENSe<cnum>:FREQuency:STARt <num>

(Read-Write) Sets the start frequency of the analyzer.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Start frequency. Choose any number between the **MIN** and **MAX** frequency limits of the analyzer. Units are Hz If FREQ:START is set greater than FREQ:STOP, then STOP is set equal to START. This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
SENS:FREQ:STAR 1000000
sense2:frequency:start MIN
```

Query Syntax SENSe<cnum>:FREQuency:STARt?

If Sweep type is segment, this query returns the start frequency of the first segment.

Return Type Numeric

Default Minimum frequency of the analyzer

SENSe<cnum>:FREQuency:STOP <num>

(Read-Write) Sets the stop frequency of the analyzer.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Stop frequency. Choose any number between: the **minimum** and **maximum** frequency limits of the analyzer. Units are Hz. If FREQ:STOP is set less than FREQ:START, then START will be set equal to STOP. This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
SENS:FREQ:STOP 1000000
sense2:frequency:stop max
```

Query Syntax SENSe<cnum>:FREQuency:STOP?

If Sweep type is segment, this query returns the stop frequency of the last segment.

Return Type Numeric

Default Maximum frequency of the analyzer

Last Modified:

5-Feb-2008 Modified Max and Min notes

SENSe:GCSetup Commands

Controls the Gain Compression configuration.

SENSe:GCSetup:

AMODe <char>

COMPression:

| **ALGorithm <char>**

| **BACKoff:LEVel <num>**

| **DELTa:X <num>**

| **DELTa:Y <num>**

| **INTerpolation <bool>**

| **LEVel <num>**

EOSoperation <string>

PMAP

| **INPut?**

| **OUTPut?**

POWer:

| **LINear:INPut:LEVel <num>**

| **REVerse:LEVel <num>**

| **STARt:LEVel <num>**

| **STOP:LEVel <num>**

SAFE:

| **CPADjustment <num>**

| **ENABle <bool>**

| **FPADjustment <num>**

| **FTHReshold <num>**

SFA?

SMARt:

| MITerations <num>

| SITerations <bool>

| STIMe <num>

| TOLerance <num>

SWEep:

| FREQuency:POINts <num>

| POWer:POINts <num>

Click on a blue keyword to view the command details.

Other Gain Compression commands

The calibration commands listed in this topic are supplemental to the Guided Cal commands.

- CALC:CUSTom:DEFine - creates a gain compression measurement.
- **GCA Calibration** uses the Guided Calibration commands, except for the following:
- Sens:Corr:GCS:Power - sets power level for Source Power Cal

See Also

- **Example Program**: Create and Cal a Gain Compression Measurement
- Learn about Gain Compression Application
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<ch>:GCSetup:AMODe <char>

(Read-Write) Set and read the method by which gain compression data is acquired.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<char>	Choose from: • PFREQuency - 2D Power Per Frequency • FPOWer - 2D Frequency Per Power • SMARtsweep - Smart Sweep
Examples	`SENS:GCS:AMOD SMAR` `sense:gcsetup:amode pfrequency`
Query Syntax	SENSe<ch>:GCSetup:AMODe ?
Return Type	Character
Default	SMARtsweep

SENSe<ch>:GCSetup:COMPression:ALGorithm <char>

(Read-Write) Set and read the algorithm method used to compute gain compression.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<char>	Algorithm method. Choose from: • **CFLG** - compression from linear gain • **CFMG** - compression from maximum gain • **BACKoff** - compression from BackOff • **XYCOM** - X/Y Compression
Examples	`SENS:GCS:COMP:ALG BACK` `sense:gcsetup:compression:algorithm XYcom`
Query Syntax	SENSe<ch>:GCSetup:COMPression:ALGorithm?
Return Type	Character
Default	CFLG

SENSe<ch>:GCSetup:COMPression:BACKoff:LEVel <num>

(Read-Write) Set and read value for the BackOff compression algorithm.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Backoff value in dB. Choose from 30 to (-30)
Examples	`SENS:GCS:COMP:BACK:LEV 10` `sense:gcsetup:compression:backoff:level 5`
Query Syntax	SENSe<ch>:GCSetup:COMPression:BACKoff:LEVel?
Return Type	Numeric
Default	10

SENSe<ch>:GCSetup:COMPression:DELTa:X <num>

(Read-Write) Set and read the 'X" value in the delta X/Y compression algorithm.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	X value in dB. Choose from 30 to (-30)
Examples	`SENS:GCS:COMP:DELT:X 9` `sense:gcsetup:compression:delta:X 8`
Query Syntax	SENSe<ch>:GCSetup:COMPression:DELTa:X?
Return Type	Numeric
Default	10

SENSe<ch>:GCSetup:COMPression:DELTa:Y <num>

(Read-Write) Set and read the 'Y" value in the delta X/Y compression algorithm.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Y value in dB. Choose from 30 to (-30)
Examples	`SENS:GCS:COMP:DELT:Y 9` `sense:gcsetup:compression:delta:Y 8`
Query Syntax	SENSe<ch>:GCSetup:COMPression:DELTa:Y?
Return Type	Numeric
Default	9

SENSe<ch>:GCSetup:COMPression:INTerpolation <bool>

(Read-Write) Sets whether or not interpolation should be performed on 2D measured compression data. Applies ONLY to 2D acquisition modes.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<bool>	Choose from: **ON** or (**1**) Interpolate the results **OFF** or (**0**) Do NOT interpolate the results but return the value closest to compression.
Examples	`SENS:GCS:COMP:INT 1` `sense:gcsetup:compression:interpolation off`
Query Syntax	SENSe<ch>:GCSetup:COMPression:INTerpolation?
Return Type	Boolean
Default	OFF

SENSe<ch>:GCSetup:COMPression:LEVel <num>

(Read-Write) Set and read the desired gain reduction (from reference gain).

This value is used for Compression from Linear Gain and Compression from Maximum Gain.

Use SENS:GCS:COMP:ALG CFLG to set this compression algorithm.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Compression level in dB. Choose a value greater than 0.1 dB.
Examples	`SENS:GCS:COMP:LEV 1` `sense:gcsetup:compression:level 3`
Query Syntax	SENSe<ch>:GCSetup:COMPression:LEVel?
Return Type	Numeric
Default	1

SENSe<ch>:GCSetup:EOSoperation <char>

(Read-Write) Set and read the This setting is used to protect a sensitive device from too much power during the sweep retrace. Other instrument settings or channels may over-ride this setting. Learn more.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<char>	End Of Sweep operation. Choose from: • STANdard Use the default PNA method. Learn more. • POFF Always turn power OFF while waiting. • PSTArt Sweep Start power • PSTOp Sweep Stop power.
Examples	`SENS:GCS:EOS PSTA` `sense:gcsetup:eosoperation standard`
Query Syntax	SENSe<ch>:GCSetup:EOSoperation?
Return Type	Character
Default	STANdard

SENSe<ch>:GCSetup:PMAP <in>,<out>

(Write-only) Set and read the DUT-to-PNA port mapping for the Gain Compression measurement.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<in>	PNA port which is connected to the DUT input.
<out>	PNA port which is connected to the DUT output.
Examples	`SENS:GCS:PMAP 1,2` `sense:gcsetup:pmap 2,1`
Query Syntax	Not Applicable
Default	1,2

SENSe<ch>:GCSetup:PMAP:INPut?

(Read-only) Read the PNA port number to be connected to the DUT Input.

Use SENS:GCS:PORTMap to set the port mapping.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
Examples	`SENS:GCS:PMAP:INP?` `sense:gcsetup:pmap:input?`
Return Type	Numeric
Default	1

SENSe<ch>:GCSetup:PMAP:OUTPut?

(Read-only) Read the PNA port number to be connected to the DUT Output.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
Examples	`SENS:GCS:PMAP:OUTP?` `sense:gcsetup:pmap:output?`
Return Type	Numeric
Default	2

SENSe<ch>:GCSetup:POWer:LINear:INPut:LEVel <num>

(Read-Write) Set and read the input power at which Linear Gain and all S-parameters are measured.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Input power level in dBm. Choose a value from +30 to (-30).
Examples	`SENS:GCS:POW:LIN:INP:LEV 0` `sense:gcsetup:power:linear:input:level -10`
Query Syntax	SENSe<ch>:GCSetup:POWer:LINear:INPut:LEVel?
Return Type	Numeric
Default	-25 dBm

SENSe<ch>:GCSetup:POWer:REVerse:LEVel <num>

(Read-Write) Set and read the reverse power level to the DUT. This is applied to the DUT output port when making reverse measurements like S22.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Reverse power level in dBm. Choose a value from +30 to (-30).
Examples	`SENS:GCS:POW:REV:LEV 0` `sense:gcsetup:power:reverse:level -5`
Query Syntax	SENSe<ch>:GCSetup:POWer:REVerse:LEVel?
Return Type	Numeric
Default	-5

SENSe<ch>:GCSetup:POWer:STARt:LEVel <num>

(Read-Write) Set and read the start power level.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Start power level in dBm. Choose a value from +30 to (-30).
Examples	`SENS:GCS:POW:STAR:LEV 0` `sense:gcsetup:power:start:level -5`
Query Syntax	SENSe<ch>:GCSetup:POWer:STARt:LEVel?
Return Type	Numeric
Default	-30

SENSe<ch>:GCSetup:POWer:STOP:LEVel <num>

(Read-Write) Set and read the stop power level.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Stop power level in dBm. Choose a value from +30 to (-30).
Examples	`SENS:GCS:POW:STOP:LEV 0` `sense:gcsetup:power:stop:level -5`
Query Syntax	SENSe<ch>:GCSetup:POWer:STOP:LEVel?
Return Type	Numeric
Default	-5

SENSe<ch>:GCSetup:SAFE:CPADjustment <num>

(Read-Write) Set and read the Safe Sweep COARSE power adjustment. Learn more.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Coarse power adjustment setting in dBm. Choose a value from +30 to (-30).
Examples	`SENS:GCS:SAFE:CPAD 2` `sense:gcsetup:safe:cpadjustment 3.5`
Query Syntax	SENSe<ch>:GCSetup:SAFE:CPADjustment?
Return Type	Numeric
Default	3.0

SENSe<ch>:GCSetup:SAFE:ENABle <bool>

(Read-Write) Set and read the (ON | OFF) state of Safe Sweep mode. Learn more

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	**(Boolean) -** Safe Sweep state. Choose from: **OFF** (or **0)** - Disable Safe Sweep **ON** (or **1) -** Enable Safe Sweep
Examples	`SENS:GCS:SAFE:ENAB 0` `sense:gcsetup:safe:enable 1`
Query Syntax	SENSe<ch>:GCSetup:SAFE:ENABle?
Return Type	Boolean
Default	0

SENSe<ch>:GCSetup:SAFE:FPADjustment <num>

(Read-Write) Set and read the Safe Sweep FINE power adjustment. Learn more

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Fine power adjustment setting in dBm. Choose a value from +30 to (-30).
Examples	`SENS:GCS:SAFE:FPAD 2` `sense:gcsetup:safe:fpadjustment .5`
Query Syntax	SENSe<ch>:GCSetup:SAFE:FPADjustment?
Return Type	Numeric
Default	1.0 dBm

SENSe<ch>:GCSetup:SAFE:FTHReshold <num>

(Read-Write) Set and read the compression level in which Safe Sweep changes from the COARSE power adjustment to the FINE power adjustment. Learn more

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Threshold setting in dB. Choose a value from +30 to (-30).
Examples	`SENS:GCS:SAFE:FTHR .1` `sense:gcsetup:safe:fthreshold .5`
Query Syntax	SENSe<ch>:GCSetup:SAFE:FTHReshold?
Return Type	Numeric
Default	0.75 dB

SENSe<ch>:GCSetup:SFA?

(Read-only) Returns a comma-separated list of the frequency indexes that were out of tolerance for SMART Sweep mode, or at the power limit for 2D acquisition modes. Zero (0) is the first frequency data point.

Must be Single triggered. Invalid results occur if the GCA channel is continuously sweeping.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
Examples	`SENS:GCS:SFA?` `sense:gcsetup:sfa?`
Return Type	Comma-separated list of frequency indexes.
Default	Not Applicable

SENSe<ch>:GCSetup:SMARt:MITerations <num>

(Read-Write) Set and read the maximum permitted number of iterations which SMART Sweep may utilize to find the desired compression level, to within the specified tolerance.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Maximum number of iterations. Choose a value between 1 and 10e8
Examples	`SENS:GCS:SMAR:MIT 5` `sense:gcsetup:smart:miterations 3`
Query Syntax	SENSe<ch>:GCSetup:SMARt:MITerations?
Return Type	Numeric
Default	20

SENSe<ch>:GCSetup:SMARt:SITerations <bool>

(Read-Write) Set and read enable for showing intermediate results for each iteration of SMART Sweep

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<bool>	Choose from: **ON** or (**1**) Compression traces are updated after each iteration. **OFF** or (**0**) Compression traces are updated after ALL iterations are complete.
Examples	`SENS:GCS:SMAR:SIT 1` `sense:gcsetup:smart:siterations off`
Query Syntax	SENSe<ch>:GCSetup:SMARt:SITerations?
Return Type	Boolean
Default	OFF

SENSe<ch>:GCSetup:SMARt:STIMe <num>

(Read-Write) Set and read the amount of time SMART Sweep will dwell at the first point where the input power changes by the Backoff or X level. Applies only to SMART Sweep when Backoff or XY compression methods are selected. Learn more.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<bool>	Settling time in seconds. Choose any positive value.
Examples	`SENS:GCS:SMAR:STIM 1` `sense:gcsetup:smart:stime .1`
Query Syntax	SENSe<ch>:GCSetup:SMARt:STIMe?
Return Type	Numeric
Default	0

SENSe<ch>:GCSetup:SMARt:TOLerance <num>

(Read-Write) Set and read the acceptable range SMART Sweep will allow for the measured compression level.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Tolerance level in dBm. Choose a value between .01 and 10
Examples	`SENS:GCS:SMAR:TOL .1` `sense:gcsetup:smart:tolerance .05`
Query Syntax	SENSe<ch>:GCSetup:SMARt:TOLerance?
Return Type	Numeric
Default	.05

SENSe<ch>:GCSetup:SWEep:FREQuency:POINts <num>

(Read-Write) Set and read the number of data points in each frequency sweep. Learn more

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Frequency points. Do not exceed the max number of data points. See Data Points Limit
Examples	`SENS:GCS:SWE:FREQ:POIN 201` `sense:gcsetup:sweep:frequency:points 101`
Query Syntax	SENSe<ch>:GCSetup:SWEep:FREQuency:POINts?
Return Type	Numeric
Default	201

SENSe<ch>:GCSetup:SWEep:POWer:POINts <num>

(Read-Write) Set and read the number of data points in each power sweep. Applies ONLY to 2D acquisition modes.

Parameters	
<ch>	Any existing GCA channel. If unspecified, value is set to 1.
<num>	Power points. Do not exceed the max number of data points. See Data Points Limit
Examples	`SENS:GCS:SWE:POW:POIN 50` `sense:gcsetup:sweep:power:points 21`
Query Syntax	SENSe<ch>:GCSetup:SWEep:POWer:POINts?
Return Type	Numeric
Default	26

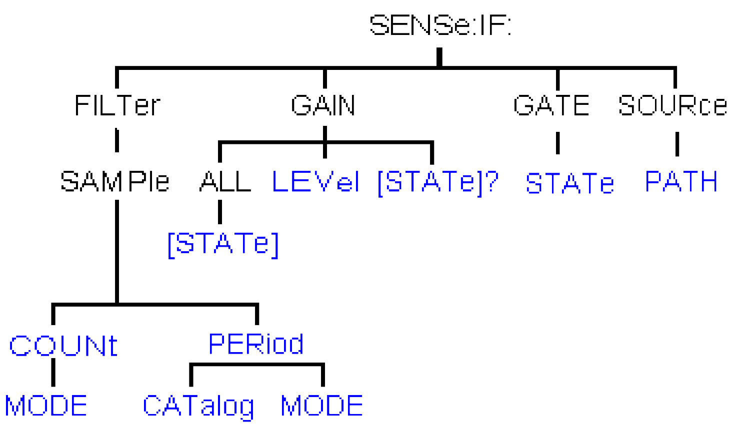
Last Modified:

9-Nov-2007	MX New topic

Sense:IF Commands

Controls the IF source and gain settings for use with the E836x H11 Option.

See IF/DSP and Pulse commands for the PNA-X.



- Click on a blue keyword to view the command details.
- See IF Access User Interface Settings
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:IF:FILTer:SAMPle:COUNt <num>

(Read-Write) Sets and returns the number of taps in the IF filter. The IF filter sample count setting is only used when SENSe:IF:FILTer:SAMPle:COUNt:MODE is set to MANUAL. **Critical Note:**

Parameters	
<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
<num>	An integer value. (MIN and MAX return the minimum and maximum allowed values, respectively.)
Examples	`SENS:IF:FILT:SAMP:COUN 40` `sense2:if:filter:sample:count maximum`
Query Syntax	SENS:IF:FILTer:SAMPle:COUNt?
Return Type	Numeric
Default	Instrument dependent.

SENSe<cnum>:IF:FILTer:SAMPle:COUNt:MODE <char>

(Read-Write) Sets and returns the IF filter sample count mode to the specified value. When in MANUAL mode, the value specified for the IF Filter sample count is used as the number of taps in the IF filter. **Critical Note:**

Parameters	
<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
<char>	Choose either AUTO or MANUAL.
Examples	`SENS:IF:FILT:SAMP:COUN:MODE MANUAL` `sense2:if:filter:sample:count:mode AUTO`
Query Syntax	SENS:IF:FILTer:SAMPle:COUNt:MODE?
Return Type	Character
Default	AUTO

SENSe<cnum>:IF:FILTer:SAMPle:PERiod <num>

(Read-Write) Sets and returns the IF filter sample period. The IF filter sample period setting is only used by the instrument when the SENS:IF:FILT:SAMP:PER:MODE is set to MANUAL. **Critical Note:**

Parameters	
<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
<num>	Sample period. Choose from values returned from the SENS:IF:FILTer:SAMPle:PERiod:CAT? command.
Examples	`SENS:IF:FILT:SAMP:PER 6 us` `sense2:if:filter:sample:period maximum`
Query Syntax	SENS:IF:FILTer:SAMPle:PERiod?
Return Type	Numeric
Default	Instrument dependent.

SENSe<cnum>:IF:FILTer:SAMPle:PERiod:CATalog?

(Read-Only) Returns the list of allowed IF filter sample periods for this instrument. **Critical Note:**

Parameters	
<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
Examples	`SENS:IF:FILT:SAMP:PER:CAT?` `sense2:if:filter:sample:period:catalog?`
Query Syntax	SENS:IF:FILTer:SAMPle:PERiod:CATalog?
Return Type	String
Default	AUTO

SENSe<cnum>:IF:FILTer:SAMPle:PERiod:MODE <char>

(Read-Write) Sets and returns the IF filter sample period mode to the specified value. **Critical Note:**

Parameters	
<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
<char>	Sample period mode. Choose from **AUTO** or **MANUAL**.
Examples	`SENS:IF:FILT:SAMP:PER:MODE MANUAL` `sense2:if:filter:sample:period:mode AUTO`
Query Syntax	SENS:IF:FILTer:SAMPle:PERiod:MODE?
Return Type	Character
Default	AUTO

SENSe<cnum>:IF:GAIN:ALL[:STATe]<char>

(Write only) Sets the gain state for ALL receivers to Auto or Manual.

Parameters	
<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
<char>	Choose from **AUTO** or **MANUAL**
Examples	`SENS:IF:GAIN:ALL AUTO` `sense:if:gain:all:state manual`
Query Syntax	Not Applicable
Return Type	Character
Default	AUTO

SENSe<cnum>:IF:GAIN:LEVel <id>, <level>

(Read Write) Manually sets the gain level for the specified receiver.

Parameters

<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
<id>	Choose from: 'A', 'B', 'R1', 'R2'.
	Note: The A and R1 receivers are always switched together. B and R2 are also always switched together. For example, if you specify 'A', R1 will also be switched.
<level>	Gain level. Choose from: 0 - Lowest gain setting 1 2 - Highest gain setting
Examples	`SENS:IF:GAIN:LEVel 'A', 1`
Query Syntax	SENSe<cnum>:IF:GAIN:LEVel? <id>
Return Type	Numeric
Default	0

SENSe<cnum>:IF:GAIN[:STATe]?, <id>

(Read only) Returns the gain state for the specified receiver. Use SENS:IF:GAIN:ALL. to set the gain state for all channels.

Parameters

<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
<id>	Choose from: 'A', 'B', 'R1', 'R2'.
	Note: The A and R1 receivers are always switched together. B and R2 are also always switched together. For example, if you specify 'A', R1 will also be switched.
Examples	`SENS:IF:GAIN? 'A'`
Return Type	Boolean
Default	Not Applicable

SENSe<cnum>:IF:GATE:STATe <boolean>

(Read-Write) Sets or returns the IF filter gate state.

Parameters

<cnum>	Existing channel number to manipulate. If unspecified, <cnum> is set to 1.
<boolean>	Choose from ON or OFF
Examples	`SENS:IF:FILT:GATE:STAT ON` `sense2:if:filter:gate:state 0`
Query Syntax	SENS:IF:FILTer:SAMPle:COUNt:MODE?
Return Type	Boolean
Default	AUTO

SENSe<cnum>:IF:SOURce:PATH <id>, <char>

(Read Write) Sets the source path for the specified receiver. An error is returned if <id> is not valid, or if <char> is not valid for the specified <id>.

Parameters

<cnum> Existing channel number to manipulate. If unspecified, <cnum> is set to 1.

<id> Choose from: 'A', 'B', 'R1', 'R2'

> **Note**: The A and R1 receivers are always switched together. B and R2 are also always switched together. For example, if you specify "A", R1 will also be switched.

<char> Choose from:

- **NORMal** - the PNA decides the appropriate IF input paths.
- **EXTernal** - always use the rear panel IF inputs.

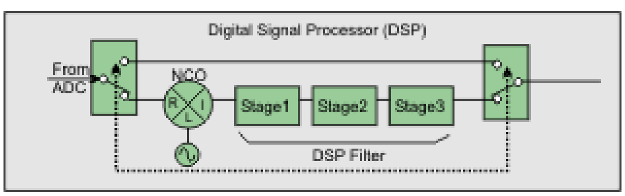
Examples	`SENS:IF:SOUR:PATH 'A', Ext`
Query Syntax	SENSe<cnum>:IF:SOURce:PATH? <id>
Return Type	Character
Default	Normal

Sense:IF Commands

Controls the IF filter for use with the PNA X.

- SENSe:IF
  - FILTer
    - AUTO
    - CMODe
    - ERRors?
    - STAGe
      - COEFficients
      - COUNt?
      - FREQuency
      - CATalog?
      - PARameter
      - TYPE
      - PCATalog?
  - FREQuency
    - AUTO
    - VALue

- Click on a blue keyword to view the command details.
- Synchronizing the PNA and Controller
- SCPI Command Tree



PNA-X DSP Block diagram

All of the Sense:IF commands, except the frequency commands, make settings related to the DSP section of the IF Path.

See the entire IF Path Configuration.

Note: For any of the Filter "Stage" parameters to take effect, SENS:IF:FILT:AUTO must be set to OFF (MANUAL) and mode, and SENS:IF:FILT:CMOD must be set to OFF.

Critical Note: These commands act on the selected measurement. You can select one measurement for each channel using Calc:Par:Select

---

SENSe<cnum>:IF:FILTer:AUTO <bool>

(Read-Write) Sets and returns whether the PNA configures the 3-stage digital filter settings or they will be configured manually. When making manual settings, also send SENS:IF:FILT:CMOD OFF which routes the IF through the 3-stage filter.

Critical Note

Parameters	
<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
<bool>	(Boolean) **ON** (or **1**) - Automatic: PNA controls digital filter settings. **OFF** (or **0**) - Manual: You control digital filter settings using other Sens:IF commands.
Examples	`SENS:IF:FILT:AUTO 1` `sense2:if:filter:auto 0`
Query Syntax	SENSe<cnum>:IF:FILTer:AUTO?
Return Type	Boolean
Default	ON

SENSe:IF:FILTer:CMODe <bool>

(Read-Write) Sets and returns the ADC capture mode modeled as a 2-pole switch in the above diagram. The switch either bypasses or routes the IF through the 3-stage digital filter.

Critical Note

Parameters	
<bool>	(Boolean) **ON** (or **1**) - The digital filters are bypassed and the raw ADC readings are taken directly. A maximum of 4096 data points per sweep can be acquired. **OFF** (or **0**) - The digital filters are used to process IF information. The filters can be configured automatically or manually using SENS:IF:FILT:AUTO.
Examples	`SENS:IF:FILT:CMOD 1` `sense2:if:filter:cmode 0`
Query Syntax	SENSe<cnum>:IF:FILTer:CMODe?

Return Type Boolean

Default OFF

SENSe<cnum>:IF:FILTer:ERRors?

(Read-only) Returns the error string associated with the digital filters. The return string has three fields separated by commas: "stage1 status, stage2 status, stage3 status"

Each of these fields can contain one or more of the following error codes:

- **NO ERROR**
- ***NUMBER-OF-COEFFICIENTS** - the number of coefficients is excessive for that filter-stage
- ***COEFFICIENT VALUE** - one or more coefficients are out of range for that filter-stage
- ***SUM-OF-COEFFICIENTS** - the sum of all coefficients is excessive for that filter-stage,
- ***FREQUENCY** - the frequency for Stage 1 is out of range (only applies stage1 field),
- ***PARAMETER** - one or more parameters are out of range (only applies to stage 3 field)

Critical Note

Parameters

<cnum> Existing channel number. If unspecified, <cnum> is set to 1.

Examples

```
SENS:IF:FILT:ERR?

'example return strings"

NO ERROR, NO ERROR, NO ERROR
indicates no errors,

*SUM-OF-COEFFICIENTS, NO ERROR, NO ERROR
indicates that the sum of all filter coefficients exceed the
maximum value for the Stage-1 filter,

*COEFFICIENT *SUM-OF-COEFFICIENTS, NO ERROR, *PARAMETER
indicates a problems with Stage 1 coefficients and a problem with
one or more of the parameters associated with the Stage 3 filter.
```

Return Type String

Default Not Applicable

SENSe<cnum>:IF:FILTer:STAGE<n>:COEFficients <coef>

(Read-Write) Sets and returns the digital filter coefficients of the specified stage.

Critical Note

Parameters	
<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
<n>	Stage number. Choose 1 or 2
<coef>	An array of real numbers. Filter coefficients
Examples	`SENS:IF:FILT:STAG2:COEF 0,0.1,0.7,0.7,0.1` `sense2:if:filter:stage1:coefficients`
Query Syntax	SENSe<cnum>:IF:FILTer:STAGE<n>:COEFficients?
Example	`SENS:IF:FILT:STAG2:COEF?` `sense2:if:filter:stage1:coefficients?`
Return Type	Numeric
Default	Stage dependent

SENSe<cnum>:IF:FILTer:STAGE<n>:COUNt? [char]

(Read-only) Returns the number of taps in the digital filter of the specified stage. The filter sample count setting is only used when SENSe:IF:FILTer:AUTO is set to False (MANUAL).

Critical Note

Parameters	
<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
<n>	Stage number. Choose 1 or 2
[char]	Optional parameter. Choose from: not specified - returns the current number of coefficients for the specified stage. **MIN** - returns the minimum number of coefficients for the specified stage. Stage1: **10**, Stage2: **1** **MAX** - returns the maximum number of coefficients for the specified stage. Stage1 & 2: **1024**
Examples	`SENS:IF:FILT:STAG2:COUN?` `sense2:if:filter:stage1:count? max`
Return Type	Numeric
Default	Stage dependent

SENSe<cnum>:IF:FILTer:STAGE1:FREQuency <value>

(Read-Write) Sets and returns the Numerically Controlled Oscillator (NCO) frequency. This command is only used when SENSe:IF:FILTer:AUTO is set to False (Manual).

Critical Note

Parameters	
<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
<value>	Stage 1 Frequency. Min value= 0 Hz, Max value= 15 MHz. Or programmatically use the Max and Min queries to determine the range of settable values.
Examples	`SENS:IF:FILT:STAGe1:FREQ 9e6` `sense2:if:filter:stage1:frequency 9.2e6`
Query Syntax	SENSe<cnum>:IF:FILTer:STAGE1:FREQuency? 'returns the current parameter value SENSe<cnum>:IF:FILTer:STAGE1:FREQuency? Min 'returns the minimum frequency value. SENSe<cnum>:IF:FILTer:STAGE1:FREQuency? Max 'returns the maximum frequency value.
Return Type	Numeric
Default	9 MHz

SENSe<cnum>:IF:FILTer:STAGE3:CATalog?

(Read-only) Returns a list of strings for the currently supported filter types that can be used for the stage 3 filter. This command is only used when SENSe:IF:FILTer:AUTO is set to False (Manual). See SENS:IF:FILT:STAGe3:TYPE for a list of currently supported filter types.

Critical Note

Parameters	
<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
Examples	`SENS:IF:FILT:STAGe3:CAT?` `sense2:if:filter:stage3:catalog?`
Return Type	String array
Default	Not Applicable

SENSe<cnum>:IF:FILTer:STAGe3:TYPE <value>

(Read-Write) Sets and returns the Stage 3 filter type. This command is only used when SENSe:IF:FILTer:AUTO is set to False (Manual).

Critical Note

Parameters

<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
<value>	(String) Filter type. Chose from: • **"RECT"** Rectangular Window Filter • **"TUKEY"** Tukey Filter • **"PWIN"** Pulse Window Filter
Examples	`SENS:IF:FILT:STAGe3:TYPE RECT` `sense2:if:filter:stage3:type pwin`
Query Syntax	SENSe<cnum>:IF:FILTer:STAGE3:TYPE?
Return Type	String
Default	"TUKEY"

SENSe<cnum>:IF:FILTer:STAGe3:PARameter <p>, <value>

(Read-Write) Sets and returns the Stage 3 filter parameters.

Must first select the filter type (SENS:IF:FILT:STAGe3:TYPE) before setting these parameters

Use SENSe:IF:FILT:STAGE3:PCAT? to return a list of the available parameters for the currently selected filter type.

Critical Note

Parameters

<cnum> Existing channel number. If unspecified, <cnum> is set to 1.

<p> (String) Filter parameter. Choose from:

"C" - Tap count (Tukey, RECT, PWIN)

"P" - Period (PWIN ONLY)

"D" - Delay (PWIN ONLY)

"W" - Width (PWIN ONLY)

"R" - Ramp Count (PWIN ONLY)

<value>	(String) Parameter Value for the specified stage 3 parameter. Use the query form to return the minimum and maximum values for the specified parameter.
Examples	`SENS:IF:FILT:STAGe3:PAR "C",64` `sense2:if:filter:stage3:parameter "d",0.5E-6`
Query Syntax	SENSe<cnum>:IF:FILTer:STAGE3:PARameter? <p> returns the current parameter value SENSe<cnum>:IF:FILTer:STAGE3:PARameter? <p>,Min returns the minimum parameter value. SENSe<cnum>:IF:FILTer:STAGE3:PARameter? <p>,Max returns the maximum parameter value.
Examples	`SENS:IF:FILT:STAGe3:PAR? "C"` `sense2:if:filter:stage3:parameter? "d",min`
Return Type	Numeric
Default	**RECT:** C = 1 **PWIN:** C=1E6, P=10ms, D=50us, W=50us, R=7 **TUKEY:** C=1

SENSe<cnum>:IF:FILTer:STAGE3:PCATalog?

(Read-only) Returns a list of the available parameters for the currently selected filter type.

Critical Note

Parameters	
<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
Examples	`SENS:IF:FILT:STAGe3:PCAT?` `sense2:if:filter:stage3:pcatalog?`
Return Type	String
Default	Not Applicable

SENSe<cnum>:IF:FREQuency:AUTO <bool>

(Read-Write) Sets and returns the method for specifying the way the IF Frequency is determined.

Critical Note

Parameters	
<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
<bool>	(Boolean) **ON** (or **1**) - Automatic. PNA determines the setting for the IF frequency. **OFF** (or **0**) - Manual. Use SENS:IF:FREQ to set the frequency.
Examples	`SENS:IF:FREQ:AUTO 1` `sense2:if:frequency:auto 0`
Query Syntax	SENSe<cnum>:IF:FREQuency:AUTO?
Return Type	Boolean
Default	**ON**

SENSe<cnum>:IF:FREQuency[:VALue] <value>

(Read-Write) Sets and returns the IF frequency for ALL receiver paths being used for the specified channel. To set this frequency, SENS:IF:FREQ:AUTO must be set to OFF (Manual).

Also returns the maximum and minimum allowable frequency settings.

Critical Note

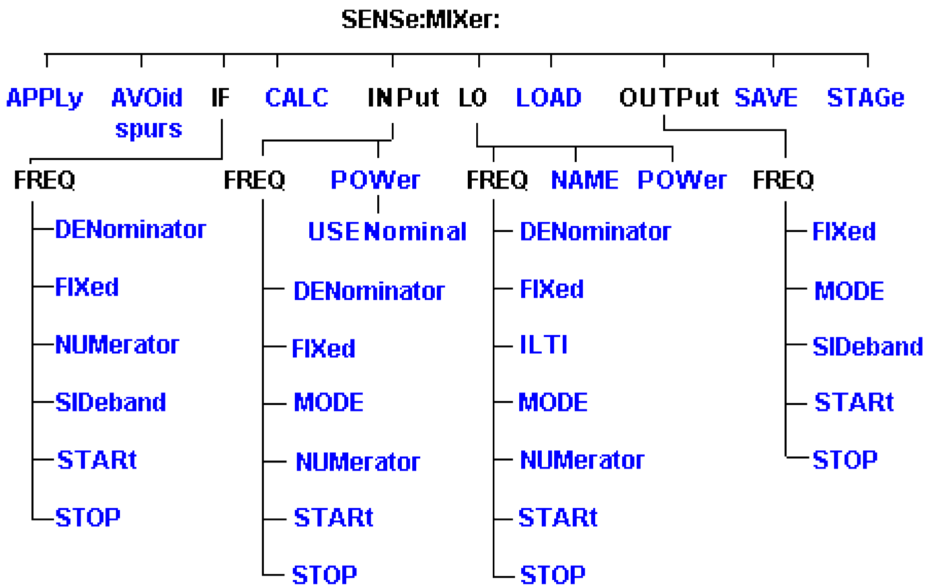
Parameters	
<cnum>	Existing channel number. If unspecified, <cnum> is set to 1.
<value>	(Numeric) Frequency value**.**
Examples	`SENS:IF:FREQ` `sense2:if:frequency`
Query Syntax	SENSe<cnum>:IF:FREQuency? 'returns the current frequency setting SENSe<cnum>:IF:FREQuency? Max 'returns the maximum allowable frequency setting SENSe<cnum>:IF:FREQuency? Min 'returns the minimum allowable frequency setting
Return Type	Numeric
Default	9 MHz

Last Modified:

18-Jan-2007 MX New topic

Sense:Mixer Commands

Performs Mixer setup and configuration.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about the Frequency Converter Application
- Synchronizing the PNA and Controller
- SCPI Command Tree

Note: If you are changing several mixer configuration settings, you can make all the changes first and then issue the Calculate and Apply commands as you would do from the user interface.

SENSe<ch>:MIXer:APPLy

(Write only) Applies the mixer setup settings and turns the channel ON. (Performs the same function as the Apply button on the mixer setup dialog box).

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:MIX:APPL`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<ch>:MIXer:AVOidspurs <bool>

(Read Write) Sets and returns the state of the avoid spurs feature. Learn more about avoid spurs.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<bool>	Avoid spurs state. Choose from 0 - Avoid spurs OFF 1 - Avoid spurs ON
Examples	`SENS:MIX:AVO` `sense2:mixer:avoidspurs 1`
Query Syntax	SENSe<ch>:MIXer:AVOidspurs?
Return Type	Boolean
Default	0 (OFF)

SENSe<ch>:MIXer:CALCulate <char>

(Write only) Calculates the Input, IF, or Output frequencies of the mixer setup and updates the channel settings.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<char>	Mixer port to be calculated. Choose from:

<char>	1st or only stage requires:	In addition, 2nd stage requires:
INPUT	• Output Start and Stop frequencies • LO frequency • Output sideband (High or Low)	• IF Start and Stop frequencies • 2nd LO frequency • IF sideband (High or Low)
Both	NA	• IF Start and Stop frequencies • Both LO frequencies
OUTPUT	• Input Start and Stop frequencies • LO frequency • Output sideband (High or Low)	• IF Start and Stop frequencies • 2nd LO frequency • IF sideband (High or Low)
LO_1	• Input Start and Stop frequencies • Output frequency • Output sideband (High or Low)	• IF Start and Stop frequencies • 2nd LO frequency • IF sideband (High or Low)
LO_2	NA	• Input Start and stop frequencies • 1st LO start and stop frequencies • Output frequency • IF sideband(High or Low • Output sideband(High or Low)

Examples

```
SENS:MIX:CALC Output
```

Query Syntax Not Applicable

Default Not Applicable

SENSe<ch>:MIXer:LOAD <name>

(Write-only) Loads a previously-configured mixer attributes file (.mxr)

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<name>	Path and file name (including .mxr extension) to load.
Examples	`SENSe:MIXer:LOAD "C:\Program Files\Agilent\Network Analyzer\Documents\Mixer\MyMixer.mxr"`
Default	Not Applicable

SENSe<ch>:MIXer:SAVE <name>

(Write-only) Saves the settings for the mixer/converter test setup to a mixer attributes file.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<name>	Path and file name (including .mxr extension) to save.
Examples	`SENSe:MIXer:SAVE "C:\Program Files\Agilent\Network Analyzer\Documents\Mixer\MyMixer.mxr"`
Default	Not Applicable

SENSe<ch>:MIXer:STAGe <n>

(Read-Write) Number of IF stages of the mixer**.**

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	Number of stages. Choose either **1** or **2**
Examples	`SENSe:MIX:STAG 2` `SENSe:MIXer:STAGE 1`
Query Syntax	SENSe<ch>:MIXer:STAGe?
Return Type	Numeric
Default	1

SENSe<ch>:MIXer:IF:FREQuency:DENominator <num>

(Read-Write) Sets or returns the denominator value of the IF Fractional Multiplier. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<num>	Denominator value.
Examples	`SENSe:MIX:IF:FREQ:DEN 5` `SENSe2:MIXer:IF:FREQ:DENominator 4`
Query Syntax	SENSe<ch>:MIXer:IF:FREQuency:DENominator?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:IF:FREQuency:FIXed <num>

(Read-Write) Sets or returns the fixed frequency of the IF. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<num>	Frequency.
Examples	`SENSe:MIXer:IF:FREQ:FIXed 1e9` `SENSe2:MIXer:IF:FREQ:FIXed 1000000000`
Query Syntax	SENSe<ch>:MIXer:IF:FREQuency:FIXed?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:IF:FREQuency:NUMerator <num>

(Read-Write) Sets or returns the numerator value of the IF Fractional Multiplier. See Note

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<num> Numerator value of the IF fractional multiplier

Examples

```
SENSe:MIX:IF:FREQ:NUM 4
SENSe2:MIXer:IF2:FREQ:NUMerator 3
```

Query Syntax SENSe<ch>:MIXer:IF:FREQuency:NUMerator?

Return Type Numeric

Default Not Applicable

SENSe<ch>:MIXer:IF:FREQuency:SIDeband <char>

(Read-Write) Sets or returns the value of the IF sideband. See Note

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<char> Sideband value. Choose from

LOW - Low or Difference (-)

HIGH - High or Sum (+)

Examples

```
SENS:MIX:IF:FREQ:SIDE LOW
SENSe2:MIXer:IF:FREQ:SIDEband HIGH
```

Query Syntax SENSe<ch>:MIXer:IF:FREQuency:SIDeband?

Return Type Character

Default LOW

SENSe<ch>:MIXer:IF:FREQuency:STARt <num>

(Read-Write) Sets or returns the IF start frequency value of the mixer. See Note

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<num>	IF Start Frequency value
Examples	`SENS:MIX:IF:FREQ:STAR 1e9` `SENSe2:MIXer:IF:FREQ:STARt 1000000000`
Query Syntax	SENSe<ch>:MIXer:IF:FREQuency:STARt?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:IF:FREQuency:STOP <num>

(Read-Write) Sets or returns the stop frequency value of the mixer IF frequency. See Note

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<num>	IF Stop Frequency value
Examples	`SENS:MIX:IF:FREQ:STOP 2e9` `SENSe2:MIXer:IF:FREQ:STOP 2000000000`
Query Syntax	SENSe<ch>:MIXer:IF:FREQuency:STOP?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:INPut:FREQuency:DENominator <value>

(Read-Write) Sets or returns the denominator value of the Input Fractional Multiplier. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Input denominator value.
Examples	`SENS:MIX:INP:FREQ:DEN 5` `SENS2:MIXer:INPut:FREQ:DENominator 4`
Query Syntax	SENSe<ch>:MIXer:INPut:FREQuency:DENominator?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:INPut:FREQuency:FIXed<value>

(Read-Write) Sets or returns the fixed frequency of the input. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Input frequency.
Examples	`SENSe:MIXer:INPut:FREQ:FIXed 1e9` `SENSe2:MIXer:INPut:FREQ:FIXed 1000000000`
Query Syntax	SENSe<ch>:MIXer:INPut:FREQuency:FIXed?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:INPut:FREQuency:MODE <char>

(Read-Write) Sets or returns the Input sweep mode.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<char>	Input sweep mode. Choose either **FIXED** or **SWEPT**

Examples

```
SENS:MIX:INP:FREQ:MODE FIXED
SENSe2:MIXer:INP:FREQ:MODE swept
```

Query Syntax SENSe<ch>:MIXer:INPut:FREQuency:MODE?

Return Type Character

Default Fixed

SENSe<ch>:MIXer:INPut:FREQuency:NUMerator <value>

(Read-Write) Sets or returns the numerator value of the Input Fractional Multiplier. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Input numerator value.

Examples

```
SENS:MIX:INP:FREQ:NUM 3
SENSe2:MIXer:INPut:FREQ:NUMerator 1
```

Query Syntax SENSe<ch>:MIXer:INPut:FREQ:NUMerator?

Return Type Numeric

Default Not Applicable

SENSe<ch>:MIXer:INPut:FREQuency:STARt <value>

(Read-Write) Sets or returns the Input start frequency value of the mixer. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Input Start frequency
Examples	**SENS:MIX:INP:FREQ:STAR 1e9** **SENSe2:MIXer:INPut:FREQ:STARt 1000000000**
Query Syntax	SENSe<ch>:MIXer:INPut:FREQuency:STARt?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:INPut:FREQuency:STOP <value>

(Read-Write) Sets or returns the Input stop frequency value of the mixer. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Input stop frequency
Examples	**SENS:MIX:INP:FREQ:STOP 2e9** **SENSe2:MIXer:INPut:FREQ:STOP 2000000000**
Query Syntax	SENSe<ch>:MIXer:INPut:FREQuency:STOP?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:INPut:POWer <value>

(Read-Write) Sets or returns the value of the Input Power.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Input power in dBm.
Examples	`SENS:MIX:INP:POW 9` `SENSe2:MIXer:INPut:POWer 5`
Query Syntax	SENSe<ch>:MIXer:INPut:POWer?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:INPut:POWer:USENominal <bool>

(Read-Write) Toggles the Nominal Incident Power setting ON and OFF. This setting is ONLY to be used with SMC measurements, not VMC. Learn more about Nominal Incident Power.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	**(boolean)** - Nominal Incident Power State. Choose from: True (1) - Turn nominal incident power ON False (0) - Turn nominal incident power OFF
Examples	`SENS:MIX:INP:POW:USEN 1` `SENSe2:MIXer:INPut:POWer:USENominal false`
Query Syntax	SENSe<ch>:MIXer:INPut:POWer:USENominal?
Return Type	Boolean
Default	False

SENSe<ch>:MIXer:LO<n>:FREQuency:DENominator <value>

(Read-Write) Sets or returns the denominator value of the LO Fractional Multiplier. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage number. Choose 1 or 2.
<value>	LO denominator.

Examples

```
SENS:MIX:LO:FREQ:DEN 5
SENSe2:MIXer:LO2:FREQ:DENominator 4
```

Query Syntax SENSe<ch>:MIXer:LO<n>:FREQuency:DENominator?

Return Type Numeric

Default 1

SENSe<ch>:MIXer:LO<n>:FREQuency:FIXed <value>

(Read-Write) Sets or returns the fixed frequency of the specified mixer LO. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage number. Choose **1** or **2**
<value>	LO frequency.

Examples

```
SENS:MIX:LO:FREQ:FIX 1e9
SENSe2:MIXer:LO2:FREQ:FIXed 1000000000
```

Query Syntax SENSe<ch>:MIXer:LO<n>:FREQuency:FIXed?

Return Type Numeric

Default Not Applicable

SENSe<ch>:MIXer:LO<n>:FREQuency:ILTI <bool>

(Read-Write) Specifies whether to use the Input frequency that is **greater than** the LO or **less than** the LO. To learn more, see the mixer setup dialog box help.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage number. Choose **1** or **2**
<bool>	**True (1)** - Use the Input that is Greater than the specified LO. **False (0)** - Use the Input that is Less than the specified LO.
Examples	`SENS:MIX:LO1:FREQ:ILTI 1` `sense2:mixer:lo2:frequency:ilti true`
Query Syntax	SENSe<ch>:MIXer:LO<n>:FREQuency:ILTI?
Return Type	Boolean
Default	False

SENSe<ch>:MIXer:LO<n>:FREQuency:MODE <char>

(Read-Write) Sets or returns the LO sweep mode.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage number. Choose **1** or **2**
<char>	LO sweep mode. Choose either **FIXED** or **SWEPT**
Examples	`SENS:MIX:LO:FREQ:MODE FIXED` `SENSe2:MIXer:LO2:FREQ:MODE swept`
Query Syntax	SENSe<ch>:MIXer:LO<n>:FREQuency:MODE?
Return Type	Character
Default	Fixed

SENSe<ch>:MIXer:LO<n>:FREQuency:NUMerator <value>

(Read-Write) Sets or returns the numerator value of the LO Fractional Multiplier. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage number. Choose **1** or **2**
<value>	LO Numerator.
Examples	`SENS:MIX:LO:FREQ:NUM 5` `SENSe2:MIXer:LO2:FREQ:NUMerator 4`
Query Syntax	SENSe<ch>:MIXer:LO<n>:FREQuency:NUMerator?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:LO<n>:FREQuency:STARt <value>

(Read-Write) Sets or returns the LO start frequency value. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage number. Choose **1** or **2**
<value>	LO Start Frequency in Hertz.
Examples	`SENS:MIX:LO:FREQ:STAR 5E9`
Query Syntax	SENSe<ch>:MIXer:LO<n>:FREQuency:STARt?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:LO<n>:FREQuency:STOP <value>

(Read-Write) Sets or returns the LO stop frequency value. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage number. Choose **1** or **2**
<value>	LO Stop Frequency in Hertz.
Examples	`SENS:MIX:LO:FREQ:STOP 5E9`
Query Syntax	SENSe<ch>:MIXer:LO<n>:FREQuency:STOP?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:LO<n>:NAME <value>

(Read-Write) Sets or returns the name of the PNA internal source or external source to use as the LO in an FCA measurement.

See Remotely Specifying a Source Port.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage number. Choose 1 or 2.
<value>	**(string)** - LO Source name. Use Source:CAT? to return a list of valid source ports. An external source must be configured and selected to be valid. Learn more about external source configuration.
Examples	`SENS:MIX:LO:NAME "MySource"`
Query Syntax	SENSe<ch>:MIXer:LO<n>:NAME?
Return Type	String
Default	Not Controlled

SENSe<ch>:MIXer:LO<n>:POWer <value>

(Read-Write) Sets or returns the value of the LO Power.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	LO stage. Choose **1** or **2**
<value>	LO Power in dBm
Examples	**SENS:MIX:LO:POW 9**
Query Syntax	SENSe<ch>:MIXer:LO<n>:POWer?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:OUTPut:FREQuency:FIXed <value>

(Read-Write) Sets or returns the output fixed frequency of the mixer. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Output fixed frequency in Hertz.
Examples	**SENS:MIX:OUTP:FREQ:FIX 5e9**
Query Syntax	SENSe<ch>:MIXer:OUTPut:FREQuency:FIXed?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:OUTPut:FREQuency:MODE <char>

(Read-Write) Sets or returns the Output sweep mode.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<char>	Output sweep mode. Choose either **FIXED** or **SWEPT**

Examples

```
SENS:MIX:OUT:FREQ:MODE FIXED
SENSe2:MIXer:OUTput:FREQuency:MODE swept
```

Query Syntax SENSe<ch>:MIXer:OUTPut:FREQuency:MODE?

Return Type Character

Default Fixed

SENSe<ch>:MIXer:OUTPut:FREQuency:SIDeband <value>

(Read-Write) Sets or returns the value of the output sideband. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	**Boolean** Sideband value. Choose from **LOW** - Low or Difference (-) **HIGH** - High or Sum (+)

Examples

```
SENS:MIX:OUTP:FREQ:SIDe LOW
SENSe2:MIXer:OUTPut:FREQ:SIDeband HIGH
```

Query Syntax SENSe<ch>:MIXer:OUTPut:FREQuency:SIDeband?

Return Type Character

Default LOW

SENSe<ch>:MIXer:OUTPut:FREQuency:STARt <value>

(Read-Write) Sets or returns the Output start frequency of the mixer. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Output start frequency
Examples	`SENS:MIX:OUTP:FREQ:STAR 1e9` `SENSe2:MIXer:OUTPut:FREQ:STARt 1000000000`
Query Syntax	SENSe<ch>:MIXer:OUTPut:FREQuency:STARt?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:OUTPut:FREQuency:STOP <value>

(Read-Write) Sets or returns the Output stop frequency of the mixer. See Note

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<value>	Output stop frequency
Examples	`SENS:MIX:OUTP:FREQ:STOP 1e9` `SENSe2:MIXer:OUTPut:FREQ:STOP 1000000000`
Query Syntax	SENSe<ch>:MIXer:OUTPut:FREQuency:STOP?
Return Type	Numeric
Default	Not Applicable

Last Modified:

6-Mar-2008	Added note to page top
23-Jul-2007	Clarified LO Name command

Sense:Mixer:ELO Commands

Controls the Mixer with Embedded LO setting.

SENSe:MIXer:ELO

- LO:DELTa
- LO:RESet
- NORMalize:POINt
- STATe
- TUNing
  - IFBW
  - INTerval
  - ITERations
  - MODE
  - RESet
  - SPAN
  - TOLerance
- DIAGnostic
  - CLEar
  - STATus?
  - SWEep
    - COUNt?
    - DATA?
    - LO:DELTa?
    - MARKer
      - ANNotation?
      - POSition?
      - STATe?
    - PARameter?
    - X
      - ANNotation?
      - STARt?
      - STOP?
    - Y:ANNotation?

Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Embedded LO Settings
- Synchronizing the PNA and Controller

- SCPI Command Tree

Note: The Embedded LO **DIAGnostic** commands read data from the various broadband and precise tuning sweeps, similar to the textual and graphical data that are available in the user interface.

SENSe<ch>:MIXer:ELO:LO:DELTa <num>

(Read-Write) Sets and returns LO Frequency Delta. There is usually no need to set this value. Read this value to determine the difference between the LO Frequency that is stated in the Mixer dialog box and the last measured LO Frequency.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	LO Frequency delta in Hertz.
Examples	`SENS:MIX:ELO:LO:DELT 10.3`
Query Syntax	SENSe<ch>:MIXer:ELO:LO:DELTa?
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:ELO:LO:RESet

(Write-only) Resets the LO Delta Frequency to 0 (zero).

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:MIX:ELO:LO:RES` `sense2:mixer:elo:lo:reset`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<ch>:MIXer:ELO:NORMalize:POINt <num>

(Read-Write) Sets and returns the sweep data point around which to perform broadband and precise tuning.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Mixer Sweep data point. Choose a data point number, between1 and the max number of data points in the sweep, that has the least amount of expected noise.
Examples	`SENS:MIX:ELO:LO:NORM:POIN 200` `sense2:mixer:elo:normalize:point 101`
Query Syntax	SENSe<ch>:MIXer:ELO:NORMalize:POINt?
Return Type	Numeric
Default	Center point in the sweep span

SENSe<ch>:MIXer:ELO:STATe <bool>

(Read-Write) Sets and returns the ON |OFF state of Embedded LO.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<bool>	ON | OFF state. Choose from 0 - Embedded LO OFF 1 - Embedded LO ON
Examples	`SENS:MIX:ELO:STAT 1` `sense2:mixer:elo:state 0`
Query Syntax	SENSe<ch>:MIXer:ELO:STATe?
Return Type	Boolean
Default	OFF

SENSe<ch>:MIXer:ELO:TUNing:IFBW <num>

(Read-Write) Sets and returns the IF Bandwidth for Broadband and Precise tuning sweeps.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	IF Bandwidth
Examples	`SENS:MIX:ELO:TUN:IFBW 10kHz` `sense2:mixer:elo:tuning:ifbw 20e3`
Query Syntax	SENSe<ch>:MIXer:ELO:TUNing:IFBW?
Return Type	Numeric
Default	30kHz

SENSe<ch>:MIXer:ELO:TUNing:INTerval <num>

(Read-Write) Sets and returns how often a tuning sweep is performed.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Tuning sweep interval
Examples	`SENS:MIX:ELO:TUN:INT 2` `sense2:mixer:elo:tuning:interval 1`
Query Syntax	SENSe<ch>:MIXer:ELO:TUNing:INTerval?
Return Type	Numeric
Default	1

SENSe<ch>:MIXer:ELO:TUNing:ITERations <num>

(Read-Write) Sets and returns the maximum number of tuning iterations to achieve the precise tolerance.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Number of tuning iterations. Choose a number between 1 and 100.

Examples

```
SENS:MIX:ELO:TUN:ITER 5
sense2:mixer:elo:tuning:iterations 3
```

Query Syntax SENSe<ch>:MIXer:ELO:TUNing:ITERations?

Return Type Numeric

Default 5

SENSe<ch>:MIXer:ELO:TUNing:MODE <char>

(Read-Write) Sets and returns the method used to determine the embedded LO Frequency.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1

<char> Tuning mode. Choose from:

BROadband Both broadband and precise tuning

PRECise Precise tuning only

NONe No tuning; just apply the LO Frequency Delta value.

Examples

```
SENS:MIX:ELO:TUN:MODE BRO
sense2:mixer:elo:tuning:mode precise
```

Query Syntax SENSe<ch>:MIXer:ELO:TUNing:MODE?

Return Type Character

Default BROadband

SENSe<ch>:MIXer:ELO:TUNing:RESet

(Write-only) Resets the tuning parameters to their default values.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:MIX:ELO:TUN:RES` `sense2:mixer:elo:tuning:reset`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<ch>:MIXer:ELO:TUNing:SPAN <num>

(Read-Write) Sets and returns the frequency span for the broadband tuning sweep.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Broadband frequency span in Hz.
Examples	`SENS:MIX:ELO:TUN:SPAN 1e6` `sense2:mixer:elo:tuning:span 1mhz`
Query Syntax	SENSe<ch>:MIXer:ELO:TUNing:SPAN?
Return Type	Numeric
Default	3 MHz

SENSe<ch>:MIXer:ELO:TUNing:TOLerance <num>

(Read-Write) Sets and returns the tuning tolerance for precise tuning.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Tuning tolerance in Hz. Choose a number between .001 and 1e3.
Examples	`SENS:MIX:ELO:TUN:TOL .5` `sense2:mixer:elo:tuning:tolerance 1`
Query Syntax	SENSe<ch>:MIXer:ELO:TUNing:TOLerance?
Return Type	Numeric
Default	1 Hz

SENSe<ch>:MIXer:ELO:DIAGnostic:CLEar

(Write-only) Clears current diagnostic information.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:MIX:ELO:DIAG:CLEar` `sense2:mixer:elo:diagnostic:clear`
Query Syntax	Not Applicable
Default	Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:STATus?

(Read-only) Returns a string that describes the result of the last tuning sweeps.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:MIX:ELO:DIAG:STAT?` `sense2:mixer:elo:diagnostic:status`
Return Type	String
Default	Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep:COUNt?

(Read-only) Returns the number of tuning sweeps used for the latest embedded LO measurement.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:MIX:ELO:DIAG:SWEep:COUNt` `sense2:mixer:elo:diagnostic:sweep:count?`
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:DATA?

(Read-only) Returns an array of data that describes the data retrieved from the specified tuning sweep.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.

Examples

```
SENS:MIX:ELO:DIAG:SWE2:DATA?
sense2:mixer:elo:diagnostic:sweep1:data?
```

Return Type Array

Default Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:LO:DELTa?

(Read-only) Returns the LO frequency delta from the specified tuning sweep.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.

Examples

```
SENS:MIX:ELO:DIAG:SWE2:LO:DELT?
sense2:mixer:elo:diagnostic:sweep1:lo:delta?
```

Return Type Numeric

Default Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:MARKer:ANNotation?

(Read-only) Returns the Y-axis marker value from the specified tuning sweep. This command assumes that a marker was used. Use SENS:MIX:ELO:DIAG:SWE:MARK:STATe? to confirm if a marker was used for the tuning sweep.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.
Examples	`SENS:MIX:ELO:DIAG:SWE2:MARKer:ANN?` `sense2:mixer:elo:diagnostic:sweep1:marker:annotation?`
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:MARKer:POSition?

(Read-only) Returns the X-axis marker position from the specified tuning sweep.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.
Examples	`SENS:MIX:ELO:DIAG:SWE2:MARK:POS?` `sense2:mixer:elo:diagnostic:sweep1:marker:position?`
Return Type	Numeric
Default	Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:MARKer:STATe?

(Read-only) Returns whether or not a marker was used for the specified tuning sweep.

Parameters		
	<ch>	Any existing channel number. If unspecified, value is set to 1
	<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.
Examples		**SENS:MIX:ELO:DIAG:SWE2:MARK:POS?** **sense2:mixer:elo:diagnostic:sweep1:marker:position?**
Return Type		Numeric
Default		Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:PARameter?

(Read-only) Returns the name of the parameter of the specified tuning sweep.

Parameters		
	<ch>	Any existing channel number. If unspecified, value is set to 1
	<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.
Examples		**SENS:MIX:ELO:DIAG:SWE2:PAR?** **sense2:mixer:elo:diagnostic:sweep1:parameter?**
Return Type		String - either "VC21" or "B,1"
Default		Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:TITLe?

(Read-only) Returns the title of the specified tuning sweep.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.
Examples	`SENS:MIX:ELO:DIAG:SWE2:TITL?` `sense2:mixer:elo:diagnostic:sweep1:title?`
Return Type	String
Default	Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:X:ANNotation?

(Read-only) Returns the X-Axis annotation of the specified tuning sweep.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.
Examples	`SENS:MIX:ELO:DIAG:SWE2:X:ANN?` `sense2:mixer:elo:diagnostic:sweep1:x:annotation?`
Return Type	String - either "Hz" or "s"
Default	Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:X:STARt?

(Read-only) Returns the start value of the specified tuning sweep.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.

Examples

```
SENS:MIX:ELO:DIAG:SWE2:X:STAR?
sense2:mixer:elo:diagnostic:sweep1:x:start?
```

Return Type Numeric

Default Not Applicable

SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:X:STOP?

(Read-only) Returns the stop value of the specified tuning sweep.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.

Examples

```
SENS:MIX:ELO:DIAG:SWE2:X:STOP?
sense2:mixer:elo:diagnostic:sweep1:x:stop?
```

Return Type Numeric

Default Not Applicable

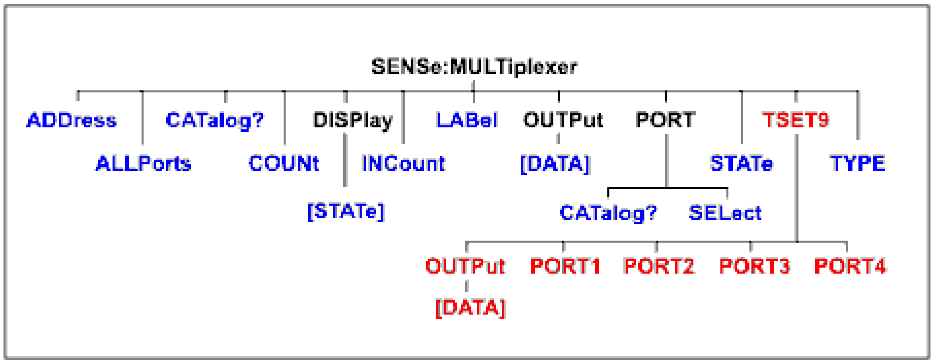
SENSe<ch>:MIXer:ELO:DIAGnostic:SWEep<n>:Y:ANNotation?

(Read-only) Returns Y-axis annotation value of the specified tuning sweep.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<n>	Tuning sweep number. Use SENS:MIX:ELO:DIAG:SWE:COUNt? to find the number of sweeps taken.
Examples	**SENS:MIX:ELO:DIAG:SWE2:Y:ANN?** **sense2:mixer:elo:diagnostic:sweep1:y:annotation?**
Return Type	String - either "U" or "Phase"
Default	Not Applicable

Sense:Multiplexer Commands

Controls External Test Sets (N44xx, E5091A, "Z", and "H" series).



Click on a blue keyword to view the command details.

Red commands are superseded.

See Also

- See an example program using these commands.
- Learn about External Test Set Control
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe:MULTiplexer<id>:ADDRess <address>

(Read-Write) Sets and returns the address for the external test set at the specified ID. This command should be immediately preceded by the SENSe:MULT:TYPE command.

Parameters

<id> Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.

<address> Integer The test set address.

- For a GPIB test set (N44xx and some specials), this is the GPIB address.
- For a test set I/O test set (some specials), it is the position of the test set in the chain (starting at 0).
- For USB test sets (E5091A), the address is set by DIP switches on the rear panel.

Examples	`SENS:MULT1:TYPE "Z5623A_K66" ' use K66 test set, and reference it through ID 1`
	`SENS:MULT1:ADDR 0 ' first test set in sequence`
	`' All subsequent commands using SENS:MULT1 will refer to this test set`

Query Syntax	SENSe:MULTiplexer<id>:ADDRess?
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:MULTiplexer<id>:ALLPorts <string>

(Read-Write) Sets or gets the port selections for all available ports on the specified channel.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<id>	Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.
<string>	Comma-separated list of port selections, one for each port. Each port selection must correspond to one of the values returned by SENS:MULT:PORT:CAT?. Do NOT include + and - .

Examples	`' for channel 5 and test set 1, set port 1 to T1,`
	`' port 2 to A, port 3 to R2+, port 4 to R3-.`
	`SENS5:MULT1:ALLP "T1,A,R2,R3 "`

Query Syntax	SENSe<cnum>:MULTiplexer<id>:ALLPorts?
Return Type	STRING
Default	Not Applicable

SENSe:MULTiplexer:CATalog?

(Read-Only) Returns a comma-separated list of the external test sets models that are currently supported. Choose one of these items to send SENS:MULT1:TYPE.

Examples	`SENS:MULT:CAT?`
Return Type	String
Default	Not Applicable

SENSe:MULTiplexer<id>:COUNt?

(Read-Only) Returns the total number of ports of the specified test set.

Returns 0 if no test set is connected (GPIB test sets only).

Parameters	
<id>	Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.
Examples	`SENS:MULT1:COUN?` `sense:multiplexer2:count?`
Return Type	Numeric
Default	Not Applicable

SENSe:MULTiplexer<id>:DISPlay[:STATe] <bool>

(Read-Write) Turns ON and OFF the display of the test set control status bar. This status bar indicates the test set that is being controlled and the current port mappings. This setting is turned ON automatically when the test set is enabled.

Parameters	
<id>	Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.
<bool>	ON(1) Turns ON the display. OFF (0) Turns OFF the display.
Examples	`SENS:MULT1:DISP 1` `sense:multiplexer2:display:state on`
Query Syntax	SENSe:MULTiplexer<id>:DISPlay[:STATe]?
Return Type	Boolean
Default	OFF (0)

SENSe:MULTiplexer<id>:INCount?

(Read-Only) Returns the number of input ports for the specified test set.

- For test sets such as the E5091A that do NOT use jumper cables to route the stimulus and response signals, this command returns the number of test set ports that can be connected to the PNA.
- For test sets that DO use jumper cables to route the stimulus and response signals, such as the N44xx, the return value is not valid.

Parameters	
<id>	Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.
Examples	`SENS3:MULT1:INC?  ' returns the number of input ports for test set 1 on channel 3`
Return Type	Numeric
Default	Not Applicable

SENSe<cnum>:MULTiplexer:LABel <string>

(Read-Write) Sets and returns the display label for the testset on the specified channel. The label appears in a status bar at the bottom of the PNA display when SENS:MULT:DISP is set to TRUE.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<string>	Display label text.
Examples	`SENS3:MULT:LAB 'High-power output'`
Query Syntax	SENSe<cnum>:MULTiplexer:LABel?
Return Type	String
Default	Not Applicable

SENSe<cnum>:MULTiplexer<id>:OUTPut[:DATa] <num>

(Read-Write) Sets or returns the control line value for the specified channel.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1.

<id> Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.

<numr> An integer specifying the decimal value of the control line. Values are obtained by adding weights from the following table that correspond to individual lines.

Line	Weight
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

Note:

- The E5091A interprets SENS:MULT1:OUTP 0 as all lines OFF.
- All "Z"and "H" series test sets interpret SENS:MULT1:OUTP 0 as all lines ON.

Refer to your test set documentation for setting control line values.

Examples

```
SENS3:MULT1:OUTP 48  'For Z5623A K64, lines 5 and 6 are OFF; all other lines are set to ON state.
```

Query Syntax SENSe<cnum>:MULTiplexer<id>:OUTPut[:DATa]?

Return Type Numeric

Default Not Applicable

SENSe:MULTiplexer<id>:PORT<pnum>CATalog?

(Read-Only) Returns a comma-separated list of valid port selections for the specified port.

Parameters	
<id>	Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.
<pnum>	Integer - Input port number for which to return valid Output port selections. Read the number of input ports for the test set using SENS:MULT:INCount?
Examples	`SENS:MULT1:PORT3:CAT? ' returns the valid port selections for port 3`
Return Type	String
Default	Not Applicable

SENSe<cnum>:MULTiplexer<id>:PORT<logi>SELect <phys>

(Write-Only) Sets and returns a port mapping for a single port. If this command creates a conflict with an existing port, the PNA will resolve the conflict.

Note: This command is currently not supported for the Z5623AK44.

Parameters	
<cnum>	Channel number of the measurement. If unspecified, value is set to 1.
<id>	Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.
<logi>	Integer - Logical port number.
<string>	String - Physical port number.
Examples	`SENS:MULT1:PORT3:SEL "4" 'sets logical port 3 to physical port 4.`
Return Type	String
Default	Not Applicable

SENSe:MULTiplexer<id>:STATe <bool>

(Read-Write) Enables and disables (ON/OFF) the port mapping and control line output of the specified test set.

If the specified test set is not connected or not ON, then setting State ON will report an error. All other properties can be set when the test set is not connected.

When this command is set to ON, then the display of the test set status bar (SENS:MULT:DISP) is also set to ON.

Parameters	
<id>	Id of the external test set. If unspecified, Id is assumed to be 1. Must be previously set by the SENSe:MULT:TYPE command.
<bool>	ON(1) Enables test set control. OFF (0) Disables test set control.
Examples	`SENS:MULT1:STAT 1` `sense2:multiplexer2:state on`
Query Syntax	SENSe<cnum>:MULTiplexer<id>:STATe?
Return Type	Boolean
Default	OFF (0)

SENSe<cnum>:MULTiplexer<id>:TSET9:OUTPut[:DATA] <data> Superseded

Note: This command is replaced with SENS:MULT:OUTP

(Read-Write) Sets the control lines of the specified E5091A. Control lines, provided through a E5091A front panel connector, are used to control external equipment such as a part handler. See your E5091A documentation to learn more about control lines.

Parameters	
<cnum>	Channel number of the measurement. If unspecified, value is set to 1.
<id>	Id of the E5091A test set. Choose from 1 or 2. Learn how to set ID value.
<data>	Data value used to set control lines. Values are obtained by adding weights from the following table that correspond to individual lines. HIGH =1; LOW=0.

Line	Weight
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

0 - Sets all lines low

255 - Sets all lines high

Examples

```
'The following sets line 3 and 4 high. All other lines low.

SENS:MULT1:TSET9:OUTP 12
```

Query Syntax SENSe<cnum>:MULTiplexer<id>:TSET9:OUTPut[:DATA]?

Return Type Numeric

Default 0

SENSe<cnum>:MULTiplexer<id>:TSET9:PORT1 <char> Superseded

Note: This command is replaced with SENS:MULT:ALLPorts which sets ALL ports to the specified outputs.

(Read-Write) Switches Port 1 of the specified E5091A to one of the available outputs.

Parameters

<cnum> Any existing channel number; if unspecified, value is set to 1.

<id> Id of the E5091A test set. Choose from 1 or 2. Learn how to set ID value.

<char> Output port to be switched to. Choose from:

A

T1 - (If Port 2 already is connected to T1, then Port 2 will be switched to T2.)

Examples

```
SENS:MULT1:TSET9:PORT1 A
```

Query Syntax SENSe<cnum>:MULTiplexer<id>:TSET9:PORT1?

Return Type Character

Default A

SENSe<cnum>:MULTiplexer<id>:TSET9:PORT2 <char> Superseded

Note: This command is replaced with SENS:MULT:ALLPorts which sets ALL ports to the specified outputs.

(Read-Write) Switches Port 2 of the specified E5091A to one of the available outputs.

Parameters

<cnum> Any existing channel number; if unspecified, value is set to 1.

<id> Id of the E5091A test set. Choose from 1 or 2. Learn how to set ID value.

<char> Output port to be switched to. Choose from:

T1 - If Port 1 already is connected to T1, then Port 1 will be switched to A.

T2

Examples

```
SENS:MULT1:TSET9:PORT2 T2
```

Query Syntax SENSe<cnum>:MULTiplexer<id>:TSET9:PORT2?

Return Type Character

Default T1

SENSe<cnum>:MULTiplexer<id>:TSET9:PORT3 <char> Superseded

Note: This command is replaced with SENS:MULT:ALLPorts which sets ALL ports to the specified outputs.

(Read-Write) Switches Port 3 of the specified E5091A to one of the available outputs.

Parameters

<cnum> Any existing channel number; if unspecified, value is set to 1.

<id> Id of the E5091A test set. Choose from 1 or 2. Learn how to set ID value.

<char> Output port to be switched to. Choose from:

R1 (R1+)

R2 (R2+)

	R3 (R3+) If option 007 (7port), R2 is selected.
Examples	`SENS:MULT1:TSET9:PORT3 R2`
Query Syntax	SENSe<cnum>:MULTiplexer<id>:TSET9:PORT3?
Return Type	Character
Default	R1

SENSe<cnum>:MULTiplexer<id>:TSET9:PORT4 <char> Superseded

Note: This command is replaced with SENS:MULT:ALLPorts which sets ALL ports to the specified outputs.

(Read-Write) Switches Port 4 of the specified E5091A to one of the available outputs.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
<id>	Id of the E5091A test set. Choose from 1 or 2. Learn how to set ID value.
<char>	Output port to be switched to. Choose from: **R1** (R1-) **R2** (R2-) **R3** (R3-) If option 007 (7port), R2 is selected.
Examples	`SENS:MULT1:TSET9:PORT4 R2`
Query Syntax	SENSe<cnum>:MULTiplexer<id>:TSET9:PORT4?
Return Type	Character
Default	R1

SENSe:MULTiplexer<id>:TYPe <name>

(Read-Write) Loads a configuration file for the specified type of external test set.

This command should be immediately followed by the SENSe:MULT:ADDRess command.

Parameters	
<name>	String The name of the type of test set. Must be one of the items in the list returned by the SENSe:MULT:CATalog? query.
<id>	Id of the external test set. Set by this command. Use consecutive values starting at 1.
Examples	`SENS:MULT1:TYPE "Z5623AK66"   ' use K66 test set, and reference it through ID 1`
Query Syntax	SENSe:MULTiplexer<id>:TYPe?
Return Type	String
Default	Not Applicable

Last Modified:

17-Aug-2007 Modified Data command for differences in active high and low

SENSe:NOISe Commands

Controls the Noise Figure configuration and calibration.

SENSe:NOISe:
AVERage <num>
| STATe <bool>
BWIDth <num>
CALibration:METHod <string>
ENR:FILename <string>
GAIN <num>
IMPedance:COUNt <num>
SOURce:
| CKIT <string>
| CONNector <string>
TEMPerature:AMBient <num>
TUNer:
| ID <string>
| INPut <string>
| OUTPut <string>

Click on a blue keyword to view the command details.

Other Noise Figure SCPI commands

The calibration commands listed in this topic are supplemental to the Guided Cal commands.

- CALC:CUSTom:DEFine - creates a noise figure measurement.
- CONTrol:NOISe:SOURce **or** OUTPut:MANual:NOISe[:STATe] - turns the Noise Source ON and OFF.
- MMEMory:LOAD:ENR and MMEM:STORe:ENR - load and save ENR files.
- SENSe:PATH:CONF:ELEMent[:STATe] - sets the port 1 and port 2 noise switches.
- SENS:CORR:ENR:CAL:- manage ENR data - usually not necessary.

- SYST:PREF:ITEM:SWIT:DEF - Sets the default setting of the Noise Tuner switch

See Also

- **Example:** Create and Cal a Noise Figure Measurement
- Learn about Noise Figure Application
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<ch>:NOISe:AVERage <num>

(Read-Write) Set and read the averaging factor for the noise receiver. Learn more

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Averaging value. Choose any number from 1 to 99.
Examples	`SENS:NOIS:AVER 20` `sense:noise:average 10`
Query Syntax	SENSe:NOISe:AVERage?
Return Type	Numeric
Default	1

SENSe<ch>:NOISe:AVERage:STATe <bool>

(Read-Write) Turns noise averaging ON and OFF.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<bool>	Averaging state. Choose from 0 - Noise averaging OFF 1 - Noise averaging ON
Examples	`SENS:NOIS:AVER:STAT 0` `sense:noise:average:state 1`
Query Syntax	SENSe:NOISe:AVERage:STATe?
Return Type	Boolean

Default **O - OFF**

SENSe<ch>:NOISe:BWIDth[:RESolution] <num>

(Read-Write) Set and read the bandwidth of the noise receiver. Learn more

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Bandwidth value. Choose from: 800 KHz, 2 MHz, 4 MHz, 8 MHz, or 24 MHz. Or the numerical equivalent, such as 8e6 and so forth. If the value does not match one of these, it is rounded up to the next legal value.

Examples	`SENS:NOIS:BWID 2e6`
	
	`sense:noise:bwidth:resolution 8mhz`

Query Syntax	SENSe:NOISe:BWIDth[:RESolution]?
Return Type	Numeric
Default	4MHz

SENSe<ch>:NOISe:CALibration:METHod <string>

(Read-Write) Set and read the method for performing a calibration on a noise channel.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1
<string>	Calibration method. Note case-sensitive. Choose from: • "VectorFull" • "SParameter"

Examples	`SENS:NOIS:CAL:METH "Vector"`
	
	`sense:noise:calibration:method "SParameter"`

Query Syntax	SENSe:NOISe:CALibration:METHod?
Return Type	String

Default "VectorFull"

SENSe<ch>:NOISe:ENR:FILename <string>

(Read-Write) Set and read the path and name of the ENR file associated with the noise source.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<string>	Full path, filename, and extension of the ENR file.

Examples	`SENS:NOIS:ENR:FIL "c:\ProgramFiles\Agilent\Network Analyzer\Documents\ENR\346C.enr"`
	
	`sense:noise:enr:filename "c:\ProgramFiles\Agilent\Network Analyzer\Documents\ENR\346C.enr"`

Query Syntax	SENSe:NOISe:ENR:FILename?
Return Type	String
Default	Not applicable

SENSe<ch>:NOISe:GAIN <num>

(Read-Write) Set and read the amount of gain for the noise receiver.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1

<num> Gain value. Choose from:

- **0** - Low gain;select if the gain of your DUT is relatively high (>35 dB).
- **15** - Medium gain; select if the gain of your DUT is about average (20 dB to 45 dB).
- **30** - High gain;.select if the gain of your DUT is relatively low (<30 dB).

Learn more about Noise Receiver Gain setting.

If the value does not match one of these, it is rounded up to the next legal value.

Examples

```
SENS:NOIS:GAIN 15

sense:noise:gain 0
```

Query Syntax SENSe:NOISe:GAIN?

Return Type	Numeric
Default	30

SENSe<ch>:NOISe:IMPedance:COUNt <num>

(Read-Write) Sets the number of impedance states to use during calibrated measurements.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Number of impedance states to use. Choose between 4 and the maximum number allowed by the noise tuner device. The more states that are used, the more accurate, and slower, the measurement. If the specified number exceeds the capability of the device, the measurement will use the maximum number of states the device allows.
Examples	`SENS:NOIS:IMP:COUN 5` `sense:noise:impedance:count 7`
Query Syntax	SENSe:NOISe:IMPedance:COUNt?
Return Type	Numeric
Default	4

SENSe<ch>:NOISe:SOURce:CKIT <string>

(Read-Write) Set and read the Cal Kit that will be used for the Noise Source adapter.

An adapter is always necessary to connect a 346C Noise Source to the PNA port 2. Select a Cal Kit that is the same type and gender as the noise source connector.

If the Noise Source mates directly to PNA port 2, then set this type to "None".

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1

<string> Cal Kit. Case sensitive.

To read possible cal kit strings for the adapter:

- Change the port connector type to that of the noise source using: SENS:CORR:COLL:GUID:CONN:PORT<n>
- Then read the possible cal kit strings for that port using:

SENS:CORR:COLL:GUID:CKIT:PORT<n>:CAT?

Examples	`SENS:NOIS:SOUR:CKIT "N4691-60004 ECal"` `sense:noise:source:ckit "`
Query Syntax	SENSe:NOISe:SOURce:CKIT?
Return Type	String
Default	Not applicable

SENSe<ch>:NOISe:SOURce:CONNector <string>

(Read-Write) Set and read the Noise Source connector type and gender. The Agilent 346C has an "APC 3.5 male" connector.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<string>	Noise source connector type and gender. Case sensitive. Use SENS:CORR:COLL:GUID:CONN:CAT? to read possible connector strings.
Examples	`SENS:NOIS:SOUR:CONN "APC 3.5 male"` `sense:noise:source:connector "APC 3.5 female"`
Query Syntax	SENSe:NOISe:SOURce:CONNector?
Return Type	String
Default	Not applicable

SENSe<ch>:NOISe:TEMPerature:AMBient <num>

(Read-Write) Sets the temperature at which the current noise measurement is occurring. Learn more

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<num>	Ambient temperature in Kelvin.
Examples	`SENS:NOIS:TEMP:AMB 292` `sense:noise:temperature 289`
Query Syntax	SENSe:NOISe:TEMPerature:AMBient?
Return Type	Numeric
Default	295

SENSe<ch>:NOISe:TUNer:ID <string>

(Read-Write) Set and read the identity of the noise tuner. This is an ECal model and serial number string. To read the identities of the connected ECal modules, use SENSe:CORRection:CKIT:ECAL:LIST? and SENSe:CORRection:CKIT:ECAL<mod>:INFormation?

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<string>	ECal model and serial number string. The ECal module must be connected when this command is sent.
Examples	`SENS:NOIS:TUN:ID "N4691-60004 ECal 02822"` `sense:noise:tuner:id ""N4691-60004 ECal 02822"`
Query Syntax	SENSe:NOISe:TUNer:ID?
Return Type	String
Default	Not applicable

SENSe<ch>:NOISe:TUNer:INPut <string>

(Read-Write) Sets and reads the port of the ECal noise tuner that is connected to the PNA SOURCE OUT.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<string>	ECal port identifier. Case sensitive.
Examples	`SENS:NOIS:TUN:INP "B"` `sense:noise:tuner:input "A"`
Query Syntax	SENSe:NOISe:TUNer:INPut?
Return Type	String
Default	"B"

SENSe<ch>:NOISe:TUNer:OUTPut <string>

(Read-Write) Sets and reads the port of the ECal noise tuner that is connected to the CPLR THRU.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1
<string>	ECal port identifier. Case sensitive.
Examples	`SENS:NOIS:TUN:OUTP "B"` `sense:noise:tuner:output "A"`
Query Syntax	SENSe:NOISe:TUNer:OUTput?
Return Type	String
Default	"A"

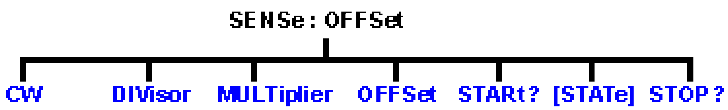
Last Modified:

21-Jun-2007 MX New topic

Sense:Offset Commands Superseded

Note: These commands are replaced by the Sense:FOM commands which include the features of the new FOM dialog. Although these old commands will continue to work, they can NOT be mixed with the new commands.

Sets the offset frequency functions, causing the stimulus and response frequencies to be different.



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Frequency Offset
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:OFFSet:CW <bool>

(Read-Write) Turns stimulus CW Override mode ON or OFF. Use this setting to establish a fixed (CW) stimulus frequency while measuring the Response over a swept frequency range.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<bool>	ON (or 1) - turns CW override ON. OFF (or 0) - turns CW overide OFF.
Examples	`SENS:OFFS:CW ON` `sense2:offset:cw off`
Query Syntax	SENSe<cnum>:OFFSet:CW?
Return Type	Boolean
Default	OFF

SENSe<cnum>:OFFSet:DIVisor <num>

(Read-Write) Specifies (along with the multiplier) the value to multiply by the stimulus.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Divisor value. Range is 1 to 1000

Examples

```
SENS:OFFS:DIV 3
sense2:offset:divisor 2
```

Query Syntax SENSe<cnum>:OFFSet:DIVisor?

Return Type Numeric

Default 1

SENSe<cnum>:OFFSet:MULTiplier <num>

(Read-Write) Specifies (along with the divisor) the value to multiply by the stimulus.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Multiplier value. Range is +/- 1000. Negative multipliers cause the stimulus to sweep in decreasing direction. For mixer measurements, this would be for setups requiring the RF frequency to be less than LO frequency

Examples

```
SENS:OFFS:MULT 2
sense2:offset:multiplier 4
```

Query Syntax SENSe<cnum>:OFFSet:MULTplier?

Return Type Numeric

Default 1

SENSe<cnum>:OFFSet:OFFSet <num>

(Read-Write) Specifies an absolute offset frequency in Hz. For mixer measurements, this would be the LO frequency.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Offset frequency. Range is +/- 1000 GHz. Offsets can be positive or negative

Examples

```
SENS:OFFS:OFFS 1GHz
sense2:offset:offset 1e9
```

Query Syntax SENSe<cnum>:OFFSet:OFFSet?

Return Type Numeric

Default **0 Hz**

SENSe<cnum>:OFFSet:STARt?

(Read-Only) Returns the response start frequency

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1

Examples

```
SENS:OFFS:STAR?
sense2:offset:start?
```

Return Type Numeric

Default Not applicable

SENSe<cnum>:OFFSet:[STATe] <bool>

(Read-Write) Enables Frequency Offset Mode on ALL measurements that are present on the active channel. This immediately causes the source and receiver to tune to separate frequencies. The receiver frequencies are specified with the other SENS:OFFSet commands. To make the stimulus settings use the SENS:FREQ commands.

Tip: To avoid unnecessary errors, first make other offset frequency settings, then set Frequency Offset ON.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<bool>	ON (or 1) - turns Frequency Offset ON. OFF (or 0) - turns Frequency Offset OFF.
Examples	`SENS:OFFS ON` `sense2:offset:state off`
Query Syntax	SENSe<cnum>:OFFSet:[STATe]?
Return Type	Boolean
Default	OFF (0)

SENSe<cnum>:OFFSet:STOP?

(Read-Only) Returns the response stop frequency.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:OFFS:STOP` `sense2:offset:stop`
Return Type	Numeric
Default	Not applicable

Last Modified:

23-Jul-2007 Superseded Note.

Sense:Path:Configuration Commands

Controls the path configuration settings.

SENSe:PATH:CONFiguration
- CATalog?
- DELete
- DTEXt
- ELEMent
  - CATalog?
  - [STATe]
  - VALue:CATalog?
- NAME
- SELect
- STORe

Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Path Configuration
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe:PATH:CONFiguration:CATalog?

(Read-only) Returns a list of configuration names stored in the PNA.

Examples	`SENS:PATH:CONF:CAT?`
Return Type	Comma-separated list of double-quoted strings
Default	Not Applicable

SENSe:PATH:CONFiguration:DELete <string>

(Write-only) Deletes the specified configuration name from the PNA. The factory configurations cannot be deleted. This is the only method of distinguishing a factory configuration from a user-named configuration.

Parameters	
<string>	Configuration name to be deleted.
Examples	`SENS:PATH:CONF:DEL "MyMixer"`
Return Type	Not Applicable
Default	Not Applicable

SENSe:PATH:CONFiguration:DTEXt <string>

(Read-Write) Write and read descriptive text associated with the configuration. This text is displayed in the path configuration dialog. Text is generally used to describe external connections that must be made manually to complete the configuration setup.

Parameters	
<string>	Descriptive text enclosed in quotes. Double quotes are not allowed within the descriptive text.
Examples	`SENS:PATH:CONF:DTEX "Connect J1 jumper on the rear panel."`
Query Syntax	SENSe<ch>:PATH:CONFiguration:DTEXt?
Return Type	String
Default	Not Applicable

SENSe<ch>:PATH:CONFiguration:ELEMent:CATalog?

(Read-only) Returns the names of configurable elements as a comma-delimited list of strings.

See a list of configurable elements and settings for various PNA models.

Parameters

<ch>	Any existing channel number; if unspecified, value is set to 1.

Examples	`SENS:PATH:CONF:ELEM:CAT?`
	`'returns`
	`“Combiner”, “Src1”, “Src2”`

Default	Not Applicable

SENSe<ch>:PATH:CONFiguration:ELEMent[:STATe] <elem>, <setting>

(Read-Write) Write or read the setting of a specified element in the current configuration.

See a list of configurable elements and settings for various PNA models.

Parameters

<ch>	Any existing channel number; if unspecified, value is set to 1.
<elem>	Name of the element for which a setting is to be made.
<setting>	Element setting. Use SENS:PATH:CONF:ELEM:VAL:CAT? to return a list of valid settings for the specified element.
Examples	`SENS:PATH:CONF:ELEM "Combiner","Normal"`
Query Syntax	SENSe<ch>:PATH:CONFiguration:ELEMent? "Combiner" Returns the current state of the Combiner element.
Return Type	String
Default	Not applicable

SENSe<ch>:PATH:CONFiguration:ELEMent:VALue:CATalog? <element>

(Read-only) Returns the list of valid settings that can be used with the specified element.

See a list of configurable elements and settings for various PNA models.

Parameters

<ch>	Any existing channel number; if unspecified, value is set to 1.
<element>	String. Element name for which to return valid settings.
Examples	`SENS:PATH:CONF:ELEM:VAL:CAT? "Combiner"` `'returns "Normal", "Reversed"`
Default	Not Applicable

SENSe<ch>:PATH:CONFiguration:NAME?

(Read-only) Returns the name of the current configuration only if NO individual element settings had been changed since selecting or storing a configuration. When element settings change, the path configuration name is cleared.

Parameters

<ch>	Any existing channel number; if unspecified, value is set to 1.
Examples	`SENS:PATH:CONF:NAME?` `'returns "Default"`
Return Type	String
Default	Not Applicable

SENSe<ch>:PATH:CONFiguration:SELect <string>

(Write only) Loads the named configuration onto the specified channel.

Use SENS:PATH:CONF:CAT? to return the configuration names that are stored on the PNA.

Parameters

<ch>	Any existing channel number; if unspecified, value is set to 1.
<string>	Configuration name. "Default" is the default factory configuration.
Examples	`SENS:PATH:CONF:SEL 'default'` `sense2:path:configuration:select "MyMixer"`
Query Syntax	Not Applicable
Default	"Default"

SENSe<ch>:PATH:CONFiguration:STORe <name>

(Write only) Saves the path configuration currently associated with channel <ch> to the specified configuration name.

Parameters

<ch>	Any existing channel number; if unspecified, value is set to 1.
<name>	String. Configuration name. Factory configurations can NOT be overwritten. Specifying the name of a pre-defined factory configuration will result in an error.
Examples	`SENS:PATH:CONF:STOR "MyMixer"`
Query Syntax	Not Applicable
Default	Not Applicable

Last Modified:

14-Dec-6	MX New Topic

Sense:Power Command

Learn about Receiver Attenuation

SENSe<cnum>:POWer:ATTenuation <recvr>,<num>

(Read-Write) Sets the attenuation level for the specified receiver.

Note: Attenuation cannot be set with Sweep Type set to Power

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<recvr> Receiver to get attenuation. Choose from:

- **AREceiver** - receiver A
- **BREceiver -** receiver B
- **CREceiver** - receiver C
- **DREceiver** - receiver D

Receiver attenuation can NOT be set using logical receiver notation.

<num> Attenuation value in dB. To determine how many receiver attenuators, the maximum receiver attenuation, and attenuation step size, for a PNA model, see PNA Models and Options.

If a number other than these is entered, the analyzer will select the next lower valid value. For example, if 19 is entered for the E8361A, then 10 dB attenuation will be selected.

Examples

```
SENS:POW:ATT AREC,10
sense2:power:attenuation breceiver,30
```

Query Syntax SENSe<cnum>:POWer:ATTenuation? <rec>

Return Type Numeric

Default 0

Last Modified:

25-Oct-2007 Edit range of values

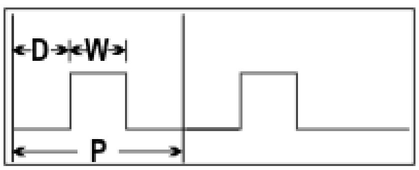
Sense:Pulse Commands

Configures the 5 pulse generators in the PNA-X.

SENSe:PULSe
- DELay
- DINCrement
- PERiod
- STATe
- WIDTh

Click on a blue keyword to view the command details.

Pulse Definitions



- D = Delay; the time before each pulse begins
- W = Width; the time the pulse is ON
- P = Period; one complete pulse cycle
- Duty Cycle = W/P

Important: If **D + W** is greater than **P**, then undefined PNA behavior results. There is NO error message or warning.

See Also

- PNA-X IF Path Block diagram
- SENS:IF configuration commands
- Example Programs
- PNA-X Pulse Application
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<ch>:PULSe<n>:DELay <value>

(Read-Write) Sets the pulse delay. The amount of time before a new pulse begins.

See Pulse Definition diagram.

Parameters	
<ch>	Any existing channel number; if unspecified, value is set to 1.
<n>	Pulse generator number. Choose from 0 to 4. 0 is the generator that pulses the ADC.
<value>	Delay value in seconds. Choose a value from about 33ns to about 70 seconds.
Examples	`SENS:PULS:DEL .5`
Query Syntax	SENSe<ch>:PULSe<n>:DELay?
Return Type	Numeric
Default	0

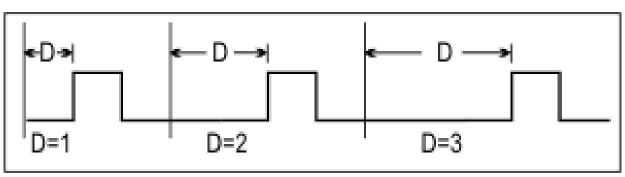
SENSe<ch>:PULSe<n>:DINCrement <value>

(Read-Write) Sets the pulse delay increment. The delay increments with each pulse by the <value> amount.

For example, in this diagram the delay starts as 1. On the second pulse, delay=2. On the third pulse, delay=3.

Important: If **D + W** is greater than **P**, then undefined PNA behavior results. There is NO error message or warning. Delay includes the incremented value.

This is useful for pulse profiling.



See Pulse Definition diagram.

Parameters	
<ch>	Any existing channel number; if unspecified, value is set to 1.

<n>	Pulse generator number. Choose from 0 to 4. 0 is the generator that pulses the ADC.
<value>	Delay increment value in seconds.
Examples	`SENS:PULS:DINC .5`
Query Syntax	SENSe<ch>:PULSe<n>:DINCrement?
Return Type	Numeric
Default	0

SENSe<ch>:PULSe:PERiod <value>

(Read-Write) Sets the pulse-period (1/PRF) for ALL pulse generators.

The resolution of the period is 16.667nS.

See Pulse Definition diagram.

Parameters	
<ch>	Any existing channel number; if unspecified, value is set to 1.
<value>	Pulse period in seconds. Choose a value from about 33ns to about 70 seconds.
Examples	`SENS:PULS:PERiod .5`
Query Syntax	SENSe<ch>:PULSe:PERiod?
Return Type	Numeric
Default	1e-3 sec

SENSe<ch>:PULSe<n>:STATe <bool>

(Read-Write) Turns the pulse output ON and OFF.

Parameters	
<ch>	Any existing channel number; if unspecified, value is set to 1.
<n>	Pulse generator number. Choose from 0 to 4. 0 is the generator that pulses the ADC.
<bool>	ON (or 1) - turns pulse output ON. OFF (or 0) - turns pulse output OFF.
Examples	`SENS:PULS:STAT 1`
Query Syntax	SENSe<ch>:PULSe:STATe?
Return Type	Boolean
Default	OFF

SENSe<ch>:PULSe<n>:WIDTh <value>

(Read-Write) Sets the pulse width. The amount of time that the pulse is ON.

See Pulse Definition diagram.

Parameters	
<ch>	Any existing channel number; if unspecified, value is set to 1.
<n>	Pulse generator number. Choose from 0 to 4. 0 is the generator that pulses the ADC.
<value>	Pulse width in seconds. Choose a value from about 33ns to about 70 seconds.
Examples	`SENS:PULS:WIDT .5`
Query Syntax	SENSe<ch>:PULSe<n>:WIDTh?
Return Type	Numeric
Default	1e-4 sec

Last Modified:

2-Jan-2007	MX New topic

Sense:Roscillator Command

Learn about the Reference Osc.

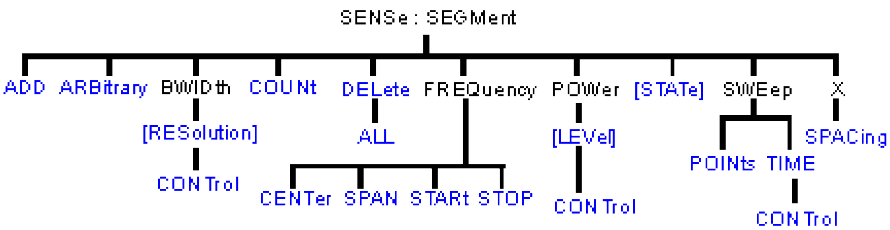
SENSe:ROSCillator:SOURce?

(Read-only) Applying a signal to the Reference Oscillator connector automatically sets the Reference Oscillator to EXTernal. This command allows you to check that it worked.
EXT is returned when a signal is present at the **Reference Oscillator** connector.
INT is returned when **NO** signal is present at the **Reference Oscillator** connector.

Examples	`SENS:ROSC:SOUR?` `sense:roscillator:source?`
Return Type	Character
Default	Not applicable

Sense:Segment Commands

Defines the segment sweep settings. Enable segment sweep with **SENS:SWE:TYPE SEGMent.**



Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Segment Sweep
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:SEGMent<snum>:ADD

(Write-only) Adds a segment.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Segment number to add. If unspecified, value is set to 1. Segment numbers must be sequential. If a new number is added where one currently exists, the existing segment and those following are incremented by one.
Examples	Two Segments exist (1 and 2). The following command will add a new segment (1). The existing (1 and 2) will become (2 and 3) respectively. **`SENS:SEGM1:ADD`** **`sense2:segment1:add`**
Query Syntax	Not applicable. Use Sense:Segment:Count to determine the number of segments in a trace.
Default	Not Applicable

SENSe<cnum>:SEGMent:ARBitrary <ON | OFF>

(Read-Write) Enables you to setup a segment sweep with arbitrary frequencies. The start and stop frequencies of each segment can overlap other segments. Also, each segment can have a start frequency that is greater than its stop frequency which causes a reverse sweep over that segment. Learn more about Arbitrary Segment Sweep.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<ON | OFF>	**ON** (or 1) - Allows the setup of arbitrary segment sweep. **OFF** (or 0) - Prevents the setup of arbitrary segment sweep.
Examples	**`SENS:SEGM:ARB ON`** **`sense2:segment:arbitrary off`**
Query Syntax	SENSe<cnum>:SEGMent:ARBitrary?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

SENSe<cnum>:SEGMent<snum>:BWIDth[:RESolution] <num>

(Read-Write) Sets the IF Bandwidth for the specified segment. First set SENS:SEGM:BWIDth:CONTrol ON. All subsequent segments that are added assume the new IF Bandwidth value.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Segment number to modify. Choose any existing segment number.
<num>	IF Bandwidth in Hz. The list of valid IF Bandwidths is different depending on the PNA model. (Click to see the lists.) If an invalid number is specified, the analyzer will round up to the closest valid number. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	**`SENS:SEGM:BWID 1KHZ`** **`sense2:segment2:bwidth:resolution max`**
Query Syntax	SENSe<cnum>:SEGMent<snum>:BWIDth[:RESolution]?
Return Type	Numeric
Default	See Preset IFBW for your PNA model.

SENSe<cnum>:SEGMent:BWIDth[:RESolution]:CONTrol <ON | OFF>

(Read-Write) Specifies whether the IF Bandwidth resolution can be set independently for each segment.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns Bandwidth control ON. Bandwidth can be set for each segment **OFF** (or 0) - turns Bandwidth control OFF. Use channel bandwidth setting
Examples	`SENS:SEGM:BWID:CONT ON` `sense2:segment:bwidth:control off`
Query Syntax	SENSe<cnum>:SEGMent:BWIDth[:RESolution]:CONTrol?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

SENSe<cnum>:SEGMent:COUNt?

(Read-only) Queries the number of segments that exist in the specified channel.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:SEGM:COUNt?` `sense2:segment:count?`
Return Type	Numeric
Default	1 segment

SENSe<cnum>:SEGMent<snum>:DELete

(Write-only) Deletes the specified sweep segment. When ALL segments are deleted, Sweep Mode (SENS:SWE:MODE) is automatically set to Linear because there are no segments to sweep.

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Number of the segment to delete. If unspecified, value is set to 1
Examples	`SENS:SEGM:DEL` `sense2:segment2:delete`
Query Syntax	Not applicable
Default	Not Applicable

SENSe<cnum>:SEGMent:DELete:ALL

(Write-only) Deletes all sweep segments. When this command is executed, Sweep Mode (SENS:SWE:MODE) is automatically set to Linear because there are no segments to sweep.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
Examples	`SENS:SEGM:DEL:ALL` `sense2:segment:delete:all`
Query Syntax	Not applicable
Default	Not Applicable

SENSe<cnum>:SEGMent<snum>:FREQuency:CENTer <num>

(Read-Write) Sets the Center Frequency for the specified segment. The Frequency Span of the segment remains the same. The Start and Stop Frequencies change accordingly.

Note: All previous segment's Start and Stop Frequencies that are larger than the new Start Frequency are changed to the new Start Frequency. All following segment's start and stop frequencies that are smaller than the new Stop Frequency are changed to the new Stop Frequency.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Segment number to modify. Choose any existing segment number.
<num>	Center Frequency in Hz. Choose any number between the **minimum** and **maximum** frequency of the analyzer. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`SENS:SEGM:FREQ:CENT 1MHZ` `sense2:segment2:frequency:center 1e9`
Query Syntax	SENSe<cnum>:SEGMent<snum>:FREQuency:CENTer?
Return Type	Numeric
Default	Stop Frequency of the previous segment. If first segment, start frequency of the analyzer.

SENSe<cnum>:SEGMent<snum>:FREQuency:SPAN <num>

(Read-Write) Sets the Frequency Span for the specified segment. The center frequency of the segment remains the same. The start and stop frequencies change accordingly.

Note: All previous segment's Start and Stop Frequencies that are larger than the new Start Frequency are changed to the new Start Frequency. All following segment's start and stop frequencies that are smaller than the new Stop Frequency are changed to the new Stop Frequency.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Segment number to modify. Choose any existing segment number.
<num>	Frequency Span in Hz. Choose any number between the **minimum** and **maximum** frequency of the analyzer. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
SENS:SEGM:FREQ:SPAN 1MHZ
sense2:segment2:frequency:span max
```

Query Syntax SENSe<cnum>:SEGMent<snum>:FREQuency:SPAN?

Return Type Numeric

Default If first segment, frequency span of the analyzer. Otherwise 0.

SENSe<cnum>:SEGMent<snum>:FREQuency:START <num>

(Read-Write) Sets the Start Frequency for the specified sweep segment.

Notes

All other segment Start and Stop Frequency values that are larger than this frequency are changed to this frequency.

To return the start and stop frequency of the entire sweep (all segments), Use SENS:FREQ:STARt? and SENS:FREQ:STOP?

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Segment number to modify. Choose any existing segment number.
<num>	Start Frequency in Hz. Choose any number between the **minimum** and **maximum** frequency of the analyzer. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples	`SENS:SEGM:FREQ:STAR 1MHZ` `sense2:segment2:frequency:start minimum`
Query Syntax	SENSe<cnum>:SEGMent<snum>:FREQuency:STARt?
Return Type	Numeric
Default	Stop Frequency of the previous segment. If first segment, start frequency of the analyzer.

SENSe<cnum>:SEGMent<snum>:FREQuency:STOP <num>

(Read-Write) Sets the Stop Frequency for the specified sweep segment.

Notes

All other segment Start and Stop Frequency values that are larger than this frequency are changed to this frequency.

To return the start and stop frequency of the entire sweep (all segments), Use SENS:FREQ:STARt? and SENS:FREQ:STOP?

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Segment number to modify. Choose any existing segment number.
<num>	Stop Frequency in Hz. Choose any number between the **minimum** and **maximum** frequency of the analyzer. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`SENS:SEGM:FREQ:STOP 1MHZ` `sense2:segment2:frequency:stop maximum`
Query Syntax	SENSe<cnum>:SEGMent<snum>:FREQuency:STOP?
Return Type	Numeric
Default	If first segment, stop frequency of the analyzer. Otherwise, start frequency of the segment.

SENSe<cnum>:SEGMent<snum>:POWer[<port>][:LEVel] <num>

(Read-Write) Sets the Port Power level for the specified sweep segment. First set SENS:SEGM:POW:CONTrol ON.

When port power is Coupled, setting port power for one port will apply port power for all source ports.

All subsequent segments that are added assume the new Power Level value.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Segment number to modify. Choose any existing segment number.
<port>	Port number of the source. If unspecified, value is set to 1.
<num>	Power level. **Note:** The range of settable power values depends on the PNA model and if source attenuators are installed. To determine the range of values, send SOUR:POW? MAX and SOUR:POW? MIN. (SOUR:POW:ATT:AUTO must be set to ON). Actual achievable leveled power depends on frequency.

Examples

```
SENS:SEGM:POW 0
sense2:segment2:power1:level -10
```

Query Syntax SENSe<cnum>:SEGMent<snum>:POWer[<port>][:LEVel]?

Return Type Numeric

Default 0

SENSe<cnum>:SEGMent:POWer[:LEVel]:CONTrol <ON | OFF>

(Read-Write) Specifies whether Power Level can be set independently for each segment.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns Power Level control ON. Power level can be set for each segment. **OFF** (or 0) - turns Power Level control OFF. Use the channel power level setting.

Examples

```
SENS:SEGM:POW:CONT ON
sense2:segment:power:level:control off
```

Query Syntax SENSe<cnum>:SEGMent:POWer[:LEVel]:CONTrol?

Return Type Boolean (1 = ON, 0 = OFF)

Default OFF

SENSe<cnum>:SEGMent<snum>[:STATe] <ON | OFF>

(Read-Write) Turns the specified sweep segment ON or OFF. At least ONE segment must be ON or Sweep Mode is automatically set to **Linear**.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Segment number to be turned ON or OFF
<ON | OFF>	**ON** (or 1) - turns segment ON. **OFF** (or 0) - turns segment OFF.
Examples	`SENS:SEGM ON` `sense2:segment2:state off`
Query Syntax	SENSe<cnum>:SEGMent<snum>[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF

SENSe<cnum>:SEGMent<snum>:SWEep:POINts <num>

(Read-Write) Sets the number of data points for the specified sweep segment.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Any existing segment number. If unspecified, value is set to 1
<num>	Number of points in the segment. The total number of points in all segments cannot exceed **20001.** A segment can have as few as 1 point. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`SENS:SEGM:SWE:POIN 51` `sense2:segment2:sweep:points maximum`
Query Syntax	SENSe<cnum>:SEGMent<snum>:SWEep:POINts?
Return Type	Numeric
Default	21

SENSe<cnum>:SEGMent<snum>:SWEep:TIME <num>

(Read-Write) Sets the time the analyzer takes to sweep the specified sweep segment.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Any existing segment number.
<num>	Sweep time in seconds. Choose a number between **0** and **100** **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.

Examples

```
SENS:SEGM:SWE:TIME 1ms
sense2:segment2:sweep:time .001
```

Query Syntax SENSe<cnum>:SEGMent<snum>:SWEep:TIME?

Return Type Numeric

Default Not Applicable

SENSe<cnum>:SEGMent:SWEep:TIME:CONTrol <ON | OFF>

(Read-Write) Specifies whether Sweep Time can be set independently for each sweep segment.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns Sweep Time control ON. Sweep Time can be set for each segment. **OFF** (or 0) - turns Sweep Time control OFF. Uses the channel Sweep Time setting.

Examples

```
SENS:SEGM:SWE:TIM:CONT ON
sense2:segment:sweep:time:control off
```

Query Syntax SENSe<cnum>:SEGMent:SWEep:TIME:CONTrol?

Return Type Boolean (1 = ON, 0 = OFF)

Default OFF

SENSe<cnum>:SEGMent<snum>:X:SPACing <char>

(Read-Write) Sets X-axis spacing ON or OFF

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<snum>	Any existing segment number. (This parameter is ignored)
<char>	**LINear** - turns X-axis point spacing OFF **OBASe** - turns X-axis point spacing ON
Examples	**SENS:SEGM:X:SPACing LIN** **sense2:segment1:spacing obase**
Query Syntax	SENSe<cnum>:SEGMent<snum>:X:SPACing?
Return Type	Character
Default	LINear

Last Modified:

21-Jun-2007 Increased max number of points

Sense:Sweep Commands

Specifies the sweep functions of the analyzer.

SENSe:SWEep:
DWELl
| AUTO
GENeration
GROups
| COUNt
MODE
POINts
SRCPort
TIME
| AUTO
TRIGger
| DELAY
| MODE
| POINt
TYPE

Click on a blue keyword to view the command details.

See Also

- Example Programs
- **Example** Triggering the PNA using SCPI
- Learn about Sweeping
- Synchronizing the PNA and Controller
- SCPI Command Tree

SENSe<cnum>:SWEep:DWELl <num>

(Read-Write) Sets the dwell time between each sweep point.

- Dwell time is **ONLY** available with SENSe:SWEep:GENeration set to **STEPped; It** is **Not** available in **ANALOG**.
- Sending dwell = 0 is the same as setting SENS:SWE:DWEL:AUTO **ON.** Sending a dwell time > 0 sets SENS:SWE:DWEL:AUTO **OFF**.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Dwell time in seconds. This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`SENS:SWE:DWEL .1` `sense2:sweep:dwell min`
Query Syntax	SENSe<cnum>:SWEep:DWELl?
Return Type	Numeric
Default	0 - (**Note**: dwell time set to 0 is the same as dwell:auto ON)

SENSe<cnum>:SWEep:DWELl:AUTO <ON | OFF>

(Read-Write) Specifies whether or not to automatically calculate and set the minimum possible dwell time. Setting Auto **ON** has the same effect as setting dwell time to **0**.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns dwell ON. **OFF** (or 0) - turns dwell OFF.
Examples	`SENS:SWE:DWEL:AUTO ON` `sense2:sweep:dwell:auto off`
Query Syntax	SENSe<cnum>:SWEep:DWELl:AUTO?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

SENSe<cnum>:SWEep:GENeration <char>

(Read-Write) Sets sweep as Stepped or Analog.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<char> Choose from:

STEPped - source frequency is CONSTANT during measurement of eah displayed point. More accurate than ANALog. Dwell time can be set in this mode.

ANALog - source frequency is continuously RAMPING during measurement of each displayed point. Faster than STEPped. Sweep time (not dwell time) can be set in this mode.

Examples

```
SENS:SWE:GEN STEP
sense2:sweep:generation analog
```

Query Syntax SENSe<cnum>:SWEep:GENeration?

Return Type Character

Default Analog

SENSe<cnum>:SWEep:GROups:COUNt <num>

(Read-Write) Sets the trigger count (groups) for the specified channel. Set trigger mode to group after setting this count.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<num> Count (groups) number. Choose any number between:
1 and **2e6** (1 is the same as single trigger)

Examples

```
SENS:SWE:GRO:COUN 10
sense2:sweep:groups:count 50
```

Query Syntax SENSe<cnum>:SWEep:GROups:COUNt?

Return Type Numeric

Default 1

SENSe<cnum>:SWEep:MODE <char>

(Read-Write) Sets the number of trigger signals the specified channel will ACCEPT.

See Triggering the PNA Using SCPI.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Trigger mode. Choose from: **HOLD** - channel will not trigger **CONTinuous** - channel triggers indefinitely **GROups** - channel accepts the number of triggers specified with the last SENS:SWE:GRO:COUN <num>. This is one of the PNA overlapped commands. Learn more. **SINGle** - channel accepts ONE trigger, then goes to HOLD. **Note:** Beginning with 7.50, the SINGle argument makes it no longer necessary to use SENS:SWE:GRO:COUN 1.
Examples	`SENS:SWE:MODE CONT` `sense2:sweep:mode hold`
Query Syntax	SENSe<cnum>:SWEep:MODE?
Return Type	Character
Default	CONTinuous

SENSe<cnum>:SWEep:POINts <num>

(Read-Write) Sets the number of data points for the measurement.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Choose any number between **1** and **20001.** This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`SENS:SWE:POIN 51` `sense2:sweep:points max`
Query Syntax	SENSe<cnum>:SWEep:POINts?
Return Type	Numeric
Default	201

SENSe<cnum>:SWEep:SRCPort <1 | 2> Superseded

This command is superseded. The Calc:Par:Def:Ext and Calc:Par:Mod:Ext can now optionally include the source port.

(Read-Write) Sets the source port when making non S-parameter measurements. Has no effect on S-parameter measurements.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<1 | 2>	**1** - Source power comes out Port 1 **2** - Source power comes out Port 2
Examples	`SENS:SWE:SRCP 1` `sense2:sweep:srcport 2`
Query Syntax	SENSe<cnum>:SWEep:SRCPort?
Return Type	Character
Default	1

SENSe<cnum>:SWEep:TIME <num>

(Read-Write) Sets the time the analyzer takes to complete one sweep. If sweep time accuracy is critical, use ONLY the values that are attained using the up and down arrows next to the sweep time entry box. See Sweep Time.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Sweep time in seconds. Choose a number between **0** and **86,400** (24hrs), To select the fastest sweep speed, either send MIN as an argument to this command, or send SENS:SWE:TIME:AUTO 1. This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
Examples	`SENS:SWE:TIME 1ms` `sense2:sweep:time .001`
Query Syntax	SENSe<cnum>:SWEep:TIME?
Return Type	Numeric
Default	NA

SENSe<cnum>:SWEep:TIME:AUTO <ON | OFF>

(Read-Write) Turns the automatic sweep time function ON or OFF.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns the automatic sweep time ON. **OFF** (or 0) - turns the automatic sweep time OFF.
Examples	`SENS:SWE:TIME:AUTO` `sense2:sweep:time:auto off`
Query Syntax	SENSe<cnum>:SWEep:TIME:AUTO?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

SENSe<cnum>:SWEep:TRIGger:DELay <num>

(Read-Write) Sets and reads the trigger delay for all measurements in the specified CHANNEL. This delay is only applied while TRIG:SOURce EXTernal and TRIG:SCOP CURRent . After an external trigger is applied, the start of the sweep is delayed for the specified delay value plus any inherent latency.

To apply a trigger delay for all channels (Global), use TRIG:DEL

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Trigger delay value in seconds. Range is from 0 to 107 seconds
Examples	`SENS:SWE:TRIG:DELay .003` `sense2:sweep:trigger:delay 1`
Query Syntax	SENSe<cnum>:SWEep:TRIGger:DELay?
Return Type	Numeric
Default	0

SENSe<cnum>:SWEep:TRIGger:MODE <char>

(Read-Write) Sets and reads the trigger mode for the specified channel. This determines what EACH signal will trigger. Learn more.

Note: Setting Point and Sweep mode forces Trigger:SCOPe = CURRent

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Trigger mode. choose from: • **CHANNEL** - Each trigger signal causes **ALL traces** in that channel to be swept. • **SWEEP** - Each Manual or External trigger signal causes **ALL traces that share a source port** to be swept. • **POINT** - Each Manual or External trigger signal causes one data point to be measured.
Examples	`SENS:SWE:TRIG:MODE SWEEP` `sense2:sweep:trigger:mode point`
Query Syntax	SENSe<cnum>:SWEep:TRIGger:MODE?
Return Type	Character
Default	Channel

SENSe<cnum>:SWEep:TRIGger:POINt <ON | OFF> Superseded

This command is replace with SENS:SWE:TRIG:MODE POINT

(Read-Write) Specifies whether the specified channel will measure one point for each trigger or all of the measurements in the channel. Setting any channel to POINt mode will automatically set the TRIGger:SCOPe = CURRent.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - Channel measures one data point per trigger. **OFF** (or 0) - All measurements in the channel made per trigger.
Examples	`SENS:SWE:TRIG:POIN ON` `sense2:sweep:trigger:point off`
Query Syntax	SENSe<cnum>:SWEep:TRIGger:POINt?
Return Type	Boolean (1 = Point, 0 = Measurement)
Default	0 - Measurement

SENSe<cnum>:SWEep:TYPE <char>

(Read-Write) Sets the type of analyzer sweep mode.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Choose from: **LINear | LOGarithmic | POWer | CW | SEGMent** **Note**: SWEep TYPE cannot be set to SEGMent if there are no segments turned ON. A segment is automatically turned ON when the analyzer is started.
Examples	`SENS:SWE:TYPE LIN` `sense2:sweep:type segment`
Query Syntax	SENSe<cnum>:SWEep:TYPE?
Return Type	Character
Default	LINear

Last Modified:

21-Jun-2007	Increased max number of points
18-Jun-2007	Added Single to Mode
24-Apr-2007	Clarified Sweep mode

X Values Command

SENSe<cnum>:X[:VALues]?

(Read-only) Returns the stimulus values for the specified channel. If the channel is sweeping the source backwards, the values will be in descending order.

Parameters	
<cnum>	Any existing channel number; if unspecified, value is set to 1.
Examples	`SENS:X?` `sense2:x:values?`
Return Type	Depends on FORM:DATA command
Default	Not applicable

Source Commands

Controls the power delivered to the DUT.

```
SOURce
 ├ CATalog?
 └ POWer
    ├ ALC[:MODE]
    │  └ CATalog?
    ├ ATTenuation
    │  └ AUTO
    ├ CENTer
    ├ CORRection (More)
    ├ COUPle
    ├ DETector
    ├ [LEVel]
    │  ├ [IMMediate][AMPLitude]
    │  └ SLOPe
    │     └ STATe
    ├ MODE
    ├ SPAN
    ├ STARt
    └ STOP
```

Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Power Settings
- Synchronizing the PNA and Controller
- SCPI Command Tree
- Remotely Specifying a Source Port

SOURce<cnum>:CATalog?

(Read-Write) Returns a list of valid port names that can be controlled. Some ports only have string names, NOT numbers. All commands that require a port argument have provisions for specifying either a port number OR a string name.

See also: Remotely Specifying a Source Port.

Parameters	

Examples	`SOUR:CAT?`
	`source:catalog`
	
	`'Some PNA-X models return`
	`"Port 1,Port 2,Port 3,Port 4,Port 1 Src2"`

Return Type	Comma-separated list of strings.
Default	Not applicable

SOURce<cnum>:POWer<port>:ALC[:MODE]:CATalog?, [src]

(Read-Write) Returns a list of valid ALC modes for the specified channel and port number. Use the returned values to set SOUR:POW:ALC:MODE.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number of the PNA. If unspecified, value is set to 1. To make settings for ports that are not simple numbers, use the [src] argument.
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples	`SOUR:POW:ALC:MODE:CAT?`
	
	`source2:power2:alc:mode:catalog?`
	
	`source:power:alc:mode:catalog? "Port 1 Src2"`

Return Type	Comma-separated list of strings.
Default	Not applicable

SOURce<cnum>:POWer<port>:ALC[:MODE] <char>, [src]

(Read-Write) Sets and returns the ALC mode for the specified channel and port. Use SOUR:POW:ALC:MODE:CAT? to return a list of valid ALC modes for the PNA.

Learn more about ALC mode.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number of the PNA. If unspecified, value is set to 1. To make settings for ports that are not simple numbers, use the [src] argument.
<char>	ALC Mode. For the PNA-X choose from: • **INTernal** Standard ALC loop • **OPENloop** No ALC loop
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples	`SOUR:POW:ALC INT`
	
	`source2:power2:alc:mode openloop`
	
	`source:power:alc:mode openloop,"Port 1 Src2"`

Query Syntax	SOURce<cnum>:POWer<port>:ALC:MODE? [src]
Return Type	Character
Default	INTernal

SOURce<cnum>:POWer<port>:ATTenuation <num>, [src]

(Read-Write) Sets the attenuation level for the selected channel. Sending this command turns automatic attenuation control (SOUR:POW:ATT:AUTO) to OFF. If the ports are coupled, changing the attenuation on one port will also change the attenuation on all other ports. To turn port coupling OFF use SOURce:POWer:COUPle OFF.

Note: Attenuation cannot be set with **Sweep Type** set to **Power**

See Sens:Power:ATT to change receiver attenuation.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number of the PNA. If unspecified, value is set to 1. To make settings for ports that are not simple numbers, use the [src] argument.
<num>	Attenuation value. The range of settable values depends on the PNA model. To determine the valid settings, do one of the following: • See PNA models and options to see the range and step size for each model / option. • Perform a query using MAX, then MIN, as an argument. Example: `SOURce:POWer:ATT? Max` However, this will not tell you the attenuation step size. If an invalid attenuation setting is entered, the PNA will select the next lower valid value. For example, if 19 is entered, then for an E8361A, 10 dB attenuation will be selected. **Note**: This command will accept **MIN** or **MAX** instead of a numeric parameter. See SCPI Syntax for more information.
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples	`SOUR:POW:ATT 10`
	`source2:power2:attenuation maximum`
	`source:power:att 20, "Port 1 Src2"`

Query Syntax	SOURce<cnum>:POWer<port>:ATTenuation? [min/max] [src] [min/max,src]
Return Type	Numeric
Default	0

SOURce<cnum>:POWer<port>:ATTenuation:AUTO <bool>, [src]

(Read-Write) Turns automatic attenuation control ON or OFF. Setting an attenuation value (using SOURce:POWer:ATTenuation <num>) sets AUTO **OFF**.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<port>	Port number of the PNA. If unspecified, value is set to 1.To make settings for ports that are not simple numbers, use the [src] argument.
<bool>	**ON** (or 1) - turns coupling ON. The analyzer automatically selects the appropriate attenuation level to meet the specified power level. **OFF** (or 0) - turns coupling OFF. Attenuation level must be set using SOURce:POWer:ATTenuation <num>.
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples	`SOUR:POW2:ATT:Auto On`
	
	`source2:power:attentuation:auto off`
	
	`sour:pow:att:auto 1, "Port 1 Src2"`

Query Syntax	SOURce<cnum>:POWer:ATTenuation:Auto? [src]
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

SOURce<cnum>:POWer:CENTer <num>

(Read-Write) Sets the power sweep center power. Must also set: SENS:SWE:TYPE POWer and SOURce:POWer:SPAN <num>.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Center power. Actual achievable leveled power depends on frequency.
Examples	`SOUR:POW:CENT -15` `source2:power:center -7`
Query Syntax	SOURce<cnum>:POWer:CENTer?
Return Type	Numeric
Default	0 dBm

SOURce<cnum>:POWer:COUPle <ON | OFF>

(Read-Write) Turns Port Power Coupling ON or OFF.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON | OFF>	**ON** (or 1) - turns coupling ON. The same power level is used for both source ports. **OFF** (or 0) - turns coupling OFF. Power level can be set individually for each source port.
Examples	`SOUR:POW:COUP ON` `source2:power:couple off`
Query Syntax	SOURce<cnum>:POWer:COUPle?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON

SOURce<cnum>:POWer:DETector <char> OBSOLETE

(Read-Write) The PNA models with external leveling are now OBSOLETE.

Sets the source leveling loop as Internal or External.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	**INTernal** - Internal leveling is applied to the source **EXTernal** - External leveling is applied to the source through a rear-panel connector. ONLY provided on 3 GHz, 6 GHz, and 9 GHz PNA models.
Examples	`SOUR:POW:DET INT` `source2:power:detector external`
Query Syntax	SOURce<cnum>:POWer:DETector?
Return Type	Character
Default	INTernal

SOURce<cnum>:POWer<port>[:LEVel][:IMMediate][:AMPLitude] <num>, [src]

(Read-Write) Sets the RF power output level.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number of the PNA. If unspecified, value is set to 1. To make settings for ports that are not simple numbers, use the [src] argument.
<num>	Source power in dBm. **Note:** The range of settable power values depends on the PNA model and if source attenuators are installed. To determine the range of values, perform a query using MAX, then MIN, as an argument. (SOUR:POW:ATT:AUTO must be set to ON) Example: SOURce:POWer? Max Actual achievable leveled power depends on frequency.
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples

```
SOUR:POW1 5DB
source2:power:level:immediate:amplitude maximum

sour:pow 5, "Port 1 Src2"
```

Query Syntax SOURce<cnum>:POWer[:LEVel][:IMMediate][:AMPLitude]? [src]

Return Type Numeric

Default 0 dBm

SOURce<cnum>:POWer[:LEVel]:SLOPe <num>

(Read-Write) Sets the RF power slope value.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<num> Slope value in db/GHz. Choose any integer between **-2** and **2** (0 is no slope).

Examples

```
SOUR:POW:SLOP 2
source2:power:slope -2
```

Query Syntax SOURce<cnum>:POWer[:LEVel]:SLOPe?

Return Type Numeric

Default 0

SOURce<cnum>:POWer[:LEVel]:SLOPe:STATe <ON | OFF>

(Read-Write) Turns Power Slope ON or OFF.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<ON|OFF> **ON** (or 1) - turns slope ON.

OFF (or 0) - turns slope OFF.

Examples

```
SOUR:POW:SLOP:STAT ON
source2:power:slope:state off
```

Query Syntax SOURce<cnum>:POWer[:LEVel]:SLOPe:STATe?

Return Type Boolean (1 = ON, 0 = OFF)

Default OFF

SOURce<cnum>:POWer<port>:MODE <state>, [src]

(Read-Write) Sets the state of PNA source for the specified port.

Learn more about the PNA internal second source

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number of the PNA. If unspecified, <port> is set to 1. To make settings for ports that are not simple numbers, use the [src] argument.
<state>	Source state. Choose from: • **AUTO** Source power is turned ON when required for a measurement. • **ON** Source power is always ON regardless of the measurement. • **OFF** Source power is always OFF regardless of the measurement. **Note:** ON and OFF are valid only on PNA models with two sources.
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples

```
SOUR:POW:MODE ON

source2:power4:mode OFF

sour:pow:mode 1, "Port 1 Src2"
```

Query Syntax SOURce<cnum>:POWer<port>:MODE? [src}

Return Type Character

Default Auto

SOURce<cnum>:POWer:SPAN <num>

(Read-Write) Sets the power sweep span power. Must also set:

SENS:SWE:TYPE POWer and SOURce:POWer:CENTer <num>.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<num>	Span power. Actual achievable leveled power depends on frequency.
Examples	`SOUR:POW:SPAN -15` `source2:power:span -7`
Query Syntax	SOURce<cnum>:POWer:SPAN?
Return Type	Numeric
Default	0 dBm

SOURce<cnum>:POWer:STARt <num>

(Read-Write) Sets the power sweep start power. Must also set

SENS:SWE:TYPE POWer and SOURce:POWer:STOP <num>.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Start power. **Note:** The range of settable power values depends on the PNA model and if source attenuators are installed. To determine the range of values, perform a query using MAX, then MIN, as an argument. (SOUR:POW:ATT:AUTO must be set to ON) Example: SOURce:POWer:STARt? MIN Actual achievable leveled power depends on frequency.
Examples	`SOUR:POW:STAR -15` `source2:power:start -7`
Query Syntax	SOURce<cnum>:POWer:STARt?
Return Type	Numeric
Default	0 dBm

SOURce<cnum>:POWer:STOP <num>

(Read-Write) Sets the power sweep stop power. Must also set: SENS:SWE:TYPE POWer and SOURce:POWer:START <num>.

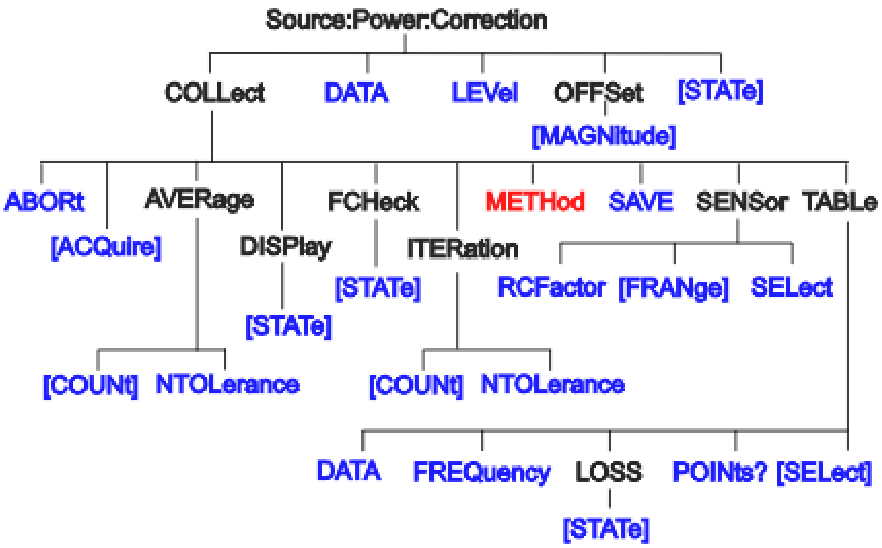
Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<num>	Stop power.
	Note: The range of settable power values depends on the PNA model and if source attenuators are installed. To determine the range of values, perform a query using MAX, then MIN, as an argument. (SOUR:POW:ATT:AUTO must be set to ON) Example: SOURce:POWer:STOP? MAX
	Actual achievable leveled power depends on frequency.
Examples	`SOUR:POW:STOP -15` `source2:power:stop -7`
Query Syntax	SOURce<cnum>:POWer:STOP?
Return Type	Numeric
Default	0 dBm

Last modified:

25-Oct-2007	Edit test for source and rec attenuators commands
27-Jun-2007	Edited wording on Source:Cat?
10/18/06	MQQ Added Mode command

Source:Power:Correction Commands

Used to perform source power calibration on internal and external sources.



Click on a blue keyword to view the command details.

See Also

- Example program using these commands.
- Template for creating your own Power Meter Driver
- Learn about Source Power Cal
- Synchronizing the PNA and Controller
- SCPI Command Tree

Note: The SOURce:POWer:CORRection:COLLect:ACQuire command, used to step the PNA and read a power meter, cannot be sent over the GPIB unless the power meter is connected to a different GPIB interface. See the alternative methods described in the command details.

SOURce<cnum>:POWer<port>:CORRection:COLLect:ABORt

(Write-only) Aborts a source power calibration sweep that is in progress.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number to correct for source power. If unspecified, value is set to 1.
Examples	`SOUR:POW:CORR:COLL:ABOR` `source1:power2:correction:collect:abort`
Query Syntax	Not Applicable
Default	Not Applicable

SOURce<cnum>:POWer<port>:CORRection:COLLect[:ACQuire] <char>,<id>[,src]

Note: With PNA Rev. 6.2, a new "id" argument has been added to this command, replacing SOUR:POW:CORR:COLL:METH.

(Write-only) Initiates a source power cal acquisition sweep using the power sensor attached to the specified channel (A or B) on the power meter, or using the specified PNA receiver.

Note: This command, when used with a power meter, cannot be sent over the GPIB unless the power meter is connected to a different GPIB interface. Use one of the following methods to perform this command or its equivalent:

- If present, use the GPIB dedicated controller port.
- Connect the power meter to the PNA using a USB / GPIB interface (Agilent 82357A).
- SCPI programming of the PNA using a LAN Client interface (see example)
- Send SCPI commands through the COM interface using the SCPI String Parser object.
- Directly control the Power Meter and PNA to step frequency; then acquire and store the Power reading. (see example).

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number to correct for source power. If unspecified, value is set to 1.
<char>	The following choices are new beginning PNA Rev 6.2. Choose from:

- **PMETer** - Power Meter is used for all readings.
- **PMReceiver** - Power meter for the first iteration; then use the reference receiver for remaining readings if necessary (same as "fast iteration" box checked on

dialog box)

- **REceiver -** Use PNA measurement receiver for all readings.

The following choices are **superseded** but still supported, in conjunction with SOUR:POW:CORR:COLL:METH.

- **ASENsor** - Sensor on power meter channel A
- **BSENsor** - Sensor on power meter channel B

<id> **String.** Not case sensitive. The power sensor or PNA receiver to use for measuring power.

- For PMETer or PMREceiver: select **"ASENSOR"** or **"BSENSOR"**.
- For REceiver: select a PNA receiver to acquire readings using physical or logical receiver notation.
- For ASENsor or BSENsor, this argument is NOT required.

[src] **String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names.

While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples

```
SOUR:POW:CORR:COLL PMET  'acquires power meter readings using the A sensor.
source1:power2:correction:collect:acquire receiver,"a1"
'acquires source cal readings using the reference receiver for port 1.
```

Query Syntax Not Applicable

Default Not Applicable

SOURce:POWer:CORRection:COLLect:AVERage[:COUNt] <num>

(Read-Write) This command, along with SOUR:POW:CORR:COLL:AVER:NTOLerance, allows for settling of the power sensor READINGS.

Specifies the maximum number of power readings that are taken at each stimulus point to allow for measurement settling. Each reading is averaged with the previous readings at that stimulus point.

When this average meets the Average:NTOLerance value or this number of readings has been made, the average is returned as the valid reading.

This setting is not necessary when using a PNA receiver (SOUR:POW:CORR:COLL REC) to make the measurement.

Learn more.

Parameters	
<num>	Maximum number of readings to make to allow for settling. Choose any number between 3 and 25.
Examples	`SOUR:POW:CORR:COLL:AVER 2` `source:power:correction:collect:average:count 3`
Query Syntax	SOURce:POWer:CORRection:COLLect:AVERage[:COUNt]?
Return Type	Numeric
Default	3

SOURce:POWer:CORRection:COLLect:AVERage:NTOLerance <num>

(Read-Write) This command, along with SOUR:POW:CORR:COLL:AVER:COUNT, allows for settling of the power sensor READINGS.

Each power reading is averaged with the previous readings at each stimulus point. When the average meets this nominal tolerance value or the max number of readings has been made, the average is returned as the valid reading.

This setting is not necessary when using a PNA receiver (SOUR:POW:CORR:COLL REC) to make the measurement.

Learn more.

Parameters	
<num>	Power measurement settling tolerance value in dB. Choose any number between 0 and 5.
Examples	`SOUR:POW:CORR:COLL:AVER:NTOL .05` `source1:power2:correction:collect:average:ntolerance .003`

Query Syntax	SOURce:POWer:CORRection:COLLect:AVERage:NTOLerance?
Return Type	Numeric
Default	.050 dBm

SOURce<cnum>:POWer:CORRection:COLLect:DISPlay[:STATe] <ON | OFF>

(Read-Write) Enables and disables the display of power readings on the PNA screen. Send this command BEFORE you begin a source power cal acquisition. After the source power cal data is acquired, this setting is reset to ON.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON|OFF>	**ON (1)** Source power calibration dialog box is shown on the PNA screen. Power readings are plotted against the Tolerance value as limit lines. **OFF (0)** - Source power calibration dialog box is NOT shown on the PNA screen.
Examples	`SOUR:POW:CORR:COLL:DISP ON` `source1:power2:correction:collect:display:state off`
Query Syntax	SOURce:POWer:CORRection:COLLect:DISPlay[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	ON (1)

SOURce<cnum>:POWer:CORRection:COLLect:FCHeck[:STATe] <ON | OFF>

(Read-Write) Enables and disables frequency checking of source power cal acquisition sweeps. ONLY use when you have more than one power sensor.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON|OFF>	**ON (1)** turns source power cal frequency checking ON. A requested acquisition will only succeed for those frequency points which fall within a frequency range specified for the power sensor being used. An acquisition will pause in mid-sweep if the frequency is about to exceed the maximum frequency limit specified for that sensor. When the sweep is paused in this manner, a sensor connected to the other channel input of the power meter can be connected to the measurement port in place of the previous sensor, and used to complete the sweep. However, the maximum frequency specified for the

second sensor would need to be sufficient for the sweep to complete. Frequency limits are specified using the SOUR:POW:CORR:COLL:SEN command.

OFF (0) - turns source power cal frequency checking OFF. An acquisition will use just one power sensor for the entire sweep, regardless of frequency.

Examples	`SOUR:POW:CORR:COLL:FCH ON` `source1:power2:correction:collect:fcheck:state off`
Query Syntax	SOURce:POWer:CORRection:COLLect:FCHeck[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF (0)

SOURce:POWer:CORRection:COLLect:ITERation[:COUNt] <num>

(Read-Write) This command, along with SOUR:POW:CORR:COLL:ITER:NTOL describes the number of ADUSTMENTS to make to the source power.

Sets the maximum number of readings to take at each data point for iterating the source power. Power READINGS (performed by SOUR:POW:CORR:COLL:AVER:COUNT and SOUR:POW:CORR:COLL:AVER:NTOLerance) will continue to be made, and source power adjusted, until the measurement is within the iteration tolerance value or this max number of measurements has been met. The last value is the valid measurement for that data point.

Learn more.

Parameters	
<num>	Maximum number of readings. Choose any number between 1 and 100.
Examples	`SOUR:POW:CORR:COLL:ITER 2` `source:power:correction:collect:iteration 3`
Query Syntax	SOURce:POWer:CORRection:COLLect:ITERation[:COUNt]?
Return Type	Numeric
Default	1

SOURce:POWer:CORRection:COLLect:ITERation:NTOLerance <num>

(Read-Write) This command, along with SOUR:POW:CORR:COLL:ITER:COUNT describes the number of ADUSTMENTS to make to the source power.

Sets the maximum desired deviation from the sum of the test port power and the offset value. Power READINGS (performed by SOUR:POW:CORR:COLL:AVER:COUNT and SOUR:POW:CORR:COLL:AVER:NTOLerance) will continue to be made, and source power adjusted, until a measurement is within this tolerance value or the max number of measurements has been met. The last value is the valid measurement for that data point.

Learn more.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number to correct for source power. If unspecified, value is set to 1.
<num>	Tolerance value in dBm. Choose any number between 0 and 5
Examples	`SOUR:POW:CORR:COLL:ITER:NTOL .005` `source:power:correction:collect:iteration:ntolerance .1`
Query Syntax	SOURce:POWer:CORRection:COLLect:ITERation:NTOLerance?
Return Type	Numeric
Default	.05

SOURce<cnum>:POWer<port>:CORRection:COLLect:METHod <char> Superseded

This command is replaced with SOUR:POW:CORR:COLLect[:ACQuire] which now specifies the method and the device.

(Read-Write) Selects the calibration method to be used for the source power cal acquisition.

Parameters

<cnum> Any existing channel number. If unspecified, value is set to 1

<port> Port number to correct for source power. If unspecified, value is set to 1.

<char> Choose from:

NONE - No Cal method

PMETer - Power Meter is used for all readings. (same as "fast iteration" box not checked on dialog box)

PMReceiver - Power meter for the first iteration; then use the reference receiver for remaining readings if necessary (same as "fast iteration" box checked on dialog box)

Examples	`SOUR:POW:CORR:COLL:METH PMET` `source1:power2:correction:collect:method pmreceiver`
Query Syntax	SOURce:POWer:CORRection:COLLect:METHod?
Return Type	Character
Default	NONE

SOURce<cnum>:POWer<port>:CORRection:COLLect:SAVE [<RREC>]

(Write-only) Applies the array of correction values after a source power calibration sweep has completed. The source power correction will then be active on the specified source port for channel <cnum>. This command does NOT save the correction values. To save correction values, save an instrument / calibration state (*.cst file) after performing a source power cal.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number to correct for source power. If unspecified, value is set to 1.
<RREC>	Optional argument. **RRECeiver** In addition to a source Power Cal, perform a calibration of the reference receiver used in the measurement. ONLY the Reference Receiver calibration is then saved to a Cal Set or Cal Register as specified by the current setting of SENS:CORR:PREF:CSET:SAVE.
Examples	`SOUR:POW:CORR:COLL:SAVE` `source1:power2:correction:collect:save rreceiver`
Query Syntax	Not Applicable
Default	Not Applicable

SOURce<cnum>:POWer:CORRection:COLLect:<pmChan>SENsor[:FRANge] <num1>,<num2>

(Read-Write) Specifies the frequency range over which the power sensors connected to the specified channels (A and B) of the power meter can be used (minimum frequency, maximum frequency). If the power meter has only a single channel, that channel is considered channel A.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<pmChan>	Power Meter channel. Choose from: **A** - Channel A **B -** Channel B
<num1>	Minimum frequency for the sensor. If a frequency unit is not specified, Hz is assumed. No limits are placed on this value.
<num2>	Maximum frequency for the sensor. If a frequency unit is not specified, Hz is assumed. No limits are placed on this value.
Examples	`SOUR:POW:CORR:COLL:ASEN 100E3, 3E9` `source1:power2:correction:collect:bsensor:frange 10 MHz, 18 GHz`
Query Syntax	SOURce:POWer:CORRection:COLLect:ASENsor[:FRANge]? SOURce:POWer:CORRection:COLLect:BSENsor[:FRANge]?
Return Type	Numeric
Default	0,0

SOURce<cnum>:POWer:CORRection:COLLect:<pmChan>SENsor:RCFactor <num>

(Read-Write)) Specifies the reference cal factor for the power sensor connected to channel A or B of the power meter. If the power meter has only a single channel, that channel is considered channel A.

Note: If the sensor connected to the specified channel of the power meter contains cal factors in EPROM (such as the Agilent E-series power sensors), those will be the cal factors used during the calibration sweep. The reference cal factor value associated with this command, and any cal factors entered into the PNA for that sensor channel, will not be used.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<pmChan>	Power Meter channel. Choose from: **A** - Channel A **B -** Channel B

<num>	Reference cal factor in percent. Choose any number between 1 and 150.
Examples	`SOUR:POW:CORR:COLL:ASEN:RCF 98.7` `source1:power2:correction:collect:bsensor:rcfactor 105`
Query Syntax	SOURce:POWer:CORRection:COLLect:ASENsor:RCFactor? SOURce:POWer:CORRection:COLLect:BSENsor:RCFactor?
Return Type	Numeric
Default	100

SOURce<cnum>:POWer:CORRection:COLLect:<pmChan>SENsor:SELect

(Read-Write) Sets and returns the power sensor channel (A or B) to be used. This performs the same function as the **Use this sensor only** checkbox in the Power Sensor Settings dialog.

Note: This write portion of this command is only necessary when performing an SMC calibration.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<pmChan>	Power Meter channel. Choose from: **A** - Channel A **B -** Channel B

Examples	`SOUR:POW:CORR:COLL:<pmChan>SEN:SEL 'Write`
	
	`source1:power2:correction:collect:bsensor:select? 1e9 'Read`

Query Syntax	SOURce:POWer:CORRection:COLLect:ASENsor:SELect? <Frequency> SOURce:POWer:CORRection:COLLect:BSENsor:SELect? <Frequency> Returns a boolean 1 or 0 (true or false) indicating whether the sensor is to be used at the specified frequency. If frequency checking is OFF, then the <Frequency> parameter is ignored. The query returns if the sensor is selected for ALL frequencies.
Return Type	Numeric
Default	Not Applicable

SOURce<cnum>:POWer:CORRection:COLLect:TABLe:DATA <data>

(Read-Write) Read or write data into the selected table. Use SOUR:POW:CORR:COLL:TABL:SELect to select a table.

- If the selected table is a power sensor table, the data is interpreted as cal factors in **percent**.
- If the loss table is selected, the data is interpreted as loss in **dB**.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<data>	Data to write into the selected table.
Examples	`SOURce:POWer:CORRection:COLLect:TABLe:DATA 0.12, 0.34, 0.56`
Query Syntax	SOURce<cnum>:POWer:CORRection:COLLect:TABLe:DATA? If the selected table is currently empty, no data is returned.
Return Type	Numeric - one number per table segment.
Default	Not Applicable

SOURce<cnum>:POWer:CORRection:COLLect:TABLe:FREQuency <data>

(Read-Write) Read or write frequency values for the selected table (cal factor table for a power sensor, or the loss compensation table).

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<data>	Frequency data to write into the selected table.
Examples	`SOURce:POWer:CORRection:COLLect:TABLe:FREQuency 10E6, 1.5E9, 9E9`
Query Syntax	SOURce<cnum>:POWer:CORRection:COLLect:TABLe:FREQuency? If the selected table is currently empty, no data is returned.
Return Type	Numeric - one number per table segment
Default	Not Applicable

SOURce<cnum>:POWer:CORRection:COLLect:TABLe:LOSS[:STATe] <ON | OFF>

(Read-Write) Indicates whether or not to adjust the power readings using the values in the loss table during a source power cal sweep.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<ON|OFF>	**ON (or 1) -** turns use of the loss table ON. **OFF (or 0)** - turns use of the loss table OFF.
Examples	`SOUR:POW:CORR:COLL:TABL:LOSS ON` `source1:power2:correction:collect:table:loss:state off`
Query Syntax	SOURce:POWer:CORRection:COLLect:TABLe:LOSS[:STATe]?
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF (0)

SOURce<cnum>:POWer:CORRection:COLLect:TABLe:POINts?

(Read-only) Returns the number of segments that are currently in the selected table.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
Examples	`SOUR:POW:CORR:COLL:TABL:POIN?` `source1:power2:correction:collect:table:points?`
Return Type	Numeric
Default	0

SOURce<cnum>:POWer:CORRection:COLLect:TABLe[:SELect] <char>

(Read-Write) Selects which table you want to write to or read from. Read or write using SOURce:POWer:CORRection:COLLect:TABLe:FREQuency and SOURce:POWer:CORRection:COLLect:TABLe:DATA

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<char>	Choose from: **NONE** - No table selected **ASENsor** - Cal Factor table for Power Sensor A **BSENsor** - Cal Factor table for Power Sensor B **LOSS** - Loss compensation table
Examples	`SOUR:POW:CORR:COLL:TABL ASEN` `source1:power2:correction:collect:table:select bsensor`
Query Syntax	SOURce:POWer:CORRection:COLLect:TABLe[:SELect]?
Return Type	Character
Default	NONE

SOURce<cnum>:POWer<port>:CORRection:DATA <data>[,src]

(Read-Write) Writes and reads source power calibration data.

When querying source power calibration data, if no source power cal data exists for the specified channel and source port, then no data is returned.

If a change in the instrument state causes interpolation and/or extrapolation of the source power cal, the correction data associated with this command correspond to the new instrument state (interpolated and/or extrapolated data).

If the channel is sweeping the source backwards, then the first data point is the highest frequency value; the last data point is the lowest. Use the SENS:X:VALues? command to return the X-axis values in the displayed order.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number to correct for source power. If unspecified, value is set to 1.
<data>	Correction Data

[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples

```
SOURce1:POWer2:CORRection:DATA 0.12, -0.34, 0.56
```

Query Syntax SOURce<cnum>:POWer<port>:CORRection:DATA? [src]

Return Type Depends on FORMat:DATA command

Default Not Applicable

SOURce<cnum>:POWer<port>:CORRection:LEVel <num>[,src]

(Read-Write) Specifies the power level that is expected at the desired reference plane (DUT input or output). This is not used for segment sweep with independent power levels or power sweeps.

Note: Although this command still works, it is recommended that you specify cal power by setting the test port power and offset value.

Parameters

<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number to correct for source power. If unspecified, value is set to 1.
<num>	Cal power level in dBm. Because this could potentially be at the output of a device-under-test, no limits are placed on this value here. It is realistically limited by the specifications of the device (power sensor) that will be used for measuring the power. The power delivered to the PNA receiver must never exceed PNA specifications for the receiver!
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.

Examples

```
SOUR:POW:CORR:LEV 10
source1:power2:correction:level 0 dbm
```

Query Syntax SOURce:POWer:CORRection:LEVel? [src]

Return Type	Numeric
Default	0 dBm

SOURce<cnum>:POWer<port>:CORRection:OFFSet[:MAGNitude] <num>[,src]

(Read-Write) Sets or returns a power level offset from the PNA test port power. This can be a gain or loss value (in dB) to account for components you connect between the source and the reference plane of your measurement. For example, specify 10 dB to account for a 10 dB amplifier at the input of your DUT.

Cal power is the sum of the test port power setting and this offset value. Following the calibration, the PNA power readouts are adjusted to the cal power.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number to correct for source power. If unspecified, value is set to 1.
<num>	Gain or loss value in dB. Choose a value between -200 and 200
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.
Examples	`SOUR:POW:CORR:OFFS 10` `source1:power2:correction:offset:magnitude -3`
Query Syntax	SOURce:POWer:CORRection:OFFSet[:MAGNitude]? [src]
Return Type	Numeric
Default	0 dB

SOURce<cnum>:POWer<port>:CORRection[:STATe] <bool>[,src]

(Read-Write) Enables and disables source power correction for the specified port on the specified channel.

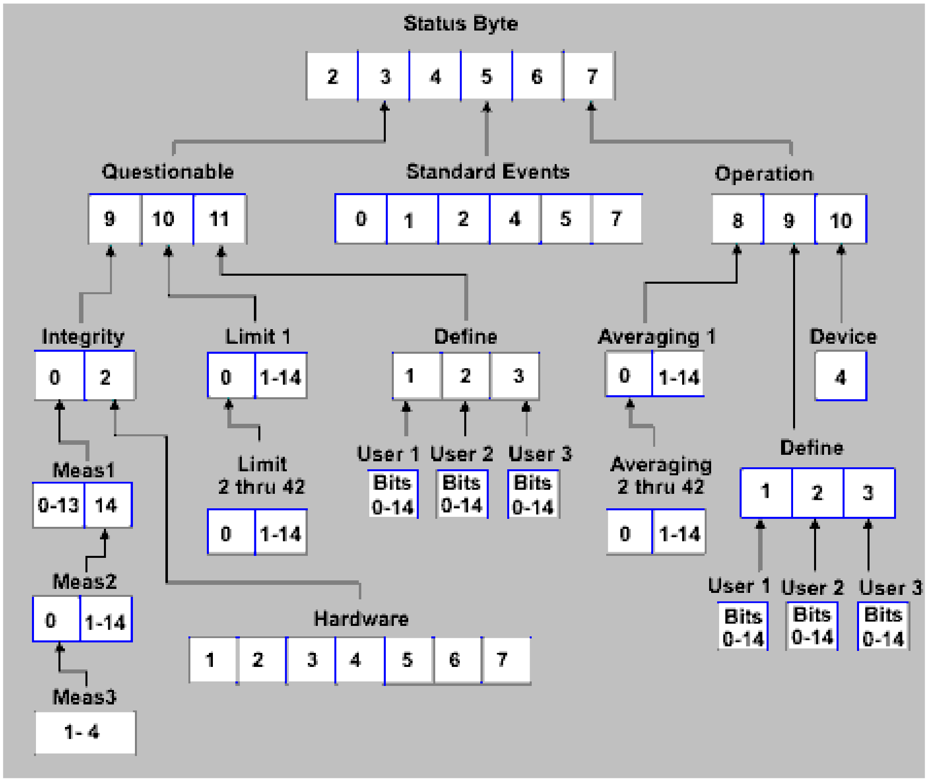
Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1
<port>	Port number to correct for source power. If unspecified, value is set to 1.
<bool>	ON (or 1) turns source power correction ON. OFF (or 0) - turns source power correction OFF.
[src]	**String**. (NOT case sensitive). Source port. Optional. Use SOUR:CAT? to return a list of valid port names. While this argument can be used to make settings for ALL ports, it is designed to access ports that are not simple numbers, such as "Port 1 Src2". Otherwise, the <port> argument performs the same function. If both arguments are specified, [src] takes priority.
Examples	`SOUR:POW:CORR ON` `source1:power2:correction:state off`
Query Syntax	SOURce:POWer:CORRection[:STATe]? [src]
Return Type	Boolean (1 = ON, 0 = OFF)
Default	OFF (0)

Last modified:

April 17, 2007	Removed ch and port arguments for 4 settling and accuracy commands.
9/12/06	MQ Modified for receiver only SPC

Status Register Commands

The status registers enable you to query the state of selected events that occur in the analyzer.



Note: This documentation requires familiarity with the "Standard Status Data Structure - Register Model" as defined in IEEE Std 488.2-1992.

Click on a blue keyword to view the command details.

See Also

- Example Programs
- Learn about Status Registers
- Synchronizing the PNA and Controller
- SCPI Command Tree

Note: Any bit not shown in the registers is not used but may be reserved for future use.

Status Byte Register

Summarizes the states of the other registers and monitors the PNA output queue. It also generates **service requests**. The Enable register is called the Service Request Enable Register.

Commands	Description
*CLS	Clears ALL "event" registers and the SCPI Error / Event queue. The corresponding ENABLE registers are unaffected.
*STB?	Reads the value of the analyzer's status byte. The byte remains after being read.
*SRE?	Reads the current state of the Service Request **Enable** Register.
*SRE <*num*>	Sets bits in the Service Request **Enable** register. The current setting of the SRE register is stored in non-volatile memory. Use *SRE 0 to clear the enable. <*num*> Combined value of the weights for bits to be set.

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
2	4	Error / Event queue Summary (EAV)	the Error / Event queue is not empty. To read the error message, use SYST:ERR?
3	8	Questionable Register Summary	any enabled bit in the **questionable** event status register is set to 1
4	16	Message Available	the output queue is not empty
5	32	Standard Event Register Summary	any enabled bit in the **standard** event status register is set to 1
6	64	Request Service	any of the other bits in the status byte register is set to 1 (used to alert the controller of a service request within the analyzer). This bit cannot be disabled.
7	128	Operation Register Summary	any enabled bit in the standard **operation** event status register is set to 1

STATus:QUEStionable:<keyword>

Summarizes conditions that monitor the quality of measurement data.

<keyword>	Example
:CONDition?	`STAT:QUES:COND?`
:ENABle <bits>	`STAT:QUES:ENAB 1024`
[:EVENt]?	`STAT:QUES?`
:NTRansition <bits>	`STAT:QUES:NTR 1024`
:PTRansition <bits>	`STAT:QUES:PTR 0`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
9	512	Integrity Reg summary	any enabled bit in the **Integrity** event register is set to 1
10	1024	Limit Registers summary	any enabled bit in the **Limit** event registers is set to 1
11	2048	Define Registers summary	any enabled bit in the **Define** event registers is set to 1

STATus:QUEStionable:INTegrity <keyword>

Summarizes conditions in the Measurement Integrity register.

<keyword>	Example
:CONDition?	`STAT:QUES:INT:COND?`
:ENABle <bits>	`STAT:QUES:INT:ENAB 1024`
[:EVENt]?	`STAT:QUES:INT?`
:NTRansition <bits>	`STAT:QUES:INT:NTR 1024`
:PTRansition <bits>	`STAT:QUES:INT:PTR 0`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
0	1	Measurement Summary	any bit in the **Measurement Integrity** event register is set to 1
2	4	Hardware Summary	any bit in the **Hardware** event register is set to 1

STATus:QUEStionable:INTegrity:HARDware<keyword>

Monitors the status of hardware failures.

<keyword>	Example
:CONDition?	`STAT:QUES:INT:HARD:COND?`
:ENABle <bits>	`STAT:QUES:INT:HARD:ENAB 1024`
[:EVENt]?	`STAT:QUES:INT:HARD?`
:NTRansition <bits>	`STAT:QUES:INT:HARD:NTR 1024`
:PTRansition <bits>	`STAT:QUES:INT:HARD:PTR 0`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
1	2	Phase Unlock	the source has lost phaselock, possibly caused by a reference channel open or a hardware failure.
2	4	Unleveled	the source power is unleveled. This could be caused by a source set for more power than it can deliver at the tuned frequency. Or it could be caused by a hardware failure.
3	8	Not used	N/A
4	16	EE Write Failed	an attempted write to the EEPROM has failed, possibly caused by a hardware failure.
5	32	Not used	N/A
6	64	Ramp Cal Failed	the analyzer was unable to calibrate the analog ramp generator due to a possible hardware failure.
7	128	Not used	N/A

STATus:QUEStionable:INTegrity:MEASurement<n> <keyword>

Monitors the lag between changing a channel setting and when the data is ready to query.

When you change the channel state (start/stop freq, bandwidth, and so forth), then the questionable bit for that channel is set. This indicates that your desired channel state does not yet match the data you would get if querying a data trace. When the next sweep is complete (without aborting in the middle), and the data trace matches the channel state that produced it, the bit is cleared for that channel.

<n>	Measurement register number. Choose from 1 to 3
<keyword>	**Example**
:CONDition?	`STAT:QUES:INT:MEAS1:COND?`
:ENABle <bits>	`STAT:QUES:INT:MEAS2:ENAB 1024`
[:EVENt]?	`STAT:QUES:INT:MEAS3?`
:NTRansition <bits>	`STAT:QUES:INT:MEAS2:NTR 1024`
:PTRansition <bits>	`STAT:QUES:INT:MEAS1:PTR 0`

		Measurement Register <n>			
Bit	**Weight**	**1**	**2**	**3**	**Bit is set to 1 when the following conditions exist:**
0	1	1	Summary from Meas Reg 3		a setting change on this channel has occurred and the data does not yet reflect that change.
1	2	2	15	29	a setting change on this channel has occurred and the data does not yet reflect that change.
2	4	3	16	30	a setting change on this channel has occurred and the data does not yet reflect that change.
3	8	4	17	31	a setting change on this channel has occurred and the data does not yet reflect that change.
4	16	5	18	32	a setting change on this channel has occurred and the data does not yet reflect that change.
5	32	6	19		a setting change on this channel has occurred and the data does not yet reflect that change.
6	64	7	20		a setting change on this channel has occurred and the data does not yet reflect that change.

7	128	8	21		a setting change on this channel has occurred and the data does not yet reflect that change.
8	256	9	22		a setting change on this channel has occurred and the data does not yet reflect that change.
9	512	10	23		a setting change on this channel has occurred and the data does not yet reflect that change.
10	1024	11	24		a setting change on this channel has occurred and the data does not yet reflect that change.
11	2048	12	25		a setting change on this channel has occurred and the data does not yet reflect that change.
12	4096	13	26		a setting change on this channel has occurred and the data does not yet reflect that change.
13	8192	14	27		a setting change on this channel has occurred and the data does not yet reflect that change.
14	16384	Summary from Meas Reg 2	28		a setting change on this channel has occurred and the data does not yet reflect that change.

STATus:QUEStionable:LIMit<n> <keyword>

Monitors and summarizes the status of limit line failures. When a trace fails, the representative bit is set to 1.

Bit 0 is used to summarize failures in the registers that follow. For example, Limit Register 3, bit 0, summarizes the failures from registers 4 through 10.

All enable bits are set to 1 by default.

To find the measurement number, use Calc:Par:Mnum

<n>	Limit register: Choose from 1 to 10.
<keyword>	**Example**
:CONDition?	`STAT:QUES:LIM4:COND?`
:ENABle <bits>	`STAT:QUES:LIM1:ENAB 1024`
[:EVENt]?	`STAT:QUES:LIM3?`
:NTRansition <bits>	`STAT:QUES:LIM2:NTR 1024`
:NTRansition?	`STAT:QUES:LIM1:NTR?`

:PTRansition <bits>	`STAT:QUES:LIM5:PTR 0`
:PTRansition?	`STAT:QUES:LIM1:PTR?`

		Limit Register <n>										
Bit	**Weight**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**...**	**41**	**Bit is set to 1 when the following conditions exist:**
0	1	2-42	3-42	4-42	5-42	6-42	7-42	8-42	9-42	...	42	Summary Bit - If any bit from that register fails, it propagates to the previous register, bit 0.
		Trace Numbers										
1	2	1	15	29	43	57	71	85	99	**...**	575	any point on trace fails the limit test
2	4	2	16	30	44	58	72	86	100	**...**	576	any point on trace fails the limit test
3	8	3	17	31	45	59	73	87	101	**...**	577	any point on trace fails the limit test
4	16	4	18	32	46	60	74	88	102	**...**	578	any point on trace fails the limit test
5	32	5	19	33	47	61	75	89	103	**...**	579	any point on trace fails the limit test
6	64	6	20	34	48	62	76	90	104	**...**	580	any point on trace fails the limit test
7	128	7	21	35	49	63	77	91	105	**...**	--	any point on trace fails the limit test
8	256	8	22	36	50	64	78	92	106	**...**	--	any point on trace fails the limit test
9	512	9	23	37	51	65	79	93	107	**...**	--	any point on trace fails the limit test
10	1024	10	24	38	52	66	80	94	108	**...**	--	any point on trace fails the limit test
11	2048	11	25	39	53	67	81	95	109	**...**	--	any point on trace fails the limit test

12	4096	12	26	40	54	68	82	96	110	...	--	any point on trace fails the limit test
13	8192	13	27	41	55	69	83	97	111	...	--	any point on trace fails the limit test
14	16384	14	28	42	56	70	84	98	112	...	--	any point on trace fails the limit test

To determine Register, Bit number, and Weight for trace numbers between 113 and 574 (not shown in the above table) use the following calculations.

The limit status for trace numbers higher than 580 can NOT be tracked.

The following example calculates the Register, Bit number, and Bit Weight for trace # 400:

- To determine Limit **Register** number, use ((Trace # - 1) / 14) + 1.
- To determine Limit **Bit Number,** use the **remainder** +1 of the above calculation.
- ((400-1)/14) + 1 = **Register#** r+1**Bit**
  - 399/14 = 28 r7
  - 28+1= **Register 29**
  - 7+1= **Bit number 8**
- To determine Limit **Bit Weight**: Use above table. For example: Bit 8 = **256**

STATus:QUEStionable:DEFine<keyword>

Summarizes conditions in the Questionable:Define:User<1|2|3> event registers.

<keyword>	Example
:CONDition?	`STAT:QUES:DEF:COND?`
:ENABle <bits>	`STAT:QUES:DEF:ENAB 1024`
[:EVENt]?	`STAT:QUES:DEF?`
:NTRansition <bits>	`STAT:QUES:DEF:NTR 1024`
:PTRansition <bits>	`STAT:QUES:DEF:PTR 0`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
1	2	USER1	any bit in the **USER1** event register is set to 1
2	4	USER2	any bit in the **USER2** event register is set to 1
3	8	USER3	any bit in the **USER3** event register is set to 1

STATus:QUEStionable:DEFine:USER<1|2|3><keyword>

Monitors conditions that you define and map in any of the three QUES:DEF:USER event registers.

<keyword>	Example
:ENABle <bits>	`STAT:QUES:DEF:USER1:ENABle 1024`
[:EVENt]?	`STAT:QUES:DEF:USER1?`
:MAP <bit>,<error>	`STAT:QUES:DEF:USER1:MAP 0,-113 'when error -113 occurs, bit 0 in USER1 will set to 1.`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
0	1	for user	user defined
1	2	for user	user defined
2	4	for user	user defined
3	8	for user	user defined
4	16	for user	user defined
5	32	for user	user defined
6	64	for user	user defined
7	128	for user	user defined
8	256	for user	user defined
9	512	for user	user defined
10	1024	for user	user defined
11	2048	for user	user defined
12	4096	for user	user defined
13	8192	for user	user defined
14	16384	for user	user defined

Standard Event Status Register

Monitors "standard" events that occur in the analyzer. This register can only be cleared by:

- a Clear Command (*CLS).
- reading the Standard Enable Status Register (*ESE?).
- a power-on transition. The analyzer clears the register and then records any transitions that occur, including setting the Power On bit (7).

Commands	Description
*ESE?	Reads the settings of the standard event **ENABLE** register.
*ESE <***bits***>	Sets bits in the standard event **ENABLE** register. The current setting is saved in non-volatile memory. <***bits***> The sum of weighted bits in the register. Use *ESE 0 to clear the enable register.
*ESR?	Reads and clears the **EVENT** settings in the Standard Event Status register.
*OPC	Sets bit 0 when the overlapped command is complete. (see Understanding Command Synchronization / OPC).
*OPC?	Operation complete query - read the Operation Complete bit (0).

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
0	1	Operation Complete	the two following events occur **in order:** 1. the *OPC command is sent to the analyzer 2. the analyzer completes all pending overlapped commands
1	NA	Request Control	Not Supported - the analyzer application is not configured to control GPIB operation
2	4	Query Error	a query error is detected indicating: - an attempt to read data from the output queue when no data was present **OR** - data in the output queue was lost, as in an overflow
4	16	Execution Error	an execution error is detected indicating: - a <PROGRAM DATA> element was outside the legal range or inconsistent with the operation of the analyzer **OR**

			- the analyzer could not execute a valid command due to some internal condition
5	32	Command Error	a command error is detected indicating that the analyzer received a command that: • did not follow proper syntax • was misspelled • was an optional command it does not implement
7	128	Power ON	Power to the analyzer has been turned OFF and then ON since the last time this register was read.

STATus:OPERation<keyword>

Summarizes conditions in the Averaging and Operation:Define:User<1|2|3> event registers.

<keyword>	Example
:CONDition?	`STAT:OPER:COND?`
:ENABle <bits>	`STAT:OPER:ENAB 1024`
[:EVENt]?	`STAT:OPER?`
:NTRansition <bits>	`STAT:OPER:NTR 1024`
:PTRansition <bits>	`STAT:OPER:PTR 0`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
8	256	Averaging summary	either enabled bit in the **Averaging summary** event register is set to 1
9	512	User Defined summary	
10	1024	Device summary	either enabled bit in the **Device summary** event register is set to 1

STATus:OPERation:AVERaging<n> <keyword>

Monitors and summarizes the status of Averaging on traces 1 to 128. When averaging for a trace is complete, the representative bit is set to 1.

Bit 0 is used to summarize the status in the registers that follow. For example, Average Register, bit 0, summarizes the status from registers 4 through 10.

All enable bits are set to 1 by default.

To find the measurement number, use Calc:Par:Mnum.

<n>	Averaging Register. Choose from 1 to 10
<keyword>	**Example**
:CONDition?	`STAT:OPER:AVER1:COND?`
:ENABle <bits>	`STAT:OPER:AVER1:ENAB 1024`
[:EVENt]?	`STAT:OPER:AVER1?`
:NTRansition <bits>	`STAT:OPER:AVER1:NTR 1024`
:PTRansition <bits>	`STAT:OPER:AVER1:PTR 0`

		Averaging Register <n>										
Bit	**Weight**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**...**	**42**	**Bit is set to 1 when the following conditions exist:**
0	1	2-42	3-42	4-42	5-42	6-42	7-42	8-42	9-42	...	42	Summary Bit - If any bit from that register fails, it propagates to the previous register, bit 0.
		Trace Numbers										
1	2	1	15	29	43	57	71	85	99	**...**	575	Averaging on this trace is complete
2	4	2	16	30	44	58	72	86	100	**...**	576	Averaging on this trace is complete
3	8	3	17	31	45	59	73	87	101	**...**	577	Averaging on this trace is complete
4	16	4	18	32	46	60	74	88	102	**...**	578	Averaging on this trace is complete

5	32	5	19	33	47	61	75	89	103	**...**	579	Averaging on this trace is complete
6	64	6	20	34	48	62	76	90	104	**...**	580	Averaging on this trace is complete
7	128	7	21	35	49	63	77	91	105	**...**	--	Averaging on this trace is complete
8	256	8	22	36	50	64	78	92	106	**...**	--	Averaging on this trace is complete
9	512	9	23	37	51	65	79	93	107	**...**	--	Averaging on this trace is complete
10	1024	10	24	38	52	66	80	94	108	**...**	--	Averaging on this trace is complete
11	2048	11	25	39	53	67	81	95	109	**...**	--	Averaging on this trace is complete
12	4096	12	26	40	54	68	82	96	110	**...**	--	Averaging on this trace is complete
13	8192	13	27	41	55	69	83	97	111	**...**	--	Averaging on this trace is complete
14	16384	14	28	42	56	70	84	98	112	**...**	--	Averaging on this trace is complete

To determine Register, Bit number, and Weight for trace numbers between 113 and 574 (not shown in the above table) use the following calculations.

The averaging status for trace numbers higher than 580 can NOT be tracked.

The following example calculates the Register, Bit number, and Bit Weight for trace # 400:

- To determine **Register** number, use ((Trace # - 1) / 14) + 1.
- To determine **Bit Number,** use the **remainder** +1 of the above calculation.
- ((400-1)/14) + 1 = **Register#** r+1**Bit**
    - 399/14 = 28 r7
    - 28+1= **Register 29**
    - 7+1= **Bit number 8**

- To determine **Bit Weight**: Use above table. For example: Bit 8 = **256**

STATus:OPERation:DEFine<keyword>

Summarizes conditions in the OPERation:Define:User<1|2|3> event registers.

<keyword>	Example
:CONDition?	`STAT:OPER:DEF:COND?`
:ENABle <bits>	`STAT:OPER:DEF:ENAB 12`
[:EVENt]?	`STAT:OPER:DEF?`
:NTRansition <bits>	`STAT:OPER:DEF:NTR 12`
:PTRansition <bits>	`STAT:OPER:DEF:PTR 0`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
1	2	USER1	any bit in the **USER1** event register is set to 1
2	4	USER2	any bit in the **USER2** event register is set to 1
3	8	USER3	any bit in the **USER3** event register is set to 1

STATus:OPERation:DEFine:USER<1|2|3><keyword>

Monitors conditions that you define and map in any of the three OPER:DEF:USER event registers.

<keyword>	Example
:ENABle <bits>	`STAT:OPER:DEF:USER1:ENAB 1024`
[:EVENt]?	`STAT:OPER:DEF:USER1?`
:MAP <bit>,<error>	`STAT:OPER:DEF:USER1:MAP 0,-113 'when error -113 occurs, bit 0 in USER1 will set to 1.`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
0	1	for user	user defined
1	2	for user	user defined
2	4	for user	user defined
3	8	for user	user defined
4	16	for user	user defined
5	32	for user	user defined
6	64	for user	user defined
7	128	for user	user defined
8	256	for user	user defined
9	512	for user	user defined
10	1024	for user	user defined
11	2048	for user	user defined
12	4096	for user	user defined
13	8192	for user	user defined
14	16384	for user	user defined

STATus:OPERation:DEVice<keyword>

Summarizes conditions in the OPERation:DEVice event registers.

<keyword>	Example
:CONDition?	`STAT:OPER:DEV:COND?`
:ENABle <bits>	`STAT:OPER:DEV:ENAB 16`
[:EVENt]?	`STAT:OPER:DEV?`
:NTRansition <bits>	`STAT:OPER:DEV:NTR 16`
:PTRansition <bits>	`STAT:OPER:DEV:PTR 0`

Bit	Weight	Description	Bit is set to 1 when the following conditions exist:
0	1	Unused	
1	2	Unused	
2	4	Unused	
3	8	Unused	
4	16	Sweep Completed	When sweep is complete
5	32	Unused	
6	64	Unused	
7	128	Unused	
8	256	Unused	
9	512	Unused	
10	1024	Unused	
11	2048	Unused	
12	4096	Unused	
13	8192	Unused	
14	16384	Unused	

Last modified:

March 10, 2008	Fixed typo in STAT:QUES:INT register
9/19/06	MQ Modified for unlimited windows.

System Commands

SYSTem:
ACTive
| CHANnel
| MEASurement
CHANnels
| HOLD
| RESume
COMMunicate
| GPIB
| PMETer
| ADDRess
| RDEVice
| CLOSe
| OPEN
| READ?
| RESet
| WBINary
| WBLock
| WRITe
| PSENsor
| USB:PMETer:CAT?
CONFigure
CORRection
| WIZard
ERRor?
| COUNt?
| REPort
| SUNLeveled
FPReset
MACRO:COPY
| CHANnel
| SOURce
PRESet
PREFerences:ITEM
| OFFSet
| RCV
| SRC
| PSRTrace
| RETRace

| POWer
| SWITch:DEF
SECurity
| [LEVel]
SHORtcut
| ARGuments
| DELete
| EXECute
| PATH
| TITLe
TOUChscreen
UPReset
| FPANel[:STATe]
| LOAD
| SAVE[:STATe]

Click on a blue keyword to view the command details.

See Also

- Example Programs
- Synchronizing the PNA and Controller
- SCPI Command Tree

SYSTem:ACTive:CHANnel?

(Read-only) Returns the number of the active channel or an error message if there is no active channel. The active channel is the channel number that contains the active measurement.

Examples	SYST:PRES SYST:ACT:CHAN? 'Returns 1
Return Type	Integer
Default	Not Applicable

SYSTem:ACTive:MEASurement?

(Read-only) Returns the name of the active measurement or an error message if there is no active measurement. While looking at the PNA display, the active measurement is the trace that has an indented Trace Status button and a label in the upper-left corner of the display. Only displayed measurements can be active.

Examples	`SYST:PRES`
	`SYST:ACT:MEAS?`
	
	`'Returns "CH1_S11_1"`

Return Type	String
Default	Not Applicable

SYSTem:CHANnels:HOLD

(Write-only) Places all channels in hold mode. To place a single channel in hold mode, use SENS:SWE:MODE.

Examples	`SYST:CHAN:HOLD`
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:CHANnels:RESume

(Write-only) Resumes the trigger mode of all channels that was in effect before sending SYSTem:CHANnels:HOLD (must be sent before SYST:CHAN:RESume).

Examples	`SYST:CHAN:RES`
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:COMMunicate:GPIB:PMETer:ADDRess <num> Superseded

Note: This command is replaced with SYST:COMM:PSENsor

(Read-Write) Specifies the GPIB address of the power meter to be used in a source power calibration. When performing a source power cal, the PNA will search VISA interfaces that are configured in the Agilent IO LIbraries on the PNA.

Use

Parameters	
<num>	GPIB address of the power meter. Choose any integer between 0 and 30.
Examples	`SYST:COMM:GPIB:PMET:ADDR 13` `system:communicate:gpib:pmeter:address 14`
Query Syntax	SYSTem:COMMunicate:GPIB:PMETer:ADDRess?
Return Type	Numeric
Default	13

SYSTem:COMMunicate:GPIB:RDEVice:CLOSe <ID>

(Write only) Closes the remote GPIB session. This command should be sent when ending every successful OPEN session.

Parameters	
<ID>	Session identification number that was returned with the OPEN? command.
Examples	See an example program
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:COMMunicate:GPIB:RDEVice:OPEN <bus>, <addr>, <timeout>

(Read-Write) Initiates a GPIB pass-through session. First send this OPEN command, then send the OPEN query to read the session ID number. An existing GPIB pass-through session remains open after an instrument preset.

To learn more about GPIB pass-through capability, see the example program.

Parameters	
<bus>	Bus ID number. You can find the USB-GPIB adapter bus number by looking at the dialog that appears when the USB-GPIB device is connected. Error 1073 indicates the bus or address number is incorrect. Use 0 (zero) when connected using a GPIB cable to the PNA controller port.
<addr>	GPIB Address of the device to be controlled
<timeout>	The amount of time (in milliseconds) to wait for a response from the remote device after sending a command. A "timeout" error is displayed after this time has passed without a response.
Examples	See an example program
Query Syntax	SYSTem:COMMunicate:GPIB:RDEVice:OPEN? Returns the session identification number that is used when communicating with this device.
Return Type	Numeric
Default	Not Applicable

SYSTem:COMMunicate:GPIB:RDEVice:READ? <ID>

(Read-only) Returns data from the GPIB pass-through device.

Parameters	
<ID>	Session identification number that was returned with the OPEN? command.
Examples	See an example program
Return Type	String
Default	Not Applicable

SYSTem:COMMunicate:GPIB:RDEVice:RESet

(Write-only) Performs the same function as SYST:COMM:GPIB:RDEV:CLOS except that ALL pass-through sessions are closed.

Examples `SYST:COMM:GPIB:RDEV:RES`

Query Syntax Not Applicable

Default Not Applicable

SYSTem:COMMunicate:GPIB:RDEVice:WBINary <ID>,<data>

(Write-only) Sends data to a GPIB pass-through device. This command requires a header that specifies the size of the data to be written. The header (described below) is not passed along to the device.

Use this command if too many embedded quotes prevent you from using SYST:COMM:GPIB:RDEV:WRIT.

Use SYST:COMM:GPIB:RDEV:OPEN to open the pass through session.

Parameters

<ID> Session identification number that was returned with the OPEN? command.

<data> Data to be sent to the GPIB pass-through device. Use the following syntax:

```
#<num digits><byte count><data bytes><NL><END>
```

<num_digits> specifies how many digits are contained in <byte_count>

<byte_count> specifies how many data bytes will follow in <data bytes>

Examples

```
SYSTem:COMMunicate:GPIB:RDEVice:WBINary 101,#17ABC+XYZ<nl><end>
```

- always sent before data.

1 - specifies that the byte count is one digit (7).

7 - specifies the number of data bytes that will follow, not counting <NL><END>.

ABC+XYZ - Data block

<nl><end> - always sent at the end of block data.

The following example sends a line feed at the end.

`SYST:COMM:GPIB:RDEV:WBIN 1,#210SYST:PRES<EOL>`

The <EOL> represents your linefeed character.

Query Syntax Not Applicable

Default Not Applicable

SYSTem:COMMunicate:GPIB:RDEVice:WBLock <ID>,<data>

(Write-only) Same as SYSTem:COMM:GPIB:RDEV:WBIN (above) but the header **IS** passed along to the device.

Use this command if too many embedded quotes prevent you from using SYST:COMM:GPIB:RDEV:WRIT.

Parameters

<ID>	Session identification number that was returned with the OPEN? command.
<data>	Data to be sent to the GPIB pass-through device. See previous command.
Examples	See previous example.
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:COMMunicate:GPIB:RDEVice:WRITe <ID>,<string>

(Write-only) Sends ASCII string data to the GPIB pass-through device.

A line feed is NOT appended to the string data. To send a line feed, see the example in SYST:COMM:GPIB:RDEV:WBIN.

Parameters

<ID>	Session identification number that was returned with the OPEN? command.
<string>	Commands to be sent to the GPIB pass-through device.
Examples	See an example program
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:COMMunicate:PSENsor <char>, <string>

This command replaces SYST:COMM:GPIB:PMET:ADDR.

(Read-Write) Specifies the type and location of the power meter to be used in a source power calibration.

Parameters	
<char>	Type of power meter/ sensor. Choose from: • **GPIB** GPIB power meter • **USB** USB power sensor or USB power sensor • **LAN** LAN enabled power meter
<string>	For **GPIB**, address of the power meter. Choose any integer between 0 and 30. For **USB**, the ID string of the power meter or power sensor. Use SYST:COMM:USB:PMET:CAT? to see a list of ID strings of connected power meters and sensors. For **LAN**, the hostname or IP address of the power meter.

Examples	`SYST:COMM:PSEN gpib, "14"`
	
	`system:communicate:psensor usb, "Agilent Technologies,U2000A,MY12345678,X.01.16"`
	
	`syst:comm:psen lan, "mymeter.agilent.com"`

Query Syntax	SYSTem:COMMunicate:PSENsor?
Return Type	Character / String
Default	GPIB

SYSTem:COMMunicate:USB:PMETer:CATalog?

(Read-only) Returns the ID string of power meters / sensors that are connected to the PNA USB. Use the list to select a power sensor for a source power cal.

Parameters	

Examples	`SYST:COMM:USB:PMET:CAT?`
	
	`system:communicate:usb:pmeter:catalog?`

Return Type	Comma-delimited strings
Default	Not applicable

SYSTem:CONFigure <model>,<address>

(Write-only) Restarts as an "N-port" PNA using the specified multiport test set.

Learn more about PNA Multiport capability.

See other commands to configure multiport test sets.

Parameters	
<model>	String - Model of the test set with which to restart. Use **"Native"** to restart without a test set. To see a list of supported test sets, use SENS:MULT:CAT?
<address>	Numeric - GPIB Address of the test set. Ignored when model = "Native".
Examples	`SYST:CONF "NATIVE",0` `system:configure "N44xx",18`
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:CORRection:WIZard <char>

(Write-only) Launches either the Calibration Wizard or the Version 2 Calibration Kit File Manager dialog box.

Parameters	
<char>	Choose from: **MAIN** - Launches the Calibration Wizard **CKIT** - Launches the Version 2 Calibration Kit File Manager dialog box. Both display on the PNA screen.
Examples	`SYST:CORR:WIZ MAIN` `system:correction:wizard ckit`
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:ERRor?

(Read-only) Returns the next error in the error queue. Each time the analyzer detects an error, it places a message in the error queue. When the `SYSTEM:ERROR?` query is sent, one message is moved from the error queue to the output queue so it can be read by the controller. Error messages are delivered to the output queue in the order they were received. The error queue is cleared when any of the following conditions occur:

- When the analyzer is switched ON.
- When the `*CLS` command is sent to the analyzer.
- When all of the errors are read.

If the error queue overflows, the last error is replaced with a `"Queue Overflow" error.` The oldest errors remain in the queue and the most recent error is discarded.

Examples	`SYST:ERR?` `system:error?`
Default	Not Applicable

SYSTem:ERRor:COUNt?

(Read-only) Returns the number of errors in the error queue. Use SYST:ERR? to read an error.

Examples	`SYST:ERR:COUN?` `system:error:count?`
Default	Not Applicable

SYSTem:ERRor:REPort:SUNLeveled <bool>

(Read-Write) Specifies whether or not to report Source Unleveled errors to the SCPI system error buffer.

Parameters	
<bool>	**True** (or 1) Report Source Unleveled Errors. Read errors from the system error buffer using SYST:ERR? **False** (or 0) Do NOT report Source Unleveled Errors.

Examples	`SYST:ERR:REP:SUNL 1`
	
	`system:error:report:sunleveled true`

Query Syntax	SYSTem:ERRor:REPort:UNLeveled?
Default	False

SYSTem:FPReset

(Write-only) Performs a standard Preset, then deletes the default trace, measurement, and window. The PNA screen becomes blank.

Examples	`SYST:FPR` `system:fpreset`
Default	Not applicable

SYSTem:MACRo:COPY:CHANnel<cnum>[:TO] <num>

(Write-only) Sets up channel <num> as a copy of channel <cnum>. Learn more about copy channels.

Parameters	
<cnum>	Any existing channel number. If unspecified, value is set to 1.
<num>	Number of the channel which is to become a copy of channel <cnum>.

Examples	`SYST:MACR:COPY:CHAN1 2`
	
	`system:macro:copy:channel2:to 3`

Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:MACRo:COPY:CHANnel<fromChan>:SOURce <fromPort>,<toChan>,<toPort>

(Write-only) Copies and applies an existing Source Power Calibration to another channel. Learn more about source power calibration.

Parameters	
<fromChan>	Channel number of the existing source power correction.
<fromPort>	Port number of the existing source power correction.
<toChan>	Channel number to which the source power correction will be copied.
<toPort>	Port number to which the source power correction will be applied.

Examples	`SYST:MACR:COPY:CHAN1:SOUR 1,2,1`
	
	`system:macro:copy:channel2:source 2,1,2`

Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:PRESet

(Write-only) Deletes all traces, measurements, and windows. In addition, resets the analyzer to factory defined default settings and creates a S11 measurement named "CH1_S11_1". For a list of default settings, see Preset.

Regardless of the state of the User Preset Enable checkbox, the SYST:PRESet command will always preset the PNA to the factory preset settings, and SYST:UPReset will always perform a User Preset.

If the PNA display is disabled with DISP:ENAB OFF then SYST:PRES will NOT enable the display.

This command performs the same function as *RST.

Examples	`SYST:PRES` `system:preset`
Default	Not applicable

SYSTem:PREFerences:ITEM:OFFSet:RCV <bool>

(Read-Write) Set and return whether to offset the test port receivers by the amount of receiver attenuation. Learn more.

To send this command using the PNA front panel, open the GPIB Command Processor Console, then type either of the following examples at the command prompt. Then type the Query Syntax and press enter to be sure the PNA took the command.

This setting remains until changed again using this command, or until the hard drive is changed or reformatted.

Parameters	
<bool>	Choose from: **True (1)** Offset the test port receivers **False (0)** Do NOT offset the test port receivers
Examples	`SYST:PREF:ITEM:OFFS:RCV 1` `system:preferences:item:offset:rcv false`
Query Syntax	SYSTem:PREFerences:ITEM:OFFSet:RCV?
Return Type	Boolean
Default	PNA-L and E836xB: **False** (does NOT offset the display). PNA-X: **True** (offsets the display).

SYSTem:PREFerences:ITEM:OFFSet:SRC <bool>

(Read-Write) Set and return whether to offset the reference receiver by the amount of source attenuation. Learn more.

To send this command using the PNA front panel, open the GPIB Command Processor Console, then type either of the following examples at the command prompt. Then type the Query Syntax and press enter to be sure the PNA took the command.

This setting remains until changed again using this command, or until the hard drive is changed or reformatted.

Parameters	
<bool>	Choose from: **True (1)** Offset the reference receivers. **False (0)** Do NOT Offset the reference receivers.
Examples	`SYST:PREF:ITEM:OFFS:SRC 1` `system:preferences:item:offset:src false`
Query Syntax	SYSTem:PREFerences:ITEM:OFFSet:SRC?
Return Type	Boolean
Default	All models: **True** (offset the display).

SYSTem:PREFerences:ITEM:PSRTrace <char>

(Read-Write) At the end of a power sweep, while waiting to trigger the next sweep, maintain source power at either the start power level or at the stop power level.

To send this command using the PNA front panel, open the GPIB Command Processor Console, then type either of the following examples at the command prompt. Then type the Query Syntax and press enter to be sure the PNA took the command.

This setting remains until changed again using this command, or until the hard drive is changed or reformatted.

Parameters	
<char>	Choose from: **STARt -** Maintain source power at the start power level. **STOP -** Maintain source power at the stop power level.

Examples	`SYST:PREF:ITEM:PSRT STOP` `system:preferences:item:psrtrace start`
Query Syntax	SYSTem:PREFerences:ITEM:PSRTrace?
Return Type	Character
Default	STARt

SYSTem:PREFerences:ITEM:RETRace:POWer <char>

(Read-Write) For single-band frequency or segment sweeps ONLY, specify whether to turn RF power ON or OFF during a retrace. Learn more about RF power during sweep retrace.

To send this command using the PNA front panel, open the GPIB Command Processor Console, then type either of the following examples at the command prompt. Then type the Query Syntax and press enter to be sure the PNA took the command.

This setting remains until changed using this command, or until the hard drive is changed or reformatted.

Parameters	
<char>	Choose from: **AUTO**: Power is left ON during retrace of single-band frequency or segment sweeps ONLY. **OFF**: Power is turned OFF during retrace of single-band frequency or segment sweeps ONLY.

Examples	`SYST:PREF:ITEM:RETR:POW OFF`
	
	`system:preferences:item:retrace:power auto`

Query Syntax	SYSTem:PREFerences:ITEM:RETRace:POWer?
Return Type	Character
Default	AUTO

SYSTem:PREFerences:ITEM:SWITch:DEF <string>, <int>

(Read-Write) Sets the default setting for the Noise Tuner switch. This is the setting that occurs when a new channel is created. Learn more.

To send this command using the PNA front panel, open the GPIB Command Processor Console, then type either of the following examples at the command prompt. Then type the Query Syntax and press enter to be sure the PNA took the command.

This setting remains until changed using this command, or until the hard drive is changed or reformatted.

Parameters	
<string>	Name of the switch to set. Choose from: • **"Port1NoiseTuner"**
<int>	Value to set. Choose from: **0** Sets the default (preset) to INTERNAL **1** Sets the default (preset) to EXTERNAL
Examples	`SYST:PREF:ITEM:SWIT:DEF "Port1NoiseTuner" 1 'Write` `system:preferences:item:switch:def? "Port1NoiseTuner" 'Read`
Query Syntax	SYSTem:PREFerences:ITEM:SWITch:DEF? <switch>
Return Type	Integer
Default	**1** (External)

SYSTem:SECurity[:LEVel] <char>

(Read-Write) Sets and returns the display of frequency information on the PNA screen and printouts.

Learn more about security level.

Parameters	
<char>	Choose from: **NONE -** ALL frequency information is displayed. **LOW -** NO frequency information is displayed. Frequency information can be redisplayed using the Security Setting dialog box or this command. **HIGH -** LOW setting plus GPIB console is disabled. Frequency information can be redisplayed ONLY by performing a Preset, recalling an instrument state with None or Low security settings, or using this command. **EXTRa** - HIGH setting plus ASCII data saving is disabled. Same method to redisplay frequency information as HIGH setting.
Examples	`SYST:SEC LOW` `system:security:level high`
Query Syntax	SYSTem:SECurity[:LEVel]?
Return Type	Character
Default	None

SYSTem:UPReset

(Write-only) Performs a User Preset. There must be an active User Preset state file (see Load and Save) or an error will be returned. Learn more about User Preset.

Regardless of the state of the User Preset Enable checkbox, the SYST:PRESet command will always preset the PNA to the factory preset settings, and SYST:UPReset will always perform a User Preset.

Examples	`SYST:UPReset`
	
	`system:upreset`

Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:UPReset:FPANel[:STATe] <bool>

(Read-Write) 'Checks' and 'clears' the enable box on the User Preset dialog box. This only affects subsequent Presets from the front panel user interface.

Regardless of the state of the User Preset Enable checkbox, the SYST:PRESet command will always preset the PNA to the factory preset settings, and SYST:UPReset will always perform a User Preset.

Parameters	
<bool>	Front Panel User Preset State. Choose from: **0** User Preset OFF **1** User Preset ON
Examples	`SYST:UPR:FPAN 1` `system:upreset:fpanel:state 0`
Query Syntax	SYSTem:UPREset:FPANel[:STATe]?
Return Type	Boolean
Default	0

SYSTem:UPReset:LOAD <file>

(Read-Write) Loads an existing instrument state file (.sta or .cst) to be used for User Preset. Subsequent execution of SYSTem:UPReset will cause the PNA to assume this instrument state.

Regardless of the state of the User Preset Enable checkbox, the SYST:PRESet command will always preset the PNA to the factory preset settings, and SYST:UPReset will always perform a User Preset.

Learn more about User Preset.

Parameters	
<file>	String - Name of the file to be loaded. The default folder "C:\Program Files\Agilent\Network Analyzer\Documents" is used if unspecified. Change the default folder name using MMEMory:CDIRectory.
Examples	`SYST:UPR:LOAD '1MHzto20GHzUserPreset.cst'` `system:upreset:load 'C:\Documents and Settings\Administrator\My Documents\NewUserPreset.cst'`
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:UPReset:SAVE[:STATe]

(Write-only) Saves the current instrument settings as UserPreset.sta. Subsequent execution of SYSTem:UPReset will cause the PNA to assume this instrument state.

Regardless of the state of the User Preset Enable checkbox, the SYST:PRESet command will always preset the PNA to the factory preset settings, and SYST:UPReset will always perform a User Preset.

Learn more about User Preset.

Examples	`SYST:UPR:SAVE` `system:upreset:save:state`
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:SHORtcut<n>:ARGuments<string>

(Read-Write) Reads and writes the arguments for the specified macro. On the Edit Macro Dialog, this is called the "Macro run string parameters".

Parameters	
<n>	Numeric. Number of the macro that is stored in the PNA. To find the number of a macro, either open the Macro Setup dialog and count the line number of the desired macro, or query the titles of all 12 macros for the desired macro title.
<string>	Arguments for the specified macro.
Examples	`SYST:SHOR1:ARG "http://na.tm.agilent.com/pna/help/PNAWebHelp/help.htm"`
Query Syntax	SYSTem:SHORtcut<n>:ARGuments?
Default	Not Applicable

SYSTem:SHORtcut<n>:DELete

(Write-only) Removes the specified macro from the list of macros in the PNA. Does not delete the macro executable file.

Parameters

<n>	Numeric. Number of the macro that is stored in the PNA. To find the number of a macro, either open the Macro Setup dialog and count the line number of the desired macro, or query the titles of all 12 macros for the desired macro title.
Examples	`SYST:SHOR1:DEL`
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:SHORtcut<n>:EXECute

(Write-only) Executes (runs) the specified Macro (shortcut) that is stored in the PNA.

Parameters

<n>	Numeric. Number of the macro that is stored in the PNA. To find the number of a macro, either open the Macro Setup dialog and count the line number of the desired macro, or query the titles of all 12 macros for the desired macro title.
Examples	`SYST:SHOR1:EXEC`
Query Syntax	Not Applicable
Default	Not Applicable

SYSTem:SHORtcut<n>:PATH <string>

(Read-Write) Defines a Macro (shortcut) by linking a path and file name to the Macro number. To be executed, the executable file must be put in the PNA at the location indicated by this command.

Parameters	
<n>	Numeric. Number of the macro to be stored in the analyzer. If the index number already exists, the existing macro is replaced with the new macro.
<string>	Full path, file name, and extension, of the existing macro "executable" file. To find the number of a macro, either open the Macro Setup dialog and count the line number of the desired macro, or query the titles of all 12 macros for the desired macro title.
Examples	`SYST:SHOR1:PATH "C:\Program Files\Agilent\Network Analyzer\Documents\unguideMultiple.vbs"`
Query Syntax	SYSTem:SHORtcut<n>:PATH?
Default	Not Applicable

SYSTem:SHORtcut<n>:TITLe<string>

(Read-Write) Reads and writes the name of the specified macro.

Parameters	
<n>	Numeric. Number of the macro that is stored in the PNA. To find the number of a macro, either open the Macro Setup dialog and count the line number of the desired macro, or query the titles of all 12 macros for the desired macro title.
<string>	The name to be assigned to the macro.
Examples	`SYST:SHOR1:TITL "Guided 4-Port Cal"`
Query Syntax	SYSTem:SHORtcut<n>:TITLe?
Default	Not Applicable

SYSTem:TOUChscreen[:STATe] <bool>

(Read-Write) Enables and disables the **PNA-X** touchscreen.

This setting remains until changed again from the front-panel or remotely, or until the hard drive is changed or reformatted.

Parameters	
<bool>	Choose from: **True (1)** Enables the touchscreen. **False (0)** Disables the touchscreen.
Examples	`SYST:TOUC 1` `system:touchscreen:state false`
Query Syntax	SYSTem:TOUChscreen[:STATe]?
Return Type	Boolean
Default	**TRUE** when shipped from factory.

Last modified:

811-Feb-2008	Added Noise switch preference
5-Feb-2007	Added Extra security and USB power meter commands
February 23, 2007	MX Added touchscreen command
15-Nov-2006	MX Added Unleveled Error reporting
31-Oct-2006	Added PSRTrace command

Trigger Commands

Controls the starts or ends of data acquisition.

TRIGger:
AUX
| COUNt
CHANnel:AUX
| DELay
| DURation
| ENABle
| HANDshake
| INTerval
| IPOLarity
| OPOLarity
| POSition
| TYPE
DELay
PREFerence
| AIGLobal
ROUTe
| INPut
| READy
[SEQuence]
| LEVel
| SCOPe
| SOURce
TYPE

Click on a blue keyword to view the command details.

Red commands are superseded.

See Also

- **Example program** Triggering the PNA
- See other SCPI Triggering commands
- Learn about External / Aux Triggering
- Synchronizing the PNA and Controller
- SCPI Command Tree

TRIGger:AUX:COUNt?

(Read-only) Returns the number of AUX trigger input / output connector pairs in the instrument.

- PNA-X = **2**
- E836xB and PNA-L models = **1**

Parameters	
Examples	`TRIG:CHAN:AUX:COUN?` `trigger:channel2:aux:count?`
Return Type	Numeric
Default	Not Applicable

TRIGger:CHANnel<ch>:AUX<n>:DELay <num>

(Read-Write) Specifies the delay that should be applied by the PNA after the Aux trigger input is received and before the acquisition is made.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<n> Rear panel connectors used to send or receive signals.

- PNA-X - choose from **1** (AUX TRIG 1 IN) or **2** (AUX TRIG 2 IN)
- All other models: choose **1**.

If unspecified, value is set to 1**.**

<num> Delay value in seconds. Choose a value between 0 and 3.0 seconds.

Examples

```
TRIG:CHAN:AUX:DEL .5
trigger:channel2:aux2:delay 1.5
```

Query Syntax TRIGger:CHANnel<ch>:AUX<n>:DELay?

Return Type Numeric

Default 0

TRIGger:CHANnel<ch>:AUX<n>:DURation <num>

(Read-Write) Specifies the width of the output pulse, which is the time that the Aux trigger output will be asserted.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<n> Rear panel connector used to send or receive signals.

- PNA-X - choose from **1** (AUX TRIG 1) or **2** (AUX TRIG 2)
- All other models: choose **1**. (BNC Trig I/O

If unspecified, value is set to 1**.**

<num> Duration value in seconds. Choose a value between 1us (1E-6) and 1

Examples

```
TRIG:CHAN:AUX:DUR .1
trigger:channel2:aux2:duration .01
```

Query Syntax TRIGger:CHANnel<ch>:AUX<n>:DURation?

Return Type Numeric

Default 1E-6

TRIGger:CHANnel<ch>:AUX<n>[:ENABle] <bool>

(Read-Write) Turns ON / OFF the trigger output.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<n> Rear panel connector used to send or receive signals.

- PNA-X - choose from **1** (AUX TRIG 1) or **2** (AUX TRIG 2)
- All other models: choose **1**. (BNC Trig I/O

If unspecified, value is set to 1**.**

<bool> **ON** (or 1) - turns trigger output ON.

OFF (or 0) - turns trigger output OFF.

Examples

```
TRIG:CHAN:AUX 1

trigger:channel2:aux2:enable off
```

Query Syntax TRIGger:CHANnel<ch>:AUX<n>:[ENABle]?

Return Type Boolean

Default OFF

TRIGger:CHANnel<ch>:AUX<n>:HANDshake <bool>

(Read-Write) Turns handshake ON / OFF.

To enable handshake, the main trigger enable must also be set using TRIG:CHAN:AUX:ENAB.

When ON, PNA waits indefinitely for the input line to be asserted before continuing with the acquisition. When OFF, the PNA acquires data without waiting.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	Rear panel connector used to send or receive signals. • PNA-X - choose from **1** (AUX TRIG 1) or **2** (AUX TRIG 2) • All other models: choose **1**. (BNC Trig I/O If unspecified, value is set to 1**.**
<bool>	**ON** (or 1) - turns handshaking ON. **OFF** (or 0) - turns handshaking OFF.
Examples	`TRIG:CHAN:AUX:HAND 1` `trigger:channel2:aux2:handshake off`
Query Syntax	TRIGger:CHANnel<ch>:AUX<n>:HANDshake?
Return Type	Boolean
Default	OFF

TRIGger:CHANnel<ch>:AUX<n>:INTerval <char>

(Read-Write) Specifies how often a trigger output signal is sent.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<n> Rear panel connector used to send or receive signals.

- PNA-X - choose from **1** (AUX TRIG 1) or **2** (AUX TRIG 2)
- All other models: choose **1**. (BNC Trig I/O

If unspecified, value is set to 1.

<char> Choose from:

- **POINt** Trigger signal is sent every data point. (effectively the same as Point sweep)
- **SWEep** Trigger signal is sent once every sweep.

Examples

```
TRIG:CHAN:AUX:INT POI
trigger:channel2:aux2:interval sweep
```

Query Syntax TRIGger:CHANnel<ch>:AUX<n>:INTerval?

Return Type Character

Default SWEep

TRIGger:CHANnel<ch>:AUX<n>:IPOLarity <char>

(Read-Write) Specifies the polarity of the trigger IN signal to which the PNA will respond.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<n> Rear panel connector used to send or receive signals.

- PNA-X - choose from **1** (AUX TRIG 1) or **2** (AUX TRIG 2)
- All other models: choose **1**. (BNC Trig I/O

If unspecified, value is set to 1.

<char> Choose from:

- **POSitive** PNA responds to leading edge or HIGH level

- **NEGative** PNA responds to trailing edge or LOW level.

Set Edge or Level triggering using TRIG:CHAN:AUX:TYPE

Examples

```
TRIG:CHAN:AUX:IPOL POS

trigger:channel2:aux2:ipolarity negative
```

Query Syntax TRIGger:CHANnel<ch>:AUX<n>:IPOLarity?

Return Type Character

Default NEGative

TRIGger:CHANnel<ch>:AUX<n>:OPOLarity <char>

(Read-Write) Specifies the polarity of the Aux Output signal being supplied by the PNA.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<n> Rear panel connector used to send or receive signals.

- PNA-X - choose from **1** (AUX TRIG 1) or **2** (AUX TRIG 2)
- All other models: choose **1**. (BNC Trig I/O

If unspecified, value is set to 1**.**

<char> Choose from:

- **POSitive** PNA sends positive going pulse.
- **NEGative** PNA sends negative going pulse.

Examples

```
TRIG:CHAN:AUX:OPOL NEG

trigger:channel2:aux2:opolarity positive
```

Query Syntax TRIGger:CHANnel<ch>:AUX<n>:OPOLarity?

Return Type Character

Default NEGative

TRIGger:CHANnel<ch>:AUX<n>:POSition <char>

(Read-Write) Specifies whether the aux trigger out signal is sent BEFore or AFTer the acquisition.

Parameters	
<ch>	Any existing channel number. If unspecified, value is set to 1.
<n>	Rear panel connector used to send or receive signals. • PNA-X - choose from **1** (AUX TRIG 1) or **2** (AUX TRIG 2) • All other models: choose **1**. (BNC Trig I/O If unspecified, value is set to 1**.**
<char>	Choose from: • **BEFore** Use if the external device needs to be triggered before the data is acquired, such as a power meter. • **AFTer** Use if the external device needs to be triggered just after data has been acquired, such as an external source. This could be more efficient since it allows the external device to get ready for the next acquisition at the same time as the PNA.
Examples	`TRIG:CHAN:AUX:POS BEF` `trigger:channel2:aux2:position after`
Query Syntax	TRIGger:CHANnel<ch>:AUX<n>:POSition?
Return Type	Character
Default	AFTer

TRIGger:CHANnel<ch>:AUX<n>:TYPE <char>

(Read-Write) Specifies the type of Aux input detection that the PNA will employ.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<n> Rear panel connector used to send or receive signals.

- PNA-X - choose from **1** (AUX TRIG 1) or **2** (AUX TRIG 2)
- All other models: choose **1**. (BNC Trig I/O

If unspecified, value is set to 1**.**

<char> Choose from:

EDGE PNA responds to the leading edge of a signal

LEVel PNA responds to the level (HIGH or LOW) of a signal

Examples

```
TRIG:CHAN:AUX:TYPE EDGE

trigger:channel2:aux2:type level
```

Query Syntax TRIGger:CHANnel<ch>:AUX<n>:TYPE?

Return Type Character

Default EDGE

TRIGger:DELay <num>

(Read-Write) Sets and reads the trigger delay. This delay is only applied while in External Trigger mode. After an external trigger is applied, the start of the sweep is held off for an amount of time equal to the delay setting plus any inherent latency.

Parameters

<num> Delay value in seconds. Choose from 0 to 107.

Examples

```
TRIG:DEL .0003

Sets the trigger delay to 300 microseconds. The sweep will not
start until approximately 300 microseconds after an external
trigger is applied.
```

Query Syntax TRIGger:DELay?

Return Type Numeric

Default 0

TRIGger:CHANnel<ch>:ROUTe:INPut <char>

(Read-Write) Specifies the connector to use for the external trigger input.(Similar to CONTROL:SIGNal <conn>)

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<char>	Choose from: **MAIN** - meas trig ready **MATH** - material handler **AUXT** - auxio (PNA-L and E836xB ONLY)
Examples	`TRIG:CHAN:ROUT:INP MAIN` `trigger:channel2:route:input main`
Query Syntax	TRIGger:CHANnel<ch>:ROUTe:INPut?
Return Type	Character
Default	

TRIGger:CHANnel<ch>:ROUTe:READy <char>

(Read-Write) Specifies the connector to use for the external trigger OUT ready line.

Parameters

<ch>	Any existing channel number. If unspecified, value is set to 1.
<char>	Choose from: **MAIN** - Meas trig ready **MATH** - Material handler pin 21 **AUXT** - AUX I/O pin 18 (PNA-L and E836xB ONLY)
Examples	`TRIG:CHAN:ROUT:READ main` `trigger:channel2:route:ready auxt`
Query Syntax	TRIGger:CHANnel<ch>:ROUTe:READy?
Return Type	Character
Default	

TRIGger:PREFerence:AIGLobal <bool>

(Read-Write) Sets the Trigger OUT behavior to either Global or Channel. Learn more about this setting.

This command will cause the PNA to Preset.

This setting remains until changed again using this command, or until the hard drive is changed or reformatted.

To send this command using the PNA front panel, open the GPIB Command Processor Console, then type either of the following examples at the command prompt. Then type the Query Syntax and press enter to be sure the PNA took the command.

Parameters

<bool> Choose from:

- **ON** (or 1) - Trigger properties apply to ALL channels (Global).
  - Allows use of CONT:SIGNal command to configure the external trigger properties.
  - "Per Point" trigger property is not settable. Use the channel's Point trigger setting.
  - Default setting for E836xB and PNA-L models.
- **OFF** (or 0) - External Trigger properties apply to each channel independently.
  - Must use TRIG:CHAN:AUX commands to configure the external trigger properties. CONT:SIGNal will NOT work.
  - "Per Point" trigger output property is set using the channel's Point trigger setting **AND** TRIG:CHAN:AUX:INTerval.
  - Default setting for PNA-X models.

Examples

```
TRIG:PREF:AIGL 1
trigger:preference:aiglobal 0
```

Query Syntax TRIGger:PREFerence:AIGLobal?

Return Type Boolean

Default **1** - E836xB and PNA-L models

0 - PNA-X models

TRIGger[:SEQuence]:LEVel <char> - Superseded

This command is replaced with CONTrol:SIGNal

(Read-Write) Triggers either on a **High or Low** level trigger signal. This setting only has an effect when TRIG:SOURce EXTernal is selected.

Parameters

<char> Choose from:

- **HIGH -** analyzer triggers on TTL **High**
- **LOW -** analyzer triggers on TTL **Low**

Examples

```
TRIG:LEV HIGH
trigger:sequence:level low
```

Query Syntax TRIGger[:SEQuence]:LEVel?

Return Type Character

Default LOW

TRIGger[:SEQuence]:SCOPe <char>

(Read-Write) Specifies whether a trigger signal is sent to all channels or only the current channel.

See Triggering the PNA using SCPI.

Parameters

<char> Choose from:

- **ALL -** trigger signal is sent to all channels. Also sets SENS:SWEep:TRIG:POINt OFF on **ALL** channels.
- **CURRent -** trigger signal is sent to only one channel at a time. With each trigger signal, the channel is incremented to the next triggerable channel.

Examples

```
TRIG:SCOP ALL
trigger:sequence:scope current
```

Query Syntax TRIGger[:SEQuence]:SCOPe?

Return Type Character

Default ALL

TRIGger[:SEQuence]:SOURce <char>

(Read-Write) Sets the source of the sweep trigger signal. This command is a super-set of INITiate:CONTinuous, which can NOT set the source to External. To configure external triggering, see CONTrol:SIGNal.

See Triggering the PNA using SCPI.

Parameters

<char> Choose from:

- **EXTernal -** external (rear panel) source.
- **IMMediate** - internal source sends continuous trigger signals
- **MANual -** sends one trigger signal when manually triggered from the front panel or INIT:IMM is sent.

Examples

```
TRIG:SOUR EXT
trigger:sequence:source immediate
```

Query Syntax TRIGger[:SEQuence]:SOURce?

Return Type Character

Default IMMediate

TRIGger:TYPE <char>

(Read-Write) Specifies the type of EXTERNAL trigger input detection used to listen for signals on the Ext I/O Trig and Meas Trig IN connectors. Edge triggers are most commonly used.

Parameters

<ch> Any existing channel number. If unspecified, value is set to 1.

<char> Choose from:

EDGE PNA responds to the rising and falling edge of a signal

LEVel PNA responds to a level (HIGH or LOW).

Examples

```
TRIG:TYPE EDGE

trigger:type level
```

Query Syntax TRIGger:TYPE?

Return Type Character

Default EDGE

Last modified:

22-Feb-2008	Clarified AIGL command
24-Apr-2007	Clarified trigger source and scope
15-Feb-2007	MX Updated for AUX triggering

Catalog Measurements using SCPI

This Visual Basic Program does the following:

- Catalogs the currently defined measurements, windows, and traces
- Selects a measurement for further definition
- Adds a Title to the window

To run this program, you need:

- An established GPIB interface connection

See Other SCPI Example Programs

```
Dim Meas as String
Dim Win as String
Dim Trace as String

'Read the current measurements in Channel 1
GPIB.Write "CALCulate1:PARameter:CATalog?"
Meas = GPIB.Read
MsgBox ("Ch1 Measurments: " & Meas)

'Read the current windows
GPIB.Write "DISPlay:CATalog?"
Win = GPIB.Read
MsgBox ("Windows: " & Win)

'Read current traces in window 1
GPIB.Write "DISPlay:WINDow1:CATalog?"
Trace = GPIB.Read
MsgBox ("Traces in Window1: " & Win)
```

Create an FOM Measurement

All three VBScript examples in this topic create a FOM measurement with the following attributes:

- Sweep the Source (input) from 1 GHz to 2 GHz
- Sweep the Receivers (output) from 2 GHz to 3 GHz
- You provide an LO at 1 GHz

Learn more about Frequency Offset Mode

These programs can be run as a macro in the PNA. To do this, copy the code into a text editor file such as Notepad and save on the PNA hard drive as FOM.vbs. Learn how to setup and run the macro.

See Other SCPI Example Programs

The following example will run on any PNA model with FOM (opt 080). However, these commands have no provisions for internal second source. It uses Sens:Offset commands introduced before 'enhanced FOM' was released for the A.07.10 release.

```
' This section gets the PNA application
' starts the scpi parser, and presets the PNA
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
scpi.Execute("SYST:FPRESET")
' Create and turn on window 1
scpi.Execute ("DISPlay:WINDow1:STATE ON")
'Define a measurement name, parameter
scpi.Execute ("CALCulate:PARameter:DEFine 'MyMeas',S21")
'Associate ("FEED") the measurement name ('MyMeas') to WINDow (1)
'and give the new TRACe a number (1).
scpi.Execute ("DISPlay:WINDow1:TRACe1:FEED 'MyMeas'")

scpi.Execute ("SENS:FREQ:START 1e9")
scpi.Execute ("SENS:FREQ:STOP 2e9")
'set the receivers to be 2e9 -> 3e9
scpi.Execute ("SENS:OFFS:OFFS 1e9")
scpi.Execute ("SENS:OFFS ON")
```

The following example can be run ONLY on a PNA with revision A.07.10 or later and has FOM (opt 080). It uses new Sens:FOM commands.

```
' This section gets the PNA application
' starts the scpi parser, and presets the PNA
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
scpi.Execute("SYST:FPRESET")
' Create and turn on window 1
scpi.Execute ("DISPlay:WINDow1:STATE ON")
'Define a measurement name, parameter
scpi.Execute ("CALCulate:PARameter:DEFine 'MyMeas',S21")
'Associate ("FEED") the measurement name ('MyMeas') to WINDow (1), and give the
new TRACe a number (1).
scpi.Execute ("DISPlay:WINDow1:TRACe1:FEED 'MyMeas'")


scpi.Execute("SENS:FREQ:START 1e9")
scpi.Execute("SENS:FREQ:STOP 2e9")
'set the receivers to be 2e9 -> 3e9
scpi.Execute("SENS:FOM:RANG3:FREQ:OFFS 1e9")
scpi.Execute("SENS:OFFS ON")
```

The following example can be run ONLY on a PNA with a second internal source, has revision A.07.10 or later, and has FOM (opt 080). It uses the internal 2nd source for the fixed LO frequency.

```
' This section gets the PNA application
' starts the scpi parser, and presets the PNA
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
scpi.Execute("SYST:FPRESET")
' Create and turn on window 1
scpi.Execute ("DISPlay:WINDow1:STATE ON")
'Define a measurement name, parameter
scpi.Execute ("CALCulate:PARameter:DEFine 'MyMeas',S21")
'Associate ("FEED") the measurement name ('MyMeas') to WINDow (1)
'and give the new TRACe a number (1).
scpi.Execute ("DISPlay:WINDow1:TRACe1:FEED 'MyMeas'")
```

```
scpi.Execute ("SENS:FREQ:START 1e9")
scpi.Execute ("SENS:FREQ:STOP 2e9")
'set the receivers to be 2e9 -> 3e9
scpi.Execute ("SENS:FOM:RANG3:FREQ:OFFS 1e9")
'setup the 2nd source frequencies
scpi.Execute ("SENS:FOM:RANG4:COUP 0")
scpi.Execute ("SENS:FOM:RANG4:FREQ:START 1e9")
scpi.Execute ("SENS:FOM:RANG4:FREQ:STOP 1e9")
'turn off coupling
scpi.Execute ("SOUR:POW:COUP 0")
'set LO power to 10dBm
scpi.Execute ("SOUR:POW3 10")
'turn ON port 3, our LO signal
scpi.Execute ("SOUR:POW3:MODE ON")
scpi.Execute ("SENS:FOM:STAT ON")
```

Last Modified:

9-Oct-2007 MX New topic

Create a Measurement using SCPI

This VBScript program creates a new S21 measurement and displays it on the PNA screen.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as NewMeas.vbs. Learn how to setup and run the macro.

See Other SCPI Example Programs

```
Dim app
Dim scpi
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser

' A comment
'Preset the analyzer
scpi.Execute ("SYST:FPReset")
' Create and turn on window 1
scpi.Execute ("DISPlay:WINDow1:STATE ON")
'Define a measurement name, parameter
scpi.Execute ("CALCulate:PARameter:DEFine 'MyMeas',S21")
'Associate ("FEED") the measurement name ('MyMeas') to WINDow (1), and give the new
TRACe a number (1).
scpi.Execute ("DISPlay:WINDow1:TRACe1:FEED 'MyMeas'")
```

Create a Balanced Measurement using SCPI

This example program does the following:

- creates several Balanced measurements in separate windows
- generates markers
- calculates statistics
- sets limit lines and queries results
- queries a measurement to determine if we have a balanced parameter and what type it is.

Note: By their nature, balanced measurements are extremely sensitive to phase differences between the two RF paths that make up the balanced port, especially at higher frequencies. A good calibration (not performed in this example) is critical to achieving good balanced measurement results.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Balanced.vbs. Learn how to setup and run the macro.

See Other SCPI Example Programs

```
Dim app
Dim scpi
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
' A comment
scpi.Parse("SYST:FPRESET")
' Put in "Single" trigger mode.
scpi.Parse("SENS:SWE:GROups:COUNt 1")
scpi.Parse("SENS:SWE:MODE GROUPS")

' This example uses DUT topology Bal-Bal -
' a DUT with a balanced input and balanced output.
'
' Port mapping for our DUT:
' logical port 1 = physical ports 1 and 4
' logical port 2 = physical ports 2 and 3
' The default is:
' logical port 1 = physical ports 1 and 2
' logical port 2 = physical ports 3 and 4
'
'  logical 1             logical 2
'          ___________
' 1 ------|           |------ 2 +
'         |    DUT    |
' 4 ------|___________|------ 3 -
```

```
scpi.Parse("CALC:FSIM:BAL:DEVice BBALanced")
scpi.Parse("CALC:FSIM:BAL:TOPology:BBAL:PPORts 1,4,2,3")
' Set up stimulus
scpi.Parse("SENS:SWE:POINts 801")
scpi.Parse("SENS:FREQ:STARt 10e6")
scpi.Parse("SENS:FREQ:STOP  1e9")
' Turn on Four windows
scpi.Parse("DISP:WIND1:STATe ON")
scpi.Parse("DISP:WIND2:STATe ON")
scpi.Parse("DISP:WIND3:STATe ON")
scpi.Parse("DISP:WIND4:STATe ON")
' Create a trace called "sdd21", and for that trace turn on the balanced
' transformation and set the balanced transformation to BBAL SDD21.
scpi.Parse("CALC:PAR:DEF ""sdd21"",S11")
scpi.Parse("CALC:PAR:SEL ""sdd21""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SDD21")
' Feed the sdd21 trace to window 1, trace 1
scpi.Parse("DISP:WIND1:TRAC1:FEED ""sdd21""")
' Similarly create 3 more balanced transmission/conversion parameters
' Create Scd21
scpi.Parse("CALC:PAR:DEF ""scd21"",S11")
scpi.Parse("CALC:PAR:SEL ""scd21""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SCD21")
scpi.Parse("DISP:WIND1:TRAC2:FEED ""scd21""")
' Create Sdc21
scpi.Parse("CALC:PAR:DEF ""sdc21"",S11")
scpi.Parse("CALC:PAR:SEL ""sdc21""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SDC21")
scpi.Parse("DISP:WIND1:TRAC3:FEED ""sdc21""")
' Create Scc21
scpi.Parse("CALC:PAR:DEF ""scc21"",S11")
scpi.Parse("CALC:PAR:SEL ""scc21""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SCC21")
scpi.Parse("DISP:WIND1:TRAC4:FEED ""scc21""")
' Now create logical port 1 reflection parameters, and place them in window 2
scpi.Parse("CALC:PAR:DEF ""sdd11"",S11")
scpi.Parse("CALC:PAR:SEL ""sdd11""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SDD11")
' Feed the sdd11 trace to window 2, trace 1
scpi.Parse("DISP:WIND2:TRAC1:FEED ""sdd11""")
' Similarly create 3 more balanced reflection/conversion parameters
scpi.Parse("CALC:PAR:DEF ""scd11"",S11")
scpi.Parse("CALC:PAR:SEL ""scd11""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SCD11")
scpi.Parse("DISP:WIND2:TRAC2:FEED ""scd11""")
scpi.Parse("CALC:PAR:DEF ""sdc11"",S11")
```

```
scpi.Parse("CALC:PAR:SEL ""sdc11""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SDC11")
scpi.Parse("DISP:WIND2:TRAC3:FEED ""sdc11""")
scpi.Parse("CALC:PAR:DEF ""scc11"",S11")
scpi.Parse("CALC:PAR:SEL ""scc11""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SCC11")
scpi.Parse("DISP:WIND2:TRAC4:FEED ""scc11""")
' Now create reverse transmission parameters, and place them in window 3
scpi.Parse("CALC:PAR:DEF ""sdd12"",S11")
scpi.Parse("CALC:PAR:SEL ""sdd12""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SDD12")
' Feed the sdd11 trace to window 3, trace 1
scpi.Parse("DISP:WIND3:TRAC1:FEED ""sdd12""")
' Similarly create 3 more balanced reverse transmission/conversion parameters
scpi.Parse("CALC:PAR:DEF ""scd12"",S11")
scpi.Parse("CALC:PAR:SEL ""scd12""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SCD12")
scpi.Parse("DISP:WIND3:TRAC2:FEED ""scd12""")
scpi.Parse("CALC:PAR:DEF ""sdc12"",S11")
scpi.Parse("CALC:PAR:SEL ""sdc12""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SDC12")
scpi.Parse("DISP:WIND3:TRAC3:FEED ""sdc12""")
scpi.Parse("CALC:PAR:DEF ""scc12"",S11")
scpi.Parse("CALC:PAR:SEL ""scc12""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SCC12")
scpi.Parse("DISP:WIND3:TRAC4:FEED ""scc12""")
' Now create reverse reflection parameters, and place them in window 4
scpi.Parse("CALC:PAR:DEF ""sdd22"",S11")
scpi.Parse("CALC:PAR:SEL ""sdd22""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SDD22")
' Feed the sdd11 trace to window 3, trace 1
scpi.Parse("DISP:WIND4:TRAC1:FEED ""sdd22""")
' Similarly create 3 more balanced reverse reflection parameters
scpi.Parse("CALC:PAR:DEF ""scd22"",S11")
scpi.Parse("CALC:PAR:SEL ""scd22""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SCD22")
scpi.Parse("DISP:WIND4:TRAC2:FEED ""scd22""")
scpi.Parse("CALC:PAR:DEF ""sdc22"",S11")
scpi.Parse("CALC:PAR:SEL ""sdc22""")
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SDC22")
scpi.Parse("DISP:WIND4:TRAC3:FEED ""sdc22""")
scpi.Parse("CALC:PAR:DEF ""scc22"",S11")
scpi.Parse("CALC:PAR:SEL ""scc22""")
```

```
scpi.Parse("CALC:FSIM:BAL:PAR:STATe ON")
scpi.Parse("CALC:FSIM:BAL:PAR:BBAL:DEF SCC22")
scpi.Parse("DISP:WIND4:TRAC4:FEED ""scc22""")
' Show statistics for forward differential transmission
scpi.Parse("CALC:PAR:SEL ""sdd21""")
scpi.Parse("CALC:FUNC:STATistics:STATe ON")
' Set up test range for markers.  Set up range 1 to be between 100MHz and 900MHz
scpi.Parse("CALC:FUNC:DOMain:USER:STARt 1,100e6")
scpi.Parse("CALC:FUNC:DOMain:USER:STOP  1,900e6")
' Set up a marker on Sdd21, find minimum differential transmission
' Set this marker to use user-range 1 (previously defined)
scpi.Parse("CALC:PAR:SEL ""sdd21""")
scpi.Parse("CALC:MARK ON")
scpi.Parse("CALC:MARK:FUNC:DOM:USER:RANGE 1")
scpi.Parse("CALC:MARK:FUNC:EXEC MIN")
' Find Maximum common mode to differential mode conversion within user-range 1.
scpi.Parse("CALC:PAR:SEL ""sdc21""")
scpi.Parse("CALC:MARK ON")
scpi.Parse("CALC:MARK:FUNC:DOM:USER:RANGE 1")
scpi.Parse("CALC:MARK:FUNC:EXEC MAX")
' Set up limit lines
' 'MIN' Limit on Sdd21 between 100MHz and 900MHz at -2dB
scpi.Parse("CALC:PAR:SEL ""sdd21""")
scpi.Parse("CALC:LIM:SEGM:TYPE LMIN")
scpi.Parse("CALC:LIM:SEGM:STIM:STARt 100e6")
scpi.Parse("CALC:LIM:SEGM:STIM:STOP  900e6")
scpi.Parse("CALC:LIM:SEGM:AMPL:STARt -2")
scpi.Parse("CALC:LIM:SEGM:AMPL:STOP  -2")
scpi.Parse("CALC:LIM:DISP:STATe ON")
scpi.Parse("CALC:LIM:STATe ON")
' 'MAX' Limit on Sdc21 between 100MHz and 900MHz at -20dB
scpi.Parse("CALC:PAR:SEL ""sdc21""")
scpi.Parse("CALC:LIM:SEGM:TYPE LMAX")
scpi.Parse("CALC:LIM:SEGM:STIM:STARt 100e6")
scpi.Parse("CALC:LIM:SEGM:STIM:STOP  900e6")
scpi.Parse("CALC:LIM:SEGM:AMPL:STARt -20")
scpi.Parse("CALC:LIM:SEGM:AMPL:STOP  -20")
scpi.Parse("CALC:LIM:DISP:STATe ON")
scpi.Parse("CALC:LIM:STATe ON")
' "Single" trigger to take data.
scpi.Parse("SENS:SWE:MODE GROUPS")
response = scpi.Parse("*OPC?")
' Read the limit status byte to determine pass/fail.
' If bit 1 is set (+2), then our first measurement failed (Sdd21).
' If bit 3 is set (+8), then our third measurement failed (Sdc21).
' Both measurements failing would return +10.
response = scpi.Parse("STAT:QUES:LIM1:COND?")
If response <> 0 Then
Wscript.Echo "Failure of limit lines: " & response
End If

' Here we demonstrate how to determine if we have
```

```
' a balanced parameter and what type it is.
' Read back one parameter to verify its type
scpi.Parse("CALC:PAR:SEL ""sdd21""")
' Is this a balanced parameter?
isbal = scpi.Parse("CALC:FSIM:BAL:PAR?")
' Which topology/device is set?
device = scpi.Parse("CALC:FSIM:BAL:DEV?")
device = Left( device, Len(device)-1 ) ' strip off newline
' Which parameter are we measuring within that topology?
balparam = scpi.Parse("CALC:FSIM:BAL:PAR:" & device & ":DEF?")
balparam = Left( balparam, Len(balparam)-1 ) ' strip off newline
If isbal Then
WScript.Echo "Balanced Parameter: " & balparam & " in topology: " & device & "."
Else
WScript.Echo "Parameter not balanced."
End If
```

Channels, Windows, and Measurements using SCPI

SOURce and most SENSe commands act on the **channel** that is specified in the command. Channel 1 is default if not specified.

Most **DISPlay** commands act on the **window and trace** specified in the command. Window1 and Trace1 are default if not specified.

CALCulate commands act on the **selected measurement** in the specified channel. Select the measurement for each channel using CALCulate<channel number>:PARameter:SELect <meas name>. You can select one measurement in each channel.

The following Visual Basic program does the following:

- Presets the analyzer
- Create 2 windows
- Create 2 Measurements
- Feed the measurements to windows / traces
- Change frequency ranges for channels
- Select both measurements
- Turn marker 1 ON for each measurement

To run this program, you need:

- An established GPIB interface connection

See Other SCPI Example Programs

```
GPIB.Write "SYSTem:PRESet"

'Create Measurements
GPIB.Write "CALCulate1:PARameter:DEFine 'Meas1',S11"
GPIB.Write "CALCulate2:PARameter:DEFine 'Meas2',S21"

' Turn on windows - creates if new
GPIB.Write "DISPlay:WINDow1:STATE ON"
GPIB.Write "DISPlay:WINDow2:STATE ON"

'Associate ("FEED") the measurement name('Meas1') to WINDow(1), and give the new
TRACe a number(1).
GPIB.Write "DISPlay:WINDow1:TRACe1:FEED 'Meas1'"
GPIB.Write "DISPlay:WINDow2:TRACe2:FEED 'Meas2'"

'Change each channel's frequency range
GPIB.Write "SENSe1:FREQuency:SPAN 1e9"
GPIB.Write "SENSe2:FREQuency:SPAN 2e9"
```

```
'Select both measurements
GPIB.Write "CALCulate1:PARameter:SELect 'Meas1'"
GPIB.Write "CALCulate2:PARameter:SELect 'Meas2'"

'Turn marker 1 ON for each measurement
GPIB.Write "CALCulate1:MARKer:STATe ON"
GPIB.Write "CALCulate2:MARKer:STATE ON"
```

Setup Sweep Parameters using SCPI

This Visual Basic program sets up sweep parameters on the Channel 1 measurement.
To run this program, you need:

- An established GPIB interface connection

See Other SCPI Example Programs

```
GPIB.Write "SYSTem:PRESet"
'Select the measurement
GPIB.Write "CALCulate:PARameter:SELect 'CH1_S11_1'"
'Set sweep type to linear
GPIB.Write "SENSe1:SWEep:TYPE LIN"

'Set IF Bandwidth to 700 Hz
GPIB.Write "SENSe1:BANDwidth 700"

'Set Center and Span Freq's to 4 GHz
GPIB.Write "SENSe1:FREQuency:CENTer 4ghz"
GPIB.Write "SENSe1:FREQuency:SPAN 4ghz"

'Set number of points to 801
GPIB.Write "SENSe1:SWEep:POINts 801"

'Set sweep generation mode to Analog
GPIB.Write "SENSe1:SWEep:GENeration ANAL"

'Set sweep time to Automatic
GPIB.Write "SENSe1:SWEep:TIME:AUTO ON"

'Query the sweep time
GPIB.Write "SENSe1:SWEep:TIME?
SweepTime = GPIB.Read
```

Setup the Display using SCPI

This Visual Basic program:

- Sets data formatting
- Turns ON the Trace, Title, and Frequency Annotation
- Autoscales the Trace
- Queries Per Division, Reference Level, and Reference Position
- Turn ON and set averaging
- Turn ON and set smoothing

To run this program, you need:

- An established GPIB interface connection

See Other SCPI Example Programs

```
GPIB.Write "SYSTem:PRESet"

'Select the measurement
GPIB.Write "CALCulate:PARameter:SELect 'CH1_S11_1'"

'Set the Data Format to Log Mag
GPIB.Write ":CALCulate1:FORMat MLOG"

'Turn ON the Trace, Title, and Frequency Annotation
GPIB.Write "Display:WINDow1:TRACe1:STATe ON"
GPIB.Write "DISPlay:WINDow1:TITLe:STATe ON"
GPIB.Write "DISPlay:ANNotation:FREQuency ON"

'Autoscale the Trace
GPIB.Write "Display:WINDow1:TRACe1:Y:Scale:AUTO"

'Query back the Per Division, Reference Level, and Reference Position
GPIB.Write "DISPlay:WINDow1:TRACe1:Y:SCALe:PDIVision?"
Pdiv = GPIB.Read
GPIB.Write "DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel?"
Rlev = GPIB.Read
GPIB.Write "DISPlay:WINDow1:TRACe1:Y:SCALe:RPOSition?"
Ppos = GPIB.Read

'Turn ON, and average five sweeps
GPIB.Write "SENSe1:AVERage:STATe ON"
GPIB.Write "SENSe1:AVERage:Count 5"

'Turn ON, and set 20% smoothing aperture
GPIB.Write "CALCulate1:SMOothing:STATe ON"
```

```
GPIB.Write "CALCulate1:SMOothing:APERture 20"
```

Triggering the PNA using SCPI

To understand how to trigger the PNA using SCPI, it is very important to understand the PNA trigger model. Here is a very simple explanation. These three separate functions control PNA triggering:

1. Trigger:Source - Where the trigger signals originate:
    - Internal Continuous
    - Internal Manual (Single)
    - External - a trigger source that is connected to the PNA rear panel.
2. Trigger:Scope - what gets triggered:
    - Global - each signal triggers all channels in turn.
    - Channel - each signal triggers ONE channel.
3. Channel settings (Sense<ch>:Sweep:Mode) How many triggers will each channel accept before going into hold.
    - HOLD - channel will not trigger.
    - CONTinuous - channel triggers indefinitely.
    - GROups - channel accepts the number of triggers specified with the last SENS:SWE:GRO:COUN <num>.
    - **SINGle** - channel accepts ONE trigger, then goes to HOLD.
    - Point trigger SENS1:SWE:TRIG:POINt

When controlling the PNA using SCPI, a SINGLE trigger is used to ensure that a complete sweep is taken. This example demonstrates how to Single trigger the PNA using two methods.

- **Simplest Triggering** This method sets the Trigger Source to Internal Continuous - a stream of trigger signals. Each channel is configured to ACCEPT only a single trigger signal, then HOLD. This method can also be used when an External trigger source sends a continuous stream of trigger signals.
- **Advanced Triggering** This method SENDS a single trigger from the Source, either Internal (using INIT:IMM) or External triggering. Each channel is configured to accept an unlimited number of triggers. This method is the only way to perform point triggering. See INIT:IMM Advanced for details when requiring multiple channels to accept continuous and single triggers.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Trigger.vbs. Learn how to setup and run the macro.

Measurement setup example: sets up S11 traces on two channels, 10 points, sweep time of 2 seconds, which allows us to verify that the trace is being triggered.

```
Dim app
Dim scpi
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
'============================================
'Setup the PNA
'Preset the analyzer
scpi.Execute ("SYST:FPReset")
' Create and turn on window/channel 1
scpi.Execute ("DISPlay:WINDow1:STATE ON")
'Define a measurement name, parameter
scpi.Execute ("CALCulate1:PARameter:DEFine 'MyMeas1',S11")
'Associate ("FEED") the measurement name ('MyMeas') to WINDow (1)
scpi.Execute ("DISPlay:WINDow1:TRACe1:FEED 'MyMeas1'")
' Create and turn on window/channel 2
scpi.Execute ("DISPlay:WINDow2:STATE ON")
'Define a measurement name, parameter
scpi.Execute ("CALCulate2:PARameter:DEFine 'MyMeas2',S11")
'Associate ("FEED") the measurement name ('MyMeas') to WINDow (2)
scpi.Execute ("DISPlay:WINDow2:TRACe2:FEED 'MyMeas2'")
'Set slow sweep so we can see
scpi.Execute ("SENS1:SWE:TIME 2")
scpi.Execute ("SENS2:SWE:TIME 2")
'set number of points to 10
scpi.Execute ("SENS1:SWE:POIN 10")
scpi.Execute ("SENS2:SWE:POIN 10")
'============================================
' Put both channels in Hold
scpi.Execute ("SENS1:SWE:MODE HOLD")
scpi.Execute ("SENS2:SWE:MODE HOLD")
'================================
```

```
'Pick Single Send or Single Accept
resp=Msgbox ("Single Send? - Click No for Single Accept", 4, "PNA Trigger Demo")
If resp=6 Then
SingleSend()
Else
SingleAccept()
End If
```

Simple Triggering The following example sends a continuous stream of trigger signals and each PNA channel is set to ACCEPT only a signal trigger signal, then HOLD.

- This example can be used to configure External triggering where the trigger source sends a continuous stream of trigger signals. Configure the type of trigger signal that the PNA responds to using the CONTrol:SIGNal command. The command in this example sets the PNA to respond to HIGH TTL signals at the rear-panel BNC1 trigger IN connector. This command also automatically sets Trigger Source to External Trigger.
- The TRIG SCOPE (Global or Channel) setting is NOT necessary with a continuous stream of trigger signals. The example program directly controls when each channel is triggered.
- Point triggering can NOT be used with a continuous stream of trigger signals because in point triggering the channel will accept as many triggers as necessary to complete ONE full sweep. Use the single SEND example for point triggering.

```
Sub SingleAccept()
'PNA sends continuous trigger signals
scpi.Execute ("TRIG:SOUR IMMediate")
'Uncomment the following to set External triggering
'scpi.Execute ("CONT:SIGN BNC1,TILHIGH")
AcceptOne()
End Sub

Sub AcceptOne()
'The following command makes the channel immediately sweep
'*OPC? allows the measurement to complete before the controller sends another
command
scpi.Execute ("SENS1:SWE:MODE SINGle;*OPC?")
' You could do something to ch2 here before sweeping it
scpi.Execute ("SENS2:SWE:MODE SINGle;*OPC?")
```

```
resp=Msgbox ("Another trigger?", 1, "PNA Trigger Demo")
If resp=1 Then
AcceptOne()
End If
End Sub
```

Advanced Trigger This example section performs Single Send triggering. Here, single triggering is accomplished by SENDING one trigger signal from the Trigger source and each channel is setup to accept unlimited trigger signals. See the INIT:IMM command for more details.

- Using this method, it is possible to change Trigger:Scope to Global or Channel. Set trigger scope to channel if there is some code to execute between channel measurements. Similarly, this method can be used to set Point triggering. Use this method if there is some code to execute between data point measurements.
- In addition, this method can also be used to perform External triggering if the external trigger source is capable of SENDING single triggers. See the CONTrol:SIGNal command to set the type of signal to which the PNA will respond.
- If the external source can only send a continuous stream of trigger signals, then the Single Accept section must be used.

```
Sub SingleSend()
'Set Source Internal - Manual Triggering
scpi.Execute ("TRIG:SOUR MANual")
'If using an External trigger source that is capable of
'sending SINGLE trigger signals, then uncomment the following.
'This command automatically sets trigger source to External
'scpi.Execute ("CONT:SIGN BNC1,TILHIGH")

'Setup Trigger Scope
'WHAT gets triggered
'Pick one using comments
'Set Channel triggering
'scpi.Execute ("TRIG:SCOPe CURRent")
'Set Global triggering (Default)
scpi.Execute ("TRIG:SCOPe ALL")

'Set Channel Settings
'The channels respond to UNLIMITED trigger signals (Default)
scpi.Execute ("SENS1:SWE:MODE CONTinuous")
```

```
scpi.Execute ("SENS2:SWE:MODE CONTinuous")

'To do Point trigger on one or more channels, uncomment the following
'Point trigger automatically sets Trig:Scope to Current/Channel
'scpi.Execute ("SENS1:SWE:TRIG:POINt ON")
'scpi.Execute ("SENS2:SWE:TRIG:POINt ON")
IntTrig()
End Sub

Sub IntTrig()
'If External triggering, replace this Sub with code
'to single trigger the External Trig Source
Dim resp
'*OPC? allows the measurement to complete before the controller sends another
command
scpi.Execute ("INITiate:IMMediate;*OPC?")
resp=Msgbox ("Another trigger?", 1, "PNA Trigger Demo")
If resp=1 Then
IntTrig()
End If
End Sub
```

Last modified:

18-Jun-2007	Updated with Sens:Swe:Mode Single
June 6, 2007	Changed order and wording
April 24, 2007	Updated with links
Oct. 5, 2006	New topic

GPIB using Visual C++

[See Other SCPI Example Programs]

```
/*
 * This example assumes the user's PC has a National Instruments GPIB board. The
example is comprised of three basic parts:
 *
 * 1. Initialization
 * 2. Main Body
 * 3. Cleanup
 *
 * The Initialization portion consists of getting a handle to the PNA and then doing
a GPIB clear of the PNA.
 *
 * The Main Body consists of the PNA SCPI example.
 *
 * The last step, Cleanup, releases the PNA for front panel control.
 */

#include <stdio.h>
#include <stdlib.h>

/*
 * Include the WINDOWS.H and DECL-32.H files. The standard Windows
 * header file, WINDOWS.H, contains definitions used by DECL-32.H and
 * DECL-32.H contains prototypes for the NI GPIB routines and constants.
 */
#include <windows.h>
#include "decl-32.h"

#define ERRMSGSIZE 1024 // Maximum size of SCPI command string
#define ARRAYSIZE 1024 // Size of read buffer

#define BDINDEX 0 // Board Index of GPIB board
#define PRIMARY_ADDR_OF_PNA 16 // GPIB address of PNA
#define NO_SECONDARY_ADDR 0 // PNA has no Secondary address
#define TIMEOUT T10s // Timeout value = 10 seconds
#define EOTMODE 1 // Enable the END message
#define EOSMODE 0 // Disable the EOS mode

int pna;
char ValueStr[ARRAYSIZE + 1];
char ErrorMnemonic[21][5] = {"EDVR", "ECIC", "ENOL", "EADR", "EARG",
  "ESAC", "EABO", "ENEB", "EDMA", "",
  "EOIP", "ECAP", "EFSO", "", "EBUS",
  "ESTB", "ESRQ", "", "", "", "ETAB"};


void GPIBWrite(char* SCPIcmd);
char *GPIBRead(void);
```

```
void GPIBCleanup(int Dev, char* ErrorMsg);


int main()
{

char *opc;
char *result;
char *value;

/*
 * ==========================================
* INITIALIZATION SECTION
 * ==========================================
 */

  /*
  * The application brings the PNA online using ibdev. A device handle,pna, is
returned and is used in all subsequent calls to the PNA.
  */
  pna = ibdev(BDINDEX, PRIMARY_ADDR_OF_PNA, NO_SECONDARY_ADDR,
  TIMEOUT, EOTMODE, EOSMODE);
  if (ibsta & ERR)
  {
  printf("Unable to open handle to PNA\nibsta = 0x%x iberr = %d\n",
  ibsta, iberr);
  return 1;
  }

  /*
  * Do a GPIB Clear of the PNA. If the error bit ERR is set in ibsta, call
GPIBCleanup with an error message.
  */
  ibclr (pna);
  if (ibsta & ERR)
  {
  GPIBCleanup(pna, "Unable to perform GPIB clear of the PNA");
  return 1;
  }

/*
 * ==========================================
 * MAIN BODY SECTION
 * ==========================================
 */

  // Reset the analyzer to instrument preset
  GPIBWrite("SYSTem:FPRESET");

  // Create S11 measurement
  GPIBWrite("CALCulate1:PARameter:DEFine 'My_S11',S11");
```

```
  // Turn on Window #1
  GPIBWrite("DISPlay:WINDow1:STATe ON");

  // Put a trace (Trace #1) into Window #1 and 'feed' it from the measurement
  GPIBWrite("DISPlay:WINDow1:TRACe1:FEED 'My_S11'");

  // Setup the channel for single sweep trigger
  GPIBWrite("INITiate1:CONTinuous OFF;*OPC?");
  opc = GPIBRead();
  GPIBWrite("SENSe1:SWEep:TRIGger:POINt OFF");

  // Set channel parameters
  GPIBWrite("SENSe1:SWEep:POINts 11");
  GPIBWrite("SENSe1:FREQuency:STARt 1000000000");
  GPIBWrite("SENSe1:FREQuency:STOP 2000000000");

  // Send a trigger to initiate a single sweep
  GPIBWrite("INITiate1;*OPC?");
  opc = GPIBRead();

  // Must select the measurement before we can read the data
  GPIBWrite("CALCulate1:PARameter:SELect 'My_S11'");

  // Read the measurement data into the "result" string variable
  GPIBWrite("FORMat ASCII");
  GPIBWrite("CALCulate1:DATA? FDATA");
  result = GPIBRead();

  // Print the data to the display console window
printf("S11(dB) - Visual C++ SCPI Example for PNA\n\n");
  value = strtok(result, ",");
while (value != NULL)
  {
  printf("%s\n", value);
  value = strtok(NULL, ",");
  }

/*
 * ========================================
 * CLEANUP SECTION
 * ========================================
 */

  /* The PNA is returned to front panel control. */
  ibonl(pna, 0);

  return 0;
}

/*
 * Write to the PNA
 */
```

```
void GPIBWrite(char* SCPIcmd)
{
int length;
char ErrorMsg[ERRMSGSIZE + 1];
length = strlen(SCPIcmd) ;

  ibwrt (pna, SCPIcmd, length);
  if (ibsta & ERR)
  {
  strcpy(ErrorMsg, "Unable to write this command to PNA:\n");
  strcat(ErrorMsg, SCPIcmd);

  GPIBCleanup(pna, ErrorMsg);
  exit(1);
  }
}

/*
 * Read from the PNA
 */
char* GPIBRead(void)
{
  ibrd (pna, ValueStr, ARRAYSIZE);
  if (ibsta & ERR)
  {
  GPIBCleanup(pna, "Unable to read from the PNA");
  exit(1);
  }
else
  return ValueStr;
}

/*
 * After each GPIB call, the application checks whether the call succeeded. If an
NI-488.2 call fails, the GPIB driver sets the corresponding bit in the global status
variable. If the call failed, this procedure prints an error message, takes the PNA
offline and exits.
 */
void GPIBCleanup(int Dev, char* ErrorMsg)
{
  printf("Error : %s\nibsta = 0x%x iberr = %d (%s)\n",
  ErrorMsg, ibsta, iberr, ErrorMnemonic[iberr]);
  if (Dev != -1)
  {
  printf("Cleanup: Returning PNA to front panel control\n");
  ibonl (Dev, 0);
  }
}
```

Perform a Guided 2-Port or 4-Port Cal using SCPI

This example performs a Guided 2-Port or 4-port Calibration using ONE set of calibration standards or an ECAL module.

A measurement must first be set up with desired frequency range, power, and so forth, ready to be calibrated.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file, such as Notepad, and save it on the PNA hard drive as *.vbs.

Learn how to setup and run the macro.

See Guided Cal SCPI commands

See Other SCPI Example Programs

```
Dim app
Dim scpi
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser

' To perform 2-port cal, Uncomment TwoPortGuidedCal()
' Then comment FourPortGuidedCal()

'Do 2-port Cal
'TwoPortGuidedCal()

'Do 4-port Cal
FourPortGuidedCal

Sub TwoPortGuidedCal()
' Select the connectors
scpi.Execute("sens:corr:coll:guid:conn:port1 ""APC 3.5 female"" ")
scpi.Execute("sens:corr:coll:guid:conn:port2 ""APC 3.5 male"" ")
scpi.Execute("sens:corr:coll:guid:conn:port3 ""Not used"" ")
scpi.Execute("sens:corr:coll:guid:conn:port4 ""Not used"" ")
MsgBox("Connectors defined for Ports 1 and 2")
' Select the Cal Kit for each port being calibrated.
scpi.Execute("sens:corr:coll:guid:ckit:port1 ""85052D"" ")
scpi.Execute("sens:corr:coll:guid:ckit:port2 ""85052D"" ")
' To use an ECal module instead, comment out the above two lines
' and uncomment these two lines and use the part number printed
' on your module (which in our case was N4691-60004), followed
' by the word 'ECal'.  Your ECal module must already be connected
' via USB to the PNA.
'scpi.Execute("sens:corr:coll:guid:ckit:port1 ""N4691-60004 ECal"" ")
'scpi.Execute("sens:corr:coll:guid:ckit:port2 ""N4691-60004 ECal"" ")
```

```
MsgBox("Cal kits defined for Ports 1 and 2")
' Initiate the calibration and query the number of steps
numSteps = GenerateSteps()
' Measure the standards, compute and apply the cal
MeasureAndComplete(numSteps)
End Sub

Sub FourPortGuidedCal()
' Select the connectors
scpi.Execute("sens:corr:coll:guid:conn:port1 ""APC 3.5 female"" ")
scpi.Execute("sens:corr:coll:guid:conn:port2 ""APC 3.5 female"" ")
scpi.Execute("sens:corr:coll:guid:conn:port3 ""APC 3.5 female"" ")
scpi.Execute("sens:corr:coll:guid:conn:port4 ""APC 3.5 female"" ")
MsgBox("Connectors defined for Ports 1 to 4")
' Select the Cal Kit for each port being calibrated.
scpi.Execute("sens:corr:coll:guid:ckit:port1 ""85052D"" ")
scpi.Execute("sens:corr:coll:guid:ckit:port2 ""85052D"" ")
scpi.Execute("sens:corr:coll:guid:ckit:port3 ""85052D"" ")
scpi.Execute("sens:corr:coll:guid:ckit:port4 ""85052D"" ")
' To use an ECal module instead, comment out the above four lines
' and uncomment these four lines and use the part number printed
' on your module (which in our case was N4431-60003), followed
' by the word 'ECal'.  Your ECal module must already be connected
' via USB to the PNA.
'scpi.Execute("sens:corr:coll:guid:ckit:port1 ""N4431-60003 ECal"" ")
'scpi.Execute("sens:corr:coll:guid:ckit:port2 ""N4431-60003 ECal"" ")
'scpi.Execute("sens:corr:coll:guid:ckit:port3 ""N4431-60003 ECal"" ")
'scpi.Execute("sens:corr:coll:guid:ckit:port4 ""N4431-60003 ECal"" ")
MsgBox("Cal kits defined for Ports 1 to 4")
' Initiate the calibration and query the number of steps
numSteps = GenerateSteps()
' If your selected cal kit is not a 4-port ECal module which can
' mate to all 4 ports at once, then you may want to choose which
' thru connections to measure for the cal.  You must measure at
' least 3 different thru paths for a 4-port cal (for greatest
' accuracy you can choose to measure a thru connection for all 6
' pairings of the 4 ports).  If you omit this command, the default
' is to measure from port 1 to port 2, port 1 to port 3, and
' port 1 to port 4.   For this example we select to measure
' from port 1 to port 2, port 2 to port 3, and port 2 to port 4.
scpi.Execute("sens:corr:coll:guid:thru:ports 1,2,2,3,2,4")
' Re-generate the connection steps to account for the thru changes
numSteps = GenerateSteps()
' Measure the standards, compute and apply the cal
MeasureAndComplete(numSteps)
End Sub

Function GenerateSteps()
' Initiate the calibration and query the number of steps
scpi.Execute("sens:corr:coll:guid:init")
GenerateSteps =  scpi.Execute("sens:corr:coll:guid:steps?")
End Function
```

```
Sub MeasureAndComplete(numSteps)
MsgBox("Number of steps is " + CStr(numSteps))
' Measure the standards
For i = 1 To numSteps
step = "Step " + CStr(i) + " of " + CStr(numSteps)
strPrompt = scpi.Execute("sens:corr:coll:guid:desc? " + CStr(i))
MsgBox strPrompt, vbOKOnly, step
scpi.Execute("sens:corr:coll:guid:acq STAN" + CStr(i))
Next
' Conclude the calibration
scpi.Execute("sens:corr:coll:guid:save")
MsgBox ("Cal is done!")
End Sub
```

Perform a Guided Calibration using SCPI

This VBScript program performs a Guided Calibration using ECal **or** Mechanical standards. This example includes optional ECal orientation features.

- This example has been updated to include the setting of Unknown Thru or Adapter Removal adapter delay. (March 2006).
- This example has been updated to show the activation of a channel to be calibrated. (Aug. 2006).

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Guided.vbs. Learn how to setup and run the macro.

```
' Performing a Guided 2-port cal (Ports 1 and 2)
TwoPortGuidedCal
Sub TwoPortGuidedCal
Dim app
Dim scpi
Dim connList
Dim selectedConn1, selectedConn2
Dim kitList
Dim selectedKit
Dim message
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser

'The following demonstrates that the Active Channel is cal'd
'Preset the PNA
scpi.Execute "SYST:PRES"
'Create a new measurement on Chan 2
'Now there are two windows, channels and measurements
'This becomes the Active Measurement
scpi.Execute ("DISPlay:WINDow2:STATE ON")
'Define a measurement name, parameter
scpi.Execute ("CALCulate2:PARameter:DEFine 'MyMeas',S21")
'"FEED" the measurement
scpi.Execute ("DISPlay:WINDow2:TRACe1:FEED 'MyMeas'")
```

```
'This is the Active Measurement
'Activate the 'Preset' measurement to cal chan 1
scpi.Execute ("CALC1:PAR:SEL 'CH1_S11_1'")

' Query the list of connectors that the PNA system recognizes
connList = scpi.Execute("sens:corr:coll:guid:conn:cat?")
' Format the list with linefeed characters in place of the commas
connList = FormatList(connList)
message = "Enter your DUT connector for Port 1.  Choose from this list:"
message = message & Chr(10) & Chr(10) & connList
' Select the connector for Port 1
selectedConn1 = InputBox(message)
If selectedConn1 = "" Then Exit Sub
scpi.Execute "sens:corr:coll:guid:conn:port1 '" & selectedConn1 & "'"
message = "Enter your DUT connector for Port 2.  Again, choose from this list:"
message = message & Chr(10) & Chr(10) & connList
' Select the connector for Port 2
selectedConn2 = InputBox(message)
If selectedConn2 = "" Then Exit Sub
scpi.Execute "sens:corr:coll:guid:conn:port2 '" & selectedConn2 & "'"
' Note: If your PNA has more than 2 ports, then uncomment
' one or both of these next two lines.
'scpi.Execute "sens:corr:coll:guid:conn:port3 ""Not used"" "
'scpi.Execute "sens:corr:coll:guid:conn:port4 ""Not used"" "

' This next block of commented code demonstrates how to specify an adapter
' and it's electrical delay, in situations where you are performing an
' Unknown Thru or Adapter Removal calibration.  In most situations, the
' PNA is able to correctly determine an adapter's electrical length
' at the end of the calibration.  However, there are scenarios where
' the PNA cannot correctly calculate the length -- such as when the channel
' has a relatively small number of measurement points (for example, 201 or less)
' and the adapter is significantly long (for example, a cable that is several feet).
' In these cases, the ADAP commands (below) enable you to explicitly specify
' the adapter you are using.
' Send these commands prior to the "sens:corr:coll:guid:init" command.
```

```
' Create adapter and return the adapter number
'adapterNum = scpi.Execute("sens:corr:coll:guid:adap:cre? '" & selectedConn1 & "','"& selectedConn2 & "'")
' The adapterNum string contains a '+' character.
' Here we convert to integer to remove that.
'adapterNum = CStr( CInt(adapterNum) )
' Specify that this adapter has 10 nanoseconds electrical delay (coaxial).
'scpi.Execute "sens:corr:coll:guid:adap" & adapterNum & ":del 10E-9"
' Text description of adapter
'scpi.Execute "sens:corr:coll:guid:adap" & adapterNum & ":desc 'My adapter'"
' Select to use this adapter specifically between ports 1 and 2
'scpi.Execute "sens:corr:coll:guid:adap" & adapterNum & ":path 1,2"
' End of adapter block

' Query the list of acceptable cal kits and
' ECal module characterizations for Port 1.
kitList = scpi.Execute("sens:corr:coll:guid:ckit:port1:cat?")
' Format the list with linefeed
' characters in place of the commas
kitList = FormatList(kitList)
message = "Enter your cal kit or ECal module characterization for Port 1.  "
message = message & "Choose from this list:"
message = message & Chr(10) & Chr(10) & kitList
' Select the Cal Kit or ECal module
' characterization to use for Port 1.
selectedKit = InputBox(message)
If selectedKit = "" Then Exit Sub
scpi.Execute "sens:corr:coll:guid:ckit:port1 '" & selectedKit & "'"
' Query the list of acceptable cal kits
' and ECal module characterizations for Port 2.
kitList = scpi.Execute("sens:corr:coll:guid:ckit:port2:cat?")
' Format the list with linefeed characters in place of the commas
kitList = FormatList(kitList)
message = "Enter your cal kit or ECal module characterization for Port 2.  "
message = message & "Choose from this list:"
message = message & Chr(10) & Chr(10) & kitList
' Select the Cal Kit or ECal module
```

```
' characterization to use for Port 2.
selectedKit = InputBox(message)
If selectedKit = "" Then Exit Sub
scpi.Execute "sens:corr:coll:guid:ckit:port2 '" & selectedKit & "'"

' This next block of commented code
' shows optional functions when using ECal.
' Send these "sens:corr:pref" commands prior to the
' "sens:corr:coll:guid:init" command.
' Read ECAL information from ECal module #1 on the USB bus
' about the Agilent factory characterization data
'module1Info = scpi.Execute("sens:corr:coll:ckit:inf? ECAL1,CHAR0")
'MsgBox "Description of ECal Module #1:" & Chr(10) & Chr(10) & module1Info

' The following command enables auto orientation of
' the ECal module (The PNA senses which port of the
' module is connected to which port of the PNA).
'scpi.Execute "sens:corr:pref:ecal:ori ON"
' However, if you are measuring at very low power levels where
' the PNA may fail to sense the module's orientation, then turn auto
' orientation OFF and specify how the module is connected.
' "A1,B2" indicates Port A of the module is connected
' to PNA Port 1 and Port B is connected to PNA Port 2).
'scpi.Execute "sens:corr:pref:ecal:ori OFF"
'scpi.Execute "sens:corr:pref:ecal:pmap ECAL1,'A1,B2'"
' End of optional ECal setup

' Select the thru method of "Default".  This instructs the PNA to
' determine which thru standard measurement technique to use
' based upon the selected connectors and
' calibration kit(s) and the PNA model number.
' with new CMET and TMET 'default' is set by not sending the commands
'
' Initiate the calibration and query the number of steps
scpi.Execute "sens:corr:coll:guid:init"
numSteps = scpi.Execute("sens:corr:coll:guid:steps?")
```

```
MsgBox "Number of steps is " + CStr(numSteps)
' Measure the standards
For i = 1 To numSteps
step = "Step " + CStr(i) + " of " + CStr(numSteps)
strPrompt = scpi.Execute("sens:corr:coll:guid:desc? " + CStr(i))
MsgBox strPrompt, vbOKOnly, step
scpi.Execute "sens:corr:coll:guid:acq STAN" + CStr(i)
Next
' Conclude the calibration
scpi.Execute "sens:corr:coll:guid:save"
MsgBox "Cal is done!"
End Sub
Function FormatList(list)
Dim tokens
' Strip the leading and trailing quotation
' marks from the list string
list = Mid(list, 2, Len(list) - 3)
' Tokenize the comma-delimited list string
' into an array of the individual substrings
tokens = Split(list, ",")
' Rebuild the list string, placing linefeed
' characters where the commas were,
' using Trim to remove leading and trailing spaces.
list = ""
For i = 0 To UBound(tokens)
tokens(i) = Trim(tokens(i))
list = list & tokens(i) & Chr(9)
If i < UBound(tokens) Then
 i = i + 1
 tokens(i) = Trim(tokens(i))
 list = list & tokens(i) & Chr(10)
End If
Next
FormatList = list
End Function
```

Last Modified:

14-May-2007 MX Updated for new CMET and TMET commands

Perform Guided ECal using SCPI

This VBScript program performs a Guided ECal Calibration. While this example is good to use as a starting point for Guided ECal, the Guided comprehensive cal example has some advanced features that are not in this program.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Guided.vbs. Learn how to setup and run the macro.

```
' Performing a 2-port cal (Ports 1 and 2)
Dim app
Dim scpi

' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser

' Specify the DUT connectors
' (for each connector of your DUT, one of the ECal module's ports must have
'  that same connector, or else you cannot achieve the cal using that module).
scpi.Execute "sens:corr:coll:guid:conn:port1 ""APC 3.5 female"" "
scpi.Execute "sens:corr:coll:guid:conn:port2 ""APC 3.5 male"" "

' Note: If your PNA has more than 2 ports, you would need to uncomment
' one or both of these next two lines, to explicitly specify this is
' just a 2-port cal.
'scpi.Execute "sens:corr:coll:guid:conn:port3 ""Not used"" "
'scpi.Execute "sens:corr:coll:guid:conn:port4 ""Not used"" "
MsgBox "Connectors defined for Ports 1 and 2"

' Select the ECal module for each port being calibrated.
' Replace N4691-60004 with the part number printed on your module
' followed by User x if using a User characterization, then the word 'ECal'
' Your ECal module must already be connected via USB to the PNA.
scpi.Execute "sens:corr:coll:guid:ckit:port1 ""N4691-60004 ECal"" "
scpi.Execute "sens:corr:coll:guid:ckit:port2 ""N4691-60004 User 1 ECal"" "
MsgBox "Cal kits defined for Ports 1 and 2"

' Initiate the calibration and query the number of steps
scpi.Execute "sens:corr:coll:guid:init"
numSteps = scpi.Execute("sens:corr:coll:guid:steps?")
MsgBox "Number of steps is " + CStr(numSteps)

' Measure the standards
For i = 1 To numSteps
step = "Step " + CStr(i) + " of " + CStr(numSteps)
strPrompt = scpi.Execute("sens:corr:coll:guid:desc? " + CStr(i))
MsgBox strPrompt, vbOKOnly, step
scpi.Execute "sens:corr:coll:guid:acq STAN" + CStr(i)
```

```
Next

' Conclude the calibration
scpi.Execute "sens:corr:coll:guid:save"
MsgBox "Cal is done!"
```

Perform Guided Mechanical Cal using SCPI

This VBScript program performs a Guided Calibration using Mechanical standards. While this example is good to use as a starting point for guided mechanical cal, the Guided comprehensive cal example has some advanced features that are not in this program.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Guided.vbs. Learn how to setup and run the macro.

' Performing a 2-port cal (Ports 1 and 2)

```
Dim app
Dim scpi

' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser

' Specify the DUT connectors
scpi.Execute "sens:corr:coll:guid:conn:port1 ""APC 3.5 female"" "
scpi.Execute "sens:corr:coll:guid:conn:port2 ""APC 3.5 male"" "

' Note: If your PNA has more than 2 ports, you would need to uncomment
' one or both of these next two lines, to explicitly specify this is
' just a 2-port cal.
'scpi.Execute "sens:corr:coll:guid:conn:port3 ""Not used"" "
'scpi.Execute "sens:corr:coll:guid:conn:port4 ""Not used"" "
MsgBox "Connectors defined for Ports 1 and 2"

' Select the Cal Kit for each port being calibrated.
scpi.Execute "sens:corr:coll:guid:ckit:port1 ""85052D"" "
scpi.Execute "sens:corr:coll:guid:ckit:port2 ""85052D"" "
MsgBox "Cal kits defined for Ports 1 and 2"

' Initiate the calibration and query the number of steps
scpi.Execute "sens:corr:coll:guid:init"
numSteps = scpi.Execute("sens:corr:coll:guid:steps?")
MsgBox "Number of steps is " + CStr(numSteps)

' Measure the standards
'The following series of commands shows that standards
'can be measured in any order. These steps acquire
'measurement of standards in reverse order.
'It is easiest to iterate through standards using
'a For-Next Loop.
For i = numSteps To 1
step = "Step " + CStr(i) + " of " + CStr(numSteps)
strPrompt = scpi.Execute("sens:corr:coll:guid:desc? " + CStr(i))
MsgBox strPrompt, vbOKOnly, step
```

```
scpi.Execute "sens:corr:coll:guid:acq STAN" + CStr(i)
Next

' Conclude the calibration
scpi.Execute "sens:corr:coll:guid:save"
MsgBox "Cal is done!"
```

Last Modified:

20-Jan-2007	Added note about any order for steps.

Perform a Guided 1-Port Cal on Port 2

This VBScript program does the following:

1. Clear measurements from the PNA
2. Create a new S22 measurement
3. Set an instrument state
4. Select the connector types
5. Select a cal kit
6. Initiate a Guided calibration
7. Display a prompt to connect each standard
8. Save the calibration to a newly created cal set

Note: This example illustrates an important step when calibrating a reflection measurement in the reverse direction. You MUST create a reverse (S22) measurement and have it be the active (selected) measurement on the channel that is being calibrated. This is not necessary for any calibrating any other measurement parameter.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Guided.vbs. Learn how to setup and run the macro.

```
Dim App
Set App = CreateObject("AgilentPNA835x.Application")
App.Preset

Dim step
Dim Parser
Dim prompt
Dim txtDat
Dim Chan

Rem Clear old measurements
App.Reset

Rem Create a new Measurement
Set Parser = App.SCPIStringParser
Parser.Parse "DISPlay:WINDow1:STATE ON"
Parser.Parse "CALCulate:PARameter:DEFine 'MyMeas',S22"
Parser.Parse "DISPlay:WINDow1:TRACe1:FEED 'MyMeas'"

Rem Initialize state
Set Chan = App.ActiveChannel
Chan.StartFrequency = 200e6
```

```
Chan.StopFrequency = 1.5e9
Chan.IFBandwidth = 1000
step = 3

Rem Begin a guided calibration
Parser.Parse "SENS:CORR:COLL:GUID:CONN:PORT1 'Not used'"
Parser.Parse "SENS:CORR:COLL:GUID:CONN:PORT2 'Type N (50) male'"
Parser.Parse "SENS:CORR:COLL:GUID:CKIT:PORT1 ''"
Parser.Parse "SENS:CORR:COLL:GUID:CKIT:PORT2 '85054D'"
Parser.Parse "SENS:CORR:COLL:GUID:INIT"

Rem Query the number of steps
txtDat = Parser.Parse("SENS:CORR:COLL:GUID:STEP?")

Rem Display the number of steps
MsgBox("Number of steps is " + txtDat)

Rem Set the loop counter limit
step = txtDat

Rem  Measure the standards
For i = 1 To step
If i= 1 Then
prompt = Parser.Parse("sens:corr:coll:guid:desc? 1")
MsgBox(prompt)
Parser.Parse ("sens:corr:coll:guid:acq STAN1")
ElseIf i = 2 then
prompt = Parser.Parse("sens:corr:coll:guid:desc? 2")
MsgBox(prompt)
Parser.Parse ("sens:corr:coll:guid:acq STAN2")
ElseIf i = 3 then
prompt = Parser.Parse("sens:corr:coll:guid:desc? 3")
MsgBox(prompt)
Parser.Parse ("sens:corr:coll:guid:acq STAN3")
End If
Next

Rem All standards have been measured.  Save the result
Parser.Parse "SENS:CORR:COLL:GUID:SAVE"
MsgBox("The calibration has been completed")
```

Perform Guided TRL Calibration

This VBScript file performs a 2-Port Guided TRL calibration on **2-port PNA analyzers**. (See an example of TRL cal on a 4-port PNA.) This program does the following:

- Clear old measurements from the PNA
- Create a new S22 measurement
- Set an instrument state
- Select the connectors and cal kit
- Initiate a Guided calibration
- Display a prompt as each new standard must be connected
- Save the calibration to a newly created cal set.

Note: This program runs without error on all PNA code revisions 7.21 and higher.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as TRL.vbs. Learn how to setup and run the macro.

```
Dim App
Dim Parser
Dim Chan
Dim txtDat
Dim step
Dim parserTxt
Dim prompt
Set App = CreateObject("AgilentPNA835x.Application")
' Clear old measurements
App.Reset
' Create a new Measurement
Set Parser = App.SCPIStringParser
Parser.Parse "DISPlay:WINDow1:STATE ON"
Parser.Parse "CALCulate:PARameter:DEFine 'MyMeas',S12"
Parser.Parse "DISPlay:WINDow1:TRACe1:FEED 'MyMeas'"
' Initialize state
Set Chan = App.ActiveChannel
```

```
Chan.StartFrequency = 18.0e9
Chan.StopFrequency = 20.0e9
Chan.IFBandwidth = 1000
' Begin a guided calibrations
Parser.Parse "SENS:CORR:COLL:GUID:CONN:PORT1 'APC 3.5 male'"
Parser.Parse "SENS:CORR:COLL:GUID:CONN:PORT2 'APC 3.5 female'"
Parser.Parse "SENS:CORR:COLL:GUID:CKIT:PORT1 '85052C'"
Parser.Parse "SENS:CORR:COLL:GUID:CKIT:PORT2 '85052C'"
' Select TRL cal method.
Parser.Parse "SENS:CORR:COLL:GUID:PATH:CMET 1,2,'TRL'"
txtDat = Parser.Parse("SENS:CORR:COLL:GUID:PATH:CMET? 1,2")
MsgBox("Method " + txtDat)
Parser.Parse "SENS:CORR:COLL:GUID:INIT"
' Query the number of steps
txtDat = Parser.Parse("SENS:CORR:COLL:GUID:STEP?")
' Display the number of steps
MsgBox("Number of steps is " + txtDat)
' Set the loop counter limit
step = CInt(txtDat)
' Measure the standards
For i = 1 To step
parserTxt = "sens:corr:coll:guid:desc? " + CStr(i)
prompt = Parser.Parse(parserTxt)
MsgBox(prompt)
parserTxt = "sens:corr:coll:guid:acq STAN" + CStr(i)
Parser.Parse (parserTxt)
Next
' All standards have been measured.  Save the result
Parser.Parse "SENS:CORR:COLL:GUID:SAVE"
MsgBox("The TRL calibration has been completed")
```

Last Modified:

9-Apr-2007 MX Updated for new CMethod command

Perform Unknown Thru or TRL Cal

The following program performs either a 2-port SOLT Unknown Thru Cal or a 2-port TRL Cal. The 85052C Cal Kit used in this program contains both types of standards. This program can be run on 2-port or 4-port PNAs. When run on a multiport (4 or more ports) PNA, which does not have a reference receiver per port, a Delta Match Cal is required.

See example of Delta Match Cal.

See the Guided Cal commands

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Unknown.vbs. Learn how to setup and run the macro.

```
Sub PerformUnknownThruOrTRLCal()
Set pna = CreateObject("AgilentPNA835x.Application")
Set scpi = pna.ScpiStringParser

' Specify connectors for Ports 1 and 2
scpi.Parse "SENS:CORR:COLL:GUID:CONN:PORT1 'APC 3.5 female'"
scpi.Parse "SENS:CORR:COLL:GUID:CONN:PORT2 'APC 3.5 male'"

'If your PNA has 3 or 4 ports, uncomment one or both of
'these next two lines, to explicitly specify this is a 2-port cal.
'scpi.Parse "SENS:CORR:COLL:GUID:CONN:PORT3 'Not used'"
'scpi.Parse "SENS:CORR:COLL:GUID:CONN:PORT4 'Not used'"

' Specify cal kit for Ports 1 and 2
scpi.Parse "SENS:CORR:COLL:GUID:CKIT:PORT1 '85052C'"
scpi.Parse "SENS:CORR:COLL:GUID:CKIT:PORT2 '85052C'"
' Since the 85052C cal kit contains SOLT standards and also TRL
' standards, these next two lines set cal and thru method
scpi.Execute "SENS:CORR:COLL:GUID:PATH:CMEThod 1,2,"SOLT"
scpi.Execute "SENS:CORR:COLL:GUID:PATH:TMEThod 1,2,"UNKN"

' To set up the cal as TRL, comment the previous line and uncomment
' this next line. The TMEThod is set by default
'scpi.Execute "SENS:CORR:COLL:GUID:PATH:CMEThod 1,2,"TRL"

' Initiate the calibration
scpi.Parse "SENS:CORR:COLL:GUID:INIT"

' Query the list of ports that need delta match
retStr = scpi.Parse("SENS:CORR:COLL:GUID:DMAT:APPL:PORT?")
portList = Split(retStr, ",")

' If portList contains just one element and it's value is 0, then that indicates
' none of the ports being calibrated require delta match data.
' Note: if each testport on the PNA has it's own reference receiver (R channel),
'       then delta match is never needed, so portList will always be just 0.
lowerBound = LBound(portList)
If (UBound(portList) <> lowerBound) Or (CInt( portList(lowerBound) ) <> 0) Then
```

```
  ' Delta match data is required for at least one port.
 ' For this example, we assume a Global Delta Match Cal has previously been
 ' performed so the Global Delta Match CalSet exists.
 ' The Global Delta Match CalSet is used when the APPL command is invoked
 ' without a specific calset ID (GUID).
  scpi.Parse "SENS:CORR:COLL:GUID:DMAT:APPL"
End If

' Query the number of calibration steps
retStr = scpi.Parse("SENS:CORR:COLL:GUID:STEP?")
numSteps = CInt(retStr)

' Measure the cal standards
For i = 1 To numSteps
 prompt = scpi.Parse("SENS:CORR:COLL:GUID:DESC? " & CStr(i))
 retVal = MsgBox(prompt, vbOKCancel)
 If retVal = vbCancel Then Exit Sub
 retStr = scpi.Parse("SENS:CORR:COLL:GUID:ACQ STAN" & CStr(i) & ";*OPC?")
Next

' Compute the error coefficients and save the cal to CalSet, and turn it on
scpi.Parse "SENS:CORR:COLL:GUID:SAVE"
MsgBox "Cal is done!"
End Sub
```

Last Modified:

14-May-2007 MX Updated for new CMET and TMET commands

Perform Global Delta Match Cal

The following program performs a Global Delta Match Calibration. This is required when performing an Unknown Thru Cal or TRL Cal on PNAs without a reference receiver for each test port. See example of Unknown Thru or TRL Cal.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Delta.vbs. Learn how to setup and run the macro.

```
Sub PerformGlobalDeltaMatchCal()
Set pna = CreateObject("AgilentPNA835x.Application")
Set scpi = pna.ScpiStringParser

' Initiate a Global Delta Match calibration, choosing connector and cal kit
scpi.Parse "SENS:CORR:COLL:GUID:DMAT 'APC 3.5 female', '85033D/E'"

' Query the number of calibration steps
retStr = scpi.Parse("SENS:CORR:COLL:GUID:STEP?")
numSteps = CInt(retStr)

' Measure the cal standards
For i = 1 To numSteps
 prompt = scpi.Parse("SENS:CORR:COLL:GUID:DESC? " & CStr(i))
 retVal = MsgBox(prompt, vbOKCancel)
 If retVal = vbCancel Then Exit Sub
 retStr = scpi.Parse("SENS:CORR:COLL:GUID:ACQ STAN" & CStr(i) & ";*OPC?")
Next

' Compute the error coefficients and save the cal to Global Delta Match CalSet
scpi.Parse "SENS:CORR:COLL:GUID:SAVE"
MsgBox "Cal is done!"
End Sub
```

Perform an Unguided ECal

This VBScript program performs an Unguided Full 2-Port ECal.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Unguided.vbs. Learn how to setup and run the macro.

```
Set pna = CreateObject("AgilentPNA835x.Application")
Set scpi = pna.ScpiStringParser
' Preset the analyzer
scpi.Execute "SYSTem:PRESet"

' Start frequency of 10 MHz
scpi.Execute "SENSe:FREQuency:STARt 10E6"

' Stop frequency of 9 GHz
scpi.Execute "SENSe:FREQuency:STOP 9E9"

' Select the preset S11 measurement
scpi.Execute "CALCulate:PARameter:SELect 'CH1_S11_1'"
' Read the information about the Agilent factory
' characterization data of ECal module #1 on the USB bus
module1Info = scpi.Execute("SENSe:CORRection:COLLect:CKIT:INFormation? ECAL1,CHAR0")

' Prompt for the ECal module
MsgBox "Description of ECal Module #1:" & Chr(10) & Chr(10) & module1Info & _Chr(10)
& Chr(10) & "Make port connections to the ECal module, then press enter"
' ECal full 1 port and 2 port
' Choose a Calibration Type (comment out one of these)
scpi.Execute "SENSe:CORRection:COLLect:METHod refl3"
scpi.Execute "SENSe:CORRection:COLLect:METHod SPARSOLT"
' Specify to have the PNA automatically determine which port of the
' ECal module is connected to which port of the PNA.
scpi.Execute "SENSe:CORRection:PREFerence:ECAL:ORIentation ON"
' Alternatively, if you are measuring at very low power levels where
' the PNA fails to sense the module's orientation, you may need to turn
' off the auto orientation and specify how the module is connected (as in
' these next two commented lines of code -- "A1,B2" would indicate Port A
' of the module is connected to Port 1 and Port B is connected to Port 2).
'scpi.Execute "SENSe:CORRection:PREFerence:ECAL:ORIentation OFF"
'scpi.Execute "SENSe:CORRection:PREFerence:ECAL:PMAP ECAL1,'A1,B2'"
' Acquire and store the calibration terms.  *OPC? causes a "+1" to be
' returned when finished.  CHAR0 indicates to use the Agilent factory
' characterized data within the ECal module (as opposed to a user characterization).
x = scpi.Execute("SENSe:CORRection:COLLect:ACQuire ECAL1,CHAR0;*OPC?")
MsgBox "Done with calibration."
```

Perform an Unguided 2-Port Mechanical Cal

This VBScript program performs an Unguided, Full 2-Port, calibration using ONE set of mechanical calibration standards.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Unguided.vbs. Learn how to setup and run the macro.

```
Set App = CreateObject("AgilentPNA835x.Application")
Set Scpi = App.SCPIStringParser

'Initialize state
Scpi.Execute ("SYSTem:PRESet")

'Select the Preset measurement
Scpi.Execute ("CALCulate:PARameter:SELect 'CH1_S11_1'")

'Set the calibration method
Scpi.Execute ("SENSe:CORRection:COLLect:METHod SPARSOLT")

'Select a cal kit
Scpi.Execute ("SENSe:CORRection:COLLect:CKIT:SELect 1")

'Set one set of standards
Scpi.Execute ("SENSe:CORRection:TSTandards OFF")

'Set acquisition to FORWARD
Scpi.Execute ("SENSe:CORRection:SFORward ON")

'Measure the standards in forward direction
MsgBox "Connect OPEN to Port 1; then press OK"
Scpi.Execute ("SENSe:CORRection:COLLect:ACQuire stan1")

MsgBox "Connect SHORT to Port 1; then press OK"
Scpi.Execute ("SENSe:CORRection:COLLect:ACQuire stan2")

MsgBox "Connect LOAD to Port 1; then press OK"
Scpi.Execute ("SENSe:CORRection:COLLect:ACQuire stan3")

'Set acquisition to REVERSE
Scpi.Execute ("SENSe:CORRection:SFORward OFF")

'Measure the standards in reverse direction
MsgBox "Connect OPEN to Port 2; then press OK"
Scpi.Execute ("SENSe:CORRection:COLLect:ACQuire stan1")

MsgBox "Connect SHORT to Port 2; then press OK"
Scpi.Execute ("SENSe:CORRection:COLLect:ACQuire stan2")
```

```
MsgBox "Connect LOAD to Port 2; then press OK"
Scpi.Execute ("SENSe:CORRection:COLLect:ACQuire stan3")

'Measure the thru standard
MsgBox "Connect THRU between Ports 1 and 2; then press OK"
Scpi.Execute ("SENSe:CORRection:COLLect:ACQuire stan4")

'OPTIONAL Measure Isolation
MsgBox "Connect LOADS to Port 1 AND Port 2; then press OK"
Scpi.Execute ("SENSe:CORRection:COLLect:ACQuire stan5")

'All standards have been measured.  Save the result
Scpi.Execute ("SENS:CORR:COLL:SAVE")
MsgBox "The calibration has been completed"
```

Perform an Unguided 1-Port Cal on Port 2

This VBScript program does the following:

1. Clear measurements from the PNA
2. Create a new S22 measurement
3. Set an instrument state
4. Select a cal kit
5. Initiate an Unguided calibration
6. Display a prompt to connect each standard
7. Save the calibration to a newly created cal set

Note: This example illustrates an important step when calibrating a reflection measurement in the reverse direction. You MUST create a reverse (S22) measurement and have it be the active (selected) measurement on the channel that is being calibrated. This is not necessary for any calibrating any other measurement parameter.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Unguided.vbs. Learn how to setup and run the macro.

```
Dim App
Set App = CreateObject("AgilentPNA835x.Application")
App.Preset

Dim Parser
Dim Chan

Rem Clear old measurements
App.Reset

Rem Create a new Measurement
Set Parser = App.SCPIStringParser
Parser.Parse "DISPlay:WINDow1:STATE ON"
Parser.Parse "CALCulate:PARameter:DEFine 'MyMeas',S22"
Parser.Parse "DISPlay:WINDow1:TRACe1:FEED 'MyMeas'"

Rem Initialize state
Set Chan = App.ActiveChannel
Chan.StartFrequency = 200e6
Chan.StopFrequency = 1.5e9
Chan.IFBandwidth = 1000

Rem Begin an unguided calibration
```

```
Rem Set the calibration method
Parser.Parse "SENSe:CORRection:COLLect:METHod REFL3"

Rem Turn off continuous sweep
Parser.Parse "INITiate:CONTinuous OFF"

Rem Select a cal kit
Parser.Parse "SENSe:CORRection:COLLect:CKIT:SELect 1"

Rem  Measure the standards
MsgBox("Connect OPEN to port 2.  Then press OK")
Parser.Parse ("sens:corr:coll:acq STAN1")

MsgBox("Connect SHORT to port 2.  Then press OK")
Parser.Parse ("sens:corr:coll:acq STAN2")

MsgBox("Connect LOAD to port 2.  Then press OK")
Parser.Parse ("sens:corr:coll:acq STAN3")

Rem All standards have been measured.  Save the result
Parser.Parse "SENS:CORR:COLL:SAVE"

Rem Turn ON continuous sweep
Parser.Parse "INITiate:CONTinuous ON"
MsgBox("The calibration has been completed")
```

Perform an Unguided Cal on a 4-Port PNA

This topic describes how to perform an unguided calibration on a multiport network analyzer using SCPI. The objective here is to make clear the relationship between the physical port on which a standard is being measured, the actual device in the cal kit, and the SCPI command used to acquire the device.

There are two sets of SCPI commands that acquire calibrations. One set is used for guided cal, the other for unguided. The SCPI commands that provide remote access to unguided cal are in the SENS:CORR:COLL block:

- SENS:CORR:COLL:METHod
- SENS:CORR:COLL:ACQuire
- SENS:CORR:COLL:SAVE

On a four port network analyzer, the remote programmer needs to be aware of the relationship between the physical port and the calibration kit class assignments. The example program (below) illustrates the usage by performing three unique 2 port cals, taking care to acquire the appropriate standards.

Calibration standards classes are 'categories' of standard types. To perform a 2 port calibration, the cal wizard requires the user to measure:

3 reflection standards on the forward port:

- Class S11A typically an open
- Class S11B typically a short
- Class S11C typically a load

Likewise, 3 reflection standards are required for the reverse port:

- Class S22A typically an open
- Class S22B typically a short
- Class S22C typically a load

There is also a transmission standard that is measured in both directions:

- Class S21T typically a thru

The following illustrates the relationship between cal kit physical standards and calibration classes.

Here is a list of the physical devices in my calibration kit.

Standard #1 = "3.5 mm male short"

Standard #2 = "3.5 mm male open"

Standard #3 = "3.5 mm male broadband load"

Standard #4 = "Insertable thru standard"

Standard #5 = "3.5 mm male sliding load"

Standard #6 = "3.5 mm male lowband load"

Standard #7 = "3.5 mm female short"

Standard #8 = "female to female characterized thru adapter"

Standard #9 = "0-2 Load"

Standard #10 = "Open"

Standard #11 = "Non-insertable thru"

Standard #12 = "3.5 mm female lowband load"

Standard #13 = "3.5 mm female sliding load"

Standard #14 = "3.5 mm female broadband load"

Standard #15 = "3.5 mm female open"

When you perform a calibration remotely using SCPI, you don't specify the device number directly. Rather, you specify the class you want to measure. Each device in the calibration kit is assigned to a class. And since more than one device can be assigned to the same class, each class contains an ordered list of devices. The class assignments are user-settable using the Advanced Modify Cal Kit dialog or the SCPI command:

SENS:CORR:COLL:CKIT:ORDer<class>, <std>, <std>, <std>, <std>,<std>,<std>,<std>

The 85052B kit used in the example program had the following standard list for each class: The list was obtained by issuing the corresponding SCPI query:

SENS:CORR:COLL:CKIT:OLIST1?   S11A = +2,+15,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST2?   S11B = +1,+7,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST3?   S11C = +6,+5,+3,+12,+13,+14,+0

SENS:CORR:COLL:CKIT:OLIST4?   S21T = +4,+8,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST5?   S22A = +2,+15,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST6?   S22B = +1,+7,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST7?   S22C = +6,+5,+3,+12,+13,+14,+0

SENS:CORR:COLL:CKIT:OLIST8?   S12T = +4,+8,+0,+0,+0,+0,+0

When you perform the calibration, you acquire data by issuing the ACQuire command:

SENS:CORR:COLL:ACQ <class>[, <subst>]

For example:

SENS:CORR:COLL:SFOR 1

SENS:CORR:COLL:ACQ STANA, SST2

The SFOR command tells the wizard to make the next acquisition in the forward direction. The ACQuire command specifies that we are measuring the 2nd device in the list for STANA. And since we are measuring SFORward, STANA refers to class #1 or S11A. The list of devices for this class are specified in the OLIST1 query above. The associations are shown in red.

Alternately, you could modify the device order for the S11A class to move device #15 into the first position (SENS:CORR:COLL:CKIT:ORDER1). When the desired device is in the first position, you needn't specify the order number in the ACQuire command. The default is the first device in the OLIST. This worked well for two port network analyzers where the order for S11A,B,C classes were setup for port 1 and the order for S22A,B,C was set up for port 2. With the kit setup in the proper order, you could eliminate the specification of the substandard number (SST<n>).

When performing 2 port calibrations on 4 Port Network Analyzers (e.g.: PNA Model N5230A), the wizard applies S11A,B,C standards to the lower numbered port, S22A,B,C standards to the higher numbered port. Since the two classes (S11A,B,C and S22A,B,C) are applied to multiple ports, the programmer must take into account the ports being measured and take greater care when specifying the ACQuire command to ensure that the correct device is being measured.

Port to class relationship

Ports	S11A Port	S22A Port
1,2	1	2
1,3	1	3
1,4	1	4
2,3	2	3
2,4	2	4
3,4	3	4

The following example program shows one method of handling two port cals on a multiport network analyzer. The connectors at the measurement plane are assumed to be (1) male, (2) female, (3) male, and (4) male. In the example, three cals are performed: 1-2 (insertable male to female), 2-3 (insertable female to male), and 3-4 (noninsertable using an characterized adapter).

```
option explicit
public scpi
public pna
' assume a 4 port PNA with the following connectors:
' the standard measured on these ports will be the opposite gender
' PORT 1 = 3.5 male
' PORT 2 = 3.5 female
' PORT 3 = 3.5 male
' PORT 4 = 3.5 male
'To perform 2 port calibrations between 1-2, 2-3, and 3-4 you need to do the
following

call main

sub main
set pna = CreateObject("AgilentPnA835x.Application")
set scpi = pna.ScpiStringParser
pna.Preset
' select a kit to use for this demonstration
' kit #1 for the N5230A is the 85052B 3.5mm kit with sliding load
scpi.execute("SENS:CORR:COLL:CKIT:SELECT 1" )
```

```
PrintKitStandardInfo 1
PrintKitOlist 1

' ------------------------------------------
'    CALIBRATE PORTS 1 and 2, insertable cal
' ------------------------------------------
wscript.echo
wscript.echo "Calibrating ports 1 and 2"
scpi.execute("SYST:PRES;")
scpi.execute("calc:par:sel CH1_S11_1")
scpi.execute("SENS:CORR:TST:STATE 0")
scpi.execute("SENS:CORR:COLL:METHod SPARSOLT")
scpi.execute("SENS:CORR:SFOR 1")
MeasureFemaleStandards 1
scpi.execute("SENS:CORR:SFOR 0")
MeasureMaleStandards 2
MeasureTransmissionStandards 1,2
scpi.execute("SENS:CORR:COLL:SAVE")

' ------------------------------------------
'    CALIBRATE PORTS 2 and 3, insertable cal
' ------------------------------------------
wscript.echo
wscript.echo "Calibrating ports 2 and 3"
scpi.execute("SYST:PRES;")
scpi.execute("calc:par:sel CH1_S11_1")
scpi.execute("calc:par:mod S23")
scpi.execute("SENS:CORR:TST:STATE 0")
scpi.execute("SENS:CORR:COLL:METHod SPARSOLT")
scpi.execute("SENS:CORR:SFOR 1")
MeasureMaleStandards 2
scpi.execute("SENS:CORR:SFOR 0")
MeasureFemaleStandards 3
MeasureTransmissionStandards 2,3
scpi.execute("SENS:CORR:COLL:SAVE")

' ------------------------------------------
'    CALIBRATE PORTS 3 and 4, non-insertable cal
' ------------------------------------------
wscript.echo
wscript.echo "Calibrating ports 3 and 4"
scpi.execute("SYST:PRES;")
scpi.execute("calc:par:sel CH1_S11_1")
scpi.execute("calc:par:mod S43")
scpi.execute("SENS:CORR:COLL:METHod SPARSOLT")
scpi.execute("SENS:CORR:SFOR 1")
MeasureFemaleStandards 3
scpi.execute("SENS:CORR:SFOR 0")
MeasureFemaleStandards 4
MeasureAdapter 3, 4
scpi.execute("SENS:CORR:COLL:SAVE")
end sub
```

```
sub MeasureMaleStandards ( portNumber )
dim portstr
portstr = formatnumber(portNumber,0)
Promptconnect1 1, 1, portNumber
scpi.execute("SENS:CORR:COLL:ACQ STAN1;*OPC?")

Promptconnect1 2, 1, portNumber
scpi.execute("SENS:CORR:COLL:ACQ STAN2;*OPC?")
Promptconnect1 3, 3, portNumber
scpi.execute("SENS:CORR:COLL:ACQ STAN3,SST3;*OPC?")
end sub

sub MeasureFemaleStandards (portNumber)
dim portstr
portstr = formatnumber(portNumber,0)
Promptconnect1 1, 2, portNumber
scpi.execute("SENS:CORR:COLL:ACQ STAN1,SST2;*OPC?")
Promptconnect1 2, 2, portNumber
scpi.execute("SENS:CORR:COLL:ACQ STAN2,SST2;*OPC?")
Promptconnect1 3, 6, portNumber
scpi.execute("SENS:CORR:COLL:ACQ STAN3,SST6;*OPC?")
end sub

sub MeasureTransmissionStandards( port1, port2)
dim p1str
dim p2str
p1str = formatnumber( port1, 0)
p2str = formatnumber( port2, 0)

Promptconnect2 4, 1, port1, port2
scpi.execute("SENS:CORR:COLL:ACQ STAN4;*OPC?")
end sub

sub MeasureAdapter( port1, port2)
dim p1str
dim p2str
p1str = formatnumber( port1, 0)
p2str = formatnumber( port2, 0)

Promptconnect2 4, 2, port1, port2
scpi.execute("SENS:CORR:COLL:ACQ STAN4,SST2;*OPC?")
end sub

' return the nth item in the comma separated list
Function GetItemNumber( list, n)
dim strVector
strVector = split(list,",",-1,1)
GetItemNumber = strVector(n-1)
end function
' remove the trailing newline from str
function chop( str )
```

```
dim tmp
tmp = str
' remove the appended newline
dim pos
pos = InStrRev(tmp,vblf)
if (pos >0) then
tmp = mid(tmp,1,pos-1)
end if
chop = tmp
end function

'return the label for the nth standard assigned to the class described by
class_index.
' if class_index = 1, class is S11A (STAN1)
' if class_index = 2, class is S11B (STAN2), etc
function GetStandardLabel( class_index, nth)
dim olist
dim stdnum
dim resp
olist = scpi.execute("SENS:CORR:COLL:CKIT:OLIST" + formatnumber(class_index,0)+"?")
stdnum = GetItemNumber( olist, nth)
scpi.execute("SENS:CORR:COLL:CKIT:STAN " + formatnumber(stdnum,0))
resp = scpi.execute("SENS:CORR:COLL:CKIT:STAN:LABel?")
GetStandardLabel = chop(resp)
end function

sub PromptConnect1( class_index, nth, port)
wscript.echo "CONNECT " + GetStandardLabel( class_index, nth) + " to port " +
formatnumber(port,0)
end sub

sub PromptConnect2( class_index, nth, port1, port2)
wscript.echo "CONNECT " + GetStandardLabel( class_index, nth) + " between ports " +
formatnumber(port1,0) + " and " + formatnumber(port2,0)
end sub

' Print the order of standards per class for this kit
sub PrintKitOlist( kit )
dim i
dim cmd
dim resp
wscript.echo
dim olistcmd
olistcmd = "SENS:CORR:COLL:CKIT:OLIST"
' list the sub standards for each of the following classes
' S11A, S11B, S11C, FWD TRANS, FWD ISOL, S22A, S22B, S22C, REV TRANS, REV ISOL
for i = 1 to  8
cmd = olistcmd + formatNumber(i,0) + "?"
resp = scpi.execute(cmd)
wscript.echo cmd + "= " + chop(resp)
next
end sub
```

```
sub PrintKitStandardInfo( kit )
wscript.echo scpi.execute("SENS:CORR:COLL:CKIT:NAME?")
dim i
for i = 1 to 30
dim slabel
dim snum
snum = formatNumber(i,0)
scpi.execute("SENS:CORR:COLL:CKIT:STAN " + snum)
slabel=scpi.execute("SENS:CORR:COLL:CKIT:STAN:LABel?")
wscript.echo "Standard #"+snum+ " = " + chop(slabel)
next
end sub
```

The output from this program is as follows:

Microsoft (R) Windows Script Host Version 5.6

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"85052B 3.5 mm with sliding load"

Standard #1 = "3.5 mm male short"

Standard #2 = "3.5 mm male open"

Standard #3 = "3.5 mm male broadband load"

Standard #4 = "Insertable thru standard"

Standard #5 = "3.5 mm male sliding load"

Standard #6 = "3.5 mm male lowband load"

Standard #7 = "3.5 mm female short"

Standard #8 = "female to female characterized thru adapter"

Standard #9 = "0-2 Load"

Standard #10 = "Open"

Standard #11 = "Non-insertable thru"

Standard #12 = "3.5 mm female lowband load"

Standard #13 = "3.5 mm female sliding load"

Standard #14 = "3.5 mm female broadband load"

Standard #15 = "3.5 mm female open"

Standard #16 = "Open"

Standard #17 = "Open"

Standard #18 = "Open"

Standard #19 = "Open"

Standard #20 = "Open"

Standard #21 = "Open"

Standard #22 = "Open"

Standard #23 = "Open"

Standard #24 = "Open"

Standard #25 = "Open"

Standard #26 = "Open"

Standard #27 = "Open"

Standard #28 = "Open"

Standard #29 = "Open"

Standard #30 = "Open"

SENS:CORR:COLL:CKIT:OLIST1?= +2,+15,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST2?= +1,+7,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST3?= +6,+5,+3,+12,+13,+14,+0

SENS:CORR:COLL:CKIT:OLIST4?= +4,+8,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST5?= +2,+15,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST6?= +1,+7,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST7?= +6,+5,+3,+12,+13,+14,+0

SENS:CORR:COLL:CKIT:OLIST8?= +4,+8,+0,+0,+0,+0,+0

Calibrating ports 1 and 2

CONNECT "3.5 mm female open" to port 1

CONNECT "3.5 mm female short" to port 1

CONNECT "3.5 mm female broadband load" to port 1

CONNECT "3.5 mm male open" to port 2

CONNECT "3.5 mm male short" to port 2

CONNECT "3.5 mm male broadband load" to port 2

CONNECT "Insertable thru standard" between ports 1 and 2

Calibrating ports 2 and 3

CONNECT "3.5 mm male open" to port 2

CONNECT "3.5 mm male short" to port 2

CONNECT "3.5 mm male broadband load" to port 2

CONNECT "3.5 mm female open" to port 3

CONNECT "3.5 mm female short" to port 3

CONNECT "3.5 mm female broadband load" to port 3

CONNECT "Insertable thru standard" between ports 2 and 3

Calibrating ports 3 and 4

CONNECT "3.5 mm female open" to port 3

CONNECT "3.5 mm female short" to port 3

CONNECT "3.5 mm female broadband load" to port 3

CONNECT "3.5 mm female open" to port 4

CONNECT "3.5 mm female short" to port 4

CONNECT "3.5 mm female broadband load" to port 4

CONNECT "female to female characterized thru adapter" between ports 3 and 4

Perform an Unguided Cal on Multiple Channels

This VBScript program performs an Unguided Calibration simultaneously on two channels.

This could be used in the following cases:

- If you need more than the current number of data points per trace, so the additional points must be added to a different channel.
- If you need several channels with independent settings, but you want to calibrate all channels with a minimal number of standard connections. This would be especially critical for on wafer calibration.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as Unguided.vbs. Learn how to setup and run the macro.

```
Dim app
Dim scpi
Dim NumberOfActiveChannels
NumberOfActiveChannels = 2
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
' Query the list of connectors that the PNA system recognizes
scpi.Execute("SYST:PRES")
'Wait for successful preset before continuing
done=scpi.Execute("*OPC?")
'The following section sets up 2 channels with different frequency ranges
scpi.Execute("DISP:WIND1:STATE OFF")
'Reset Windows
scpi.Execute("DISP:WIND1:STATE ON")
scpi.Execute("DISP:WIND2:STATE ON")
'
' Assign a measurement to the first window
scpi.Execute("CALC1:PAR:DEF 'Meas1', S21")
scpi.Execute("DISP:WIND1:TRAC1:FEED 'Meas1'")
'Assign a measurement to the second window
scpi.Execute("CALC2:PAR:DEF 'Meas2', S21")
scpi.Execute("DISP:WIND2:TRAC1:FEED 'Meas2'")
```

```
'Set up two channels with independent parameters
scpi.Execute("SENS1:FREQ:SPAN 1e9")
scpi.Execute("SENS2:FREQ:SPAN 1e6")
'Wait for changes before continuing
done=scpi.Execute("*OPC?")
'
'This section sets the calibration kits for channel 1 and channel 2
'Select a trace from channel 1 and set calibration type and cal kit
scpi.Execute("CALC1:PAR:SEL 'Meas1'")
scpi.Execute("SENS1:CORR:COLL:METH SPARSOLT")
scpi.Execute("SENS1:CORR:COLL:CKIT 2") '85056D for default settings
'Same standards for forward and reverse direction
scpi.Execute("SENS1:CORR:TST OFF")
'Select a trace from channel 2 and set calibration type and cal kit
scpi.Execute("CALC2:PAR:SEL 'Meas2'")
scpi.Execute("SENS2:CORR:COLL:METH SPARSOLT")
scpi.Execute("SENS2:CORR:COLL:CKIT 2") '85056D for default settings
'Same standards for forward and reverse direction
scpi.Execute("SENS2:CORR:TST OFF")

'Set both channels to manual triggering
scpi.Execute("INIT1:CONT OFF")
scpi.Execute("INIT2:CONT OFF")
'
'The following assumes female port connector on port 1
' and male port connector on port 1
'Step through all active channels and calibrate and measure all standards.
scpi.Execute("SENS1:CORR:SFOR ON") 'Set acquisition to forward
scpi.Execute("SENS2:CORR:SFOR ON") 'Set acquisition to forward
MsgBox("Connect OPEN standard to port 1")
For CurrentChannel  = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL stan1")
done= scpi.Execute("*OPC?")
Next
```

```
MsgBox("Connect SHORT standard to port 1")
For CurrentChannel = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL stan2")
done=scpi.Execute("*OPC?")
Next

MsgBox("Connect LOAD standard to port 1")
For CurrentChannel = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL stan3")
done=scpi.Execute("*OPC?")
Next
scpi.Execute("SENS1:CORR:SFOR OFF") 'Set acquisition to reverse
scpi.Execute("SENS2:CORR:SFOR OFF") 'Set acquisition to forward

MsgBox("Connect OPEN standard to port 2")
For CurrentChannel = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL stan1")
done=scpi.Execute("*OPC?")
Next

MsgBox("Connect SHORT standard to port 2")
For CurrentChannel = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL stan2")
done=scpi.Execute("*OPC?")
Next

MsgBox("Connect LOAD standard to port 2")
For CurrentChannel = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL stan3")
done=scpi.Execute("*OPC?")
Next
```

```
'
'Measure thru standard for all channels in both forward and reverse direction
MsgBox("Connect THRU between ports 1 and 2")
scpi.Execute("SENS1:CORR:SFOR ON") 'Set acquisition to forward
scpi.Execute("SENS2:CORR:SFOR ON") 'Set acquisition to forward
For CurrentChannel = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL stan4")
done=scpi.Execute("*OPC?")
Next
scpi.Execute("SENS1:CORR:SFOR OFF") 'Set acquisition to reverse
scpi.Execute("SENS2:CORR:SFOR OFF") 'Set acquisition to reverse
For CurrentChannel = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL stan4")
done=scpi.Execute("*OPC?")
Next

For CurrentChannel = 1 To NumberOfActiveChannels
scpi.Execute("CALC" & CurrentChannel & ":PAR:SEL 'Meas" & CurrentChannel & "'")
scpi.Execute("SENS" & CurrentChannel & ":CORR:COLL:SAVE")
done=scpi.Execute("*OPC?")
Next

'Set both channels to continuous triggering
scpi.Execute("INIT1:CONT ON")
scpi.Execute("INIT2:CONT ON")
```

ECALConfidence Check using SCPI

This Visual Basic program performs a complete ECAL confidence check.

To run this program, you need:

- An established GPIB interface connection
- Agilent's VISA or National Instrument's VISA installed on your PC
- The module visa32.bas added to your VB project.
- A form with two buttons: cmdRun and cmdQuit
- A calibrated S11 1-port or N-port measurement active on Channel 1
- Window 1 is visible

See Other SCPI Example Programs

```
'Session to VISA Default Resource Manager
Private defRM As Long
'Session to PNA
Private viPNA As Long
'VISA function status return code
Private status As Long

Private Sub Form_Load()
   defRM = 0
End Sub

Private Sub cmdRun_Click()
'String to receive data from the PNA
Dim strReply As String * 200

' Open the VISA default resource manager
status = viOpenDefaultRM(defRM)
If (status < VI_SUCCESS) Then HandleVISAError

' Open a VISA session (viPNA) to the PNA at GPIB address 16.
status = viOpen(defRM, "GPIB0::16::INSTR", 0, 0, viPNA)
If (status < VI_SUCCESS) Then HandleVISAError

' Need to set the VISA timeout value to give all our GPIB Reads
' sufficient time to complete before a timeout error occurs.
' For this example, let's try setting the limit to
' 10000 milliseconds (10 seconds).
status = viSetAttribute(viPNA, VI_ATTR_TMO_VALUE, 10000)
If (status < VI_SUCCESS) Then HandleVISAError

' Get the catalog of all the measurements currently on Channel 1.
status = myGPIBWrite(viPNA, "CALC1:PAR:CAT?")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError
```

```
' If an S11 measurement named "MY_S11" doesn't already exist,
' then create it.
If InStr(strReply, "MY_S11") = 0 Then
   status = myGPIBWrite(viPNA, "CALC1:PAR:DEF MY_S11,S11")
   If (status < VI_SUCCESS) Then HandleVISAError
End If
strReply = ""

' Get the catalog of all the trace numbers currently active
' in Window 1.
status = myGPIBWrite(viPNA, "DISP:WIND1:CAT?")
If (status < VI_SUCCESS) Then HandleVISAError

status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError

' If a trace number 4 already exists in Window 1, then this
' will remove it.
If InStr(strReply, "4") > 0 Then
   status = myGPIBWrite(viPNA, "DISP:WIND1:TRAC4:DEL")
   If (status < VI_SUCCESS) Then HandleVISAError
End If

' Set trace number 4 to MY_S11.
status = myGPIBWrite(viPNA, "DISP:WIND1:TRAC4:FEED MY_S11")
If (status < VI_SUCCESS) Then HandleVISAError

' Set up trace view so we are viewing only the data trace.
status = myGPIBWrite(viPNA, "DISP:WIND1:TRAC4 ON")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBWrite(viPNA, "DISP:WIND1:TRAC4:MEM OFF")
If (status < VI_SUCCESS) Then HandleVISAError

' Select MY_S11 as the measurement to be used for the
' Confidence Check.
status = myGPIBWrite(viPNA, "SENS1:CORR:CCH:PAR MY_S11")
If (status < VI_SUCCESS) Then HandleVISAError

' Acquire the S11 confidence check data from ECal Module A
' into the memory buffer (asking for an OPC reply when it's done).
status = myGPIBWrite(viPNA, "SENS1:CORR:CCH:ACQ ECAL1;*OPC?")
If (status < VI_SUCCESS) Then HandleVISAError

' The PNA sends an OPC reply ("+1") when the confidence data
' acquisition into memory is complete, so this Read is waiting on
' the reply until it is received.
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError

' Turn on trace math so the trace shows data divided by memory.
' You can be confident the S11 calibration is reasonably good if
```

```
' the displayed trace varies no more than a few tenths of a dB
' from 0 dB across the entire span.
status = myGPIBWrite(viPNA, "CALC1:PAR:SEL MY_S11")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBWrite(viPNA, "CALC1:MATH:FUNC DIV")
If (status < VI_SUCCESS) Then HandleVISAError
End Sub

Private Sub cmdQuit_Click()
' Turn off trace math
status = myGPIBWrite(viPNA, "CALC1:MATH:FUNC NORM")
If (status < VI_SUCCESS) Then HandleVISAError

' Conclude the confidence check to set the ECal module
' back to it's idle state.
status = myGPIBWrite(viPNA, "SENS1:CORR:CCH:DONE")
If (status < VI_SUCCESS) Then HandleVISAError

' Close the resource manager session (which also closes
' the session to the PNA).
If defRM <> 0 Then Call viClose(defRM)

' End the program
End
End Sub

Private Function myGPIBWrite(ByVal viHandle As Long, ByVal strOut As String) As Long
' The "+ Chr$(10)" appends an ASCII linefeed character to the output, for
' terminating the write transaction.
myGPIBWrite = viVPrintf(viHandle, strOut + Chr$(10), 0)
End Function

Private Function myGPIBRead(ByVal viHandle As Long, strIn As String) As Long
myGPIBRead = viVScanf(viHandle, "%t", strIn)
End Function

Sub HandleVISAError()
Dim strVisaErr As String * 200
Call viStatusDesc(defRM, status, strVisaErr)
MsgBox "*** Error : " + strVisaErr, vbExclamation
End
End Sub
```

Perform a Source and Receiver Power Cal using SCPI

Programming the PNA using COM or using SICL/VISA over LAN (as in this example) leaves the PNA free to control GPIB devices as needed.

The first example, using Visual Basic, demonstrates the following:

- Performing a source power calibration of Port 2 for Channel 1.
- Reading the calibration data.

The second example performs a Receiver Power Cal using VBScript.

Learn more about Power Calibrations.

See an example that Uploads a Source Power Cal.

Other SCPI Example Programs

To run this program, you need:

- One of the following power meters connected to the PNA through GPIB: E4416A, E4417A, E4418A/B, E4419A/B, 437B, 438A, EPM-441A, EPM-442A

Note: If your power meter is other than these, you can create your own Power Meter Driver using our template.

- Your PC and PNA both connected to a LAN (for communicating with each other).
- The SICL and VISA components of Agilent's I/O Libraries software installed on your PC (both are included when you install the software, unless you already have another vendor's VISA installed. Then specify Full SICL and VISA installation to overwrite the other vendor's VISA.
- The module visa32.bas added to your VB project.
- A form with one button labeled cmdRun.
- A VISA interface configured on your remote PC to control the PNA. This could be GPIB interface or a VISA LAN Client.
- On the PNA connect a Thru cable from port 1 to port 2.

Note: The SOURce:POWer:CORRection:COLLect:ACQuire command, when used with a power meter, cannot be sent over the GPIB unless the power meter is connected to a different GPIB interface. See the alternative methods described in the command details.

```
'Session to VISA Default Resource Manager
Private defRM As Long
```

```
'Session to PNA
Private viPNA As Long
'VISA function status return code
Private status As Long

Private Sub Form_Load()
defRM = 0
End Sub

Private Sub cmdRun_Click()
' String to receive data from the PNA.
' Dimensioned large enough to receive scalar comma-delimited values
' for 21 frequency points (20 ASCII characters per point)
Dim strReply As String * 420

Dim strStimulus, strCalValue
Dim strResult As String

' Open the VISA default resource manager
status = viOpenDefaultRM(defRM)
If (status < VI_SUCCESS) Then HandleVISAError

' Open a session (viPNA) to the PNA at "address 16" on the VISA
' interface configured as "GPIB1" on this PC.  This could be a
' VISA LAN Client pointing to the SICL LAN Server on the PNA, or
' an actual GPIB interface on this PC connected to the PNA GPIB
' (in which case the power meter would need to be connected to a
' different GPIB interface on the PNA, such as the Agilent 82357A
' USB-to-GPIB).
status = viOpen(defRM, "GPIB0::16::INSTR", 0, 0, viPNA)
If (status < VI_SUCCESS) Then HandleVISAError

' Set the number of sweep points to 21 on Channel 1.
status = myGPIBWrite(viPNA, "SENS1:SWE:POIN 21")
If (status < VI_SUCCESS) Then HandleVISAError
```

```
' Specify the GPIB address of the power meter
' that will be used in performing the calibration.
status = myGPIBWrite(viPNA, "SYST:COMM:GPIB:PMET:ADDR 13")
If (status < VI_SUCCESS) Then HandleVISAError

' Turn use of the loss table OFF (this assumes there is
' virtually no loss in the RF path to the power sensor
' due to a splitter, coupler or adapter).
status = myGPIBWrite(viPNA, "SOUR:POW:CORR:COLL:TABL:LOSS OFF")
If (status < VI_SUCCESS) Then HandleVISAError

' Turn frequency checking OFF (so one power sensor is used for the entire cal
' acquisition sweep regardless of frequency span).
status = myGPIBWrite(viPNA, "SOUR:POW:CORR:COLL:FCH OFF")
If (status < VI_SUCCESS) Then HandleVISAError

' Specify a nominal power accuracy tolerance (NTOLerance) in dB for the
calibration,
' and the maximum number (COUNt) of iterations to adjust power at each point,
' attempting to achieve within tolerance of the desired power.  If at any
stimulus
' point the power fails to reach within the set tolerance of the desired power
' after the maximum number of iterations, the power at that point will be set to
the
' value determined by the last iteration (the Source Power Cal dialog box will
' indicate the FAIL, but we can still apply the cal if desired when it's
complete).
' Each iteration is based upon a SETTLED power reading (see comments preceding
the
' next two commands below).
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:ITER:NTOL 0.1")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:ITER:COUN 3")
If (status < VI_SUCCESS) Then HandleVISAError

' The worst-case window of power uncertainty (for a calibration which meets
' tolerance) is the sum of the iteration tolerance and the power meter settling
' tolerance (which is described below).
```

```
' At each stimulus point, the PNA takes power meter readings and determine when
' they have settled by comparing the magnitude difference between consecutive
' readings versus a nominal dB tolerance limit (NTOLerance) on that magnitude
' difference.  When consecutive readings are within tolerance of each other, or
' if they are not within tolerance but we've taken a maximum number of readings
' (COUNt), the PNA does a weighted average of the readings taken at that stimulus
' point and that is considered our settled power reading.
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:AVER:NTOL 0.1")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:AVER:COUN 5")
If (status < VI_SUCCESS) Then HandleVISAError

' Specify if the cal power level is offset (positive value for a gain, negative
' value for a loss) from the PNA port power setting on the channel when no source
' power cal is active.  This is to account for components between the PNA test
' port and cal reference plane.  In this example, we will calibrate at the PNA
' test port, so there is no offset (it is zero).

status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:OFFS 0 DB")
If (status < VI_SUCCESS) Then HandleVISAError

' Show the source power cal dialog during the source power cal acquisition.
' (this is the default, so this command is only necessary if this setting
' may have been changed beforehand, perhaps by another program).
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:DISP ON")
If (status < VI_SUCCESS) Then HandleVISAError

' Specify the method (type of device) that will be used to perform the cal.
' Choose from power meter (PMETer), power meter and receiver (PMReceiver)
' or just receiver (RECeiver).
' PMReceiver uses the power meter for the first iteration of each point and
' the PNA's reference receiver for subsequent iterations, so is much faster
' than using power meter only.  But the power meter accounts for compression
' when calibrating at the output of an active device, whereas the reference
' receiver cannot unless it is coupled to the cal reference plane (on a PNA
```

```
' which allows direct access to the receivers).
' Perform the source power cal acquisition sweep using the sensor attached to
' Channel A of the power meter (asking for an OPC reply when it’s done).  This
' assumes that the power sensor is already connected to Port 2 of the PNA.

' We'll put up an hourglass cursor while waiting for the acquire to complete.
Screen.MousePointer = vbHourglass
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:ACQ PMET,'ASEN';*OPC?")
If (status < VI_SUCCESS) Then HandleVISAError
' Other valid selections would be the following:
‘ This mode uses Power Meter and Reference Receiver
‘status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:ACQ PMR,'BSEN';*OPC?")
‘ This mode uses PNA receiver only (no power meter)
‘status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:ACQ REC,'b1';*OPC?")

' In the process of beginning a source power cal acquisition, the PNA searches
' for the power meter on VISA interfaces configured in the Agilent I/O Libraries
' on the PNA.  One of those interfaces is the SICL/VISA LAN server, so if this
' program is using that interface, we need to ensure our program is not pending
' an operation on that interface when the PNA wants to search it.  So this
' Wait subroutine suspends execution of our program (for 6000 milliseconds =
' 6 seconds), giving the PNA time to search that interface and discover that the
' power meter is not there (the 6 seconds is just to be safe, the search actually
' takes only a few seconds).
' Note: If instead of using the VISA LAN server interface, you are having this
' program communicate with the PNA via it's GPIB interface (which requires the
' power meter be connected to a different GPIB interface on the PNA, such as the
' Agilent 82357A USB-to-GPIB), then this Wait is not needed.
Wait 6000

' The PNA sends an OPC reply ("+1") when the cal acquisition is complete, so
' our Read operation will wait on the reply until it is received.  We need to
' set the VISA timeout value long enough to give our Read sufficient time to
' complete before a timeout error occurs.  For this example, let's try setting
' the limit to 60000 milliseconds (60 seconds).
status = viSetAttribute(viPNA, VI_ATTR_TMO_VALUE, 60000)
```

```
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError

' Change mouse cursor from hourglass back to normal
Screen.MousePointer = vbDefault

' Conclude the calibration.  This applies the cal data to PNA channel memory,
' and turns the correction ON for Port 2 on Channel 1,
' but does NOT save the calibration.
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:COLL:SAVE")
If (status < VI_SUCCESS) Then HandleVISAError

' At this point, if you choose to save the instrument state as a ".CST" file,
' the calibration will be saved with the instrument state in that file.

' Prepare for doing data transfer in ASCII format.
status = myGPIBWrite(viPNA, "FORM:DATA ASCII")
If (status < VI_SUCCESS) Then HandleVISAError

' Read the stimulus values from Channel 1.
status = myGPIBWrite(viPNA, "SENS1:X?")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError

' Tokenize the reply string into an array containing the values
strStimulus = Split(strReply, ",")

' Read the source power correction data.
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:DATA?")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError

' Tokenize the reply string into an array containing the values
```

```
strCalValue = Split(strReply, ",")

' Print the data using a message box (here, Chr returns the ASCII characters
' for Tab (9) and Linefeed (10)).
strResult = "Stimulus" & Chr(9) & Chr(9) & "Cal Value" & Chr(10)
For i = 0 To UBound(strStimulus)
strResult = strResult & Val(strStimulus(i)) & Chr(9) & Val(strCalValue(i)) &
Chr(10)
Next
MsgBox strResult
End Sub

Private Function myGPIBWrite(ByVal viHandle As Long, ByVal strOut As String) As
Long

' The "+ Chr$(10)" appends an ASCII linefeed character to the
' output, for terminating the write transaction.
myGPIBWrite = viVPrintf(viHandle, strOut + Chr$(10), 0)
End Function

Private Function myGPIBRead(ByVal viHandle As Long, strIn As String) As Long
myGPIBRead = viVScanf(viHandle, "%t", strIn)
End Function

Sub HandleVISAError()
Dim strVisaErr As String * 200
Call viStatusDesc(defRM, status, strVisaErr)
MsgBox "*** Error : " + strVisaErr, vbExclamation

' Close the resource manager session (which also closes
' the session to the PNA).

If defRM <> 0 Then Call viClose(defRM)
End
End Sub

Public Sub Wait(ByVal mS_delay As Long)
```

```
Dim t0 As Single
t0 = Timer
Do While Timer - t0 < mS_delay / 1000
Dim dummy As Integer
dummy = DoEvents() ' if we cross midnight, back up one day
If Timer < t0 Then t0 = t0 - 86400
Loop
End Sub
```

Perform a Receiver Power Cal

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file, such as Notepad, and save it on the PNA hard drive as *.vbs.

Learn how to setup and run the macro.

```
Dim pna
Dim scpi
Set pna = CreateObject("AgilentPNA835x.Application")
Set scpi = pna.ScpiStringParser
' For simplicity, this example starts from the preset instrument state
scpi.Execute "SYST:PRESet"
' Turn off continuous sweep
scpi.Execute "INITiate:CONTinuous OFF"
' Select the S11 measurement that was created by the instrument preset
scpi.Execute "CALCulate:PARameter:SELect 'CH1_S11_1'"
' Change the measurement parameter to measure the B receiver
scpi.Execute "CALCulate:PARameter:MODify B,1"
' Specify the Calibration Type, then Prompt
' to ensure the receiver is connected to port 1.
scpi.Execute "SENSe:CORRection:COLLect:METHod RPOWer"
MsgBox "Connect port 1 to port 2 so power is supplied to the B receiver, then press
enter"
' Acquire the power measurement; returning reply to *OPC? when finished.
response = scpi.Execute( "SENSe:CORRection:COLLect:ACQuire POWer;*OPC?" )
' Compute the error term, store to calset and turn on the calibration.
response = scpi.Execute( "SENSe:CORRection:COLLect:SAVE" )
MsgBox "Done with calibration."
```

Last modified:

9/22/06	Modified for receiver only feature

Uploading a Source Power Cal using SCPI

Programming the PNA using COM or using SICL/VISA over LAN (as in this example) leaves the PNA free to control GPIB devices as needed. This Visual Basic program demonstrates:

- Uploading a source power calibration of Port 2 for Channel 1.
- Reading the calibration data.

Learn more about Power Calibrations

Other SCPI Example Programs

To run this program, you need:

- Your PC and PNA both connected to a LAN (if using VISA LAN server / client).
- The SICL and VISA components of Agilent's I/O Libraries software installed on your PC (both are included when you install the software, unless you already have another vendor's VISA installed. Then specify Full SICL and VISA installation to overwrite the other vendor's VISA.
- The module visa32.bas added to your VB project.
- A form with two buttons: cmdRun and cmdQuit.
- A VISA interface configured on your remote PC to control the PNA. This could be GPIB interface or a VISA LAN Client.

```
'Session to VISA Default Resource Manager
Private defRM As Long
'Session to PNA
Private viPNA As Long
'VISA function status return code
Private status As Long
Private Sub Form_Load()
defRM = 0
End Sub
Private Sub cmdRun_Click()

' String to receive data from the PNA.
' Dimensioned large enough to receive scalar comma-delimited values
' for 21 frequency points (20 ASCII characters per point)
Dim strReply As String * 420
Dim strPower As String, strCalPower As String
Dim strStimulus, strCalValue
Dim strResult As String

' Open the VISA default resource manager
```

```
status = viOpenDefaultRM(defRM)
If (status < VI_SUCCESS) Then HandleVISAError

' Open a session (viPNA) to the PNA at "address 16" on the VISA
' interface configured as "GPIB0" on this PC.
status = viOpen(defRM, "GPIB0::16::INSTR", 0, 0, viPNA)
If (status < VI_SUCCESS) Then HandleVISAError

' Set the number of sweep points to 2 on Channel 1.
status = myGPIBWrite(viPNA, "SENS1:SWE:POIN 2")
If (status < VI_SUCCESS) Then HandleVISAError

' Ensure there's currently no source power cal on for this channel and port.
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR OFF")
If (status < VI_SUCCESS) Then HandleVISAError

' Specify if the cal power level is offset (positive value for a gain, negative
' value for a loss) from the PNA port power setting on the channel when no source
' power cal is active.  This is to account for components between the PNA test
' port and cal reference plane.  In this example, let's set up our calibration
' at the output of an amplifier with 15 dB gain.
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:OFFS 15 DB")
If (status < VI_SUCCESS) Then HandleVISAError

' Prepare for doing data transfer in ASCII format.
status = myGPIBWrite(viPNA, "FORM:DATA ASCII")
If (status < VI_SUCCESS) Then HandleVISAError

' Send our source power correction data to the PNA.  For purpose of simplicity
' in this example, we'll set up for no correction (0) at our start stimulus and
' 0.5 dB at our stop stimulus (recall that our sweep currently has just 2 points).
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:DATA 0,0.5")
If (status < VI_SUCCESS) Then HandleVISAError

' Set the number of sweep points to 21 on Channel 1.
status = myGPIBWrite(viPNA, "SENS1:SWE:POIN 21")
If (status < VI_SUCCESS) Then HandleVISAError

' Read the fixed power level for this port on Channel 1.
status = myGPIBWrite(viPNA, "SOUR1:POW2:LEV?")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError
strPower = strReply

' Turn the source power cal on.
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR ON")
If (status < VI_SUCCESS) Then HandleVISAError

' Again read the fixed power level for this port on Channel 1
' (with our calibration turned on, this should now include the 15 dB offset
' we indicated our power amplifier provides).
```

```
status = myGPIBWrite(viPNA, "SOUR1:POW2:LEV?")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError
strCalPower = strReply

' Read the stimulus values from Channel 1.
status = myGPIBWrite(viPNA, "SENS1:X?")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError

' Tokenize the reply string into an array containing the values
strStimulus = Split(strReply, ",")

' Read back the source power correction data, now interpolated for 21 points
status = myGPIBWrite(viPNA, "SOUR1:POW2:CORR:DATA?")
If (status < VI_SUCCESS) Then HandleVISAError
status = myGPIBRead(viPNA, strReply)
If (status < VI_SUCCESS) Then HandleVISAError

' Tokenize the reply string into an array containing the values
strCalValue = Split(strReply, ",")

' Print the data using a message box (here, Chr returns the ASCII characters
' for Tab (9) and Linefeed (10)).
strResult = "PNA port power = " & Val(strPower) & Chr(10)
strResult = strResult & "Power at reference plane = " & Val(strCalPower) & Chr(10)
 Chr(10)
strResult = strResult & "Stimulus" & Chr(9) & Chr(9) & "Cal Value" & Chr(10)
For i = 0 To UBound(strStimulus)
 strResult = strResult & Val(strStimulus(i)) & Chr(9) & Val(strCalValue(i)) &
Chr(10)
Next
MsgBox strResult
End Sub
Private Sub cmdQuit_Click()

' Close the resource manager session (which also closes
' the session to the PNA).
If defRM <> 0 Then Call viClose(defRM)

' End the program
End
End Sub
Private Function myGPIBWrite(ByVal viHandle As Long, ByVal strOut As String) As Long

' The "+ Chr$(10)" appends an ASCII linefeed character to the
' output, for terminating the write transaction.
myGPIBWrite = viVPrintf(viHandle, strOut + Chr$(10), 0)
End Function
Private Function myGPIBRead(ByVal viHandle As Long, strIn As String) As Long
```

```
myGPIBRead = viVScanf(viHandle, "%t", strIn)

' Remove trailing linefeed character
If Right(strIn, 1) = Chr(10) Then strIn = Left(strIn, Len(strIn) - 1)
End Function
Sub HandleVISAError()
Dim strVisaErr As String * 200
Call viStatusDesc(defRM, status, strVisaErr)
MsgBox "*** Error : " + strVisaErr, vbExclamation

' Close the resource manager session (which also closes
' the session to the PNA).
If defRM <> 0 Then Call viClose(defRM)
End
End Sub
```

Perform a Sliding Load Calibration using GPIB

This Visual Basic program does a **only** the sliding load portion of a Calibration.
To run this program, you need:

- An established GPIB interface connection
- A measurement and calibration routine to call this sub-program
- STAN3 set up as a sliding load standard

See Other SCPI Example Programs

```
Sub slide()
'Measure the sliding load for at least 5 and no more than 7 slides
'Note that "SLSET" and "SLDONE" must be executed before the actual acquisition of a
slide
MsgBox "Connect Sliding Load; set to Position 1; then press OK"
GPIB.Write "SENS:CORR:COLL SLSET"
GPIB.Write "SENS:CORR:COLL STAN3;"

MsgBox "Set Sliding Load to position 2; then press OK"
GPIB.Write "SENS:CORR:COLL SLSET"
GPIB.Write "SENS:CORR:COLL STAN3;"

MsgBox "Set Sliding Load to position 3; then press OK"
GPIB.Write "SENS:CORR:COLL SLDONE"
GPIB.Write "SENS:CORR:COLL STAN3;"
End Sub
```

Load Error Terms during a Cal Sequence

This example requires that you already have a Cal Set named "foo" that contains a 1-port cal on port 1 and a 1-port cal on port 2.

This example starts a Guided Calibration specifying an Unknown Thru. It loads the 1-port Cals from the existing "foo" Cal Set, then recalculates the number of steps required to complete the cal. After loading the 1-port cals, only the Unknown Thru standard is left to acquire.

```
SENS:CORR:COLL:GUID:CONN:PORT1 "APC 3.5 female"
SENS:CORR:COLL:GUID:CONN:PORT2 "APC 3.5 female"
SENS:CORR:COLL:GUID:CKIT:PORT1 "85033D/E"
SENS:CORR:COLL:GUID:CKIT:PORT2 "85033D/E"
SENS:CORR:COLL:GUID:METH UNKN
' auto-create user calsets for SCPI
SENS:CORR:PREF:CSET:SAVU 1
SENS:CORR:COLL:GUID:INIT
' should return the number 7
SENS:CORR:COLL:GUID:STEPS?
' to port 1, from port 1 in calset
SENS:CORR:COLL:GUID:ETER:LOAD "foo",1,1
' to port 2, from port 2 in calset
SENS:CORR:COLL:GUID:ETER:LOAD "foo",2,2
' should now return the number 1
SENS:CORR:COLL:GUID:STEPS?
' measure the unknown thru
SENS:CORR:COLL:GUID:ACQ STAN1
' save the cal to new user calset
SENS:CORR:COLL:GUID:SAVE
```

Create New Cal Kit using SCPI

When creating new cal kits programmatically, the order in which cal kit commands are sent can be important. For example to create a kit with opens, shorts, loads, and thrus. Be sure to use the following sequence for each newly defined standard.

1. Programmatically select the standard number
2. Programmatically select the standard type.
3. Program the cal standard's values.
4. Repeat steps 1, 2, 3 for additional new standards being defined.

```
10   !
20   !
30   ! This example program demonstrates how to create
40   ! new PNA calibration kits.
50   !
60   ! 1) Select a kit not previously defined
70   ! 2) Define open, short, load, and thru cal standards
80   !    Note:  Each of the newly defined standards is assigned
90   !    a default connector name.  These default connector names
100  !    will be replaced in subsequent steps.
110  ! 3) Use the delete connector command to remove default
120  !    connector names.
130  ! 4) Add connectors.  Specify:
140  !      Start and Stop Freq
150  !      Z - Impedance
160  !      sex - MALE, FEMALE, NONE
170  !      media - COAX, WAVE
180  !      cutoff - Frequency for waveguide
190  ! 5) Assign the appropriate connector to each standard
200  ! 6) Modify the class assignments for the standards defined
210  ! 7) Verify the kit values
220  !
230  ! Additional Note:  After setting each new cal kit value, it is
240  ! recommended that the program periodically perform queries to
250  ! verify the new values.
260  !
270  ! This will prevent program synchronization issues that can affect
280  ! final values stored within new cal kits.
290  !
300  !------------------------------------------------------------
310  !
320  ! Set up I/O path
330   ASSIGN @Na TO 716
340   DIM Calkname$[80],Conn$[80]
350   INTEGER Calkitnum
```

```
360 !
370  CLEAR SCREEN
380 !
390 !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
400 ! Designate the kit selection to be used for performing cal's
410  OUTPUT @Na;":sens:corr:ckit:count?"
420  ENTER @Na;Calkitnum
430  Calkitnum=Calkitnum+1
440  OUTPUT @Na;":sens:corr:coll:ckit "&VAL$(Calkitnum)
450 !
460 ! Name this kit with your own name
470  OUTPUT @Na;":sens:corr:coll:ckit:name ""Special 2.4 mm Model 85056"""
480 !
490 !
500  DISP "Defining kit std 1..."
510 ! Now set up standard #1
520  OUTPUT @Na;":sens:corr:coll:ckit:stan 1"
530  OUTPUT @Na;":sens:corr:coll:ckit:stan:type SHORT"
540  Get_std
550  OUTPUT @Na;":sens:corr:coll:ckit:stan:char coax"
560  OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""My Short"""
570  Get_label
580 !
590  DISP "Defining kit std 2..."
600 ! Now set up standard #2
610  OUTPUT @Na;":sens:corr:coll:ckit:stan 2"
620  OUTPUT @Na;":sens:corr:coll:ckit:stan:type OPEN"
630  Get_std
640  OUTPUT @Na;":sens:corr:coll:ckit:stan:char coax"
650  OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""My Open"""
660  Get_label
670 !
680  DISP "Defining kit std 3..."
690 ! Now set up standard #3
700  OUTPUT @Na;":sens:corr:coll:ckit:stan 3"
710  OUTPUT @Na;":sens:corr:coll:ckit:stan:type LOAD"
720  Get_std
730  OUTPUT @Na;":sens:corr:coll:ckit:stan:char coax"
740  OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""My Fixed Load"""
750  Get_label
760 !
770  DISP "Defining kit std 4..."
780 ! Now set up standard #4
790  OUTPUT @Na;":sens:corr:coll:ckit:stan 4"
800  OUTPUT @Na;":sens:corr:coll:ckit:stan:type THRU"
810  Get_std
820  OUTPUT @Na;":sens:corr:coll:ckit:stan:char coax"
830  OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""My Thru"""
840  Get_label
```

```
850  !
860   DISP "Defining kit std 5..."
870  ! Now set up standard #5
880   OUTPUT @Na;":sens:corr:coll:ckit:stan 5"
890   OUTPUT @Na;":sens:corr:coll:ckit:stan:type SLOAD"
900   Get_std
910   OUTPUT @Na;":sens:corr:coll:ckit:stan:char coax"
920   OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""Sliding Load"""
930   Get_label
940  !
950   DISP "Defining kit std 6..."
960  ! Now set up standard #6
970  !
980   OUTPUT @Na;":sens:corr:coll:ckit:stan 6"
990   OUTPUT @Na;":sens:corr:coll:ckit:stan:type SHORT"
1000  Get_std
1010  OUTPUT @Na;":sens:corr:coll:ckit:stan:char coax"
1020  OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""Short"""
1030  Get_label
1040 !
1050  DISP "Defining kit std 7..."
1060 ! Now set up standard #7
1070  OUTPUT @Na;":sens:corr:coll:ckit:stan 7"
1080  OUTPUT @Na;":sens:corr:coll:ckit:stan:type SHORT"
1090  Get_std
1100  OUTPUT @Na;":sens:corr:coll:ckit:stan:char coax"
1110  OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""Short"""
1120  Get_label
1130 !
1140  DISP "Defining kit std 8..."
1150 ! Now set up standard #8
1160 !
1170  OUTPUT @Na;":sens:corr:coll:ckit:stan 8"
1190  OUTPUT @Na;":sens:corr:coll:ckit:stan:type ARBI"
1200  Get_std
1210  OUTPUT @Na;":sens:corr:coll:ckit:stan:char coax"
1220  OUTPUT @Na;":sens:corr:coll:ckit:stan:TZR 15;"
1230  OUTPUT @Na;":sens:corr:coll:ckit:stan:TZI -9;"
1240  OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""Z Load"""
1250  Get_label
1260 !
1270 !
1280 !
1290 ! First remove any old connector names
1300  OUTPUT @Na;":sens:corr:coll:ckit:conn:del"
1310 ! Verify that no connectors are currently installed
1320  OUTPUT @Na;":sens:corr:coll:ckit:conn:cat?"
1330  ENTER @Na;Conn$
1340  PRINT "Verify empty list: ";Conn$
```

```
1350 !
1360 ! Define your new connectors
1370  OUTPUT @Na;":sens:corr:coll:ckit:conn:add ""PSC
2.4"",0HZ,999GHZ,50.0,MALE,COAX,0.0"
1380  OUTPUT @Na;":sens:corr:coll:ckit:conn:add ""PSC
2.4"",0HZ,999GHZ,50.0,FEMALE,COAX,0.0"
1390 !
1400 ! Verify that the new connectors are installed
1410  OUTPUT @Na;":sens:corr:coll:ckit:conn:cat?"
1420  ENTER @Na;Conn$
1430  PRINT "Verify new connectors: ";Conn$
1440  DISP ""
1450 !
1460  DISP "Defining conn std 1..."
1470 ! Now set up standard #1
1480  OUTPUT @Na;":sens:corr:coll:ckit:stan 1"
1490  Verify_std
1500  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",FEMALE,1"
1510  Print_connector
1520 !
1530  DISP "Defining conn std 2..."
1540 ! Now set up standard #2
1550  OUTPUT @Na;":sens:corr:coll:ckit:stan 2"
1560  Verify_std
1570  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",FEMALE,1"
1580  Print_connector
1590 !
1600  DISP "Defining conn std 3..."
1610 ! Now set up standard #3
1620  OUTPUT @Na;":sens:corr:coll:ckit:stan 3"
1630  Verify_std
1640  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",FEMALE,1"
1650  Print_connector
1660 !
1670  DISP "Defining conn std 4..."
1680 ! Now set up standard #4
1690  OUTPUT @Na;":sens:corr:coll:ckit:stan 4"
1700  Verify_std
1710  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",FEMALE,1"
1720  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",MALE,2"
1730  Print_connector
1740 !
1750  DISP "Defining conn std 5..."
1760 ! Now set up standard #5
1770  OUTPUT @Na;":sens:corr:coll:ckit:stan 5"
1780  OUTPUT @Na;":sens:corr:coll:ckit:stan:label ""Sliding Load"""
1790  Verify_std
1800  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",MALE,1"
1810  Print_connector
```

```
1820 !
1830  DISP "Defining conn std 6..."
1840 ! Now set up standard #6
1850 !
1860  OUTPUT @Na;":sens:corr:coll:ckit:stan 6"
1870  Verify_std
1880  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",MALE,1"
1890  Print_connector
1900 !
1910  DISP "Defining conn std 7..."
1920 ! Now set up standard #7
1930  OUTPUT @Na;":sens:corr:coll:ckit:stan 7"
1940  Verify_std
1950  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",MALE,1"
1960  Print_connector
1970 !
1980  DISP "Defining conn std 8..."
1990 ! Now set up standard #8
2000  OUTPUT @Na;":sens:corr:coll:ckit:stan 8"
2010  Verify_std
2020  OUTPUT @Na;":sens:corr:coll:ckit:conn:snam ""PSC 2.4"",MALE,1"
2030  Print_connector
2040 !
2050  DISP "Class assignments..."
2060 !
2070 ! Designate the "order" associated with measuring the standards
2080 !
2090 !    Set Port 1, 1st standard measured to be standard #2
2100  OUTPUT @Na;":sens:corr:coll:ckit:order1 2"
2110 !    Set Port 1, 2nd standard measured to be standard #1
2120  OUTPUT @Na;":sens:corr:coll:ckit:order2 1,6,7"
2130 !    Set Port 1, 3nd standard measured to be standard #3 and #5
2140  OUTPUT @Na;":sens:corr:coll:ckit:order3 3,5"
2150 !    Set Port 1, 4th standard measured to be standard #4
2160  OUTPUT @Na;":sens:corr:coll:ckit:order4 4"
2170 !
2180 !    Set Port 2, 1st standard measured to be standard #2
2190  OUTPUT @Na;":sens:corr:coll:ckit:order5 2"
2200 !    Set Port 2, 2nd standard measured to be standard #1
2210  OUTPUT @Na;":sens:corr:coll:ckit:order6 1,6,7"
2220 !    Set Port 2, 3nd standard measured to be standard #3 and #6
2230  OUTPUT @Na;":sens:corr:coll:ckit:order7 3,5"
2240 !    Set Port 2, 4th standard measured to be standard #4
2250  OUTPUT @Na;":sens:corr:coll:ckit:order8 4"
2260 !
2270 !    Set Port 1, 1st standard
2280  OUTPUT @Na;":sens:corr:coll:ckit:olabel1 ""MyOpen1"""
2290 !    Set Port 1, 2nd standard
2300  OUTPUT @Na;":sens:corr:coll:ckit:olabel2 ""MyShorts1"""
```

```
2310 !    Set Port 1, 3nd standard
2320  OUTPUT @Na;":sens:corr:coll:ckit:olabel3 ""MyLoads1"""
2330 !    Set Port 1, 4th standard measured to be standard #4
2340  OUTPUT @Na;":sens:corr:coll:ckit:olabel4 ""MyThru1"""
2350 !
2360 !    Set Port 2, 1st standard
2370  OUTPUT @Na;":sens:corr:coll:ckit:olabel5 ""MyOpen2"""
2380 !    Set Port 2, 2nd standard
2390  OUTPUT @Na;":sens:corr:coll:ckit:olabel6 ""MyShorts2"""
2400 !    Set Port 2, 3nd standard
2410  OUTPUT @Na;":sens:corr:coll:ckit:olabel7 ""MyLoads2"""
2420 !    Set Port 2, 4th standard
2430  OUTPUT @Na;":sens:corr:coll:ckit:olabel8 ""MyThrus2"""
2440 !
2450  BEEP
2460  DISP "Done!"
2470  END
2480  SUB Get_label
2490    OUTPUT 716;":sens:corr:coll:ckit:stan:label?"
2500    ENTER 716;Label$
2510    PRINT Label$
2520  SUBEND
2530 !
2540  SUB Get_std
2550    OUTPUT 716;":sens:corr:coll:ckit:stan:type?"
2560    ENTER 716;Type$
2570    PRINT Type$
2580  SUBEND
2590 !
2600  SUB Print_connector
2610    DIM Nam$[40]
2620    OUTPUT 716;":sens:corr:coll:ckit:conn:sname?"
2630    ENTER 716;Nam$
2640    PRINT Nam$
2650  SUBEND
2660 !
2670  SUB Verify_std
2680    OUTPUT 716;":sens:corr:coll:ckit:stan:label?"
2690    ENTER 716;Label$
2700  SUBEND
2710 !
```

Modify a Calibration Kit using SCPI

This Visual Basic program:

- Modifies Calibration kit number 3
- Completely defines standard #4 (thru)

To run this program, you need:

- An established GPIB interface connection

See Other SCPI Example Programs

```
'Modifying cal kit number 3
Calkitnum = 3

'Designate the kit selection to be used for performing cal's
GPIB.Write "SENSe:CORRection:COLLect:CKIT:SELect " & Val(Calkitnum)

'Reset to factory default values.
GPIB.Write "SENSe:CORRection:COLLect:CKIT:RESet " & Val(Calkitnum)

'Name this kit with your own name
GPIB.Write "SENSe:CORRection:COLLect:CKIT:NAME 'My Cal Kit'"

'Assign standard numbers to calibration classes
'Set Port 1, class 1 (S11A) to be standard #8
GPIB.Write "SENSe:CORRection:COLLect:CKIT:ORDer1 8"
'Set Port 1, class 2 (S11B) to be standard #7
GPIB.Write "SENSe:CORRection:COLLect:CKIT:ORDer2 7"
'Set Port 1, class 3 (S11C) to be standard #3
GPIB.Write "SENSe:CORRection:COLLect:CKIT:ORDer3 3"
'Set Port 1, class 4 (S21T) to be standard #4
GPIB.Write "SENSe:CORRection:COLLect:CKIT:ORDer4 4"
'Set Port 2, class 1 (S22A) to be standard #8
GPIB.Write "SENSe:CORRection:COLLect:CKIT:ORDer5 8"
'Set Port 2, class 2 (S22B) to be standard #7
GPIB.Write "SENSe:CORRection:COLLect:CKIT:ORDer6 7"
'Set Port 2, class 3 (S22C) to be standard #3
GPIB.Write "SENSe:CORRection:COLLect:CKIT:ORDer7 3"
'Set Port 2, class 4 (S12T) to be standard #4
GPIB.Write "SENSe:CORRection:COLLect:CKIT:ORDer8 4"

'Set up Standard #4 completely
'Select Standard #4; the rest of the commands act on it
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard 4"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:FMIN 300KHz"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:FMAX 9GHz"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:IMPedance 50"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:DELay 1.234 ns"
```

```
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:LOSS 23e6"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:C0 0"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:C1 1"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:C2 2"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:C3 3"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:L0 10"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:L1 11"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:L2 12"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:L3 13"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:LABel 'My Special Thru'"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:TYPE THRU"
GPIB.Write "SENSe:CORRection:COLLect:CKIT:STANdard:CHARacteristic Coax"
```

Create and Calibrate a VMC Measurement

This VB Script example creates and calibrates a Vector mixer measurement. To run this example **without modification** you need the following:

- A Mixer setup file saved on the PNA: C:\Program Files\Agilent\Network Analyzer\Documents\Mixer\MyMixer.mxr.
- If the mixer file uses an external LO source, it must also be attached and configured.
- An ECal module that covers the frequency range of the measurement.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example. However, some modification is necessary to make the program run on a traditional GPIB Interface.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as VMC.vbs. Learn how to setup and run the macro.

```
Dim app
Dim scpi
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
'---Create a Vector Mixer Measurement
'First, delete all measurements on the channel
scpi.Parse "CALC:PAR:DEL:ALL"
'Create a forward scalar mixer measurement and configure
'it in channel 1.
'The first parameter is a unique identifying string
'(specified by the user) to allow subsequent
'commands to be directed at this specific measurement.
scpi.Parse "CALC:CUST:DEF 'My VC21', 'Vector Mixer/Converter', 'VC21'"
'Setup the new measurement as the 2nd trace in the active window
scpi.Parse "DISP:WIND:TRAC2:FEED 'My VC21'"
'Make the new trace the active measurement
scpi.Parse "CALC:PAR:SEL 'My VC21'"
'The parameters of the mixer measurement can now be configured.
'This can be done by either using the SENS:MIX commands
'for each of the parameters or by loading a mixer setup file.
'This example loads a mixer setup file. The path name
'for the mixer file may be loaded from other mapped drives.
scpi.Parse "SENS:MIXer:Load 'C:\Program Files\Agilent\Network
Analyzer\Documents\Mixer\MyMixer.mxr'"

'--------------Perform A Vector Mixer Calibration-------------
'Initialize an VMC guided calibration for session number 6
scpi.Parse "SENS:CORR:COLL:SESS6:INIT ""VMC"""
'This sets the VMC operation to full system cal as opposed to
'performing a mixer characterization only.
```

```
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:OPER ""CAL"""
'This example uses ECal for the 2-port cal portion of the procedure
'To use a mechanical kit you will have to use the following command:
'scpi.Parse "SENS:CORR:COLL:SESS6:SMC:TWOPort:OPTion""MECH"""
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:TWOPort:OPTion ""ECAL"""
'If you select the mechanical method then you also have to
'specify the connector types and the cal kits for each of the ports.
'The comments below show an example of how that is done:
'scpi.Parse "SENS:CORR:COLL:SESS6:CONN:PORT1:SEL ""APC 3.5 male"""
'scpi.Parse "SENS:CORR:COLL:SESS6:CONN:PORT2:SEL ""APC 3.5 female"""
'scpi.Parse "SENS:CORR:COLL:SESS6:CKIT:PORT1:SEL ""85052D"""
'scpi.Parse "SENS:CORR:COLL:SESS6:CKIT:PORT2:SEL ""85052D"""
'Choose the between ECal or Mechanical calibration for the
'Mixer Characterization portion of the VMC cal.
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:MIX:CHAR:CAL:OPT ""ECAL"""
'This command sets the port mapping for the ECal to be used
'during the Mixer Characterization portion of the VMC cal.
'It is a required command if in the previous command the option
'was set to 'ECAL'.  The only valid port maps are either 'A1'
'or 'B1'.
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:MIX:ECAL:PORT 1, ""A1"""
'Specify the ECal module and the ECal characterization for the
'two port calibration portion of this session.  FCA calibrations
'currently only support ECal module number 1.  In this example
'the factory characterization is used by specifying 0 for the
'characterization number.
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:TWOP:ECAL:CHAR 1,0"
'Specify the ECal module and the ECal characterization for the
'Mixer Characterization portion of this session.  FCA calibrations
'currently only support ECal module number 1.  In this example
'the factory characterization is used by specifying 0 for the
'characterization number.
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:MIX:ECAL:CHAR 1,0"
'Specify the thru measurement method.  This applies to both ECal
'and mechanical calibrations.  For ECal 'DEFAULT' will use the ECal
'thru.  Other choices may be used depending on the genders and types
'of the connectors on the test interface.
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:TWOP:METH ""DEFAULT"""
'Omit the isolation part of the 2-port cal
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:TWOP:OMIT 1"
'Turn on auto orientation for the ECal
scpi.Parse "SENS:CORR:COLL:SESS6:VMC:TWOP:ECAL:ORI:STATE 1"

'Tell the wizard to generate and report the number of steps in this
'cal session
Dim steps
Dim desc
'Determine the number of steps required to complete the calibration.
'First send the write command, then the query.
scpi.Parse "SENS:CORR:COLL:SESS6:STEP"
steps = scpi.Parse ("SENS:CORR:COLL:SESS6:STEP?")
For i = 1 To steps
```

```
'Display the prompt for each step
desc = scpi.Parse ("SENS:CORR:COLL:SESS6:DESC? " & CStr(i))
MsgBox (desc)
'Perform the measurement for each step
scpi.Parse "SENS:CORR:COLL:SESS6:ACQ " & CStr(i)
Next
Dim calset
'Finish the cal and save the calset
calset = scpi.Parse ("SENS:CORR:COLL:SESS6:SAVE?")
Msgbox ("VMC Cal Complete!")
```

Create and Cal an SMC Measurement

This Visual Basic example creates and calibrates a scalar mixer measurement.

To run this example **without modification** you need the following:

- A Mixer setup file saved on the PNA: C:\Program Files\Agilent\Network Analyzer\Documents\Mixer\MyMixer.mxr.
- If the mixer file uses an external LO source, it must also be attached and configured.
- An ECAL module that covers the frequency range of the measurement.
- A power meter must be attached to the PNA. If this example is run in the PNA, the power meter does not need to be attached using a GPIB/USB interface.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example. However, some modification is necessary to make the program run on a traditional GPIB Interface. For example, during the power meter portion of this calibration, scpi.Parse will not process a command until the power meter routine has completed. Traditional GPIB would require a serial polling technique to ensure the routine has completed before proceeding.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as SMC.vbs. Learn how to setup and run the macro.

```
Dim app
Dim scpi
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
'---Create a Scalar Mixer Forward Measurement
'First, delete all measurements on the channel
scpi.Parse "CALC:PAR:DEL:ALL"
'Create a forward scalar mixer measurement and configure it in
'channel 1.  The first parameter is a unique
'identifying string (specified by the user) to allow subsequent
'commands to be directed at this specific measurement.
scpi.Parse "CALC:CUST:DEF 'My SC21', 'Scalar Mixer/Converter', 'SC21'"

'Setup the new measurement as the 2nd trace in the active window
scpi.Parse "DISP:WIND:TRAC2:FEED 'My SC21'"
'Make the new trace the active measurement
scpi.Parse "CALC:PAR:SEL 'My SC21'"
'The parameters of the mixer measurement can now be configured.
'This can be done by either using the individual SENS:MIX commands
'for each of the parameters or by loading a mixer setup file.  This
'example loads a mixer setup file. The path name
'for the mixer file may be loaded from other mapped drives
scpi.Parse "SENS:MIXer:Load ""C:\Program Files\Agilent\Network
Analyzer\Documents\Mixer\MyMixer.mxr"""
'--------------Perform A Scalar Mixer Calibration---------------------
'Initialize an SMC guided calibration for session number 6
```

```
scpi.Parse "SENS:CORR:COLL:SESS6:INIT ""SMC"""
'Select to use an ECal for the 2-port cal portion of the procedure
'To use a mechanical kit you will have to use the following command:
'scpi.Parse "SENS:CORR:COLL:SESS6:SMC:TWOPort:OPTion ""MECH"""
scpi.Parse "SENS:CORR:COLL:SESS6:SMC:TWOPort:OPTion ""ECAL"""
'If you select the mechanical method then you also have to
'specify the connector types and the cal kits for each of the ports.
'The comments below show an example of how that is done:
'scpi.Parse "SENS:CORR:COLL:SESS6:CONN:PORT1:SEL ""APC 3.5 male"""
'scpi.Parse "SENS:CORR:COLL:SESS6:CONN:PORT2:SEL ""APC 3.5 female"""
'scpi.Parse "SENS:CORR:COLL:SESS6:CKIT:PORT1:SEL ""85052D"""
'scpi.Parse "SENS:CORR:COLL:SESS6:CKIT:PORT2:SEL ""85052D"""
'Specify the ECal module and the ECal characterization for this
'session.  FCA calibrations currently only support ECal module
'number 1.  In this example the factory characterization is used
'by specifying 0 for the characterization number.
scpi.Parse "SENS:CORR:COLL:SESS6:SMC:ECAL:CHAR 1,0"
'Specify the thru measurement method.  This applies to both ECal
'and mechanical calibrations.  For ECal 'DEFAULT' will use the ECal
'thru.  Other choices may be used depending on the genders and types
'of the connectors on the test interface.
scpi.Parse "SENS:CORR:COLL:SESS6:SMC:TWOP:METH ""DEFAULT"""
'Omit the isolation part of the 2-port cal
scpi.Parse "SENS:CORR:COLL:SESS6:SMC:TWOP:OMIT 1"
'Turn on auto orientation for the ECal
scpi.Parse "SENS:CORR:COLL:SESS6:SMC:TWOP:ECAL:ORI:STATE 1"
'Tell the wizard to generate and report the number of steps in this
'cal session
Dim steps
Dim desc
'Determine the number of steps required to complete the calibration.
'First send the write command, then the query.
scpi.Parse "SENS:CORR:COLL:SESS6:STEP"
steps = scpi.Parse ("SENS:CORR:COLL:SESS6:STEP?")
For i = 1 To steps
'Display the prompt for each step
desc = scpi.Parse ("SENS:CORR:COLL:SESS6:DESC? " & CStr(i))
MsgBox (desc)
'Perform the measurement for each step
scpi.Parse "SENS:CORR:COLL:SESS6:ACQ " & CStr(i)
Next
Dim calset
'Finish the cal and save the calset
calset = scpi.Parse ("SENS:CORR:COLL:SESS6:SAVE?")
Msgbox ("SMC Cal Complete!")
```

Create an SMC Fixed Output Measurement with SCPI

This VB Script example creates a calibrated SMC fixed output measurement using a controlled LO. Then a single sweep is taken and data is retrieved.

This example requires that an external LO be previously setup and named '8360'.

Fixed output measurements require that an external LO source be swept and synchronized with the PNA source. FCA performs this synchronization using the external source configuration settings.

The fastest, and recommended, method of controlling the LO source is Hardware List (BNC) triggering mode. However, in this mode, FCA channels will not respond to manual triggers. Therefore, the example uses the following mechanism to trigger a sweep:

```
Write "SENS:SWE:MODE HOLD"    'place channel 1 in HOLD mode
Write "INIT:CONT ON"          'place PNA in internal trigger mode
Write "SENS:SWE:GRO:COUNT 1"  'specify that the group count is 1 sweep
Write "SENS:SWE:MODE GROUPS"  'execute group count (1 sweep)
Write "*OPC?"       'wait until the sweep is complete
Read
```

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You can run a VBScript (*.vbs) program from the PNA using Macros. To run this program, copy the following code into a text editor and save it as a *.vbs file.

```
option explicit
' Setup infrastructure to use the SCPI over COM
dim app
set app = createobject("Agilentpna835x.application")
dim p
set p = app.scpistringparser
dim returnStr
sub Write (command)
if len(returnStr) <> 0 then
err.Raise 55,"Write","Query Unterminated"
end if
returnStr = p.parse(command)
end sub
sub WriteIgnoreError(command)
returnStr = p.Execute(command)
p.Parse("SYST:ERR?") ' clear error queue
end sub
function Read
if len(returnStr) = 0 then
err.Raise 55,"Read","Bad read"
```

```
end if
Read = returnStr
returnStr = ""
end function
Write "SYST:PRES"
' When programming in remote mode, hold mode is recommended
Write "SENS:SWE:MODE HOLD"
' Delete the standard measurement
Write "CALC:PAR:DEL:ALL"
' Create an SC21 measurement
Write "CALC:CUST:DEF 'MySMC', 'Scalar Mixer/Converter', 'SC21'"
Write "DISP:WIND:TRACE:FEED 'MySMC'"
Write "CALC:PAR:SEL 'MySMC'"
' Set number of points to 11
Write "SENS:SWE:POIN 11 "
' Setup the mixer parameters for a swept LO, fixed output measurement
Write "SENS:MIX:INP:FREQ:START 200e6"
Write "SENS:MIX:INP:FREQ:STOP 700e6"
Write "SENS:MIX:LO:FREQ:MODE Swept"
Write "SENS:MIX:OUTPUT:FREQ:FIX 3.4e9"
Write "SENS:MIX:OUTP:FREQ:SID HIGH"
Write "SENS:MIX:INP:POW -17"
Write "SENS:MIX:LO:POW 10"
' Specify the LO name, for controlled LO.
' This name is setup in the External Source Config Dialog
'Write "SENS:MIX:LO:NAME '8360'"
' The CALC method calculates the LO frequency from the other parameters,
' It also applies the mixer parameters to the channel.
Write "SENS:MIX:CALC LO_1"
' Create an S11 in the same channel
Write "CALC:CUST:DEF 'MyS11', 'Scalar Mixer/Converter', 'S11'"
Write "DISP:WIND:TRACE2:FEED 'MyS11'"
Write "CALC:PAR:SEL 'MyS11'"
' Create an IPwr in the same channel
Write "CALC:CUST:DEF 'MyIPwr', 'Scalar Mixer/Converter', 'IPwr'"
Write "DISP:WIND:TRACE3:FEED 'MyIPwr'"
```

```
Write "CALC:PAR:SEL 'MyIPwr'"
' Create an OPwr in the same channel
Write "CALC:CUST:DEF 'MyOPwr', 'Scalar Mixer/Converter', 'OPwr'"
Write "CALC:PAR:SEL 'MyOPwr'"
Write "DISP:WIND:TRACE4:FEED 'MyOPwr'"
' Perform a single sweep, synchronously. When *OPC returns, the sweep is done
Write "SENS:SWE:GRO:COUN 1"
Write "SENS:SWE:MODE GROUPS"
Write "*OPC?"
Read
' Retrieve the SC21 data
Write "CALC:PAR:SEL 'MySMC'"
Write "CALC:DATA? SDATA"
dim data
data = Read()
wscript.echo(data)
'Retrieve the S11 data
Write "CALC:PAR:SEL 'MyS11'"
Write "CALC:DATA? SDATA"
data = Read()
wscript.echo(data)
```

Create and Cal a GCA Measurement

This VBS program does the following:

- creates and configures GCA to perform a SMART Sweep
- performs a calibration using an ECal with 3.5 mm Female on Port A and 3.5 mm Male connectors on Port B

This program can be run as a macro in the PNA. To do this, copy the code into a text editor file such as Notepad and save on the PNA hard drive as GCA.vbs. Learn how to setup and run the macro.

See the Gain Compression commands

```
option explicit
dim CompLevel , Tolerance , StartFreq , StopFreq , NumFreqs , Scale , LinearPower
dim AcqMode , BackOff , StartPower , StopPower , NumPowers , EnableInterp , CompAlg
dim DwellTime , IFBandwidth , ShowIterations , host , app , parser
'' GCA Settings/Values
''
'' Acquisition Mode:
'' naSmartSweep = 0
'' naSweepPowerAtEachFreq2D = 1
'' naSweepFreqAtEachPower2D = 2
''
'' Compression Algorithm
'' naCompressionFromLinearGain = 0
'' naCompressionFromMaximumGain = 1
'' naBackoffCompression = 2
'' naXYCompression = 3
''
'' EndOfSweepOperation
'' naDefaultPowerSet = 0
'' naSetToStartPower = 1
'' naSetToStopPower = 2
'' naSetRFOff = 3
''
CompLevel         = 1      ' 1 dB compression level
Tolerance         = 0.05   ' SMART Sweep tolerance
```

```
StartFreq         = 1E9
StopFreq          = 9E9
NumFreqs          = 201
Scale             = 0.1
LinearPower       = -20
BackOff           = 10     ' Not used for Deviation from linear gain
StartPower        = -20
StopPower         = 8
NumPowers         = 60     ' Not used for SMART Sweep
DwellTime          = 0.0005 ' Allow some time for DUT bias/thermal effects
IFBandwidth        = 1000   ' Reasonable trace noise at -20 dBm
EnableInterp       = False   ' Disable interpolation
AcqMode           = 0      ' Smart Sweep
CompAlg            = 0      ' Deviation from linear gain
ShowIterations   = False   ' Configure SMART to not show iteration results
dim objargs
set objargs = wscript . Arguments
if ( objArgs . Count = 1) then host = objargs (0)
''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
'' Create and Configuration GCA Channel:
''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
set app = CreateObject ("Agilentpna835x.application" )
set parser = app .ScpiStringParser
call SetupGCA ( parser ,_
               StartFreq ,_
               StopFreq ,_
               NumFreqs ,_
               EnableInterp ,_
               Scale ,_
               CompLevel ,_
               LinearPower ,_
               AcqMode ,_
               BackOff ,_
               StartPower ,_
               StopPower ,_
               NumPowers ,_
```

```
               CompAlg ,_
               DwellTime ,_
               IFBAndwidth ,_
               ShowIterations )
call CalGCA ( parser )
''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
'' GCA Setup
''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
sub SetupGCA ( parser , StartFreq , StopFreq , NumFreqs , EnableInterp , Scale ,
CompLevel , LinearPower ,_
              AcqMode , BackOff , StartPower , StopPower , NumPowers , CompAlg ,
DwellTime , IFBAndwidth ,_
              ShowIterations )
 parser . Parse "*RST "
  parser . Parse "CALC:PAR:DEL:ALL "
  parser . Parse "CALC:CUST:DEF ""S21"",""Gain Compression"",""S21"" "
 parser . Parse "DISP:WIND:TRAC1:FEED ""S21"" "
  parser . Parse "CALC:PAR:SEL ""S21"" "
  parser . Parse "CALC:CUST:DEF ""CompIn21"",""Gain Compression"",""CompIn21"" "
 parser . Parse "DISP:WIND:TRAC2:FEED ""CompIn21"" "
  parser . Parse "CALC:CUST:DEF ""DeltaGain21"",""Gain Compression"",""DeltaGain21""
"
 parser . Parse "DISP:WIND:TRAC3:FEED ""DeltaGain21"" "
  parser . Parse "SENS:SWE:MODE HOLD"
  parser . Parse "DISP:WIND1:TRAC3:Y:SCAL:PDIV " & Scale
  parser . Parse "DISP:WIND1:TRAC3:Y:RLEV " & -CompLevel
 select case AcqMode
  case 0 ' SMART Sweep
   parser . Parse "SENS:GCS:AMOD SMAR"
  case 1 ' 2D Power Sweeps
   parser . Parse "SENS:GCS:AMOD PFREQ"
  case 2 ' 2D Freq Sweeps
   parser . Parse "SENS:GCS:AMOD FPOW"
 end select
select case CompAlg
 case 0 ' Deviation from linear gain
  parser . Parse "SENS:GCS:COMP:ALG CFLG"
```

```
 case 1 ' Deviation from max gain
  parser . Parse "SENS:GCS:COMP:ALG CFMG"
 case 2 ' Back Off
  parser . Parse "SENS:GCS:COMP:ALG BACK"
 case 3 ' XY
  parser . Parse "SENS:GCS:COMP:ALG XYCOM"
end select

if EnableInterp then
 parser . Parse "SENS:GCS:COMP:INT ON"
else
  parser . Parse "SENS:GCS:COMP:INT OFF"
end if

if ShowIterations then
  parser . Parse "SENS:GCS:SMAR:SIT ON"
else
  parser . Parse "SENS:GCS:SMAR:SIT OFF"
end if

  parser . Parse "SENS:GCS:COMP:LEV " & CompLevel
  parser . Parse "SENS:GCS:COMP:BACK:LEV " & BackOff
  parser . Parse "SENS:GCS:COMP:DELT:X " & BackOff
  parser . Parse "SENS:GCS:COMP:DELT:Y " & BackOff
  parser . Parse "SENS:GCS:SWE:FREQ:POIN " & NumPowers
  parser . Parse "SENS:GCS:SMAR:STIM " & DwellTime
  parser . Parse "SENS:BAND " & IFBandwidth
  parser . Parse "SENS:SWE:DWEL " & DwellTime
  parser . Parse "SOUR:POW:STAR " & StartPower
  parser . Parse "SOUR:POW:STOP " & StopPower
  parser . Parse "SENS:FREQ:STAR " & StartFreq
  parser . Parse "SENS:FREQ:STOP " & StopFreq
  parser . Parse "SENS:SWE:POIN " & NumFreqs
  parser . Parse "SENS:SWE:MODE SING"

  dim str
```

```
  str = parser .Parse ("* OPC ?" )

end sub

''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
'' GCA Calibration
''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
sub CalGCA ( parser )
  dim CalSteps , I
  parser . parse "SENS:CORR:COLL:GUID:CONN:PORT1 'APC 3.5 female'"
  parser . parse "SENS:CORR:COLL:GUID:CONN:PORT2 'APC 3.5 male'"
  parser . parse "SENS:CORR:COLL:GUID:CKIT:PORT1 'N4691-60004 ECal '"
  parser . parse "SENS:CORR:COLL:GUID:CKIT:PORT2 'N4691-60004 ECal '"
  parser . parse "SENS:CORR:GCSetup:POW 0"
  parser . parse "SENS:CORR:COLL:GUID:INIT "
  CalSteps = parser . parse ( " SENS:CORR:COLL:GUID:STEP ?" )
  for I = 1 to CalSteps
  msgBox parser .parse ("SENS:CORR:COLL:GUID:DESC ? " & I )
  parser . parse ( "SENS:CORR:COLL:GUID:ACQ STAN"& I )
 next
  parser . parse "SENS:CORR:COLL:GUID:SAVE "
  msgBox "Done"
end sub
```

Last Modified:

10-Mar-2008 MX New topic

Create and Cal a Noise Figure Measurement

This program does the following:

- Setup a Noise Figure Measurement
- Calibrate Noise Figure

This program can be run as a macro in the PNA. To do this, copy the code into a text editor file such as Notepad and save on the PNA hard drive as NF.vbs. Learn how to setup and run the macro.

See the Noise figure commands.

See Other SCPI Example Programs

```
' This section gets the PNA application
' starts the scpi parser, and presets the PNA
windowNum = 1
channelNum = 1
set pna=CreateObject("AgilentPNA835x.Application")
set scpi = pna.ScpiStringParser
' Create noise figure measurement
scpi.Parse "SYST:FPR"
scpi.Parse "DISP:WIND ON"
scpi.Parse "CALC:CUST:DEF 'noiseFig', 'Noise Figure Cold Source', 'NF'"
scpi.Parse "DISP:WIND:TRAC:FEED 'noiseFig'"
scpi.Parse "CALC:PAR:SEL 'noiseFig'"
' Substitute appropriate Ecal identification strings here
tunerEcal = "N4691-60004 ECal 02821"
pullEcal = "N4691-60004 ECal 02297"
' configure channel
ConfigureChannel
ConfigureNoiseSettings
' perform calibration
SetupNoiseSource
SetupCalAttributes_Insertable
FinishCalibration
' ----- Support subroutines ------
```

```
' Configure noise channel
sub ConfigureChannel
  scpi.Parse "SENS:FREQ:START 750MHz"
  scpi.Parse "SENS:FREQ:STOP 5.0GHz"
  scpi.Parse "SENS:SWEEP:POINTS 401"
  scpi.Parse "SENS:BWID 1.0E3"
end sub
' Configure noise-specific channel settings
sub ConfigureNoiseSettings
  scpi.Parse "SENS:NOIS:AVER:STAT ON"   ' turn averaging ON
  scpi.Parse "SENS:NOIS:AVER 40"            ' noise averaging
  scpi.Parse "SENS:NOIS:BWID 8MHz"        ' noise bandwidth
  scpi.Parse "SENS:NOIS:GAIN 30"            ' gain of noise receiver
  scpi.Parse "SENS:NOIS:TEMP:AMB 301"   ' ambient temperature, in Kelvin
  scpi.Parse "SENS:NOIS:IMP:COUN 5"       ' number of tuner impedance states
  scpi.Parse "SENS:NOIS:TUN:ID '" & tunerEcal & "'" ' set ID of tuner Ecal module
  scpi.Parse "SENS:NOIS:TUN:INP 'B'"         ' orientation of tuner input port
  scpi.Parse "SENS:NOIS:TUN:OUTP 'A'"        ' orientation of tuner output port
  scpi.Parse "SENS:CORR:TCOL:USER:VAL 300"  ' noise source cold temperature
end sub
sub   SetupCalAttributes_Insertable
   scpi.Parse "SENS:CORR:COLL:GUID:CONN:PORT1  'APC 3.5 female'"
   scpi.Parse "SENS:CORR:COLL:GUID:CONN:PORT2  'APC 3.5 male'"
   scpi.Parse "SENS:CORR:COLL:GUID:CKIT:PORT1 '" & pullEcal & "'"  ' port 1
calkit
   scpi.Parse "SENS:CORR:COLL:GUID:CKIT:PORT2 '" & pullEcal & "'"  ' port 2
calkit


   scpi.Parse "SENS:NOIS:SOUR:CONN 'APC 3.5 male'"     ' noise source connector
type
   scpi.Parse "SENS:NOIS:SOUR:CKIT '" & pullEcal & "'"   ' noise source calkit
   scpi.Parse "SENS:NOISE:CAL:METHOD 'Vector'"           ' cal method
   scpi.Parse "SENS:CORR:COLL:GUID:INIT"
end sub
sub SetupNoiseSource
  ' specify the ENR file for the noise source
  enrfile = "C:\Program Files\Agilent\Network Analyzer\Noise\346C_MY44420454.enr"
```

```
   scpi.Parse "SENS:NOIS:ENR:FILENAME '" & enrfile & "'"
  ' set noise source cold temperature
   scpi.Parse "SENS:CORR:TCOLd:USER:VAL 301.1"
end sub
' Build the connection list and acquire the calibration
sub FinishCalibration
   steps = scpi.Parse("SENS:CORR:COLL:GUID:STEPS?")
   for i = 1 to steps
     str = scpi.Parse("SENS:CORR:COLL:GUID:DESC? " & i)
     msgbox  str
     scpi.Parse "SENS:CORR:COLL:GUID:ACQ STAN" & i
   next
   scpi.Parse "SENS:CORR:COLL:GUID:SAVE 0"
   wscript.echo "Calibration complete"
end sub
```

Show Custom Cal Windows during a Guided Calibration

This VBScript program shows how to send commands that allow you to view specific 'custom' windows, and sweep specific channels, during a UI (Cal Wizard) or remote calibration.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as CalWindow.vbs. Learn how to setup and run the macro.

These commands are used to show and sweep windows and channels:

- SENS:CORR:COLL:DISP:WIND
- SENS:CORR:COLL:SWE:CHAN
- SENS:CORR:COLL:DISP:WIND:AOFF
- SENS:CORR:COLL:SWE:CHAN:AOFF
- SENS:CORR:COLL:GUID:PACQuire

See Other SCPI Example Programs

```
Dim app
Dim scpi
' Create / Get the PNA application.
Set app = CreateObject("AgilentPNA835x.Application")
Set scpi = app.ScpiStringParser
' A comment
'Preset the analyzer
'This creates an S11 measurement in channel 1, window 1
scpi.Execute "SYST:PReset"
' Create and turn on window 2
scpi.Execute "DISPlay:WINDow2:STATE ON"
'Define an S21 measurement in channel 2
scpi.Execute "CALCulate2:PARameter:DEFine 'MyMeas',S21"
'Associate ("FEED") the measurement name ('MyMeas') to WINDow2
'and give the new TRACe a number (1).
scpi.Execute "DISPlay:WINDow2:TRACe1:FEED 'MyMeas'"
```

```
'The following lines are all you need in order to:
'show and sweep the custom Cal windows during a UI Calibration
'If sending ONLY these commands, make sure you know the
'correct window and channel numbers to show and sweep.
'Flag windows 1 and 2 to show during Ch1 calibration
scpi.Execute "SENS:CORR:COLL:DISP:WIND1 ON"
scpi.Execute "SENS:CORR:COLL:DISP:WIND2 ON"
'Flag channels 1 and 2 to sweep during Ch1 calibration
scpi.Execute "SENS1:CORR:COLL:SWE:CHAN1 ON"
scpi.Execute "SENS1:CORR:COLL:SWE:CHAN2 ON"

' ============================================================
' The following code performs a remote guided Cal on Ch1.
' From a remote cal, the Cal window does not normally show and sweep
' after the previous standard has been acquired.
' This shows how to include the PACQuire (preview) to view and sweep the Cal
Window.
' The Custom window also shows and sweeps due to the flag commands above.
' The flags are cleared at the end of this section.

' Specify the DUT connectors
scpi.Execute "sens:corr:coll:guid:conn:port1 ""APC 3.5 female"" "
scpi.Execute "sens:corr:coll:guid:conn:port2 ""APC 3.5 male"" "
' Select the Cal Kit for each port being calibrated.
scpi.Execute "sens:corr:coll:guid:ckit:port1 ""85052D"" "
scpi.Execute "sens:corr:coll:guid:ckit:port2 ""85052D"" "
' Initiate the calibration and query the number of steps
scpi.Execute "sens:corr:coll:guid:init"
numSteps = scpi.Execute("sens:corr:coll:guid:steps?")
MsgBox "Number of steps is " + CStr(numSteps)
' Measure the standards
For i = 1 to numSteps
step = "Step " + CStr(i) + " of " + CStr(numSteps)
strPrompt = scpi.Execute("sens:corr:coll:guid:desc? " + CStr(i))
'send the Preview Acquire command, then prompt
scpi.Execute "sens:corr:coll:guid:PACquire STAN" + CStr(i)
```

```
' Do NOT send any Guided Cal commands here or the cal window will not sweep
MsgBox strPrompt, vbOKOnly, step
scpi.Execute "sens:corr:coll:guid:acq STAN" + CStr(i)
Next
' Conclude the calibration
scpi.Execute "sens:corr:coll:guid:save"
MsgBox "Cal is done!"

'Remove the Custom Window flags
scpi.Execute "SENS:CORR:COLL:DISP:WIND:AOFF"
'Remove the channel sweep flags
scpi.Execute "SENS:CORR:COLL:SWE:CHAN:AOFF"
```

Last Modified:

1-Nov-2007	New topic

Getting and Putting Data using SCPI

This Visual Basic Program does the following:

- Reads data from the analyzer
- Puts the data back into memory
- To see the data on the analyzer after running the program, from the front panel click: **Trace - Math/Memory - Memory Trace**

To run this program, you need:

- An established GPIB interface connection

See Other SCPI Example Programs

Note: To change the read and write location of data, removing the comment from the beginning of ONE of the lines, and replace the comment in the beginning of the SDATA and SMEM lines.

```
Private Sub ReadWrite_Click()
Dim i As Integer
Dim t As Integer
Dim q As Integer
Dim dat As String
Dim cmd As String
Dim datum() As Double

GPIB.Configure
GPIB.Write "SYSTem:PRESet;*wai"

'Select the measurement
GPIB.Write "CALCulate:PARameter:SELect 'CH1_S11_1'"

'Read the number of data points
GPIB.Write "SENSe1:SWEep:POIN?"
numpts = GPIB.Read

'Turn continuous sweep off
GPIB.Write "INITiate:CONTinuous OFF"

'Take a sweep
GPIB.Write "INITiate:IMMediate;*wai"

'Ask for the Data

'PICK ONE OF THESE LOCATIONS TO READ
'GPIB.Write "CALCulate:DATA? FDATA" 'Formatted Meas
'GPIB.Write "CALCulate:DATA? FMEM" 'Formatted Memory
GPIB.Write "CALCulate:DATA? SDATA" 'Corrected, Complex Meas
'GPIB.Write "CALCulate:DATA? SMEM" 'Corrected, Complex Memory
'GPIB.Write "CALCulate:DATA? SCORR1" 'Error-Term Directivity

'Number of values returned per data point
```

```
'q = 1 ' Pick this if reading FDATA or FMEM
q = 2 ' Otherwise pick this

'Parse the data
ReDim datum(q, numpts)
For i = 0 To numpts - 1
  For t = 0 To q - 1
  'Read the Data
  dat = GPIB.Read(20)
  'Parse it into an array
  datum(t, i) = Val(dat)
  Next t
Next i

'PUT THE DATA BACK IN
GPIB.Write "format ascii"

'PICK ONE OF THESE LOCATIONS TO PUT THE DATA
'cmd = "CALCulate:DATA FDATA," 'Formatted Meas
'cmd = "CALCulate:DATA FMEM," 'Formatted Memory
'cmd = "CALCulate:DATA SDATA," 'Corrected, Complex Meas
cmd = "CALCulate:DATA SMEM," 'Corrected, Complex Memory
'cmd = "CALCulate:DATA SCORR1," 'Error-Term Directivity

For i = 0 To numpts - 1
  For t = 0 To q - 1
  If i = numpts - 1 And t = q - 1 Then
  cmd = cmd & Format(datum(t, i))
  Else
  cmd = cmd & Format(datum(t, i)) & ","
  End If
  Next t
Next i

GPIB.Write cmd
End Sub
```

Getting and Putting Data

This Rocky Mountain Basic example does the following:

1. Takes a sweep, and reads the formatted data trace into an array. The trace is read as a definite length block.

2. Instructs you to remove DUT

3. Downloads the trace back to the analyzer as an definite length block.

See Other SCPI Example Programs

```
100   DIM A$[10],Data1(1:51)
110   INTEGER Digits,Bytes
120   !
130   COM /Sys_state/ @Hp87xx,Scode
140   ! Identify I/O Port
150   CALL Iden_port
160   !
170   !
180   OUTPUT @Hp87xx;"SYST:PRES"
190   !
200   OUTPUT @Hp87xx;"CALC:PAR:SEL 'CH1_S11_1'"
210   !
220   ! Set up the analyzer to measure 51 data points.
230   OUTPUT @Hp87xx;"SENS1:SWE:POIN 51;*OPC?"
240   ENTER @Hp87xx;Opc
250   !
260   ! Take a single sweep, leaving the analyzer
270   ! in trigger hold mode.
280   OUTPUT @Hp87xx;"ABOR;:INIT1:CONT OFF;:INIT1;*WAI"
290   !
300   ! Select binary block transfer
310   OUTPUT @Hp87xx;"FORM:DATA REAL,64"
320   !
330   ! Request the channel 1 formatted data array
340   ! from the analyzer.
350   OUTPUT @Hp87xx;"CALC:DATA? FDATA"
360   !
370   ! Turn on ASCII formatting on the I/O path.
380   ! It is needed for reading the header
390   ! information.
400   ASSIGN @Hp87xx;FORMAT ON
410   !
420   ! Get the data header.  "A$" will contain the
430   ! "#" character indicating a block data transfer.
440   ! "Digits" will contain the number of characters
```

```
450  ! for the number of bytes value which follows.
460  ENTER @Hp87xx USING "%,A,D";A$,Digits
470  !
480  ! Get the rest of the header.  The number of
490  ! bytes to capture in the data array will be
500  ! placed in "Bytes".  Note the use of "Digits"
510  ! in the IMAGE string.
515  !
520  ENTER @Hp87xx USING "%,"&VAL$(Digits)&"D";Bytes
525  PRINT "HEADER",A$,Digits,Bytes
530  !
540  ! Turn off ASCII formatting on the I/O path;
550  ! it is not needed for transferring binary
560  ! formatted data.
570  ASSIGN @Hp87xx;FORMAT OFF
580  !
590  ! Get the data.
600  ENTER @Hp87xx;Data1(*)
610  !
620  ! Turn on ASCII formatting again.
630  ASSIGN @Hp87xx;FORMAT ON
640  !
650  ! Get the "end of data" character.
660  ENTER @Hp87xx;A$
670  !
680  ! Display the first three numbers in the array.
690  DISP "Trace: ";Data1(1);Data1(2);Data1(3);"..."
700  !
710  ! Use this time to visually compare the
720  ! numbers to the visible data trace.
730  WAIT 5
740  !
750  ! Prompt the operator to disconnect the test
760  ! device and how to continue the program.
770  DISP "Disconnect the test device -- Press Continue"
780  PAUSE
790  !
800  ! Update the display line.
810  DISP "Taking a new sweep...";
820  !
830  ! Take a sweep so the display shows new data.
840  OUTPUT @Hp87xx;":INIT1;*WAI"
850  DISP " Done."
860  WAIT 5
870  !
880  ! Send the header for an indefinite block length
890  ! data transfer.
900  DISP "Downloading saved trace...";
915  ! The first byte '3' indicates the next three digits equal number of transfer
bytes
916  ! The number of transfer bytes equals 8x the number of tracepoints.
920  OUTPUT @Hp87xx;"CALC:DATA FDATA, #3408";
```

```
930  !
940  ! Turn off ASCII formatting.
950  ASSIGN @Hp87xx;FORMAT OFF
960  !
970  ! Send the data array back to the analyzer.
980  OUTPUT @Hp87xx;Data1(*),END
990  !
1000 ! Turn on ASCII formatting again.
1010 ASSIGN @Hp87xx;FORMAT ON
1020 DISP " Done!"
1030 END
1040 !
1050 !*************************************************************
1060 ! Iden_port:   Identify io port to use
1070 ! Description: This routines sets up the I/O port address for
1080 !              the SCPI interface.  For "HP 87xx" instruments,
1090 !              the address assigned to @Hp87xx = 800 otherwise,
1100 !              716.
1110 !*************************************************************
1120 SUB Iden_port
1130     COM /Sys_state/ @Hp87xx,Scode
1140 !
1150     IF POS(SYSTEM$("SYSTEM ID"),"HP 87")<>0 THEN
1160         ASSIGN @Hp87xx TO 800
1170         Scode=8
1180     ELSE
1190         ASSIGN @Hp87xx TO 716
1200         Scode=7
1210     END IF
1220 !
1230 SUBEND !Iden_port
1240 !
```

External Test Set Control using SCPI

This program demonstrates the use of several External Test Set Control commands.

The SCPI commands in this example are sent over a COM interface using the SCPIStringParser object. You do NOT need a GPIB connection to run this example.

This VBScript (*.vbs) program can be run as a macro in the PNA. To do this, copy the following code into a text editor file such as Notepad and save it on the PNA hard drive as ExtTS.vbs. Learn how to setup and run the macro.

```
' Demonstrate some SCPI commands for external testsets.
Dim pna
Set pna = CreateObject("AgilentPNA835x.Application")
Set scpi = pna.ScpiStringParser
' The K64 testset is only usable on a 4-port PNA
If (pna.NumberOfPorts <> 4) Then
MsgBox("This program only runs on 4-port analyzers.")
Else
'If Help is active, show the measurement window and help
scpi.Execute("DISP:ARR TILE")
'Return the list of supported test sets
list=scpi.Execute("SENS:MULT:CATalog?")
MsgBox(list)
'************* K64 ****************
'The K64 is connected using the Testset I/O
'connector. There is no handshake information.
'Therefore, a testset need not be connected.
' Load a configuration file.
scpi.Execute("SENS:MULT1:TYPE 'Z5623AK64'")
scpi.Execute("SENS:MULT1:ADDR 0")
'return stuff about the test set
' Returns number of input ports
Inports=scpi.Execute("SENS:MULT1:INCount?")
MsgBox("Input Ports: " & CStr(Inports))
' Returns number of output ports
ports=scpi.Execute("SENS:MULT1:COUNt?")
MsgBox("Output Ports: " & CStr(ports))
' Returns valid output ports for each input port
```

```
For portNum = 1 To Inports

ports=scpi.Execute("SENS:MULT1:PORT" & CStr(portNum) & ":CAT?")

MsgBox("Port " & CStr(portNum) & " catalog: " & (ports))

Next

'Set different port mapping

scpi.Execute("SENS:MULT1:ALLPorts '1 ext R,2 ext R,3 ext R,4 ext R'")

'Return port mapping

portMap=scpi.Execute("SENS:MULT1:ALLPorts?")

MsgBox("Ports will be mapped to " & CStr(portMap))

' Enable external testset control and execute port mapping. This automatically
enables status bar display as well.

scpi.Execute("SENS:MULT1:STATe 1")

MsgBox("Z5623A K64 Enabled")

End If
```

Transfer Data using GPIB

The following RMB examples transfer data to and from a remote PC using the MMEM:TRANSfer command.

Transferring data FROM the PNA -- TO a remote PC:

```
30    !
40    !                  Set up I/O paths
50    !
60    ! Network analyzer address
70    ASSIGN @Na TO 716
75    !
77    ! File to be stored on local computer
80    ! First time -- need to create the file.
90    ! After file name, number records set to 0 (ignored by WinOS)
95    ! Use "PURGE" command to delete if desired.
100   CREATE "mytestdata.s2p",0
110   ASSIGN @File TO "mytestdata.s2p"
120   !
122   !              TRANSFER the data (download)
123   !
125   ! Analyzer has file 'testdata.s2p' in default directory
130   OUTPUT @Na;":MMEM:TRAN? ""testdata.s2p"""
135   !
137   ! Now read the bytes coming back from the analyzer in four steps
138   ! (1) Read and dump the first character - '#'
140   ENTER @Na USING "#,A";A$
141   !
142   ! (2) Read the next character which is the number of digits in the file size
150   ENTER @Na USING "#,A";Digit$
160   !
161   ! (3) Use the value of the number of digits to read back the file byte size
170   ! Create query string using this number of digits
180   Img$="#,"&Digit$&"A"
190   !
200   ! Byte$ holds the number of bytes in string format
210   ENTER @Na USING Img$;Byte$
220   !
225   ! (4) Read the file contents into a buffer and store the buffer contents to a
local file
230   ! Allocate a buffer for holding the data
240   ALLOCATE Dat$[VAL(Byte$)]
250   !
260   ! Set up a different image for filling the buffer
270   Img$=Byte$&"A"
280   !
290   ! Retrieve the actual file data
300   ENTER @Na USING Img$;Dat$
305   !
307   ! Now save the file locally.
310   OUTPUT @File;Dat$
```

```
320   END
```

Transferring data FROM the remote PC - TO the PNA:

```
40    !                  Set up I/O paths
50    !
60    ! Network analyzer address
70    ASSIGN @Na TO 716
77    ! File to be retrieved from local computer
78    ASSIGN @File TO "mytestdata.s2p"
79    !
120   !
122   !              TRANSFER the data
123   !
230   ! Allocate a buffer for holding the data
240   ALLOCATE Dat$[26236]
250   !
260   ! Get data from the file and fill Dat$
270   ENTER @File;Dat$
280   !
325   ! Data to be transferred to analyzer file 'testupld.s2p'
325   ! in default directory.
326   !
327   ! A specific block transfer designator must follow the
328   ! file name:
329   !     '#' specifies a block transfer.
330   !     '6' specifies 6 digits to follow.
331   !     '026236' matches the buffer size allocated above
332   !     not counting <NL><END> (new line and end of file).
430   OUTPUT @Na;":MMEM:TRAN ""testupld.s2p"",#6026236",Dat$
520   END
```

Last Modified:

26-Jul-2007 Added comments to example

Establish a VISA Session

This Visual Basic program demonstrates how to send a SCPI command using VISA and the Agilent IO libraries. To run this program, you need:

- Your PC and PNA both connected to a LAN (for communicating with each other).
- The SICL and VISA components of Agilent's I/O Libraries software installed on your PC. Both are included when you install the software, unless you already have another vendor's VISA installed. Then specify Full SICL and VISA installation to overwrite the other vendor's VISA.
- The module visa32.bas added to your VB project. After you install VISA, the module will be located at C:\VXIPNP\WINNT (or equivalent)\INCLUDE\Visa32.bas
- A form with two buttons: cmdRun and cmdQuit.
- Your PC configured to be a VISA LAN Client, and the SICL Server capability enabled on the PNA. See Configure for VISA and SICL

See Other SCPI Example Programs

Note: This example is a piece of a larger VISA program that performs a source power calibration.

```
'Session to VISA Default Resource Manager
Private defRM As Long
'Session to PNA
Private viPNA As Long
'VISA function status return code
Private status As Long

Private Sub Form_Load()
defRM = 0
End Sub

Private Sub cmdRun_Click()
' String to receive data from the PNA.
' Dimensioned large enough to receive scalar comma-delimited values
' for 21 frequency points (20 ASCII characters per point)
Dim strReply As String * 420

' Open the VISA default resource manager
status = viOpenDefaultRM(defRM)
If (status < VI_SUCCESS) Then HandleVISAError

' Open a VISA session (viPNA) to the SICL LAN server
' at "address 16" on the PNA pointed to by the "GPIB0"
' VISA LAN Client on this PC.
' CHANGE GPIB0 TO WHATEVER YOU PNA IS SET TO
status = viOpen(defRM, "GPIB0::16::INSTR", 0, 0, viPNA)
If (status < VI_SUCCESS) Then HandleVISAError

' Need to set the VISA timeout value to give all our calls to
```

```
' myGPIBRead sufficient time to complete before a timeout
' error occurs.
' For this example, let's try setting the limit to
' 30000 milliseconds (30 seconds).
status = viSetAttribute(viPNA, VI_ATTR_TMO_VALUE, 30000)
If (status < VI_SUCCESS) Then HandleVISAError


' Preset the PNA
status = myGPIBWrite(viPNA, "SYST:PRES")
If (status < VI_SUCCESS) Then HandleVISAError


' Print the data using a message box
MsgBox strReply
End Sub

Private Sub cmdQuit_Click()
' Close the resource manager session (which also closes
' the session to the PNA).
If defRM <> 0 Then Call viClose(defRM)

' End the program
End
End Sub

Private Function myGPIBWrite(ByVal viHandle As Long, ByVal strOut As String) As Long
' The "+ Chr$(10)" appends an ASCII linefeed character to the
' output, for terminating the write transaction.
myGPIBWrite = viVPrintf(viHandle, strOut + Chr$(10), 0)
End Function

Private Function myGPIBRead(ByVal viHandle As Long, strIn As String) As Long
myGPIBRead = viVScanf(viHandle, "%t", strIn)
End Function

Sub HandleVISAError()
Dim strVisaErr As String * 200
Call viStatusDesc(defRM, status, strVisaErr)
MsgBox "*** Error : " + strVisaErr, vbExclamation
End
End Sub
```

See Other SCPI Example Programs

Status Reporting using SCPI

This Visual Basic program demonstrates two methods of reading the analyzer's status registers:

- Polled Bit Method - reads the Limit1 register continuously.
- SRQ Method - enables an interrupt of the program when bit 6 of the status byte is set to 1. The program then queries registers to determine if the limit line failed.

To run this program, you need:

- An established GPIB interface connection
- A form with two buttons: Poll and SRQ Method
- A means of causing the limit line to fail, assuming it passes initially.

```
Private Sub Poll_Click()
' POLL THE BIT METHOD
' Clear status registers
GPIB.Write "*CLS"

'Loop FOREVER
Do
  DoEvents
  GPIB.Write "STATus:QUEStionable:LIMit1:EVENt?"
  onn = GPIB.Read
Loop Until onn = 2

MsgBox "Limit 1 Failed "
End Sub


Private Sub SRQMethod_Click()
'SRQ METHOD
GPIB.Write "SYSTem:PRESet"
GPIB.Write "CALCulate:PARameter:SELect 'CH1_S11_1'"
'slow down the trace
GPIB.Write "SENS:BWID 150"

'Setup limit line
GPIB.Write "CALC:LIM:DATA 2,3e9,6e9,-2,-2"
GPIB.Write "CALC:LIMit:DISP ON"
GPIB.Write "CALC:LIMit:STATe ON"

' Clear status registers.
GPIB.Write "*CLS;*wai"
' Clear the Service Request Enable register.
GPIB.Write "*SRE 0"
' Clear the Standard Event Status Enable register.
GPIB.Write "*ESE 0"
```

```
' Enable questionable register, bit(10) to report to the status byte.
GPIB.Write "STATus:QUEStionable:ENABle 1024"

' Enable the status byte register bit3 (weight 8) to notify controller
GPIB.Write "*SRE 8"

' Enable the onGPIBNotify event
GPIB.NotifyMask = cwGPIBRQS
GPIB.Notify
End Sub

----------------------------------------------------
Private Sub GPIB_OnGPIBNotify(ByVal mask As Integer)
' check to see what failed
' was it the analyzer?
GPIB.Write "*STB?"
onn = GPIB.Read
If onn <> 0 Then
' If yes, then was it the questionable register?
  GPIB.Write "STATus:QUEStionable:EVENt?"
  onn = GPIB.Read
  ' Determine if the limit1 register, bit 8 is set.
  If onn = 1024 Then
  'if yes, then was it trace 1?
  GPIB.Write "STAT:QUES:LIMIT1:EVEN?"
  onn = GPIB.Read
  If onn = 2 Then MsgBox ("Limit Line1 Failed")
  End If
End If
End Sub
```

Create a Custom Power Meter Driver

This topic requires that you have a working knowledge of Visual Basic.

This topic will help you create your own power meter driver for use with Source Power Calibration on the PNA. If you are using an Agilent Power Meter to perform a Source Power Calibration, you do NOT need to create your own driver.

Your Power Meter driver will be created from a template written in Visual Basic using VISA over the GPIB bus.

Note: This procedure applies to Visual Basic 6.0. Applicability to Visual Basic .NET has not yet been investigated.

- **Prepare Template Files**
- **Modify Template Files**
- **Compile, Copy, and Register, Your New Driver**
- **Test Your new Driver**

Other SCPI Example Programs

Prepare Template Files

1. Copy all the files from the PNA hard drive C:\Program Files\Agilent\Network Analyzer\Automation\Power Meter Driver Template folder, to a folder on your development PC.
2. In Visual Basic click **File**, then **Open Project…**, find **MyPowerMeter.vbp** (a file you copied from the PNA). Click **Open**. This is a VB ActiveX EXE template, which you will fill in to become your driver.
3. Click **Project**, then **MyPowerMeter Properties**. Click the **General** tab.
4. Overwrite the Project Name with a name of your own choosing. This will be the name of your driver's type library (also the default name of your exe).

Note If the name of your exe does not match the VB Project Name with which it was compiled, registration of the exe on the PNA will not succeed.

5. Set the Project Description. After building your driver if you wish to test it using VB, this is the string that will show up in the VB References list of your test project, and also in the lower pane of the VB Object Browser.
6. Set the Thread Pool size to 1 thread.
7. Click **OK** to close the project properties dialog.
8. From the VB **Project** menu, click **References…** Ensure that **Agilent PNA Power Meter 1.0 Type Library** and **VISA Library** are checked. Click **OK.**

Note: Agilent's implementation of VISA is installed as part of the Agilent I/O Libraries on the PNA. For help on

VISA, go to the Windows Start button on your PNA, select Programs, Agilent IO Libraries, VISA Help.

Modify Template Files

From Visual Basic **View** menu click **Project Explorer**. Expand the **Modules** and **Class Modules** folders. Ensure there is one module (WinAPI) and one class module (PowerMeter).

Let's look at the WinAPI module first.

1. In the **Project Explorer** window, click **WinAPI**.
2. From the **View** menu click **Code**.

There is only one line of code you should need to modify in this module: the value of the string constant named sIDSEARCH. The comments preceding the declaration of that string describe how to change it. The rest of this module contains functions which will use the Microsoft Windows API to insure proper registration of your driver on the PNA. If you know of other Windows API functions you feel might be helpful to call from within your PowerMeter class module (to help in formatting data, for example), this module would be the place to declare them.

Now let's look at the class module.

1. In the Project Explorer window, click **PowerMeter**.
2. From the **View** menu click **Properties Window.** The **Instancing** property must be set to MultiUse. This allows other applications to create objects from this class, such that one instance of your driver EXE can supply more than one such object at a time.
3. From the **View** menu click **Code.**

Do NOT modify the Interfaces to IPowerMeter subroutines and functions. PNA source power cal expects to find these interfaces as they are currently defined.

The only members that you need to supply code to are those containing **“Your code here”** comments.

In addition, comments have been provided at the beginning of each member to describe the information that member needs to be read from or written to the power meter.

To get an idea of how communicate with the power meter using the VISA functions **viWrite** and **viRead**, examine the code which has been implemented for you in IPowerMeter_Connect, IPowerMeter_QueryMeter, and IPowerMeter_WriteMeter.

Compile, Copy, and Register Your New Driver

When your driver is ready to run, you will first need to compile it into an EXE.

From the File menu select **Make exe.**

After compiling, the following will instruct VB to use the same ID (GUID) every time you re-compile your project.

1. From the **Project** menu, click **PowerMeter Properties**.
2. On the **Component** tab, select **Binary Compatibility** and click **...**
3. Browse to and select your project EXE. Click **Open.**

4. Click **OK** to close **Project Properties.**

5. Save your project.

6. Copy your driver EXE file to a folder on your PNA (do NOT use C:\Program Files\Agilent\Network Analyzer\Automation\Power Meter Driver Template folder).

7. Run the EXE file. A message box will pop up reporting whether or not registration was successful. If not successful, it will make a suggestion on what to fix.

When your driver is properly registered, PNA Source Power Cal should be able to associate it with the ID string of your power meter.

Test Your Power Meter Driver

We have also provided a Visual Basic project to test your new Power Meter driver. This project individually calls every IPowerMeter method and property in your driver to verify that it performs correctly. Before running the test your PC and PNA must be configured to communicate using DCOM.

1. Connect your PC and the PNA to LAN.

2. Add your PC logon to the PNA. Both logons and password must match to communicate using DCOM. See Additional PNA users.

3. Configure your driver using DCOM Config on the PNA. This will give you permission to launch and access the driver. See Configure for COM-DCOM Programming.

Modify the Test Project

1. In Visual Basic click **File**, then **Open Project…**, find **MyPowerMeterTest.vbp** (a file you copied from the PNA). Click **Open**.

2. From the **Project** menu, click **References…** From the list, find and check your new Power Meter Driver. (It should have been registered on your PC when you successfully made your driver EXE.) Click **OK.**

3. From the **View** menu click **Code.**

4. Modify the **CreateObject** line as follows:
   Replace **MyPowerMeter** with the Project Name that you chose for your driver
   Replace **MyPNA** with the Computer Name of your PNA.
   For example:

```
Set PowerMeterObj = CreateObject("AcmeBrand.PowerMeter", "AGILENT-PNA123")
```

(This assumes that you kept **PowerMeter** as class module name in your driver.)

Run the Test Project

Ensure your power meter is connected to the PNA with a GPIB cable.

Put the PNA in system controller mode:

1. From the PNA **System** menu point to **Configure** then click **SICL/GPIB**.

2. In the GPIB box click **System Controller**.

Run the test project. If there are no errors, the driver is created successfully. If there are errors, try to figure out what went wrong and fix it. Then re-compile, re-copy the .exe to the PNA, and re-run the test. You should not need to re-register the driver or re-modify the test program.

GPIB Pass-Through Example

The SCPI SYSTem commands used in this example allow you to send GPIB commands to another GPIB device through the PNA. The other GPIB device cannot be connected to the GPIB bus through the PNA rear panel if the PNA is being controlled by a remote PC using that connector. The other device would typically be connected to the PNA using a USB/GPIB interface.

This VB Script example uses the COM SCPIStringParser object. However, this is not critical to the use of these commands; they can be sent using the normal syntax of your programming environment. Using the SCPIStringParser over LAN allows you to communicate with GPIB devices without requiring your remote PC to have a GPIB interface card installed.

Although this method of pass-through works for most applications, there are a couple of limitations:

- All data is transferred using ASCII format. Therefore, transferring large blocks of data is very slow.
- Only read and write functions are possible. Service Interrupts are not supported.

See Other SCPI Example Programs

```
option explicit
dim app
set app = CreateObject("AgilentPNA835x.Application")

dim p
set p = app.ScpiStringParser

' Open a new GPIB session on Bus:2 Device:14 Timeout: 100ms
p.Parse "SYST:COMM:GPIB:RDEV:OPEN 2,14,100"
dim handleAsStr

' Retrieve the handle (ID number)
handleAsStr = p.Parse ("SYST:COMM:GPIB:RDEV:OPEN?")

' Convert the handle to an integer
dim handleAsInt
handleAsInt = CInt(handleAsStr)

' Send the "*IDN?" query
p.Parse "SYST:COMM:GPIB:RDEV:WRITE " & handleAsInt & ",'*IDN?'"

' Read its results
dim idn
idn = p.Parse("SYST:COMM:GPIB:RDEV:READ? " & handleAsInt)
msgbox idn

' Close the GPIB session
p.Parse "SYST:COMM:GPIB:RDEV:CLOSE " & handleAsInt
```

PNA as Controller and Talker / Listener

This Visual Basic Program uses VISA to do the following:

- Control the PNA using a VISA LAN Client interface on the PNA.
- Control another instrument using the PNA as GPIB controller.
- Queries both the analyzer and other instrument to identify themselves with *IDN?

Note: This program can be modified to work from a remote PC to control both instruments. In that case, set up the PNA to be a talker/listener.

To run this program, you need to do the following:

- Add module **visa32.bas** to the VB project. It is located on the analyzer at C:\Program Files\HP\VXIPNP\WINNT\Include\VISA32.bas
- Configure the PNA for VISA / SICL
- Set up the PNA to be GPIB system controller.
  1. On the **System** menu, point to **Configure**. Click **SICL / GPIB**
  2. Click **System Controller**
- Connect another instrument to the analyzer through a GPIB cable with Primary address of 13 on GPIB0 interface

See Other SCPI Example Programs

```
Sub main()

'This application run from onboard the PNA
'can control both the PNA and another GPIB instrument.
'
'To run this program the module visa32.bas must be added
'to the project.

'VISA function status return code
Dim status As Long
'Session to Default Resource Manager
Dim defRM As Long
'Session to instrument
Dim viPNA As Long
'Session to other GPIB instrument
Dim viInstrument As Long
'String to hold results
Dim strRes As String * 200
On Error GoTo ErrorHandler

status = viOpenDefaultRM(defRM)
```

```
If (status < VI_SUCCESS) Then GoTo VisaErrorHandler


'Open the session to the PNA
status = viOpen(defRM, "GPIB1::16::INSTR", 0, 0, viPNA)
If (status < VI_SUCCESS) Then GoTo VisaErrorHandler

'Ask for the PNA's ID.
status = viVPrintf(viPNA, "*IDN?" + Chr$(10), 0)
If (status < VI_SUCCESS) Then GoTo VisaErrorHandler

'Read the ID as a string.
status = viVScanf(viPNA, "%t", strRes)
If (status < VI_SUCCESS) Then GoTo VisaErrorHandler
'Display the results
MsgBox "PNA is: " + strRes


'Open the session to the other instrument
status = viOpen(defRM, "GPIB0::13::INSTR", 0, 0, viInstrument)
If (status < VI_SUCCESS) Then GoTo VisaErrorHandler

'Ask for the instrument's ID.
status = viVPrintf(viInstrument, "*IDN?" + Chr$(10), 0)
If (status < VI_SUCCESS) Then GoTo VisaErrorHandler

'Read the ID as a string.
status = viVScanf(viPNA, "%t", strRes)
If (status < VI_SUCCESS) Then GoTo VisaErrorHandler

'Display the results
MsgBox "Other instrument is: " + strRes
' Close the resource manager session (which closes everything)
Call viClose(defRM)
End

ErrorHandler:
'Display the error message
MsgBox "*** Error : " + Error$, MB_ICONEXCLAMATION
End

VisaErrorHandler:
Dim strVisaErr As String * 200
Call viStatusDesc(defRM, status, strVisaErr)
MsgBox "*** Error : " + strVisaErr

End
End Sub
```

Socket Client

The following C# example demonstrates how to send a SCPI program to an Agilent TCP socket-enabled instrument such as the PNA or ENA network analyzer. If the command is a query, the program will read the instrument's response. You can add or replace the SCPI commands in this program with your own.

Learn how to enable Sockets communication on the PNA.

For both of the following methods, first copy the example text below into a Notepad file and name it SocketClient.cs.

To run using Microsoft Visual Studio 2003 or 2005

1. From the Visual Studio **File** menu, select **New**, then **Project**.
2. In the **New Project** window, select the following items (noting the location of the file folder it is creating for you) then click **OK**.

- Project Type: Visual C#
- Template: Console Application
- Project Name: SocketClient

1. Copy SocketClient.cs into the folder that was created in the previous step.
2. In the Solution Explorer window pane, right-click **Class1.cs** (if Visual Studio 2003) or **Program.cs** (if Visual Studio 2005). Select **Delete** to delete that file.
3. In the Solution Explorer, right-click **SocketClient** , and select **Add**, then **Existing Item….**
4. Browse to select **SocketClient.cs** and click **OK**.

You should then be able to build the project, and test the resulting **SocketClient.exe** from a command prompt (shell) window.

To run using Mono

Mono is a cross-platform version of .NET. You can download a free version of Mono at http:\www.mono-project.com. Once downloaded and installed:

1. Run the Mono command prompt (shell) window.
2. Navigate to the directory where the example SocketClient.cs is stored.
3. Type: **MCS SocketClient.cs** (builds the .exe and saves in that same folder.)
4. Type **mono SocketClient.exe** <PNA name or IP address>

This example was compiled and tested successfully with Mono version 1.1.13. It was run on a PC using the Red

Hat version 9.0 distribution of the Linux operating system. It was also run on a PC using Windows XP. This program has not been tested with other versions of Mono, or on other operating systems.

To run with Agilent T&M Toolkit

Agilent T&M Toolkit 2.0 is the first version to support communication using Sockets.

Use the following to address the Sockets port: **TCPIP0::**<PNA name or IP address>**::5025::SOCKET**

```
using System;
using System.Net;
using System.Net.Sockets;
// This C# "Console Application" example program demonstrates sending
// SCPI commands to an Agilent TCP socket-enabled instrument
// (for example, a PNA or ENA network analyzer), and reading back the
// instrument's response if the command is a query.
namespace CSharpSocketClient
{
/// <summary>
/// The class supporting the main entry point for the application.
/// </summary>
class MainClass
{
/// <summary>
/// The main entry point for the application.
/// </summary>
[STAThread]
static int Main(string[] args)
{
try
{
if (args.Length != 1)
{
Console.WriteLine("");
Console.WriteLine("Usage -- with Microsoft's .NET runtime:");
Console.WriteLine("SocketClient servernameoraddress");
Console.WriteLine("Example: SocketClient 192.168.0.1");
Console.WriteLine("");
Console.WriteLine("Usage -- with Mono's (www.mono-project.com) .NET runtime:");
```

```
Console.WriteLine("mono SocketClient.exe servernameoraddress");
Console.WriteLine("Example: mono SocketClient.exe 192.168.0.1");
return 1;
}
string server = args[0];
Int32 port = 5025; // default socket port number for the PNA
// Create a TcpClient for the server instrument
// and associated with the necessary port number.
TcpClient client = new TcpClient(server, port);
// Send a preset command to the instrument.
Parse(client, "SYST:PRES");
// Query the instrument ID.
string id = Parse(client, "*IDN?");

// Close the client session.
client.Close();
}
catch (ArgumentNullException e)
{
Console.WriteLine("ArgumentNullException: {0}", e);
}
catch (SocketException e)
{
Console.WriteLine("SocketException: {0}", e);
}
Console.WriteLine("\n Press Enter to continue...");
Console.Read();
return 0;
}

static string Parse(TcpClient client, string command)
{
// Translate the passed command into ASCII and store it as a Byte array.
Byte[] data = System.Text.Encoding.ASCII.GetBytes(command);
// Get a client stream for reading and writing.
NetworkStream stream = client.GetStream();
```

```
// Send the command to the socket-enabled instrument.
stream.Write(data, 0, data.Length);
// Has to be followed by a linefeed character as terminator.
Byte[] lf = {(Byte)'\n'};
stream.Write(lf, 0, 1);
Console.WriteLine("Sent: {0}", command);
// If the message was a query (involved a question mark)
// receive the instrument response.
if (command.IndexOf("?") >= 0)
{
// Buffer to store the response bytes.
// For simplicity of this example, we allocate just for a 256-byte maximum
// response size.
data = new Byte[256];
// String to store the response ASCII representation.
string responseData = String.Empty;
// Read the batch of response bytes.
Int32 bytes = stream.Read(data, 0, data.Length);
responseData = System.Text.Encoding.ASCII.GetString(data, 0, bytes);
Console.WriteLine("Received: {0}", responseData);
return responseData;
}
return "";
}
}
}
```

GPIB Fundamentals

The General Purpose Interface Bus (GPIB) is a system of hardware and software that allows you to control test equipment to make measurements quickly and accurately. This topic contains the following information:

- **The GPIB Hardware Components**
- **The GPIB / SCPI Programming Elements**
- **Specifications**
- **GPIB Interface Capability Codes**

Note: All of the topics related to programming assume that you already know how to program, preferably using a language that can control instruments.

Other Topics about GPIB Concepts

The GPIB Hardware Components

The system bus and its associated interface operations are defined by the IEEE 488 standard. The following sections list and describe the main pieces of hardware in a GPIB system:

GPIB Addresses

Every GPIB instrument must have its own unique address on the bus. The PNA address (716) consists of two parts:

1. **The Interface select code** (typically 7) indicates which GPIB port in the system controller is used to communicate with the device.
2. **The primary address** (16) is set at the factory. You can change the primary address of any device on the bus to any number between 0 and 30. To change the analyzer address click System \ Configure \ SICL-GPIB

The secondary address is sometimes used to allow access to individual modules in a modular instrument system, such as a VXI mainframe. The analyzer does not have secondary addresses.

Controllers

Controllers specify the instruments that will be the talker and listener in a data exchange. The controller of the bus must have a GPIB interface card to communicate on the GPIB.

- The **Active Controller** is the computer or instrument that is currently controlling data exchanges.
- The **System Controller** is the only computer or instrument that can take control and give up control of the GPIB to another computer or instrument, which is then called the active controller.

The **PNA can NOT be passed control** of the GPIB. However, you can communicate with other GPIB devices through the PNA using one of, or a combination of, the following methods:

- Use the SCPI SYST:COMM:GPIB:RDEV: commands.
- Use VISA or SICL over LAN to accomplish this. See an example.
- Use USB / GPIB Interface
- Use a PNA with dedicated Controller and Talker/Listener GPIB ports.

Talker / Listener Instruments

The PNA is configured as a Talker / Listener by default.

- **Talkers** are instruments that can be addressed to send data to the controller.
- **Listeners** are instruments that can be addressed to receive a command, and then respond to the command. All devices on the bus are required to listen.

Cables

GPIB Cables are the physical link connecting all of the devices on the bus. There are eight data lines in a GPIB cable that send data from one device to another. There are also eight control lines that manage traffic on the data lines and control other interface operations.

You can connect instruments to the controller in any arrangement with the following limitations:

- Do not connect more than 15 devices on any GPIB system. This number can be extended with the use of a bus extension.
- Do not exceed a total of 20 meters of total cable length or 2 meters per device, whichever is less.
- Avoid stacking more than three connectors on the back panel of an instrument. This can cause unnecessary strain on the rear-panel connector.

The GPIB / SCPI Programming Elements

The following software programming elements combine to become a GPIB program:

- **GPIB / SCPI Commands**
- **Programming Statements**
- **Instrument Drivers**

GPIB Commands

The GPIB command is the basic unit of communication in a GPIB system. The analyzer responds to three types of GPIB commands:

1. IEEE 488.1 Bus-management Commands

These commands are used primarily to tell some or all of the devices on the bus to perform certain interface operations.

All of the functions that can be accomplished with these commands can also be done with IEEE 488.2 or SCPI commands. Therefore, these commands are not documented in this Help system. For a complete list of IEEE 488.1 commands refer to the IEEE 488 standard. **Examples** of IEEE 488.1 Commands

- **`CLEAR` - Clears the bus of any pending operations**
- **`LOCAL` - Returns instruments to local operation**

2. IEEE 488.2 Common Commands

These commands are sent to instruments to perform interface operations. An IEEE 488.2 common command consists of a single mnemonic and is preceded by an asterisk (*). Some of the commands have a query form which adds a "?" after the command. These commands ask the instrument for the current setting. See a complete list of the Common Commands that are recognized by the analyzer. **Examples** of IEEE 488.2 Common Commands

- **`*OPC  - Operation Complete`**
- **`*RST  - Reset`**
- **`*OPT? - Queries the option configuration`**

3. SCPI Commands

The Standard Commands for Programmable Instruments (SCPI) is a set of commands developed in 1990. The standardization provided in SCPI commands helps ensure that programs written for a particular SCPI instrument are easily adapted to work with a similar SCPI instrument. SCPI commands tell instruments to do device specific functions. For example, SCPI commands could tell an instrument to make a measurement and output data to a controller. **Examples** of SCPI Commands:

```
CALCULATE:AVERAGE:STATE ON
SENSE:FREQUENCY:START?
```

For more information on SCPI:

- The Rules and Syntax of SCPI Commands provides more detail of the SCPI command structure.
- SCPI Command Tree is a complete list of the SCPI commands for the analyzer

Programming Statements

SCPI commands are included with the language specific I/O statements to form program statements. The programming language determines the syntax of the programming statements. SCPI programs can be written in a variety of programming languages such as VEE, HP BASIC, or C++. **Example** of a Visual Basic statement:

- **`GPIB.Write "SOURCE:FREQUENCY:FIXED 1000 MHz"`**

Note about examples

Instrument Drivers

Instrument drivers are subroutines that provide routine functionality and can be reused from program to program. GPIB industry leaders have written standards for use by programmers who develop drivers. When programmers write drivers that comply with the standards, the drivers can be used with predictable results. To comply with the standard, each instrument driver must include documentation describing its functionality and how it should be implemented.

GPIB Specifications

Interconnected devices - Up to 15 devices (maximum) on one contiguous bus.

Interconnection path - Star or linear (or mixed) bus network, up to 20 meters total transmission path length or 2 meters per device, whichever is less.

Message transfer scheme - Byte-serial, bit-parallel, asynchronous data transfer using an interlocking 3-wire handshake.

Maximum data rate - 1 megabyte per second over limited distances, 250 to 500 kilobytes per second typical maximum over a full transmission path. The devices on the bus determine the actual data rate.

Address capability - Primary addresses, 31 Talk and 31 Listen; secondary addresses, 961 Talk and 961 Listen. There can be a maximum of 1 Talker and up to 14 Listeners at a time on a single bus. See also previous section on GPIB addresses.

GPIB Interface Capability Codes

The IEEE 488.1 standard requires that all GPIB compatible instruments display their interface capabilities on the rear panel using codes. The codes on the analyzer, and their related descriptions, are listed below:

SH1	full source handshake capability
AH1	full acceptor handshake capability
T6	basic talker, serial poll, no talk only, unaddress if MLA (My Listen Address)
TEO	no extended talker capability
L4	basic listener, no listen only, unaddress if MTA (My Talk Address)
LEO	no extended listener capability
SR1	full service request capability
RL1	full remote / local capability
PPO	**no parallel poll capability**
DC1	full device clear capability
DT1	full device trigger capability
C1	system controller capability
C2	send IFC (Interface Clear) and take charge controller capability
C3	send REN (Remote Enable) controller capability

C4 respond to SRQ (Service Request)

The Rules and Syntax of SCPI

Most of the commands used for controlling instruments on the GPIB are SCPI commands. The following sections will help you learn to use SCPI commands in your programs.

Other Topics about GPIB Concepts

Branches on the Command Tree

All major functions on the analyzer are assigned keywords which are called ROOT commands. (See GPIB Command Finder for a list of SCPI root commands). Under these root commands are branches that contain one or more keywords. The branching continues until each analyzer function is assigned to a branch. A root command and the branches below it is sometimes known as a subsystem.

For example, under `SOURce:POWer` are several branch commands.

Sometimes the same keyword, such as `STATE`, is used in several branches of the command tree. To keep track of the current branch, the analyzer's command parser uses the following rules:

- **Power On and Reset** - After power is cycled or after `*RST`, the current path is set to the root level commands.
- **Message Terminators** - A message terminator, such as a <NL> character, sets the current path to the root command level. Many programming language output statements send message terminators automatically. Message terminators are described in Sending Messages to the Analyzer.
- **Colon (:)** - When a colon is between two command keywords, it moves the current path down one level in the command tree. For example, the colon in `:SOURCE:POWER` specifies that `POWER` is one level below `SOURCE`. When the colon is the first character of a command, it specifies that the following keyword is a root level command. For example, the colon in `:SOURCE` specifies that source is a root level command.

Note: You can omit the leading colon if the command is the first of a new program line. For example, the following two commands are equivalent:
```
SOUR:POW:ATT:AUTO
:SOUR:POW:ATT:AUTO
```

- **<WSP>** - Whitespace characters, such as <tab> and <space>, are generally ignored. There are two important exceptions:

    - Whitespace inside a keyword, such as `:CALC ULATE`, is not allowed.

    - Most commands end with a parameter. You must use whitespace to separate these ending parameters from commands. **Always refer to the command documentation**. In the following example, there is whitespace between `STATE` and `ON`.

```
CALCULATE1:SMOOTHING:STATE ON
```

- **Comma (,)** - If a command requires more than one parameter, you must separate adjacent parameters using a comma. For example, the `SYSTEM:TIME` command requires three values to set the analyzer clock: one for hours, one for minutes, and one for seconds. A message to set the clock to 8:45 AM would be `SYSTEM:TIME 8,45,0.` Commas do not affect the current path.

- **Semicolon(;)** - A semicolon separates two commands in the same message without changing the current path. See Multiple Commands later in this topic.

- **IEEE 488.2 Common Commands** - Common commands, such as `*RST`, are not part of any subsystem. An instrument interprets them in the same way, regardless of the current path setting.

Command and Query

A SCPI command can be an Event command, Query command (a command that asks the analyzer for information), or both. The following are descriptions and examples of each form of command. GPIB Command Finder lists every SCPI command that is recognized by the analyzer, and its form.

Form	Examples
Event commands - cause an action to occur inside the analyzer.	`:INITIATE:IMMEDIATE`
Query commands - query only; there is no associated analyzer state to set.	`:SYSTem:ERRor?`
Command and query - set or query an analyzer setting. The query form appends a question mark (?) to the set form	`:FORMat:DATA ! Command` `:FORMat:DATA? ! Query`

Multiple Commands

You can send multiple commands within a single program message. By separating the commands with semicolons the current path does not change. The following examples show three methods to send two commands:

1. **Two program messages:**

```
SOURCE:POWER:START 0DBM
SOURCE:POWER:STOP 10DBM
```

2. **One long message**. A colon follows the semicolon that separates the two commands causing the command parser to reset to the root of the command tree. As a result, the next command is only valid if it includes the entire keyword path from the root of the tree:

    ```
    SOURCE:POWER:START 0DBM;:SOURCE:POWER:STOP 10DBM
    ```

3. **One short message**. The command parser keeps track of the position in the command tree. Therefore, you can simplify your program messages by including only the keyword at the same level in the command tree.

    ```
    SOURCE:POWER:START 0DBM;STOP 10DBM
    ```

Common Commands and SCPI Commands

You can send Common commands and SCPI commands together in the same message. (For more information on these types of commands see GP-IB Fundamentals.) As in sending multiple SCPI commands, you must separate them with a semicolon.

Example of Common command and SCPI commands together

```
*RST;SENSE:FREQUENCY:CENTER 5MHZ;SPAN 100KHZ
```

Command Abbreviation

Each command has a long form and an abbreviated short form. The syntax used in this Help system use uppercase characters to identify the short form of a particular keyword. The remainder of the keyword is lower case to complete the long form.

```
SOUR - Short form
SOURce - Long form
```

Either the complete short form or complete long form must be used for each keyword. However, the keywords used to make a complete SCPI command can be a combination of short form and long form.

The following is **unacceptable** - The first three keywords use neither short or long form.

```
SOURc:Powe:Atten:Auto on
```

The following is **acceptable** - All keywords are either short form or long form.

```
SOUR:POWer:ATT:AUTO on
```

In addition, the analyzer accepts lowercase and uppercase characters as equivalent as shown in the following equivalent commands:

```
source:POW:att:auto ON
Source:Pow:Att:Auto on
```

Optional [Bracketed] Keywords

You can omit some keywords without changing the effect of the command. These optional, or default, keywords are used in many subsystems and are identified by brackets in syntax diagrams.

Example of Optional Keywords

The `HCOPy` subsystem contains the optional keyword `IMMediate` at its first branching point. Both of the following commands are equivalent:

```
"HCOPY:IMMEDIATE"
"HCOPY"
The syntax in this Help system looks like this:
HCOPy[:IMMediate]
```

Vertical Bars | Pipes

Vertical bars, or "pipes", can be read as **"or"**. They are used in syntax diagrams to separate alternative parameter options.

Example of Vertical Bars:

```
SOURce:POWer:ATTenuation:AUTO <on|off>
```

Either `ON` or `OFF` is a valid parameter option.

MIN and MAX Parameters

The special form parameters "MINimum" and "MAXimum" can be used with commands that specify single frequency (Hz) and time (seconds) as noted in the command documentation. **Note**: Also with these commands, kHZ, MHz, and GHz are accepted as suffixes/units.

The short form (min) and long form (minimum) of these two keywords are equivalent.

- **MAX**imum refers to the largest value that the function can currently be set to
- **MIN**imum refers to the smallest value that the function can currently be set to.

For example, the following command sets the start frequency to the smallest value that is currently possible:

```
SENS:FREQ:START MIN
```

In addition, the max and min values can also be queried for these commands.

For example, the following command returns the smallest value that Start Frequency can currently be set to:

```
SENS:FREQ:START? MIN
```

An error will be returned if a numeric parameter is sent that exceeds the MAX and MIN values.

For example, the following command will return an "Out of range" error message.

```
SENS:FREQ:START 1khz
```

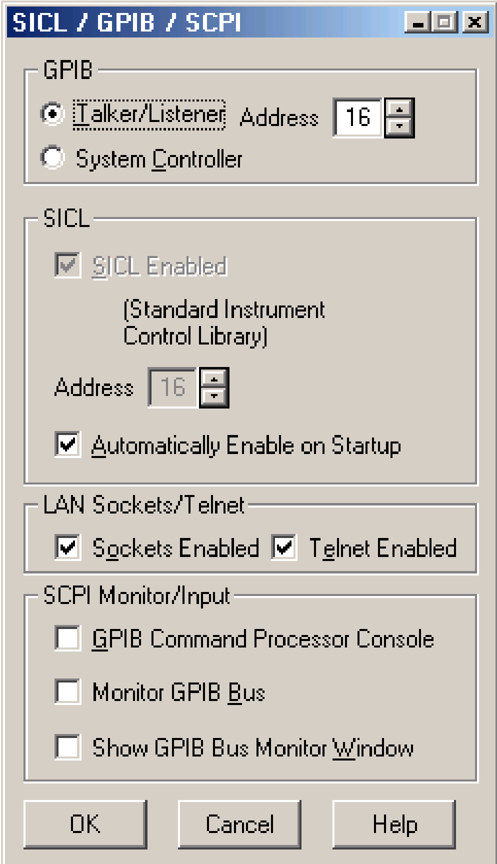
Last Modified:

10-Jul-2007	Removed image

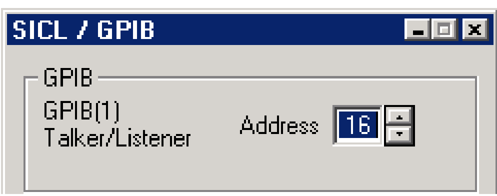
Configure for GPIB, SCPI, and SICL

The following settings are used to configure the PNA for remote control using SCPI commands.

How to Configure for SICL / GPIB Operation	
Using front-panel **HARDKEY [softkey] buttons**	**PNA Menu using a mouse**
For PNA-L and E836x models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Configure** 3. then **SICL/GPIB/SCPI**
For PNA-X and 'C' models	Programming Commands
1. Press **SYSTEM** 2. then **[Configure]** 3. then **[SICL/GPIB]**	1. Click **Utility** 2. then **System** 3. then **Configure** 4. then **SICL/GPIB/SCPI**



Dialog box for PNA models with 2 GPIB ports:



SICL / GPIB dialog box help

GPIB

PNA models with 2 GPIB ports have an Address setting for ONLY the Talker/Listener Port. Learn more about the PNA models with 2 GPIB ports.

Talker/Listener Sets the PNA to receive and send GPIB/SCPI messages to the system controller (external computer).

Talker/Listener Address Sets the PNA talker/listener GPIB address.

System Controller Sets the PNA as the system controller, controlling GPIB communications of external devices. Learn about the PNA as controller. Use the National Instruments interface or the ACE (Agilent Connection Expert) interface to change the System Controller address

SICL

SICL Enabled When checked, the analyzer is capable of running GPIB programs on its computer to control analyzer functions. The programs must be run from a GPIB-capable programming environment (VEE, Visual

Basic). This mode does not allow control of external GPIB instruments. To uncheck this box, exit the PNA application - (Click File, then Exit). The PNA restarts with the SICL enabled box unchecked unless **Automatically Enable on Startup** is checked.

Learn more about Configuring for VISA and SICL.

Address Sets the PNA address.

Automatically Enable on Startup When checked, SICL Enabled is automatically selected when starting the PNA application.

LAN Sockets/Telnet

Provides ability to communicate with the PNA from a PC that uses a Windows, or non-Windows, operating system.

- These settings are checked by default. If you have security concerns, clear these check boxes.
- These settings remain after the PNA is shutdown and restarted.

Sockets Enabled When checked, provides the ability to control the PNA from a remote SCPI program using port number 5025. See the C# example that illustrates how this is done.

Telnet Enabled When checked, provides the ability to send single SCPI commands from a remote Windows, or non-Windows, PC to the PNA using port number 5024.

How to send single SCPI commands using Telnet:

1. On the remote PC, click **Start**, then **Run**
2. Type: **telnet** <computer name> **5024**
   where <computer name> is the full computer name of the PNA. See how to find the computer name of the PNA.
3. A Telnet window with a **SCPI>** prompt should appear on the remote PC screen.
4. From the SCPI prompt:
   - Type single SCPI commands
   - If an invalid SCPI command is sent, the prompt will disappear. Press **Enter** or **Ctrl C** to recover the SCPI prompt.
     - To exit the telnet window click **X** in the upper-right corner.
     - To get a normal telnet prompt, press **Ctrl]** (closing bracket).
       - To close the normal telnet window, type **Quit** and press **Enter**.

SCPI Monitor / Input

GPIB Command Processor Console Launches a window that is used to send single SCPI/GPIB commands from the PNA keyboard.

Note: Press **Control+Z** , then enter, to close the console window.

- Type a valid command, with appropriate arguments and press enter.
- Use the arrow keys to recall previous commands.
- The console window may launch behind the PNA application. Press **Control**+**Tab** to bring the console window to the top.

Monitor GPIB Bus Enables monitoring activity on the GPIB.

Show GPIB Bus Monitor Window Shows and hides the window monitoring GPIB activity.

Local and Remote Operation

The analyzer **LCL** and **RMT** (Local and Remote) operation labels appear in the lower right corner of the status bar.

Note: The status bar is NOT visible when the analyzer is preset. See how to make the status bar visible.

- **LCL** appears when NOT under SCPI control
- **RMT** appears when under SCPI control. The RMT label does NOT appear when under COM control Remote operation disables the front panel keys except for the **Macro/Local** key.

To return to Local (front panel) operation, press the 

(Macro / Local) key

Sending the GPIB "GTL" (go to local) command also returns the analyzer to Local operation.

Sending the GPIB "LLO" (local lockout) command disables the front panel Local button.

Last Modified:

21-Feb-2008 Include Windows OS in Telnet/Sockets

Getting Data from the Analyzer

Data is sent from the analyzer in response to program queries. Data can be short response messages, such as analyzer settings, or large blocks of measurement data. This topic discusses how to read query responses and measurement data from the analyzer in the most efficient manner.

Note: Some PCs use a modification of the IEEE floating point formats with the byte order reversed. To reverse the byte order for data transfer into a PC, use the FORMat:BORDer command.

Other Topics about GPIB Concepts

Response Message Syntax

Responses sent from the analyzer contain data, appropriate punctuation, and message terminators.

<NL><^END> is always sent as a response message terminator. Most programming languages handle these terminators transparent to the programmer.

Response messages use commas and semicolons as separators in the following situations:

- a comma separates response data items when a single query command returns multiple values

```
FORM:DATA? 'Query
ASC, +0 'Analyzer Response
```

- a semicolon separates response data when multiple queries are sent within the same messages

```
SENS:FREQ:STAR?;STOP? --Example Query
+1.23000000E+008; +7.89000000E+008<NL><^END> 'Analyzer Response
```

Clearing the Output Queue

After receiving a query, the analyzer places the response message in it's output queue. Your program should read the response immediately after the query is sent. This ensures that the response is not cleared before it is read. The response is cleared when one of the following conditions occur:

- When the query is not properly terminated with an ASCII carriage return character or the GPIB <^END> message.
- When a second program query is sent.

- When a program message is sent that exceeds the length of the input queue
- When a response message generates more response data than fits in the output queue.
- When the analyzer is switched ON.

Response Data Types

The analyzer sends different response data types depending on the parameter being queried. You need to know the type of data that will be returned so that you can declare the appropriate type of variable to accept the data. For more information on declaring variables see your programming language manual. The GPIB Command Finder lists every GPIB command and the return format of data in response to a query. The analyzer returns the following types of data:

- [Numeric Data](#)
- [Character Data](#)
- [String Data](#)
- [Block Data](#)

Numeric Data

All numeric data sent over the GPIB is ASCII character data. Your programming environment may convert the character data to numeric data for you. Boolean data (1 | 0) is a type of numeric data.

Character Data

Character data consists of ASCII characters grouped together in mnemonics that represent specific analyzer settings. The analyzer always returns the short form of the mnemonic in upper-case alpha characters. Character data looks like string data. Therefore, refer to the GPIB Command Finder to determine the return format for every command that can be queried.

Example of Character Data

```
MLOG
```

String Data

String data consists of ASCII characters. String parameters can contain virtually any set of ASCII characters. When sending string data to the analyzer, the string **must** begin with a single quote (') or a double quote (") and end with the same character (called the delimiter).

Note: The analyzer responds best to all special characters if the string is enclosed in single quotes. If quotes are not used, the analyzer will convert the text to uppercase. The analyzer may not respond as you expect.

The analyzer always encloses data in double quotes when it returns string data.

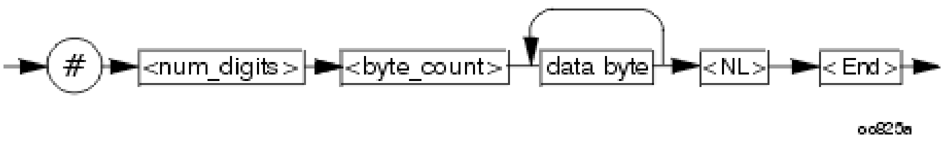
Example of String Data

```
GPIB.Write "DISP:WINDow:TITLe:DATA?"

“This is string response data.”
```

Block Data

Block data is used to transfer measurement data. Although the analyzer will accept either definite length blocks or indefinite length blocks, it always returns definite length block data in response to queries unless the specified format is ASCII. The following graphic shows the syntax for definite block data:



<num_digits> specifies how many digits are contained in <byte_count>

<byte_count> specifies how many data bytes will follow in <data bytes>

Example of Definite Block Data

#17ABC+XYZ<nl><end>

Where:

- always sent before definite block data

1 - specifies that the byte count is one digit (7)

7 - specifies the number of data bytes that will follow, not counting <NL><END>

ABC+XYZ - Data

<NL><END> - always sent at the end of block data

Transferring Measurement Data

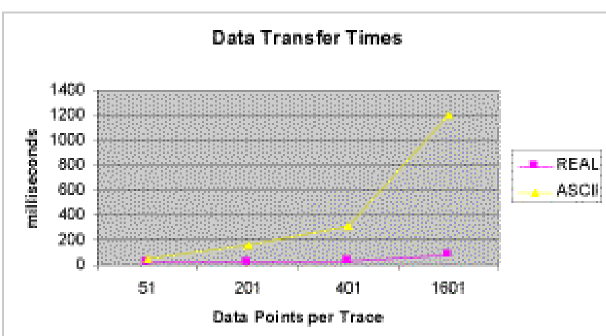
Measurement data is blocks of numbers that result from an analyzer measurement. Measurement data is available from various processing arrays within the analyzer. For more information on the analyzer's data processing flow, see Accessing Data Map. Regardless of which measurement array is read, transferring measurement data is done the same.

`See an example.`

When transferring measurement data, the FORMat:DATA command allows you to choose from the following two data types:

- REAL
- ASCII

The following graphic shows the differences in transfer times between the two:



REAL Data

REAL data (also called floating-point data) types transfer faster. This is because REAL data is binary and takes about half the space of ASCII data. The disadvantage of using REAL data is that it requires a header that must be read. See definite length block data. The binary floating-point formats are defined in the IEEE 754-1985 standard. The following choices are available in REAL format:

- **REAL,32** - IEEE 32-bit format - single precision (not supported by HP BASIC)
- **REAL,64** - IEEE 64-bit format - double precision

ASCII Data

The easiest and slowest way to transfer measurement data is to use ASCII data. ASCII data is sent if the data contains both numbers and characters (the setting of FORMat:DATA is ignored). ASCII data is separated by commas.

Last Modified:

26-Jul-2007	Added link to example

Synchronizing the PNA and Controller

Synchronizing the PNA and Controller means to keep PNA and the controller working at approximately the same pace.

The Problem

The controller sends commands to the PNA as fast as the GPIB bus will allow. The PNA stores these commands in the PNA Input queue. However, the PNA executes those commands at a slower rate than they are accepted. If left unchecked, the PNA input buffer will contain a long list of commands waiting to be executed.

At some point, the controller will send a query command which requires a response from the PNA. The controller will not send more commands until a response is received. It will wait for a response from the PNA for the amount of time set by the Timeout setting. If the PNA is working off a long list of commands in the input buffer, if may not execute and respond to the query command until the controller has quit waiting, or "timed out".

The Solution

The easiest way to keep the controller and the PNA "synched" is to send query commands often. This stops the controller from sending more commands until the PNA executes and responds to the query. This limits the number of commands that are waiting in the PNA input queue to be processed.

Although any query will stop the controller from sending more commands, a good practice is to send *OPC? Most of the time, as soon as this query is executed, it will immediately reply. The exception to this is the Overlapped command.

- **Sequential** commands are executed quickly and in the order in which they are received.
- **Overlapped** commands take longer to execute. Therefore, they allow the PNA to execute other commands while waiting. However, the programmer may want to prevent the analyzer from processing new commands until the overlapped command has completed. If the PNA is executing an overlapped command when a *OPC? is received, it will wait until the overlapped command is complete.

Note: The analyzer has two overlapped commands:

- **INITitate:IMMediate**
- **SENSe:SWEep:MODE GROUPS** (when INIT:CONT is ON)

Analyzer Queues

Queues are memory buffers that store messages until they can be processed. The analyzer has the following queues:

- **Input Queue**
- **Output Queue**
- **Error Queue**

Input Queue

The controller sends statements to the analyzer without regard to the amount of time required to execute the statements. The input queue is very large (31k bytes). It temporarily stores commands and queries from the controller until they are read by the analyzer's command parser. The input queue is cleared when the analyzer is switched ON.

Output Queue

When the analyzer parses a query, the response is placed in the output queue until the controller reads it. Your program should immediately read the response or it may be cleared from the output queue. The following conditions will clear a query response:

- When a second query is sent before reading the response to the first. This does not apply when multiple queries are sent in the same statement.
- When a program statement is sent that exceeds the length of the input queue.
- When a response statement generates more data than fits in the output queue.
- When the analyzer is switched ON.

Error Queue

Each time the analyzer detects an error, it places a message in the error queue. When the `SYSTEM:ERROR?` query is sent, one message is moved from the error queue to the output queue so it can be read by the controller. Error messages are delivered to the output queue in the order they were received. The error queue is cleared when any of the following conditions occur:

- When the analyzer is switched ON.
- When the `*CLS` command is sent to the analyzer.
- When all of the errors are read.

If the error queue overflows, the last error is replaced with a `"Queue Overflow" error.` The oldest errors remain in the queue and the most recent error is discarded.

Synchronization Methods

The following common commands are used to synchronize the analyzer and controller. Examples are included that illustrate the use of each command in a program. See the SCPI command details to determine if a command is an overlapped command.

- **[*WAI]**
- **[*OPC?]**
- **[*OPC]**

*WAI

The *WAI command:

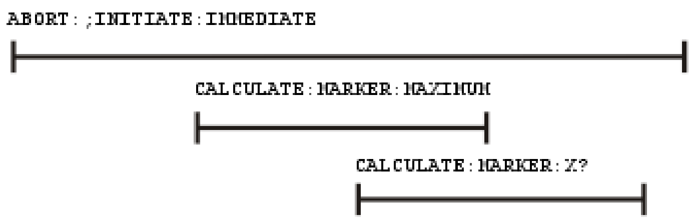
- **Stops the analyzer** from processing subsequent commands until all overlapped commands are completed.

- **It does NOT stop the controller** from sending commands to this and other devices on the bus. This is the easiest method of synchronization.

Example of the *WAI command

```
GPIB.Write "ABORT;:INITIATE:IMMEDIATE" 'Restart the measurement.
GPIB.Write "CALCULATE:MARKER:SEARCH:MAXIMUM" 'Search for max amplitude.
GPIB.Write "CALCULATE:MARKER:X?" 'Which frequency?
```

The following timeline shows how the processing times of the three commands relate to each other:

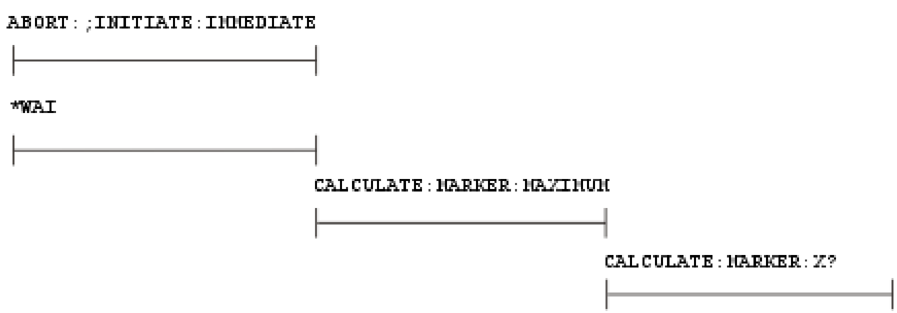


`INITIATE:IMMEDIATE` is an overlapped command; it allows the immediate processing of the sequential command, `CALCULATE:MARKER:SEARCH:MAXIMUM`. However, the `INITIATE:IMMEDIATE` is not considered complete until the measurement is complete. Therefore, the marker searches for maximum amplitude before the measurement completes. **The `CALCULATE:MARKER:X?` query could return an inaccurate value.**

To solve the problem, insert a `*WAI` command.

```
GPIB.Write "ABORT;:INITIATE:IMMEDIATE" 'Restart the measurement.
GPIB.Write "*WAI" 'Wait until complete.
GPIB.Write "CALCULATE:MARKER:MAXIMUM" 'Search for max amplitude.
GPIB.Write "CALCULATE:MARKER:X?" 'Which frequency
```

The timeline now looks like this:



The `*WAI` command keeps the `MARKER:SEARCH:MAXIMUM` from taking place until the measurement is completed. The `CALCULATE:MARKER:X?` query returns the correct value.

Note: Although *WAI stops the analyzer from processing subsequent commands, it does not stop the controller. The controller could send commands to other devices on the bus.

*OPC?

The *OPC? query stops the controller until all pending commands are completed.

In the following example, the **Read** statement following the *OPC? query will not complete until the analyzer responds, which will not happen until all pending commands have finished. Therefore, the analyzer and other devices receive no subsequent commands. A "**1**" is placed in the analyzer output queue when the analyzer completes processing an overlapped command. The "**1**" in the output queue satisfies the **Read** command and the program continues.

Example of the *OPC? query

This program determines which frequency contains the maximum amplitude.

```
GPIB.Write "ABORT; :INITIATE:IMMEDIATE"! Restart the measurement
GPIB.Write "*OPC?" 'Wait until complete
Meas_done = GPIB.Read 'Read output queue, throw away result
GPIB.Write "CALCULATE:MARKER:MAX" 'Search for max amplitude
GPIB.Write "CALCULATE:MARKER:X?" 'Which frequency?
Marker_x = GPIB.Read
PRINT "MARKER at " & Marker_x & " Hz"
```

*OPC

The *OPC command allows the analyzer and the controller to process commands while processing the overlapped command.

When the analyzer completes processing an overlapped command, the *OPC command sets bit 0 of the standard event register to 1 . This requires polling of status bytes or use of the service request (SRQ) capabilities of your controller. See Reading the Analyzer's Status Registers for more information about the standard event status register, generating SRQs, and handling interrupts.

Note: Be careful when sending commands to the analyzer between the time you send *OPC and the time you receive the interrupt. Some commands could jeopardize the integrity of your measurement. It also could affect how the instrument responds to the previously sent *OPC.

Example of polled bit and SRQ processes.

When To Synchronize the Analyzer and Controller

The need to synchronize depends upon the situation in which the overlapped command is executed. The following section describes situations when synchronization is required to ensure a successful operation.

- **Completion of a Measurement**
- **Measurements with External Trigger**
- **Averaged Measurements**

Completion of a Measurement

To synchronize the analyzer and controller to the completion of a measurement, use the `ABORT;INITIATE:IMMEDIATE` command sequence to initiate the measurement.

This command sequence forces data collection to start (or restart) under the current measurement configuration. A restart sequence, such as `ABORT;INITIATE:IMMEDIATE` is an overlapped command. It is complete when all operations initiated by that restart command sequence, including the measurement, are finished. The `*WAI`, `*OPC?` and `*OPC` commands allow you to determine when a measurement is complete. This ensures that valid measurement data is available for further processing.

Measurements with External Trigger

To use an external trigger, synchronize the analyzer and controller before the trigger is supplied to the measurement. Setup the analyzer to receive a trigger from an external source (wired to the EXTERNAL TRIGGER connector on the rear panel. The trigger system is armed by GPIB with INITIATE:IMMEDIATE. Because the source of the trigger has been specified as external, this command "readies" the analyzer for a trigger but it does not actually generate the trigger.

Averaged Measurements

Averaged measurements are complete when the average count is reached. The average count is reached when the specified number of individual measurements is combined into one averaged measurement result. Use synchronization to determine when the average count has been reached.

If the analyzer continues to measure and average the results after the average count is reached, use synchronization to determine when each subsequent measurement is complete.

Calibrating the PNA Using SCPI

There are several ways to calibrate the PNA using SCPI depending on your measurement needs. As from the Cal Wizard, you can perform a Guided Cal, Unguided Cal, or ECal. This topic explains the differences in these calibration choices when using SCPI commands.

- **Guided Calibrations**
- **ECal**
- **Creating Cal Sets**
- **Applying Cal Sets and Cal Types**
- **Uploading Error Terms**
- **Unguided Cals and Calibration Classes**

See SCPI Calibration Examples

Guided Calibrations

- Use Sens:Corr:Coll:Guided commands.
- These commands calibrate the ACTIVE channel. Activate a channel by selecting a measurement on the channel to be calibrated using Calc:Par:Select.
- Full 1,2,3,4-port SOLT and TRL calibrations - No response cals.
- All of the advanced calibration features (Thru method, specify DUT connectors and Cal kits for each port, port pairings).
- A Cal Set is applied to the channel and saved at the completion of a guided cal according to the preference setting SENS:CORR:PREF:CSET:SAVE

ECal

From the Cal Wizard or from a SCPI program, ECal is fast, accurate, and very repeatable. Unlike from the Cal Wizard, you can use SCPI to perform ECal using either the Guided or Unguided commands. The Unguided commands are easiest to use. However, the following situations require that you use the Guided commands.

- To maximize accuracy, all ECal calibrations on the PNA perform an Unknown Thru measurement of the ECal module Thru state **IF** the PNA model being used has 1 reference receiver per port. If your PNA does NOT have 1 reference receiver per port, use Guided ECal commands and specify a Thru method.
- If your ECal module connectors do NOT match the DUT connectors, and you choose not to perform a User Characterization, use Guided ECal commands and specify the Thru method.

ECAL Notes:

- When using either Guided or Unguided ECal commands under low power situations, use the Orientation settings. The Guided example shows the use of these commands. When using Unguided, they must appear before the Acquire command.
- The frequency range of the measurement must be within the range of the ECal module. Otherwise, the calibration will fail.
- Although we recently provided the command, you do NOT have to send the ECal module state command. The ECal algorithm switches ECal states automatically.
- All of these ECal choices are listed in the Programming Command Search function in this Help file.

See Using ECal to learn about all of the ECal features.

Creating Cal Sets

There are several ways to store guided cal data into a unique Cal Set. The following is probably the easiest. It does not require the name of an existing Cal Set and it allows you to name the Cal Set.

```
SENS:CORR:COLL:GUID:INIT  'start the cal with no cal set argument
'Perform the cal
SENS:CORR:COLL:GUID:SAVE 'create cal set with auto-generated name or to cal
register
SENS:CORR:CSET:NAME 'MyCalSet'  'name the current cal set.
```

Applying Cal Sets and Cal Types

A Cal Set is applied to the channel and saved at the completion of a guided cal according to the preference setting SENS:CORR:PREF:CSET:SAVE.

When you select a Cal Set to apply to an uncalibrated channel, the PNA attempts to find the most comprehensive calibration type in the Cal Set and turn it ON. In addition, changing a measurement parameter (for example, from S11 to S21) will also initiate an attempt to apply the best Cal Type and turn correction ON.

There may be times when you do not want the most comprehensive Cal Type. For example, say there is a Full 2-port Cal Set applied, but there is only an S11 measurement displayed. If measurement speed is a concern, you can apply a Full 1-Port Cal Type from that same Cal Set and save time by not doing the extra background sweeps. Learn more about background sweeps.

If you change the measurement parameter, the PNA will reapply the Full 2-Port Cal Type.

See the SCPI and COM commands for Cal Sets and Cal Types.

Uploading Error Terms

There are two ways to upload error terms using SCPI: the old way and the recommended way. The old way will still works but requires a 'preference' setting.

The old way is this:

```
SENS:CORR:COLL:METHod <cal type>
SENS:CORR:COLL:SAVE
CALC:DATA SCORR[n]  < data to upload >
```

This technique, used in WinCal software, starts a calibration and immediately saves it without acquiring any standards. In PNA Rev 6.0, executing SAVE without acquiring data will return an error. To suppress the error and continue to use the above technique to upload error terms, send the following command to set the preference:

SENS:CORR:PREF:SIMCal 1

Or you can execute the script that is saved on the PNA at C:\Program Files\Agilent\Network Analyzer\System\wincal32.reg.

Setting this preference defeats some error checking when performing unguided cal using SCPI. This is not recommended unless needed for backward compatibility.

The recommended way is to upload error terms into a created or selected Cal Set:

```
SENS:CORR:CSET:CREAte or SENS:CORR:CSET:GUID
SENS:CORR:CSET:Data <term> <port> <port> <data>
SENS:CORR:CSET:SAVE
```

This method puts error terms into a Cal Set, outside of a Guided or Unguided calibration session. The Cal Set can then be applied at any time.

See SENS:CORR:CSET commands.

Unguided Cals and Calibration Classes

- Use Sens:Correction commands.
- 1-port, 2-port, Response.
- Can select 2 sets of standards.
- TRL is NOT recommended.

The following describes how to perform an unguided calibration using SCPI. The objective here is to make clear the relationship between the physical port on which a standard is being measured, the actual device in the cal kit, and the SCPI command used to acquire the device.

Calibration standards classes are 'categories' of standard types. To perform a 2 port calibration, the cal wizard requires the following types of standards to be measured:

3 reflection standards on the forward port:

- Class S11A typically an open
- Class S11B typically a short
- Class S11C typically a load

Likewise, 3 reflection standards are required for the reverse port:

- Class S22A typically an open

- Class S22B typically a short
- Class S22C typically a load

There is also a transmission standard that is measured in both directions:

- Class S21T typically a thru

The following illustrates the relationship between cal kit physical standards and calibration classes. Here is a list of the physical devices in my calibration kit.

Standard #1 = "3.5 mm male short"

Standard #2 = "3.5 mm male open"

Standard #3 = "3.5 mm male broadband load"

Standard #4 = "Insertable thru standard"

Standard #5 = "3.5 mm male sliding load"

Standard #6 = "3.5 mm male lowband load"

Standard #7 = "3.5 mm female short"

Standard #8 = "female to female characterized thru adapter"

Standard #9 = "0-2 Load"

Standard #10 = "Open"

Standard #11 = "Non-insertable thru"

Standard #12 = "3.5 mm female lowband load"

Standard #13 = "3.5 mm female sliding load"

Standard #14 = "3.5 mm female broadband load"

Standard #15 = "3.5 mm female open"

When you perform a calibration remotely using SCPI, you don't specify the device number directly. Rather, you specify the class you want to measure. Each device in the calibration kit is assigned to a class. And since more than one device can be assigned to the same class, each class contains an ordered list of devices. The class assignments are set using the Advanced Modify Cal Kit dialog or the SCPI command:

SENS:CORR:COLL:CKIT:ORDer<class>, <std>, <std>, <std>, <std>,<std>,<std>,<std>

The 85052B kit used in the example program has the following standard list for each class: The list was obtained by issuing the corresponding SCPI query:

SENS:CORR:COLL:CKIT:OLIST1?   S11A = +2,+15,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST2?   S11B = +1,+7,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST3?   S11C = +6,+5,+3,+12,+13,+14,+0

SENS:CORR:COLL:CKIT:OLIST4?   S21T = +4,+8,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST5?   S22A = +2,+15,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST6?   S22B = +1,+7,+0,+0,+0,+0,+0

SENS:CORR:COLL:CKIT:OLIST7?   S22C = +6,+5,+3,+12,+13,+14,+0

SENS:CORR:COLL:CKIT:OLIST8?   S12T = +4,+8,+0,+0,+0,+0,+0

When you perform the calibration, you acquire data by issuing the ACQuire command:

SENS:CORR:COLL:ACQ <class>[, <subst>]

For example:

SENS:CORR:COLL:SFOR 1

SENS:CORR:COLL:ACQ STANA, SST2

The SFOR command tells the wizard to make the next acquisition in the forward direction. The ACQuire command specifies that we are measuring the 2nd device in the list for STANA. And since we are measuring SFORward, then STANA refers to class #1 or S11A. The list of devices for this class are specified in the OLIST1 query above.

Alternately, you could modify the device order for the S11A class to move device #15 into the first position (SENS:CORR:COLL:CKIT:ORDER1). When the desired device is in the first position, you need not specify the order number in the ACQuire command. The default is the first device in the OLIST. This works well for two port network analyzers where the order for S11A,B,C classes is set up for port 1 and the order for S22A,B,C is set up for port 2. With the kit set up in the proper order, you eliminate the need to specify the substandard number (SST<n>).

See an example: Perform an Unguided 2-port Cal on a **4-port PNA.**

The PNA as a USB Device

Use of the PNA as a USB Device is not supported at this time.

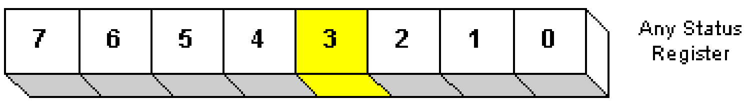
Reading the Analyzer's Status Register

The PNA has several status registers that your program can read to know when specific events occur. There are two methods of reading the status registers in the analyzer: the Polled Bit method and the Service Request method.

- **Polled Bit Method**
- **Service Request Method**
- **Setting and Reading Bits in Status Registers**
- **Positive and Negative Transitions**
- **Status Commands**

Other Topics about GPIB Concepts

Most of the status registers in the analyzer have sixteen bits. For simplicity, this topic will illustrate their use with 8-bit registers. Bits in registers represent the status of different conditions inside of the analyzer. In the following graphic, a register is represented by a row of boxes; each box represents a bit. Bit 3 is ON.



The Polled Bit Method

With the Polled Bit Method, your program **continually** monitors a bit in the status register that represents the condition of interest to you. When the analyzer sets the bit to 1, your program immediately sees it and responds accordingly.

Advantage: This method requires very little programming.

Disadvantage: This method renders your program unavailable to do anything other than poll the bit of interest until the condition occurs.

Procedure:

1. Decide which condition to monitor. The Status Commands topic lists all of the possible conditions that can be monitored in the analyzer.

2. Determine the command and the bit that will monitor the command.

3. Construct a loop to poll that bit until it is set.

4. Construct the routine to respond when the bit is set.

The Service Request (SRQ) Method

Your program enables the bits in the status registers representing the condition of interest. When the condition occurs, the analyzer actively interrupts your program from whatever it is doing, and an event handler in your program responds accordingly. Do this method if you have several conditions you want to monitor or the conditions are such that it is not practical to wait for the condition to occur.

Advantage: This method frees your program to do other things until the condition occurs. The program is interrupted to respond to the condition.

Disadvantage: This method can require extensive programming depending on the number and type of conditions that you want to monitor.

Procedure:

1. Decide which conditions to monitor. The Status Commands topic lists all of the possible analyzer conditions that can be monitored.

2. Set the enable bits in the **summary** registers and the **status byte** register.

> **Enabling** is like making power available to a light - without power available, the switch can be activated, but the light won't turn ON. In the analyzer, without enabling, the condition may occur, but the controller won't see it unless it is enabled.
>
> The condition, and the bit in the **summary** registers in the reporting path, must be enabled. This is like streams (conditions) flowing into rivers (summary registers), and rivers flowing into the ocean (controller). See the diagram of status registers in Status Commands.
>
> Bit 6 of the **status byte** register is the only bit that can interrupt the controller. When **any** representative bit in the status byte register goes ON, bit 6 is automatically switched ON.

3. Enable your program to interrupt the controller. This is done several ways depending on the programming language and GPIB interface card you use. An example program is provided showing how this is done with in Visual Basic with a National Instruments GPIB card.

4. Construct a subroutine to handle the interrupt event. If you are monitoring more than one condition in your system, your event handler must determine which condition caused the interrupt. Use the *SPE command to determine the instrument that caused the interrupt, then poll the summary registers, then poll condition registers to determine the cause of the interrupt.

Setting and Reading Bits in Status Registers

Both methods for reading status registers requires that you read bits out of the status registers. Most of the PNA status registers contain 16 bits, numbered 0 to 15. Each bit has a weighted value. The following example shows how to set the bits in a 8-bit status register.

8-bit register

Bit	0	1	2	3	**4**	**5**	6	7
Weight	1	2	4	8	**16**	**32**	64	128

We want to set bits 4 and 5 in the Standard Event Status Enable register.

Step	**Example**
1. Read the weighted bit value for these bits	weights 16 and 32 (respectively)
2. Add these values together	16 + 32 = 48
3. Send this number as an argument in the appropriate command. (see Status Commands)	STAT:QUES:LIMIT1:ENAB 48

Positive and Negative Transitions

Transition registers control what type of in a condition register will set the corresponding bit in the event register.

- **Positive** transitions (**0 to 1**) are only reported to the event register if the corresponding positive transition bit is set to 1.
- **Negative** transitions (**1 to 0**) are only reported to the event register if the corresponding negative transition bit is set to 1.
- Setting **both** transition bits to 1 causes both **positive and negative** transitions to be reported.

Transition registers are read-write and are unaffected by *CLS (clear status) or queries. They are reset to their default settings at power-up and after *RST and SYSTem:PRESet commands. The **following are the default settings** for the transition registers:

- All Positive Transition registers = 1
- All Negative Transition registers = 0

This means that, by default, the analyzer will latch all event registers on the negative to positive transition (0 to 1).

The following is an example of why you would set transition registers:

A critical measurement requires that you average 10 measurements and then restart averaging. You decide to poll the averaging bit. When averaging is complete, the bit makes a positive transition. After restart, you poll the bit to ensure that it is set back from 1 to 0, a negative transition. You set the negative transition bit for the averaging register.

Configure for SCPI LAN using SICL / VISA

Other Topics about GPIB Concepts

PNA Supported Interfaces

The PNA supports the following interfaces for SICL / VISA communication:

- **LAN** - as a remote GPIB interface. The PNA LAN is presented as a virtual GPIB interface. It does NOT support simple TCPIP-based control. Therefore, when configuring the Agilent IO libraries on your PC, add a **REMOTE GPIB** interface, which uses the LAN client interface.
- **GPIB** - requires that your external controller have a GPIB card.

Note: For optimum LAN interface performance, use COM to control the PNA. SCPI commands can be sent to the PNA using the COM SCPIStringParser object.

The following interfaces are NOT supported:

- **USB**
- **Serial**

Important Note:

To enable VISA or SICL communication over LAN, you must do the following:

1. On the PNA, click **System,** point to **Configure,** then click **SICL/GPIB**.
2. Check **SICL Enabled.** To automatically enable SICL when the PNA is booted, check **Automatically enable on Startup**.
3. Click **OK.**

The PNA is now ready to be controlled over LAN.

Learn more about this dialog box.

Agilent I/O Libraries

The Agilent I/O libraries includes the drivers to allow you to communicate with Agilent test instruments. Every PNA is shipped with the Agilent I/O libraries installed. We recommend you do NOT upgrade the Agilent I/O libraries on the PNA as unexpected results may occur. If you choose to upgrade the Agilent I/O libraries on the PNA, do NOT change the default folder path in the InstallShield Wizard.

To communicate with the PNA, the Agilent I/O libraries must also be installed on your external controller. To purchase the Agilent I/O libraries, or download a free upgrade, go to www.agilent.com and search for IO Libraries. Scroll to find Software, Firmware & Drivers.

SICL / VISA Programs Running on the PNA

You can run your SICL / VISA program on the PNA to control the PNA. Although the Agilent I/O libraries are already installed on the PNA, it is configured as the **Host**. You must also configure a SICL or VISA LAN **Client** interface on the PNA, specifying the LAN hostname of that same PNA.

If your program uses the COM interface to VISA, and is compiled on a PC with the Agilent IO Libraries Suite (version 14 or later), and the resulting executable is copied and run on the PNA, it will produce a “type mismatch error”. This is because the PNA has the ‘M’ version of Agilent I/O libraries. The following Visual Basic code is an example of how to avoid this error when communicating with the PNA from within the PNA:

```
Dim rm As IResourceManager
Dim fmio As IFormattedIO488
Set rm = CreateObject("AgilentRM.SRMCls")
Set fmio = CreateObject("VISA.BasicFormattedIO")
Set fmio.IO = rm.Open("GPIB0::22")
fmio.WriteString "*IDN?" & Chr(10)
MsgBox fmio.ReadString()
```

Controlling the PNA over LAN while controlling other instruments over GPIB

The PNA can NOT be both a controller and talker/listener on the same GPIB bus. Using SICL / VISA, you can use LAN to control the PNA, leaving the PNA free to use the rear-panel GPIB interface to control other GPIB devices.

Configure the PNA for SICL / VISA

1. On the PNA, click **System** then check **Windows Taskbar**
2. Click **Start** then point to **Program Files, Agilent IO Libraries**, then click **IO Config**
3. Select each GPIB Interface and click **Edit** to verify (or make) the default settings in the following table. These settings are REQUIRED when using a 82357A USB / GPIB Interface with the PNA.
4. When complete, click **OK** to close the edit dialog.
5. Click **OK** to close the IO Config dialog.

VISA Interface Name	SICL Interface Name	Dialog box title	Description
GPIB0	gpib0	GPIB Using NI-488.2	PNA Rear-panel GPIB connector. This GPIB interface can be used to control the PNA **OR** for the PNA to control external equipment. IT CAN NOT DO BOTH IN THE SAME PROGRAM. Learn more about pass-through options.
GPIB1	hpib7	Internal Instrument Configuration	Internal interface for programs running on the PNA to control itself.

Configure the External Controller

Please refer to the Agilent I/O libraries documentation to learn how to configure your controller to communicate with the PNA. These links can show you how to find the following PNA information:

- PNA full computer name
- GPIB Address
- IP Address

This example program can help test your VISA configuration.

Agilent VEE Pro RunTime Installed

Beginning in Dec. 2005, Agilent VEE Pro RunTime is installed on new PNAs. This means that programs written with Agilent VEE (.vxe files) can be run directly on the PNA. New PNA models with 1.1 GHz CPU have VEE 7.5 runtime with Agilent I/O Libraries suite 14.

PNAs **without** Agilent VEE installed can go to the Agilent VEE website and download Agilent **VEE Pro 6.2** RunTime to the PNA and begin to run VEE programs directly on the PNA. This version does not require Agilent I/O Libraries suite 14. Do **NOT** upgrade to Agilent I/O libraries suite 14 on the PNA.

With Agilent VEE Pro RunTime installed on the PNA, the following examples can be run directly on the PNA:

- Basic Control of the PNA

For more VEE examples, see the PNA support website.

For more information on Agilent VEE, see www.agilent.com/find/VEE

Basic Control using VEE

This VEE Pro 6.0 example does the following:

- Controls PNA windows and traces.
- Changes stimulus settings.
- Measures all four S parameters.
- Create markers and displays marker readout.

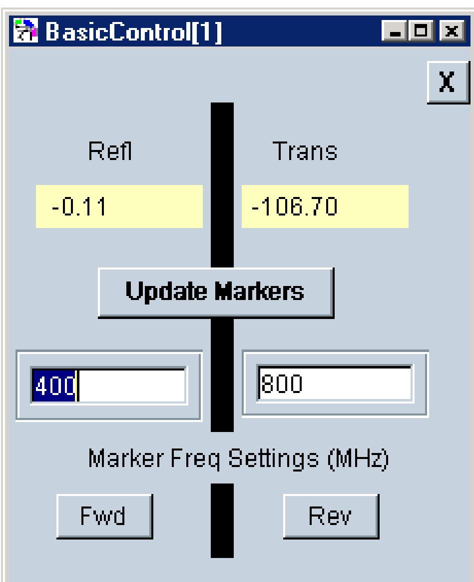
If this Help file is on a PNA and VEE Pro RunTime is installed, then:

1. Run the BasicControl.vxe example
2. Then click **Open** on the following dialog box to run the program.

Otherwise, you can modify the example program using VEE, save the VEE BasicControl.vee

Learn how to run this program as a Macro on the PNA.

The following dialog box will be visible on the PNA when the example program is running.



- Click **Fwd** to activate the Forward (S11 and S21) measurements.
- Click **Rev** to activate the Reverse (S22 and S12) measurements.
- Click **Update Markers** to sweep the PNA.
- Type values to change Marker Frequencies.

ECal with Confidence Check using VEE

This VEE Pro 6.0 example performs an ECal and subsequent ECal confidence Check.

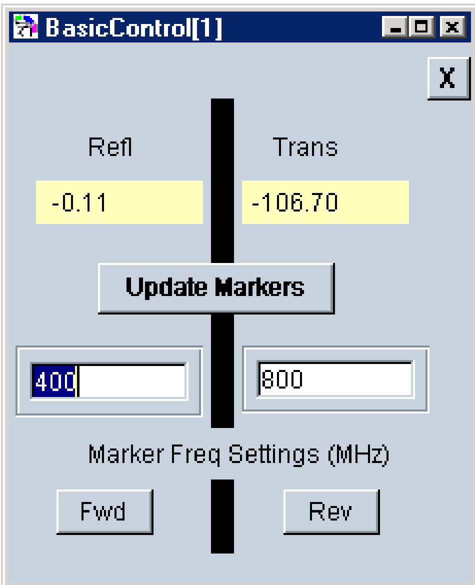
If this Help file is on a PNA and VEE Pro RunTime is installed:

- Run the .vxe example
- Then click **Open** on the following dialog box to run the program.

Or to modify the example program using VEE, save the VEE BasicControl.vee

Learn how to run this program as a Macro on the PNA.

The following dialog box will be visible on the PNA when the example program is running.



- Click **Fwd** to activate the Forward (S11 and S21) measurements.
- Click **Rev** to activate the Reverse (S22 and S12) measurements.
- Click **Update Markers** to sweep the PNA.
- Type values to change Marker Frequencies.

Interface Control

The Interface Control feature allows you to send remote commands and data to the following PNA rear-panel Interfaces: GPIB, Material Handler I/O, Test Set I/O, and Auxiliary I/O.

Other External Device Control Topics

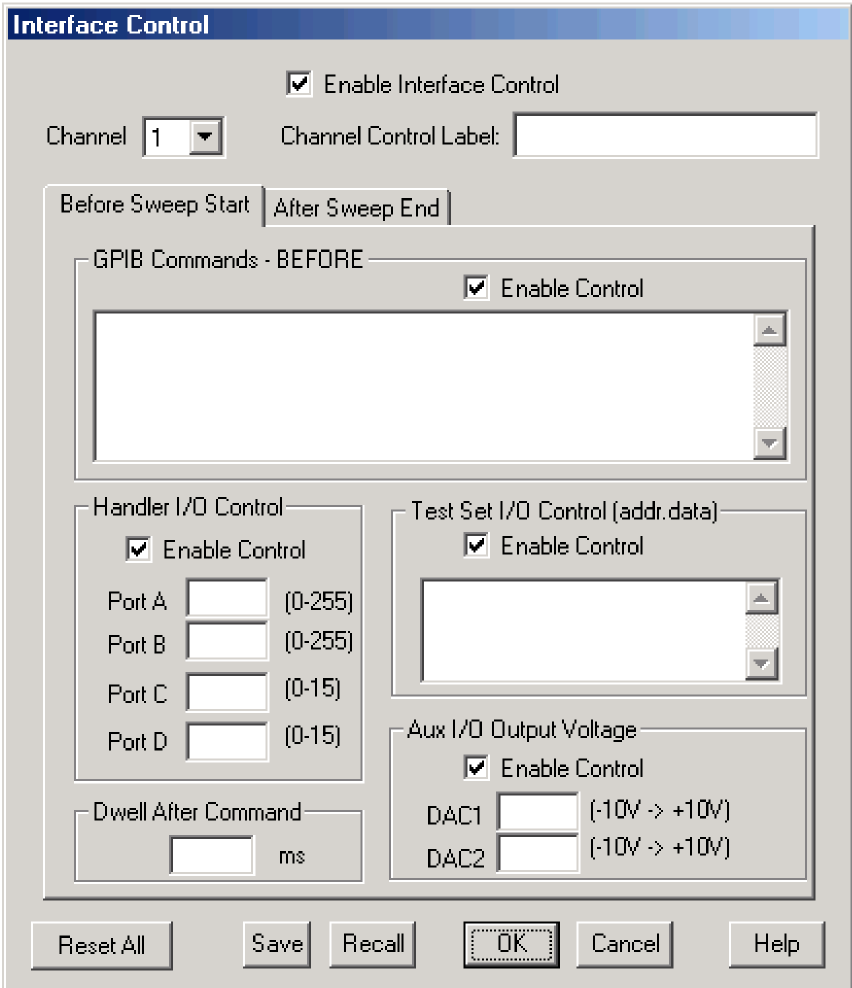
Overview

The Interface Control feature allows you to send data to control external equipment such as GPIB instruments, a material handler, test set, or other equipment, without needing to create a remote program. The PNA manages the timing and required interface setup. See Rear Panel Tour.

- A unique set of control data can be sent for each channel. In addition, a unique set of control data can be sent before the channel sweep starts, and after the sweep ends.
- Interface Control settings can be saved and recalled from the Interface Control dialog box, or with Instrument State Save and Recall.
- Interface Control settings can be copied to other channels using Copy Channels.
- Control data can only be WRITTEN to the interfaces, NOT READ from the interfaces.
- Control data is sent in the following order. This order cannot be changed.

1. GPIB Interface
2. Material Handler Interface
3. Test Set Interface
4. Aux Interface
5. Dwell Time

How to access Interface Control settings	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Channel** 2. then **Interface Control**
For PNA-X and 'C' models	Programming Commands
1. Press TRACE/CHAN 2. then **[Channel]** 3. then **[More]** 4. then **[Interface Control]**	1. Click **Trace/Chan** 2. then **Channel** 3. then **More** 4. then **Interface Control**



Interface Control dialog box help

See Interface Control Overview (scroll up)

An Instrument Preset will reset all of the fields to their default settings.

Note: If an error is encountered when sending Interface Control data, an error message is displayed on the PNA screen. The Channel Trigger State is set to Hold. You must fix the condition that caused the error, then change the Channel Trigger State to its original setting.

Enable Interface Control Enables and disables ALL Interface Control communication. When cleared (default setting) Interface Control is disabled and NO data is sent. To send data, the individual interfaces must also be enabled.

Channel Specifies the channel number for dialog settings. Each channel is configured individually. The list box shows the channels that currently have measurements. There must be at least one measurement present in order to make settings.

Channel Label Specifies the label to be displayed on the second status bar at the bottom of the PNA screen. This field is shared with External Testset control. The second status bar is automatically displayed when Interface Control is enabled.

Learn about the primary status bar.

Before Sweep Start - After Sweep End Tabs

Commands / data for all four interfaces can be sent both Before Sweep Start and After Sweep End. However, they are configured and enabled on separate tabs of the Interface Control dialog box. For example, to send GPIB commands both Before and After a PNA sweep, the Enable Control checkbox must be selected and commands entered on BOTH the Before Sweep Start and After Sweep End tabs.

Before Sweep Start The data is sent BEFORE the first trace on the channel begins sweeping.

After Sweep End The data is sent AFTER the last trace on the channel completes sweeping.

GPIB Commands

Notes:

- While using the rear-panel GPIB port with Interface Control, the PNA must be in GPIB System Controller mode. If the PNA is NOT in System Controller mode, an error message appears AND Interface Control is disabled. To correct this situation,

    1. Put the PNA in System Controller mode, and
    2. Re-enable Interface Control.

- GPIB instruments CAN be connected to the PNA using a USB/GPIB adapter. In this case, the PNA can be in talker-listener mode.
- GPIB Queries are NOT supported.

Enable Control Enables and disables sending commands out the GPIB interface.

Multi-line edit control Each line contains a GPIB command using the following syntax:

```
address    command
```

Where:

address a number between 0 and 31. The PNA will look through all of the GPIB interfaces for an instrument connected to the specified address. If an instrument with that address is not recognized, an error is returned.

command a GPIB command, with or without enclosing quotes. Enclosing quotes are ignored.

Address and command are separated by at least one space.

Commands should be separated by a new line, or carriage return. For example:

```
19 ":init:cont off"
16 init:imm
```

The front-panel **Enter** key inserts a new line into the field.

The number of GPIB commands that can be entered is limited only by the available memory of the PNA.

See Z5326A H08 Test Set Commands.

Material Handler I/O

Enable Control Enables and disables sending data out the Material Handler I/O connector

Ports A, B, C, D Sends values to the respective Handler I/O port. Although ports C and D are normally bidirectional, ONLY Output mode is allowed using the Interface Control feature. It cannot read from these, or any other, ports.

Test Set I/O

Note: The PNA has a separate interface for controlling the E5091A Test Set.

Enable Control Enables and disables sending data out the External Test Set I/O connector.

Multi-line edit control Each line contains a Write command using the following syntax:

```
address.value
```

Where:

`address` any positive integer.

`value` numeric character. Entries that require **alpha** characters should use the GPIB interface.

Address and value are separated by a period. For example:

```
18.2
27.3
```

Entries should be separated by a new line, or carriage return. The PNA front-panel **Enter** key inserts a new line into the field.

All entries are sent out the Test Set I/O port using the WriteData Method.

The number of entries is limited only by the available memory of the PNA.

Aux I/O

Enable Control Enables and disables sending data out the Auxiliary I/O connector.

DAC1, DAC2 Sets voltages on the Aux I/O connector pins 2 (DAC1) and pin 3 (DAC2).

Dwell After Command Specifies a wait time, in milliseconds, after all commands to all interfaces are sent. Any positive integer is allowed. This is used to allow all external devices to settle before beginning a measurement. An erratic trace could indicate that more settling time is necessary.

Reset All Sets ALL fields on ALL channels to their default values.

Save and Recall Saves and recalls the contents of this dialog box. If the Interface Control dialog box is populated with settings during an Instrument State Save, the settings are automatically recalled with the Instrument State settings.

Interface control uses an *.xml file type. An example file is stored on the PNA hard drive. You can recall it into the dialog, or you can open and edit it with a word processor, such as Word Pad.

OK Applies the settings and closes the dialog box.

Cancel Does not apply changes that were made, and closes the dialog box.

Z5623A H08 Test Set Commands

The following table lists the commands that are used to control the popular Agilent Z5623A H08 Test Set. These commands can be entered into the GPIB Interface control.

Connection Path	Test Set Command
Reflection to Port 1	refl_01
Reflection to Port 2	refl_02
Reflection to Port 3	refl_03
Reflection to Port 4	refl_04
Reflection to Port 5	refl_05
Reflection to Port 6	refl_06
Reflection to Port 7	refl_07
Reflection to Port 8	refl_08
Transmission to Port 1	tran_01
Transmission to Port 2	tran_02
Transmission to Port 3	tran_03
Transmission to Port 4	tran_04
Transmission to Port 5	tran_05
Transmission to Port 6	tran_06
Transmission to Port 7	tran_07
Transmission to Port 8	tran_08
Reset	*rst
Reflection Termination	*r_term
Transmission Termination	*t_term
All Termination	*all_term

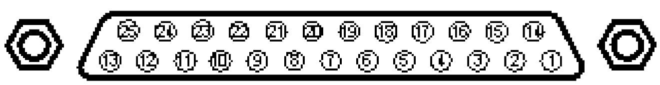
Auxiliary I/O Connector

General Description

This DB-25 male connector provides a variety of analog I/O, digital I/O, timing I/O, and supply lines. You can change the settings on the Auxiliary IO connector through SCPI and COM programming commands. The settings are NOT accessible through the front-panel keys or display menu.

Note: This connector does NOT exist on the PNA-X model.

Note: The AUX IO configuration settings REMAIN after an Instrument Preset and Hibernation. However, Preset will clear the DAC values. The settings will revert to their default settings ONLY after the PNA is restarted, or until they are changed by you. AUX IO settings are saved and recalled with Instrument State.



Pin	Name	Description
1	ACOM	Ground reference for analog signals
2	Analog Out 2	-10 to +10Vdc output, 10mA max
3	Analog Out 1	-10 to +10Vdc output, 10mA max
4	no connect	for future enhancements
5	DCOM	Ground reference for digital signals
6	reserved	for future enhancements
7	reserved	for future enhancements
8	reserved	for future enhancements
9	+5V	+5Vdc output, 100mA max.
10	Pass/Fail Write Strobe	Indicates pass/fail line is valid (active low)
11	Sweep End	Indicates sweep is done (programmable modes)
12	Pass/Fail	Indicates pass/fail (programmable logic, modes and scope)
13	Output Port Write Strobe	Writes I/O port data (active low)
14	Analog In	-10 to +10VDC analog input
15	ACOM	Ground reference for analog signals
16	Power Button In	Grounding replicates front panel power button press

17	DCOM	Ground reference for digital signals
18	Ready for Trigger	Indicates ready for external trigger (active low)
19	External Trigger In	Measurement trigger input (programmable to be active high or low)
20	Footswitch In	Active low input latches a user-readable status bit.
21	+22V	+22Vdc output, 100mA max.
22	In/Out port C0	General purpose input / output
23	In/Out port C1	General purpose input / output
24	In/Out port C2	General purpose input / output
25	In/Out port C3	General purpose input / output

ACOM (pins 1, 15)

Description

Analog common (ground) - To be used with the Analog Out and Analog In lines.

ACOM and DCOM are connected to system ground at a star ground point inside the analyzer.

Analog Out 1, 2 (pins 2, 3)

Description

Two analog outputs programmable to +/-10V; I_{out}<10mA; R_{out}=100 ohms

12-bit DACs with voltage resolution of approximately 5mV/count.

The DACs are set to constant values using SCPI or COM, and can be read using SCPI or COM commands.

Preset state for both pins is 0 volts.

HW Details

Looking into this output pin is a 100-ohm series resistor followed by two diodes tied to +/-15V for static protection, then the output or an op-amp.

The voltage output is provided by a 12-bit DAC with an op amp buffer.

Specifics:

- Maximum output current = 10mA
- Settling time = 3us

Timing

The DACs are set after the last data point is measured, during retrace. If the analyzer is in single sweep mode, the DACs are set as part of the presweep process, before the sweep is triggered.

DCOM (pins 5, 17)

Description

Digital common (ground).

Used with the digital input and output lines.

ACOM and DCOM are connected to system ground at a star ground point inside the analyzer.

Pins 6, 7, 8

Description

Reserved

+5V (pin 9)

Description

+5V nominal output (100mA max).

Protected by self-healing fuse:

Pass/Fail Write Strobe (pin 10)

Description

See Handler IO connector.

Sweep End (pin 11)

Description

See Handler IO connector.

Pass/Fail (pin 12)

Description

See Handler IO connector.

Output Port Write Strobe (pin 13)

Description

See Handler IO connector.

Analog In (pin 14)

Description

Analog input, +/-10V range, Rin=100k ohm

Bandwidth = 40kHz (2-pole lowpass filter).

This analog input may be read using the SCPI or COM commands.

HW Details

Looking into this pin there is 1k-ohm series resistor followed by 100k-ohm resistor to ground, static protection diodes after the 1k resistor limit the signal to +/-15V, then a high impedance buffer and active filter limiting the bandwidth to 40kHz with a lowpass filter.

Power Button In (pin 16)

Description

Short this pin to ground to replicate a front panel power button key press.

HW Details

Looking into the pin there is a 215-ohm series resistor followed by a 10k pull-up to the 3V standby supply, static protection diodes to the 0V/5V and then connects to the front panel power key circuit.

CAUTION: Because this line is internally pulled up to 3V, it should not be driven by a TTL driver.

Timing

Grounding this line for 1us to 2 seconds will simulate pressing the front panel power button.

Grounding this line for >4 seconds will perform a hard reset (similar to a personal computer) and is not recommended.

Ready for Trigger (pin 18)

Description

TTL output.

Active Low signal indicates that system is ready for an external trigger.

Remains High if system is not in External Trigger mode.

Goes High after an External Trigger is acknowledged.

Goes Low after the system has finished with its measurements, the source has been set up, and the next data point is ready to be measured.

HW Details

Looking into this pin there is a 215-ohm series resistor followed by a 10k pullup, diodes to 0V/5V for static protection, then the output of an "ABT" TTL buffer.

This line is enabled only when the analyzer is in External Trigger mode.

Refer to External Trigger In (following pin) for more information.

Timing

Refer to External Trigger In (following pin)

External Trigger In (pin 19)

Description

This input accepts level trigger signals (High / Low) on all PNA models, or edge trigger signals on some PNA models.

The external trigger configuration is set from the front panel, SCPI or COM.

For more information, see External triggering.

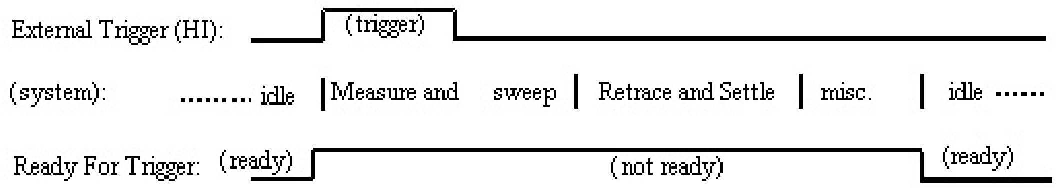
A single trigger is achieved by asserting the external trigger for a period from 1us to 50us. Continuous triggering is achieved by holding the external trigger in the "asserted" mode (either Low or High).

HW Details

Looking into this pin is a 215-ohm series resistor followed by a 4.64k pullup, 1000pF to ground and then a "FAST" TTL buffer input.

Timing

A level trigger width should be between 1us and 50us.



Footswitch In (pin 20)

Description

TTL input.

A Low level input such as shorting this line to ground using a footswitch (where the input stays low for >1us) will be latched.

The latched status may be read using the SCPI or COM commands.

Only one footswitch press can be latched (remembered) by the system.

Reading the latch status will reset it if Footswitch In has returned to a high level.

HW Details

Looking into this pin is a 215-ohm series resistor followed by a 4.64k pullup to 5V and 1000pF to ground. This line is an input to a "FAST" TTL buffer.

Timing

Footswitch In must be Low for at least 1us.

+22V (pin 21)

Description

+22V nominal output (100mA max).
Protected by self-healing fuse.

In/Out Port C0-C3 (pins 22-25)

Description

See Handler IO connector

External Test Set I/O Connector

General Description

This DB-25 female connector is used to control external test sets. The external test set bus consists of 13 multiplexed address and data lines, three control lines, and an open-collector interrupt line. The Test Set IO is not compatible with the 8753 test sets.

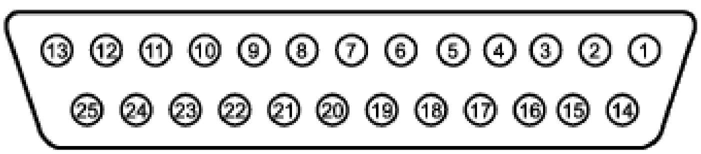
You can change the settings on the External Test Set IO connector through SCPI and COM programming commands. The settings are NOT accessible through the front-panel keys or display menu.

Notes:

- The External Test Set pin settings are NOT affected by Instrument State Save/Recall or Instrument Preset.
- At PNA Power Up and return from Hibernation, the External Test Set bus data lines, address lines, and control lines are set HIGH, and no strobe lines are pulsed.

Caution: Do not mistake this connector with a Parallel Printer port. A printer may be damaged if connected to this port.

Other External Device Control Topics



Pin	Name	Description
1	SEL0	Test set select bit 0; tied to GND
2	Sweep Holdoff In	TTL input - state may be read with SCPI or COM command
3	AD12	Address and latched data
4	AD10	Address and latched data
5	AD9	Address and latched data
6	AD8	Address and latched data
7	GND	0V
8	LAS	TTL output Low = Address Strobe

9	AD4	Address and latched data
10	AD3	Address and latched data
11	AD2	Address and latched data
12	GND	0V
13	Interrupt In	TTL input - state may be read with a SCPI or COM command
14	No connect	**CAUTION**: Older PNAs have +22v on this line; this will damage a printer.
15	SEL1	Test set select bit 1; tied to GND
16	SEL2	Test set select bit 2; tied to GND
17	AD11	Address and latched data
18	SEL3	Test set select bit 3; tied to GND
19	AD7	Address and latched data
20	AD6	Address and latched data
21	AD5	Address and latched data
22	AD0	Address and latched data
23	AD1	Address and latched data
24	LDS	TTL output - active low data strobe
25	RLW	TTL output - high-read, low write

SEL0-SEL3 (pins 1,15,16,18)

Description

Selects addresses of test sets that are "daisy chained" to this port. The select code is set to zero at the PNA connector and is incremented by one as it goes through each successive external test set. Therefore, the first test set in the chain has address zero and so on, for up to 16 test sets.

HW Details

Connected to ground inside the PNA.

Timing

None

Sweep Holdoff In (pin 2)

Description

Input line used by the test set for holding off a sweep. Holding off a sweep is one way of introducing a delay that allows an external device to settle before the PNA starts taking data. You must write a program that will query the line and perform the delay. The program needs to query the line and keep PNA from sweeping while the line remains low. When a subsequent query detects that the line went high the program would then trigger the PNA to start the sweep.

Use either Single or External trigger mode to control the PNA sweep.

HW Details

This pin has a series 215-ohms resistor followed by 4.7k-ohm pull-up and then an "ABT" TTL buffered register.

Timing

This input is not latched by the PNA hardware. Therefore the input level must be held at the desired state by the test set until it's read by your program.

AD0-AD12 (pins 3-6, 9-11, 17, 19-23)

Description

Thirteen lines are used to output data addresses or input / output data. Several SCPI and COM commands are available for reading and writing to these lines. You can choose to use commands where the PNA provides the appropriate timing signals needed for strobing the addresses and data. Or you can choose to control the timing signal directly. The timing signals are RLW, LAS and LDS. If you decide to do direct control refer to the corresponding SCPI and COM command details. Close attention to detail is needed to insure the desired results.

After a write command, lines AD0-AD12 are left in the state they were programmed. Default setting for Mode is Read / Input).

After a read command, lines AD0-AD12 are left in input mode. While in this mode an external test set attached to the IO is free to set the level on each line.

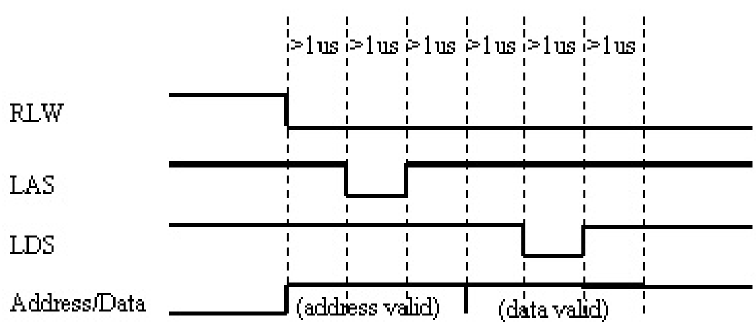
HW Details

Each of these I/O pins has a series 215-ohm resistor followed by 4.7k-ohm pull-up resistor.

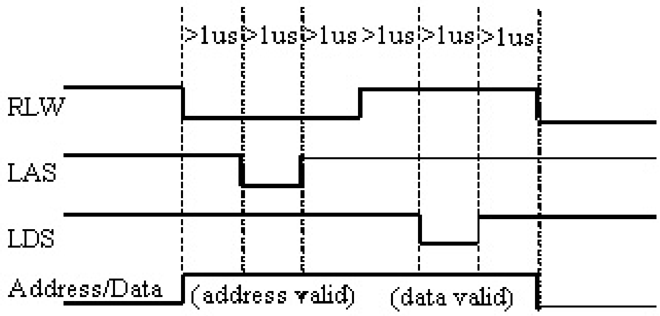
Write/Read is implemented by an output tri-state TTL buffer / latch for latching and enabling write data in parallel with a TTL input buffer for reading.

Timing

Output Address and data setup and hold times are 1us minimum.



Address & Data I/O Write



Address & Data I/O Read - Data must be valid for 1us before and after strobe

---

GND (pins 7, 12)

Description

Two ground pins used as ground references by the test set.

HW Details

Connected to digital ground.

Timing

None.

LAS (Low Address Strobe) (pin 8)

Description

This line has two behaviors that are command dependent. Refer to the SCPI and COM commands for further details.

In one behavior LAS is one of the lines used by the PNA to provide appropriate timing for writing Address and Data to the Test Set. In this case LAS is controlled automatically by the PNA and is intended to be used as the strobe for the Address. When LAS is low, lines AD0 - AD12 represent the Address. LAS will return to its normally high state when the transaction is finished.

In the second behavior the PNA will NOT provide appropriate timing. In this case LAS is controlled directly by the user through a SCPI or COM command. When the transaction is finished LAS is left set to the state it was programmed to until another command changes it. (Default for LAS is TTL High).

HW Details

This output pin is driven by a TTL latched buffer with a series 215-ohm resistor followed by 2.15k-ohm pull-up.

Timing

Strobe length, setup and hold times are all 1us minimum.

See the description for AD0-AD12 for more timing information.

Interrupt In (pin 13)

Description

Query this line with a SCPI or COM command.

HW Details

This line is a non-latched TTL input, has series 215-ohms followed by 4.64k-ohm pullup.

Timing

The Test Set must maintain at the desired TTL level until its read.

(pin 14) No Connect (previously +22V)

WARNING: Early versions of the PNA had +22v on this pin. **Connecting a printer to this port will usually damage the printer.**

Description

+22V, 100mA max. The 25-pin D connector is the same as a computer parallel printer port connector. Pin (14) corresponds to a printer's "autofeed" line. **Connecting a printer to this port will damage the printer if +22v is present** since printers requires less than 5V on all control lines.

HW Details

No connect

Timing

None

LDS (Low Data Strobe) (pin 24)

Description

This line has two behaviors that are command dependent. Refer to the External Test Set IO SCPI and COM commands for further details. (Default setting for LDS is TTL High)

In one behavior LDS is one of lines used by the PNA to provide appropriate timing for writing Address and Data to the Test Set. In this case LDS is controlled automatically by the PNA and is intended to be used as the strobe for the Data. When LDS is low, lines AD0 - AD12 represents Data. LDS will return to its normally high state when the transaction is finished.

In the second behavior the PNA will NOT provide appropriate timing. In this case LDS is controlled directly by the user through a SCPI or COM command. When the transaction is finished the LDS is left set to the state it was programmed to.

HW Details

This output pin is driven by a TTL latched buffer with a series 215-ohm resistor followed by 2.15k-ohm pull-up.

Timing

Strobe length, setup and hold times are all 1us minimum.

See the description for AD0-AD12 for more timing information.

RLW (pin 25)

Description

This line is the output for the Read Write signal. It has two behaviors that are command dependent. Refer to the External Test Set IO SCPI and COM commands for further details. (Default setting for RLW is TTL High)

In one behavior RWL is controlled automatically by the PNA during a Read Write operation. When RLW is low, lines AD0 - AD12 represent output Data. When RLW is high, the lines represent input Data.

In the second behavior the PNA does NOT provide the timing. The user must control it directly through the SCPI or COM command. In this case the line is left set to the state it was programmed to.

HW Details

This pin is a TTL latched output with a series 215-ohm resistor followed by 2.15k-ohm pull-up resistor.

Timing

Strobe length, setup and hold times are all 1us minimum.

See the description for AD0-AD12 for more timing information.

Material Handler I/O Connector

This rectangular 36-pin female connector provides communication signals between the PNA and a material parts handler. You can change the settings on the Material Handler IO connector using SCPI and COM commands. The settings are NOT accessible through the front-panel keys or display menu.

- **Overview - Controlling a Material Handler**
- **Pin Assignments**
- **Pin Descriptions**
- **Timing Diagrams**
- **Input Output Electrical Characteristics**

Note: On early PNAs this connector is labeled "GPIO". It is covered to indicate that the connector is not functional.

Overview - Controlling a Material Handler

The PNA is capable of interacting with an external material handler or part handler. This allows the PNA to be used in an automated test environment, where devices to be tested are inserted into a test fixture by a part handler, and sorted into pass/fail bins by the handler after testing is complete. By connecting the part handler to the PNA Auxiliary or Material Handler I/O ports, the PNA and part handler can synchronize their activities in a way that makes automated testing possible.

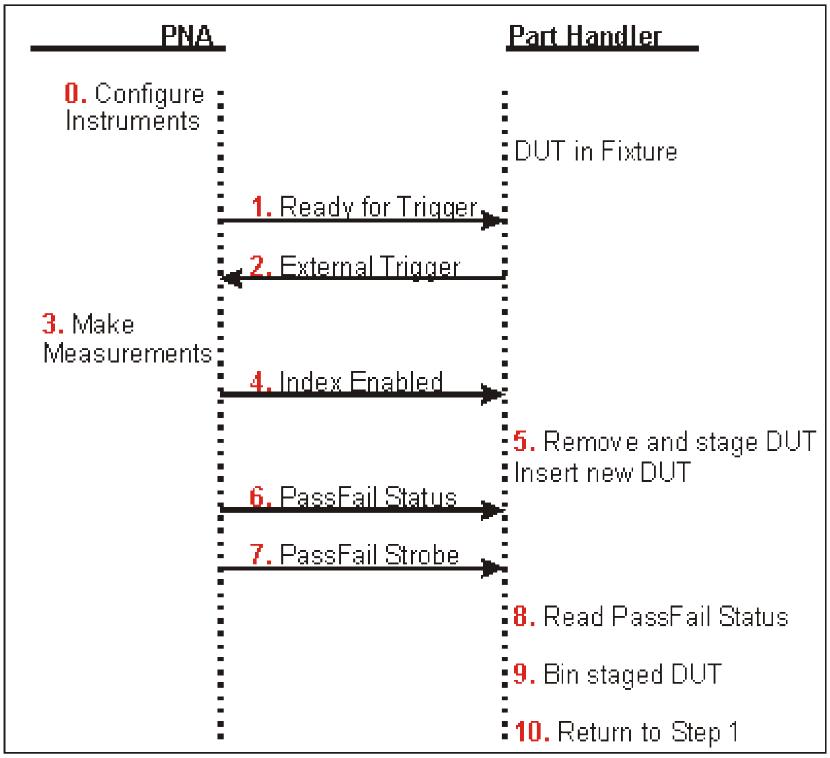
PNA and Part Handler Preparation

1. Define the measurements you want to make.
2. Define limits for each of the measurements.
3. Configure the PNAs Material Handler port so that it is compatible with your part handler. This usually involves setting the handler logic, pass/fail logic, pass/fail scope, and pass/fail mode. These settings are made remotely using SCPI or COM commands.
4. Use a cable to connect the PNA to your part handler.
5. Put the PNA in External Trigger mode.
6. Load parts in handler per manufacturer instructions.

Note: The Material Handler configuration settings REMAIN after an Instrument Preset and Hibernation. The settings will revert to their default settings ONLY after the PNA is restarted, or until they are changed by you. Material Handler settings are saved and recalled with Instrument State.

Flow Diagram

The following diagram and descriptions summarizes the events that occur during automated testing. 'DUT' refers to Device Under Test.

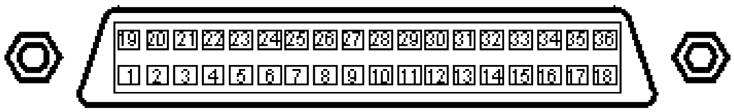


Text Descriptions

0. (Optional). The PNA sends values out the Material Handler and/or Auxiliary I/O connectors to configure external instruments. The A,B,C, and D ports of the Material Handler can be used to control devices used in testing, such as step attenuators, part handlers, or even the DUT itself. Also, the DAC1 and DAC2 lines on the Aux I/O connector can be used to provide bias voltages for devices and instruments. If you wish to use the Material Handler or Aux connectors for testing, you will need to write a program to send values out the various lines and ports, as there is no activity on these lines by default.
1. The part handler receives a Ready for Trigger signal from the PNA. This indicates that the PNA is properly configured and ready to take a measurement.
2. The part handler sends an External Trigger signal to the PNA. This signals that the part handler has settled, and allows the PNA to begin taking measurements.
3. The PNA takes measurements on all triggerable channels.
4. The Index line on the material handler goes to a Low state, which means that all required data has been collected by the PNA.
5. The part handler removes the DUT from the test fixture, and inserts a new DUT into the fixture. This operation is often referred to as part handler indexing. The device just tested is staged (removed from the fixture and prepared for binning), and the next part to be tested is put into the fixture. The removed DUT cannot be assigned to a Pass/Fail bin yet, as the Pass/Fail status is not available.
6. The PNA sends the Pass/Fail Status.
7. The PNA sends the Pass/Fail Strobe meaning that the Pass/Fail status has been determined.

8. The part handler reads the Pass/Fail Status line.
9. The part handler bins the staged part based on the Pass/Fail Status.
10. The test process repeats at step 1, waiting for Ready for Trigger from the PNA.

Material Handler IO Pin Assignments



There are three different Handler IO pin assignment configurations depending on the PNA model:

- **Type 1** - All E835xA, E880xA, N338xA models. You can change the pinout configuration to Type 2 on these models. This requires opening the instrument and changing a connector internally. Refer to the procedure in the Service Guide, Chapter 7. You can download the Service Guide for your PNA model from our website:http://na.tm.agilent.com/pna **Caution:** Changing this connection should be done by qualified service personnel.
- **Type 2** - E8362x, E8363x, E8364x and N5230A Opts 220, 225, 420, 425, 520, 525;
- **Type 3** - All N5242A (PNA-X) and N5230 Opts 020, 025, 120, 125, 140, 145, 146, 245, 240, 245, 246.

See PNA models and options.

Shaded/bold indicates changes from Type 1

Note: A slash (/) preceding the signal names indicates that the signal uses negative (active low) logic. A low pulse is a logical 1.

Pin	Type 1	Type 2	Type 3
1	Ground	Ground	Ground
2	/ INPUT1	/ INPUT1	/ INPUT1
3	/ OUTPUT1	/ OUTPUT1	/ OUTPUT1
4	/ OUTPUT2	/ OUTPUT2	/ OUTPUT2
5	/ Output port A0	/ Output port A0	/ Output port A0
6	/ Output port A1	/ Output port A1	/ Output port A1
7	/ Output port A2	/ Output port A2	/ Output port A2
8	/ Output port A3	/ Output port A3	/ Output port A3
9	/ Output port A4	/ Output port A4	/ Output port A4
10	/ Output port A5	/ Output port A5	/ Output port A5

11	/ Output port A6	/ Output port A6	/ Output port A6
12	/ Output port A7	/ Output port A7	/ Output port A7
13	/ Output port B0	/ Output port B0	/ Output port B0
14	/ Output port B1	/ Output port B1	/ Output port B1
15	/ Output port B2	/ Output port B2	/ Output port B2
16	/ Output port B3	/ Output port B3	/ Output port B3
17	/ Output port B4	/ Output port B4	/ Output port B4
18	no connect	**/ Output port B5**	**/ Ext. Trigger**
19	/ Output port B5	**/ Output port B6**	/ Output port B5
20	/ Output port B6	**/ Output port B7**	**/ Output port B6** -or **/ Index Signal** Learn more
21	/ Output port B7	**/ In/Out port C0**	**/ Output port B7** or **/ Ready for Trigger** Learn more
22	/ In/Out port C0	**/ In/Out port C1**	/ In/Out port C0
23	/ In/Out port C1	**/ In/Out port C2**	/ In/Out port C1
24	/ In/Out port C2	**/ In/Out port C3**	/ In/Out port C2
25	/ In/Out port C3	**/ In/Out port D0**	/ In/Out port C3
26	/ In/Out port D0	**/ In/Out port D1**	/ In/Out port D0
27	/ In/Out port D1	**/ In/Out port D2**	/ In/Out port D1
28	/ In/Out port D2	**/ In/Out port D3**	/ In/Out port D2
29	/ In/Out port D3	**Port C Status**	/ In/Out port D3
30	Port C Status	**Port D Status**	Port C Status
31	Port D Status	**/ Output Port Write Strobe**	Port D Status
32	/ Output Port Write Strobe	**no connect**	/ Output Port Write Strobe
33	/ Pass/Fail	/ Pass/Fail	/ Pass/Fail
34	/ Sweep End	**+5V**	/ Sweep End

35	+5V	**/ Sweep End**	+5V
36	/ Pass/Fail Write Strobe	/ Pass/Fail Write Strobe	/ Pass/Fail Write Strobe

Pin Descriptions

Input1

When this Input line receives a Low pulse from the material handler, data is latched on the OUTPUT1 and OUTPUT2 lines. See OUTPUT1|2 Data Output Write Timing

Note: Type 1 and Type 2 Behavior: The Input line responds to a High (rising edge) pulse.

The Input Line activity can be read:

SCPI	COM
CONTrol:HANDler:INPut?	get_Input1 Method

Output1, Output2

See OUTPUT1|2 Data Output Write Timing

The **current** state of these latched TTL outputs may be set High or Low (Default setting) using the (non-user) SCPI put_Output (COM) commands.

The **next** state (following a negative edge on the INPUT1 line) may be pre-loaded to High or Low (Default setting) using the user commands.

For example, on the next negative pulse on the INPUT1 line, you want the OUTPUT1 line to go from 0 to 1. To do this:

```
CONT:HAND:OUTP1:DATA 0   'Force the OUTPUT1 line to 0
CONT:HAND:OUTP1:USER 1   'Set the OUTPUT1:USER buffer to 1, indicating the next
state
```

	SCPI	COM
Write User Data	CONT:HAND:OUTP<pin>:USER	**put**_Output Method
Read last value written	CONT:HAND:OUTP<pin>:USER	get_Output Method.
Write non-user data	CONT:HAND:OUTP<pin>:DATA	**put**_Output Method
Read last value written	CONT:HAND:OUTP<pin>:DATA	get_Output Method

Output Ports A and B

These two general purpose, 8-bit output ports are used to write data to the material handler. When any line changes state, all output lines are latched to the I/O connector as the Output Write Strobe goes Low.

The default state for data is Low.

See Data Output Write Timing Diagram

Set Port Logic:

The logic for the data lines can be set to either: Positive (1 = High) or Negative (1 = Low). This setting affects all data ports. They cannot be set independently.

SCPI	COM
CONTrol:HANDler:LOGic	PortLogic Property

Combine to read or write data to Port F:

Ports A and B can be virtually combined to write data to one 16-bit I/O port **F.**

SCPI	COM
CONTrol:HANDler:F <num>	put Port (F)

Input/Output Ports C and D

These two general purpose 4-bit Input/Output ports are used to write data (Output) or read data (Input). These lines could be used to write to an external device such as a step attenuator.

When any line changes state, all output lines are latched to the I/O connector as the Output Write Strobe goes Low. See Data Output Write Timing

The four lines of Port C are connected internally to the Auxiliary IO connector.

Set Input | Output Mode:

Each port may be independently defined as Output or Input.

SCPI	COM
CONTrol:HANDler:C:MODE	PortMode Property
CONTrol:HANDler:D:MODE	

Set Port Logic:

The logic for the data lines can be set to either: Positive (1 = High) or Negative (1 = Low). This setting affects all data ports. They cannot be set independently.

SCPI	COM
CONTrol:HANDler:LOGic	PortLogic Property

Read or write data:

Ports C and D can be virtually combined to read or write data to one 8-bit I/O port **E.** When combined, **both** C and D ports must be set to either INPUT or OUTPUT mode.

SCPI	COM
CONTrol:HANDler:<port>[:DATa]>	get_Port(x) put Port (x)

Port C Status, Port D Status

These two output lines indicate the Read / Write mode of the C and D ports.

- A Low level indicates that the associated port is in **INPUT** mode (read only).
- A High level indicates that the associated port is in **OUTPUT** mode (write only).

These logic of these status outputs cannot be changed.

See Input/Output Ports C and D to learn how to set I/O Mode

See Data Output Write Timing

Output Port Write Strobe

This Output line goes Low to write data from Ports A and B and Ports C and D when a change is detected on any of the data lines.

These logic of this strobe output cannot be changed.

This line is shared with Auxiliary IO connector.

See Data Output Write Timing

External Trigger

When trigger source is set to external, this Input line accepts a trigger signal from the material handler. This usually means that a part is in place and ready to be tested.

See Trigger Timing Diagram

Index

A Low signal on this Output line indicates to the material handler that the measurement is complete. This usually means that the handler can connect the next device. However, measurement data is not available until data is calculated. See Trigger Timing Diagram.

Set Function:

This line also serves as a data line. Set the function using the following commands:

SCPI	COM
CONTrol:HANDler:INDex:STATe	IndexState

Ready for Trigger

When this output line goes low, it indicates to the material handler that the PNA is ready for a trigger signal.

See Trigger Timing Diagram

See Pass/Fail Timing Diagram

Set Function:

This line also serves as a data line. Set the function using the following commands:

SCPI	COM
CONTrol:HANDler:RTRigger:STATe	ReadyForTriggerState

Pass/Fail State

This Output line indicates to the handler whether the limit test has passed or failed.

Pass/Fail state is valid only when the limit test function is ON and while Pass/Fail strobe line is Low. See Pass/Fail Timing Diagram

This line is shared with the Auxiliary IO connector.

Set Pass / Fail Logic:

- Positive Logic: High=Pass, Low=Fail. (Default setting)
- Negative Logic: High=Fail, Low=Pass.

SCPI	COM
CONTrol:HANDler:PASSfail:LOGic	PassFailLogic Property

Set Default Conditions:

- **PASS**- the line stays in PASS state. When a device fails, then the line goes to fail after the Sweep End line is asserted.
- **FAIL**- the line stays in FAIL state. When a device passes, then the line goes to PASS state after the Sweep End line is asserted.
- **No Wait-** the line stays in PASS state. When a device fails, then the line goes to fail IMMEDIATELY. (Default setting)

SCPI	COM
CONTrol:HANDler:PASSfail:MODE	PassFailMode Property

Set Pass / Fail Scope:

- **Channel scope:** The line resets to the default state after the measurements on a channel have completed.
- **Global scope:** The line resets to the default state after the measurements on all triggerable channels have completed. (Default setting)

SCPI	COM
CONTrol:HANDler:PASSfail:SCOPe	PassFailScope Property

Pass/Fail Write Strobe

A Low pulse indicates that Pass/Fail line is valid and the Pass / Fail State is output to the material handler.

This line is shared with the Auxiliary IO connector.

The Pass/Fail Strobe is fixed in duration and timing. However, when the strobe occurs depends on the Pass/Fail Mode and Pass/Fail Scope (Channel or Global) settings. See Pass/Fail State

See Pass/Fail Timing Diagram

+5V

+5V nominal output (100mA max).

Protected by self-healing fuse.

Sweep End

This output line indicates the status of the PNA sweep. The sweep includes sweeping the source and taking data.

- **Low** (falling edge) indicates that the specified sweep event has finished. This does NOT indicate that all calculations have finished.
- **High** indicates that the specified sweep event is active.

See Trigger Timing Diagram

This line is shared with the Auxiliary IO connector.

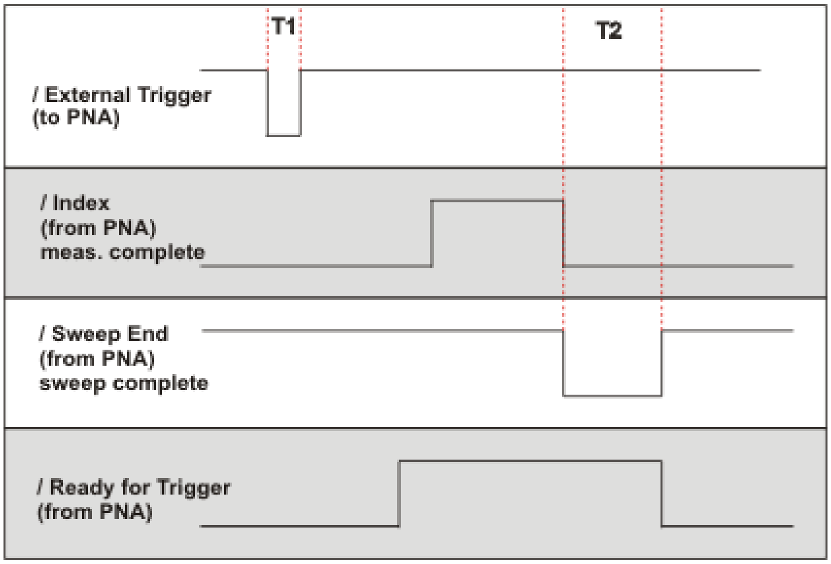
Set Sweep Event Mode:

- **Sweep**: indicates that a single source sweep has finished. (Default setting)
- **Channel**: indicates that a single channel has finished.
- **Global**: indicates that all enabled channels have finished.

SCPI	COM
CONTrol:HANDler:SWEepend	SweepEndMode Property

Timing Diagrams

Trigger Timing

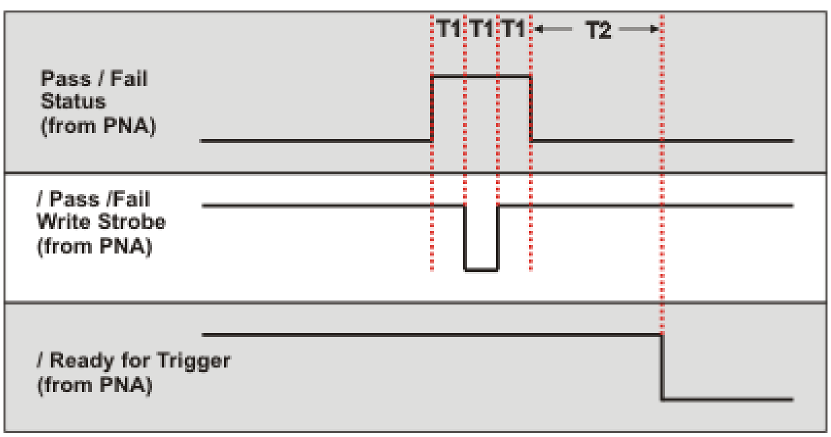


All signals are active low.

T1 = 1 ms External Trigger pulse width

T2 > 10ms Sweep End pulse width (both High and Low)

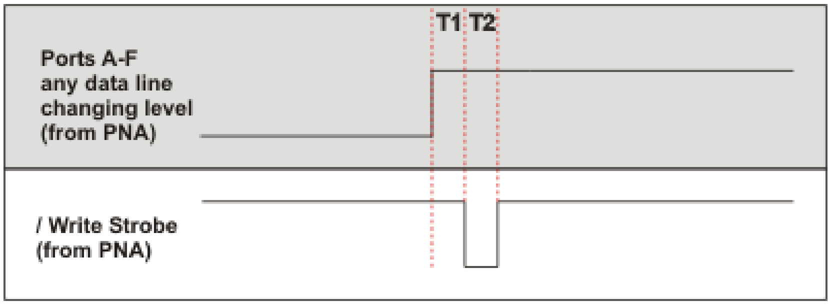
Pass / Fail Timing



T1 = 1 ms Pulse width and response time of Pass / Fail Strobe

T2 > 10 ms Ready for Trigger lag

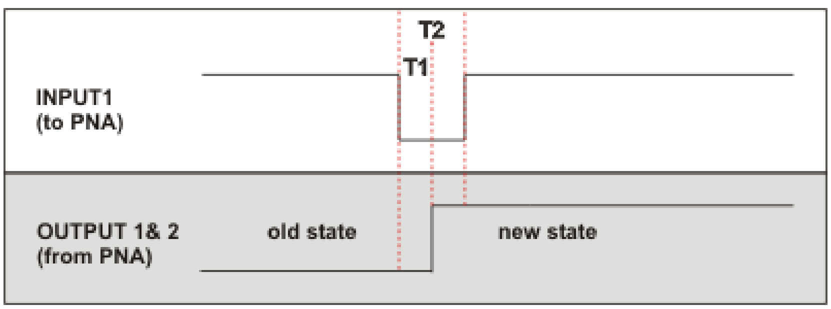
Ports A-F Data Output Write Timing



T1 = 1 ms Write Strobe response time

T2 = 1 ms Write Strobe pulse width

OUTPUT1|2 Data Output Write Timing



The old state to new state transition can be either low to high (as shown) or high to low.

T1 = .6 ms Output1|2 response time

T2 = 1 ms Input1 Strobe pulse width

Input / Output Electrical Characteristics

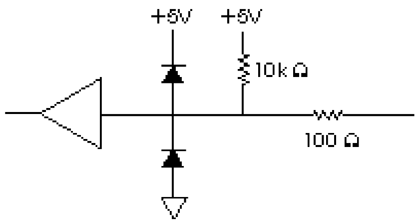
All Material Handler I/O Input and Output lines are TTL compatible.

Input and Input/Output lines

Lines carrying information IN (or bidirectional) to the PNA from the material handler.

Maximum Input Voltages:	-0.5 V to 5.5 V
TTL High level:	2.0 V to 5.0 V
TTL Low level:	0 V to 0.5 V

PNA **Input** and **Input/Output** Circuit Diagram



To Handler I/O Port

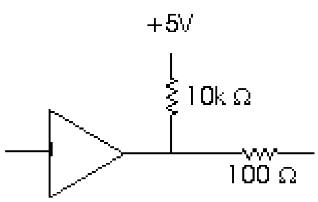
Note: The INPUT1 line does NOT have the 10K pullup resistor.

Output Lines

Lines carrying information OUT of the PNA to the material handler.

Maximum Output Current:		-10 mA to 10 mA
Output Current	TTL High level:	-5 mA
	TTL Low level:	3 mA
Output Voltage	TTL High level:	2.0 V to 3.3 V
	TTL Low level:	0 V to 0.8 V

PNA **Output** Circuit Diagram



To Handler I/O Port

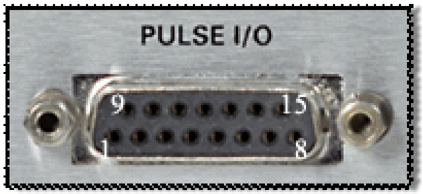
Last modified:

8-Feb-2008	Clarified Types
Nov 3, 2006	Added link from pin 20

Pulse I/O Connector

New with the PNA-X, the 15 pin D connector provides access to Pulse Modulators and Generators.

- See IF Path Configuration block diagram, which includes the Pulse Modulators and Generators.
- See the Pulsed Application (Opt H08)



Pin	Name	Description
1	IFGateAIn	IF pulse gate input A (TTL)
2	IFGateBIn	IF pulse gate input B (TTL)
3	IFGateCIn	IF pulse gate input C (TTL)
4	IFGateDIn	IF pulse gate input D (TTL)
5	IFGateRIn	IF pulse gate input R (TTL)
6	DCOM	Ground
7	PulseSyncIn	Pulse gen. synchronization trigger input (TTL)
8	RFPulseModIn	RF source pulse modulation drive input (TTL)
9	DCOM	Ground
10	Pulse1Out	Hardwired pulse train output #1 (TTL)
11	Pulse2Out	Hardwired pulse train output #2 (TTL)
12	Pulse3Out	Hardwired pulse train output #3 (TTL)
13	Pulse4Out	Hardwired pulse train output #4 (TTL)
14	N.C.	No connect -- for future use
15	DCOM	Ground

See Pulse SCPI and COM commands

N1966A Pulse I/O Adapter

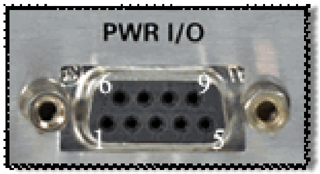
This D connector to RF adapter makes accessing the Pulse I/O connector more convenient.

Last Modified:

16-Jul-2007	Clarification
18-Jan-2007	MX New topic

Power I/O Connector

New on the PNA-X, the 9-pin D connector replaces much of the functionality of the AUX I/O connector on older PNA models. See PNA-X Rear Panel



Pin	Name	Description
1	+15V	+15V @ 400 mA
2	-15V	-15V @ 400 mA
3	AnalogOut1	Analog Output Voltage Programmable +/-10V @100 mA out Nominally 0 ohms 2.44mV typical resolution 1MHz BW Read and write voltage programmatically using: • CONT:AUX:OUTP1:VOLT (SCPI - read and write) • get OutputVoltage Method (COM - read) • put OutputVoltage Method (COM - write)
4	AnalogOut2	Analog Output Voltage Programmable +/-10V @100 mA out Nominally 0 ohms 2.44mV typical resolution 1MHz BW Read and write voltage programmatically using: • CONT:AUX:OUTP2:VOLT (SCPI - read and write) • get OutputVoltage Method (COM - read) • put OutputVoltage Method (COM - write)
5	ACOM	System ground
6	GndSense	Ground sense for Analog In & Out

		Connected with 51.1-ohm to ACOM Read voltage programmatically using: • get InputVoltageEX Method (COM) • CONT:AUX:OUTP3:VOLT (SCPI)
7	AnalogIn1	Analog input: +/-10V @ 1.22mV typical resolution Rin >1 M-ohm BW ~ 1 MHz ADC conversion time < 1 us typical Read voltage programmatically using: • CONT:AUX:INP1:VOLT (SCPI) • get InputVoltageEX Method (COM)
8	AnalogIn2	Analog input: +/-10V @ 1.22mV typical resolution Rin >1 M-ohm BW ~ 1 MHz ADC conversion time < 1 us typical Read voltage programmatically using: • CONT:AUX:INP2:VOLT (SCPI) • get InputVoltageEX Method (COM)
9	Power Button	Open collector input Active low replicates power button key press.

Last Modified:

10-Jul-2007	Added COM commands
18-Jan-2007	MX New topic

New Programming Commands

The following are new programming commands for **PNA release 8.0** See What's New

Gain Compression Setup		
Number of frequency points	SENS:GCS:SWE:FREQ:POIN	NumberOfFrequencyPoints
Number of power points	SENS:GCS:SWE:POW:POIN	NumberOfPowerPoints
Maximum number of points	None	MaximumNumberOfPoints
Total number of points	None	TotalNumberOfPoints
Acquisition mode	SENS:GCS:AMOD	AcquisitionMode
Smart tolerance	SENS:GCS:SMAR:TOL	SmartSweepTolerance
Smart Iterations	SENS:GCS:SMAR:MIT	SmartSweepMaximumIterations
Smart settling time	SENS:GCS:SMAR:STIM	SmartSweepSettlingTime
Smart show iterations	SENS:GCS:SMAR:SIT	SmartSweepShowIterations
Read compression failures	SENS:GCS:SFA?	SearchFailures
Write port map	SENS:GCS:PORTM	SetPortMap
Read Port Map (Input)	SENS:GCS:PORT	DeviceInputPort
Read Port Map (Output)	SENS:GCS:PORT	DeviceOutputPort
End of Sweep	SENS:GCS:EOS	EndOfSweepOperation
Linear input power	SENS:GCS:POW:LIN:INP:LEV	InputLinearPowerLevel
Reverse Power	SENS:GCS:POW:REV:LEV	ReverseLinearPowerLevel
Start power	SENS:GCS:POW:STAR:LEV	chan.Start Power
Stop power	SENS:GCS:POW:STOP:LEV	chan.Stop Power
Compression algorithm	SENS:GCS:COMP:ALG	CompressionAlgorithm
Compression Level	SENS:GCS:COMP:LEV	CompressionLevel
Backoff Level	SENS:GCS:COMP:BACK:LEV	CompressionBackoff

X Delta	SENS:GCS:COMP:DELT:X	CompressionDeltaX
Y Delta	SENS:GCS:COMP:DELT:Y	CompressionDeltaY
Interpolation	SENS:GCS:COMP:INT	CompressionInterpolation
Safe Sweep enable	SENS:GCS:SAFE:ENAB	SafeSweepEnable
Safe Sweep coarse	SENS:GCS:SAFE:CPAD	SafeSweepCoarsePowerAdjustment
Safe Sweep fine	SENS:GCS:SAFE:FPAD	SafeSweepFinePowerAdjustment
Safe Sweep threshold	SENS:GCS:SAFE:FTHR	SafeSweepFineThreshold
Read all GCA data	CALC:GCData:DATA	GetRaw2DData
Read real GCA data	CALC:GCData:REAL	GetDataIm
Read imaginary GCA data	CALC:GCData:IMAG	GetDataRe
Noise Figure Setup		
Create Noise figure meas	Calc:Cust:Def	CreateCustomMeasurementEx
Sets the number of impedance states to use	SENS:NOIS:IMP:COUN	ImpedanceStates
Noise averaging ON and OFF	SENS:NOIS:AVER:STAT	NoiseAverageState
Set averaging of noise receiver.	SENS:NOIS:AVER	NoiseAverageFactor
Set bandwidth of noise receiver.	SENS:NOIS:BWID	NoiseBandwidth
Set gain state of noise receiver.	SENS:NOIS:GAIN	NoiseGain
Sets noise tuner identifier	SENS:NOIS:TUN:ID	NoiseTuner
Sets the port identifier of the ECal noise tuner that is connected to the PNA Source.	SENS:NOIS:TUN:INP	NoiseTunerIn
Sets the port identifier of the ECal noise tuner that is connected to the DUT.	SENS:NOIS:TUN:OUTP	NoiseTunerOut

Set the excess noise source ON or OFF.	CONTrol:NOISe:SOURce **or** OUTPut:MANual:NOISe[:STATe]	NoiseSourceState
Set mechanical switches	SENS:PATH:CONF:ELEM	PathConfiguration
Sets the default setting for the Noise Tuner switch.	SYST:PREF:ITEM:SWIT:DEF	Port1NoiseTunerSwitchPresetsToExternal

Noise Figure Cal		
Create Noise Cal object	N/A	CreateCustomCalEx
Set Noise Calibration method	SENS:NOIS:CAL:METH	CalMethod
Noise source ENR filename	SENS:NOIS:ENR:FIL	ENRFile
Set noise source Cal Kit type	SENS:NOIS:SOUR:CKIT	NoiseSourceCalKitType
Set ambient temperature	SENS:NOIS:TEMP:AMB	AmbientTemperature
Sets noise source connector type	SENS:NOIS:SOUR:CONN	NoiseSourceConnectorType
Set Noise source temperature	SENS:CORR:TCOL:USER:VAL	NoiseSourceCold

Noise Figure ENR File Data Management		
Set ENR calibration data.	SENS:CORR:ENR:CAL:TABL:DATA	PutENRData
Read ENR calibration data.	SENS:CORR:ENR:CAL:TABL:DATA?	GetENRData
Get/set ID of ENR table.	SENS:CORR:ENR:CAL:TABL:ID:DATA	ENRID
Get/set serial number of noise source.	SENS:CORR:ENR:CAL:TABL:SERial:DATA	ENRSN
Load ENR table from file.	MMEMory:LOAD:ENR	LoadENRFile
Save ENR table to file.	MMEMory:STORe:ENR	SaveENRFile

Custom Cal Window		
Turn ON | OFF Custom Cal window.	SENS:CORR:COLL:DISP:WIND	DisplayNAWindowDuringCalAcquisition
Show NO Custom Cal windows.	SENS:CORR:COLL:DISP:WIND:AOFF	DisplayOnlyCalWindowDuringCalAcquisition
Specify channel to sweep before Cal acquisition.	SENS:CORR:COLL:SWE:CHAN	AllowChannelToSweepDuringCalAcquisition
Sweep NO channel before Cal acquisition.	SENS:CORR:COLL:SWE:CHAN:AOFF	SweepOnlyCalChannelDuringCalAcquisition
Preview sweep before remote Cal acquisition.	SENS:CORR:COLL:GUID:PACQuire	SetupMeasurementsForStep

Miscellaneous		
Set Trigger sweep mode	SENS:SWE:TRIG:MODE	Trigger Mode
Copy a Cal Set	SENSe:CORR:CSET:COPY	

The following are new programming commands for **PNA release 7.50** See What's New

USB Power Sensors		
Specifies the type of power sensor to be used	SYST:COMM:PSEN	Path
Specifies the location of the power sensor to be used.	SYST:COMM:PSEN	Locator
Returns the ID string of connected USB power meters / sensors.	SYST:COMM:USB:PMET:CAT?	USBPowerMeterCatalog

Miscellaneous		
Single trigger	SENS:SWE:MODE SINGle	
Reads ADC voltages from Power I/O connector		get InputVoltageEX Method
Copies an existing Source Power Calibration to another channel.	SYST:MACR:COPY:CHAN	ApplySourcePowerCorrectionTo
Returns an array of Cal Set names being stored on the PNA.		EnumerateCalSets

The following are new programming commands for **PNA release 7.22** See What's New

Description	**SCPI**	**COM**
Embedded LO		
Embedded LO ON | OFF	SENS:MIX:ELO:STAT	IsOn
Select tuning point	SENS:MIX:ELO:NORMalize:POINT	NormalizePoint
Set tuning mode	SENS:MIX:ELO:TUNing:MODE	TuningMode
Set broadband sweep span	SENS:MIX:ELO:TUNing:SPAN	BroadbandTuningSpan
Set precise tuning tolerance	SENS:MIX:ELO:TUNing:TOL	PreciseTuningTolerance
Set precise tuning iterations	SENS:MIX:ELO:TUNing:ITER	MaxPreciseTuningIterations
LO delta frequency	SENS:MIX:ELO:LO:DELTA	LOFrequencyDelta
Resets tuning parameters	SENS:MIX:ELO:TUNing:RESet	ResetTuningParameters
Reset LO Delta frequency	SENS:MIX:ELO:LO:RESET	ResetLOFrequency
Embedded LO Diagnostics		
Clear current diagnostic information	SENS:MIX:ELO:DIAG:CLEAr	Clear
Get result of the last tuning sweeps.	SENS:MIX:ELO:DIAG:STATus?	StatusAsString
Get number of tuning sweeps.	SENS:MIX:ELO:DIAG:SWE:COUNt?	NumberOfSweeps
Get a tuning sweep data	SENS:MIX:ELO:DIAG:SWE:DATA?	StepData

Was a marker was used for a tuning sweep?	SENS:MIX:ELO:DIAG:SWE:MARK:STATe?	IsMarkerOn
Get the marker X-axis position.	SENS:MIX:ELO:DIAG:SWE:MARK:POS?	MarkerPosition
Get the marker annotation.	SENS:MIX:ELO:DIAG:SWE:MARK:ANN?	MarkerAnnotation
Get the tuning sweep X axis annotation.	SENS:MIX:ELO:DIAG:SWE:X:ANN?	XAxisAnnotation
Get the tuning sweep Y axis annotation.	SENS:MIX:ELO:DIAG:SWE:Y:ANN?	YAxisAnnotation
Get the Start sweep value.	SENS:MIX:ELO:DIAG:SWE:X:STARt?	XAxisStart
Get the Stop sweep value.	SENS:MIX:ELO:DIAG:SWE:X:STOP?	XAxisStop
Returns the tuning sweep parameter name.	SENS:MIX:ELO:DIAG:SWE:PAR?	Parameter
Returns the tuning sweep title.	SENS:MIX:ELO:DIAG:SWE:TITL?	StepTitle
Returns the LO frequency delta from this tuning sweep	SENS:MIX:ELO:DIAG:SWE:LO:DELT?	LODeltaFound
Enhanced Response Cal		
Set guided Cal method	SENS:CORR:COLL:GUID:PATH:CMET	PathCalMethod
Set guided Thru method	SENS:CORR:COLL:GUID:PATH:TMET	PathThruMethod

The following are new programming commands for **PNA release 7.21** See What's New

Perform Isolation Cal		
Perform ECal Isolation	SENS:CORR:COLL:ISOL:ECAL	ECALIsolation
Increment Avg for ECal Isolation	SENS:CORR:COLL:ISOL:AVER:INCR	IsolationAveragingIncrement
Perform Guided (mech) Isolation	SENS:CORR:COLL:GUID:ISOL:PATHs	GetIsolationPaths Method SetIsolationPaths Method
Increment Avg for Guided Isolation	SENS:CORR:COLL:GUID:ISOL:AVER:INCR	IsolationAveragingIncrement Property

Miscellaneous Cal		
Preference to Save Cal to selected Cal Set	SENS:CORR:PREF:CSET:SAVE	RemoteCalStoragePreference
Perform a Reference Receiver cal as part of a Source Power cal.	SOUR:POW:CORR:COLL:SAVE RRECeiver	ApplyPowerCorrectionValuesEx

The following are new programming commands for **PNA release 7.20** See What's New

Description	SCPI	COM
RF and IF Path Configuration		
Catalog configuration names	SENS:PATH:CONF:CAT?	Configurations
Load a configuration	SENS:PATH:CONF:SEL	LoadConfiguration
Store a configuration	SENS:PATH:CONF:STOR	StoreConfiguration
Delete a configuration	SENS:PATH:CONF:DEL	DeleteConfiguration
Read the name of a configuration	SENS:PATH:CONF:NAME?	config.Name
Write descriptive text	SENS:PATH:CONF:DTEX	DescriptiveText
Catalog all elements	SENS:PATH:CONF:ELEM:CAT?	Elements
Catalog all settings	SENS:PATH:CONF:ELEM:VAL:CAT?	Values
Set element	SENS:PATH:CONF:ELEM	Element
Read name of current element	SENS:PATH:CONF:ELEM	element.Name
Set value for an element	SENS:PATH:CONF:ELEM	Value

IF / DSP Settings		
Sets ADC capture mode: auto or manual	SENS:IF:FILT:CMOD	ADCCaptureMode
Sets and returns method for specifying the way the IF Frequency is determined.	SENS:IF:FREQ:AUTO	IFFrequencyMode

Sets and returns the IF frequency.	SENS:IF:FREQ	IFFrequency
Returns errors with manual digital filter settings	SENS:IF:FILT:ERR?	FilterErrors
Sets digital filter mode.	SENS:IF:FILT:AUTO	FilterMode
Sets Stage1Coefficients	SENS:IF:FILT:STAGE<n>:COEF	Stage1Coefficients
Sets Stage1 NCO frequency	SENS:IF:FILT:STAGe1:FREQ	Stage1Frequency
Returns the maximum value of any single stage1coefficient.	SENS:IF:FILT:STAGE<n>:COEF	Stage1MaximumCoefficient
Returns the maximum number of Stage1 coefficients	SENS:IF:FILT:STAG<n>:COUNt?	Stage1MaximumCoefficientCount
Returns the minimum number of Stage1 coefficients	SENS:IF:FILT:STAG<n>:COUNt?	Stage1MinimumCoefficientCount
Sets Stage2Coefficients	SENS:IF:FILT:STAGE<n>:COEF	Stage2Coefficients
Returns the maximum value of any single stage2coefficient.	SENS:IF:FILT:STAGE<n>:COEF	Stage2MaximumCoefficient
Returns the maximum number of Stage2 coefficients	SENS:IF:FILT:STAG<n>:COUNt?	Stage2MaximumCoefficientCount
Returns the minimum number of Stage2 coefficients	SENS:IF:FILT:STAG<n>:COUNt?	Stage2MinimumCoefficientCount
Sets and returns stage3 filter type	SENS:IF:FILT:STAGe3:TYPE	Stage3FilterType
Returns the names of supported types of Stage3 filters.	SENS:IF:FILT:STAGe3:CAT?	Stage3FilterTypes
Sets and returns the parameter value of the current filter type.	SENS:IF:FILT:STAGe3:PAR	Stage3Parameter
Returns maximum parameter value for the current filter type.	SENS:IF:FILT:STAGe3:PAR	Stage3ParameterMaximum
Returns minimum parameter value for the current filter type.	SENS:IF:FILT:STAGe3:PAR	Stage3ParameterMinimum
Returns the names of parameters for the current filter type.	SENS:IF:FILT:STAGe3:PCAT?	Stage3Parameters

Pulse Generator Settings		
Turns the pulse output ON and OFF.	SENS:PULSe:STATe	State
Sets the pulse delay	SENS:PULS:DEL	Delay
Sets the pulse delay increment.	SENS:PULS:DINC	DelayIncrement
Sets the pulse-period (1/PRF) for ALL pulse generators.	SENS:PULS:PERiod	Period
Sets the pulse width	SENS:PULS:WIDT	Width

Auxiliary Triggering		
Returns the number of the AuxTrig connector pair being used.	Not Applicable	Number
Read number of aux connector pairs.	TRIGger:AUX:COUNt?	AuxiliaryTriggerCount
Turns ON / OFF the trigger output	TRIG:CHAN:AUX	Enable
Turns handshake ON / OFF.	TRIG:CHAN:AUX:HAND	HandshakeEnable
Specifies the polarity of the trigger IN signal.	TRIG:CHAN:AUX:IPOL	TriggerInPolarity
Specifies the polarity of the trigger OUTPUT signal.	TRIG:CHAN:AUX:OPOL	TriggerOutPolarity
Specifies the type of aux Input trigger:Edge or Level.	TRIG:CHAN:AUX:TYPE	TriggerInType
Specifies the pulse width of the Output signal	TRIG:CHAN:AUX:DUR	TriggerOutDuration
Specifies how often a trigger output signal is sent:Point or Sweep.	TRIG:CHAN:AUX:INT	TriggerOutInterval
Specifies whether the aux trigger out signal is sent BEFore or AFTer the acquisition.	TRIG:CHAN:AUX:POS	TriggerOutPosition

Sets the External Trigger OUT behavior to have either Global or Channel scope.	TRIG:PREF:AIGL	AuxTriggerScopeIsGlobal
Preferences		
Offset for Receiver Attenuator	SYST:ITEM:OFFS:RCV	OffsetReceiverAttenuator
Offset for Source Attenuator	SYST:ITEM:OFFS:SRC	OffsetSourceAttenuator
Report source unleveled events as errors?	SYST:ERR:REP:SUNL	EnableSourceUnleveledEvents
ALC Leveling		
Returns list of valid ALC Leveling Modes	SOUR:POW:ALC:MODE:CAT?	GetSupportedALCModes
Set ALC Mode	SOUR:POW:ALC:MODE	ALCLevelingMode
Specifying Source Ports		
Returns the number of source ports.	None	SourcePortCount
Returns the string names of source ports.	SOURce:CAT?	SourcePortNames
Returns the source port number of the specified string port name.	None	GetPortNumber

Miscellaneous		
Touchscreen ON|Off	SYST:TOUChscreen	app.Touchscreen
Launches dialogs	None	app.LaunchDialog
Returns error term data **(new behavior**).	N/A	Get ErrorTermByString
Turns Trace Title ON and OFF	DISP:WIND:TRAC:TITL:STATe	TraceTitleState
Writes and reads trace title.	DISP:WIND:TRAC:TITL:DATA	TraceTitle
Makes PNA app visible or not	DISP:VISible	Visible
Read voltages on the Power I/O connector.	CONT:AUX:INP:VOLT?	None
Outputs voltages on the Power I/O connector.	CONT:AUX:OUTP:VOLT	None
Segment sweep time		Sweep Time

The following are new programming commands for **PNA release 7.1** See What's New

Description	SCPI	COM
Frequency Offset Commands		
Freq Offset ON/Off	SENS:FOM	FOM.State
Read available ranges	SENS:FOM:CAT?	
Read number of ranges	SENS:FOM:COUN?	RangeCount
X-Axis display range	SENS:FOM:DISP:SEL	DisplayRange
Read range name	SENS:FOM:RANG:NAME?	Name FOMRange
Read range number	SENS:FOM:RNUM?	rangeNumber
Set range coupling	SENS:FOM:RANG:COUP	Coupled
Set sweep type	SENS:FOM:RANG:SWE:TYPE	SweepType
Set CW freq	SENS:FOM:RANG:FREQ:CW	CWFrequency

Set start freq	SENS:FOM:RANG:FREQ:STAR	StartFrequency
Set stop freq	SENS:FOM:RANG:FREQ:STOP	StopFrequency
Set offset value	SENS:FOM:RANG:FREQ:OFFS	Offset
Set divisor value	SENS:FOM:RANG:FREQ:DIV	Divisor
Set multiplier value	SENS:FOM:RANG:FREQ:MULT	Multiplier
Freq. Offset Segment Sweep		
ON|OFF	SENS:FOM:RANG:SEGM	State
Add a segment	SENS:FOM:RANG:SEGM:ADD	FOM.Add
Delete a segment	SENS:FOM:RANG:SEGM:DEL	Remove
Count the segments	SENS:FOM:RANG:SEGM: COUNT?	Count
Center Frequency	SENS:FOM:RANG:SEGM:FREQ:CENT	CenterFrequency
Frequency Span	SENS:FOM:RANG:SEGM:FREQ:SPAN	FrequencySpan
Start Frequency	SENS:FOM:RANG:SEGM:FREQ:STAR	StartFrequency
Stop Frequency	SENS:FOM:RANG:SEGM:FREQ:STOP	Stop Frequency
Number of Points	SENS:FOM:RANG:SEGM:SWE:POIN	Number of Points
IF Bandwidth value	SENS:FOM:RANG:SEGM:BWID	IF Bandwidth
IF Bandwidth control	SENS:FOM:RANG:SEGM:BWID:CONT	IF BandwidthOption
Source Power value	SENS:FOM:RANG:SEGM:POW	Test Port Power
Source Power control	SENS:FOM:RANG:SEGM:POW:CONT	Source Power Option
Sweep time value	SENS:FOM:RANG:SEGM:SWE:TIME	Sweep Time
Sweep time control	SENS:FOM:RANG:SEGM:SWE:TIME:CONT	TimeOption
Miscellaneous		
Source Power (Auto | ON | OFF)	SOUR:POWer:MODE	SourcePortMode

The following are new programming commands for **PNA release 6.2.** See What's New

Description	SCPI	COM
Multiport		
Perform Multiport restart	SYST:CONFigure	app.Configure
Returns list of supported testsets		tsets.TestsetCatalog
Returns the testset model		ts.Type
Sets and returns the logical port value		ts.SelectPort
Sets and returns a port mapping for a single port.	SENS:MULT:PORT:SEL	
Sets and returns the display label	SENS:MULT:LAB	
Create new parameter	CALC:PAR:DEF:EXT	
Change parameter	CALC:PAR:MOD:EXT	
Read the Test Set model for a Cal Set.	SENS:CORR:CSET:TSet:ALLPorts?	calset.OutputPorts
Read the Port Mapping for a Cal Set	SENS:CORR:CSET:TSET:TYPE?	calset.TestSetType
Macros		
Specify Path and filename	SYSTem:SHORtcut:PATH	
Specify Arguments	SYSTem:SHORtcut:ARGuments	
Specify Title	SYSTem:SHORtcut:TITLe	
Run a macro	SYSTem:SHORtcut:EXECute	
Remove a macro	SYSTem:SHORtcut:DELete	
Set Mixer Fixed Input and Output		
Set input to fixed or swept	SENS:MIX:INP:FREQ:MODE	mxr.InputRangeMode
Set output to fixed or swept	SENS:MIX:OUT:FREQ:MODE	mxr.OutPutRangeMode
Set input fixed frequency		mxr.InputFixedFrequency
Receiver-only source power cal		
Select and Acquire receiver-only readings	SOUR:POW:CORR:COLL:ACQ:REC	AcquirePowerReadingsEx Method

sNp Data		
Reads SnP data for the specified ports.	CALC:DATA:SNP:PORTs?	GetSnpDataWithSpecifiedPorts
Saves SnP data for the specified ports.	CALC:DATA:SNP:PORTs:Save	WriteSnpFileWithSpecifiedPorts

The following are new programming commands for **PNA release 6.04**

Description	SCPI	COM
Equation Editor		
Turn equation ON and OFF	CALC:EQUation:STATe	
Set equation	CALC:EQUation:TEXT	
Returns validity of the equation	CALC:EQUation:VALid?	
Specify THRU adapter and delay for Unknown Thru and Adapter Removal		
Specifies the use of a THRU adapter.	SENS:CORR:COLL:GUID:ADAP:CREate?	
Returns the number of THRU adapters that have been created.	SENS:CORR:COLL:GUID:ADAP:COUNt?	
Specifies the adapter delay.	SENS:CORR:COLL:GUID:ADAP:DELay	
Specifies the adapter description	SENS:CORR:COLL:GUID:ADAP:DESC	
Specifies the port pairs for the THRU connection.	SENS:CORR:COLL:GUID:ADAP:PATHs	
Macros		
Specify Path and filename	SYSTem:SHORtcut:PATH	
Specify Arguments	SYSTem:SHORtcut:ARGuments	
Specify Title	SYSTem:SHORtcut:TITLe	
Run a macro	SYSTem:SHORtcut:EXECute	
Remove a macro	SYSTem:SHORtcut:DELete	
Miscellaneous		

At the end of a power sweep, specifies whether to maintain source power at the start or stop power level.	SYST:PREF:ITEM:PSRT	PowerSweepRetracePowerMode
For single-band frequency or segment sweeps ONLY, specify whether to turn RF power ON or OFF during a retrace	SYST:PREF:ITEM:RETR:POW	PowerOnDuringRetraceMode
Various print options	Hardcopy commands	

New SCPI Programming Examples:

- Unguided Cal on Multiple Channels
- Triggering the PNA

Last modified:

March 10, 2008	MX Updated for 7.2
SeptMarch 10, 20086	MQ Updated for 7.1

COM versus SCPI

There are two methods you can use to remotely control the PNA: COM and SCPI. The following topics can help you choose the method that best meets your needs:

- Software Connection
- Physical Connection
- Selecting a Method
- Programming Languages

Other Topics about COM Concepts

Software Connection

COM uses a binary protocol, allowing you to directly invoke a PNA feature. This is more efficient than SCPI. For example, the following statement calls directly into the PNA, executing the routine GetIDString.

```
PNA.GetIDString()
```

SCPI is a text based instrument language. To retrieve the ID string, you would send the following text string to the PNA:

```
IbWrite( "*IDN?")
```

The PNA SCPI parser would first decode this text string to determine that the user has asked for the PNA to identify itself. Then the parser would call GetIDString().

The Physical Connection

Internal Control

With either COM or SCPI, the best throughput is attained by using the PNA's internal PC to execute your test code. However, if your test code uses too much system resources (CPU cycles and/or memory), this will slow the PNA's performance.

Using the SICL I/O Libraries, you can also connect to the PNA from a program running on the PNA.

External Control

You can control the PNA from a remote PC using either COM or SCPI.

COM - (Component Object Model) can be used to access any program like the PNA (835x.exe) or library (.dll) that exposes its features using a COM compliant object model. These programs or libraries are called "servers". Programs (like your remote program on your PC) that connect to and use the features of these servers are called "clients."

With COM, the server and the client do not need to reside on the same machine. DCOM, or distributed COM, is easy to configure and makes the location of the server transparent to the client. When you access the PNA from a remote computer, you are using DCOM. In this case, the mechanical transport is a LAN (local area network).

SCPI - Using a GPIB interface card in a remote computer, you can connect to the instrument using a GPIB cable. There are some constraints on the length of this cable and the number of instruments that can be daisy-chained together.

Using the Agilent SICL I/O libraries, you can connect to the instrument over a LAN connection.

(LAN or INTERNAL) You can send SCPI commands using COM with the ScpiStringParser object.

Selecting a Method

You should almost always choose COM for the following reasons:

- COM executes faster most of the time.
- COM is generally easier to use. The latest development tools embrace COM and know how to make your life easier with integrated development environments that show automation syntax as you type.
- As time goes on, more emphasis will be put on COM as the preferred programming paradigm.

But choosing a connection method depends on your situation. Here are some additional things to consider:

1. If you want to use the PNA to control other GPIB instruments, you may want to use COM as the means of talking to the PNA. In GPIB, the PNA can not be configured as both **System Controller** and **talker/listener**. Because the PNA does not support pass control mode, only one mode can be used at a time.
2. If you have legacy code written in SCPI for another network analyzer, you may be able to leverage that code to control the PNA. However, the PNA uses a different platform than previous Agilent Network Analyzers. Therefore, not all commands have a direct replacement. See the PNA Code Translator Application.

Programming Languages

You can program the PNA with either COM or SCPI using several languages. The most common include:

Agilent VEE - With this language you can send text based SCPI commands and also use automation. VEE 6.0 or later is recommended.

Visual Basic - This language has great support for automation objects and can be used to drive SCPI commands. The use of VISA drivers for your GPIB hardware interface will make the task of sending SCPI commands easier.

C++ - This language can do it all. It is not as easy to use as the above two, but more flexible.

Remotely Specifying a Source Port

In the 'not-to-distant past', it was a simple task to specify a PNA source port. It was either port 1 or port 2. Now, the following reasons, it is not so simple:

- **Internal 2nd sources** are now offered on various PNA models. However, some source ports do not have an obvious port number. One example is the second source on the PNA-X 2-port model (option 224). Learn more about Internal Second Sources.
- **External sources** can now be controlled by the PNA as though they are internal sources. External sources do not have a source port number, but use String names as identifiers.
    - **For FCA ONLY**: Once configured using the Configuration dialog, an external source can be selected remotely and controlled by the PNA by specifying the LOName using SCPI or COM.
    - **All other uses for External sources:** The external source must be configured and selected manually. You can then save an Instrument State file, then recall that state file remotely to effectively select an external source.
- **Multiport test sets**…choose between ports 1 through port N, where N is the number of ports on the test set. You still use a port number, but what port number to use may not be easy to recognize because of port mapping. Learn more about Multiport test sets.

Source Port String Names

The PNA User Interface (UI) makes it easy to configure and select the sources and ports. Remotely however, string names are used now, in addition to port numbers, to specify a Source port.

COM - The existing COM commands which specify source ports as numbers, are still used. However, it may be necessary to learn the string name for the source port to be used, then learn the port number using the following commands. Port numbers are assigned dynamically depending on whether external sources are selected.

- SourcePortNames Property
- GetPortNumber Method
- SourcePortCount Property.

SCPI - ALL of the existing SCPI commands that specify a source port are extended to also allow the source port to be specified using string names. The following new command was created to list the available source port string names: Source:Cat?

Last Modified:

5-Nov-2007   MX New topic

Connecting the PNA to a PC

This document describes how to temporarily connect a PC to a PNA using a LAN cable. This is not necessary if your PNA is already connected to a network. This type of connection is for conveniently transferring large files, such as firmware, that may have already been downloaded and stored on the PC.

The PC can have any version of Windows (Windows 95 or newer.)

You will need the following:

- RJ-45 LAN crossover cable (or two normal cables with a suitable hub).
- Must be logged on the PNA with an Administrator User name and password.

Note: If your PC is on a domain, do not leave that domain by changing to a workgroup. This may prevent you from later rejoining your domain unless you involve your IT systems administrator. The following procedure will work regardless of whether or not you are on a domain and will not change any domain settings on the PC.

Procedure for All Operating Systems

1. Disconnect the PC from any existing LAN and connect it to the PNA using a crossover cable or hub. There is no need to turn it off to do this.
2. Find the current IP address of your PC. Open a DOS prompt (command window) and type **ipconfig**. This should then show your current IP address. Note this number. For this example, we will assume a PC IP address of 10.0.0.100. If it shows 0.0.0.0, you will have to assign an IP address. See procedure below.
3. On the PNA, click **File**, then **Exit** to close the PNA application.
4. Right-click on **My Network Places** and select **Properties**.
5. Right-click on **Local Area Connection** and select **Properties**.
6. Select **Internet Protocol (TCP/IP)** then click **Properties**.
7. Click **Use the following IP address** then enter an IP address that is ONE more or ONE less than that noted for the PC. Do not use a number that ends in 000. For this example, one could use either 10.0.0.101 or 10.0.0.99. We'll assume the use of 101.
8. For **Subnet mask**, enter 255.255.255.0. Click **OK**, then **OK** again

For Windows 95/98 systems, go to Win95/98 step 9 below.

9. On the PC, open Windows Explorer. Click **Tools**, then **Map Network Drive**. Note the drive letter shown (for this example we'll assume it is "X".)
10. In **Folder** or **Path** type the IP address that was just entered for the PNA followed by C$ in the following format:\\10.0.0.101\C$
11. In **Connect As** dialog, enter the PNA User name and Password. Unless it has been changed, this is either Administrator with NO password or PNA-Admin, Password Agilent. Click **OK**.

12. In Windows Explorer on the PC, you should now see a new drive letter entry (X) with the description of C$ on 10.0.0.101. The entire contents of the PNA C drive will now be available for reading or writing. Files can now be transferred by simply dragging them from one location to the other.

13. When you are done transferring files, disconnect the LAN cable connection between the two and reconnect your PC to the network if needed. If the PNA will never be connected to any network, the current network settings could remain. However it may be safer to reset the TCP/IP settings (changed in step 7) back to **Obtain an IP address automatically**.

If your PC currently has no IP address assigned

Follow steps 4 through 8 to add an IP address for the PC. The actual steps may vary slightly depending upon your operating system (NT4 uses Network Neighborhood and you must click on Protocols.) Assign the PC an IP address of 10.0.0.100. The last digits can be anything between 1 and 255, but do not alter the first 3 numbers (10.0.0.) When complete, reset the PC network configuration back to its previous settings.

Win95/98 Procedure for Accessing/Transferring Files

Because Windows 95/98 does not have the security features of NT-based operating systems (NT, Win2k, XP), the PC cannot access the drive on the PNA. To get around this limitation, any files that need to be transferred to/from the PC must be placed in a shared folder. The PNA can then read or write within this folder. This procedure will work for all versions of Windows.

Steps 1 through 8 are identical to the above and must be performed first.

9. On the PC, open Windows Explorer. Create a directory under the C drive named **Shared**. Right click the Shared folder name and select **Sharing**. Share the directory with full read/write permissions. If Sharing does not appear as a choice, then file sharing is not enabled. To enable file sharing,

    1. Right click **Network Neighborhood**, then click **Properties**.
    2. Click **File and Print Sharing** and enable **give others access to my files**
    3. Click **OK**, then **OK** again.
    4. Repeat the beginning of this step.

10. Copy the files to be transferred to the PNA to this shared folder.

11. On the PNA, open Windows Explorer. Click on Tools, Map Network Drive. Note the drive letter shown (for this example we?ll assume it is "X".) Uncheck "Reconnect at Logon" if it is currently checked.

9. Under the Folder entry, enter the IP address of the PC and the shared folder name in the following format: \\10.0.0.100\Shared

10. The PNA should immediately connect to this folder and display its contents as drive "X". Files can now be read from, or written to, this shared directory (shown as Drive X.) Files can be transferred by simply dragging them from one location to the other.

11. When you are done transferring files, disconnect the LAN cable connection between the two and reconnect your PC to the network if needed. If the PNA will never be connected to any network, its current network settings could remain, however it is probably safer to reset the TCP/IP settings (changed in step 7) back to

Obtain an IP address automatically.

Easy versus Secure Configuration

When upgrading Firmware on the PNA, you encounter a **Choose Configuration** dialog box. This is used to determine the level of security set for the DCOM interface on the PNA. For more detailed information on the security settings for the DCOM interface, including a procedure for making these settings manually, see Configure for COM-DCOM Programming.

Comparison of the "Easy and More Secure" settings are as follows:

Easy Connection:

- No configuration of the PNA required for remote access to connect.
- Anyone on the local subnet can access the PNA remotely.
- People from other NT domains can connect to the PNA.

More Secure:

- Requires creating users on the PNA or adding the PNA to a domain
- An administrator of the PNA can specify users or groups that are allowed remote access to the PNA application

Changing Network Client

If your PC network uses Novell NetWare servers, a change must be made to the PNA setup before it can operate on your network. If you are unsure, ask your local IT department.

Note: Do NOT **Uninstall** "Client for Microsoft Networks". This will prevent proper operation of the PNA..

To remove "Client for Microsoft Networks" (Remove is different from Uninstall):

1. From the PNA Desktop, right-click **My Network Places**
2. Click **Properties**
3. Right-click **Local Area Connection**
4. Click **Properties**
5. Click (remove the check from) **Client for Microsoft Networks**

To install "Client Service for NetWare".

1. Click **Install**
2. In **Select Network Component Type**, make sure **Client** is selected
3. Click **Add**
4. In **Select Network Client**, make sure **Client Service for NetWare** is selected
5. Click **OK**.

Troubleshooting the PNA

By running a few checks, you can identify if the analyzer is at fault. Before calling Agilent Technologies or returning the instrument for service, please make the following checks.

- **Check the Basics**
- **PNA Application Terminates Unexpectedly**
- **Check Error Terms**
- **Check the Service Guide**

Other Support Topics

Check the Basics

A problem can often be solved by repeating the procedure you were following when the problem occurred. Before calling Agilent Technologies or returning the instrument for service, please make the following checks:

Note: Problems with the PNA application (slow or terminates unexpectedly) can be caused by a faulty Hard Disk Drive (HDD). For more information, see Preventing PNA Hard Drive Problems and The PNA HDD Recovery Process.

1. Is there power at the power socket? Is the instrument plugged in?
2. Is the instrument turned on? Check to see if the front panel line switch and at least one of the LED rings around the test ports glows green. This indicates the power supply is on.
3. If you are experiencing difficulty with the front-panel keypad or peripherals, the USB bus may be overloaded. Remove the USB devices, restart the PNA, and reconnect the USB devices. See Power-up.
4. If other equipment, cables, and connectors are being used with the instrument, make sure they are connected properly and operating correctly.
5. Review the procedure for the measurement being performed when the problem appeared. Are all the settings correct?
6. If the instrument is not functioning as expected, return the unit to a known state by pressing the **Preset** key.
7. Is the measurement being performed, and the results that are expected, within the specifications and capabilities of the instrument?
8. If the problem is thought to be due to firmware, check to see if the instrument has the latest firmware before starting the troubleshooting procedure.
9. Check that the measurement calibration is valid. See Accurate Measurement Calibrations for more information.
10. If the necessary test equipment is available, perform the operator's check and system verification in Chapter

2 of the PNA Service Guide, "System Tests, Verifications, and Adjustments," . You can download a copy of the Service Guide from our Web site: http://www.agilent.com.

11. **Phase lock lost message** - This usually occurs when there is not enough source power to phase lock the PNA. It can occur during an errant FCA setup or Source Power Calibration. It can also occur if one of the front panel reference channel loops is not connected. Otherwise, this indicates a hardware problem.

PNA Application Terminates Unexpectedly

If an unexpected and irrecoverable error occurs, Agilent would like to know about it. The PNA attempts to save pertinent information about the state of the system. **The PNA does NOT send this information to Agilent**.

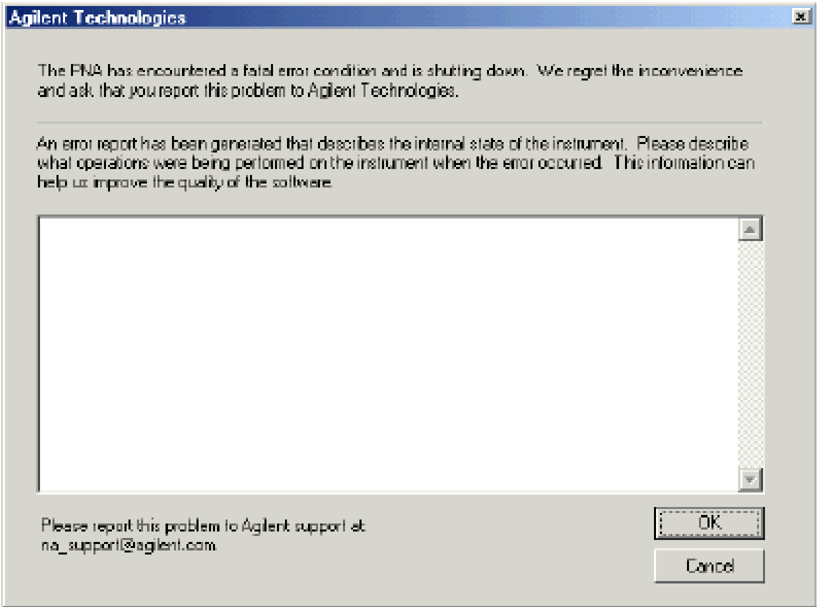
We respect the privacy of our customers. However, access to information that helps us improve the PNA is a benefit to both Agilent and you. Please take the time to contact us or email the saved information to **na_support@agilent.com.**

The following procedure shows how to do this:

1. A message box immediately appears on the screen containing the location of a directory. Please record this message. If you miss the message, you can find the directory location using the Windows Event Log: On the PNA, click Start, Settings, Control Panel, Administrative Tools, Event Viewer. Double-click the top line (most recent event). The location of the directory is seen in the Description.
2. A dialog box may appear on the screen (shown below) allowing you to add comments to help us replicate the crash.
3. Find the directory (described in Step 1) which contains the following files:

- 835x.dmp which is the 835x.exe capturing the context in which the program crashed.
- 835x.xml which reports some very basic information (exception code, OS version, and the list of modules loaded at the time of the crash and their respective version numbers).
- 835xCrashLog.txt: The text file with your comments (described in Step 2), if submitted.

4. If your PNA is not connected to LAN or is not configured to send email, copy the files to a PC. Then, please email the files to na_support@agilent.com



Check Error Terms

If you print the error terms at set intervals (weekly, monthly, and so forth), you can compare current error terms to these records. A stable, repeatable system should generate repeatable error terms over long time intervals, for example, six months. If a subtle failure or mild performance problem is suspected, the magnitude of the error terms should be compared against values generated previously with the same instrument and calibration kit. See the procedure for monitoring error terms.

- A long-term trend often reflects drift, connector and cable wear, or gradual degradation, indicating the need for further investigation and preventative maintenance. Yet, the system may still conform to specifications. The cure is often as simple as cleaning and gaging connectors or inspecting cables.
- A sudden shift in error terms reflects a sudden shift in systematic errors, and may indicate the need for further troubleshooting.

Consider the following while troubleshooting:

- All parts of the system, including cables and calibration devices, can contribute to systematic errors and impact the error terms.
- Connectors must be clean and gauged, and within specification for error term analysis to be meaningful. See the Chapter 2 in the PNA Service Guide for information on cleaning and gaging connectors.
    - Avoid unnecessary bending and flexing of the cables following measurement calibration, thus minimizing cable instability errors.
    - Use good connection techniques during the measurement calibration. The connector interface must be repeatable. See the PNA Service Guide for information on connection techniques.
- It is often worthwhile to perform the procedure twice (using two distinct measurement calibrations) to establish the degree of repeatability. If the results do not seem repeatable, check all connectors and cables.

- Use error-term analysis to troubleshoot minor, subtle performance problems. See Chapter 3, "Troubleshooting," in the PNA Service Guide if a blatant failure or gross measurement error is evident.

Check the Service Guide

Check the PNA Service Guide for specific troubleshooting procedures to help identify problems. You can download a copy of the Service Guide from our Web site: http://www.agilent.com.

Last modified:

10/16/06	Added phase lock lost

PNA Error Messages

Note: The **EventID**'s listed below are provided for COM programming. For more information, see Working with PNA Events

For more information on PNA error messages (see Error Messages).

Cal Errors

Message: 512

"A secondary parameter (power, IFBW, sweeptime, step mode) of the calibrated state has changed."

Severity: Informational

Further explanation: The calibration is questionable when any of these secondary parameters change after the calibration is performed.

Suggestions: If you require an accurate measurement with the new settings, repeat the calibration.

EventID: 68020200 (hex)

Message: 513

"Calibration cannot be completed until you have measured all the necessary standards for your selected Cal Type."

Severity: Informational

Further explanation: You probably received this message because you attempted to turn correction on without first measuring all of the calibration standards

Suggestions: Finish measuring the cal standards

EventID: 68020201 (hex)

Message: 514

"Calibration set has been recalled using a file previously saved on an analyzer that had a different hardware configuration."

Severity: Informational

Further explanation:

Suggestions:

EventID: 68020202 (hex)

Message: 515

"Calibration is required before correction can be turned on. Channel number is <x>, Measurement is <x>."

Severity: Informational

Further explanation: There are no error correction terms to apply for the specified channel and measurement.

Suggestions:Perform or recall a calibration

EventID: 68020203 (hex)

Message: 516

"Critical parameters in your current instrument state do not match the parameters for the calibration set, therefore correction has been turned off. The critical instrument state parameters are sweep type, start frequency, frequency span, and number of points."

Severity: Informational

Further explanation: None

Suggestions: You can either recalibrate using the new settings or change back to the original setting that was used when the calibration was performed.

EventID: 68020204 (hex)

Message: 517

"Interpolation is turned off and you have changed the stimulus settings of the original calibration, so correction has been turned off."

Severity: Informational

Further explanation: The most accurate calibration is maintained only when the original stimulus settings are used.

Suggestions: If reduced accuracy is OK, set interpolation ON to allow stimulus setting changes.

EventID: 68020205 (hex)

Message: 518

"Interpolation is turned off and you have selected correction ON. Correction has been restored with the previous stimulus settings."

Severity: Informational

Further explanation: None

Suggestions: None

EventID: 68020206 (hex)

Message: 519

"Stimulus settings for your current instrument state exceeded the parameters of the original calibration, so correction has been turned off."

Severity: Informational

Further explanation: Correction data outside the stimulus settings does not exist.

Suggestions: Perform a broadband calibration, with increased numbers of points with interpolation ON, to maintain calibration over the widest possible stimulus frequency settings.

EventID: 68020207(hex)

Message: 520

"Cal Type is set to NONE for Channel <x>, Measurement <x>; please select Calibration menu or press Cal hard key."

Severity: Informational

Further explanation: A cal operation can not proceed until a calibration exists or the cal type is selected. This error can occur if the calibration can not be found. Also this error can happen if a calibration type is not specified before attempting to programmatically execute cal acquisitions.

Suggestions To find a calibration, select a Cal Set that contains the calibration needed for the current measurements. OR specify the cal type before beginning a calibration procedure.

EventID: 68020208 (hex)

Message: 521

"The measurement you set up does not have a corresponding calibration type, so correction has been turned off or is not permitted."

Severity: Informational

Further explanation: The calibration for the channel may apply only to certain S-Parameters. For example, a 1-Port calibration for S11 can not be applied to a 1-Port calibration applied to S22.

Suggestions: Select a calibration type, such as full 2-Port cal, that can be applied to all the measurements to be selected.

EventID: 68020209 (hex)

Message: 522

"The calibration type you selected cannot be set up."

Severity: Informational

Further explanation: **"**Please use the SCPI command ROUTe:PATH:DEFine:PORT <num>,<num> for full 2 port type port assignment."

Suggestions:

EventID: 6802020A (hex)

Message: 523

"The calibration path you selected cannot be set up because it is not valid for the current measurement."

Severity: Informational

Further explanation: "Please use the SCPI command ROUTe:PATH:DEFine:PORT <num>,<num> for full 2 port type port assignment related to your current measurement."

Suggestions:

EventID: 6802020B (hex)

Message: 524

"The source power calibration is complete."

Severity: Informational

Further explanation:

Suggestions:

EventID: 6802020C (hex)

Message: 525

"You have specified more than 7 standards for one or more calibration classes."

Severity: Informational

Further explanation: These have been truncated to 7 selections.

EventID: 6802020D (hex)

Message: 526

"No user calibration found for this channel."

Severity: Informational

Further explanation: A cal operation can not proceed until a calibration exists.

Suggestions: To find a calibration, you can select a Cal Set that contains the calibration needed for the current measurement.

EventID: 6802020E (hex)

Message: 527

"You do not need to acquire this standard for this calibration type."

Severity: Informational

Further explanation: This error can happen as a result of PROGRAMMATICALLY requesting the measurement of an un-needed calibration standard during a calibration procedure.

Suggestions: Check the specified cal type or eliminate the request for the measurement of the standard.

EventID: 6802020F (hex)

Message: 528

"Could not configure the Electronic Calibration system. Check to see if the module is plugged into the proper connector."

Severity: Informational

Further explanation: During an ECal operation, communication could not be established with the ECal module. The calibration will not be initiated until the presence of the ECal module is verified.

Suggestions: Verify the USB cable is connected properly. Disconnect and re-connect the cable to ensure the analyzer recognizes the module.

EventID: 68020210 (hex)

Message: 529

"DATA OUT OF RANGE: Design Limits Exceeded"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020211(hex)

Message: 530

"EXECUTION ERROR: Could not open ECal module memory backup file"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020212 (hex)

Message: 531

"EXECUTION ERROR: Access to ECal module memory backup file was denied"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020213 (hex)

Message: 532

"EXECUTION ERROR: Failure in writing to ECal module memory backup file"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020214 (hex)

Message: 533

"EXECUTION ERROR: Failure in reading from ECal module memory backup file"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020215 (hex)

Message: 534

"EXECUTION ERROR: Array index out of range"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020216 (hex)

Message: 535

"EXECUTION ERROR: Arrays wrong rank"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020217 (hex)

Message: 536

"EXECUTION ERROR: CPU"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020218 (hex)

Message: 537

"EXECUTION ERROR: Cannot ERASE module"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020219 (hex)

Message: 538

"EXECUTION ERROR: Cannot WRITE module"

Severity: Error

Further explanation:

Suggestions:

EventID: E802021A (hex)

Message: 539

"EXECUTION ERROR: Entry Not Found"

Severity: Error

Further explanation:

Suggestions:

EventID: E802021B (hex)

Message: 540

"EXECUTION ERROR: Invalid command while system is busy"

Severity: Error

Further explanation:

Suggestions:

EventID: E802021C (hex)

Message: 541

"Electronic Cal: Unable to orient ECal module. Please ensure the module is connected to the necessary measurement ports."

Severity: Error

Further explanation: There is no RF connection to the ECal module during a calibration step. An ECal orientation measurement has been attempted but the signal was not found.

Suggestions: Connect the ECal module RF connections to ports specified for the calibration step. The ECal module typically requires at least -18dBm for measurements. If your measurement requires the power level to be less than that, clear the **Do orientation** checkbox to bypass the automatic detection step.

EventID: E802021D (hex)

Message: 542

"EXECUTION ERROR: NO SPACE for NEW CAL, DELETE A CAL"

Severity: Error

Further explanation:

Suggestions:

EventID: E802021E (hex)

Message: 543

"EXECUTION ERROR: No More Room"

Severity: Error

Further explanation:

Suggestions:

EventID: E802021F (hex)

Message: 544

"EXECUTION ERROR: Other array error"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020220 (hex)

Message: 545

"EXECUTION ERROR: Ranks not equal"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020221 (hex)

Message: 546

"EXECUTION ERROR: Too few CONSTANT ranks"

Severity: Error

EventID: E8020222 (hex)

Message: 547

"EXECUTION ERROR: Too few VARYing ranks"

Severity: Error

EventID: E8020223 (hex)

Message: 548

"EXECUTION ERROR: Unknown error"

Severity: Error

EventID: E8020224 (hex)

Message: 549

"EXECUTION ERROR: ecaldrvr.dll bug or invalid module #"

Severity: Error

EventID: E8020225 (hex)

Message: 550

"EXECUTION ERROR: unexpected error code from ecal driver"

Severity: Error

EventID: E8020226 (hex)

Message: 551

"EXECUTION ERROR: unexpected internal driver error"

Severity: Error

EventID: E8020227 (hex)

Message: 552

"HARDWARE ERROR: Can't access ECal Interface Module"

Severity: Error

EventID: E8020228 (hex)

Message: 553

"HARDWARE ERROR: Can't release LPT port, reboot"

Severity: Error

EventID: E8020229 (hex)

Message: 554

"HARDWARE ERROR: VNA Error"

Severity: Error

EventID: E802022A (hex)

Message: 555

"HARDWARE ERROR: not enough data read from ECal module"

Severity: Error

EventID: E802022B (hex)

Message: 556

"OPERATION ABORTED BY HOST COMPUTER"

Severity: Error

EventID: E802022C (hex)

Message: 557

"OPERATION ABORTED BY USER"

Severity: Error

EventID: E802022D (hex)

Message: 558

"OUT OF MEMORY"

Severity: Error

EventID: E802022E (hex)

Message: 559

"QUERY INTERRUPTED:Message(s Abandoned"

Severity: Error

EventID: E802022F (hex)

Message: 560

"QUERY UNTERMINATED: INCOMPLETE PROGRAM Message"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020230 (hex)

Message: 561

"QUERY UNTERMINATED: NOTHING TO SAY"

Severity: Error

Further explanation:

Suggestions:

EventID: E8020231 (hex)

Message: 562

"QUEUE OVERFLOW"

Severity: Error

EventID: E8020232 (hex)

Message: 563

"SETTINGS CONFLICT: ADDITIONAL STANDARDS ARE NEEDED"

Severity: Error

EventID: E8020233 (hex)

Message: 564

"SETTINGS CONFLICT: Adapter Cal is NOT possible"

Severity: Error

EventID: E8020234 (hex)

Message: 565

"SETTINGS CONFLICT: COMMAND OUT OF SEQUENCE"

Severity: Error

EventID: E8020235 (hex)

Message: 566

"SETTINGS CONFLICT: Cal STOPPED - VNA SETUP CHANGED"

Severity: Error

EventID: E8020236 (hex)

Message: 567

"SETTINGS CONFLICT: Calibration is NOT in progress"

Severity: Error

EventID: E8020237 (hex)

Message: 568

"SETTINGS CONFLICT: Can't find specified GPIB board"

Severity: Error

EventID: E8020238 (hex)

Message: 569

"SETTINGS CONFLICT: Can't find/load gpib32.dll"

Severity: Error

EventID: E8020239 (hex)

Message: 570

"SETTINGS CONFLICT: Can't find/load sicl32.dll"

Severity: Error

EventID: E802023A (hex)

Message: 571

"SETTINGS CONFLICT: Can't initialize VNA (bad address?"

Severity: Error

EventID: E802023B (hex)

Message: 572

"SETTINGS CONFLICT: Can't load LPT port driver or USB driver DLL"

Severity: Error

EventID: E802023C (hex)

Message: 573

"SETTINGS CONFLICT: Invalid Calibration Sweep Mode."

Severity: Error

EventID: E802023D (hex)

Message: 574

"SETTINGS CONFLICT: Invalid Calibration Type"

Severity: Error

EventID: E802023E (hex)

Message: 575

"SETTINGS CONFLICT: Invalid Calibration"

Severity: Error

EventID: E802023F (hex)

Message: 576

"SETTINGS CONFLICT: Invalid GPIB board number specified"

Severity: Error

EventID: E8020240 (hex)

Message: 577

"SETTINGS CONFLICT: Invalid GPIB board type specified"

Severity: Error

EventID: E8020241 (hex)

Message: 578

"SETTINGS CONFLICT: Invalid Module Status"

Severity: Error

EventID: E8020242 (hex)

Message: 579

"SETTINGS CONFLICT: Invalid States"

Severity: Error

EventID: E8020243 (hex)

Message: 580

"SETTINGS CONFLICT: LPT port must be between 1 and 4"

Severity: Error

EventID: E8020244 (hex)

Message: 581

"Could not configure the Electronic Calibration system. Check to see if the module is properly connected."

Severity: Error

EventID: E8020245 (hex)

Message: 582

"SETTINGS CONFLICT: Specified LPT port does not exist"

Severity: Error

EventID: E8020246 (hex)

Message: 583

"SETTINGS CONFLICT: Use frequency domain for cal"

Severity: Error

EventID: E8020247 (hex)

Message: 584

"SETTINGS CONFLICT: Use step sweep type for cal."

Severity: Error

EventID: E8020248 (hex)

Message: 585

"SETTINGS CONFLICT: VNA address must be between 0 and 30"

Severity: Error

EventID: E8020249 (hex)

Message: 586

"SETTINGS CONFLICT: Wrong LPT port driver or USB driver DLL"

Severity: Error

EventID: E802024A (hex)

Message: 587

"SYNTAX ERROR: ECAL:DELAY command must have 2 numbers"

Severity: Error

EventID: E802024B (hex)

Message: 588

"SYNTAX ERROR: INCORRECT SYNTAX"

Severity: Error

EventID: E802024C (hex)

Message: 589

"SYNTAX ERROR: UNKNOWN COMMAND"

Severity: Error

EventID: E802024D (hex)

Message: 590

"Wrong port of module in RF path"

Severity: Error

EventID: E802024E (hex)

Message: 591

"User characterization not found in module"

Severity: Error

EventID: E802024F (hex)

Message: 592

Severity: Informational

"No source power calibration found for the channel and source port of the current measurement."

Further explanation: You tried to turn on source power cal but there is no source power cal data.

Suggestions: Perform a source power calibration

EventID: 68020250 (hex)

Message: 593

Severity: Informational

"A source power calibration sweep was not performed, so there is no correction for the channel and source port of the current measurement."

Further explanation: You tried to turn on source power cal but there is incomplete source cal data.

Suggestions:Perform a complete source power calibration

EventID: 68020251 (hex)

Message: 594

Severity: Informational

"A new trace could not be added to the active window for viewing the source power cal sweep, because it would have exceeded the limit on number of traces/window. Please remove a trace from the window before proceeding with source power cal."

Further explanation: The source power cal attempts to add a data trace to the active window. The active window already contains four traces.

Suggestions:Make the active window contain less than four traces.

EventID: 68020252 (hex)

Message: 595

Severity: Informational

"A new measurement could not be added for performing the source power cal sweep, because the limit on number of measurements has been reached. Please remove a measurement before proceeding with source power cal."

Further explanation: The source power cal attempts to add a measurement. The PNA already has the maximum number of measurements.

Suggestions: Delete a measurement.

EventID: 68020253 (hex)

Message: 596

Severity: Informational

"The calibration power value associated with the source power calibration of Port %1 on Channel %2 was changed with the calibration on. The calibration was not turned off, but the power value might no longer represent the calibration."

Further explanation: The source power cal accuracy is questionable.

Suggestions: If high accuracy is required, perform another source power calibration.

EventID: 68020254 (hex)

Message: 597

Severity: Informational

- Message that is passed from the power meter driver for a source power calibration. -

Further explanation: This error is generated by the power meter driver and passed through the PNA.

EventID: 68020255 (hex)

Message: 598

"During the acquisition of the sliding load standard, the slide was not properly moved to perform a circle fit. The standard's raw impedance was used to determine the directivity for one or more points."

Severity: Informational

Further Explanation: To accurately characterize the standard, the sliding load must be move sufficiently to ensure enough samples around the complex circle or Smith Chart. Under-sampling will cause an inaccurate result.

Suggestions: For best results when using a sliding load, be sure to use multiple slide positions that cover the full range of movement from front to back of the slot.

EventID: 68020256 (hex)

Message: 599

"This feature requires an unused channel, but could not find one. Please free up a channel and try again."

Severity: Informational

Further Explanation: You attempted to view an item within a calset. However, the calset viewer requires that the result be displayed in a channel that is not currently in use. All the channels are currently used. The view can not display the requested item.

Suggestions: You must delete at least one channel that is currently in use.

EventID: 68020257 (hex)

Message: 600

"Interpolation of the original calibration is not allowed since it was performed using Segment Sweep. Correction has been turned off."

Severity: Informational

EventID: 68020258 (hex)

Message: 601

"Cal preferences saved. Cal preference settings can be changed from the 'Cal Preferences' drop down Cal menu."

Severity: Informational

Further explanation: See Save Preference

EventID: 68020259 (hex)

Message: 608

"CalType not set."

Severity: Error

Further explanation: A cal operation can not proceed until a calibration exists or the proper cal type is selected.

Suggestions: This error can happen if the calibration can't be found.   To find a calibration, you can select a Cal Set that contains the calibration needed for the current measurements. This error can also happen if a calibration type is not specified before attempting to programmatically execute cal acquisitions. Specify the cal type before beginning a calibration procedure.

EventID: E8020260 (hex)

Message: 609

"The Calibration feature requested is not implemented."

Further explanation: The specified cal type can be one of many choices. For example, response calibrations require single standards, 1-Port calibrations require 3 standards, and 2-Port calibrations require up to 12 standards.

Suggestions: Be sure to measure only the standards needed for the specified cal type.

EventID: E8020261 (hex)

Message: 610

"The Calibration Class Acquisition requested is not valid for the selected Calibration Type. Please select a different acquisition or a different Calibration Type."

EventID: E8020262 (hex)

Message: 611

"The Calibration Standard data required for the selected caltype was not found."

Severity: Error

Further explanation: An unsuccessful attempt was made to retrieve a specified standard from the raw measurement buffer. The buffer should contain the raw measurements of cal standards stored during a calibration procedure.

Suggestions: Be sure the requested standard is required for the current cal type. Not all standards are needed for all cal types.

EventID: E8020263 (hex)

Message: 612

" The Error Term data required for the selected caltype was not found."

Severity: Error

Further explanation: An unsuccessful attempt was made to retrieve a specified error term from the error correction buffer. The buffer should contain the error correction arrays for the current calibration.

Suggestions: Be sure the requested error term is required for the current cal type. Not all error terms are needed for all cal types.

EventID: E8020264 (hex)

Message: 613

The Calibration data set was not found.

Severity: Error

Further explanation: An unsuccessful attempt to access a cal set has been made. This may indicate a calset has been deleted or has been corrupted.

Suggestions: Try again or select another cal set. If the cal set appears in the cal set list, it may need to be deleted.

EventID: E8020265 (hex)

Message: 614

"The specified measurement does not have a calibration valid for Confidence Check. Please select a different measurement, or recall or perform a different Calibration Type."

Severity: Error

Further explanation: The measurement choice is prevented so that calibration will not be turned off. Not all cal types support all measurements. For example, an 1-Port cal on S11 can not be used to calibrate an S12 measurement. When a measurement is selected that does not have a calibration which can be applied, an informational message is displayed and calibration is turned off.

Suggestions: Use a full 2-Port calibration to be compatible with any S-Parameter.

EventID: E8020266 (hex)

Message: 615

" New calset created."

Severity: Informational message.

Further explanation: The newly created cal set will be automatically named and time stamped. If this is the beginning of a calibration procedure, the cal set will not be stored to memory until the calibration has completed successfully. The new cal set will be deleted if the calibration is canceled or does not otherwise complete successfully.

Suggestions: Informational

EventID: 68020267

Message: 617

The calset file: <x> appears to be corrupted and cannot be removed. Exit the application, remove the file, and restart.

Severity: Error

Suggestions: The cal set file is stored in the application home directory C:/Program Files/Agilent/Network Analyzer/PNACalSets.dat. Remove this file, then restart the application.

EventID: E8020269 (hex)

Message: 634

"The calset file: <x> load failed."

Severity: Error

Further explanation: The calset file contains a collection of calsets. The file resides on the hard drive.

Suggestions: Try restarting the application. If the failure persists, you may have to delete the cal set data file and restart the application. The cal set file is stored in the application home directory. C:/Program Files/Agilent/Network Analyzer/PNACalSets.dat. Remove this file, then restart the application.

EventID: E802027A (hex)

Message: 635

"The calset file: <x> save failed."

Severity: Error

Further explanation: The file operation detected an error. The save operation was aborted.

Suggestions: Retry.

EventID: E802027B (hex)

Message: 636

"A calset was deleted."

Severity: Informational

Further explanation: One of the calsets has been successfully deleted from the collection of calsets available. This can happen as the result of a user request or intentional operation.

Suggestions: None

EventID: 6802027C (hex)

Message: 637

"The version of the calset file: <x> is not compatible with the current instrument."

Severity: Error

Further explanation: A versioning error can prevent a calset from being used. This can happen as a result of instrument firmware upgrades.

Suggestions: If the versioning error is the result of firmware upgrade, you will have to re-install the old version of firmware to re-use the calset file. Or you can re-create the calsets with the current version of firmware.

The cal set file is stored in the application home directory C:/Program Files/Agilent/Network Analyzer/PNACalSets.dat. Remove this file, then restart the application.

EventID: E802027D (hex)

Message: 638

"Incompatible CalSets found: <x> of <y> stored calsets have been loaded."

Severity: Error

Further explanation: Errors were found on some of the calsets stored in the calset file. The errors may have been caused by versioning issues that may have corrupted the various calset keys.

Suggestions: Use the calset viewer to look at the contents of calset files. Delete the files that are corrupted.

EventID: 6802027E (hex)

Message: 639

"The Calset file: <x> was not found. A new file has been created."

Severity: Informational

Further explanation: The calset file should be stored on the hard drive. When the application is started, a search is done and the file is loaded if it can be found. If the file is not found, the analyzer will create a new file and display this message.

Suggestions: None

EventID: 6802027F (hex)

Message: 640

"The Calset specified is currently in use."

Severity: Error

Further explanation: This may indicate a conflict between multiple calset users attempting calibration tasks.

Suggestions: Save the instrument state. Preset the analyzer and recall the instrument state. This may abort any processes that may be in progress.

EventID: E8020280 (hex)

Message: 641

"The calset specified has not been opened."

Severity: Error

Further explanation: Multiple users may be attempting to access the calset.

Suggestions: Close multiple calset users so that only one user will access the calset.

EventID: E8020281 (hex)

Message: 642

"The maximum number of cal sets has been reached. Delete old or unused cal sets before attempting to create new ones."

Severity: Error

Suggestions: You may also delete the calsets data file.

The cal set file is stored in the application home directory. C:/Program Files/Agilent/Network_Analyzer/PNACalSets.dat. Remove this file, then restart the application.

EventID: E8020282 (hex)

Message: 643

The requested power loss table segment was not found.

Severity: Error

EventID: E8020283 (hex)

Message: 644

"A valid calibration is required before correction can be turned on."

Severity: Error

Further explanation: This usually indicates a calibration procedure has not run to completion or that the selected measurement does not have a valid calibration available from within the currently selected cal set.

Suggestions: To find a calibration, you can select a Cal Set that contains the calibration needed for the current measurements. This error can happen if a calibration type is not specified before attempting to programmatically execute cal acquisitions. Specify the cal type before beginning a calibration procedure.

EventID: E8020284 (hex)

Message: 645

The cal data for <x> is incompatible and was not restored. Please recalibrate."

Severity: Warning

Further explanation: None

Suggestions: None

EventID: A8020285 (hex)

Message: 646

"CalSet not loaded, version is too new."

Severity: Error

Further explanation: An old version of firmware is attempting to run with a new calset version. The version is incompatible.

Suggestions: The calset can be removed. You may also delete the calsets data file if you are migrating between various firmware revisions often and you would like to avoid this error. The cal set file is stored in the application home directory. C:/Program Files/Agilent/Network Analyzer/PNACalSets.dat. Remove this file, then restart the application.

EventID: E8020286 (hex)

Message: 647

"Custom cal type not found."

Severity: Error

Further explanation:

Suggestions:

EventID: E8020287 (hex)

Message: 648

"Custom correction algorithm defers to the client for interpolation."

Severity: Informational

EventID: 68020288 (hex)

Message: 649

"Custom cal dll threw an exception."

Severity: Error

EventID: E8020289 (hex)

Message: 650

"Could not load the ecal.dll library"

Severity: Error

EventID: E802028A (hex)

Message: 656

"The argument specified is not a valid cal type."

Severity: Error

EventID: E8020290 (hex)

Message: 657

"The function found existing interpolated data"

Severity: Informational

EventID: 68020291 (hex)

Message: 658

"The function computed new interpolation values."

Severity: Informational

EventID: 68020292 (hex)

Message: 659

"The source power measurement failed."

Severity: Error

Suggestions: Please check GPIB, power meter settings and sensor connections.

EventID: E8020293 (hex)

Message: 660

"Duplicate session found. Close session and retry."

Severity: Error

EventID: E8020294 (hex)

Message: 661

"The session does not exist. Open the session and try again."

Severity: Error

Further explanation:

EventID: E8020295 (hex)

Message: 662

"Attempt to launch a custom calibration failed."

Severity: Error

Further explanation:

EventID: E8020296 (hex)

Message: 663

"Request to measure a cal standard failed."

Severity: Error

Further explanation: Please ensure you are requesting to measure standards which are defined for this calibration.

EventID: E8020297 (hex)

Message: 664

"Since Electronic Calibration Kit is selected, Mechanical Cal Kit parameter cannot be changed."

Severity: Error

Further explanation:

EventID: E8020298 (hex)

Message: 665

"Frequencies of the active channel are below minimum or above maximum frequencies of the ECal module factory characterization."

Suggestions: Change the channel frequencies, or select another ECal module.

Severity: Error

EventID: E8020299 (hex)

Message: 666

"Calset chosen for characterizing the ECal Module Ports %1 does not contain a calibration for PNA Ports %2."

Severity: Error

Suggestions: Go back to select another calset or to perform another cal.

EventID: E802029A (hex)

Message: 667

"ECal module only has sufficient memory remaining to store a maximum of %1 points in User Characterization %2."

Severity: Error

Suggestions: Decrease your number of points, or choose to overwrite another user characterization.

EventID: E802029B (hex)

Message: 668

Input values are non-monotonic. Cannot interpolate.

Severity: Error

EventID: E802029C (hex)

Message: 669

Interpolation target is out of range. Cannot interpolate.

Severity: Error

EventID: E802029D (hex)

Message: 670

Guided Calibration Error: <>

Severity: Error

EventID: E802029E (hex)

Message: 671

The first call to the guided calibration interface must be Initialize.

Severity: Error

EventID: E802029F (hex)

Message: 672

The selected thru cal method was not recognized.

Severity: Error

EventID: E80202A0 (hex)

Message: 673

Could not generate the error terms.

Severity: Error

EventID: E80202A1 (hex)

Message: 674

Guided calibration must be performed on the active channel

Severity: Error

EventID: E80202A2 (hex)

Message: 675

You can not start using calibration steps until you have successfully called generate steps.

Severity: Error

EventID: E80202A3 (hex)

Message: 676

The step number given is out of range. Step numbers should be between 1 and the number of steps. 0 is not a valid step number.

Severity: Error

EventID: E80202A4 (hex)

Message: 677

A calset was selected for channel: <n> without restoring stimulus.

Severity: Informational

EventID: 680202A5 (hex)

Message: 678

A calset was selected for channel: <n> restoring stimulus.

Severity: Informational

EventID: 680202A6 (hex)

Message: 679

The selected calset stimulus could not be applied to the channel.

Severity: Informational

EventID: 680202A7 (hex)

Message: 680

You attempted to measure power at a frequency outside the frequency range defined for the specified power sensor. Select another sensor or adjust the range for this sensor.

Severity: Error

EventID: E80202A8 (hex)

Message: 681

Specified frequency is outside the frequency ranges currently defined for the power meter's sensors.

Severity: Error

EventID: E80202A9 (hex)

Message: 682

Additional Calibration Standards need to be acquired in order to calibrate over the entire frequency range currently being measured.

Severity: Informational

EventID: 680202AA (hex)

Message: 683

The PNA failed to convert cal kits for use by unguided calibrations. The recommended action is to restore Cal Kit defaults.

Severity: Error

EventID: E80202AB (hex)

Message: 684

The PNA failed to convert cal kits for use by unguided calibrations. CalKit defaults have been restored.

Severity: Error

EventID: E80202AC (hex)

Message: 685

Power meter is reserved by a source power cal acquisition already in progress.

Severity: Error

EventID: E80202AD (hex)

Message: 686

Source power calibration has not been performed or uploaded for the specified channel and source port.

Severity: Error

EventID: E80202AE (hex)

Message: 687

Source power calibration data array size for the specified channel and source port does not match it's associated stimulus number of points.

Severity: Error

EventID: E80202AF (hex)

Message: 688

Source power calibration of Port <n> on Channel <n> was turned off because the correction array no longer exists.

Severity: Error

EventID: E80202B0 (hex)

Message: 689

This command can only be used on a measurement created with a specified calibration loadport.

Severity: Error

EventID: E80202B1 (hex)

Message: 690

Interpolation is turned off and you have changed the stimulus settings of the original calibration, so correction has been turned off.

Severity: Error

EventID: E80202B2 (hex)

Message: 691

Stimulus settings for your current instrument state exceeded the parameters of the original calibration, so correction has been turned off.

Severity: Error

EventID: E80202B3 (hex)

Message: 692

Fixturing: the requested S2P file cannot be read. Possible formatting problem.

Severity: Error

EventID: E80202B4 (hex)

Message: 693

Fixturing: the requested S2P file cannot be opened.

Severity: Error

EventID: E80202B5 (hex)

Message: 694

Fixturing: the requested S2P file cannot be interpolated. This is usually because the frequency range in the file is a subset of the current channel frequency range.

Severity: Error

EventID: E80202B6 (hex)

Message: 695

Cal Registers can only be used by one channel: the channel conveyed in the name of the cal register. The name cannot be changed.

Severity: Error

Further explanation: See Cal Registers

EventID: E80202B7 (hex)

Message: 696

Fixturing: cannot be enabled with Response Calibrations and has been turned off.

Severity: Error

EventID: E80202B8 (hex)

Message: 697

The selected calibration cannot be performed for this measurement.

Severity: Error

EventID: E80202B9 (hex)

Message: 698

Fitting: RemoveAllConnectors() should be called prior to calling AddConnector after a fit has been attempted.

Severity: Error

EventID: E80202BA (hex)

Message: 699

An attempt was made to acquire calibration data before the system was properly initialized.

Severity: Error

EventID: E80202BB (hex)

Message: 700

Use IGuidedCalibration for multiport calibration types.

Severity: Error

EventID: E80202BC (hex)

Message: 701

Guided calibration requires number of thru measurement paths be at least equal to the number of calibration ports minus 1.

Severity: Error

EventID: E80202BD (hex)

Message: 702

A thru path was specified that includes a port which the calibration was not specified to include.

Severity: Error

EventID: E80202BE (hex)

Message: 703

One or more of the ports to be calibrated was not found in the set of specified thru paths.

Severity: Error

EventID: E80202BF (hex)

Hardware Errors

Message: 770

Input power too high. Source power is off.

Severity: Warning

EventID: A8030302 (hex)

Message: 771

Source power restored.

Severity: Informational

EventID: 68030303 (hex)

Message: 772

"The spampnp.sys driver is not working. Check system hardware. ! Data will be simulated. !"

Severity: Error

Further explanation: The Network Analyzer application cannot locate the DSP board. Hardware or a driver may be malfunctioning. This is also common when attempting to run the Network Analyzer on a workstation.

EventID: E8030304 (hex)

Message: 773

"Instrument Serial Bus Not Working."

Severity: Error

Further explanation: The instrument EEPROM appears to contain either all ones or all zeros. A serial bus hardware failure prevents reading the EEPROM.

EventID: E8030305 (hex)

Message: 848

"Phase lock lost"

Severity: Error

Further explanation: The instrument source was not able to lock properly. This can be the result of broken hardware, poor calibration, or bad EEPROM values.

Suggestions: Perform source calibration. Click System / Service / Adjustments / Source Calibration

EventID: E8030350 (hex)

Message: 849

Phaselock restored.

Severity: Success

EventID: 0x28030351 (hex)

Message: 850

"Unknown hardware error."

Severity: Error

Further explanation: Hardware malfunctioned prevents communication with the DSP.

EventID: E8030352 (hex)

Message: 851

DSP communication lost.

Severity: Error

EventID: E8030353 (hex)

Message: 852

RF power off.

Severity: Error

EventID: E8030354 (hex)

Message: 853

RF power on.

Severity: Success

EventID: 28030355 (hex)

Message: 854

Hardware OK.

Severity: Success

EventID: 28030356 (hex)

Message: 855

"Source unleveled."

Severity: Error

Further explanation: The source was unable to properly level at the requested power. The indicated power may not be accurate.

Suggestions: Try a different power level. Recalibrate source, if problem persists.

EventID: E8030357 (hex)

Message: 856

Source leveled.

Severity: Success

EventID: 28030358 (hex)

Message: 857

Input overloaded.

Severity: Error

EventID: E8030359 (hex)

Message: 858

Input no longer overloaded.

Severity: Success

EventID: 2803035A (hex)

Message: 859

"Yig calibration failed."

Severity: Error

Further explanation: Internal self-calibration of YIG oscillator tuning failed.

EventID: E803035B (hex)

Message: 860

Yig calibrated.

Severity: Success

EventID: 2803035C (hex)

Message: 861

"Analog ramp calibration failed."

Severity: Error

Further explanation: Internal analog sweep ramp calibration has failed.

EventID: E803035D (hex)

Message: 862

Analog ramp calibrated.

Severity: Success

EventID: 2803035E (hex)

Message: 863

Source temperature high.

Severity: Error

EventID: E803035F (hex)

Message: 864

Source temperature OK.

Severity: Success

EventID: 28030360 (hex)

Message: 865

"EEPROM write failed."

Severity: Error

Further explanation: Attempt to store calibration data to EEPROM has failed. There is a possible hardware failure.

EventID: E8030361 (hex)

Message: 866

EEPROM write succeeded.

Severity: Success

EventID: 28030362 (hex)

Message: 867

Attempted I/O write while port set to read only.

Severity: Error

Further explanation: Attempt to write to an I/O data port while the port set to input/read only.

Suggestions: Set data port to write/output before attempting to write to port.

EventID: E8030363 (hex)

Message: 868

" Attempted I/O read from write only port.

Severity: Error

Further explanation: Attempt to read from an I/O data port while the port set to output/write only.

Suggestions: Set data port to read/input before attempting to read from port.

EventID: E8030364 (hex)

Message: 869

Invalid hardware element identifier.

Severity: Error

EventID: E8030365 (hex)

Message: 870

Invalid gain level setting.

Severity: Error

EventID: E8030366 (hex)

Message: 871

Device driver was unable to allocate enough memory. Please try rebooting.

Severity: Error

EventID: E8030367 (hex)

Message: 872

DSP Error. Please Contact Agilent Support. Technical Information: DSP Type 1

Severity: Error

EventID: E8030368 (hex)

Message: 873

DSP Error. Please Contact Agilent Support. Technical Information: DSP Type 2

Severity: Error

EventID: E8030369 (hex)

Message: 874

DSP Error. Please Contact Agilent Support. Technical Information: DSP Type 3

Severity: Error

EventID: E803036A (hex)

Message: 875

DSP Error. Please Contact Agilent Support. Technical Information: DSP Type 4

Severity: Error

EventID: E803036B (hex)

Message: 876

DSP Error. Please Contact Agilent Support. Technical Information: DSP Type 5

Severity: Error

EventID: E803036C (hex)

Message: 910

The trigger connection argument was not recognized as valid by the firmware.

Severity: Error

EventID: 0xE803038E (hex)

Message: 911

The trigger connection specified does not support this trigger behavior

Severity: Error

EventID: E803038F (hex)

Message: 912

The trigger behavior specified was not recognized as valid by the firmware.

Severity: Error

EventID: E8030390 (hex)

Message: 913

The trigger connection specified does not physically exist on this network analyzer

Severity: Error

EventID: E8030391 (hex)

Message: 914

Cannot set "Accept Trigger Before Armed", since this hardware configuration does not support edge triggering.

Severity: Error

EventID: E8030392 (hex)

Message: 915

Cannot set "Trigger Output Enabled", since this hardware configuration does not support BNC2.

Severity: Error

EventID: E8030393 (hex)

Message: 916

Exceeded maximum trigger delay.

Severity: Error

EventID: E8030394 (hex)

Message: 917

Exceeded minimum trigger delay.

Severity: Error

EventID: E8030395 (hex)

Measure Errors

Message: 1024

If you are going to display or otherwise use a memory trace, you must first store a data trace to memory.

Severity: Warning

EventID: A8040400 (hex)

Message: 1025

"The measurement failed to shut down properly. The application is in a corrupt state and should be shut down and restarted."

Severity: Error

Further explanation: This message is displayed if the PNA application becomes corrupt. If you continue to get this error, please call customer service

EventID: E8040401 (hex)

Message: 1026

The measurement failed to shut down properly. The update thread failed to exit properly.

Severity: Warning

EventID: A8040402 (hex)

Message: 1027

"Group Delay format with CW Time or Power sweeps produces invalid data."

Severity: Warning

Further explanation: Group Delay format is incompatible with single-frequency sweeps. Invalid data is produced.

Suggestions: Ignore the data or choose a different format or sweep type.

EventID: A8040403 (hex)

Message: 1028

Severity: Informational

"MSG_LIMIT_FAILED"

Further explanation: Limit line test failed.

EventID: 68040404 (hex)

Message: 1029

Severity: Informational

"MSG_LIMIT_PASSED"

Further explanation: Limit line test passed.

EventID: 68040405 (hex)

Message: 1030

"Exceeded the maximum number of measurements allowed."

Severity: Warning

Further explanation: See Traces, Channels, and Windows on the PNA for learn about maximum measurements.

EventID: A8040406 (hex)

Message: 1031

"Network Analyzer Internal Error. Unexpected error in AddNewMeasurement."

Severity: Warning

Further explanation: If you continue to get this message, contact product support.

EventID: A8040407 (hex)

Message: 1032

"No measurement was found to perform the selected operation. Operation not completed."

Severity: Warning

Further explanation: None

Suggestions:Create a measurement before performing this operation.

EventID: A8040408 (hex)

Message: 1033

The Markers All Off command failed.

Severity: Warning

EventID: A8040409 (hex)

Message: 1034

"A memory trace has not been saved for the selected trace. Save a memory trace before attempting trace math operations."

Severity: Warning

Further explanation: Must have a memory trace when trying to do Trace Math,

EventID: A804040A (hex)

Message: 1035

"MSG_SET_AVERAGE_COMPLETE"

Severity: Informational

Further explanation: Informational for COM programming. Averaging factor has been reached.

EventID: 6804040B (hex)

Message: 1036

"MSG_CLEAR_AVERAGE_COMPLETE"

Further explanation: Informational for COM programming. Averaging factor has NOT been reached.

EventID: 6804040C (hex)

Message: 1037

"Time Domain transform requires at least 3 input points. The transform has been deactivated."

Severity: Informational

Further explanation: None

Suggestions:Increase the number of points.

EventID: 6804040D (hex)

Message: 1038

Smoothing requires a scalar format, and has been deactivated.

Severity: Informational

EventID: 6804040E (hex)

Message: 1039

A receiver power calibration in this instrument state file cannot be recalled into this firmware version.

Severity: Warning

EventID: A804040F (hex)

Message: 1104

"Exceeded limit on number of measurements."

Severity: Error

Further explanation: See Traces, Channels, and Windows on the PNA for measurement limits.

EventID: E8040450 (hex)

Message: 1105

"Parameter not valid."

Severity: Error

Further explanation: A measurement parameter that was entered programmatically is not valid.

EventID: E8040451 (hex)

Message: 1106

"Measurement not found."

Severity: Error

Further explanation: Any of these could be the cause:

Trying to calibrate but already have maximum measurements.

Trying to do a confidence check but there is not a measurement.

Trying to create, activate, or alter a measurement through COM that has been deleted through the front panel.

Trying to use a trace name through programming that is not unique.

EventID: E8040452 (hex)

Message: 1107

"No valid memory trace."

Severity: Error

Further explanation: Must have a memory trace when trying to do Trace Math,

Suggestions: Store a memory trace.

EventID: E8040453 (hex)

Message: 1108

"The reference marker was not found."

Severity: Error

Further explanation: Attempted to create a delta marker without first creating a reference marker (COM only).

EventID: E8040454 (hex)

Message: 1109

"Data and Memory traces are no longer compatible. Trace Math has been turned off."

Severity: Error

Further explanation: Warning - channel setting has changed while doing trace math.

Suggestions:Store another memory trace and turn trace math back on.

EventID: A8040455 (hex)

Message: 1110

"Data and Memory traces are not compatible. For valid trace math operations, memory and data traces must have similar measurement conditions."

Severity: Error

Further explanation: Tried to do trace math without compatible data and memory traces.

Suggestions: Store another memory trace.

EventID: E8040456 (hex)

Message: 1111

"Marker Bandwidth not found."

Severity: Error

Further explanation: Could not find a portion of trace that meets the specified bandwidth criteria.

EventID: E8040457 (hex)

Message: 1112

"The peak was not found."

Severity: Error

Further explanation: Could not find portion of trace that meets peak criteria.

Suggestions: See Marker Peak criteria.

EventID: E8040458 (hex)

Message: 1113

"The target search value was not found."

Severity: Error

Further explanation: Could not find interpolated data point that meets search value.

EventID: E8040459 (hex)

Message: 1114

"Reflection measurement, such as S11, must supply an auxiliary port to disambiguate 2-port measurements on multiport instruments."

Severity: Error

Further explanation:

EventID: E804045A (hex)

Message: 1115

"The receiver power calibration has been turned off because the type of measurement or source port has changed, so the calibration is no longer valid."

Severity: Warning

Further explanation:

EventID: A804045B (hex)

Message: 1116

"Receiver power cal requires the active measurement to be of unratioed power."

Severity: Warning

Further explanation:

EventID: A804045C (hex)

Message: 1117

"There is currently no source power calibration associated with the channel and source port of the active measurement. A source power cal should be performed or recalled before performing a receiver power calibration."

Severity: Warning

Further explanation:

EventID: A804045D (hex)

Message: 1118

"The attempted operation can only be performed on a standard measurement type."

Severity: Error

Further explanation:

EventID: E804045E (hex)

Message: 1119

"The custom measurement cannot be loaded because it is not compatible with the Network Analyzer hardware."

Severity: Error

Further explanation:

Suggestions:

EventID: E804045F (hex)

Message: 1120

"The custom measurement cannot be loaded because it is not compatible with the Network Analyzer software."

Severity: Error

Further explanation:

EventID: E8040460 (hex)

Message: 1121

"The custom measurement load operation failed for an unspecified reason."

Severity: Error

Further explanation:

EventID: E8040461 (hex)

Message: 1122

"The custom measurement data processing has generated an unhandled exception, and will be terminated. The PNA software may be in an unstable state and it is recommended that the PNA software be shutdown and restarted."

Severity: Error

Further explanation:

EventID: E8040462 (hex)

Message: 1123

"The attempted operation can only be performed on a custom measurement type."

Severity: Error

Further explanation:

EventID: E8040463 (hex)

Message: 1124

"The requested custom measurement is not available."

Severity: Error

Further explanation:

EventID: E8040464 (hex)

Message: 1125

"The requested custom algorithm was not found."

Severity: Error

Further explanation:

EventID: E8040465 (hex)

Message: 1126

"Normalization cannot be turned on because the measurement does not have a valid divisor buffer."

Severity: Error

Further explanation:

EventID: E8040466 (hex)

Message: 1127

"The Raw Data requested by the measurement could not be provided."

Severity: Warning

Further explanation:

EventID: A8040467 (hex)

Message: 1128

"The selected Sweep Type does not allow Transform and Gating. Transform and Gating disabled. "

Severity: Error

Further explanation:

EventID: E8040468 (hex)

Message: 1129

Memory trace can not be applied to this measurement

Severity: Error

EventID: E8040469 (hex)

Message: 1130

Normalization can not be applied to this measurement

Severity: Error

EventID: E804046A (hex)

Message: 1131

The data provided has an invalid number of points. It could not be stored

Severity: Error

EventID: E804046B (hex)

Message: 1132

The measurement stored in the save/recall state has an invalid version. It could not be loaded

Severity: Error

EventID: E804046C (hex)

Message: 1133

This data format argument for this operation must be "naDataFormat_Polar"

Severity: Error

EventID: E804046D (hex)

Message: 1134

This data format argument for this operation must be a scalar data format

Severity: Error

EventID: E804046E (hex)

Message: 1135

The memory trace is not valid for the current measurement setup.

Severity: Error

EventID: E804046F (hex)

Message: 1136

This measurement is incompatible with existing measurements in this channel. Choose another channel.

Severity: Error

EventID: E8040470 (hex)

Message: 1137

Port extension correction is not available for offset frequency measurements. Port extension correction has been disabled.

Severity: Error

EventID: E8040471 (hex)

Message: 1138

Physical port number assignments for logical port mappings must be unique.

Severity: Error

EventID: E8040472 (hex)

Parser Errors

Message: 1281

"You have sent a read command to the analyzer without first requesting data with an appropriate output command. The analyzer has no data in the output queue to satisfy the request."

Severity: Error

EventID: 68050501 (hex)

Message: 1282

"You must remove the active controller from the bus or the controller must relinquish the bus before the analyzer can assume the system controller mode."

Severity: Error

EventID: E8050502(hex)

Message: 1283

"The analyzer did not receive a complete data transmission. This is usually caused by an interruption of the bus transaction."

Severity: Error

EventID: E8050503 (hex)

Message: 1284

"The instrument status byte has changed."

Severity: Informational

EventID: 68050504 (hex)

Message: 1285

"The SCPI command received has caused error number %1: "%2"."

Severity: Informational

EventID: 68050505 (hex)

Message: 1286

"The INET LAN server has been started as process number %1."

Severity: Informational

EventID: 68050506 (hex)

Message: 1360

"Execution of the SCPI command has failed"

Severity: Error

EventID: E8050550 (hex)

Message: 1361

" The INET/LAN device is not accessible."

Severity: Error

EventID: E8050551 (hex)

Message: 1362

"The INET/LAN driver was not found. "

Severity: Error

EventID: E8050552 (hex)

Message: 1363

"The INET/LAN driver was not found."

Severity: Error

EventID: E8050553 (hex)

Message: 1364

"The INET/LAN device is unable to acquire the necessary resources. "

Severity: Error

EventID: E8050554 (hex)

Message: 1365

"The INET/LAN device generated a generic system error. "

Severity: Error

EventID: E8050555 (hex)

Message: 1366

"Invalid address for the INET/LAN device."

Severity: Error

EventID: E8050556 (hex)

Message: 1367

"The INET I/O library was not found. "

Severity: Error

EventID: E8050557 (hex)

Message: 1368

"An error occured in the INET system. "

Severity: Error

EventID: E8050558 (hex)

Message: 1369

"Access to the INET/LAN driver was denied. "

Severity: Error

EventID: E8050559 (hex)

Message: 1370

"Could not load error system message dll."

Severity: Error

EventID: E805055A (hex)

Message: 1371

"ErrorSystemMessage.dll does not export the right function."

Severity: Error

EventID: E805055B (hex)

Message: 1372

"Custom scpi library was not able to be knitted"

Severity: Error

EventID: E805055C (hex)

Message: 1373

"Could not knit the scpi error messages from the ErrorSystemMessage lib"

Severity: Error

EventID: E805055D (hex)

Message: 1374

Command is obsolete with this software version.

Severity: Error

EventID: E808055E (hex)

Message: 1375

CALC measurement selection set to none. Use Calc:Par:Sel

Severity: Error

EventID: E808055F (hex)

Message: 1535

"Parser got command: %1."

Severity: Informational

EventID: 680505FF (hex)

Display Errors 1536 - 1621

Message: 1536

"Exceeded the maximum of 4 traces in each window. The trace for <x> will not be added to window <x>."

Severity: Warning

Further explanation: None

Suggestions: Create the trace in another window. See the PNA window limits.

EventID: A8060600 (hex)

Message: 1537

"Exceeded the maximum of 16 data windows. New window will not be created."

Severity: Warning

Further explanation: None

Suggestions: Create the trace in an existing window. See the PNA window limits.

EventID: A8060601 (hex)

Message: 1538

"No Data Windows are present. Unable to complete operation."

Severity: Warning

Further explanation: Your remote SCPI operation tried to create a new measurement while there were no windows present

Suggestions: Create a new window before creating the measurement. See example Create a measurement using SCPI

EventID: A8060602 (hex)

Message: 1539

"No data traces are present in the selected window. Operation not completed."

Severity: Warning

Further explanation: None

EventID: A8060603 (hex)

Message: 1540

"Cannot complete request to arrange existing measurements in <x> windows due to the limit of <x> traces per window."

Severity: Informational

Further explanation: The arrange window feature cannot put the existing traces into the number of windows you requested because only 4 traces per window are allowed. See Arranging Existing Measurements

Suggestions:Either create more windows or delete some traces.

EventID: 68060604 (hex)

Message: 1541

"Unable to establish a connection with the specified printer."

Severity: Warning

Further explanation: None

Suggestions: Refer to Printer Help

EventID: A8060605 (hex)

Message: 1542

"Printout canceled."

Severity: Informational

EventID: 68060606 (hex)

Message: 1616

"Window not found."

Severity: Error

Further explanation: A window was specified in your program which does not exist.

Suggestions: Query the name of your window before specifying.

EventID: E8060650 (hex)

Message: 1617

"Duplicate window ID specified."

Severity: Error

Further explanation: None

EventID: E8060651 (hex)

Message: 1618

"Exceeded limit on number of windows."

Severity: Error

Further explanation: There is a limit of 4 windows per screen.

EventID: E8060652 (hex)

Message: 1619

"Exceeded limit on number of traces/window."

Severity: Error

Further explanation: There is a limit of 4 traces per window. See the Traces, Channels, and Windows on the PNA.

Suggestions: Create the trace in another window

EventID: E8060653 (hex)

Message: 1620

"Trace not found."

Severity: Error

Further explanation: Your program tried to communicate with a non-existing trace.

Suggestions:Query the trace ID before writing to it.

EventID: E8060654 (hex)

Message: 1621

"The operating system does not recognize this printer."

Severity: Warning

EventID: A8060655 (hex)

Message: 1622

Duplicate trace ID specified.

Severity: Error

EventID: E8060656 (hex)

Channel Errors 1792 -1878

Message: 1792

"Sweep Complete."

Severity: Informational

Further explanation: None

Suggestions:None

EventID: 68070700 (hex)

Message: 1793

"All triggerable acquisitions have completed."

Severity: Informational

Further explanation:

EventID: 68070701 (hex)

Message: 1794

"The last trigger produced an aborted sweep."

Severity: Informational

Further explanation:

EventID: 68070702 (hex)

Message: 1795

"The segment list must be adjusted to have at least one active segment with more than 0 points to use segment sweep."

Severity: Informational

Further explanation: You attempted to change **Sweep type** to Segment sweep, but there is either no segments defined or no sweep points in the defined segments

Suggestions: Define at least one segment with at least one measurement point. See Segment sweep for more information

EventID: 68070703 (hex)

Message: 1796

"MSG_SET_CHANNEL_DIRTY"

Severity: Informational

Further explanation: This informational message occurs when a channel setting has changed but the channel still has data that was taken with the previous setting. The following CLEAR message occurs when new channel data is taken.

EventID: 68070704 (hex)

Message: 1797

"MSG_CLEAR_CHANNEL_DIRTY"

Severity: Informational

Further explanation: The previous SET message occurs when a channel setting has changed but the channel still has data that was taken with the previous setting. This CLEAR message occurs when new channel data is taken.

EventID: 68070705 (hex)

Message: 1798

Sweep time has changed from Auto to Manual mode. If desired to return to Auto mode, enter sweep time value of 0.

Severity: Informational

EventID: 68070706 (hex)

Message: 1799

"Set Sweep Completed"

Severity: Informational

Further explanation: This event occurs when a sweep and it's associated sweep calculations finish. This is typically when all sweeps on a channel complete.

EventID: 68070707 (hex)

Message: 1800

"Clear Sweep Completed"

Severity: Informational

Further explanation: This event occurs immediately after the SET SWEEP COMPLETED event. These two events set and clear the "Sweep Completed" bit (bit 4) on the SCPI Device Status register.

EventID: 68070708 (hex)

Message: 1801

"All Sweeps Completed and Processed"

Severity: Informational

Further explanation: This event occurs when all of the sweeps and sweep calculations are complete for a channel.

EventID: 68070709 (hex)

Message: 1802

Low Pass : Frequency limits have been changed.

Severity: Informational

EventID: 6807070A (hex)

Message: 1803

Low Pass : Number of points have been changed.

Severity: Informational

EventID: 6807070B (hex)

Message: 1804

Low Pass : Frequency limits and number of points have been changed.

Severity: Informational

EventID: 6807070C (hex)

Message: 1805

"Channel created"

Severity: Informational

EventID: 6807070D (hex)

Message: 1806

"Channel deleted"

Severity: Informational

EventID: 6807070E (hex)

Message: 1872

"Channel not found."

Severity: Error

Further explanation: A non-existent channel is being referenced under program control.

Suggestions: Query the channel number, then refer to it by number.

EventID: E8070750 (hex)

Message: 1873

"The requested sweep segment was not found."

Severity: Error

Further explanation: A non-existent sweep segment is being referenced under program control.

EventID: E8070751 (hex)

Message: 1874

"The sweep segment list is empty."

Severity: Error

Further explanation: Segment Sweep cannot be specified unless there is at least one defined segment. This error will only occur under remote control.

EventID: E8070752 (hex)

Message: 1875

"The number of points in active sweep segment list segments is 0."

Severity: Error

Further explanation: Segment Sweep cannot be specified unless there is at least data point specified in a segment. This error will only occur under remote control.

EventID: E8070753 (hex)

Message: 1876

"The specified source attenuator is not valid."

Severity: Error

Further explanation: You tried to set the Attenuator property on the Channel object on a PNA that doesn't have a source attenuator.

EventID: E8070754 (hex)

Message: 1877

"Log Frequency sweep cannot be selected with the current Number of Points. Please reduce Number of Points."

Severity: Error

Further explanation: The maximum number of points that can be used for Log sweep is 401.

EventID: E8070755 (hex)

Message: 1878

"The requested Number of Points is greater than can be selected for Log Frequency sweep."

Severity: Error

Further explanation: The maximum number of points that can be used for Log sweep is 401.

EventID: E8070756 (hex)

Message: 1879

"Response frequencies exceeded instrument range so Frequency Offset has been turned off."

Severity: Error

Further explanation: This error is returned whenever the instrument detects that the stimulus sweep setup and Frequency Offset settings result in computed response frequencies that exceed instrument limits. When this occurs, the instrument automatically turns off Frequency Offset to avoid the out-of-range conditions.

Suggestions: When this condition has occurred, change settings for either the stimulus frequencies or Frequency Offset so that the Response frequencies are within instrument bounds. Once this is done, Frequency Offset can once again be turned on.

EventID: E8070757 (hex)

Message: 1880

The total number of points for all the given segments exceeds the maximum number of points supported. The segments were not changed.

Severity: Error

EventID: E8070758 (hex)

Message: 1881

This instance of the Channels object was not used to place the channels in Hold, so no channels were resumed.

Severity: Error

EventID: E8070759 (hex)

Message: 1882

The port number was outside the range of allowed port numbers.

Severity: Error

EventID: E807075A (hex)

Message: 1883

More ports than are present are required for this operation.

Severity: Error

EventID: E807075B (hex)

General Errors

Message: 2048

"The function you requested requires a capability provided by an option to the standard analyzer. That option is not currently installed."

Severity: Error

Further explanation: None

Suggestions:To view the options on your analyzer, click **Help / About Network Analyzer**. For more information see PNA Options

EventID: 68080800 (hex)

Message: 2049

"The feature you requested is not available on the current instrument."

Severity: Error

Further explanation: None

EventID: 68080801 (hex)

Message: 2050

"The feature you requested is incompatible with the current instrument state."

Severity: Error

Further explanation: None

Suggestions: None

EventID: 68080802 (hex)

Message: 2051

"File<x> has been saved."

Severity: Informational

Further explanation: None

EventID: 68080803 (hex)

Message: 2052

"Attempt to save <x> failed."

Severity: Error

Further explanation: None

Suggestions: If using a floppy disk, ensure it is inside the drive and the disk is not full. Check the filename for special characters.

EventID: E8080804 (hex)

Message: 2053

"Attempt to recall file failed because <x> was not found."

Severity: Error

Further explanation: None

EventID: E8080805 (hex)

Message: 2054

"<x> has a bad header."

Severity: Error

Further explanation: None

Suggestions: Recopy the file and / or delete the file.

EventID: E8080806 (hex)

Message: 2056

"Request to enter hibernate state."

Further explanation: None

EventID: 68080808 (hex)

Message: 2057

"Power up from automatic hibernate state. Program received PBT_APMRESUMEAUTOMATIC Message."

Further explanation: None

EventID: 68080809 (hex)

Message: 2058

"Power up from suspend hibernate state. Program received PBT_APMRESUMESUSPEND Message."

Further explanation: None

EventID: 6808080A (hex)

Message: 2059

"Power up from suspend hibernate state. Program received PBT_APMRESUMECRITICAL Message."

Severity: Warning

Further explanation: None

EventID: A808080B (hex)

Message: 2060

"Power up from unknown hibernate state UI recovery called. Program received no PBT_Message within the time allotted and is attempting recovery."

Severity: Warning

Further explanation: None

EventID: A808080C (hex)

Message: 2061

"<x> already exists. File is being overwritten."

Further explanation: Used only for remote applications

EventID: 6808080D (hex)

Message: 2062

"File has not been saved."

Severity: Error

Further explanation: Used only for remote applications

EventID: E808080E (hex)

Message: 2063

"File <x> has been recalled."

Further explanation: Used only for remote applications

EventID: 6808080F (hex)

Message: 2064

"State version in <x> is considered obsolete by this version of this code."

Severity: Error

Further explanation: You attempted to recall a file that is no longer valid.

Suggestions: You must recreate the file manually.

EventID: E8080810 (hex)

Message: 2065

"State version in <x> is newer than the latest version supported by this code."

Severity: Error

Further explanation: You attempted to recall a file that was created by a later version of the PNA application.

Suggestions: You must recreate the file manually.

EventID: E8080811 (hex)

Message: 2066

"Error occurred while reading file <x>"

Severity: Error

Further explanation: The file may be corrupt.

Suggestions: Try to recreate the file.

EventID: E8080812 (hex)

Message: 2067

"Windows shell error: <x>"

Severity: Error

Further explanation: None

EventID: E8080813 (hex)

Message: 2068

Send message timed out returning: <x>.

Severity: Error

Further explanation: None

EventID: E8080814 (hex)

Message: 2069

"Changing GPIB mode to System Controller."

Severity: Informational

Further explanation: None

EventID: 68080815 (hex)

Message: 2070

"Changing GPIB mode to Talker Listener."

Severity: Informational

Further explanation: None

EventID: 68080816 (hex)

Message: 2071

"The Network Analyzer can not be put in GPIB System Controller mode until the GPIB status is Local. Stop any remote GPIB programs which may be using the Network analyzer, press the Macro/Local key and try again. "

Severity: Informational

Further explanation: See **LCL and RMT Operation**

Suggestions: Press the Macro/Local key and try again.

EventID: 68080817 (hex)

Message: 2120

"This method can not be invoked through a late-bound COM call."

Severity: Error

Further explanation: None

Suggestions: Use the alternate method described in the COM programming documentation

EventID: E8080878 (hex)

Message: 2128

"The specified format is invalid."

Severity:Error

Further explanation: None

EventID: E8080850 (hex)

Message: 2129

"WINNT exception caught by Automation layer."

Severity: Error

Further explanation: None

EventID: E8080851 (hex)

Message: 2130

"Bad port specification."

Severity: Error

Further explanation: None

EventID: E8080852 (hex)

Message: 2131

"Failed to find a printer."

Severity: Error

Further explanation: None

Suggestions: See Connecting to a Printer

EventID: E8080853 (hex)

Message: 2132

"Manual trigger ignored."

Severity: Error

Further explanation: None

EventID: E8080854 (hex)

Message: 2133

"Attempt to set trigger failed."

Severity: Error

Further explanation: None

EventID: E8080855 (hex)

Message: 2134

"Macro execution failed."

Severity: Error

Further explanation: None

EventID: E8080856 (hex)

Message: 2135

"Specified macro definition is incomplete."

Severity: Error

Further explanation:

EventID: E8080857 (hex)

Message: 2137

"Block data length error."

Severity: Error

Further explanation: See Getting Data from the Analyzer

EventID: E8080859 (hex)

Message: 2139

"Requested data not found."

Severity: Error

Further explanation: None

EventID: E808085B (hex)

Message: 2142

"The parameter supplied was out of range, so was limited to a value in range before being applied to the instrument."

Severity: Success

Further explanation: None

Suggestions: View range limits before sending programming commands.

EventID: 2808085E (hex)

Message: 2143

The parameter supplied was out of range, so was limited to a value in range before being applied to the instrument.

Severity: Error

EventID: E808085F (hex)

Message: 2144

"Request failed. The required license was not found."

Severity: Error

Further explanation: None

EventID: E8080860 (hex)

Message: 2145

"A remote call to the front panel has returned hresult <x>"

Severity: Error

Further explanation: This may indicate a problem with the front panel

Suggestions: Contact Technical support

EventID: E8080861 (hex)

Message: 2146

The recall operation failed.

Severity: Error

Further explanation:

EventID: E8080862 (hex)

Message: 2147

Attempt to save file failed.

Severity: Error

Further explanation:

EventID: E8080863 (hex)

Message: 2148

Recall attempt failed because file was not found.

Severity: Error

Further explanation:

EventID: E8080864 (hex)

Message: 2149

Recall file has a bad header.

Severity: Error

Further explanation:

EventID: E8080865 (hex)

Message: 2150

Recall file version is obsolete and no longer compatible with this instrument.

Severity: Error

Further explanation:

EventID: E8080866 (hex)

Message: 2151

The recall file contains an istate version newer than this instrument. A remote call to the front panel has returned hresult %1

Severity: Error

Further explanation:

EventID: E8080867 (hex)

Message 2152

"Front Panel <x>

Severity: Error

Further explanation: None

EventID: E8080868 (hex)

Message 2153

"Front Panel message"

Severity: Informational

Further explanation: None

EventID: 68080869 (hex)

Message 2154

"Power Service <x>

Severity: Error

Further explanation: There is more than 1 instance of powerservice running. There should only be one running. This might happen after running install shield - especially when upgrading the CPU board.

Suggestions: Try rebooting. If this persists, please call Customer Support.

EventID: E808086A (hex)

Message 2155

"Power Service <x>

Severity: Informational

Further explanation: None

EventID: 6808086B (hex)

Message 2156

"The Agilent Technologies GPIB driver can not be loaded or unloaded."

Severity: Error

Further explanation: None

Suggestions: If the problem persists, from the PNA desktop, right-click on My Computer. Click Properties, Click Hardware Tab. Click Device Manager Button. Expand GPIB Devices. Right-click and click Uninstall all GPIB interfaces devices. Reboot the PNA.

EventID: E808086C (hex)

Message 2157

"The National Instruments GPIB driver can not be loaded or unloaded."

Severity: Error

Further explanation: None

Suggestions: If the problem persists, from the PNA desktop, right-click on My Computer. Click Properties, Click Hardware Tab. Click Device Manager Button. Expand GPIB Devices. Right-click and click Uninstall all GPIB interfaces devices. Reboot the PNA.

EventID: E808086D (hex)

Message 2158

"The Agilent GPIB driver is loaded but it can not start its parser."

Severity: Error

Further explanation: None

EventID: E808086E (hex)

Message: 2159

The front panel is in remote mode.

Severity: Warning

EventID: A808086F (hex)

Message: 2160

The Registry Key specified could not be found.

Severity: Error

EventID: E8080870 (hex)

Message: 2161

An overcurrent condition has been detected on a probe plugged into the front panel.

Severity: Warning

EventID: A8080871 (hex)

Message: 2162

The operation timed out.

Severity: Error

EventID: E8080872 (hex)

Message 2163

"The Network Analyzer executed a preset."

Severity:Informational

Further explanation: None

EventID: 68080873 (hex)

Message 2164

"Access to file denied."

Severity: Error

Further explanation: This means that the system can not open an output file for writing. Most likely because the file is write protected.

Suggestions: Pick another file name or file directory, check floppy disk hard disk write access.

EventID: E8080874 (hex)

Message 2165

"File type is structured storage."

Severity: Informational

Further explanation: None

EventID: 68080875 (hex)

Message 2166

"The trigger operation failed."

Severity: Error

Further explanation: None

EventID: E8080876 (hex)

Message 2167

"Argument out of range error."

Severity: Error

Further explanation: None

Suggestions: None

EventID: E8080877 (hex)

Message: 2169

The given COM object is not a custom application

Severity: Error

EventID: E8080879 (hex)

Message: 2170

The eventID supplied was not recognized as a valid PNA eventID

Severity: Error

EventID: E808087A (hex)

Message: 2171

The operation was canceled.

Severity: Error

EventID: E808087B (hex)

Message: 2172

High security level cannot be disabled directly. Only an instrument preset or recall of lower security instrument state will reset this security level.

Severity: Error

EventID: E808087C (hex)

Message: 2173

Local lockout mode is on. The PNA application will not accept input from front panel, keyboard or mouse until this mode is turned off from a remote interface.

Severity: Error

EventID: E808087D (hex)

Message: 2174

The SnP request is not valid for the selected measurement.

Severity: Error

EventID: E808087E (hex)

Message: 2175

Preset is not supported while this dialog or wizard is open. Close the dialog or wizard and then try again.

Severity: Error

EventID: E808087F (hex)

Message: 2176

The function you requested requires a capability provided by an option to the standard analyzer. That option is not currently installed.

Severity: Error

EventID: E8080880 (hex)

Message: 2177

Catastrophic error. Crash dump recorded at <n>

Severity: Error

EventID: E8080881 (hex)

Message: 2178

<n>

Severity: Error

EventID: E8080882 (hex)

Message: 2179

Failed to open gen.lic.

Severity: Error

EventID: E8080883 (hex)

Last modified:

Nov. 29, 2006	Updated bookmarks

About Error Messages

PNA errors and Operating System errors are displayed and logged in an error file. You can choose how to display PNA errors, or choose to not display PNA errors at all.

- Error Preferences
- View Error Log
- List of PNA Errors
- SCPI Errors

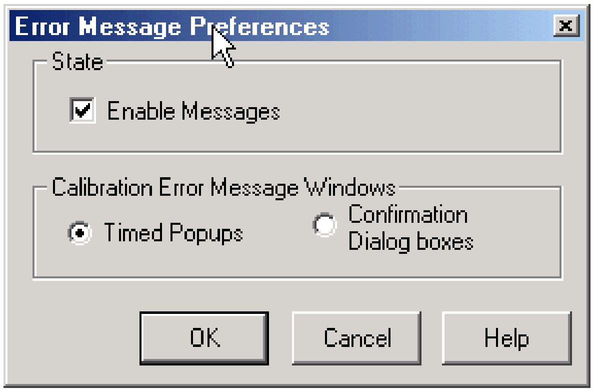
Other Support topics

Error Preferences

By default, error messages appear on the PNA screen for a brief period. You can choose to have them stay on the screen until you click an OK button, or have them not appear at all. When they stay on the screen, a Help button is available to provide further assistance.

How to select Error Preferences

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For PNA-L and E836x models	No programming commands
1. Navigate using MENU/DIALOG	1. Click Help 2. then **Error Messages** 3. then **Error Preferences**
For PNA-X and 'C' models	No programming commands
1. Press **SYSTEM** 2. then **[Help]** 3. then **[Error Messages]** 4. then **[Error Preferences]**	1. Click **Help** 2. then **Error Messages** 3. then **Error Preferences**



Error Preferences dialog box help

Enable Messages Check to display all PNA error messages as they occur. Clear to suppress the display of PNA error messages. You can still view them in the error log.

Calibration Error Message Windows

Timed Popups Displays error messages on the screen for a duration of time proportional to the length of the message. You can then view the message in the error log and get further assistance.

Confirmation Dialog boxes Displays error messages in a standard dialog box. You then choose OK or Cancel to close the dialog box, or press Help to get further information on the error message.

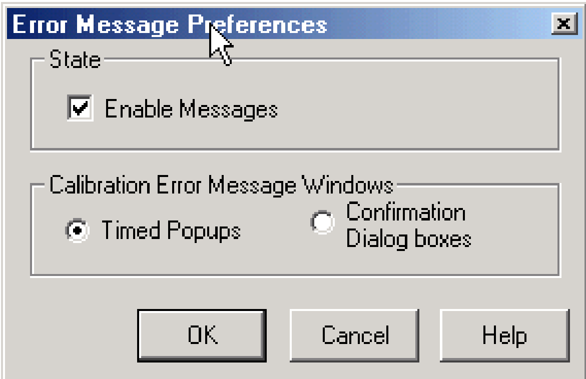
View Error Log

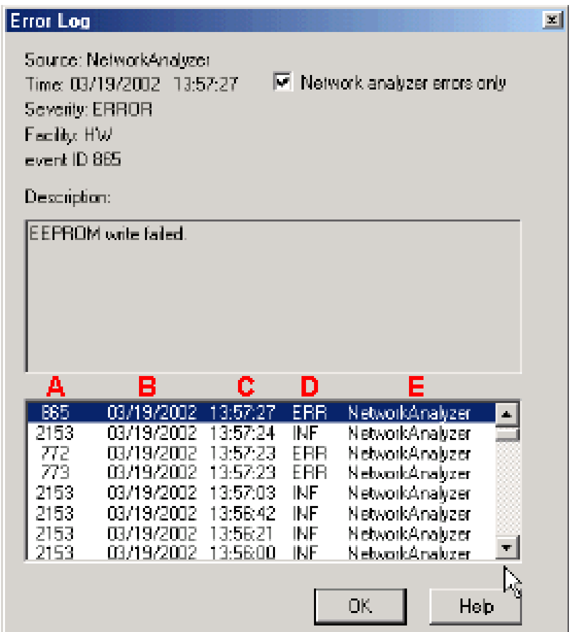
The PNA Error Log is a list of all events that have occurred. (Events are used in programming the PNA using COM.) PNA errors is a subset of PNA events. Only events with severity codes of ERROR are displayed on the PNA screen as they occur. From the error log, you can access further help with an error by selecting the error and clicking Help.

How to view the Error Log

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For PNA-L and E836x models	No programming commands
1. Navigate using MENU/DIALOG	1. Click **Help** 2. then **Error Messages** 3. then **View Error Log**
For PNA-X and 'C' models	No programming commands
1. Press **SYSTEM** 2. then **[Help]**	1. Click **Utility** 2. then **System**

3. then **[Error]**	3. then **Help** 4. then **Error**





Error Log dialog box help

Network analyzer errors only Select to view only PNA errors. Clear to view all errors that occur on all applications of the computer.

Description Error message that appears on the PNA screen.

A - Event ID Error message number

B - Date the Error occurred

C - Time the Error occurred

D - Severity Code - All events have one of the following severity codes:

- SUCcess - the operation completed successfully
- INFormational - events that occur without impact on the measurement integrity
- WARning - events that occur with potential impact on measurement integrity
- ERRor - events that occur with serious impact on measurement integrity

E - Application in which the error occurred.

OK Closes the Dialog box

Help Provides further information on the selected Error message

To clear the Error Log:

1. From the **View** menu click **Minimize Application**
2. On the desktop, select **Start, Settings, Control Panel**
3. On the Control Panel, click **Administrative Tools**
4. On the Administrative Tools window, click **Event Viewer**
5. On the Event Viewer window, right-click **Application Log**
6. Select **Clear all Events**
7. If you want to save a file with the contents of the Event Log, click **Yes**. Otherwise, click **No**

To restore the PNA application, click on the PNA Analyzer taskbar button at the bottom of the screen

Last Modified:

1-Jan-2007 MX Added UI

Analyzer Accessories

- Coax Mechanical Calibration Kits
- Waveguide Mechanical Calibration Kits
- Electronic Calibration (ECal)
- Mechanical Verification Kits
- Adapter and Accessory Kits
- Test Port Cables
- USB Peripherals
- Connector Care and Cleaning Supplies
- ESD Protection

Other Support topics

For product and order information:

- Call 1-800-452-4844 (8am-8pm EST)
- Visit www.agilent.com/find/accessories
  Use the search function to locate information about a particular accessory or view the entire RF and Microwave Test Accessories Catalog.

Accessories are available in these connector types:

- 50 ohm Type-N
- 75 ohm Type-N
- 3.5 mm
- 7 mm (APC-7)
- 7-16
- 2.92 mm
- 2.4 mm
- 1.85 mm
- 1 mm

Test port cables and a calibration kit are necessary for a complete measurement system.

A verification kit is used to verify corrected system performance.

See the connector type for each PNA model

Coax Mechanical Calibration Kits

Model	Connector Type	Frequency Upper Limit
85032B	Type-N (50 Ohm)	6 GHz
85032F	Type-N (50 Ohm)	9 GHz
85054B	Type-N (50 Ohm)	18 GHz
85036E	Type-N (75 Ohm)	3 GHz
85050B	7 mm	18 GHz
85033D	3.5 mm	6 GHz
85038A	7-16	7.5 GHz
85033E	3.5 mm	9 GHz
85052B	3.5 mm	26.5 GHz
85052C	3.5 mm TRL	26.5 GHz
85056K	2.92 mm	50 GHz
85056A	2.4 mm	50 GHz
85058B/E (data-based)	1.85 mm	67 GHz
85059A (data-based)	1.00 mm	110 GHz

Waveguide Mechanical Calibration Kits

Model	Connector Type	Frequency Range
X11644A	WR-90	8.2-12.4 GHz
P11644A	WR-62	12.4-18 GHz
K11644A	WR-42	18-26.5 GHz
R11644A	WR-28	26.5-40 GHz
Q11644A	WR-22	33-50 GHz
U11644A	WR-19	40-60 GHz
V11644A	WR-15	50-75 GHz

Electronic Calibration (ECal)

Model	Connector Type	Frequency Range
RF Two-Port		
85091C	7 mm (APC-7)	300 kHz-9 GHz
85092C	Type-N (50 ohm) Port B available with 3.5 mm or 7-16[a]	300 kHz-9 GHz
85093C	3.5 mm Port B available with Type-N (50 ohm) or 7-16[a]	300 kHz-9 GHz
85096C	Type-N (75 ohm)	300 kHz-3 GHz
85098C	7-16[a] Port B available with Type-N (50 ohm) or 3.5 mm	300 kHz-7.5 GHz
85099C	Type-F	300 kHz-3 GHz
RF Four-Port		
N4431B Option 010	3.5mm (f) (four-port)	300 kHz-13.5 GHz

N4431B Option 020	Type-N (f) (four-port)	300 kHz-13.5 GHz
N4432A Option 020	Type-N (f) (four-port)	300 kHz-18 GHz (available Feb. 2006)
N4432A Option 030	APC 7 (four-port)	300 kHz-18 GHz (available Feb. 2006)
N4433A Option 010	3.5mm (f) (four-port)	300 kHz-20 GHz (available Feb. 2006)
Microwave Two-Port		
N4690B	Type-N (50 ohm)	300 kHz-18 GHz
N4691B	3.5 mm	300 kHz-26.5 GHz
N4692A	2.92 mm	10 MHz-40 GHz
N4693A	2.4 mm	10 MHz-50 GHz
N4694A	1.85 mm	10 MHz-67 GHz
N4696BA	7 mm	300 kHz-18 GHz

a Limits ECal module high frequency to 7.5 GHz.

Verification Kits

Model	Connector Type	Frequency Range
85055A	Type-N (50 Ohm)	300 kHz-9 GHz
85053B	3.5 mm	300 kHz-26.5 GHz
85057B	2.4 mm	.045-50 GHz
R11645A	WR-28	26.5-40 GHz
Q11645A	WR-22	33-50 GHz

Adapters and Accessory Kits

Model	Description
11878A	Type-N to 3.5 mm Adapter Kit
11525A	Type-N (m) to 7 mm (APC-7)
11853A	Type-N Accessory Kit
11900B	2.4 mm (f) to 2.4 mm (f)
11900C	2.4 mm (f) to 2.4 mm (m)
85130G	Test Port Adapter Set, 2.4 mm (f) to 2.4 mm (m,f)
11901B	2.4 mm (f) to 3.5 mm (f)
11901D	2.4 mm (f) to 3.5 mm (m)
85130F	Test Port Adapter Set, 2.4 mm (f) to 3.5 mm (m,f)
11902B	2.4 mm (f) to 7 mm (APC-7)
11920A	1 mm (m) to 1 mm (m)
11920B	1 mm (f) to 1 mm (f)
11920C	1 mm (m) to 1 mm (f)
11921A	1 mm (m) to 1.85 mm (m)
11921B	1 mm (f) to 1.85 mm (f)
11921C	1 mm (m) to 1.85 mm (f)
11921D	1 mm (f) to 1.85 mm (m)
11922A	1 mm (m) to 2.4 mm (m)
11922B	1 mm (f) to 2.4 mm (f)
11922C	1 mm (m) to 2.4 mm (f)
11922D	1 mm (f) to 2.4 mm (m)

Test Port Cables

Model	Description
N4697E	1.85 mm (f) to 1.85 mm (rugged f) flexible (single)
N4697F	1.85 mm (rugged f, f) to 1.85 mm (rugged m, rugged f) flexible (set)
N6315A	Type-N (m) to Type-N (f), 16 in. (single)
N6314A	Type-N (m) to Type-N (m), 24 in. (single)
85133D	2.4 mm (f) to 2.4 mm (m,f) semi-rigid (set)
85133F	2.4 mm (f) to 2.4 mm (m,f) flexible (set)
85134D	2.4 mm (f) to 3.5 mm (m,f) semi-rigid (set)
85134F	2.4 mm (f) to 3.5 mm (m,f) flexible (set)

USB Peripherals

Model	Description
N4688A	**CD RW drive -** with USB cable.
N4689A	**USB 4-port hub** - for connecting additional USB peripherals.
82357A	**USB/GPIB Interface** - for controlling GPIB devices through USB. Learn more about using the 82357A with the PNA

Connector Care and Cleaning Supplies

Part Number	Description
9301-1243	Lint-Free Swabs (small), 100 ct.
8500-5344	IPA 99.5% alcohol, 30 ml. bottle
8500-6659	Compressed Air, 235 ml. can
5021-7607	Type-N Contact Removal Tool
1401-0225	Standard End-Cap, Type-N (m)
1401-0248	ESD Safe End-Cap, Type-N (m)
1401-0225	Standard End-Cap, Type-N (f)
1401-0247	ESD Safe End-Cap, Type-N (f)

ESD Supplies

Part Number	Description
9300-1367	Adjustable antistatic wrist strap
9300-0980	Antistatic wrist strap grounding cord (5 foot)
9300-0797	Static control table mat (2 foot x 4 foot) with earth ground wire
9300-1126	ESD heel strap

82357A USB / GPIB Interface

The Agilent 82357A is an adapter that creates a GPIB Interface from one of your unused PNA USB ports.

- Applications
- Installing
- Configuring
- Connecting
- Communicating with other Equipment

Applications

The 82357A can be used for the following PNA applications:

- **Frequency Converter Application** - The 82357A is included with the Frequency Converter Application (option 083). External sources MUST be connected to this Interface if controlling the PNA using an external PC. See connecting diagram below. To learn more, see Configure an external LO source.

Note: If the PNA is hibernated during an FCA measurement involving an external source under FCA control, and then the PNA is restarted, a VISA error message will appear stating "VI_ERROR_INV_OBJECT." To correct this problem, the 82357 USB/GPIB interface must be reinitialized after hibernation. This is done by clicking on the Accept button in the interface initialization dialog box. The green READY light on the interface will illuminate.

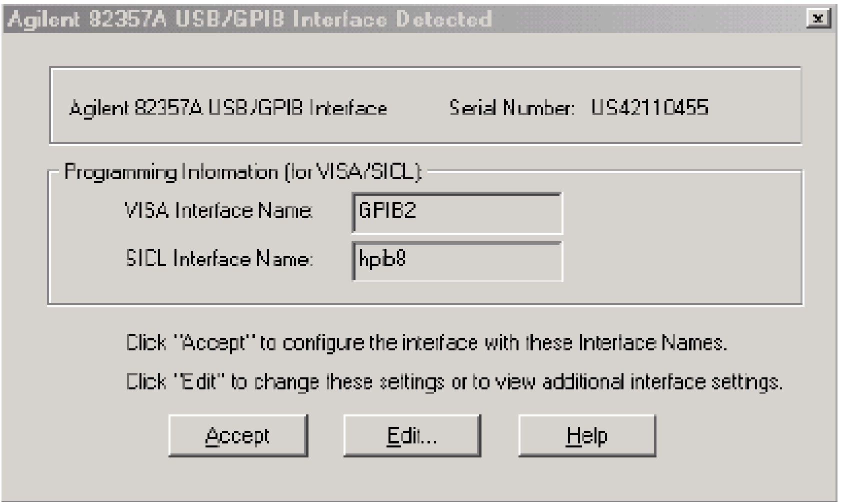
- **PNA Controller** - The 82357A can be used by the PNA to control other GPIB devices. This frees the default GPIB interface to perform other GPIB operations, such as control the PNA from an external PC.
- **Source Power Cal** - The 82357A can be used to run a source power calibration.

Installing the 82357A USB/GPIB Interface

1. Download and install firmware PNA revision 3.0 or greater. To check the revision of your PNA firmware, click **Help** then **About Network Analyzer.**
2. Upgrade to the latest Agilent IO libraries from the CDROM that was shipped with the 82357A. If not available, download them from www.Agilent.com (search for **82357A)**

Configure the 82357A USB/GPIB Interface

When the 82357A is connected to the PNA USB, the following dialog box appears:



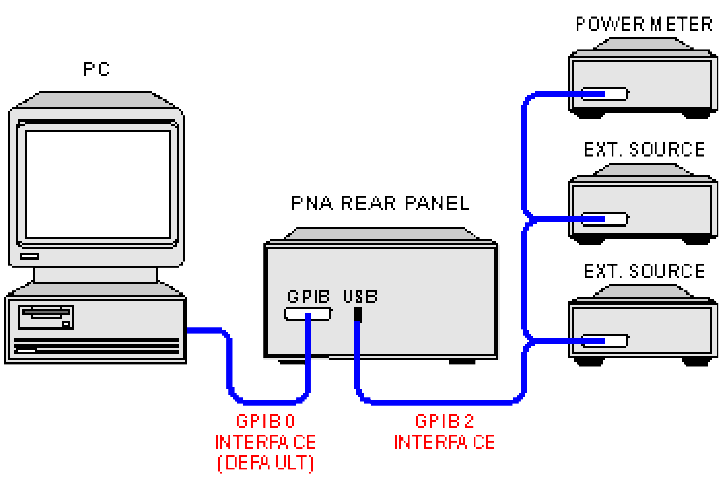
Normally, you do NOT need to edit these settings. The 82357A USB/GPIB Interface is configured automatically as the next unused VISA interface. This is usually **GPIB2** unless you have already configured it for another purpose.

If the VISA Interface Name appears as GPIB0 or GPIB1, these Interfaces must be returned to their default settings for the 82357A to work properly with the PNA. See Configure for VISA / SICL to learn how.

Connecting the 82357A USB/GPIB Interface

The following diagram illustrates how to connect GPIB test equipment using the USB/GPIB Interface.

- Plug the USB/GPIB Interface into any unused PNA USB port.
- The default GPIB Interface and USB/GPIB Interface should never be connected together.



Communicating with Equipment Connected to the USB/GPIB Interface

- The Frequency Converter Application will automatically find and communicate with test equipment that is connected to the USB/GPIB Interface.
- Source power calibration will automatically find and communicate with the power meter that is connected to the USB/GPIB Interface.

- To control other devices through your own program using the 82357A, you must include the new GPIB Interface number when addressing the devices.

Firmware Upgrade

PNA firmware upgrades are available to you at no cost in a self-extracting Install Shield file. The upgrade includes the PNA application, Online help, and Service Utilities. Note: The file is **at least** 50 MB.

The following options are available for you to upgrade your PNA application:

- Auto-Check and AgileUpdate If your PNA is connected to the Internet, these utilities will automatically check for, download, and install, the new firmware and associated files when the PNA application is started. You will be prompted before this occurs.
- Website Access If your PNA is NOT connected to the Internet, but you have a PC that is, you can download the PNA firmware and associated files to a storage medium.

To manually check the version of firmware on the PNA, click Help, then About Network Analyzer.

Note: After a firmware upgrade...

- Custom Cal Kits must be imported. Learn more
- If a different desktop icon named "Network Analyzer" exists, the shortcut to the PNA application will assume the same icon. Right-click on the desktop, then click **Refresh**.

Other Support Topics

Auto-Check

With Internet access to your PNA, Auto-Check automatically and regularly checks the Internet for new PNA firmware revisions. If a new revision is found, a notification message prompts you to run the AgileUpdate utility, which then performs the actual download.

Without Internet access to your PNA, Auto-Check provides a reminder prompt at the selected intervals.

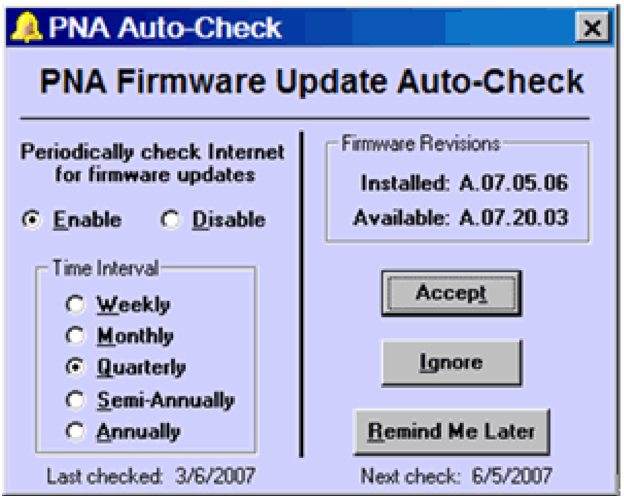
Auto-Check is run only when the PNA application is started. Once the PNA application is running, it will not check for updates again until it is restarted.

When Auto-Check runs, it checks the following conditions:

- Is there an active connection to the Internet?
- Is the Auto-Check utility enabled?
- Is it time to check for new firmware?
- Does new firmware exist?

If all of these conditions are true, Auto-Check shows the following dialog box.

If all of these conditions are NOT true, or to change these settings at any time, click **System, Service,** then **AgileUpdate**. From within AgileUpdate, click **AutoCheck**. These preferences are stored in the PNA registry. Future firmware upgrades will not change these settings.



PNA Auto-Check dialog box help
Enable When the PNA application is started, Auto-Check will search the PNA website for firmware updates at the selected time interval. **Disable** When the PNA application is started, Auto-Check will NOT search the PNA website for firmware updates. **Time Interval** Select the time interval Auto-Check is to search for firmware updates. **Accept** Starts update process. **Ignore** No further action is taken until the selected time interval has elapsed. **Remind Me Later:** This window is displayed again after 1-20 days depending upon the time interval selected.

AgileUpdate

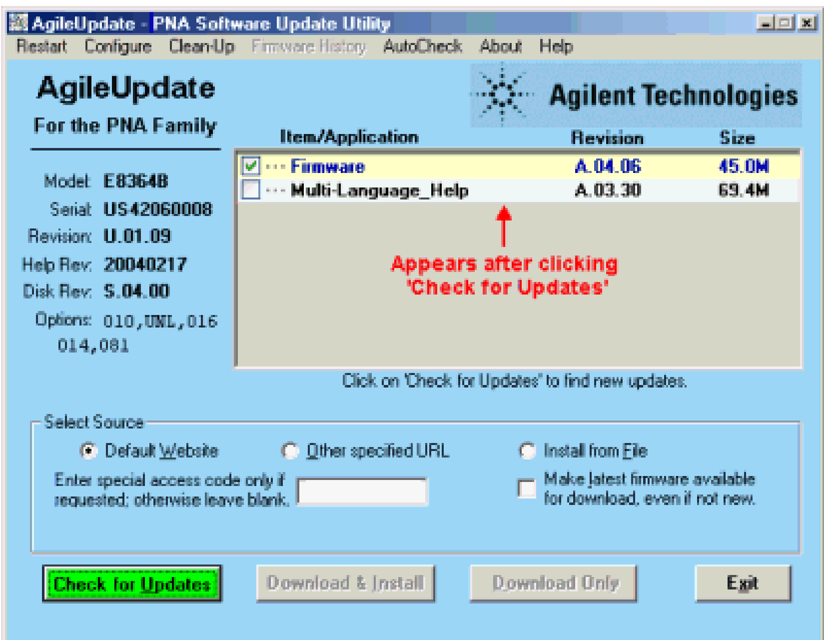
Note: You must have administrative privileges on the analyzer to run this utility. See Set Up Analyzer Users.

How to start AgileUpdate

Connect the PNA to the Internet. A LAN connection is recommended because a firmware download can take many hours using a modem.

Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For PNA-L and E836x models	No programming commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Service** 3. then **AgileUpdate**

For [PNA-X]() and ['C' models]()	No programming commands
1. Press **SYSTEM** 2. then **[Service]** 3. then **[AgileUpdate]**	1. Click Utility 2. then **System** 3. then **Service** 4. then **AgileUpdate**
1. Click **Check for Updates**. 2. If updates exist, click **Download & Install**.	



AgileUpdate dialog box help

Note: Your privacy is important to Agilent. AgileUpdate does NOT send ANY information from the PNA to the server. It only downloads from the server to the PNA.

Restart Click to restart from the beginning.

Configure Click to launch the Configure dialog box.

Clean-up Click to delete all but the two most recent install shield packages from the PNA hard drive.

Firmware History Available after clicking **Check for Updates**.

Auto-Check Launches the Auto-Check dialog box.

Item / Application Lists the items available for download at the firmware website.

- Click on items with **i** to read more information about the download.
- Items in RED should be downloaded and installed individually.
- Multi-language help includes all help files except English.

Note: The firmware includes the help file. Therefore, only the firmware checkbox will be selected if a new version for both the firmware and the help file are available.

Select Source

Default Website The Agilent site that contains upgrade FW.

Other Specified URL Click if you were instructed to get firmware from a different website.

Install from File Click if you have already downloaded the InstallShield package and want AgileUpdate to install it for you.

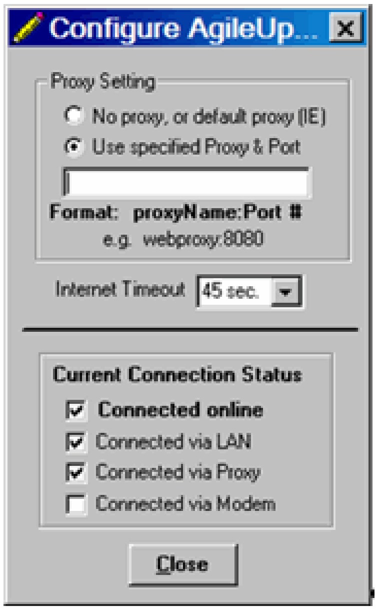
Special Access Code... Type in the code if you were given one from Agilent Technical Support. Otherwise, leave blank.

Make Latest Firmware Available... Select this checkbox if you want to download the latest firmware, even if it is not new.

Check for Updates Click to look for firmware updates at the Agilent website. If there are newer versions, the files will be listed.

Download and Install When updates are found, this selection becomes available. Some files may be pre-checked. Be sure the corresponding boxes are checked for the files you want to download. Then click to download and install the update.

Download Only Click to download the files to the analyzer hard disk and install the files at a later time. At that time, click **Install from File.**



Configuration dialog box help

Note: If AgileUpdate will not connect, try to access ANY Internet website. Contact your local IT department if necessary.

Proxy Setting

No Proxy or Default Proxy Click if you use a LAN connection. AgileUpdate will automatically use the proxy specified in Internet Explorer.

Use specified Proxy / Port Click to enter the proxy name and port. The format is: proxyName:portNumber. (The proxy port number is typically 8088).

Internet timeout If you are using an automatic dial-up Internet connection you may need to increase the timeout.

Current Connection Status Shows the current status of the PNA connection to the Internet.

Note: These settings are NOT saved; they must be re-entered each time AgileUpdate is run.

Agilent Website Access

If you cannot access the Internet directly with your PNA, you can use an external PC with Internet access to download the file from the Agilent website. You can then transfer the file from your PC to your analyzer over a LAN or other means.

1. Go to http://na.tm.agilent.com/pna/firmware
2. Click on the firmware to be downloaded.
3. Save the program to disk (hard drive of your PC).
4. Transfer the file from your PC to your PNA using LAN, CD, or USB Pen drive.
5. Double-click the file on the PNA.

Warning: You can save the upgrade file to your PC, but do not attempt to install the PNA application on your PC. It will alter system settings and can result in system crashes.

PNA Configurations and Options

Included with each PNA is a mouse, keyboard. This topic presents standard PNA models and the available options and upgrades.

- **PNA Models**
  - **PNA-X Series (N5242A)**
  - **PNA L Series (N230A and N5230C)**
  - **Microwave Models (E836x A/B/C)**
  - **RF Models (Discontinued)**
  - **mmWave Model (N5250A**
- **Common Options and Upgrade Kits**
- **Warranty Period**

To view the options that are installed on your analyzer, click **Help** then **About Network Analyzer**

A documentation CD-ROM is no longer included in each PNA shipment (Feb.05).

New PNA 'C' Models

In Spring 2008, new PNA 'C' models were introduced that will eventually replace the PNA-L and Microwave 'A' and 'B' models. The new 'C' models have the PNA-X User Interface capabilities, including touchscreen and softkeys. In addition:

- The 'C' models have a bigger 8.4" display screen.
- The 'C' models share the same Specifications as their 'A' and 'B' model counterparts.
- Upgrades from 'A' and 'B' to 'C' models are available.

Note: The term **'Legacy'** that is used in this help file refers to the PNA models that were introduced before the PNA-X (N5230A, E836xA/B, and all discontinued models).

Other Support Topics

PNA-X Series Model N5242A

Base Options

Note: To see if your PNA has a **Reference Receiver for each Test Port**, scroll down to see the number of test ports and number of reference receivers. If they are equal, then there is a reference receiver for each test port.

Click the model or option number to see a block diagram.

Click the **Option number** to see the block diagram.

Click the **Connector type** to see the connector specifications.

Option	Frequency Range	Requires	Test Ports	Reference Receivers	Sources	Test Set
200	10 MHz to 26.5 GHz	Opt 080	**2**	**2**	**1**	Includes six front-panel access loops
400	10 MHz to 26.5 GHz	**None**	**4**	**4**	**2**	Includes twelve front-panel access loops

Extended capabilities

Option	Requires Options...	Description
224	200, 219, and 080	Add internal 2nd source, combiner, and mechanical switches.
423	400, 419 and 080	Add combiner and mechanical switches.
219	200	Adds: • 65 dB source attenuator (5dB steps) • Bias-tees between each source and each test port • 35 dB receiver attenuator (5dB steps).
419	400 (080 recommended)	Adds: • 65 dB source attenuator (5dB steps). • Bias-tees between each source and each test port. • 35 dB receiver attenuator (5dB steps).
020	None	Add IF inputs on the rear panel for antenna and millimeter-wave.
021	None	Add pulse modulator to internal Source1. Learn more.
022	None	Add pulse modulator to internal Source2. Learn more.
025	None	Add four internal pulse generators. Learn more.
029	Noise Figure Application	Adds hardware and firmware for high-accuracy noise figure measurements, utilizing Agilent's unique source-correction technique. Learn more.

086	Gain Compression Application	Adds firmware for fast and accurate gain compression measurements. Learn more.

PNA-L Series Model N5230A and N5230C See note

Click the **Option number** to see the block diagram.

Click the **Connector type** to see the connector specifications.

Option	Frequency Range	Test Ports	Reference Receivers	Connector	Test Set
020	300 KHz* to 6 GHz	**2**	**2**	3.5 mm Male	**Standard**
025	300 KHz* to 6 GHz	**2**	**2**	3.5 mm Male	**Configurable**
120	300 KHz* to 13 GHz	**2**	**2**	3.5 mm Male	**Standard**
125	300 KHz* to 13 GHz	**2**	**2**	3.5 mm Male	**Configurable**
140	300 KHz* to 13.5 GHz	**4**	**1**	3.5 mm Male	**Standard**
145	300 KHz* to 13.5 GHz	**4**	**1**	3.5 mm Male	**Configurable[2]**
146	300 KHz* to 13.5 GHz	**4**	**1**	3.5 mm Male	**Configurable[3] + Second Source**
220	10 MHz* to 20 GHz	**2**	**2**	3.5 mm Male	**Standard**
225	10 MHz* to 20 GHz	**2**	**2**	3.5 mm Male	**Configurable**
240	300 KHz* to 20 GHz	**4**	**1**	3.5 mm Male	**Standard**
245	300 KHz* to 20 GHz	**4**	**1**	3.5 mm Male	**Configurable[2]**
246	300 KHz* to 20 GHz	**4**	**1**	3.5 mm Male	**Configurable[3] + Second Source**
420	10 MHz* to 40 GHz	**2**	**2**	2.4 mm Male	**Standard**
425	10 MHz* to 40 GHz	**2**	**2**	2.4 mm Male	**Configurable**
520	10 MHz* to 50 GHz	**2**	**2**	2.4 mm Male	**Standard**
525	10 MHz* to 50 GHz	**2**	**2**	2.4 mm Male	**Configurable**

* Typical specs apply

Test Set

Standard NO Configurable Test Set.

Configurable (2-port) - Adds six front panel access loops and two 60 dB step attenuators in 10 dB steps.

Configurable[2] (4-port) - Adds nine front panel access loops and one 60 db step attenuator in 10 dB steps.

Configurable[3] (4-port)- Adds nine front panel access loops and two 60 db step attenuators in 10 dB steps.

Microwave Standard Models (see options)

Click the **PNA model** to see the block diagram.

Click the **Connector type** to see the connector specifications.

PNA Model	Frequency Range	Test Ports	Reference Receivers	Connector Type	Front Panel Jumpers
E8361A E8361C	10 MHz* to 67 GHz (tunable to 70 GHz)**	**2**	**2**	1.85 mm Male	**0**
E8362A	45 MHz to 20 GHz	**2**	**2**	3.5 mm Male	**0**
E8363A	45 MHz to 40 GHz	**2**	**2**	2.4 mm Male	**0**
E8364A	45 MHz to 50 GHz	**2**	**2**	2.4 mm Male	**0**
E8362B E8362C	10 MHz* to 20 GHz	**2**	**2**	3.5 mm Male	**0**
E8363B E8363C	10 MHz* to 40 GHz	**2**	**2**	2.4 mm Male	**0**
E8364B E8364C	10 MHz* to 50 GHz	**2**	**2**	2.4 mm Male	**0**

Legend

No longer produced

* Typical specs apply from 10 to 45 MHz

** Typical specs apply from 67 to 70 GHz

New models See note

RF Standard Models (see options)

Click the **Connector type** to see the connector specifications.

PNA Model	Frequency Range	Ports	Connector Type	Reference Receivers	Front Panel Jumpers
E8356A	300 kHz to 3 GHz	**2**	Type-N Female	**2**	**4**
E8357A	300 kHz to 6 GHz	**2**	Type-N Female	**2**	**4**
E8358A	300 kHz to 9 GHz	**2**	Type-N Female	**2**	**4**
E8801A	300 kHz to 3 GHz	**2**	Type-N Female	**1**	**0**
E8802A	300 kHz to 6 GHz	**2**	Type-N Female	**1**	**0**
E8803A	300 kHz to 9 GHz	**2**	Type-N Female	**1**	**0**
N3381A	300 kHz to 3 GHz	**3**	Type-N Female	**1**	**0**
N3382A	300 kHz to 6 GHz	**3**	Type-N Female	**1**	**0**
N3383A	300 kHz to 9 GHz	**3**	Type-N Female	**1**	**0**
All RF models are no longer produced (June 1, 2005).					

Millimeter Wave PNA

PNA Model	Frequency Range	Ports	Connector Type	Reference Receivers	Front Panel jumpers
N5250A **N5250C** See note	10 MHz* to 110 GHz	**2**	1.0 mm	**2**	**N5260A**

* Typical specs apply from 10 to 45 MHz

Test heads to 325 GHz are also available

Upgrade your existing E836xB with the following:

- H11 option
- N5260A Test Set
- Millimeter-Wave VNA Frequency Extension Modules from Oleson Microwave Labs Extension Modules

Options and Upgrade Kits

The following options are installed at the time of purchase, and some are also available after the initial purchase of a PNA. To order an upgrade, contact your Agilent representative.

Option	Supported Models	Description
006	E8356A E8801A N3381A	**Upgrade to 6 GHz frequency range. (No longer available)** Adds 6 GHz operation. Includes installation at an Agilent service center. Instrument calibration (required after frequency upgrade) is available for an additional fee.
009	E8356/7A E8801/2A N3381/2A	**Upgrade to 9 GHz frequency range.(No longer available)** Adds 9 GHz operation. Includes installation at an Agilent service center. Instrument calibration (required after frequency upgrade) is available for an additional fee.
010	All	**Time-domain** Adds time-domain capability to analyzer. The serial number of the analyzer must be specified when ordering this kit. Software upgrade. Learn more about Time Domain Learn how this option is enabled.
014	E8361A E8362/ 63/ 64B	**Configurable test set** Adds front panel access to the source output and coupler input on test ports 1 and 2. Adds front panel access directly to all receivers, including the reference receiver. Upgrade includes installation at an Agilent service center.
015	E8356/ 57/ 58A	**Configurable test set (No longer available)** Adds front panel access to the source output and coupler input on test ports 1 and 2. Adds 35 dB step attenuators between the couplers and receivers. Upgrade includes installation at an Agilent service center.
016	E8361A E8362/ 63/ 64B	**Receiver Step Attenuators** Adds two step attenuators. (E8361A adds 50 dB step attenuators with 10 dB resolution; all other PNA models add 35 dB step attenuators with 5 dB resolution.) Each attenuator is inserted between a test port and its corresponding receiver. Requires option UNL.
022	E8361A E8362/ 63/ 64B	**Extended Memory** Adds more RAM for a total of 512MB. Learn more about PNA RAM
080	E8361A E8362/ 63/ 64B [illegible]	**Frequency Offset** Enables you to set the PNA source independently from where the receivers

	N5230A N5242A	are tuned. This capability is important for measuring mixers, converters, and amplifiers. To control the additional hardware, a basic user interface, SCPI, and COM commands are provided. Requires option 014 or Active test set (N5230A).
081	E8361A E8362/ 63/ 64B	**Reference Switch** Adds an internal solid state switch in the R1 reference path for controlling an external reference mixer. Requires option 014 and opt 080 See a block diagram which includes the reference switch.
082	All	**Scalar Mixer Measurements** Allows Only the Scalar Mixer Converter (SMC) portion of the Frequency Converter Measurement Application. Provides the same intuitive user-interface, easy calibration, and external source control for making fixed and swept LO Scalar Mixer measurements. When used with a multiport PNA or external test set, SMC is only available on PNA ports 1 and 2. Requires Opt 080. Learn more.
083	E8361A E8362B/ 63B/ 64B N5242A	**Frequency Converter Measurement Application** Provides an intuitive user-interface for making extremely accurate conversion loss and absolute group delay measurements on mixers and converters. Exceptional amplitude and phase accuracy is achieved through two new calibration techniques: Scalar Mixer Calibration and Vector Mixer Calibration. The application also provides automatic control of all of Agilent's major signal sources. Requires option 014, 080, and 081. Learn more
084	E8361A E8362B/ 63B/ 64B N5242A	**Embedded LO** Provides the ability to measure frequency converters that have an embedded LO. Learn more
098	E8356/ 57/ 58A	**CPU board upgrade (No longer available)** Replaces the 266 MHz CPU board with a 500 MHz CPU board. Upgrade includes installation at an Agilent service center. Learn how to check your PNA CPU speed. See also **1.1 GHz** CPU board (Dec. 2005)
1E1	E8801/ 02/ 03A N3381/ 82/ 83A	**70 dB step attenuator (No longer available)** Adds a single 70 dB step attenuator that is switched between the source and each output port to extend the output power to -85 dBm. **Note**: Two 70 dB step attenuators are standard equipment with PNA models E8356/ 57/ 58A. Upgrade includes installation at an Agilent service center.

1E5	E8801/ 02/ 03A N3381/ 82/ 83A	**High stability 10 MHz time base (No longer available)** Replaces 10 ppm time base with a 1 ppm time base. High stability time base is standard with PNA models E8356/ 57/ 58A and E8362/ 63/ 64B.
550	E8361A E8362B/ 63B/ 64B N5230A	**Add full 4 port capability and differential measurements -** Learn more. Requires a PNA with configurable test set. E836x Opt 014 or N5230A Opt. x25
551	E8361A E8362B/ 63B/ 64B N5230A	**Add fully integrated measurements at all of the available test ports.** Solutions and PNA requirements depend on the supported test set. See http://www.agilent.com/find/multiport
H08	E8361A E8362B/ 63B/ 64B N5242A	**Narrowband Pulsed Measurement Application** Provides the Pulsed Application for average pulse and point-in-pulse measurements. E836x models require options H11, UNL, 014, 080, and 081.Learn more See N5242A options for more information.
H11	E8361A E8362B/ 63B/ 64B	**IF Access** Provides rear panel access to the PNA IF paths for: • Extended frequency coverage to 325 GHz • Pulsed measurement capability • Advanced antenna measurements Requires options UNL, 014, 080, and 081. Learn more
UNL	E8361A E8362/ 63/ 64A E8362/ 63/ 64B	**Extended power range and bias tees** Adds two step attenuators and two bias tees. (E8361A adds 50 dB step attenuators; E8362/ 63/ 64A/B adds 60 dB step attenuators. All attenuators have a 10 dB resolution.) A step attenuator and bias-tee set is inserted between the source and test port 1 and another set between the source and test port 2. Upgrade includes installation at an Agilent service center.

Certification Options

Option	Supported Models	Description
1A7	E8361A E8362B/ 63B/ 64B N5250A	Complete set of measurement data which was acquired from testing your PNA to published specifications. Includes calibration label, calibration certificate, and data report. Conforms to ISO 9001.
UK6	E8361A E8362B/ 63B/ 64B N5250A	Complete set of measurement data which was acquired from testing your PNA to published specifications. Includes calibration label, ISO 17025 calibration certificate, data report, measurement uncertainties and guard bands on all specifications. Conforms to ISO17025 and ISO 9001.

Documentation and Localization Options

Description
Printed versions of PNA Help in pdf format are available at www.agilent.com/find/pna. (Apr.2005
A documentation CD-ROM is no longer included with each PNA shipment (Feb.2005).
To download a service guide for your PNA, or the latest version of PNA Help, visit www.agilent.com/find/pna, search for your PNA model, then click Library.

PNA Warranty Period

The actual warranty on your instrument depends on the date it was ordered as well as whether or not any warranty options were purchased at that time. To determine the exact warranty on your instrument, contact Agilent Technologies with the model and serial number of your instrument.

For online information about Agilent's service and support products visit: www.agilent.com/find/tm_services.

Last modified:

25-Oct-2007	Added C models
5-Sep-2007	Added Embedded LO
9/26/06	MQ Added PNA-L 4port models
9/27/06	MX Added PNA-X

Option Enable Utility

The Option Enable utility allows you to perform the following activities on your PNA.

- Enable or remove software options and some hardware options.
- Recover option data if the hard drive or other data-containing assembly is replaced.
- Input or change a serial number.

The following items are discussed in this topic:

- **Keywords**
- **Running the Program**
- **Removing an Option**
- **Installing an Option**
- **Repairing and Recovering Option Data**
- **Installing or Changing the Serial Number**

See Also

See PNA Configurations and Options

Keywords

To add certain options, you need a keyword that is provided by Agilent. There are two types of keywords:

- **Option Keywords** add a software option.
- **Model Keywords** may be required if you replace multiple assemblies.

Keywords are linked to the PNA **Host ID**, which is displayed on the Option Enable dialog box (below).

Temporary and Permanent Options

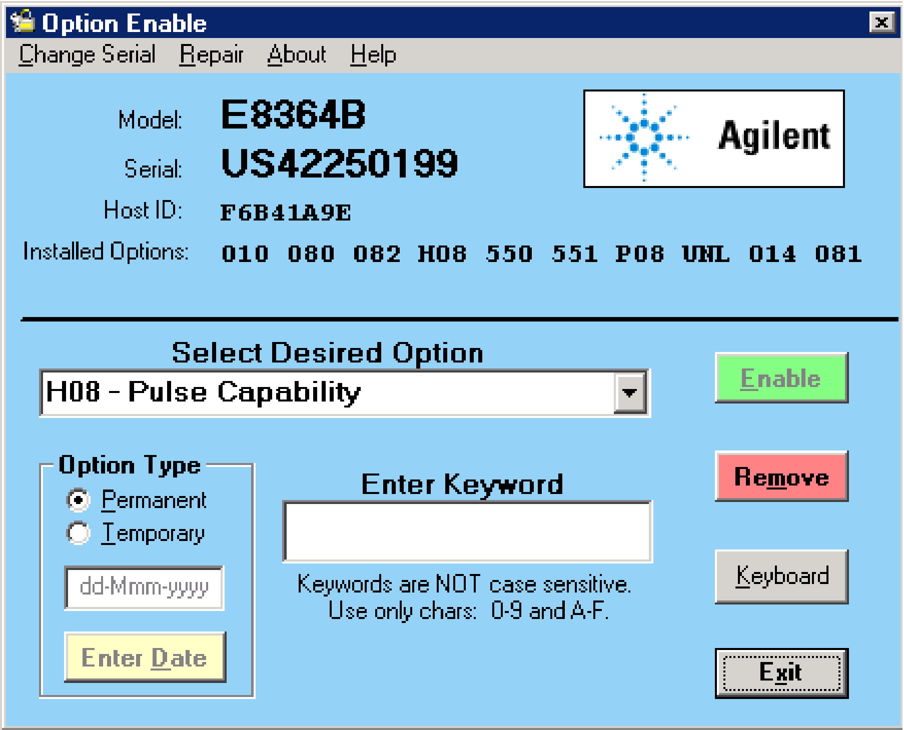
Any software option can also be installed on a temporary basis for a specified amount of time. This allows you to evaluate a specific feature or capability at no cost.

If the license key provided by Agilent has an expiration date, you must select the "temporary" option and enter the expiration date exactly as stated in the license statement. If you decide to make this option permanent, Agilent will provide a new keyword that converts the option to permanent status.

For either permanent or temporary software options, a provided keyword must be entered.

Running the Program

On the PNA, click **System,** point to **Service**, then click **Option Enable**.



1. To enable or remove an option, select it from the drop-down list of available options. If the desired option is not listed, select the last choice in the list, labeled **Enter Unlisted Option**.
2. Enter the 3-character option name and click **Enter**

If a software option was chosen, the following occurs.

- The **Remove** button will be enabled.
- The keyword entry area becomes visible.
- The permanent/temporary selection is enabled.

If a hardware option is selected, the following occurs.

- With the hardware option already installed, the **Remove** button is enabled.
- With the hardware option not installed, the **Enable** button is enabled.

Removing an Option

1. To remove an option, click **Remove**.
2. After the option is removed, restart the network analyzer application for the changes to take effect.

Note: Removal of a licensed option (such as Option 010, Time Domain) will permanently remove the license keyword. If this option **may** be needed in the future, then record the license keyword before removing the option. Do this by copying the file “gen.lic” to another location (such as a floppy disk), or print it using notepad. The file, located at “C:\Program Files\Agilent\Network Analyzer” contains all the information needed to recreate the license.

Installing an Option

1. If the keyword entry area is visible, enter a keyword. (The keyword is not case sensitive.)
2. Click **Enable**.
3. After the option is installed, restart the network analyzer application for the changes to take effect.

Note: If a desired option is not visible, it may be because a prerequisite option has not yet been installed. For example, Option 083 will not be visible if Option 080 is not already present. See PNA options.

Repairing and Recovering Option Data

Use this part of the Option Enable Utility in the following situations:

- If the hard drive is replaced
- If the frequency reference assembly is replaced

This routine rebuilds the option information contained on the hard drive and frequency reference assembly (primary and backup).

1. Select **Repair** from the **Option Enable** menu bar.

Note: If you are unsure if this routine needs to be done, run it; no harm will result.

2. The model and serial number are displayed, along with four check boxes.
3. Select the boxes that apply.
4. Click **Begin Repair**. The routine checks all data files and performs any needed repairs. You may be asked to verify certain information and processes.
5. If the routine finds that the model number is incorrect or invalid, you will be asked to select the correct model number.
    - Along with this model number, a model keyword will be required. If this is not labeled on the analyzer, or is not otherwise known, contact Agilent
    - After you have entered the requested data, click **Change Model**. This process takes about 30 seconds.
6. When done, click **Exit Repair**.
7. If you do not need to install any other options, click **Exit**.

Installing or Changing the Serial Number

It may be necessary to install or change a serial number if certain assemblies are replaced.

1. To change the serial number, select **Change Serial** from the **Option Enable** menu bar. The current serial number will be displayed. If no serial number has previously been entered, the word "NONE" will be displayed.
2. Type the new serial number into the space provided, and click **Change Serial**. (The serial number is not case sensitive.)

Note: Use extreme care when entering the serial number; only one entry chance is allowed!

3. To change an incorrect serial number, a clear-code password is required. Contact Agilent to obtain this clear code and have the existing serial number available. Enter the clear code in the space provided, along with the new serial number, then click **Change Serial**.

Last Modified:

20-Sep-2007 Added Install note

Instrument Calibration

An instrument calibration is a process where the analyzer performance is measured to ensure that the analyzer operates within specifications. If any performance parameter does not conform to the published specifications, adjustments are made to bring the performance into conformance.

Why Should I Get an Instrument Calibrated?

Over time, the active components in the analyzer age and the performance may degrade or drift. To ensure that the analyzer is performing to the published specifications, you must have an instrument calibration performed periodically.

How Often Should I Get an Instrument Calibrated?

The instrument specifications are set to consider the performance drift that may occur over a 12 month period. Therefore, getting the instrument calibrated at 12 month intervals ensures that the analyzer maintains performance within the operating specifications. If you need the analyzer to maintain more consistent operation parameters, you may want to have the instrument calibrated more often than the suggested 12-month interval.

How Do I Get an Instrument Calibrated?

To get the instrument calibrated, send it to one of the Agilent Technologies service centers. See Technical Support.

The PNA must be fully functional when it is sent to the service center, or they will charge for their repair services. If the PNA is being used in a secure environment where the hard drive can not be sent with the PNA, a second hard drive must be purchased and configured for use with the PNA in an "unclassified" environment before the PNA is sent to the service center.

To perform the instrument calibration yourself, you must have the following required items:

- Instrument Calibration Test Equipment
- Performance Test Software

What Are My Choices of Instrument Calibration?

The following types of instrument calibration are available from Agilent Technologies:

Standard	Includes a certificate of calibration, stating the instrument has been calibrated and is operating within the published specifications.
Option UK6	Includes the test data from the calibration and the standard certificate, stating the instrument has been calibrated and is operating within the published specifications.
Option M40 (Special)	Includes the test data from the calibration and a certificate, stating the instrument has been calibrated using a process in compliance with ANSI Z540 and is operating within the published specifications.

Other Support Topics

Other Resources

The following network analysis resources are also available.

Document Resources

Application Notes

You can also access application notes at this URL:

http://www.agilent.com/find/PNA

Third-Party Resources

For information about test fixtures and part handlers, contact:

> **Inter-Continental Microwave**
> www.icmicrowave.com

For information about probing equipment and accessories, contact:

> **Cascade Microtech, Inc.**
> www.cascademicrotech.com

SCPI Errors

Standard SCPI Errors

PNA specific Errors

Note: See also PNA Errors

-100 to -200 Command Errors

A command error indicates that the test set's GPIB parser has detected an IEEE 488.2 syntax error. When one of these errors is generated, the command error bit in the event status register is set.

-100	std_command	Command - This event bit (Bit 5) indicates a syntax error, or a semantic error, or a GET command was entered, see IEEE 488.2, 11.5.1.1.4.
-101	std_invalidChar	Invalid character - Indicates a syntactic elements contains a character which is invalid for that type.
-102	std_syntax	Syntax - Indicates that an unrecognized command or data type was encountered. For example, a string was received when the device does not accept strings.
-103	std_invalidSeparator	Invalid separator - The parser was expecting a separator and encountered an illegal character. For example, the semicolon was omitted after a program message unit.
-104	std_wrongParamType	Data type -The parser recognized a data element different than one allowed. For example, numeric or string data was expected but block data was encountered.
-105	std_GETNotAllowed	GET not allowed - Indicates a Group Execute Trigger was received within a program message. Correct the program so that the GET does not occur within the program code.

-108	std_tooManyParameters	Parameter not allowed - Indicates that more parameters were received than expected for the header. For example, *ESE common command only accepts one parameter, so *ESE 0,1 is not allowed.
-109	std_tooFewParameters	Missing parameter - Indicates that less parameters were received than required for the header. For example, *ESE requires one parameter, *ESE is not allowed.
-110	std_cmdHeader	Command header - Indicates an error was detected in the header. This error is used when the device cannot detect the more specific errors -111 through -119.
-111	std_headerSeparator	Header separator - Indicates that a character that is not a legal header separator was encountered while parsing the header.
-112	std_IDTooLong	Program mnemonic too long - Indicates that the header contains more that twelve characters, see IEEE 488.2, 7.6.1.4.1.
-113	std_undefinedHeader	Undefined header - Indicates the header is syntactically correct, but it is undefined for this specific device. For example, *XYZ is not defined for any device.
-114	std_suffixOutOfRange	Header suffix out of range - Indicates the value of a header suffix attached to a program mnemonic makes the header invalid.
-120	std_numericData	Numeric data - This error, as well as errors
-121	std_invalidCharInNumber	Invalid character in number - Indicates an invalid character for the data type being parsed was encountered. For example, an alpha in a decimal numeric or a "9" in octal data.
-123	std_exponentTooLarge	Exponent too large - Indicates the magnitude of an exponent was greater than 32000, see IEEE 488.2, 7.7.2.4.1.
-124	std_decimalTooLong	Too many digits - Indicates the mantissa of a decimal numeric data element contained more than 255 digits excluding leading zeros, see IEEE 488.2, 7.7.2.4.1.
-128	std_numericNotAllowed	Numeric data not allowed - Indicates that a legal numeric data element was received, but the device does not accept one in this position for the header.
-130	std_suffix	Suffix - This error, as well as errors -131 through -139, are generated when parsing a suffix. This particular error message is used if the device cannot detect a more specific error.
-131	std_badSuffix	Invalid suffix - Indicates the suffix does not follow the syntax described in IEEE 488.2, 7.7.3.2, or the suffix is inappropriate for this device.
-134	std_suffixTooLong	Suffix too long - Indicates the suffix contain more than 12 characters, see IEEE 488.2, 7.7.3.4.
-138	std_suffixNotAllowed	Suffix not allowed - Indicates that a suffix was encountered after a numeric element that does not allow suffixes.
-140	std_charData	Character data - This error, as well as errors

-141	std_invalidCharData	Invalid character data - Indicates that the character data element contains an invalid character or the particular element received is not valid for the header.
-144	std_charDataTooLong	Character data too long - Indicates the character data element contains more than twelve characters, see IEEE 488.2, 7.7.1.4.
-148	std_charNotAllowed	Character data not allowed - Indicates a legal character data element was encountered where prohibited by the device.
-150	std_stringData	String data - This error, as well as errors
-151	std_stringInvalid	Invalid string data - Indicates that a string data element was expected, but was invalid, see IEEE 488.2, 7.7.5.2. For example, an END message was received before the terminal quote character.
-158	std_stringNotAllowed	String data not allowed - Indicates that a string data element was encountered but was not allowed by the device at this point in parsing.
-160	std_blockData	Block data - This error, as well as errors -161 through -169, are generated when parsing a block data element. This particular error message is used if the device cannot detect a more specific error.
-161	std_badBlock	Invalid block data - Indicates a block data element was expected, but was invalid, see IEEE 488.2, 7.7.6.2. For example, and END message was received before the end length was satisfied.
-168	std_blockNotAllowed	Block data not allowed - Indicates a legal block data element was encountered, but not allowed by the device at this point in parsing.
-170	std_expr	Expression - This error, as well as errors -171 through -179, are generated when parsing an expression data element. This particular error message is used if the device cannot detect a more specific error.
-171	std_invalidExpression	Invalid expression - Indicates the expression data element was invalid, see IEEE 488.2, 7.7.7.2. For example, unmatched parentheses or an illegal character.
-178	std_exprNotAllowed	Expression data not allowed - Indicates a legal expression data was encountered, but was not allowed by the device at this point in parsing.
-180	std_macro	Macro - This error, as well as error -181 through -189, are generated when defining a macro or execution a macro. This particular error message is used if the device cannot detect a more specific error.
-181	std_validOnlyInsideMacro	Invalid outside macro definition - Indicates that a macro parameter place holder was encountered outside of a macro definition.
-183	std_invalidWithinMacro	Invalid inside macro definition - Indicates that the program message unit sequence, sent with a *DDT or a *DMC command, is syntactically invalid, see IEEE 488.2, 10.7.6.3.
-184	std_macroParm	Macro parameter - Indicates that a command inside the macro definition had the wrong number or type of parameters.

-200 to -299 Execution Errors

These errors are generated when something occurs that is incorrect in the current state of the instrument. These errors may be generated by a user action from either the remote or the manual user interface

-200	std_execGen	Execution - This event bit (Bit 4) indicates a PROGRAM DATA element following a header was outside the legal input range or otherwise inconsistent with the device's capabilities, see IEEE 488.2, 11.5.1.1.5.
-201	std_invalidWhileInLocal	Invalid while in local
-202	std_settingsLost	Settings lost due to rtl
-203	std_commandProtected	Command protected - Indicates that a legal password-protected program command or query could not be executed because the command was disabled.
-210	std_trigger	Trigger
-211	std_triggerIgnored	Trigger ignored
-212	std_armIgnored	Arm ignored
-213	std_initIgnored	Init ignored
-214	std_triggerDeadlock	Trigger deadlock
-215	std_armDeadlock	Arm deadlock
-220	std_parm	Parameter - Indicates that a program data element related error occurred.
-221	std_settingsConflict	Settings conflict - Indicates that a legal program data element was parsed but could not be executed due to the current device state.
-222	std_dataOutOfRange	Data out of range - Indicates that a legal program data element was parsed but could not be executed because the interpreted value was outside the legal range defined by the devices
-223	std_tooMuchData	Too much data - Indicates that a legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.
-224	std_illegalParmValue	Illegal parameter value - Indicates that the value selected was not part of the list of values given.
-225	std_noMemoryForOp	Out of memory - The device has insufficient memory to perform the requested operation.
-226	std_listLength	Lists not same length - Attempted to use LIST structure having individual LIST's of unequal lengths.

-230	std_dataCorruptOrStale	Data corrupt or stale - Indicates invalid data, a new reading started but not completed since the last access.
-231	std_dataQuestionable	Data questionable - Indicates that measurement accuracy is suspect.
-232	std_invalidFormat	Invalid format
-233	std_invalidVersion	Invalid version - Indicates that a legal program data element was parsed but could not be executed because the version of the data is incorrect to the device. For example, a not supported file version, a not supported instrument version.
-240	std_hardware	Hardware - Indicates that a legal program command or query could not be executed because of a hardware problem in the device.
-241	std_hardwareMissing	Hardware missing - Indicates that a legal program command or query could not be executed because of missing device hardware. For example, an option was not installed.
-250	std_massStorage	Mass storage - Indicates that a mass storage error occurred. The device cannot detect the more specific errors described for errors -251 through -259.
-251	std_missingMassStorage	Missing mass storage - Indicates that a legal program command or query could not be executed because of missing mass storage.
-252	std_missingMedia	Missing media - Indicates that a legal program command or query could not be executed because of missing media. For example, no disk.
-253	std_corruptMedia	Corrupt media - Indicates that a legal program command or query could not be executed because of corrupt media. For example, bad disk or wrong format.
-254	std_mediaFull	Media full- Indicates that a legal program command or query could not be executed because the media is full. For example, there is no room left on the disk.
-255	std_directoryFull	Directory full - Indicates that a legal program command or query could not be executed because the media directory was full.
-256	std_fileNotFound	File name not found - Indicates that a legal program command or query could not be executed because the file name was not found on the media.
-257	std_fileName	File name - Indicates that a legal program command or query could not be executed because the file name on the device media was in error. For example, an attempt was made to read or copy a nonexistent file.
-258	std_mediaProtected	Media protected - Indicates that a legal program command or query could not be executed becuse the media was protected. For example, the write-protect switch on a memory card was set.
-260	std_expression	Expression

-261	std_math	Math in expression
-270	std_macroExecution	Macro - Indicates that a macro related execution error occurred.
-271	std_macroSyntax	Macro syntax - Indicates that a syntactically legal macro program data sequence, according to IEEE 488.2, 10.7.2, could not be executed due to a syntax error within the macro definition.
-272	std_macroExec	Macro execution - Indicates that a syntactically legal macro program data sequence could not be executed due to some error in the macro definition, see IEEE 488.2, 10.7.6.3.
-273	std_badMacroName	Illegal macro label - Indicates that the macro label was not accepted, it did not agree with the definition in IEEE 488.2, 10.7.3
-274	std_macroPlaceholder Ma	cro parameter - Indicates that the macro definition improperly used a macro parameter placeholder, see IEEE 4882, 10.7.3.
-275	std_macroTooLong	Macro definition too long - Indicates that a syntactically legal macro program data sequence could not be executed because the string of block contents were too long for the device to handle, IEEE 488.2, 10.7.6.1.
-276	std_macroRecursion	Macro recursion - Indicates that a syntactically legal macro program data sequence count not be executed because it would be recursive, see IEEE 488.2, 10.7.6.6.
-277	std_cantRedefineMacro	Macro redefinition not allowed - Indicates that redefining an existing macro label, see IEEE 488.2, 10.7.6.4.
-278	std_macroNotFound	Macro header not found - Indicates that a legal macro label in the *GMS?, see IEEE 488.2, 10.13, could not be executed because the header was not previously defined.
-280	std_program	Program
-281	std_cantCreateProgram	Cannot create program
-282	std_illegalProgramName	Illegal program name
-283	std_illegalVarName	Illegal variable name
-284	std_programRunning	Program currently running
-285	std_programSyntax	Program syntax
-286	std_programRuntime	Program runtime
-290	std_memoryUse	Memory use

-291	std_execOutOfMemory	Out of memory
-292	std_nameNotFound	Referenced name does not exist
-293	std_nameAlreadyExists	Referenced name already exists
-294	std_incompatibleType	Incompatible type

-300 to -399 SCPI Specified Device-Specific Errors

A device-specific error indicates that the instrument has detected an error that occurred because some operations did not properly complete, possibly due to an abnormal hardware or firmware condition. For example, an attempt by the user to set an out of range value will generate a device specific error. When one of these errors is generated, the device specific error bit in the event status register is set.

-300	std_deviceSpecific	Device specific - This event bit (Bit 3) indicates that a device operation did not properly complete due to some condition, such as overrange see IEEE 488.2, 11.5.1.1.6.
-310	std_system	System
-311	std_memory	Memory - Indicates some physical fault in the devices memory, such as a parity error.
-312	std_PUDmemoryLost	PUD memory lost - Indicates protected user data saved by the *PUD command has been lost, see IEEE 488.2, 10.27.
-313	std_calMemoryLost	Calibration memory lost - Indicates that nonvolatile calibration data used by the *CAL? command has been lost, see IEEE 488.2, 10.2.
-314	std_savRclMemoryLost	Save/recall memory lost - Indicates that the nonvolatile data saved by the *SAV command has been lost, see IEEE 488.2, 10.33.
-315	std_configMemoryLost	Configuration memory lost - Indicates that nonvolatile configuration data saved by the device has been lost.
-320	std_storageFault	Storage fault - Indicates that the firmware detected a fault when using data storage. This is not an indication of physical damage or failure of any mass storage element.
-321	std_outOfMemory	Out of memory - An internal operation needed more memory than was available
-330	std_selfTestFailed	Self-test failed - Indicates a problem with the device that is not covered by a specific error message. The device may require service.
-340	std_calFailed	Calibration failed - Indicates a problem during calibration of the device that is not covered by a specific error.
-350	std_queueOverflow	Queue overflow - Indicates that there is no room in the queue and an error occurred but was not recorded. This code is entered into the queue in lieu of the code that caused the error.

-360	std_comm	Communication - This is the generic communication error for devices that cannot detect the more specific errors described for error -361 through -363.
-361	std_parity	Parity in program message - Parity bit not correct when data received for example, on a serial port.
-362	std_framing	Framing in program message - A stop bit was not detected when data was received for example, on a serial port (for example, a baud rate mismatch).
-363	std_inputBufferOverrun	Input buffer overrun - Software or hardware input buffer on serial port overflows with data caused by improper or nonexistent pacing.

-400 to -800 Query and System Errors

A Query error is generated either when data in the instrument's GPIB output queue has been lost, or when an attempt is being made to read data from the output queue when no output is present or pending.

-400	std_queryGen	Query - This event bit (Bit 2) indicates that an attempt to read data from the Output Queues when no output is present or pending, to data in the Output Queue has been lost see IEEE488.2, 11.5.1.1.7.
-410	std_interrupted	Query INTERRUPTED - Indicates the test set has been interrupted by a new program message before it finishes sending a RESPONSE MESSAGE see IEEE 488.2, 6.3.2.3.
-420	std_unterminated	Query UNTERMINATED - Indicates an incomplete Query in the program see IEEE 488.2, 6.3.2.2.
-430	std_deadlocked	Query DEADLOCKED - Indicates that the Input Buffer and Output Queue are full see IEEE 488.2, 6.3.1.7.
-440	std_responseNotAllowed	Query UNTERMINATED after indefinite response - Indicates that a query was received in the same program message after a query requesting an indefinite response was executed see IEEE 488.2, 6.5.7.5.
-500	std_powerOn	Power on
-600	std_userRequest	User request
-700	std_requestControl	Request control
-800	std_operationComplete	Operation complete

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PNA Specific SCPI Errors

100	dupWindNum	"Duplicate window number"
101	windNumNotFound	"Window number not found"
102	failedWindCreate	"Window creation failed"

103 noCalcParamSelection	"CALC measurement selection set to none"
104 dupMeasName	"Duplicate measurement name"
105 dataNotFound	"Requested data not available"
106 measNotFound	"Requested measurement not found"
107 traceNotFound	"Requested trace not found"
108 notImplemented	"Mnemonic not yet implemented"
109 noDocument	"No measurement container found"
110 dupTraceNum	"Duplicate trace number"
111 titleStrTooLong	"Title string exceeds 50 characters"
112 memoryNotFound	"Requested memory not found"
113 exceedMaxTraces	"Exceeded the maximum number of traces per window"
114 SerNumNotFound	"The serial number was not found. Please store the serial number."
115 LoadFailed	"The state was not loaded. Please check the file name."
116 StoreFailed	"The state was not stored. Please check the file and path names."
117 File	"An in the File operation occurred. Please check file and path names."
118 measChanConflict	"Measurement does not belong to specified channel."
119 exceedMaxWindows	"Exceeded the maximum number of data windows"
120 markerNotFound	"The specified marker was not found."
121 diagnostic	"Diagnostic ."
122 channelNotFound	"The specified channel was not found."
123 exceedMaxMeasurements	"Exceeded the maximum number of allowed mesurements."
124 parameterOutOfRange	"The specified value was out of range."
125 userRangeNotValid	"The currently selected user range is not valid."
126 referenceMarkerNotFound	"The reference marker is not active."
127 sweepSegmentNotFound	"The sweep segment was not found."
128 markerNotDelta	"The specified marker is not a delta marker."

129	printoutFailed	"Attempt to output to a printer failed."
130	memory_trace_not_compatible	"Memory not compatible. Trace Math not applied."
131	trace_math_reset	"Memory not compatible. Trace Math turned off."
132	hw_read_failed	"Hardware read failed."
133	hw_write_failed	"Hardware write failed."
134	dsp_active	"Failed because DSP was not halted."
135	secure_memory	"Attempt to access secure memory region."
136	snum_protected	"The serial number is protected."
137	snum_format_bad	"The serial number format is bad."
138	snum_already_set	"The serial number is already set."
139	hw_setting_failed	"Hardware setting failed."
140	cal_access_failed	"Calibration data access failed."
141	db_access_failed	"Database access failed."
142	memory_range_exceeded	"Command exceeds usable memory range."
143	lost_phase_lock	"Phase lock has been lost."
144	over_power	"Detected too much power at input."
145	ee_wrt_failed	"EEPROM write failed."
146	yig_cal_failed	"YTO calibration failed."
147	ramp_cal_failed	"Analog ramp calibration failed."
148	dspcom_bad	"DSP communication failed."
149	no_license_found	"Request failed. The required license was not found."
150	argLimited	"The argument was out of range
151	markerBWNotFound	"The Marker Bandwidth was not found."
153	peakNotFound	"The Peak was not found."
154	targetNotFound	"The Target search value was not found."
155	calNotImpl	"The Calibration feature requested is not implemented."

156	calClassNotValidForCalType	"SENS:CORR:CCH measurement selection set to none"
158	calNotValidForConfidenceChe	"Selected measurement does not have a calibration valid for Confidence Check"
159	invalidPort	"Specified port is out of range"
160	invalidPortPath	"ROUT:PATH:DEF:PORT x, y does not match measurement; setting to defaults"
161	ioInvalidWrite	"Attempted I/O write while port set to read only."
162	ioInvalidRead	"Attempted I/O read from write only port."
163	calsetNotFound	"Requested Cal Set was not found in Cal Set Storage."
164	noCalSetSelected	"There is no Cal Set currently selected for the specified channel."
165	cantDeleteCalSetInUse	"Cannot delete a Cal Set while it is being used."
166	calsetStimChange	"Channel stimulus settings changed to match selected Cal Set."
167	exceedMaxCalSets	"Exceeded the maximum number of cal sets."
168	calCouldNotTurnOn	"A valid calibration is required before correction can be turned on."
169	standardMeasurementRequired	"The attempted operation can only be performed on a standard measurement type."
170	noDivisorBuffer	"A valid divisor buffer is required before normalization can be turned on."
171	InvalidReceiverPowerCalParagraph	"Receiver power cal requires the measurement to be of unratioed power."
172	ecalCouldNotConfigure	"Could not configure the Electronic Calibration system. Check to see if the module is plugged into the proper connector."
173	measHasNoMemoryAlg	"This measurement does not support memory operations"
174	measHasNoNormalizeAlg	"This measurement does not support normalize operations."
175	userCharacterizationNotFound	"User characterization was not found in the Electronic Calibration module."
176	measInvalidBufferSize	"The data provided has an invalid number of points. It could not be stored."

Technical Support

Click on the region of interest.

- For assistance with your test and measurement needs go to **www.agilent.com/find/assist**
- Or contact the test and measurement experts at Agilent Technologies.

Other Support Topics

United States:

(tel) (+1) 800 452 4844

(alt) (+1) 303 662 3999

(fax) (+1) 888 900 8921

Canada

(tel) 1 877 894 4414

(fax) 1 (905) 206 4120

Europe:

Austria

(tel) 0820 87 44 11*

(fax) 0820 87 44 22

Belgium

(tel) (+32) (0)2 404 9340

(alt) (+32) (0)2 404 9000

(fax) (+32) (0)2 404 9395

Denmark

(tel) (+45) 7013 1515

(alt) (+45) 7013 7313

(fax) (+45) 7013 1555

Finland

(tel) 08 0052 4000

(alt) (+358) 10 855 2100

(fax) (+358) 92 536 0176

France

(tel) 0825 010 700*

(alt) (+33) (0)1 6453 5623

(fax) 0825 010 701*

Germany

(tel) 01805 24 6333*

(alt) 01805 24 6330*

(fax) 01805 24 6336*

Ireland

(tel) (+353) (0)1 890 924 204

(alt) (+353) (0)1 890 924 206

(fax) (+353) (0)1 890 924 024

Israel

(tel) (+972) 3 9288 500

(fax) (+972) 3 9288 501

Italy

(tel) (+39) (0)2 9260 8484

(fax) (+39) (0)2 9544 1175

Luxemburg

(tel) (+32) (0)2 404 9340

(alt) (+32) (0)2 404 9000

(fax) (+32) (0)2 404 9395

Netherlands

(tel) (+31) (0)20 547 2111

(alt) (+31) (0)20 547 2000

(fax) (+31) (0)20 547 2190

Russia

(tel) (+7) 095 797 3963

(alt) (+7) 095 797 3900

(fax) (+7) 095 797 3901

Spain

(tel) (+34) 91 631 3300

(alt) (+34) 91 631 3000

(fax) (+34) 91 631 3301

Sweden

(tel) 0200 88 22 55*

(alt) (+46) (0)8 5064 8686

(fax) 020 120 2266*

Switzerland (French)

(tel) 0800 80 5353 opt. 2*

(alt) (+33) (0)1 6453 5623

(fax) (+41) (0)22 567 5313

Switzerland (German)

(tel) 0800 80 5353 opt. 1*

(alt) (+49) (0)7031 464 6333

(fax) (+41) (0)1 272 7373

Switzerland (Italian)

(tel) 0800 80 5353 opt. 3*

(alt) (+39) (0)2 9260 8484

(fax) (+41) (0)22 567 5314

United Kingdom

(tel) (+44) (0)7004 666666

(alt) (+44) (0)7004 123123

(fax) (+44) (0)7004 444555

Japan:

(tel) 0120 421 345

(alt) (+81) 426 56 7832

(fax) 0120 421 678

Latin America:

Mexico

(tel) (+52) 55 5081 9469

(alt) 01800 5064 800

(fax) (+52) 55 5081 9467

Brazil

(tel) (+55) 11 4197 3600

(fax) (+55) 11 4197 3800

Australia:

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(alt) 1800 143 243

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(tel) 0 800 738 378

(fax) 64 4 495 8950

Asia Pacific:

China

(tel) 800 810 0189

(alt) (+86) 10800 650 0021

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(alt) (+852) 3197 7889

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(fax) (+65) 6836 0252

South Korea

(tel) 080 769 0800

(alt) (+82) 2 2004 5004

(fax) (+82) 2 2004 5115

Taiwan

(tel) 0800 047 866

(alt) 00801 651 317

(fax) 0800 286 331

Thailand

(tel) 1800 226 008

(alt) (+66) 2 268 1345

(fax) (+66) 2 661 3714

3.8 GHz Frequency Adjustment

This routing adjusts the internal fixed-frequency YIG Oscillator to 3.8 GHz by changing a DAC value. This DAC value is stored in the analyzer's non-volatile memory. This adjustment is only needed on some PNA models.

Typically, the oscillator can be set to within 12 kHz of 3.8GHz; it is not necessary for it to be exactly 3.8GHz.

Spectrum Analyzers Compatibility

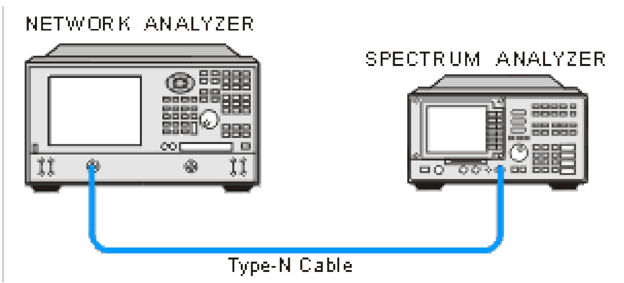
This routine is compatible with Agilent 856x and 859x spectrum analyzers, amd may also work on some other Agilent spectrum analyzers.

If no compatible analyzer is available, select "NONE" for the spectrum analyzer. You can then adjust the DAC manually by viewing the 3.8 GHz signal on another analyzer.

Procedure (For Compatible Spectrum Analyzers Only)

Note: The viewable 3.8 GHz signal level will be low; typically be around -70dBm. Do not use any attenuators in the adjustment, other than the default 10 dB attenuation used in most spectrum analyzers.

1. Connect spectrum analyzer input to the network analyzer's PORT 1 output.
2. Connect GPIB cable from analyzer to spectrum analyzer. Make sure no other controllers are active on the same connection.



3. Set the spectrum analyzer GPIB address to 18.
4. In the analyzer **System** menu, point to **Service**, **Adjustments**, and click **3.8 GHz Freq. Adjust**.
5. Click **Begin Adj.** for the program to adjust the internal oscillator for minimal error and store the results. When the status area indicates the adjustment is complete, select **Exit**.

Procedure (For Non-Compatible Spectrum Analyzers Only)

Note: The viewable 3.8 GHz signal level will be low; typically be around -70dBm. Do not use any attenuators in the adjustment, other than the default 10 dB attenuation used in most spectrum analyzers.

1. Connect the spectrum analyzer input to the network analyzer's PORT 1 output.

2. Set the spectrum analyzer to the following settings:

   - Center frequency=3.8 GHz
   - Span= 100 MHz
   - Bandwidth= 10 kHz
   - Scaling where a signal of -70 dBm will be clearly visible

3. In the analyzer **System** menu, point to **Service**, **Adjustments**, and click **3.8 GHz Freq. Adjust**.

4. Under **Spectrum Analyzer**, select **NONE** option for spectrum analyzer.

5. Click **Begin Adj**.

6. The application presets the DAC to an initial value equal to the current value stored. View the spectrum analyzer to see if the signal is above or below 3.800 GHz.

   - If the signal frequency is above 3.8 GHz, move the slider to adjust the DAC to a lower value (left).
   - If the frequency is below 3.8 GHz, move the slider to adjust the DAC to a higher value (right).

Note: The valid DAC values are from 0 to 4095. The oscillator will shift about 23 kHz per DAC value.

7. Set the DAC value to reach a frequency very close to 3.8 GHz. If you made large changes in DAC values, allow several seconds for thermal effects to stablize.

8. Change the spectrum analyzer settings to better view the frequency signal:

   - Frequency span = 500 kHz
   - Bandwidth = 3 kHz

9. Change the DAC value to keep the signal centered at 3.8 GHz.

10. Once you have determined the correct DAC value, click **SAVE DAC** to permanently store that value into EEPROM. Click **Exit**.

Note: If large changes are made to the existing DAC value, then this test should be repeated again after 15-30 minutes. This allows the thermal effects to fully stablize.

10 MHz Reference Frequency Adjustment

This routine adjusts the analyzer's internal time-base to exactly 10 MHz by changing a DAC value. This DAC value is stored in the analyzer's non-volatile memory. This routine should only be necessary in the following situations:

- The frequency reference assembly is replaced.
- The 10 MHz reference has drifted significantly from the factory adjusted value.

WARNING: The range of this adjustment is only about 20 Hz. It is highly recommended that a very accurate frequency standard be used to measure this 10 MHz signal.

Frequency Counter Compatibility

This procedure uses SCPI commands (over GPIB) to communicate with the frequency counter. It should work with the Agilent 5313xA, 5315xA, 53181A series of counters as well as the older 5350 series.

If no compatible counters are available, select the "Manual" mode of operation. If you do choose the manual mode, you must input the measured frequency manually.

Procedure for GPIB Counters Only

1. Connect the analyzer rear panel 10 MHz Reference output to the frequency counter .
2. Connect a GPIB cable from the analyzer to the counter. Make sure no other controllers are active on the same connection.
3. If applicable, connect the house frequency standard to the counter reference input.
4. Set the counter GPIB address to 03. Ensure that the counter is the only device at this address.
5. In the analyzer **System** menu, point to **Service**, **Adjustments**, and click **10 MHz Freq. Adjust**.
6. Click **Begin Adj**. The application adjusts the internal reference for minimal error and stores the results.
7. Click **Read Freq** to trigger another reading of the 10 MHz signal.
8. Click **Read DAC** to view the current DAC value stored in the analyzer's non-volatile memory (value = 0 - 4095).
9. When the status area indicates the adjustment is complete, click **Exit**.

Procedure for Non-GPIB Counters

1. Connect the counter input to the rear panel 10 MHz Reference Output.
2. Set the counter to at least 1 Hz resolution.
3. If applicable, connect the house-frequency standard to the counter reference input.
4. In the analyzer **System** menu, point to **Service**, **Adjustments** and click **10 MHz Freq. Adjust**.

5. Under **Frequency Counter**, select **Manual.**
6. Click **Begin Adj.**
7. The application presets the DAC to an initial value. Enter the measured frequency offset from 10 MHz. If the measured frequency is less than 10 MHz, use a minus (-) sign to indicate a negative error. For example:
    - If the counter reads 10000003.5 Hz, enter 3.5 (or +3.5) in the indicated window.
    - If the counter reads 9999997.8 Hz, enter -2.2 in the indicated window.
8. The adjustment loops at least 3 times unless the entered value is exactly zero.
    - Click **Read Freq** to trigger another reading of the 10 MHz signal.
    - Click **Read DAC** to view the current DAC value stored in the analyzer's non-volatile memory (value = 0 - 4095).
9. When the status area indicates the adjustment is complete, click **Exit**.

Note: If the counter is misreading the frequency, it may be necessary to attenuate the input, or set the input impedance to 50 ohms, or both.

Display Test

The PNA screen should be bright with all annotations and text readable. The display test allows you to check for non-functioning pixels and other problems.

Note If the display is dim or dark, refer to “Troubleshooting LCD Display Problems” in the PNA Service Guide.

What Is a Damaged Pixel?

A pixel is a picture element that combines to create the image on the display. They are about the size of a small pin point. Damaged pixels can be either “stuck on” or “dark.”

- Stuck on pixel - red, green, or blue; always displayed regardless of the display setting. It will be visible on a dark background.
- Dark pixel - always dark; displayed against a background of its own color.

How to Run the Display Test

On the **System** menu, point to **Service**, and then click **Display Test**.

A multi-color screen is displayed. Be prepared to look for the symptoms described below. Click the Start Test button. To continue to the next test, click the moving Next Test button. The button moves to allow you to see all of the display. After the test is completed, the display defaults to the network analyzer screen.

How to Identify a Faulty Display

One or more of the following indicate a bad display:

- Complete row or column of “stuck on” or “dark” pixels
- More than six “stuck on” pixels (but not more than three green)
- More than twelve “dark” pixels (but not more than seven of the same color)
- Two or more consecutive “stuck on” pixels or three or more consecutive “dark” pixels (but no more than one set of two consecutive dark pixels)
- "Stuck on or “dark” pixels less than 6.5 mm apart (excluding consecutive pixels)

If any of these symptoms occur, your display is considered faulty. See the Service Guide for your PNA model.

LO Power Adjustment

This procedure adjusts the receiver's LO input power to a specific level by changing DAC values. These DAC values are then stored in the analyzer's non-volatile memory. The procedure will vary depending upon the model number. This adjustment is only applicable to some PNA models.

Power Meter Compatibility

This routine is only compatible with the Agilent EPM series of power meters. Different sensors may be used. For 9 GHz analyzers and below, an 8482 or E4412A sensor can be used. For the higher frequency units (20 GHz or above), a sensor must be able to measure a maximum of 20 GHz. At no time during this test will a frequency higher than 20 GHz be measured, even if the PNA has a maximum frequency of 50 GHz.

If the older HP 84xx series of sensors are used, the correct calibration data should be entered into the appropriate cal table of the EPM series power meter, although for this adjustment, high accuracy is not required. Inaccuracies in the order of several tenths of a dB are acceptable.

Procedure

1. Allow the analyzer and power meter to warm up for 30 minutes.
2. Manually zero and calibrate the power sensor. (This allows you to skip this step later)
3. Connect a GPIB cable from the analyzer to the power meter. Make sure no other controllers are active on the same connection.
4. Set the power meter GPIB address to 13. (others can also be used; 13 is the default)
5. Remove the outer cover on the analyzer.
6. In the PNA **System** menu point to **Service**, then **Adjustments**, and click **LO Power Adjust**.
7. Connect the power sensor to the LO output, using adapters if needed.. The LO output location varies with model number. Click on the LO Power Adjust **Setup** menu selection to see a diagram of the exact location.
8. **For 9 GHz units and below:**
   Click **Begin Adj** to start the LO power cal routine. The routine adjusts the power level for each band (1 through 3) to fall within certain bounds. If any changes are made, it automatically stores them.

   For 20GHz units and above:
   If using an 84xx power sensor, click **Configure** and select the proper sensor model number. Click **Close**. Click **Calibrate** to begin the adjustment. The entire calibration process takes about 5 minutes. Once completed, you can verify the current calibration accuracy by clicking **Verify Cal**.
   Note: Correction constants are defaulted at the beginning of calibration. Once the calibration process has started, it must be completed in order to regenerate proper data.
9. Click **Read DAC** to view the current DAC values (0-4095) stored in the PNA non-volatile memory for each band (0-7).

10. When the message/status area indicates the adjustment is complete, click **Exit**.

11. Reconnect the semi-rigid cable and replace the covers.

Offset LO Power Adjustment

Note: This adjustment is only performed on PNAs with Frequency Offset Mode (option 080), and only on certain models.

The Offset LO Adjustment sets the LO power for the offset mixer to a consistent value across all bands. It requires access to the internal components of the PNA so that the power sensor can be connected to the LO output. Because the LO frequency does not exceed 3 GHz, almost any power sensor can be used. The adjustment is relatively simple and only takes a couple of minutes.

When to perform

This adjustment should be performed when any of the following occur:

- the A13 Frequency Offset Receiver is significantly modified or replaced
- the A9 Synthesizer is replaced (that is where the correction data resides)

How to perform Offset LO Power adjustment

1. To start the Offset LO adjustment, click **System**, point to **Service**, **Adjustments**, then click **Offset LO Adjust**.
2. You will be prompted to zero and cal the power sensor. (You can do this before beginning.)
3. Connect the sensor to J3 of the A13 LO output by removing the existing cable (or simply disconnecting one end) as shown in the Set-up diagram in the program.
4. Connect the power meter to the PNA using a GPIB cable. Make sure the GPIB address shown in the program matches the actual power meter address (default is 13.)
5. Click **Adjust** to begin the test and follow the instructions.

The program automatically adjusts all bands; no user input is needed. The program repeats several times as this is an iterative process. The progress of the adjustment is shown on the screen.

The Configure menu selection is for factory personnel ONLY.

Once completed, to verify the actual results, click Verify.

Upon exiting, the PNA application will restart; this takes several seconds.

Operator's Check

Overview

The Operator's Check should be performed when you first receive your PNA, and any time you wish to have confidence that the PNA is working properly.

Notes

- The Operator's Check does not verify performance to specifications. To verify PNA performance to specifications, run System Verification.
- Allow the PNA to warm up for 90 minutes before considering a failed test to be valid.
- The Operator's Check can NOT be run with a Multiport test set enabled. However, you can run a performance check as described in the Test Set User's Guide. See the N44xx User's Guide.

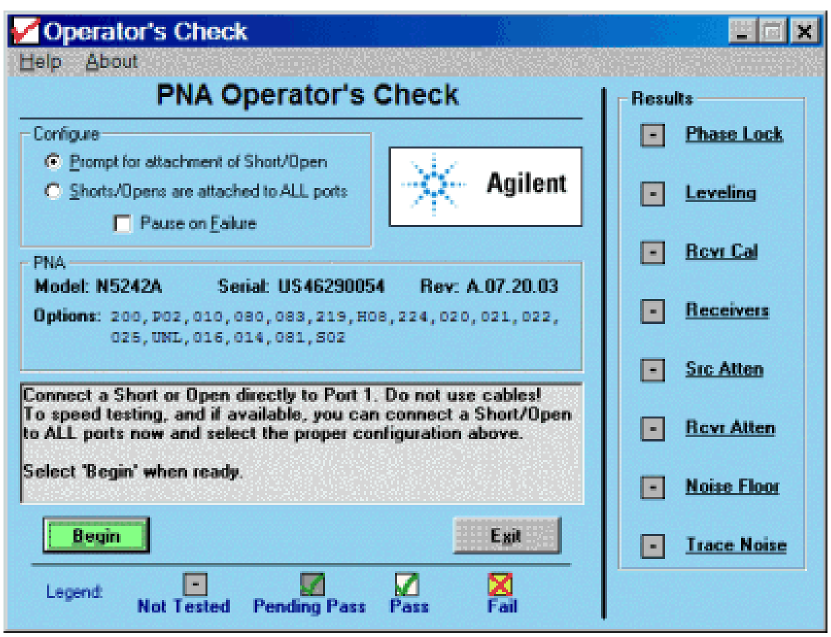
The Pass/Fail criteria used in the Operator's Check identifies **obvious failures** in the following portions of the PNA hardware:

- Repeatability of the RF switch in the test set
- Attenuation ranges of the test port attenuators (if installed)
- Calibration of the receivers
- Frequency response of the receivers
- Phase lock and leveling
- Noise floor and trace noise

How to Run the Operator's Check

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For PNA-L and E836x models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Service** 3. then **Operator's Check**
For PNA-X and 'C' models	Programming Commands
1. Press SYSTEM 2. then **[Service]** 3. then **[Operator's Check]**	1. Click **Utility** 2. then **System** 3. then **Service** 4. then **Operator's Check**

1. Connect one or more standards (see Configure).
2. Click **Begin** and **Continue** (if necessary) until "Operator's Check is complete!" appears.



This dialog box will look slightly different, depending on PNA model number and installed options. Some of the tests are not run if the appropriate option is not installed.

Operators Check dialog box help

Note: It is normal for a momentary unleveled condition to appear during portions of the Operators Check.

Configure

Prompt for attachment of Short / Open If you do not have enough shorts or opens for all test ports, you will be prompted to move the standard to the next test port. Connect either a short or open to port 1, then click Begin.

Shorts / Opens are attached to all ports Connect either a short or open for each test port, then click Begin. All ports are tested without interruption. You can mix shorts and opens on the test ports.

PNA Shows information about the PNA that is being tested.

Legend Shows the status icons used in the Operator's Check and their meaning. **Pending Pass** means that a portion of the testing has been completed successfully.

Results Shows the current status of each test. Click on the test name to learn how that test is performed. This may help in troubleshooting failed tests. If any tests Fail, refer to Chapter 3 of the PNA service guide.

Begin Starts the Operator's Check.

View Results Shows all results in text format. Failed items are preceded by **===>>>.**

This text file can be printed or saved with a unique file name to compare results with previous or subsequent testing.

Exit Ends the program and closes the window.

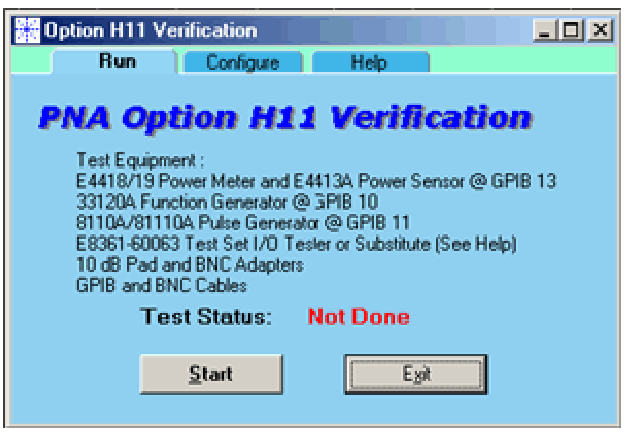
Last Modified:

5-Feb-2008 Added multiport test set note

Option H11 Test Verification

The PNA Option H11 Test / Verification utility verifies the PNA's option H11 functionality. The associated H11 inputs and outputs are tested and the results are compared against expected levels at the factory. These tests are used in conjunction with the Operator's Check and System Verification programs to check PNA functionality.

How to Run Option H11 Verification	
Using front-panel HARDKEY [softkey] buttons	**Using a mouse with PNA Menus**
For PNA-L and E836x models	
1. Navigate using **MENU/DIALOG**	1. Click **System** 2. then **Service** 3. then **Rear Panel/H11 Test** or **H11 Verification**
For PNA-X and 'C' models	
1. Not Available	1. Not Available



Option H11 Verification dialog box help

The Option H11 Verification software leads you through each of the tests listed on the Configure Tab.

Important: Required Configuration of the PNA being tested:

- All connections to external devices and test sets must be removed from the Option H11 connectors and Test Set I/O connector on the PNA rear panel.
- On the Millimeter Module Configuration dialog box, make the following settings:

  - PNA Model E8361A - Select **Agilent N5250A**, and check **Use Standard PNA operation when N5260A is NOT connected.**

  - All other PNA models - Select **Standard PNA.**

Run Tab

The list of test equipment is the complete list that is required to run ALL of the tests (recommended).

Start Click to run the tests that are selected on the Configure Tab.

Exit Exits Option H11 Verification.

Configure Tab

All of the tests are selected by default. Tests can be run separately for troubleshooting purposes by checking or clearing the boxes.

Power Tests

Output power is measured at each of the selected RF and LO Test Set connectors on the rear panel. The results are displayed against limit lines that represent the expected levels at the factory.

Equipment Required:

- PNA supported power meter and 26.5 GHz power sensor (Recommended: Agilent E4418/19 Power Meter and E4413A Power Sensor). Set GPIB address = 13.

- GPIB and Sensor cables.

- On E8361A ONLY, a device is required to simulate an N5260A Test Set is connected to the Test Set I/O. All other PNA models do NOT require this device for this test.

  - Agilent Service personnel: Use the E8361-60063 Test Set I/O Tester.

  - All others: On a commercially available DB-25 male connector, connect a jumper between pins 12 and 22. See the Test Set I/O connector diagram. Insert the male connector into the PNA rear panel Test set I/O connector.

External IF Input and Crosstalk Tests

A 8.33 MHz signal is injected into each of the selected 8.33 MHz IF IN connectors on the rear panel. The signal is measured at each of the selected receivers. The results are displayed against limit lines that represent the expected levels at the factory.

Equipment Required:

- 33120A Function Generator. Set GPIB address = 10.
- 10 dB Attenuator (Agilent 8493B or equivalent) and BNC adapters.
- GPIB and BNC cables

External Pulse Input Test

A pulse train is injected into each of the selected Pulse IN connectors on the rear panel. The signal is measured at each of the selected receivers. The results are displayed against limit lines that represent the expected levels at the factory.

Note: A noisy pulse generator can cause a false failure of the "1% Duty Cycle Pulse Input" portion of the External Pulse Input Test.

Equipment Required:

- 8110A or 81110A Pulse Generator. Set GPIB address = 11.
- GPIB and BNC cables

Test Set I/O Connector Test

Tests the ability of the PNA to detect and control an external test set through the PNA rear panel TEST SET I/O connector.

Equipment Required:

- Agilent Service personnel: Use the E8361-60063 Test Set I/O Tester.
- All others: Use a DVM to measure the TTL voltage level on the following pin numbers using pin 1 as ground:
  - Pins: 3, 4, 5, 6, 8, 9, 10, 11, 17, 19, 20, 21, 22, 23, 24
  - See Test Set I/O connector diagram to determine the pin number location.
  - The software toggles all pins HIGH, then LOW.
  - TTL HIGH should read approximately +5.0 volts.
  - TTL LOW should read approximately +0.1 volts.

Help Tab

Displays the Option H11 Verification program revision number and information about the PNA being tested.

Advanced Help Click to display this help topic.

View Results Appears after the test is run. Click to show all results in text format. Failed items are preceded by **===>>> Fail.** This text file can be printed or saved with a unique file name to compare results with previous or subsequent testing.

Last Modified:

10-Mar-2008 MX added UI

IF Gain Adjustment

Phase-Lock IF Gain Adjustment for E836x models only!

The E836x A/B PNA models have a variable gain control for the phase-lock loop IF signal. By dynamically changing the gain as a function of frequency and power, the phase-lock signal amplitude can be adjusted to a constant level for the entire operating range of the instrument. This constant level is important for phase-lock acquisition and stability.

When to perform

Phase-Lock IF Gain Adjustment should be performed when any of the following occur:

- A source calibration
- An assembly in the reference receiver path (R1,R2) is replaced.
- The Test Set Motherboard is replaced
- The Phase Lock board is replaced
- **Phase Lock Lost** error message appears after replacing a source or receiver assembly
- The external R path has changed. For example, when a multiport test set with R channel path has been added or removed.

How to perform Phase-Lock IF Gain adjustment

Ensure the Reference Channel paths are properly configured and the connections are properly torqued.

1. From the **System** menu, click **Service**, then **Adjustments**, then **IF Gain Adjustment**.
2. Under Select Specials, select **None**.
3. No connections to the test ports are required.
4. Click **Begin Adj.** The adjustment takes about a minute to complete.
5. The advanced screen is for factory personnel only.

IF Gain Adjustment for N524x models only!

The N524x PNA models have a variable gain control for the loop IF signal. By dynamically changing the gain as a function of frequency and power, the phase-lock signal amplitude can be adjusted to a constant level for the entire operating range of the instrument. This constant level is important for phase-lock acquisition and stability.

When to perform

IF Gain Adjustment should be performed when any of the following occur:

- An assembly in the reference receiver path (R1,R2) is replaced.
- The Test Set Motherboard is replaced
- The IF Mux assembly or SPAM assembly is replaced

How to perform IF Gain adjustment

Ensure the Reference Channel paths are properly configured and the connections are properly torqued.

1. From the **System** menu, click **Service**, then **Adjustments**, then **IF Gain Adjustment**.
2. An appropriate power meter and sensor will be required. The sensor must cover the upper frequency range of the PNA. A good quality cable will also be needed. Adapters can be used as needed.
3. Connect the power meter to the GPIB port labeled System Controller.
4. Click **Begin Adj.**
5. Set the GPIB address in the program accordingly and select the sensor being used.
6. Follow the instructions displayed in the program.

The adjustment takes about 5 minutes to complete for a 26.5 GHz PNA. Higher frequency units may take longer.
The Default menu selection is for factory personnel only. This will preset all values to default levels for troupbleshooting purposes only. If this is selected, a full IF gain adjustment will need to be performed.

Last modified:

3/7/07 Added N5242x information.

System Verification

The performance of the network analyzer is specified in two ways: system specifications, and instrument specifications. It is the end user's responsibility to determine which set of specifications is applicable to their use of the PNA.

A network analyzer measurement "system" includes the analyzer, calibration kit, test cables, and any necessary adapters. The system verification software in the PNA is used to verify the system's conformance to the "system" specifications. A "pass" result demonstrates that the analyzer, test cables, and adapters, perform correctly as a system. It DOES NOT demonstrate that any one component performs according to its individual specifications. A change to any part of this measurement system requires a re-verification of the system.

Instrument specifications specify the network analyzer's uncorrected measurement port characteristics and its output and input behavior. The PNA performance tests are used to verify the analyzer's conformance to "instrument" specifications.

The system verification utility verifies the PNA system specifications by automatically measuring the magnitude and phase for all four S-parameters for each verification device, and comparing the values against the following:

- Factory measured data from files on the verification disk
- Limit lines based on the measurement uncertainty

System Verification requires the use of a calibration kit and verification kit which has been certified within the past 12 months by Agilent. System Verification can NOT be used to perform this kit certification.

Operator's Check should also be performed to verify the basic operation of the PNA.

- **Equipment Used in the System Verification**
- **Precautions for Handling Airlines**
- **Flow Diagram of Procedure**
- **Procedure for System Verification**
- **If the System Fails the Verification Test**
- **Interpreting the Verification Results**

Notes

- Although the performance for all S-parameters is measured, the S-parameter phase uncertainties are less important for verifying system performance. Therefore, the limit lines will not appear on the printouts.
- System Verification can NOT be run with a Multiport test set enabled. However, you can run a performance check as described in the Test Set User's Guide. See the N44xx User's Guide.

Equipment Used in the System Verification

For PNA models:

E8356A, E8357A, E8358A
N3381A, N3382A, N3383A
E8801A, E8802A, E8803A
(Type-N test ports)

Equipment Type	Type-N	3.5 mm
Calibration kit **or** ECAL Module	85032F 85092B	85033E 85093B
Verification kit	85055A	85053B
RF Cable	N6314A	See Cable substitution

E8362A/B
N5230A (20 GHz)
(3.5 mm test ports)
N5242A

Equipment Type	3.5 mm	Type-N
Calibration kit **or** ECAL Module	85052B/C/D N4691A	85054B/D N4690A
Verification kit	85053B	85055A
RF Cable(s)	Single: 85131C/E Pair: 85131D/F	Single: 85132C/E Pair: 85132D/F
Adapters	None	Single: 85130C and one 7mm-to-Type-N from 85054B cal kit Pair: Two 7mm-to-Type-N from 85054B cal kit

E8363A/B, E8364A/B
N5230A (40 or 50 GHz)
(2.4 mm test ports)

Equipment Type	2.4 mm	3.5 mm	Type-N
Calibration kit **or** ECAL Module	85056A/D N4693A	85052B/C/D N4691A	85054B/D N4690A
Verification kit	85057B	85053B	85055A
RF Cable(s)	Single: 85133C/E Pair: 85133D/F	Single: 85134C/E Pair: 85134D/F	Single: 85135C/E Pair: 85135D/F
Adapters	None	Single: 85130F Pair: None	Single: 85130E and two 7mm-to-Type-N from 85054B cal kit Pair: Two 7mm-to-Type-N from 85054B cal kit

E8361A
(1.85 mm test ports)

Equipment Type	1.85 mm	2.4 mm 3.5 mm Type-N
Calibration kit **or** ECAL Module	85058B N4694A	See 2.4 mm test port table above
Verification kit	85058V	See 2.4 mm test port table above
RF Cable(s)	Single: N4697E Pair: N4697F	See 2.4 mm test port table above
Adapters	None	See 2.4 mm test port table above

Cable Substitution

The test port cables specified for the PNA have been characterized for connector repeatability, magnitude and phase stability with flexing, return loss, insertion loss, and aging rate. Since test port cable performance is a significant contributor to the system performance, cables of lower performance will increase the uncertainty of your measurement. It is highly recommended that the test port cables be regularly tested.

If the system verification is performed with a non-Agilent cable, ensure that the cable meets or exceeds the operation of the specified cable. Refer to the cable User's Guide for specifications.

Cable Flex Factor

Flex Factor determines how much of the cable phase uncertainty to include in determining the limit lines.

- Set to **0%** (**zero)** if the cables are held down in a fixture and are not allowed to move during the calibration and verification.

- Set to **100%** if the cables are allowed to move a lot.

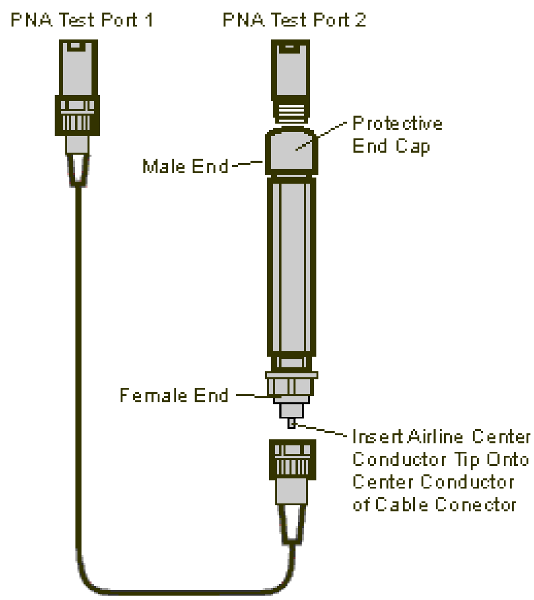
Calibration Kit Substitution

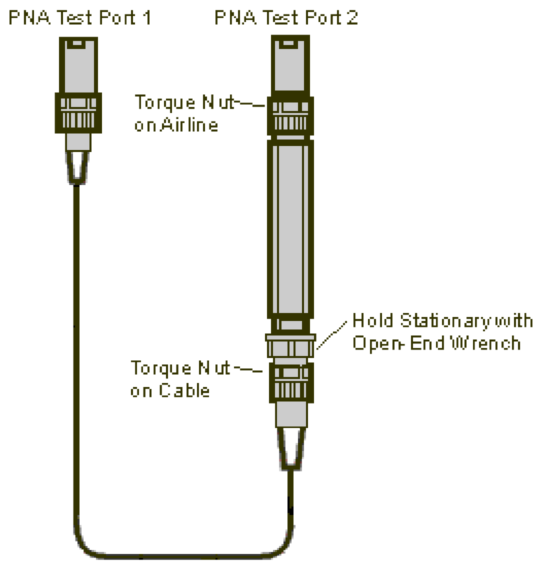
Non-Agilent calibration kits are not recommended nor supported.

Precautions for Handling Airlines

When you are using the airlines in the verification kit, observe the following practices to ensure good measurement techniques.

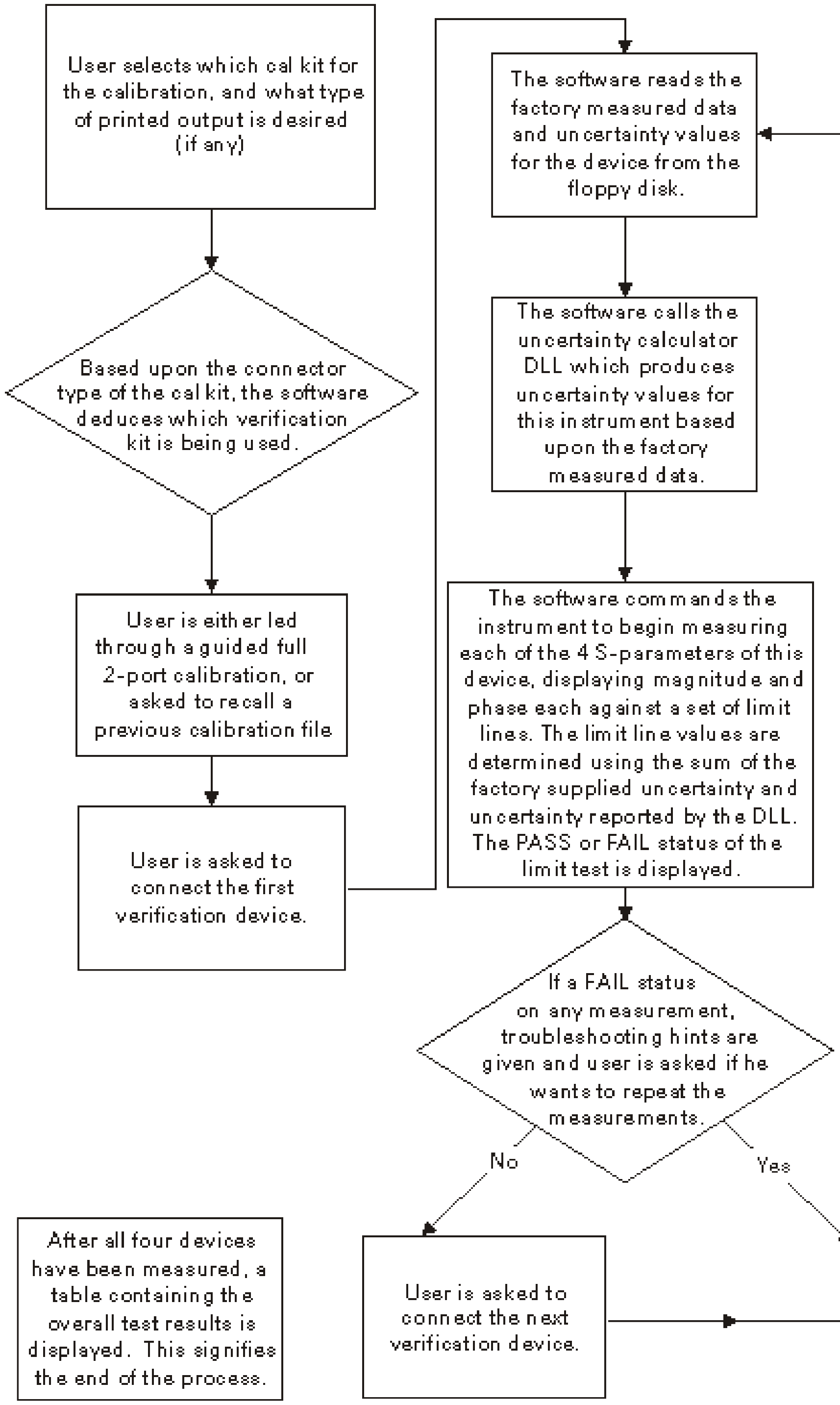
- Be very careful not to drop the airline's center or outer conductor. Damage will result if these devices are dropped.
- Use proper Electro-Static Discharge (ESD) procedures.
- Clean your hands or wear gloves as skin oils will cause a change in electrical performance.





Flow Diagram of Procedure

The operational flow of the software is depicted by the flowchart shown below.



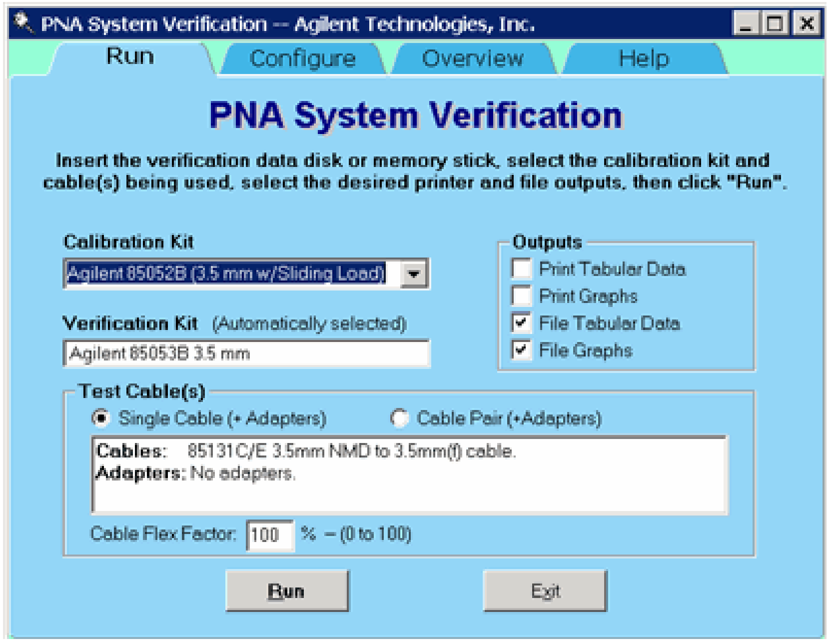
Procedure for System Verification

1. If you want printed test outputs, connect a printer to the analyzer. Let the analyzer warm up for at least 30 minutes.

2. Insert the PNA verification kit floppy disk into the analyzer disk drive.

3. On the **System** (or **Utility**) menu, point to **Service**, and click **System Verification**. The System Verification window similar to this will be displayed.

System Verification Dialog



4. In the **Calibration Kit** box, select the calibration kit or ECal module that is being used. The corresponding verification kit to use appears in the **Verification Kit** box.

5. Under **Printer Output** click on any of the following options.

   - **Print Tabular Data:** Prints the verification data in tabular form which includes measured data and uncertainty limits. Refer to a tabular data example, later in this topic.
   - **Print Graphs:** Prints the verification data in graphical form. The graphic form includes the measured data trace, factory supplied data trace and uncertainty limits. Refer to a plot data example, later in this topic.
   - **File Tabular Data:** Writes the verification data in tabular form to a text file in the C:\Program Files\Agilent\Network Analyzer\Documents\ directory.
   - **File Graphs:** Saves a screen image in .PNG format in the C:\Program Files\Agilent\Network Analyzer\Documents\ directory.

Note: If you want printed output, it is assumed you have already installed the Windows driver for your particular printer, and have tested that you can print to the printer from the network analyzer. This software is designed to print to whichever printer is currently set as the Default printer (see Printers in the Windows Control Panel).

6. To modify the number of ports to be verified, to change the number of devices to measure, or to use a previously stored verification calibration, click on the **Configure** tab and make the desired selections.

   - For the system verification to be truly adequate, the software must measure all devices in the kit with a recent calibration applied. Removing and reattaching any test port cables or adapters invalidates all previous calibrations.

7. Click **Run**.

8. Follow the instructions on the analyzer for performing the system verification, inserting the verification devices as prompted.

Note for 3 Port PNA:
The System Verification Procedure is **repeated three times**. The first time, **Ports 1 and 2** are measured as a pair; then **Ports 1 and 3** are measured; and lastly, **Ports 2 and 3** are measured.

Note for 4 Port PNA:
The System Verification Procedure is **repeated two times**. The first time, **Ports 1 and 2** are measured as a pair, then **Ports 3 and 4** are measured.

Step-by-Step Process Description

1. Depending upon the selected choice in the Calibration submenu of the Configure menu, the user is either prompted to recall a previous calibrated instrument state, or is guided through a full 2-port calibration using the selected calibration kit. For ECal, the ECal module is connected just once; a standby message is posted while the software is performing the calibration.

2. The user is prompted to connect the first verification device.

3. The software reads the factory measured data for that device and uncertainty values for that data (CITIfiles) from the floppy disk supplied with the verification kit.

4. The software sends the factory measured data, calibration kit and instrument state information to the uncertainty calculator DLL, which generates uncertainty values specific to the PNA.

5. The analyzer first sets up for magnitude measurements of all four S-parameters, each parameter in a separate window (lin mag for S_{11} and S_{22}, log mag for S_{21} and S_{12}). Each of the factory measured S-parameters are fed to the appropriate window as a memory trace. Limit line offsets are calculated as the sum of the factory measured data uncertainties and PNA uncertainties reported by the DLL. Upper and lower limits are displayed (factory measured data + uncertainty sum, factory measured data - uncertainty sum). The PNA takes a sweep, limit test is turned on and PASS/FAIL status is reported in each of the four windows.

6. The user clicks a button when ready to view phase measurements. The four windows get updated for phase format, phase memory traces, phase limits and PASS/FAIL result.

7. If the limit test of any of the four S-parameters (magnitude or phase) indicates a FAIL status, the software suggests troubleshooting tips and asks if the user would like to repeat measurement of that device or proceed to the next device. If proceeding to the next device, the factory measured data and uncertainties for the next device are read from floppy, the uncertainty DLL gets called with this next set of factory measured data, and the four measurement windows get updated for magnitude measurement of the next device.

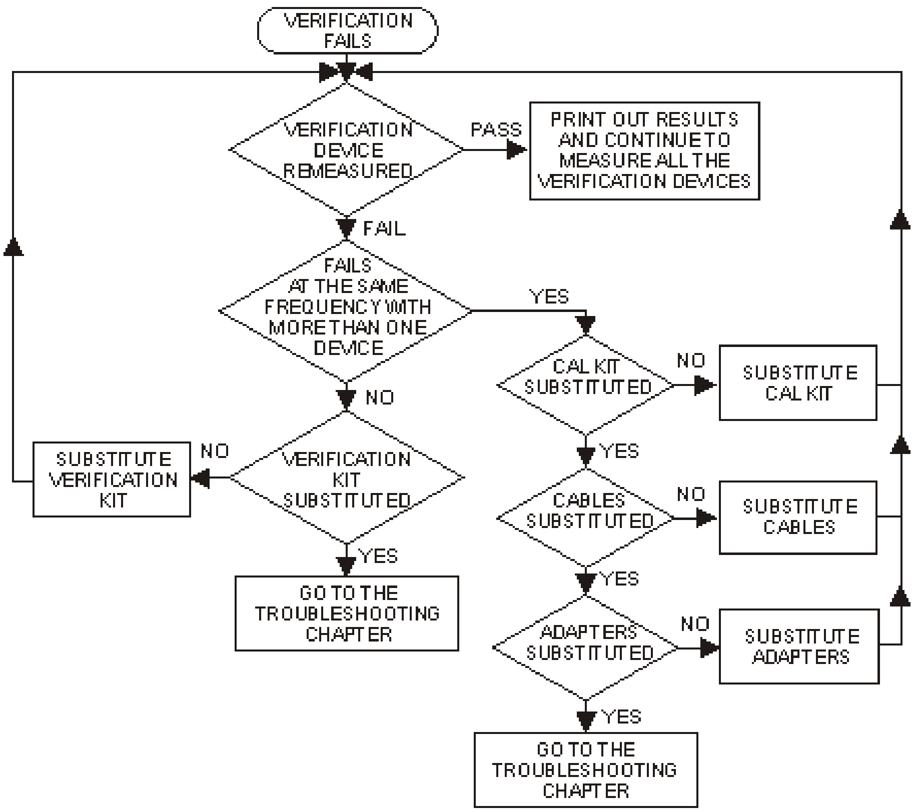
8. The software follows this same process until all selected devices have been measured, at which point a summary window is displayed containing the set of PASS/FAIL results for all four parameters of each device.

If the System Fails the Verification Test

IMPORTANT: Inspect all connections. Do not remove the cable from the analyzer test port. This will invalidate the calibration that you have done earlier.

1. Repeat this verification test. Make good connections with correct torque specifications for each verification device.
2. Disconnect, clean and reconnect the device that failed the verification test. Then measure the device again.
3. If the analyzer still fails the test, check the measurement calibration by viewing the error terms as described in "Front Panel Access to Error Terms" on page 4-7 of the Service Guide.
4. Refer to the graphic below, for additional troubleshooting steps.

Verification Fails Flowchart



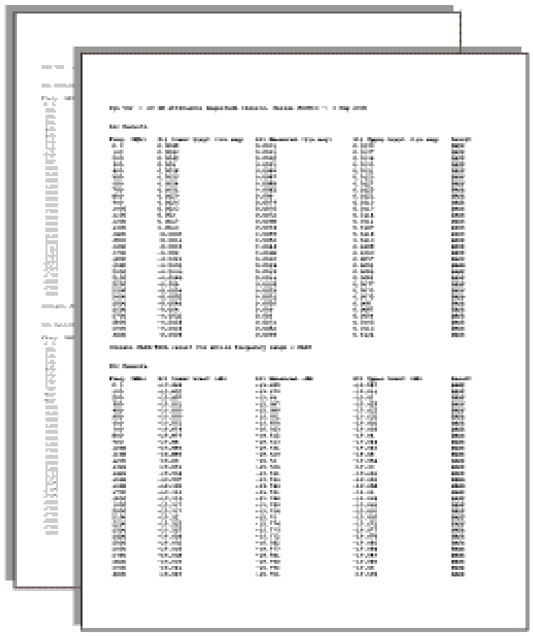
Interpreting the Verification Results

The graphic below shows an example of typical verification results with **Tabular Data** selected in the **Printer Output** area of the **System Verification** window. A graphic later in this topic shows an example of typical verification results with **Measurement Plots** selected in the **Printer Output** area of the **System Verification** windows. These printouts include a comparison of the data from your measurement results with the traceable data and corresponding uncertainty specifications. Use these printouts to determine whether your measured data falls within the total uncertainty limits at all frequencies.

The tabular data consists of:

- Frequency of the data points (in MHz).
- Lower limit line as defined by the total system uncertainty specification.
- Results of the measurement.
- Upper limit line as defined by the total system uncertainty specification.
- Test status (PASS or FAIL) of that measurement point.

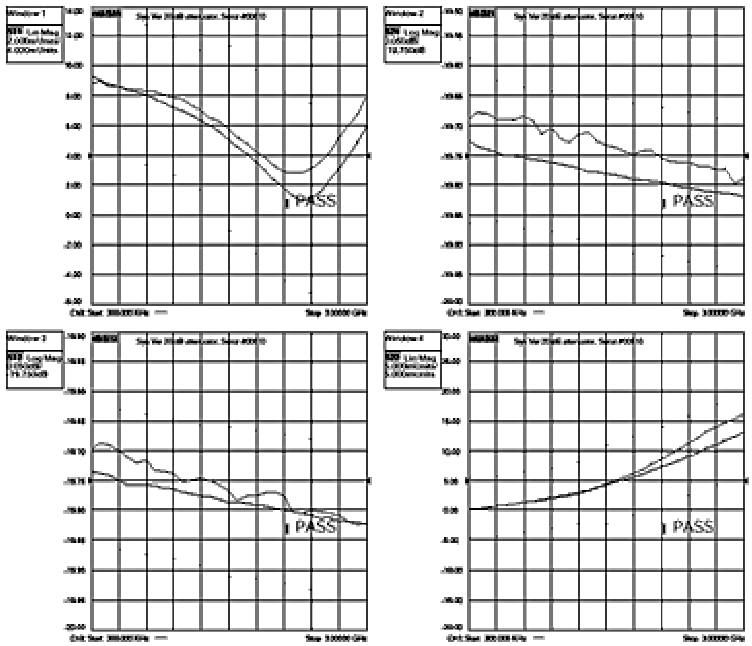
Printout of Tabular Verification Results



The printed graphical results show:

- Upper limit points as defined by the total system uncertainty specifications.
- Lower limit points as defined by the total system uncertainty specifications.
- Data measured at the factory.
- Results of measurements.
- Measurement parameter names and formats (Lin Mag or Log Mag).
- Serial number of device (00810).
- Device being measured (Sys Ver 20 dB attenuator).

Printout of Graphical Verification Results



Last Modified:

11-Feb-2008	Added note about multiport
15-Jan-2008	Added Flex Factor and image

Source Calibration

Source calibration adjusts the PNA source power for flatness across its full frequency range. This adjustment is for service only; not for measurement calibration.

Required Equipment

Preferred Power Meter: E4419B
Alternate Power Meters: E4419A or EPM-442A

Note: The power sensor depends on the PNA frequency range. Depending on the PNA model, two power sensors may be required to test the full frequency range.
The PNA front panel connector type will determine the cable used and if an adapter is required with the power sensor(s).

PNA Model	Power Sensor(s)	Cable
E8356A	8482A	N6314A
E8357A E8358A	8482A and E4412A	N6314A
E8801A	8482A	N6314A
E8802A E8803A	8482A and E4412A	N6314A
N3381A	8482A	N6314A
N3382A/N3383A	8482A and E4412A	N6314A
E8361A	8487A (use with adapter 11900B) and V8486A (use with adapter V281B) ** See E8361A procedure below	N4697-60001
E8362A / B	E4413A	85131E
E8363A/B E8364A/B	8487A (use with adapter 11900B)	85133E
N5242A	E4413A	85131E

See PNA Accessories

Procedure

1. Refer to your power meter documentation to ensure the proper calibration factors for the power sensor have been entered into the table on the power meter.

2. Connect a GPIB cable between the power meter and network analyzer (use the System Controller GPIB port if applicable.)

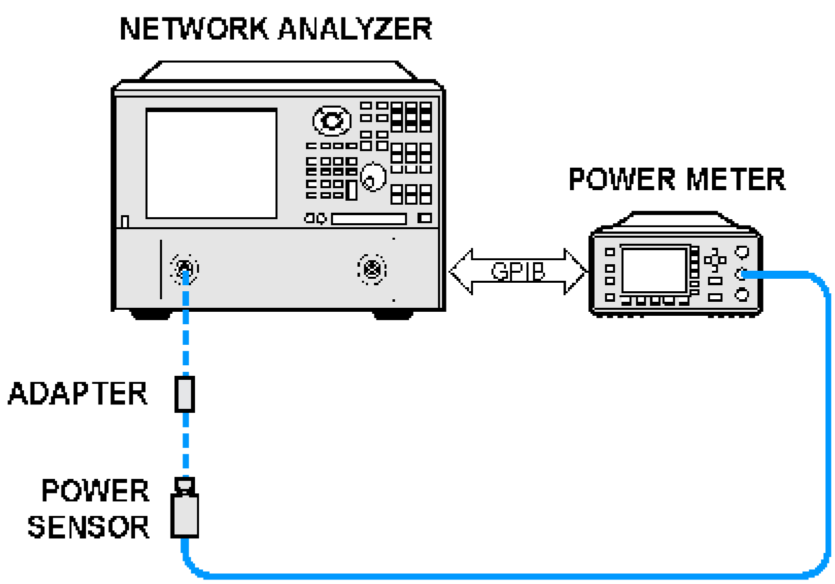
3. Ensure the power sensor(s) are connected to the power meter.

4. In the analyzer **System** menu, point to **Service**, **Adjustments**, and click **Source Calibration**.

5. There are 3 different version of the Source Calibration software; all are slightly different. All have a button that is labeled "Calibrate" or "Adjust". This is the button that will begin the calibration process. Some versions will also have a button labeled "Verify" that will test the source calibration without making any changes. Other selections are for factory personnel use only.

6. Once begun, you must enter the power meter and sensor information. The software will verify the power meter and sensor. You are then prompted to connect the sensor(s) and cable as needed.

Connecting sensors to the PNA



Additional Information

All ports are tested on all PNAs. Source calibration takes approximately 10 to 45 minutes to complete depending on the frequency range and model number of the PNA. The E8361 models may take up to 90 minutes.

Troubleshooting

In the event there is a problem with Source Calibration, please refer to the "Troubleshooting" chapter in the PNA Service Guide.

E8361 Procedure

Source and Receiver calibration requires the power meter to measure the source power over the full range of each of the PNA internal bands. Because the 8487A can not measure accurately above 50 GHz, it can only be used up to the next highest band switch frequency at 46.2 GHz. The V8486A sensor and V281B adapter are used from 46.2 GHz to 67 GHz.

For highest accuracy, the V8486A and V281B should be sent to Agilent for a custom calibration from 45 GHz to 70 GHz.

For the next highest accuracy level, the following procedure shows how to measure correction factors yourself from 46 to 50 GHz. This procedure assumes you have already loaded correction factors for both sensors into the power meter.

1. On your power meter, add 46 and 48 GHz to the Cal Factor Table.
2. Preset the PNA
3. Tune the PNA to 46 GHz (CW frequency)
4. Using the 8487A, measure power at port 1. Record this value.
5. Tune the PNA to 48 GHz (CW frequency)
6. Using the 8487A, measure power at port 1. Record this value.
7. Connect the V8486A, V281A, and 1.85 f-f adapter to the power meter.
8. Tune the PNA to 46 GHz (CW frequency)
9. Adjust the cal factor table 46 GHz setting until the power meter reading matches the power readings from step 4.
10. Tune the PNA to 48 GHz (CW frequency)
11. Adjust the cal factor table 48 GHz setting until the power meter reading matches the power readings from step 8.

Receiver Calibration

Receiver calibration adjusts the network analyzer receivers for a flat response across its full frequency range. This adjustment is for service only; not for measurement calibration.

Required Equipment

Preferred Power Meter: E4419B
Alternate Power Meters: E4419A or EPM-442A

Note: The power sensor depends on the PNA frequency range. Depending on the PNA model, two power sensors may be required to test the full frequency range.
The PNA front panel connector type will determine the cable used and if an adapter is required with the power sensor(s).

See PNA Accessories

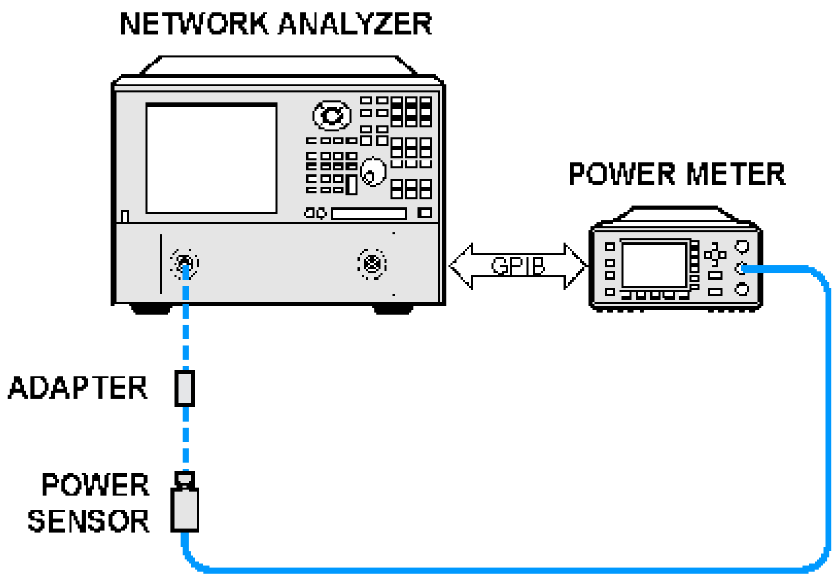
Procedure

1. Refer to your power meter documentation to ensure the proper calibration factors for the power sensor have been entered into a table on the power meter.
2. Connect a GPIB cable between the power meter and network analyzer.
3. Ensure the power sensor(s) are connected to the power meter.
4. In the analyzer **System** menu, point to **Service**, **Adjustments**,and click **Receiver Calibration**.
5. The software presents you with two choices:

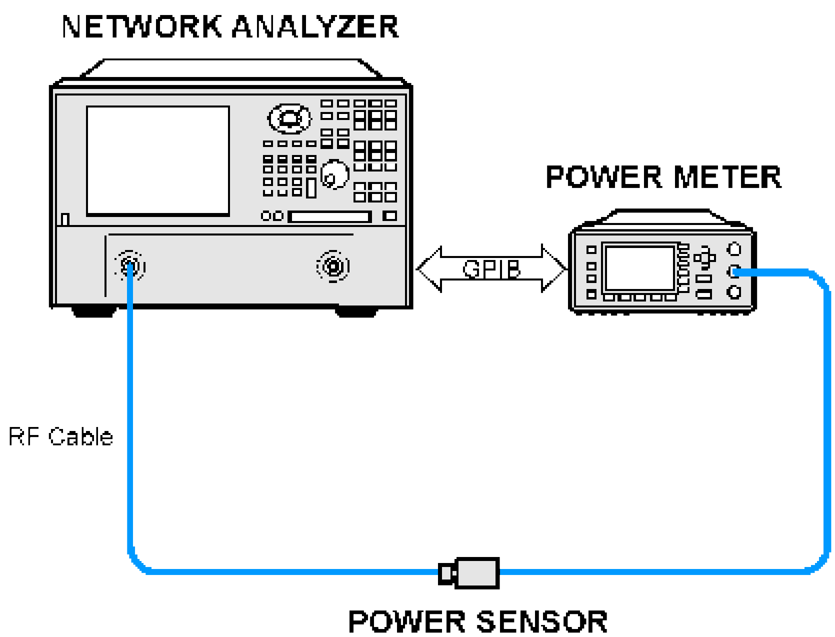
    a. Click **Inspect Flatness** to observe flatness of receiver response versus frequency. Although there is no explicit specification for receiver flatness, Receiver Calibration should improve Transmission and Reflection Tracking error terms which are specified.

    b. Click **Calibrate** to begin the receiver calibration process. The software prompts you to connect the sensor(s), cable and adapter as needed (see the following graphics).

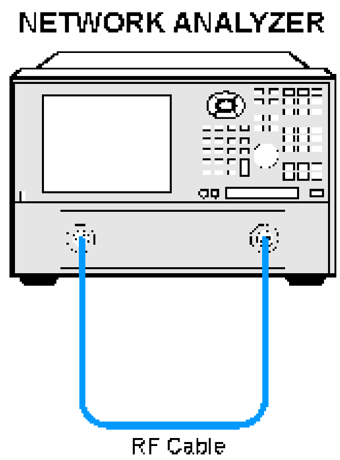
Connecting sensor(s) to the PNA



Connecting adapter and cable between sensor and PNA



Through connection using the specified cable



Additional Information

Receiver Calibration tests all PNA receivers, taking approximately 15 and 45 minutes. Length is dependent on frequency range and number of ports.

Troubleshooting

In the event there is a problem with Receiver Calibration, please refer to the "Troubleshooting" chapter in your PNA Service Guide.

Last Modified:

12-Jul-2007	Removed outdated table of supported power meters

Receiver Display

- The Receiver Display as a Troubleshooting Tool
- How to start the Receiver Display

Other Support Topics

The Receiver Display as a Troubleshooting Tool

The Receiver Display is a Troubleshooting Tool. It enables the analyzer to isolate faulty functional groups within its own Measurement System. Traces for each Receiver are Displayed in individual windows. Identifying discrepancies of the traces in these windows can help isolate the faulty assembly.

For a thorough description of Receiver Display and the troubleshooting steps see Chapter 3 of the PNA Service Guide. You can download the Service Guide for your PNA model from our website: http://na.tm.agilent.com/pna/

How to Start the Receiver Display

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For PNA-L and E836x models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Service** 3. then **Utilities** 4. then **Receiver Display**
For PNA-X and 'C' models	Programming Commands
1. Press **SYSTEM** 2. then **[Service]** 3. then **[Utilities]** 4. then **[Receiver Display]**	1. Click **Utilities** 2. then **System** 3. then **Service** 4. then **Utilities** 5. then **Receiver Display**

IF Access User Interface Settings

The following IF receiver settings can be made through the UI (User Interface) on the E836x Option H11 and PNA-X Opt 020.

- **IF Gain Configuration**
- **IF Switch Configuration**
- **IF Filter Configuration**

Other IF Access Topics

See Also

E836X Opt H11

- See the H11 option rear panel connectors
- See if your PNA can be upgraded to the H11 option.
- See the H11 specs
- Opt H08 Pulsed Application

PNA-X Opt 020

- See the PNA-X rear panel connectors.
- See IF Path Config Block Diagram

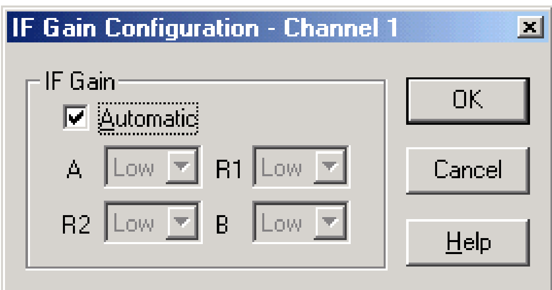
IF Gain Configuration

The IF Gain Configuration settings allow you to manually set the gain of the IF amplifiers.

Available on the E836x Option H11 ONLY.

How to Make IF Access Settings

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
	Programming Commands
1. [Navigate using MENU/DIALOG]()	1. Click **Channel** 2. then **Advanced** 3. then **IF Gain Configuration**



IF Gain Configuration dialog box help

Note: This dialog is NOT available on the PNA-X models.

Automatic - check to allow the PNA to set the IF gain automatically. Clear to enable manual IF gain settings.

Note: Clearing the **Automatic** checkbox can result in inaccurate measurements.

A, R1, R2, B Receivers

Auto Gain - The PNA selects the best gain level to make pulsed measurements.

- **Low** - about 0 dB of gain
- **Med** - about 17 dB of gain
- **Hi** - about 34 dB of gain

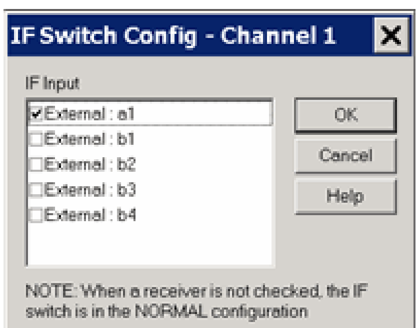
IF Switch Configuration

The IF Switch setting allows you to select the input path for each IF receiver.

Available on the E836x with Opt H11 and on the PNA-X with Opt 020.

How to Make IF Switch Settings

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For E836x models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Channel** 2. then **Advanced** 3. then **IF Switch Configuration**
For PNA-X and 'C' models	Programming Commands
1. Press TRACE/CHAN 2. then **[Channel]** 3. then **[Hardware Setup]** 4. then **[IF Switch Configuration]**	1. Click **Trace/Chan** 2. then **Channel** 3. then **Hardware Setup** 4. then **IF Switch Configuration**



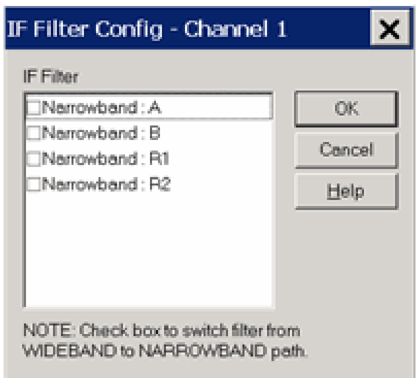
IF Switch Configuration dialog box help
Select a receiver path to switch to External. This is **Switch 1** on the PNA-X IF Path Config Block diagram. **Unchecked (Normal)** - Allow the PNA to decide the input path to the PNA IF / Receiver path. **Checked (External)** - Always use the rear panel input to the selected PNA IF / Receiver path.

IF Filter Configuration

The following IF settings allow you to select the filter path for each IF receiver in the **PNA-X ONLY**.

How to Make IF Access Settings

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For PNA-X and 'C' models	Programming Commands
1. None	1. Click **Trace/Chan** 2. then **Channel** 3. then **Hardware Setup** 4. then **IF Filter Config** setting



IF Filter Config dialog box help

Select a PNA-X IF Filter path to switch between Narrowband and Wideband filtering.

This is **Switch 2** on the IF Path Config Block diagram.

Unchecked Wideband filtering

Checked - Narrowband filtering

Last modified:

26-Jul-2007	Added IF Filter config
9/12/06	Added link to programming commands

External Millimeter Module Configuration

You can use external Millimeter Modules to extend the frequency coverage of your PNA. To use this feature your PNA must have the H11 Option. PNA-X models require Opt 020.

- **PNA Limitations when using External Millimeter Modules**
- **How to Configure Millimeter Modules**

Other IF Access Topics

PNA Limitations when using External Millimeter Modules

Power Settings When using external Millimeter Modules, the PNA cannot control the power level into your DUT above 67 GHz. Because of this limitation, PNA power settings will not function correctly. Some of these settings are: Power level in standard or segment sweep, source and receiver power calibrations, and calibration interpolation. Your modules may have a manual power control.

Frequency Offset and FCA Measurements Because of the various switch settings and configurations, Frequency Offset and FCA measurements are NOT supported when using external Millimeter Modules.

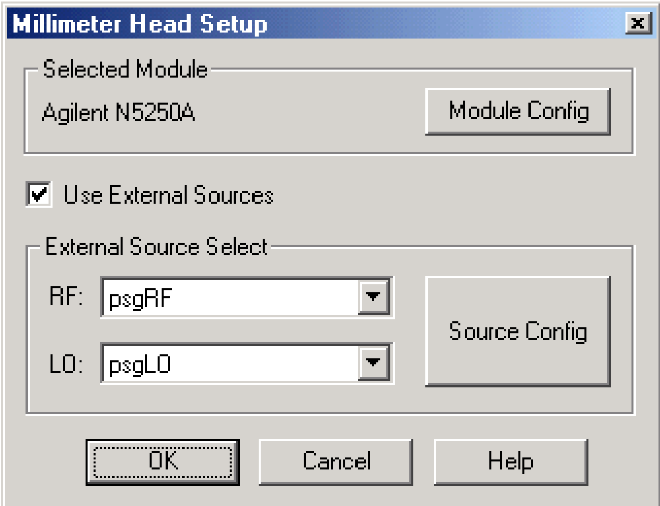
PNA-X models

- **CAUTION:** Connect a 10 dB attenuator to the N5260A LO input from the PNA-X LO Output. Otherwise, damage will occur to the N5260A test set.
- The PNA-X rear panel IF Inputs use 4 SMA connectors. Previous PNA models use BNC. Adapters may be required.

How to Configure Millimeter Modules

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	**No programming comands**
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Configure** 3. then **Millimeter Module Config**
For PNA-X and 'C' models	**No programming comands**
1. Press SYSTEM 2. then **[Configure]**	1. Click **Utility** 2. then **System**

3. then **[Millimeter Module]**	3. then **Configure** 4. then **Millimeter Module Config**



Millimeter Head Setup dialog box help

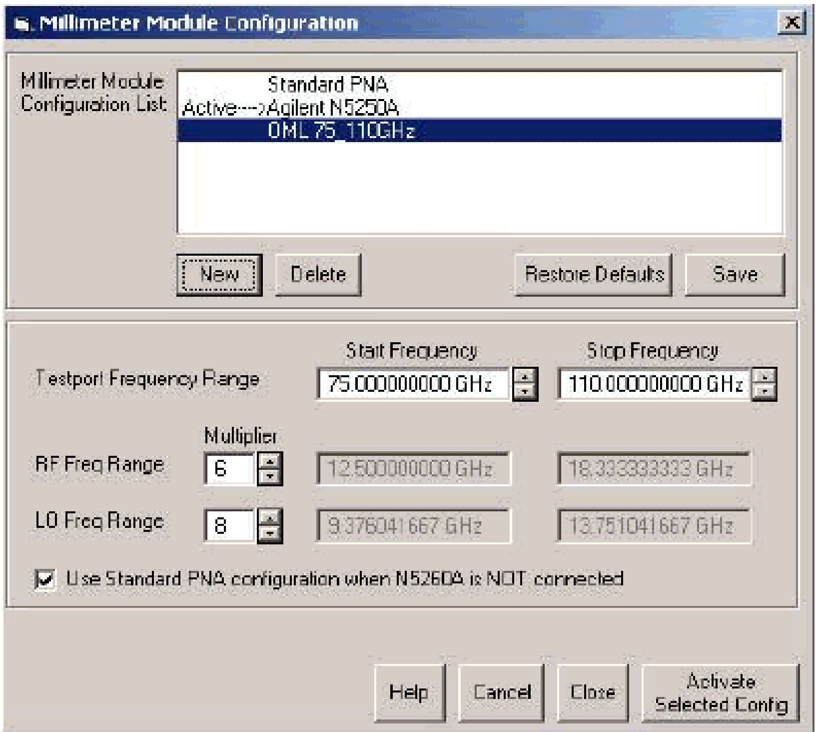
Important Notes

- The External Sources will become UNSYNCHRONIZED after recalling an instrument state. When this occurs, launch this dialog box again and click **OK.** We strongly recommend using only one channel to make measurements using external sources.
- For measurements up to 110 GHz, the amount of phase noise is comparable when using either the internal PNA sources or external sources. For the best measurement accuracy at frequencies above 110 GHz, it is strongly recommended that external sources be used.
- Only Agilent PSG sources are supported.
- When **Use External Sources** is checked, the PNA trigger settings are automatically configured and must not be changed.

Selected Module Displays the currently selected module. To select and configure a different module, click Module Config.

Use External Sources Check to use external sources to provide an LO for the Millimeter Modules.

Source Config Click to invoke the External Source Configuration dialog box. This dialog box is also used to configure external sources for the FCA application. Ignore references to FCA in the help topic.



Millimeter Module Configuration dialog box help

Millimeter Module Configuration List Lists the standard PNA configuration and others that you have created.

New Click to create a new Millimeter Module Configuration. Invokes the **Name** dialog box. Type a unique name for the new configuration using only alphanumeric characters and underscore, then click OK.

Delete Remove a Millimeter Module Configuration.

Restore Defaults Prompts, then REMOVES all configurations except for the standard PNA (and N5250A if installed).

Save Saves the current settings to the PNA hard drive.

Testport Frequency Range Set the Start and Stop frequencies of the selected configuration at the test ports. When Activated (click **Activate Selected Config**), this becomes the displayed Start and Stop frequency of the PNA.

RF Freq Range Multiplier RF Frequency Range (displayed in grey fields) multiplied by this value = Testport Frequency Range.

Use the Multiplier values that are specified in your test head documentation.

LO Freq Range Multiplier LO Frequency Range (displayed in grey field) multiplied by this value + 8.33 MHz = Testport Frequency Range.

Note: If the LO and RF frequency ranges are not within the operating range of the PNA, a warning message appears along with a red box around the invalid field. Click the appropriate Multiplier value up or down to correct the problem.

Use Standard PNA operation when N5260A is NOT connected When Activate Selected Config is clicked, the PNA detects if a N5260A is connected. If one is NOT connected and:

- This box is checked, then the selected configuration is NOT activated, but uses the Standard PNA configuration.
- This box is cleared, then the selected configuration IS activated anyhow.

Cancel Closes dialog box without saving changes.

Close Prompts to save changes, then closes the dialog box.

Activate Selected Config Saves the configuration, then closes and restarts the PNA application with the new configuration. To change to another configuration, including the standard PNA configuration, you must make this selection again.

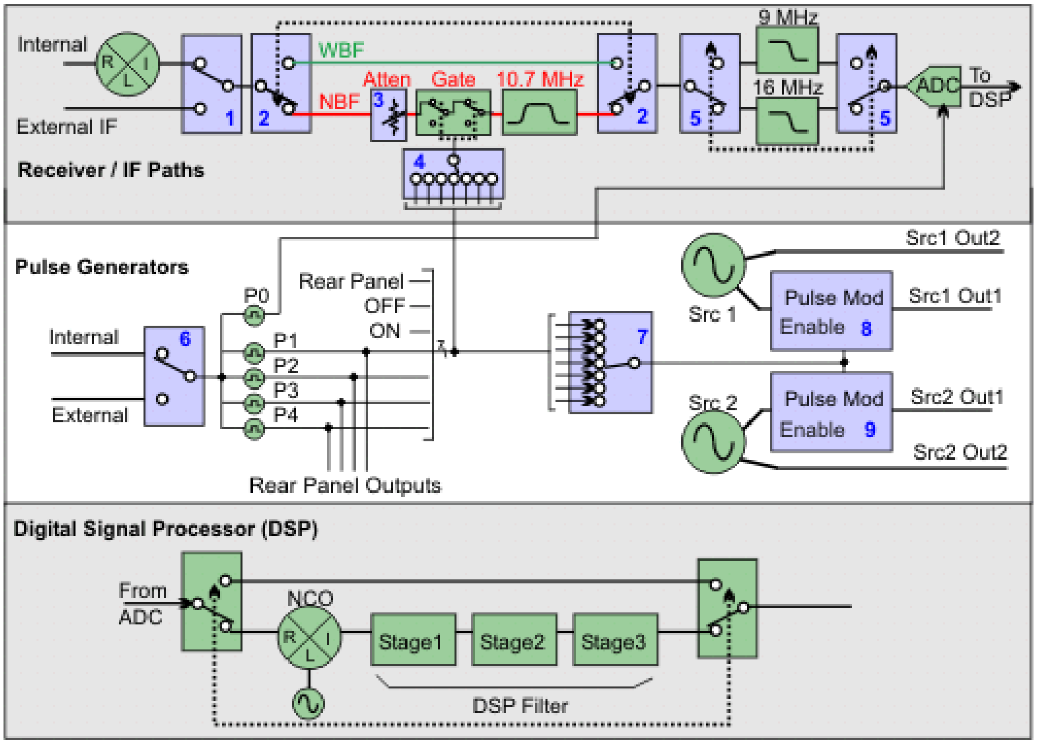
Last modified:

April 9, 2007	Updated for PNA-X
9/12/06	Note - NOT compatible with Freq Offset

IF Path Configuration Settings

For Advanced Users: the following block diagram shows the IF Configuration capability of the PNA-X.

Note: The PNA [Pulsed Application](#) (Opt H08) provides an intuitive user interface to easily make average pulse, point-in-pulse, and pulse profiling measurements.



Legend:

Blue boxes with Ref #s are configurable elements.
Click a blue box, or scroll down, to see how to make settings using [SCPI](#) and [COM](#) commands.

Description:

Receiver / IF Path (top block)

This section is duplicated for each of the receivers (A, B, C/R1, D/R2, R). [See how to make settings remotely below.](#)

- **Switch 1** Internal input is a test port or reference receiver input. External Input is through the [rear-panel connectors (A, B, C/R1, D/R2, R)](#)
- **Switch 2** Select Wideband IF or Narrowband IF, which includes the ability to pulse gates.
- **Programmable attenuator #3** Specify IF attenuation for the selected receiver.

- **Switch 4** IF Gates - 1 of 7 lines from pulse generator section to each of the receiver gates.
- **Switch 5** Select Auto, 9 MHz, or 16 MHz filters for all receivers.
- **ADC** Analog to digital converter for the selected receiver, with the ability to be pulsed by the P0 generator. ADC output goes to Digital Signal Processor (DSP).

Pulse Generators (middle block)

See how to make settings remotely below.

- **Switch 6** **Internal** or **External** inputs provide the REPETITION RATE (clock) for the pulse generator. From that rate, the generator creates five pulse outputs with unique delays and pulse widths. External input is on the Pulse I/O connector pin 7 (Synch IN).
- **P0** Hardwired to pulse the ADC for each receiver.
- **P1 thru P4** These four pulse generator outputs are hardwired to rear panel outputs on the Pulse I/O connector (pins 10 - 13). They are also routed to two switches (#4 and #7 on the above diagram) along with the following three lines:
  - **Rear Panel** External pulse generator input from Pulse I/O connector pin 8 (RFPulseModIn).
  - **OFF** Pulse is constantly in LOW state causing gate and source to be OFF.
  - **ON** Pulse is constantly in HIGH state causing gate and source to be ON.
- **Switch 7** Pulse Modulation - 1 of 7 lines to each of the sources. **Important**: When internally modulating the sources, source leveling must be set to Open-loop.
- Rear-panel Pulse I/O connector (pins 10 - 13) hardwired.
- Source1 and Source2 pulse modulators (#8 and #9 on the above diagram)

DSP (bottom block)

- Filters the ADC (digital) output from top block and outputs data to the PNA display.
- See SCPI and COM commands to control DSP settings.

See Also

- Remote RF Path Configuration
- Rear Panel Pulse I/O connector

Most of the following elements highlighted in BLUE in the above diagram, have settings that are made using SCPI or COM commands ONLY. These are the same commands that are used to make settings in the RF Path Configurator. In general the command specifies an element name and a setting.

See SCPI command

See COM object and example.

Ref#	Element Name Description	Settings
1	"IFSW**n**" For 2-port PNA-X, n = **A, B, R1, R2** For 4-port PNA-X, n = **A, B, C, D, R (for R1 to R4)** `For example: "IFSWB"` **Requires Opt 020 external IF inputs on the rear panel** This switch CAN also be set from the PNA-X UI.	• **"Internal"** • **"External"** Rear Panel IF connectors. 4-port PNA-X use R for Ref 1 to 4
2	"IFSigPath**n"** For 2-port PNA-X, n = **A, B, R1, R2** For 4-port PNA-X, n = **A, B, C, D, R1, R2, R3, R4** **"**IFSigPathAll" makes setting for ALL receivers. This switch CAN also be set from the PNA-X UI.	• **"WBF"** Wide Band Filter Path (default) • **"NBF"** Narrow Band Filter Path
3	"NBFATN**n**" For 2-port PNA-X, n = **A, B, R1, R2** For 4-port PNA-X, n = **A, B, C, D, R1, R2, R3, R4** `For example: "NBFATNB"`	0 to 31 in 1 dB steps `For example: "28"`
4	"IFGate**n**" For 2-port PNA-X, n = **A, B, R1, R2** For 4-port PNA-X, n = **A, B, C, D, R1, R2, R3, R4** `For example: "IFGateB"`	• **"On"** Gate is always ON • **"Off"** Gate is always OFF • **"RearPanel"** (use Pulse IO pins 1 to 5) • **"Pulse1"** • **"Pulse2"** • **"Pulse3"**

		• **"Pulse4"**
5	"IFAntiAliasFilter" This setting affects ALL receivers. It can NOT be made for individual receivers.	• **"Auto"** PNA selects which filter to use based on other IF settings. • **"9MHZ"** • **"16MHZ"**
6	"PulseTrigInput" **Requires Opt 025 - Four Internal Pulse Generators**	• **"Internal"** Internal Pulse In - pulse generators are triggered each period. • **"External"** External Pulse Synch In -Pulse I/O pin 7) - An external trigger signal is required to trigger the pulse generators for each pulse.
7	"PulseModDrive" Select from 1 of 7 lines to modulate the OUT1 path of Sources 1 and 2 . **Important**: When Pulse 1-4 is selected to modulate the sources, source leveling must be set to Open-loop.	**"On"** Pulse Mod drive is always ON, leaving "SRC1|2 Out 1" ON and not modulated. Default setting. **"Off"** Pulse Mod drive is always OFF, leaving "SRC1|2 Out 1" OFF. **"RearPanel"** (use Pulse IO pin 8) **"Pulse1"** **"Pulse2"** **"Pulse3"** **"Pulse4"**
8	"Src1Out1PulseModEnable" **Requires Opt 021 - Source1 Pulse Modulator**	**"Enable"** **"Disable"**
9	"Src2Out1PulseModEnable" **Requires Opt 022 - Source2 Pulse Modulator**	**"Enable"** **"Disable"**

Last Modified:

5-Sep-2007	New Image and minor edits
February 5, 2007	MX New topic

E5091 Testset Control

The E5091A is a popular Agilent Technologies 7-port / 9-port testset. Although the testset was originally designed to work with the ENA Network Analyzer, it also works well with the PNA. This topic describes how to control the testset from the PNA. For more information about the testset, refer to your E5091A documentation.

Other External Device Control Topics

Overview

When connected to the PNA, the E5091A Testset provides full 7-port or 9-port test capability. The E5091A can be configured to switch a different testset path for each PNA channel. When all channels have been configured, the entire measurement setup and calibration can be saved to a .cst or .csa file to be recalled later. In addition, the Channel Settings Table that is appended to a printed hardcopy of a measurement includes the E5901A Port Control settings.

Notes:

- The E5091A Testset has a maximum useful frequency of 11 GHz.
- The E5091A Testset Control can be automated using SCPI and COM commands.
- When enabled, a second status bar row appears which indicates the testset that is being controlled and the current switch state.
- Testset path switching occurs just before a channel is triggered. If a channel trigger state is Hold, switching for that channel does not occur.
- PNA sweep speed will be slightly slower when using the E5091A to switch measurement paths.

Connect and Configure the E5091A

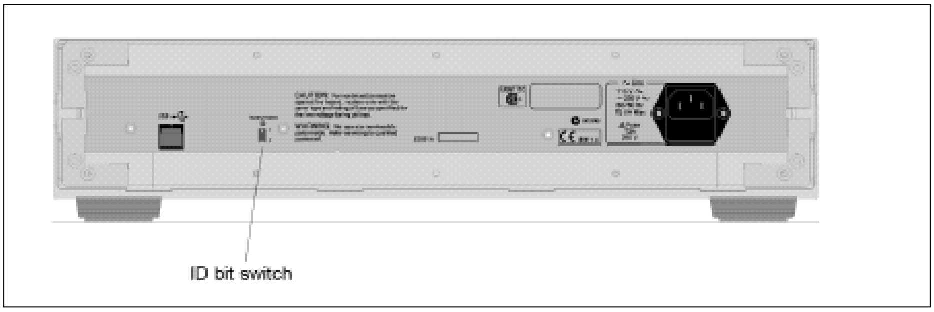
The E5091A can be connected to any one of the PNA USB ports. When first installed, Windows will automatically launch the "Add New Hardware" wizard. Click **Next** to install the E5091A Testset.

Note: See the power handling limitations of the PNA USB ports.

Connect the PNA test ports to the E5091A test ports. Match PNA test port 1 to E5091A test port 1, and so forth.

Selecting ID for E5091A

The PNA can control up to two E5091A testsets. Set the Instrument ID bit switch to 1 or 2. The testsets will then be identified automatically and referred to by the DIP switch setting on the E5091A rear-panel. Change the ID bit switch setting before connecting to the PNA USB.

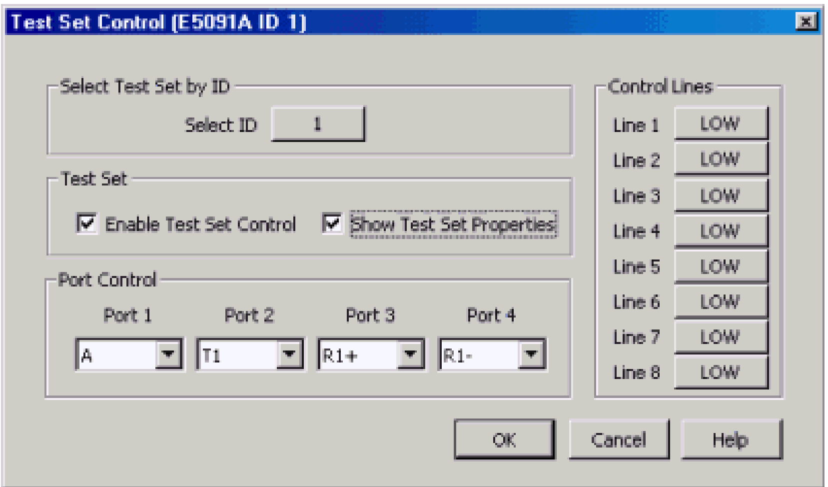


Power ON

Immediately after power-on, all of the port connection indicator LEDs of the E5091A go ON. Then, after the PNA detects the E5091A, the four LEDs that indicate the connected test ports remain ON. If the PNA is not powered on or if the E5091A is not connected using a USB cable, all of the LEDs stay ON.

How to make E5091A Testset Control Settings

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Channel** 2. then **External Testset** 3. then **E5091A**
For PNA-X and 'C' models	
1. Press TRACE/CHAN 2. then **[Channel]** 3. then **[More]** 4. then **[External Testset]** 5. then **[E5091A]**	1. Click **Trace/Chan** 2. then **Channel** 3. then **More** 4. then **External Testset** 5. then **E5091A**



E5091A Testset control dialog box help

The title of the dialog shows the testset model and ID number of the active testset..

Select ID ID of the testset to be configured. Up to two E5091A testsets can be controlled. Click to change testset ID. Learn how to set the testset ID.

Enable Test Set Control When cleared, port switching and control line settings are disabled. This selection affects all channels using the selected testset.

Show Test Set Property When checked, a second row on the status bar appears which indicates the testset that is being controlled and the current port control selection. For example, the following image shows the status bar when controlling an E5091A testset and a Z5623A K64 testset:

A. Configured channel

B. Port Control settings for E5091A

C. Port Control settings for Z5623A K64

D. Testset Label. E5091A control does not use this field. It is shared between Interface Control and External Testset Control. The two labels are separated by ***/***.

Control of the second status bar is completely separate from the first status bar, which is controlled from the View, Status Bar menu.

Port Control Controls **mapping** of Physical ports to Logical ports.

- Physical ports are the port numbers that are labeled on the test set front panel. (see N44xx test sets)
- Logical ports are the port numbers that are referred to by most of the PNA application prompts and dialog boxes.

Port Mapping Notes

- Port Control and Control Line settings effect the channel of the active (selected) measurement. These settings will occur as the channel is being measured.
- Correction is NOT turned OFF when port mappings are changed. However, the **calibration is NO LONGER VALID!**

Control Lines Specifies the values of individual control lines. These general purpose control lines on the test set front-panel can be used in your test setup. Each button toggles the control line HIGH and LOW. When first opened, the selections reflect the current control lines. See your test set documentation for more information about the control lines.

OK When clicked, the changes to the dialog box are implemented and the port selections and control values are immediately sent to the specified test sets. The Port Control and Control line settings are stored with other channel data and used when those channels are swept.

Cancel (or Escape) Changes to the dialog are not implemented and revert to the settings before the dialog box was opened.

Calibrating with the E5091A

The following are a few changes in the way you calibrate the PNA with the E5091A connected:

1. Create the measurements for the channel and configure the Port Control (switching) on the E5091A Testset Control dialog box. Enable **Show Testset Property**.
2. To calibrate, start the Calibration wizard and select a Calibration method (ECAL, SmartCal, Unguided).
3. Select the DUT connectors that are used at the E5091A measurement reference plane.
4. When prompted to connect a standard to a PNA port, instead connect the standard to the E5091A port as indicated on the Testset status bar. For example, if the status bar indicates **1 A**, instead of connecting a standard to port 1, connect it to port A reference plane of the E5091A.

Last Modified:

18-Jun-2007	MX added UI

External Multiport Test Set Control

Other External Device Control Topics

Supported Test Sets

The list of test sets that provide integrated solutions with the PNA is constantly growing. For a current list of supported multiport test sets, see www.agilent.com/find/multiport

Option 551

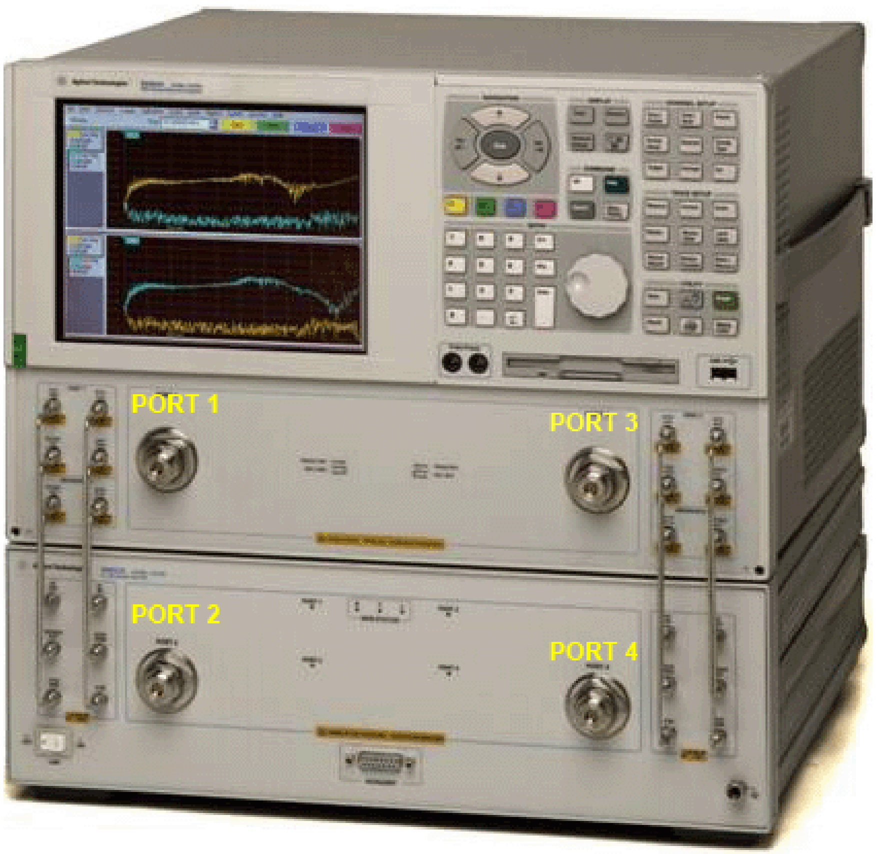
- **With** Option 551 enabled on your PNA, any supported multiport test set can be controlled directly from the PNA to make fully integrated measurements at ALL of the available test ports. To understand what test ports are available to source and receive, see the test set documentation.
- **Without** Option 551, basic operation depends on the number of PNA test ports.
  - For a 2-port PNA, configure two available test ports.
  - For a 4-port PNA, configure four available test ports.

Option 550

- **With** Option 550 enabled on your PNA, the N44xx test sets, and other supported test sets, can be controlled directly from the PNA to make fully integrated 4-port balanced measurements.
- **Without** Option 550, basic operation allows you to configure any **two** of the test ports to make standard S-parameter or receiver measurements. A different pair of ports can be configured for each channel.

N44xx Test Set Model	PNA Model (must have front-panel loops)	Frequency Range
N4419B	E8362B and N5230A Opt 225	10 MHz to 20 GHz
N4420B	E8363B and N5230A Opt 425	10 MHz to 40 GHz
N4421B	E8364B and N5230A Opt 525	10 MHz to 50 GHz
N4421B Opt H67	E8361A	10 MHz to 67 GHz

Note: By default, the system logical test ports are mapped as follows:

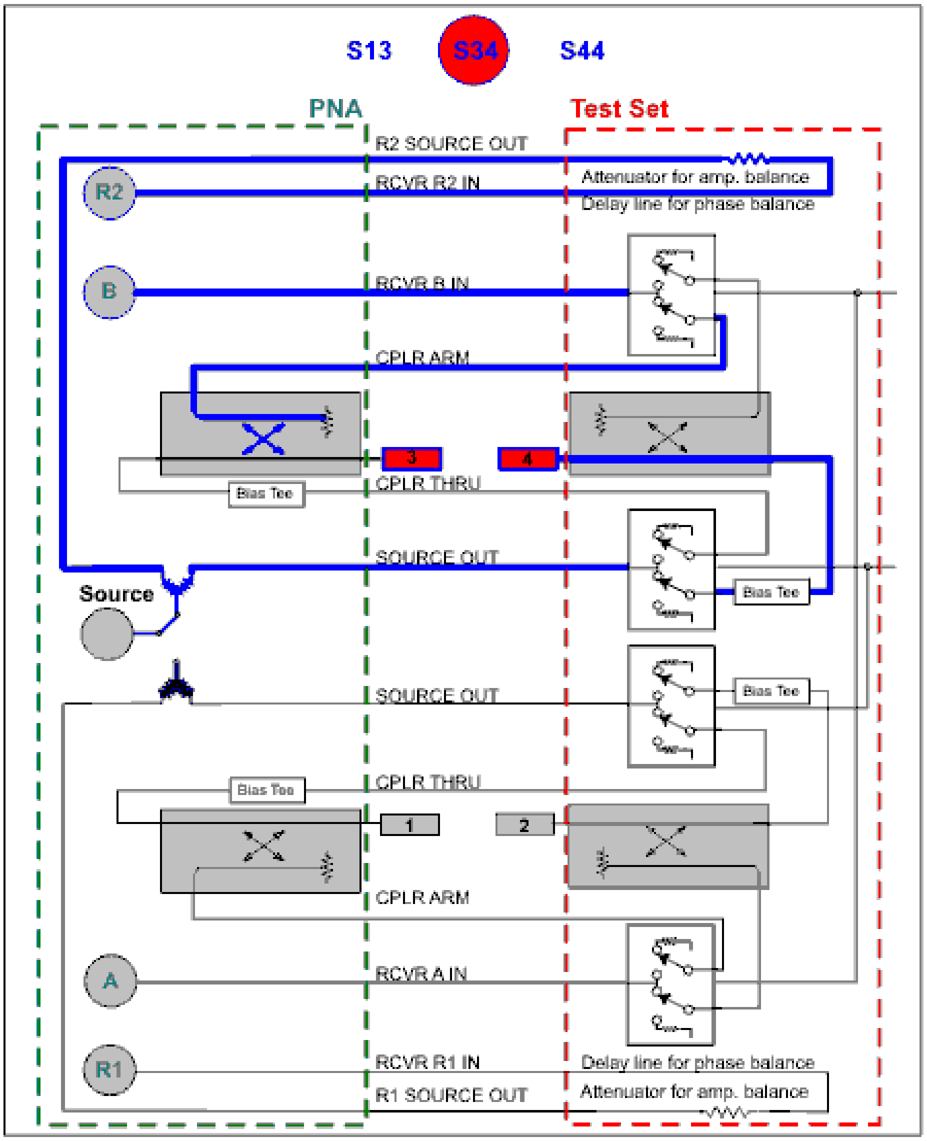


- **Port 1** - PNA port 1
- **Port 2** - Test Set port 2
- **Port 3** - PNA port 2
- **Port 4** - Test Set port 4

The ports can be **remapped** using the Port Control Setting.

Block Diagram of a 2-port PNA and N44xx Test Set

Click one of the S-parameters to see switch and path changes. Because the test set does NOT contain receivers, measurement speed and calibration can be affected.



Procedure - How to enable full Multiport Capability

1. Enable Option 550 or 551.
2. Connect the test set to the PNA using the documentation that was shipped with the test set.
3. Restart as Multiport PNA

4. Make optional External Test Set Control Settings

Connect and Configure the Test Set

Connect the test set to the PNA using the test set documentation. Most test set documentation can found at www.Agilent.com

Test Set I/O-controlled test sets

Test sets that are controlled using the Test Set I/O connector. have NO return communication capability. The PNA sends commands out the rear panel connector. It is assumed that the test set is responding appropriately.

GPIB-controlled test sets

Connect the test set to the GPIB using one of the following methods:

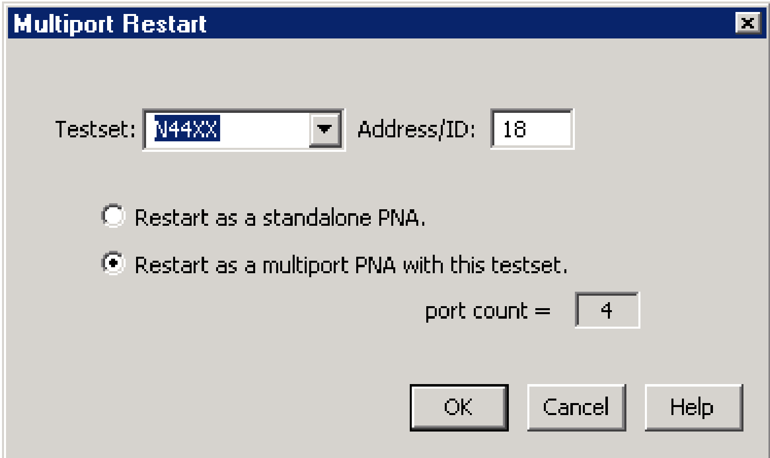
- If the **PNA will NOT be controlled** by a remote computer using GPIB, then the test set can be connected directly to the PNA GPIB port. The PNA is automatically switched to System Controller mode.
- If the **PNA WILL be controlled** by a remote computer using GPIB, then learn how to connect the test set

Restart as Multiport PNA

How to Enable Multiport capability

Note: If Option 550 or Option 551 has not been enabled, the following **Multiport Capability** menu selection will NOT be available.

Using front-panel HARDKEY **[softkey] buttons**	**Using a mouse with PNA Menus**
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **System** 2. then **Configure** 3. then **Multiport Capability**
For PNA-X and 'C' models	Programming Commands
1. Press **SYSTEM** 2. then **[Configure]** 3. then **[Multiport Capability]**	1. Click **Utility** 2. then **System** 3. then **Configure** 4. then **Multiport Capability**



Multiport Restart dialog box help

See Also External Test Set Control and other PNA Functions

After the test set is connected and PNA Option 550 or 551 is enabled, the following settings are used to enable Multiport operation.

Test Set Select the test set file to load. Only the files that are appropriate for use on that PNA model are displayed.

To Add a new Test Set file:

1. On the PNA, click **File**, then **Exit** to quit the PNA application.
2. Download the Test Set file from: http://na.tm.agilent.com/multiport/testsets/
3. Save it to the PNA C:\program files\agilent\network analyzer\testsets
4. Start the PNA application.
5. Click **System, Configure, Multiport, Testset**. The new test set should now be visible.

Address Enter the test set address.

- **Restart as a standalone PNA.** The PNA shuts down and restarts as a standard PNA. If the test set is left connected to the PNA, switch the test set OFF, then back ON to ensure that the test set routes signals to ports 1 and 2 of the PNA. In this condition, there is more loss in the test paths than without a test set connected. If the power switch is OFF, there is SIGNIFICANTLY more loss in the test paths.
- **Restart as a multiport PNA with this testset**. The PNA shuts down and restarts as a multiport PNA with the selected test set.

Click **OK** The PNA shuts down and restarts in the selected configuration.

To learn how to change port mapping, see Port Control.

Problems

If the PNA cannot find the test set, the following error is displayed on the PNA:

GPIB ERROR Address xx cannot open VISA session.

To correct the problem, verify the following:

- The test set is connected to the PNA using one of the methods described above.
- The correct test set address is set.
- The test set is turned ON.

Important: After the problem has been fixed:

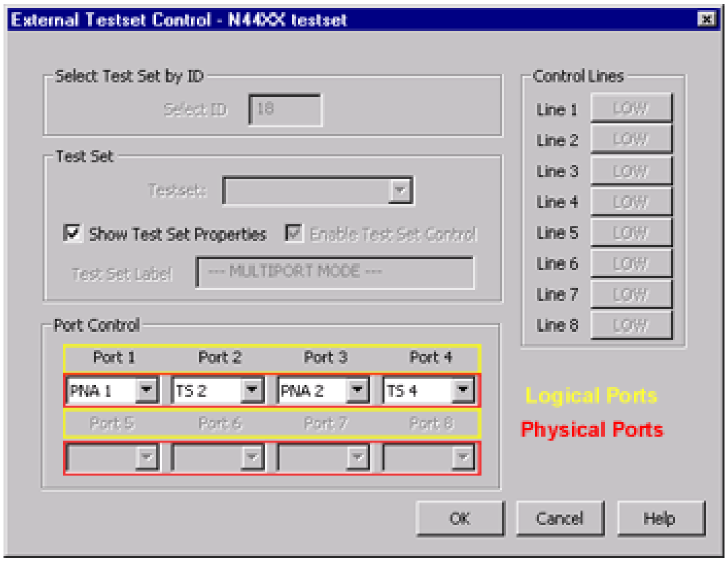
1. On the External Test Set Control dialog, click Enable Test Set Control.
2. Restart Triggering - click **Sweep, Trigger, Continuous.**
3. The PNA again tries to find the test set.

External Test Set Control Settings

The following External Test Set Control Settings are used to configure Multiport test sets. For the N44xx test sets, the only setting that is necessary is port control.

How to access the External Test Set Control Settings

Using front-panel HARDKEY [softkey] buttons	Using a mouse with PNA Menus
For N5230A and E836xA/B models	Programming Commands
1. Navigate using MENU/DIALOG	1. Click **Channel** 2. then **External Testset** 3. then **Other**
For PNA-X and 'C' models	Programming Commands
1. Press TRACE/CHAN 2. then **[Channel]** 3. then **[More]** 4. then **[External Testset]** 5. then **[Other]**	1. Click **Trace/Chan** 2. then **Channel** 3. then **More** 4. then **External Testset** 5. then **Other**



External Test Set Control dialog box help

Important Notes:

- With Options 500 and 551, **first** use the **Multiport Restart** dialog to **Restart as Multiport PNA with this test set.** The test set file is loaded and the test set is enabled automatically.
- When using GPIB to control an external test set, the PNA is automatically put in System Controller mode. It can NOT also be in talker-listener mode. To have the PNA control a GPIB test set AND be controlled by a remote PC, use a USB to GPIB adapter to control the external test set. This does NOT apply for PNA models with a 1.1 GHz CPU board, which has both a GPIB controller port and a talker/listener port.
- See also External Test Set Control and other PNA Functions

Select ID

- For N44xx test sets: the GPIB address
- Multiport test sets: either GPIB address or 0 for Test Set I/O controlled test sets.

Enable Test Set Control When cleared, port switching and control line settings are disabled. This selection affects all channels using the selected test set. When checked, the 'Show Test Set Properties' checkbox is also checked automatically.

Load Test Set File For operating **without** Options 500 or 551.

If your Test Set is not visible, see Add a new Test Set.

The selected test set file is loaded.

1. Navigate to the folder: C:/Program Files/Agilent/Network Analyzer/testsets/
2. Select a test set control file.

The title of the dialog shows the model of the test set file that is currently loaded.

See a list of supported test sets.

Show Test Set Properties This box becomes checked by default when the Enable Test Set Control is checked. When checked, a second row on the status bar appears which indicates the test set that is being controlled and the current port control selection. For example, the following image shows the status bar when controlling an E5091A test set and a Z5623A K64 test set:

A. Configured channel

B. Port Control settings for E5091A

C. Port Control settings for Z5623A K64

D. Test Set Label. This field is shared between Interface Control and External Test Set Control. The two labels are separated by ***/***.

Control of the second status bar is completely separate from the first status bar, which is controlled from the View, Status Bar menu.

Test Set Label NOT available with options 550 and 551. Add text to appear on the second status bar when **Show Test Set Properties** is checked. See image above.

Port Control Controls **mapping** of Physical ports to Logical ports. (Refer to image of dialog box above.)

- Physical ports are the port numbers that are labeled on the test set front panel.
- Logical ports are the port numbers that are referred to by most of the PNA application prompts and dialog boxes.

Port Mapping Notes

- Port Control and Control Line settings effect the channel of the active (selected) measurement. These settings occur as the channel is being measured.
- Correction is turned OFF when port mappings are changed.
- After the physical ports are mapped to logical ports, all PNA references to port numbers refer to LOGICAL port numbers. The only exception to this is during calibrations.

Control Lines Specifies the values of individual control lines. These general purpose control lines on the test set front-panel can be used in your test setup. Each button toggles the control line HIGH and LOW. When first opened, the selections reflect the current control lines. See your test set documentation for more information about the control lines.

OK When clicked, the changes to the dialog box are implemented and the port selections and control values are immediately sent to the specified test set. The Port Control and Control line settings are stored with other channel data and used when those channels are swept.

Cancel (or Escape) Changes to the dialog are not implemented and revert to the settings before the dialog box was opened.

External Test Sets and other PNA Functions

The following features may work differently with a test set connected to the PNA.

Remote Commands

See SCPI and COM commands for controlling an External Test Set.

Use *OPT? (SCPI) or NumberofPorts (COM) to query the number of ports for a PNA/External Test set.

Interface Control

When both Interface Control and External Test Set Control are configured, the commands on the Interface Control **Before Sweep Start** tab are sent out before any External Test Set Control commands are executed on that channel. Similarly, commands on the **After Sweep End** tab are sent after Test Set Control commands.

Calibration

With an External Test Set connected, calibration is performed exactly like a PNA with the following exceptions:

- Correction is turned OFF when port mappings are modified. This also applies to Source Power Cal.
- A TRL Cal, QSOLT, or Unknown Thru can be performed on these systems ONLY when other portions of the calibration fully characterize all ports using SOLT with Defined Thru or Flush Thru. For example, when calibrating all four ports of a PNA with N44xx test set, perform a SOLT between ports 1 and 2, and also between ports 3 and 4 using a Defined Thru or Flush Thru. Then Unknown Thru could be used between any combination of the remaining ports.

  A Delta Match Calibration is **NOT POSSIBLE** on External Test Set systems, although revision A.06.04 will allow it.

- With an External Test Set connected, you may be required to perform more than 3 THRU connections.

As with ALL PNA calibrations, when error correction is ON, both forward and reverse sweeps are required for EACH port pair that is corrected, even if only one reflection measurement is displayed. For example, any displayed measurement with full 4-port calibration ON will require 12 measurement sweeps. Learn more.

Source Power Cal

Source power calibration involves adjusting the source so that the power at an output port is flat across a frequency range. Because of additional loss through some of the test set paths, it may NOT be possible to obtain corrected output power because of limitations on the source signal.

During a Source Power Cal, you are prompted when and where to connect the power sensor. When one of the supported test sets are connected, the prompt refers to the PHYSICAL port number, NOT the LOGICAL port number. To help with translating physical to logical port mappings, enable Show Test Set Properties**.**

Measurements with Shared Receivers

External test sets do not contain receivers. The PNA receivers are always used to measure signals at the external test set ports. Therefore, when a channel contains two measurements that share a PNA test port receiver, additional sweeps are necessary.

For example, to make S34 and S44 measurements in the same channel with correction OFF:

- On a 4-port PNA, only ONE sweep is required using the C (port 3), D (port4), and R (reference for All receivers).
- On a N44xx system, TWO sweeps are required since both measurements use the B and R2 receivers. See interactive block diagram above.

Create Ratioed and Unratioed Measurements

When using an external test set, it IS possible to create a Ratioed measurement using two logical receivers that share the same physical PNA receiver. However, this measurement data is NOT valid. Invalid measurement traces show all data at -200dB. Learn about Logical Receiver Notation

Logical Port References

When an external test set is enabled, all references to PNA port numbers and test set port numbers (except during calibrations) refer to LOGICAL port numbers. Logical ports can be remapped using the Port Control settings. During a calibration, you are prompted to connect standards to physical port numbers.

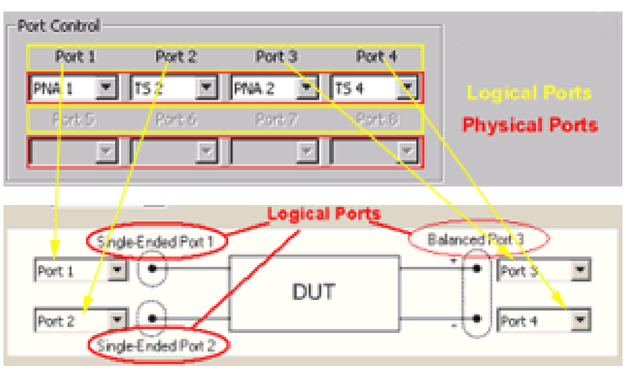
Balanced Port Mapping

"Logical Ports" is a term that is used with both External Test Sets and balanced measurements. While the concept is the same, they refer to different scenarios. The two can be easily confused when making Balanced measurements with an External Test Set connected. The important principle to remember is the order in which the logical ports for each are mapped:

1. In the External Test Set - Port Control settings dialog, the physical PNA ports and test set ports are mapped to logical ports as noted above.
2. In the Balanced Topology Dialog, the new (step 1) logical ports are mapped again to become Balanced logical ports.

1. External Test Set Mapping Dialog

2. Balanced Topology Dialog



Preset

Instrument Preset will reset Port Control settings to defaults and remove the test set label. All other settings remain. To maintain port control settings and the test set label, create a User Preset.

Instrument State Save and Recall

Instrument State files include Test Set model, Enable and Status bar settings, and Port mappings and DUT control values for each channel.

If an Instrument State recall requires that a test set configuration file be loaded, recall time may be significant. For example, this would occur if a 2-port PNA with attached test set is configured as a 2-port PNA and then recalls a state file which requires 4-port operation.

Recall Cal Sets

If a Cal Set is saved while an external test set is enabled, when the Cal Set is recalled, then the external test set must be enabled or an error message is displayed.

Copy Channel

Copy Channel copies all relevant test set data from the source channel to the target channel.

Applications

No PNA applications are supported with External Test Set Control. These include FCA (opt 083), SMC (opt 082), GCA (opt 086), NFA (opt 029), Pulsed (opt H08).

Print

Port mapping information appears on the Channel Settings Table when printing.

Save sNp Files

To save sNp data with an external test set enabled, click File, Save As, then select **Snp File(*.s*p),** then complete the Choose ports dialog.

Last modified:

15-Jan-2008	No App support
19-Nov-2007	Note to Add TS files
9-Nov-2007	Fixed S13 image and added delta match notes
17-Sep-2007	Added note for PNA-X test set files
23-Feb-2007	Modifed DM Cal for 6.20.
15-Jan2007	MX Added UI
10/16/06	Added clarification to opts.
9/18/6	MQ Many edits for Opt 551
9/12/06	Added link to programming commands

Technical Specifications for the E8356A, E8357A, E8358A

(Rev. 2005-09-23)

Because the **E8356A, E8357A, E8358A** network analyzers are no longer produced, the technical specifications are stored only on the Internet. To view or print the .pdf version of the specifications, visit our web site at http://www.agilent.com/find/pna, and search for "E8356A Specifications"

The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Technical Specifications for the E8801A, E8802, E8803A

(Rev. 2005-09-26)

Because the E8801A, E8802, E8803A network analyzers are no longer produced, the technical specifications are stored only on the Internet. To view or print the .pdf version of the specifications, visit our web site at http://www.agilent.com/find/pna, and search for "E8801A Specifications"

The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Technical Specifications for the N3381A, N3382A, N3383A

(Rev. 2005-09-26)

Because the N3381A, N3382A, N3383A network analyzers are no longer produced, the technical specifications are stored only on the Internet. To view or print the .pdf version of the specifications, visit our web site at http://www.agilent.com/find/pna, and search for "N3381A Specifications"

The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Technical Specifications for the E8361A

(Rev. 10/11/2007)

This is a complete list of the E8361A network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the .pdf version of the specifications, visit our web site at http://www.agilent.com/find/pna, and search for "E8361A Specifications"
- The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

See Specs for other PNA models

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the E8361A analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data

- System Dynamic Range
- Receiver Dynamic Range
- 1.85mm Connectors
- 2.4mm Connectors

Table 1. System Dynamic Range[a]

Description	Specification (dB) at Test Port[b]	Typical (dB) at Direct Receiver Access Input[c]	Supplemental Information
Dynamic Range (in a 10 Hz BW)			

Standard Configuration **(E8361A - Standard)**			
10 MHz to 45 MHz[d]	61	NA	--
45 MHz to 500 MHz[e]	87	NA	--
500 MHz to 750 MHz	112	NA	--
750 MHz to 2 GHz	111	NA	--
2 GHz to 10 GHz	111	NA	--
10 GHz to 24 GHz	114	NA	--
24 GHz to 30 GHz	103	NA	--
30 GHz to 40 GHz	104	NA	--
40 GHz to 45 GHz	96	NA	--
45 GHz to 50 GHz	100	NA	--
50 GHz to 60 GHz	97	NA	--
60 GHz to 67 GHz	94	NA	--
67 GHz to 70 GHz[d]	94	NA	--
Configurable Test Set **(E8361A - Option 014 or Option 014 and 080)**			
10 MHz to 45 MHz[d]	61	99	--
45 MHz to 500 MHz[e]	87	102	--
500 MHz to 750 MHz	112	125.5	--
750 MHz to 2 GHz	111	125.5	--
2 GHz to 10 GHz	111	125	--
10 GHz to 24 GHz	112	128	--
24 GHz to 30 GHz	101	117.5	Option 016 degrades performance by 2 dB.
30 GHz to 40 GHz	102	115	
40 GHz to 45 GHz	94	109	
45 GHz to 50 GHz	98	110.5	
50 GHz to 60 GHz	95	107	

60 GHz to 67 GHz	90	101	Option 016 degrades performance by 3 dB.
67 GHz to 70 GHz[d]	90	100	
Configurable Test Set & Extended Power Range **(E8361A - Option 014 & UNL or Option 014 & UNL & 080)**			
10 MHz to 45 MHz[d]	61	99	--
45 MHz to 500 MHz[e]	87	102	--
500 MHz to 750 MHz	112	125.5	--
750 MHz to 2 GHz	111	124	--
2 GHz to 10 GHz	111	124	--
10 GHz to 24 GHz	112	125	--
24 GHz to 30 GHz	101	114.5	Option 016 degrades performance by 2 dB.
30 GHz to 40 GHz	99	112	
40 GHz to 45 GHz	92	105	
45 GHz to 50 GHz	94	106.5	
50 GHz to 60 GHz	91	103	
60 GHz to 67 GHz	84	95	Option 016 degrades performance by 3 dB.
67 GHz to 70 GHz[d]	84	94	

a The system dynamic range is calculated as the difference between the noise floor and the source maximum output power. System Dynamic Range is a specification when the source is set to Port 1, and a characteristic when the source is set to Port 2. The effective dynamic range must take measurement uncertainties and interfering signals into account as well as the insertion loss resulting from a thru cable connected between Port 1 and Port 2..

b The test port system dynamic range is calculated as the difference between the test port noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account as well as the insertion loss resulting from a thru cable connected between Port 1 and Port 2..

c The direct receiver access input system dynamic range is calculated as the difference between the receiver access input noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, the analyzer can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when receiver damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

d Typical performance.

e May be limited to 100 dB at particular frequencies below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Note: This E8361A document does NOT provide technical specifications for Receiver Dynamic Range.

Note: This E8361A document provides technical specifications for the following calibration kits and Ecal modules only: 85056A, 85058B, N4693A, N4694A. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup.

Table 10. Uncorrected System Performance[a]

Specifications apply over environmental temperature of 23° ±3 °C, with < 1 °C deviation from the calibration temperature

Description	**Specification**	**Supplemental Information**
Directivity		
		typical:
10 MHz to 45 MHz[b]	--	22 dB
45 MHz to 2 GHz	24 dB	27 dB
2 GHz to 10 GHz	20 dB	24 dB
10 GHz to 20 GHz	16 dB	20 dB
20 GHz to 30 GHz	14 dB	17 dB
30 GHz to 50 GHz	13 dB	17 dB
50 GHz to 60 GHz	13 dB	17 dB
60 GHz to 67 GHz	10 dB	18 dB
67 GHz to 70 GHz[b]	--	14 dB
Source Match - Standard		
		typical:
10 MHz to 45 MHz[b]	--	7 dB
45 MHz to 2 GHz	18 dB	23 dB
2 GHz to 10 GHz	14 dB	18 dB
10 GHz to 20 GHz	12 dB	15 dB
20 GHz to 30 GHz	8 dB	11.5 dB
30 GHz to 40 GHz	7.5 dB	10 dB
40 GHz to 45 GHz	8 dB	11 dB
45 GHz to 50 GHz	7 dB	10 dB
50 GHz to 60 GHz	6 dB	8.5 dB

60 GHz to 67 GHz	5.5 dB	7.5 dB
67 GHz to 70 GHz[b]	--	7.5 dB
Source Match - Option 014		
		typical:
10 MHz to 45 MHz[b]	--	7 dB
45 MHz to 2 GHz	17 dB	21 dB
2 GHz to 10 GHz	12 dB	17 dB
10 GHz to 20 GHz	11 dB	14 dB
20 GHz to 30 GHz	10 dB	13 dB
30 GHz to 40 GHz	8.5 dB	11 dB
40 GHz to 45 GHz	8.5 dB	11 dB
45 GHz to 50 GHz	8.5 dB	11.5 dB
50 GHz to 60 GHz	6.5 dB	9 dB
60 GHz to 67 GHz	6 dB	8.5 dB
67 GHz to 70 GHz[b]	--	8.5 dB
Source Match - UNL & 014		
		typical:
10 MHz to 45 MHz[b]	--	5 dB
45 MHz to 2 GHz	15 dB	20 dB
2 GHz to 10 GHz	9 dB	13 dB
10 GHz to 20 GHz	7.5 dB	10.5 dB
20 GHz to 30 GHz	8.5 dB	11 dB
30 GHz to 40 GHz	8 dB	11 dB
40 GHz to 45 GHz	8.5 dB	12 dB
45 GHz to 50 GHz	8 dB	12 dB

50 GHz to 60 GHz	7 dB	11 dB
60 GHz to 67 GHz	6 dB	10 dB
67 GHz to 70 GHz[b]	--	10 dB
Load Match - Standard		
		typical:
10 MHz to 45 MHz[b]	--	5.5 dB
45 MHz to 2 GHz	9 dB	10 dB
2 GHz to 10 GHz	9 dB	11 dB
10 GHz to 20 GHz	8.5 dB	10 dB
20 GHz to 30 GHz	7 dB	9 dB
30 GHz to 40 GHz	6 dB	8 dB
40 GHz to 45 GHz	6.5 dB	9 dB
45 GHz to 50 GHz	6.5 dB	8.5 dB
50 GHz to 60 GHz	5.5 dB	7.5 dB
60 GHz to 67 GHz	5.5 dB	7.5 dB
67 GHz to 70 GHz[b]	--	5 dB
Load Match - Option 014		
		typical:
10 MHz to 45 MHz[b]	--	5.5 dB
45 MHz to 2 GHz	8.5 dB	10 dB
2 GHz to 10 GHz	8 dB	10 dB
10 GHz to 20 GHz	8 dB	10 dB
20 GHz to 30 GHz	7.5 dB	10 dB
30 GHz to 40 GHz	7 dB	9.5 dB
40 GHz to 45 GHz	7.5 dB	9.5 dB

45 GHz to 50 GHz	7.5 dB	10 dB
50 GHz to 60 GHz	6 dB	8.5 dB
60 GHz to 67 GHz	6 dB	8.5 dB
67 GHz to 70 GHz[b]	--	5 dB
Load Match - Option UNL & 014		
		typical:
10 MHz to 45 MHz[b]	--	6 dB
45 MHz to 2 GHz	8.5 dB	10 dB
2 GHz to 10 GHz	7 dB	9 dB
10 GHz to 20 GHz	6 dB	9 dB
20 GHz to 30 GHz	7.5 dB	11 dB
30 GHz to 40 GHz	8 dB	11.5 dB
40 GHz to 45 GHz	8 dB	12 dB
45 GHz to 50 GHz	8 dB	12 dB
50 GHz to 60 GHz	7.5 dB	11.5 dB
60 GHz to 67 GHz	6 dB	10 dB
67 GHz to 70 GHz[b]	--	13 dB
Reflection Tracking		
	--	**typical:**
10 MHz to 45 MHz	--	±1.5 dB
45 MHz to 20 GHz	--	±1.5 dB
20 GHz to 40 GHz	--	±2.0 dB
40 GHz to 50 GHz	--	±2.0 dB
50 GHz to 67 GHz	--	±3.0 dB
67 GHz to 70 GHz	--	±4.5 dB

Transmission Tracking[c]		
	--	**typical:**
10 MHz to 45 MHz	--	±1.5 dB
45 MHz to 20 GHz	--	±1.5 dB
20 GHz to 40 GHz	--	±2.0 dB
40 GHz to 50 GHz	--	±2.0 dB
50 GHz to 67 GHz	--	±3.0 dB
67 GHz to 70 GHz	--	±4.5 dB
Crosstalk[d] - Standard		
10 MHz to 45 MHz[b]	--	-63 dB (typical)
45 MHz to 500 MHz	-87 dB	--
500 MHz to 2 GHz	-110 dB	--
2 GHz to 10 GHz	-105 dB	--
10 GHz to 24 GHz	-111 dB	--
24 GHz to 30 GHz	-106 dB	--
30 GHz to 40 GHz	-104 dB	--
40 GHz to 45 GHz	-98 dB	--
45 GHz to 50 GHz	-100 dB	--
50 GHz to 60 GHz	-97 dB	--
60 GHz to 67 GHz	-94 dB	--
67 GHz to 70 GHz[b]	-94 dB	--
Crosstalk[d] - Option 014		
		typical (for Option 080 enabled[e])
10 MHz to 45 MHz[b]	--	-63 dB
45 MHz to 500 MHz	-87 dB	-87 dB

500 MHz to 2 GHz	-110 dB	-110 dB
2 GHz to 10 GHz	-105 dB	-105 dB
10 GHz to 24 GHz	-111 dB	-111 dB
24 GHz to 30 GHz	-104 dB	-104 dB
30 GHz to 40 GHz	-102 dB	-102 dB
40 GHz to 45 GHz	-96 dB	-96 dB
45 GHz to 50 GHz	-98 dB	-98 dB
50 GHz to 60 GHz	-95 dB	-95 dB
60 GHz to 67 GHz	-90 dB	-90 dB
67 GHz to 70 GHz[b]	--	-90 dB
Crosstalk[d] - Option 014 & UNL		
		typical (for Option 080 enabled[e])
10 MHz to 45 MHz[b]	--	-63 dB
45 MHz to 500 MHz	-87 dB	-87 dB
500 MHz to 2 GHz	-110 dB	-110 dB
2 GHz to 10 GHz	-104 dB	-104 dB
10 GHz to 24 GHz	-108 dB	-108 dB
24 GHz to 30 GHz	-101 dB	-101 dB
30 GHz to 40 GHz	-99 dB	-99 dB
40 GHz to 45 GHz	-92 dB	-92 dB
45 GHz to 50 GHz	-94 dB	-94 dB
50 GHz to 60 GHz	-91 dB	-91 dB
60 GHz to 67 GHz	-84 dB	-84 dB
67 GHz to 70 GHz[b]	--	-84 dB

a Specifications apply over environment temperature of 23°C +/- 3°C, with less than 1°C deviation from the calibration temperature.

b Typical performance.

cTransmission tracking performance noted here is normalized to the insertion loss characteristics of the cable used so that the indicated performance is independent of the cable used.

d Measurement conditions: normalized to a thru, measured with two shorts, 10 Hz IF bandwidth, averaging factor of 16, alternate mode, source power set to the lesser of the maximum power out or the maximum receiver power.

e 0 Hz offset.

Table 11. Test Port Output

Description	Specification			Supplemental
Frequency Range				
	Standard	**Options**		
E8361A	45 MHz to 67 GHz (Operates 10 MHz to 70 GHz)			--
Nominal Power[c]				
	Std and Options without UNL	**Options with UNL**		
E8361A	-15 dBm	-17 dBm		--
Frequency Resolution				
	1 Hz			--
CW Accuracy				
	+/-1 ppm			--
Frequency Stability				
				+/-0.05 ppm. -10° to 70° C, typical; +/-0.1 ppm/yr maximum, typical
Power Level Accuracy[a]				
	Standard	**Opt 014**	**Opt 014 & UNL**	
10 MHz to 45 MHz[b]	+/-1.5 dB (typical)	+/-1.5 dB (typical)	+/-1.5 dB (typical)	--
45 MHz to	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	Variation from nominal power

10 GHz				in range 0 (step attenuator at 0 dB)
10 GHz to 20 GHz	+/-1.5 dB	+/-1.5 dB	+/-2.0 dB	
20 GHz to 30 GHz	+/-2.0 dB	+/-2.0 dB	+/-2.5 dB	
30 GHz to 40 GHz	+/-3.0 dB	+/-3.0 dB	+/-3 dB	
40 GHz to 45 GHz	+/-3.0 dB	+/-3.0 dB	+/-3 dB	
45 GHz to 50 GHz	+/-3.5 dB	+/-3.5 dB	+/-3.5 dB	
50 GHz to 60 GHz	+/-4.0 dB	+/-4.0 dB	+/-4.0 dB	
60 GHz to 67 GHz	+/-4.0 dB	+/-4.0 dB	+/-4.5 dB	
67 GHz to 70 GHz[b]	+/-4.0 dB (typical)	+/-4.0 dB (typical)	+/-4.5 dB (typical)	
Power Level Linearity[d]				
				Any Option
Test reference is at the nominal power level (step attenuator at 0 dB)				
10 MHz to 45 MHz[b]	+/-1.0 dB for power<=-5 dBm[g] (typical)			--
45 MHz to 67 GHz	+/-1.0 dB for power<=-5 dBm[g]			--
67 GHz to 70 GHz[b]	+/-1.0 dB for power<=-5 dBm[g] (typical)			--
Power Range[a,e,f]				
Note: If power is set above the maximum specified leveled power, the test port output signal may show non-linear effects that are dependent on the DUT.				
	Standard	**Opt 014**	**Opt 014 & UNL**	

10 MHz to 45 MHz[b]	-25 to -9 dBm (typical)	-25 to -9 dBm (typical)	-75 to -9 dBm (typical)	--
45 MHz to 500 MHz	-25 to -3 dBm	-25 to -3 dBm	-75 to -3 dBm	--
500 MHz to 750 MHz	-25 to 0 dBm	-25 to 0 dBm	-75 to 0 dBm	--
750 MHz to 10 GHz	-27 to -1 dBm	-27 to -1 dBm	-77 to -1 dBm	--
10 GHz to 30 GHz	-27 to -2 dBm	-27 to -3 dBm	-77 to -3 dBm	--
30 GHz to 40 GHz	-27 to -1 dBm	-27 to -2 dBm	-77 to -5 dBm	--
40 GHz to 45 GHz	-27 to -7 dBm	-27 to -8 dBm	-77 to -10 dBm	--
45 GHz to 50 GHz	-27 to -1 dBm	-27 to -2 dBm	-77 to -6 dBm	--
50 GHz to 60 GHz	-27 to -3 dBm	-27 to -4 dBm	-77 to -8 dBm	--
60 GHz to 67 GHz	-27 to -5 dBm	-27 to -7 dBm	-77 to -13 dBm	--
67 GHz to 70 GHz[b]	-27 to -5 dBm (typical)	-27 to -7 dBm (typical)	-77 to -13 dBm (typical)	--
Power Sweep Range (ALC)				
	Standard	**Opt 014**	**Opt 014 & UNL**	ALC range starts at maximum leveled output power and decreases by power level indicated in the table.
10 MHz to 45 MHz[b]	16 dB (typical)	16 dB (typical)	16 dB (typical)	
45 MHz to 500 MHz	22 dB	22 dB	22 dB	

500 MHz to 750 MHz	25 dB	25 dB	25 dB	
750 GHz to 10 GHz	26 dB	26 dB	26 dB	
10 GHz to 30 GHz	25 dB	24 dB	24 dB	
30 GHz to 40 GHz	26 dB	25 dB	22 dB	
40 GHz to 45 GHz	20 dB	19 dB	17 dB	
45 GHz to 50 GHz	26 dB	25 dB	21 dB	
50 GHz to 60 GHz	24 dB	23 dB	19 dB	
60 GHz to 67 GHz	22 dB	20 dB	14 dB	
67 GHz to 70 GHz[b]	22 dB (typical)	20 dB (typical)	14 dB (typical)	
Power Resolution				
	0.01 dB			--
Phase Noise				
				Any Option
10 kHz offset from center frequency, nominal power at test port				
	--	**--**		**typical:**
10 MHz to 45 MHz	--	**--**	**--**	-80 dBc
45 MHz to 10 GHz	--	**--**	**--**	-70 dBc
10 GHz to 24 GHz	--	**--**	**--**	-60 dBc
24 GHz to 70 GHz	--	**--**	**--**	-55 dBc

10 kHz offset from center frequency, nominal power at test port - Option 080 enabled				
				typical:
10 MHz to 45 MHz	--	**--**	**--**	-80 dBc
45 MHz to 10 GHz	--	**--**	**--**	-70 dBc
10 GHz to 24 GHz	--	**--**	**--**	-60 dBc
24 GHz to 70 GHz	--	**--**	**--**	-55 dBc
100 kHz offset from center frequency, nominal power at test port				
				typical:
10 MHz to 45 MHz	--	**--**	**--**	-90 dBc
45 MHz to 10 GHz	--	**--**	**--**	-90 dBc
10 GHz to 24 GHz	--	**--**	**--**	-85 dBc
24 GHz to 70 GHz	--	**--**	**--**	-75 dBc
100 kHz offset from center frequency, nominal power at test port - Option 080 enabled				
				typical:
10 MHz to 45 MHz	--	**--**	**--**	-85 dBc
45 MHz to 10 GHz	--	**--**	**--**	-80 dBc
10 GHz to 24 GHz	--	**--**	**--**	-70 dBc
24 GHz to 70 GHz	--	**--**	**--**	-60 dBc
1 MHz offset from center frequency, nominal power at test port				

				typical:
10 MHz to 45 MHz	--	**--**	**--**	-115 dBc
45 MHz to 10 GHz	--	**--**	**--**	-110 dBc
10 GHz to 24 GHz	--	**--**	**--**	-105 dBc
24 GHz to 70 GHz	--	**--**	**--**	-95 dBc
1 MHz offset from center frequency, nominal power at test port - Option 080 enabled				
				typical:
10 MHz to 45 MHz	--	**--**	**--**	-110 dBc
45 MHz to 10 GHz	--	**--**	**--**	-105 dBc
10 GHz to 24 GHz	--	**--**	**--**	-95 dBc
24 GHz to 70 GHz	--	**--**	**--**	-85 dBc
Harmonics (2nd or 3rd)				
				Any Option
				typical:
10 MHz to 500 MHz	--	**--**	**--**	-10 dBc
500 MHz to 10 GHz	--	**--**	**--**	-15 dBc
10 GHz to 24 GHz	--	**--**	**--**	-23 dBc
24 GHz to 50 GHz	--	**--**	**--**	-16 dBc
50 GHz to 60 GHz	--	**--**	**--**	-13 dBc

60 GHz to 70 GHz	--	--	--	-19 dBc
Non-Harmonic Spurious (at Nominal Output Power)				
10 MHz to 20 GHz	--	--	--	-50 dBc typical, for offset frequency > 1 kHz
20 GHz to 70 GHz	--	--	--	-30 dBc typical, for offset frequency > 1 kHz

a Test port output is a specification when the source is set to Port 1, and a characteristic when the source is set to Port 2.

b Typical performance.

c Preset power.

d Power Level Linearity is a specification when the source is set to Port 1, and a typical when the source is set to Port 2.

e Test port power is specified into nominal 50 ohms.

f Power to which the source can be set and phase lock is assured.

g +/-1.6 dB for power>-5 dBm.

Table 12: Test Port Input

Description	**Specification**		**Supplemental**
	Standard or UNL	**Opt 014 or 014 & UNL**	
Test Port Noise Floor[1]			
10 Hz IF Bandwidth			
10 MHz to 45 MHz[2]	<-70 dBm (typical)	<-70 dBm (typical)	--
45 MHz to 500 MHz[3, 4]	<-90 dBm	<-90 dBm	--
500 MHz to 2 GHz	<-112 dBm	<-112 dBm	--
2 GHz to 10 GHz	<-112 dBm	<-112 dBm	--
10 GHz to 24 GHz	<-116 dBm	<-115 dBm	--
24 GHz to 30 GHz	<-105 dBm	<-104 dBm	Option 016 degrades performance by 2 dB.
30 GHz to 40 GHz	<-105 dBm	<-104 dBm	
40 GHz to 45 GHz	<-103 dBm	<-102 dBm	

45 GHz to 50 GHz	<-101 dBm	<-100 dBm	
50 GHz to 60 GHz	<-100 dBm	<-99 dBm	
60 GHz to 67 GHz	<-99 dBm	<-97 dBm	Option 016 degrades performance by 3 dB.
67 GHz to 70 GHz[2]	<-99 dBm (typical)	<-97 dBm (typical)	
1 KHz IF Bandwidth			
10 MHz to 45 MHz[2]	<-50 dBm (typical)	<-50 dBm (typical)	--
45 MHz to 500 MHz[3, 4]	<-70 dBm	<-70 dBm	--
500 MHz to 2 GHz	<-92 dBm	<-92 dBm	--
2 GHz to 10 GHz	<-92 dBm	<-92 dBm	--
10 GHz to 24 GHz	<-96 dBm	<-95 dBm	--
24 GHz to 30 GHz	<-85 dBm	<-84 dBm	Option 016 degrades performance by 2 dB.
30 GHz to 40 GHz	<-85 dBm	<-84 dBm	
40 GHz to 45 GHz	<-83 dBm	<-82 dBm	
45 GHz to 50 GHz	<-81 dBm	<-80 dBm	
50 GHz to 60 GHz	<-80 dBm	<-79 dBm	
60 GHz to 67 GHz	<-79 dBm	<-77 dBm	Option 016 degrades performance by 3 dB.
67 GHz to 70 GHz[2]	<-79 dBm (typical)	<-77 dBm (typical)	
Test Port Noise Floor[1] Option 080 enabled[5]			
			Option 014 or 014 & UNL (typical)
10 Hz IF Bandwidth			
10 MHz to 45 MHz	--	--	<-70 dBm
45 MHz to 500 MHz[3, 4]	--	--	<-90 dBm
500 MHz to 2 GHz	--	--	<-112 dBm

2 GHz to 10 GHz	--	--	<-112 dBm
10 GHz to 24 GHz	--	--	<-115 dBm
24 GHz to 30 GHz	--	Option 016 degrades performance by 2 dB.	<-104 dBm
30 GHz to 40 GHz	--		<-104 dBm
40 GHz to 45 GHz	--		<-102 dBm
45 GHz to 50 GHz	--		<-100 dBm
50 GHz to 60 GHz	--		<-99 dBm
60 GHz to 67 GHz	--	Option 016 degrades performance by 3 dB.	<-97 dBm
67 GHz to 70 GHz	--		<-97 dBm
1 KHz IF Bandwidth			
			typical:
10 MHz to 45 MHz	--	--	<-50 dBm
45 MHz to 500 MHz[3, 4]	--	--	<-70 dBm
500 MHz to 2 GHz	--	--	<-92 dBm
2 GHz to 10 GHz	--	--	<-92 dBm
10 GHz to 24 GHz	--	--	<-95 dBm
24 GHz to 30 GHz	--	Option 016 degrades performance by 2 dB.	<-84 dBm
30 GHz to 40 GHz	--		<-84 dBm
40 GHz to 45 GHz	--		<-82 dBm
45 GHz to 50 GHz	--		<-80 dBm
50 GHz to 60 GHz	--		<-79 dBm
60 GHz to 67 GHz	--	Option 016 degrades performance by 3 dB.	<-77 dBm
67 GHz to 70 GHz	--		<-77 dBm
Direct Receiver Access Input Noise Floor[1]			

	Standard		Option 014 or 014 & UNL (typical)
10 Hz IF Bandwidth			
10 MHz to 45 MHz[2]	--		<-106 dBm
45 MHz to 500 MHz[3, 4]	--		<-105 dBm
500 MHz to 2 GHz	--		<-125.5 dBm
2 GHz to 10 GHz	--		<-125 dBm
10 GHz to 24 GHz	--		<-128 dBm
24 GHz to 30 GHz	--	Option 016 degrades performance by 2 dB.	<-117.5 dBm
30 GHz to 40 GHz	--		<-117 dBm
40 GHz to 45 GHz	--		<-115 dBm
45 GHz to 50 GHz	--		<-112.5 dBm
50 GHz to 60 GHz	--		<-111 dBm
60 GHz to 67 GHz	--	Option 016 degrades performance by 3 dB	<-108 dBm
67 GHz to 70 GHz[2]	--		<-107 dBm
1 KHz IF Bandwidth			
10 MHz to 45 MHz[2]	--		<-86 dBm
45 MHz to 500 MHz[3, 4]	--		<-85 dBm
500 MHz to 2 GHz	--		<-105.5 dBm
2 GHz to 10 GHz	--		<-105 dBm
10 GHz to 24 GHz	--		<-108 dBm
24 GHz to 30 GHz	--	Option 016 degrades performance by 2 dB.	<-97.5 dBm
30 GHz to 40 GHz	--		<-97 dBm
40 GHz to 45 GHz	--		<-95 dBm

45 GHz to 50 GHz	--		<-92.5 dBm
50 GHz to 60 GHz	--		<-91 dBm
60 GHz to 67 GHz	--	Option 016 degrades performance by 3 dB.	<-88 dBm
67 GHz to 70 GHz[2]	--		<-87 dBm
Direct Receiver Access Input Noise Floor[1] - Option 080 enabled[5]			
	Standard		**Option 014**
10 Hz IF Bandwidth			
			typical:
10 MHz to 45 MHz[2]	--		<-106 dBm
45 MHz to 500 MHz[3, 4]	--		<-105 dBm
500 MHz to 2 GHz	--		<-125.5 dBm
2 GHz to 10 GHz	--		<-125 dBm
10 GHz to 24 GHz	--		<-128 dBm
24 GHz to 30 GHz	--	Option 016 degrades performance by 2 dB.	<-117.5 dBm
30 GHz to 40 GHz	--		<-117 dBm
40 GHz to 45 GHz	--		<-115 dBm
45 GHz to 50 GHz	--		<-112.5 dBm
50 GHz to 60 GHz	--		<-111 dBm
60 GHz to 67 GHz	--	Option 016 degrades performance by 3 dB.	<-108 dBm
67 GHz to 70 GHz[2]	--		<-107 dBm
1 KHz IF Bandwidth			
			typical:
10 MHz to 45 MHz[2]	--		<-86 dBm
45 MHz to 500 MHz[3, 4]	--		<-85 dBm

500 MHz to 2 GHz	--		<-105.5 dBm
2 GHz to 10 GHz	--		<-105 dBm
10 GHz to 24 GHz	--		<-108 dBm
24 GHz to 30 GHz	--	Option 016 degrades performance by 2 dB.	<-97.5 dBm
30 GHz to 40 GHz	--		<-97 dBm
40 GHz to 45 GHz	--		<-95 dBm
45 GHz to 50 GHz	--		<-92.5 dBm
50 GHz to 60 GHz	--		<-91 dBm
60 GHz to 67 GHz	--	Option 016 degrades performance by 3 dB.	<-88 dBm
67 GHz to 70 GHz[2]	--		<-87 dBm

Receiver Compression Level (measured at test ports)				
	Specifications			**Supplemental Information**
	Standard	**Option 014**	**014 & UNL**	**Typical**
10 MHz to 45 MHz[2, 6]	negligible			
45 MHz to 500 MHz[6, 7]	<0.1 dB at -9.5 dBm[8] and <0.25 dB at -3 dBm	<0.1 dB at -9.5 dBm[8] and <0.25 dB at +3 dBm		<0.1 dB at +0.5 dBm[8] and <0.25 dB at +8 dBm
500 MHz to 5 GHz	<0.1 dB at -8 dBm[8] and <0.25 dB at -1 dBm	<0.1 dB at -8 dBm[8] and <0.25 dB at 0 dBm	<0.1 dB at -7 dBm[8] and <0.25 dB at 0 dBm	<0.1 dB at -4.0 dBm[8] and <0.25 dB at +3 dBm
5 GHz to 30 GHz	<0.1 dB at -8.5 dBm[8] and <0.25 dB at -2 dBm	<0.1 dB at -8.5 dBm[8] and <0.25 dB at +1 dBm	<0.1 dB at -6 dBm[8] and <0.25 dB at +1 dBm	<0.1 dB at -1.0 dBm[8] and <0.25 dB at +6 dBm
30 GHz to 67 GHz	<0.1 dB at -10.5 dBm[8] and <0.15 dB at -7 dBm	<0.1 dB at -8.0 dBm[8] and <0.15 dB at -3 dBm	<0.1 dB at -9.5 dBm[8] and	<0.1 dB at -2.0 dBm[8, 9] and <0.15 dB

			<0.15 dB at -6 dBm	at +2 dBm[9]
67 GHz to 70 GHz[2]	NA			

System Compression Level			
	Standard	**Option 014 or 014 & UNL**	
	maximum leveled output power		See dynamic accuracy table
Third Order Intercept[10] - Tone spacing from 100 kHz - 5 MHz			
			Any Option
			typical
10 MHz to 500 MHz	--	--	+30 dBm
500 MHz to 24 GHz	--	--	+24 dBm
24 GHz to 40 GHz	--	--	+23 dBm
40 to 50 GHz	--	--	+24 dBm
50 to 67 GHz	--	--	+26 dBm
Third Order Intercept[10] - Tone spacing from 5 MHz - 20 MHz			
			Any Option
			typical
10 MHz to 500 MHz	--		NA
500 MHz to 24 GHz	--	--	+20 dBm
24 GHz to 40 GHz	--	--	+20 dBm
40 to 50 GHz	--	--	+22 dBm
50 to 67 GHz	--	--	+24 dBm
Third Order Intercept[10] - Tone spacing from 20 MHz - 50 MHz			
			Any Option

			typical
10 MHz to 500 MHz			NA
500 MHz to 24 GHz	--	--	+26 dBm
24 to 40 GHz	--	--	+24 dBm
40 to 50 GHz	--	--	+25 dBm
50 to 67 GHz	--	--	+27 dBm
Trace Noise Magnitude 1 kHz IF bandwidth. Ratio measurement, nominal power at test port.			
	Standard or 014	**014 & UNL**	
10 MHz to 45 MHz[2]	<0.150 dB rms (typical)	<0.150 dB rms (typical)	--
45 MHz to 500 MHz[11, 4]	<0.010 dB rms	<0.010 dB rms	--
500 MHz to 24 GHz	<0.006 dB rms	<0.006 dB rms	--
24 GHz to 67 GHz	<0.006 dB rms	<0.009 dB rms	--
67 GHz to 70 GHz[2]	<0.006 dB rms (typical)	<0.009 dB rms (typical)	--
Trace Noise Magnitude - Option 080 enabled[2,5] 1 kHz IF bandwidth. Ratio measurement, nominal power at test port.			
	Standard or 014	**014 & UNL**	
10 MHz to 45 MHz	<0.150 dB rms (typical)	<0.150 dB rms (typical)	--
45 MHz to 500 MHz[11, 4]	<0.010 dB rms (typical)	<0.010 dB rms (typical)	--
500 MHz to 24 GHz	<0.006 dB rms (typical)	<0.006 dB rms (typical)	--

24 GHz to 67 GHz	<0.009 dB rms (typical)	<0.012 dB rms (typical)	--
67 GHz to 70 GHz	<0.009 dB rms (typical)	<0.012 dB rms (typical)	--
Trace Noise Phase 1 kHz IF bandwidth. Ratio measurement, nominal power at test port.			
	Any Option		
10 MHz to 45 MHz[2]	--	--	<0.800° rms (typical)
45 MHz to 500 MHz[4]	<0.100° rms	--	--
500 MHz to 24 GHz	<0.060° rms	--	--
24 GHz to 67 GHz	<0.100° rms	--	--
67 GHz to 70 GHz[2]	--	--	<0.100° rms (typical)
Trace Noise Phase - Option 080 enabled[2, 5] 1 kHz IF bandwidth. Ratio measurement, nominal power at test port.			
			typical:
10 MHz to 45 MHz	--	--	<0.800° rms
45 MHz to 500 MHz[4]	--	--	<0.100° rms
500 MHz to 24 GHz	--	--	<0.060° rms
24 GHz to 67 GHz	--	--	<0.100° rms

67 GHz to 70 GHz	--	--	<0.100° rms
Reference Level Magnitude			
Range	+/-500 dB	--	--
Resolution	0.001 dB	--	--
Reference Level Phase			
Range	+/-500°	--	--
Resolution	0.01°	--	--
Stability Magnitude[12]			
			Any Option
Typical ratio measurement, made at the test port.			
10 MHz to 45 MHz	--	--	+/-0.05 dB/°C
45 MHz to 50 GHz	--	--	+/-0.02 dB/°C
50 GHz to 70 GHz	--	--	+/-0.04 dB/°C
Stability Phase[12]			
			Any Option
Typical ratio measurement, measured at the test port.			
10 MHz to 45 MHz	--	--	+/-0.5°/°C
45 MHz to 20 GHz	--	--	+/-0.2°/°C
20 GHz to 40 GHz	--	--	+/-0.5°/°C
40 GHz to 70 GHz	--	--	+/-0.8°/°C

Damage Input Level			
			typical:
Test Port 1 and 2	--	--	+27 dBm or +/-40 VDC
R1, R2 in	--	--	+15 dBm or +/-15 VDC
A, B in	--	--	+15 dBm or +/-7 VDC
Coupler Thru (Option 014 or 014 & UNL)	--	--	+27 dBm or +/-40 VDC
Coupler Arm (Option 014 or 014 & UNL)	--	--	+30 dBm or +/-7 VDC

1Total average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

2Typical performance.

3Noise floor may be degraded by 10 dB at particular frequencies (multiples of 5 MHz) due to spurious receiver residuals.

4 Specified value is for worst-case noise floor at 45 MHz

50 Hz offset

6 Coupler roll-off will reduce compression below 500 MHz. Ultimately, at 45 MHz, compression is negligible.

7 Specified value is for worst-case compression at 500 MHz.

8 This compression level comes from the dynamic accuracy curve with -30 dBm reference test port power.

9 Option 016 degrades performance by 3 dB.

10 TOI is a typical specification that applies while the network analyzer receiver is in its linear range.

11Trace noise magnitude may be degraded to 20 mdB rms at harmonic frequencies of the first IF (8.33 MHz) below 80 MHz.

12Stability is defined as a ratio measurement made at the test port.

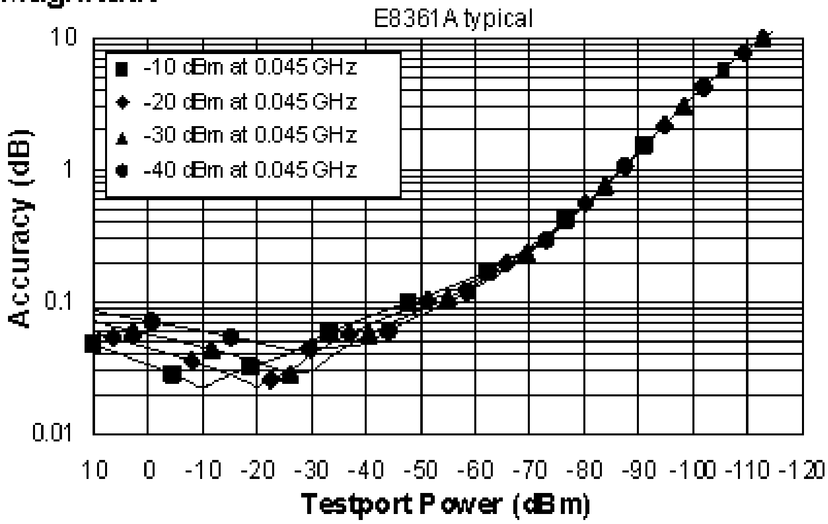
Table 13. Dynamic Accuracy (Specification[a])

Accuracy of the test port input power reading relative to the reference input power level.

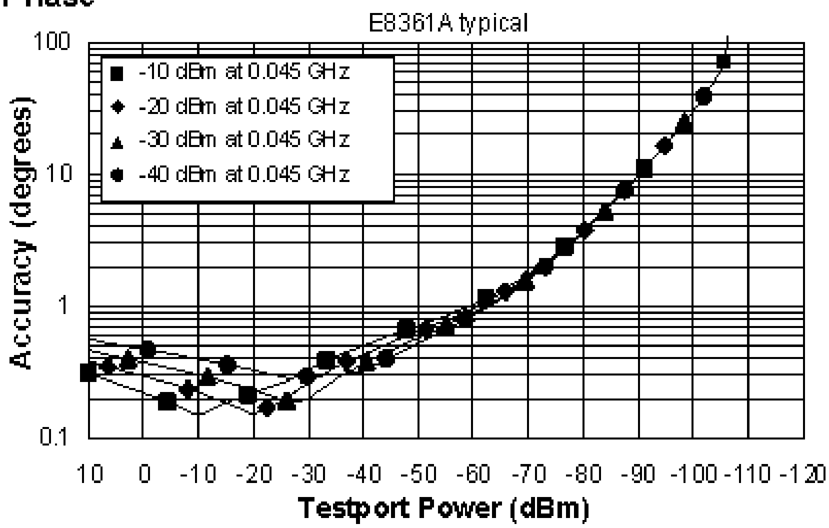
Note: If power is set above the maximum specified leveled power, the test port output signal may show non-linear effects that are dependent on the DUT

Dynamic Accuracy, 0.045 GHz

Magnitude

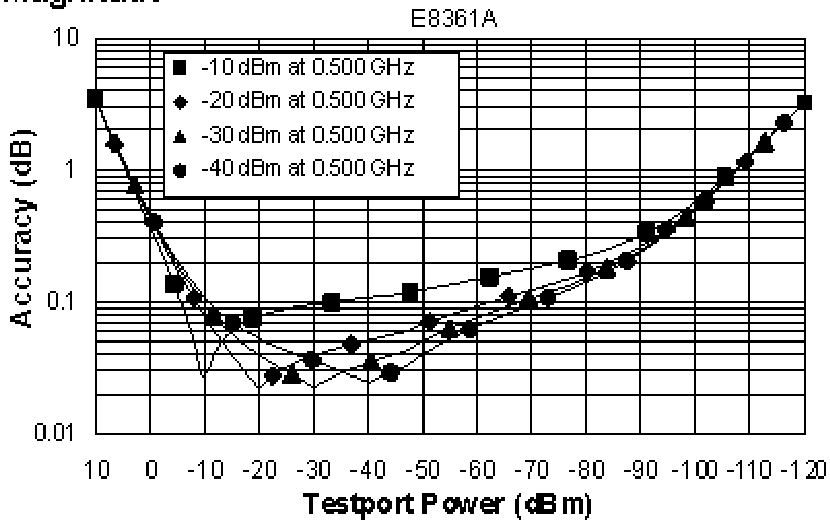


Phase

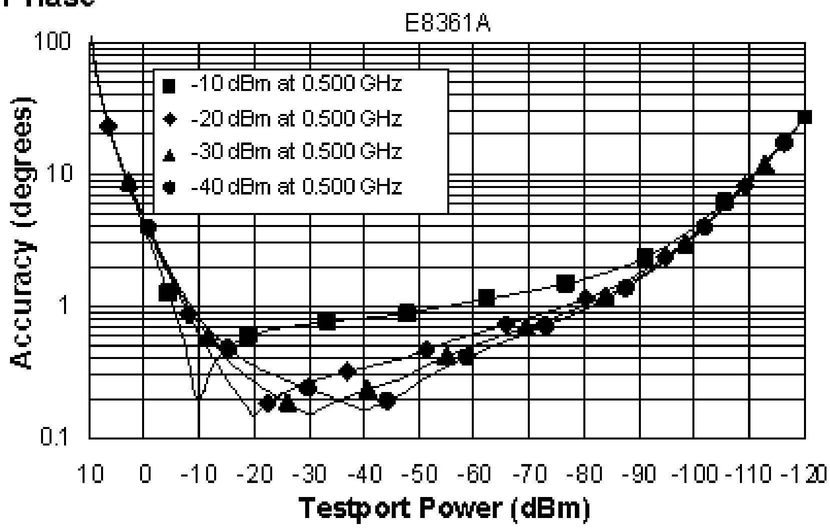


Dynamic Accuracy, 0.500 GHz

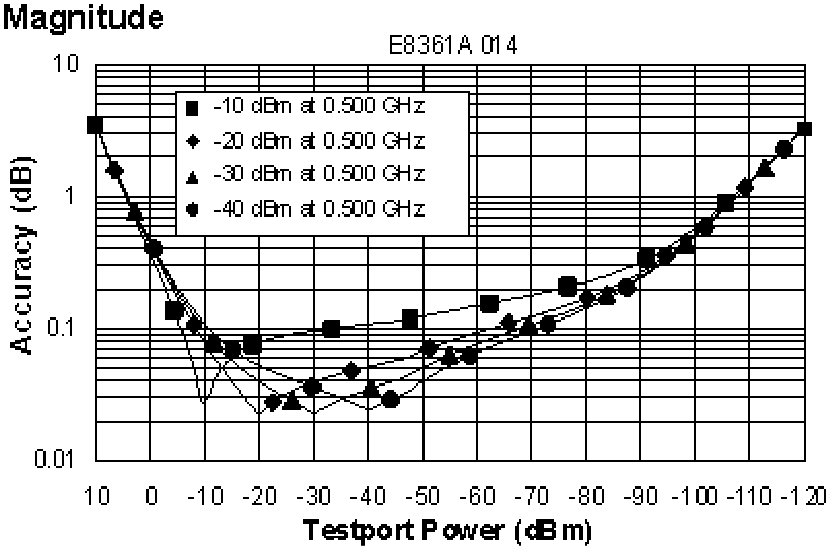
Magnitude



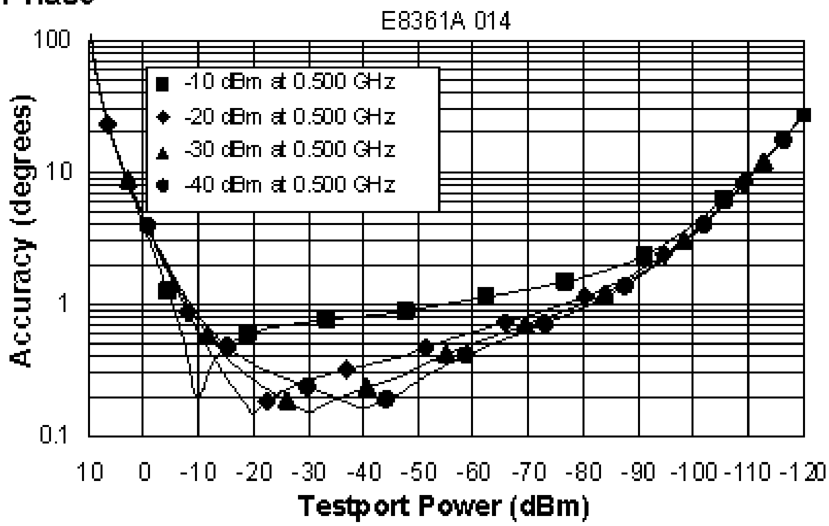
Phase



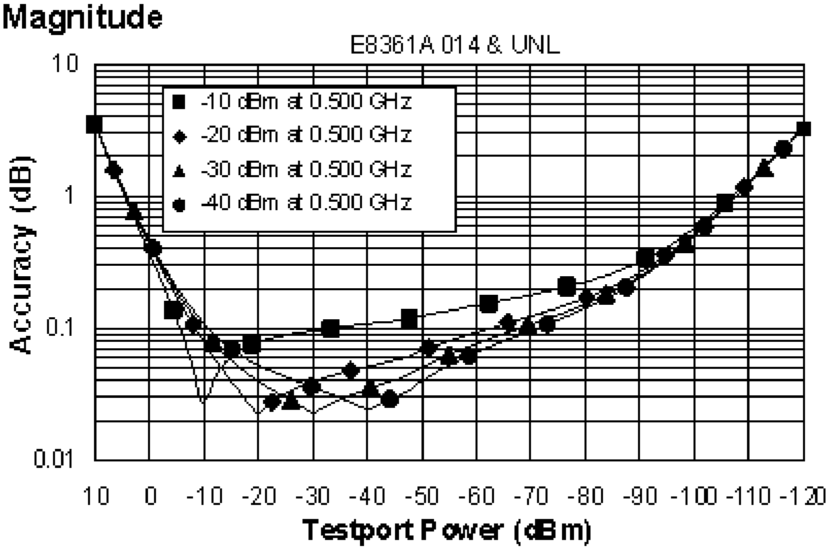
Magnitude



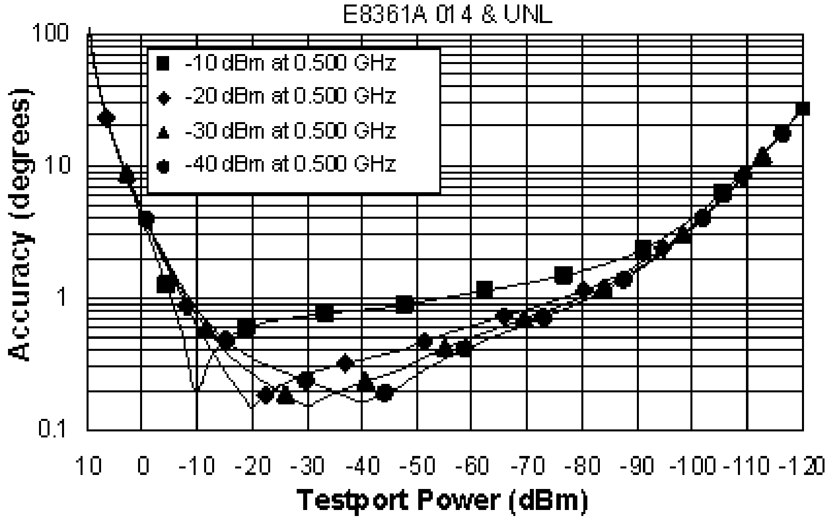
Phase



Magnitude



Phase



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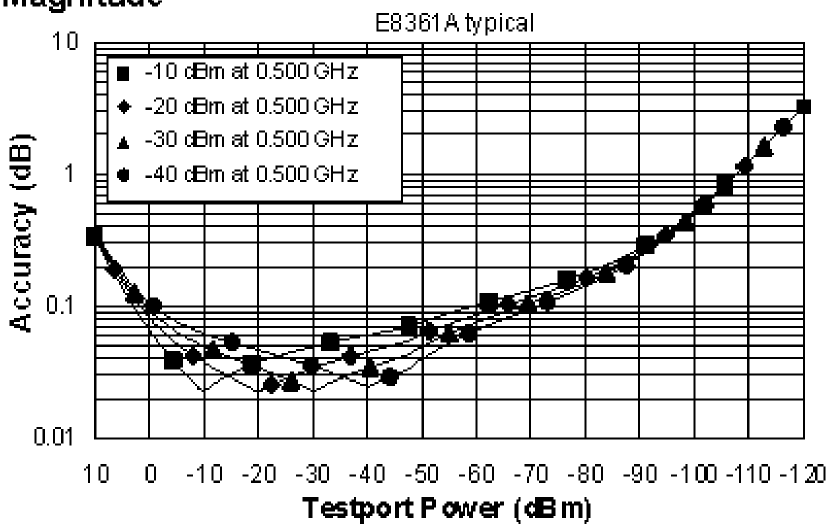
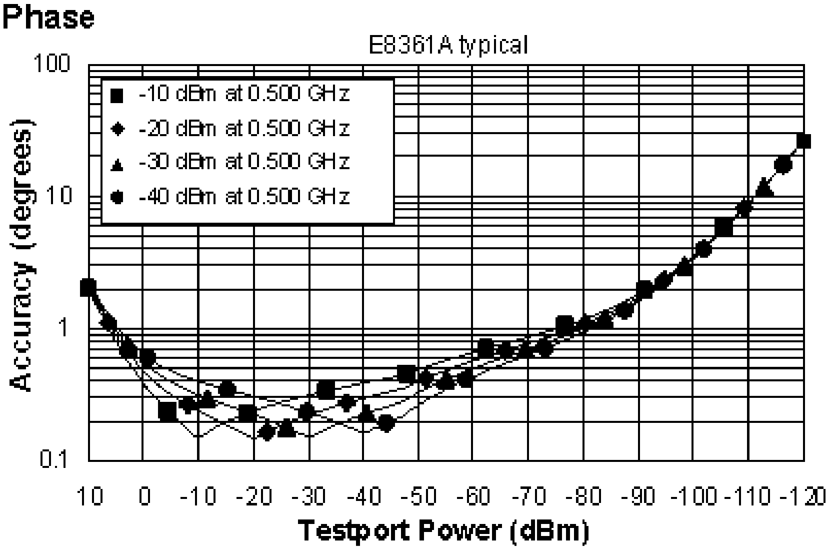
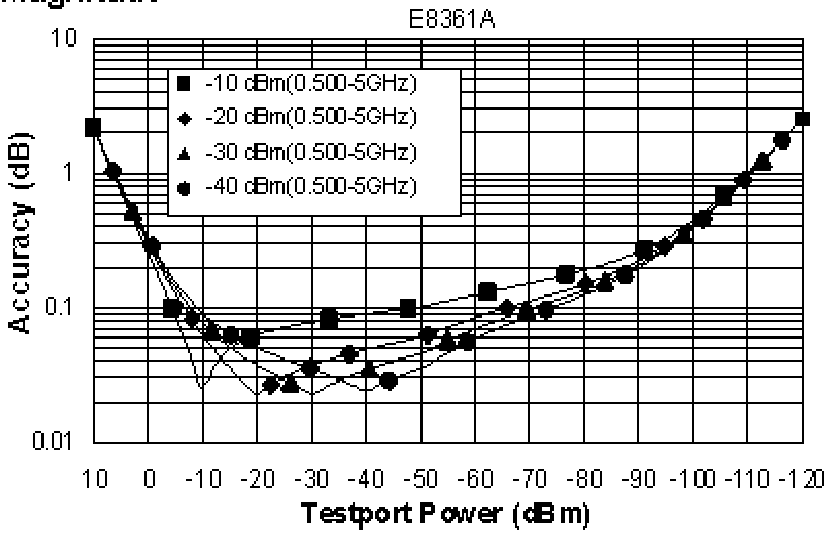


Phase

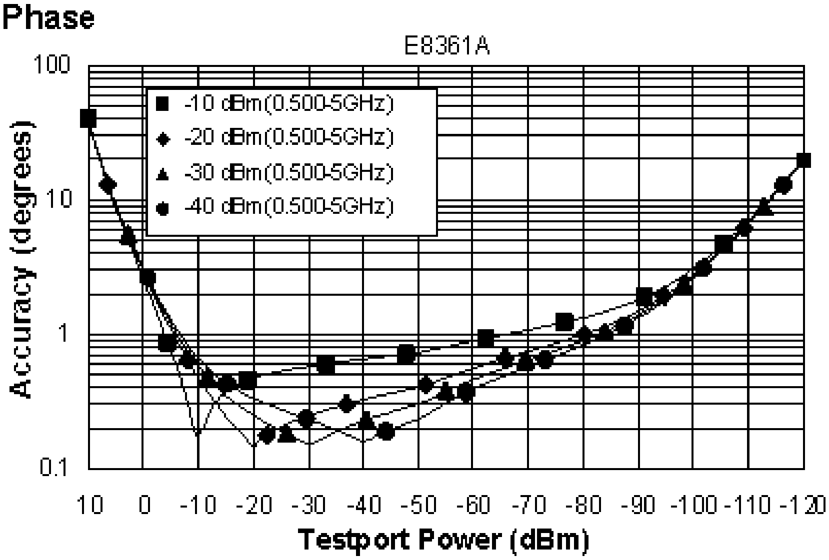


Dynamic Accuracy, 0.500 - 5 GHz

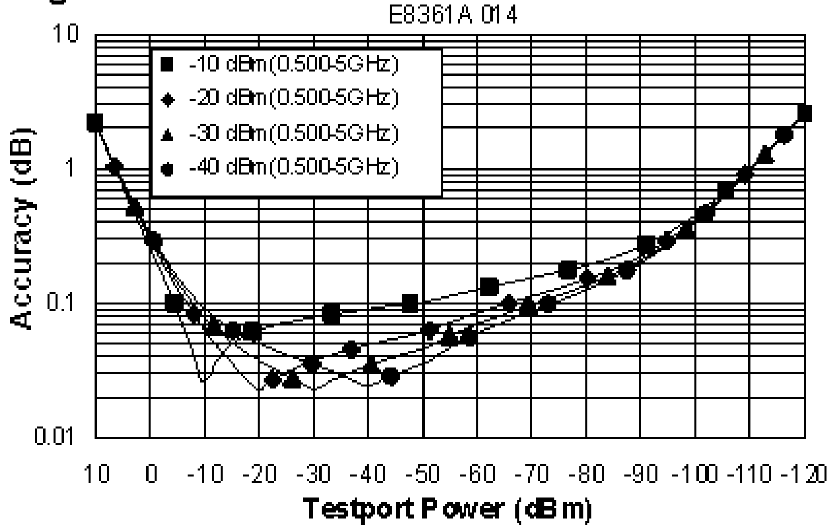
Magnitude



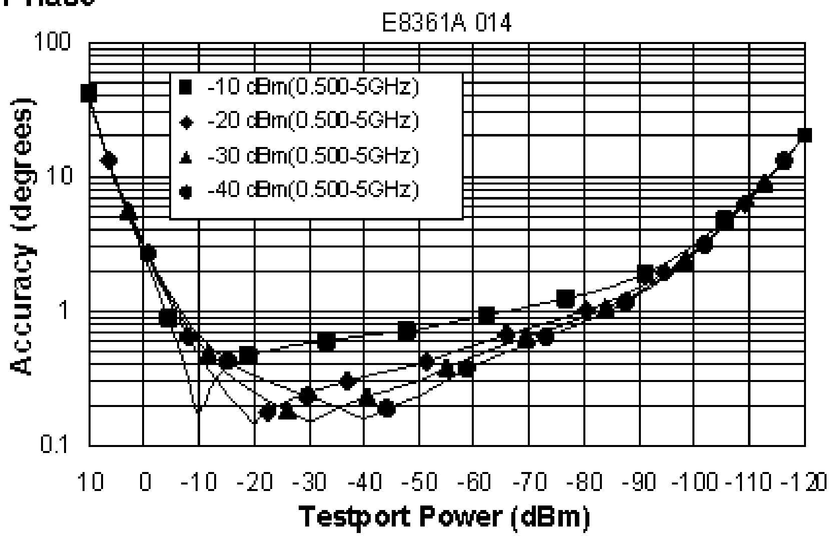
Phase



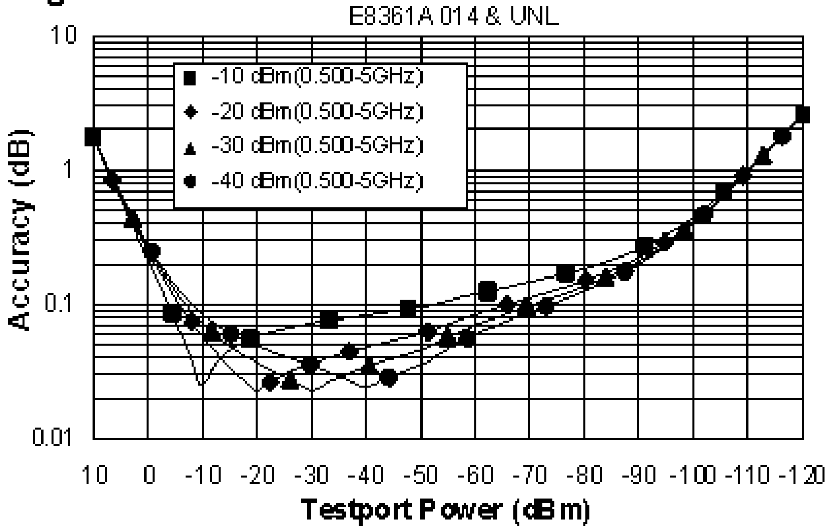
Magnitude



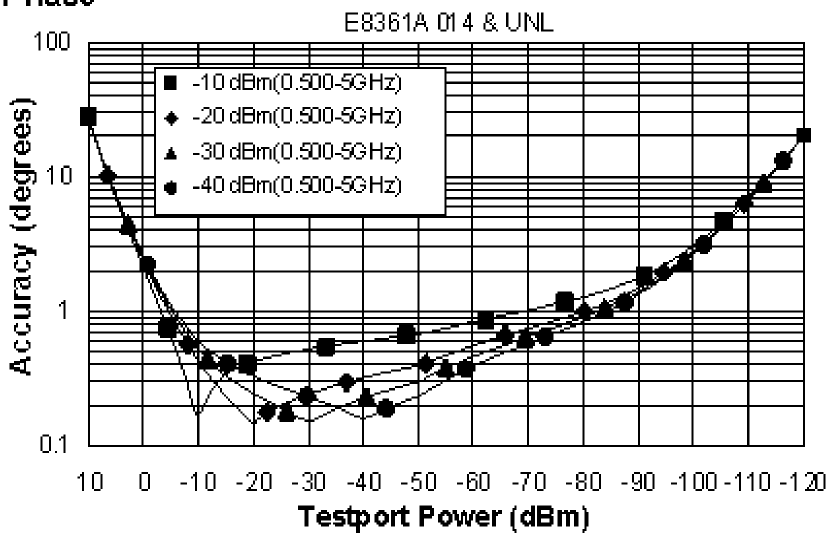
Phase



Magnitude



Phase



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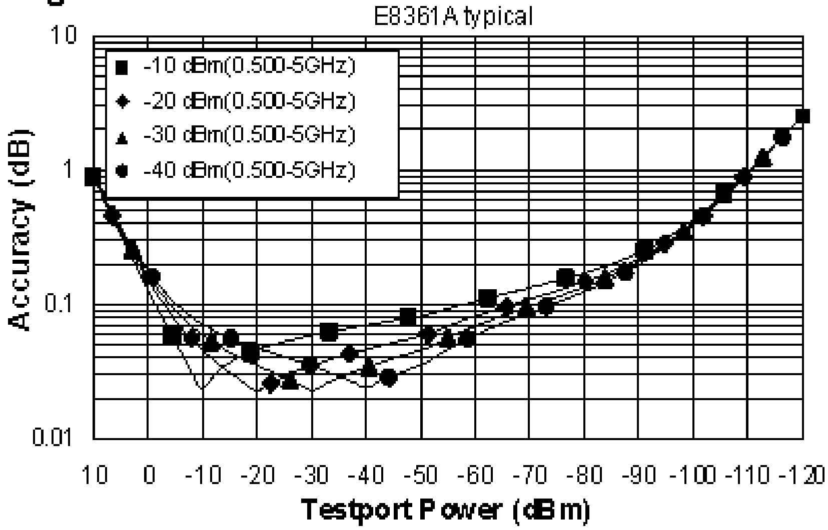
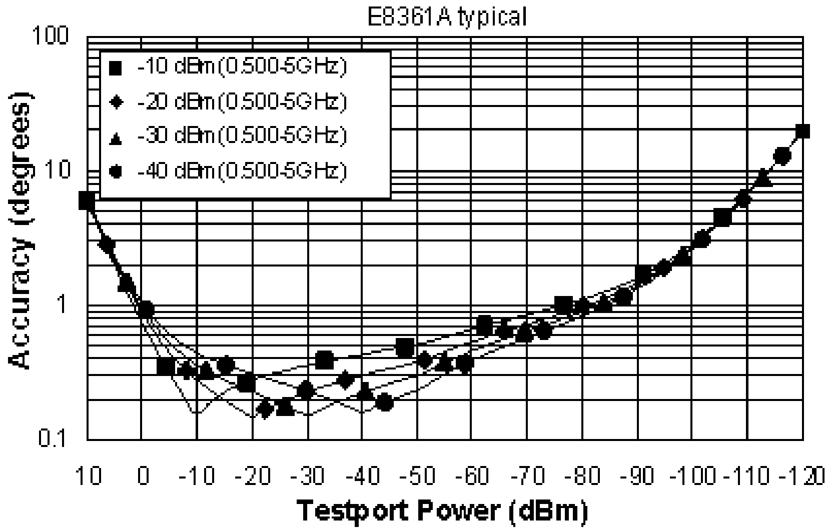
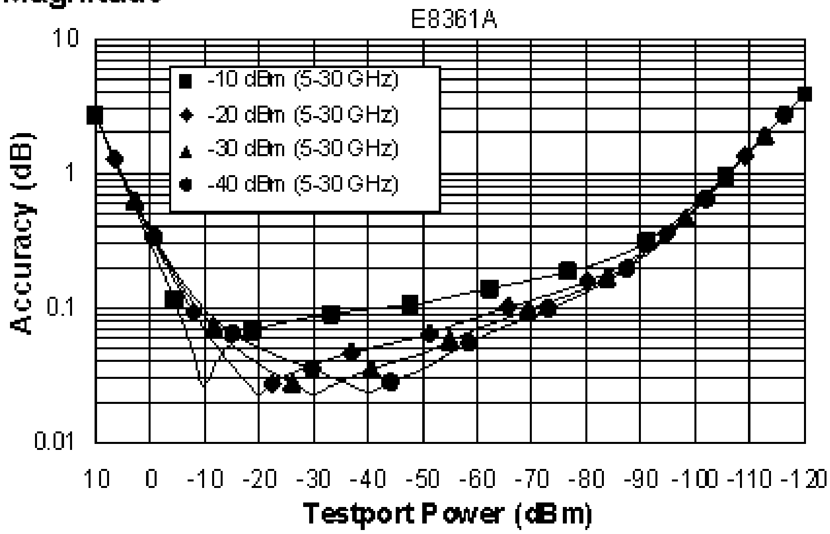


Phase

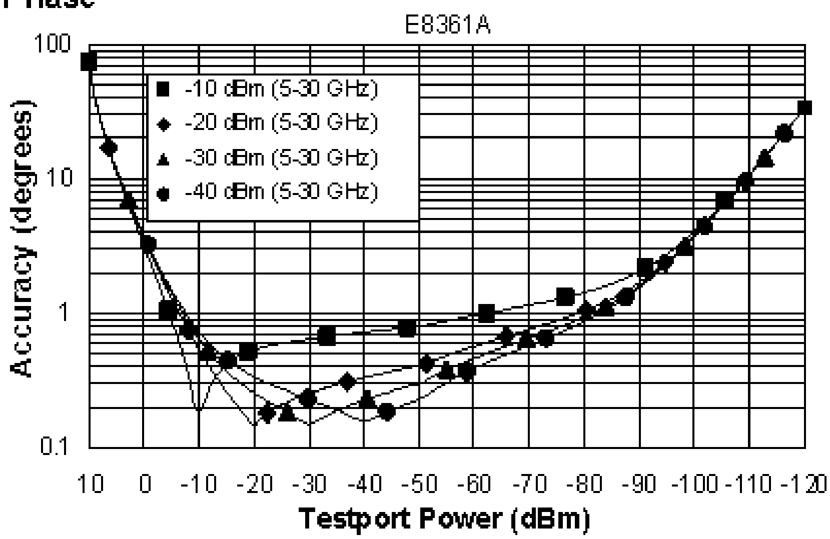


Dynamic Accuracy, 5 - 30 GHz

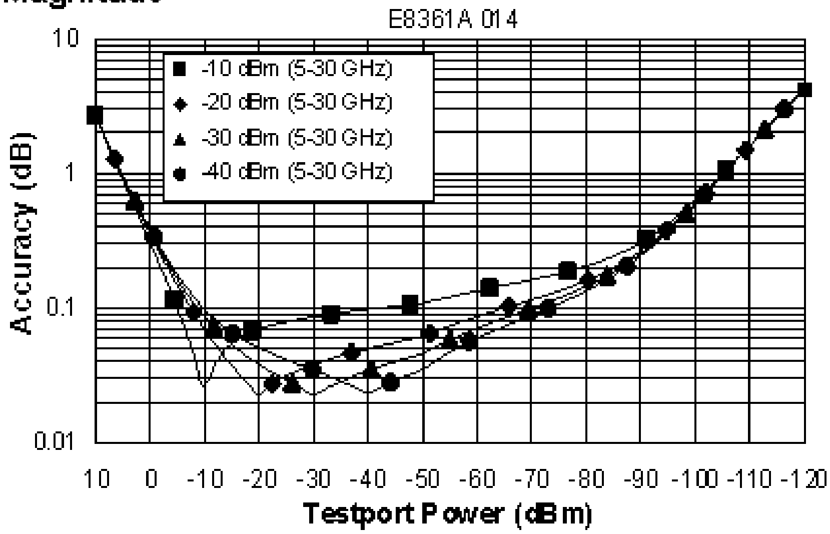
Magnitude



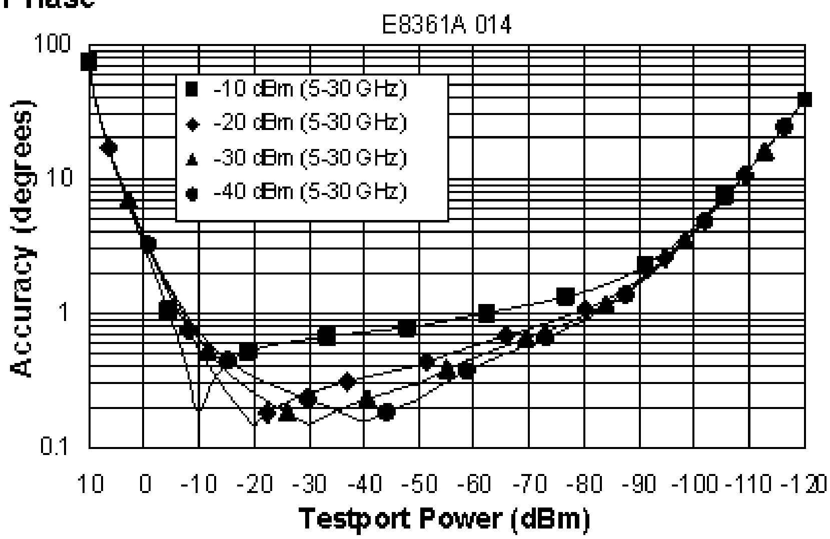
Phase



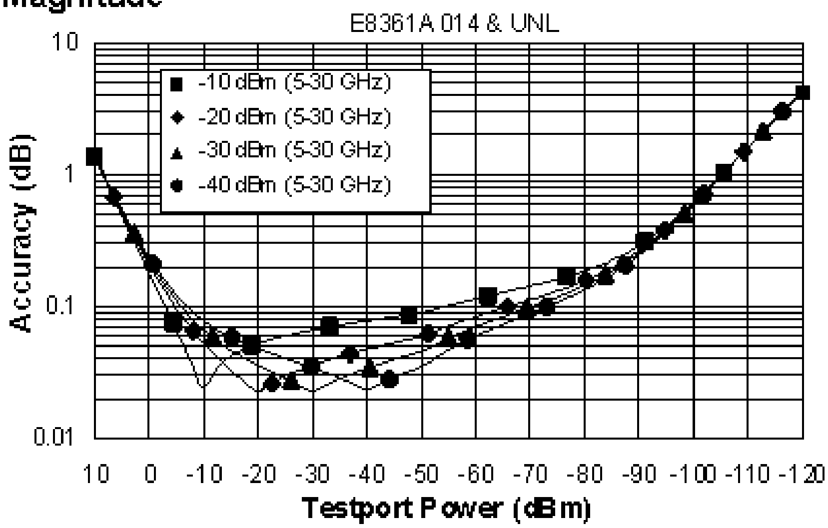
Magnitude



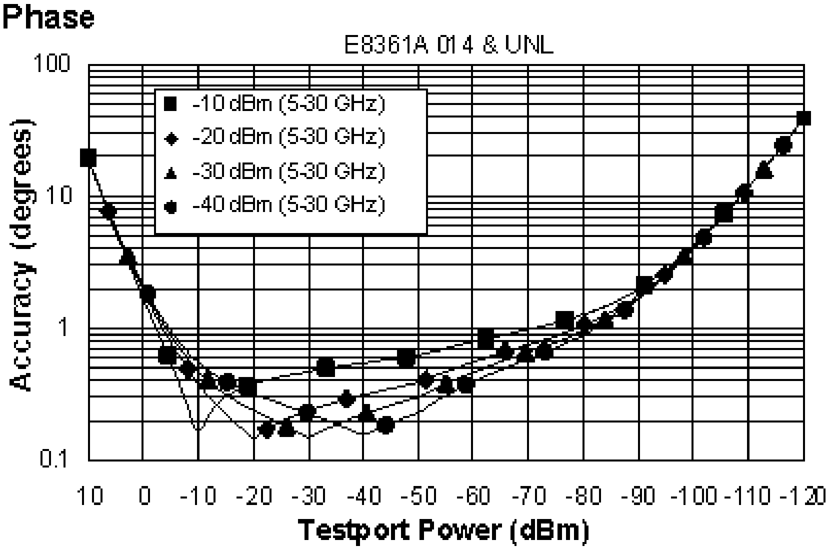
Phase



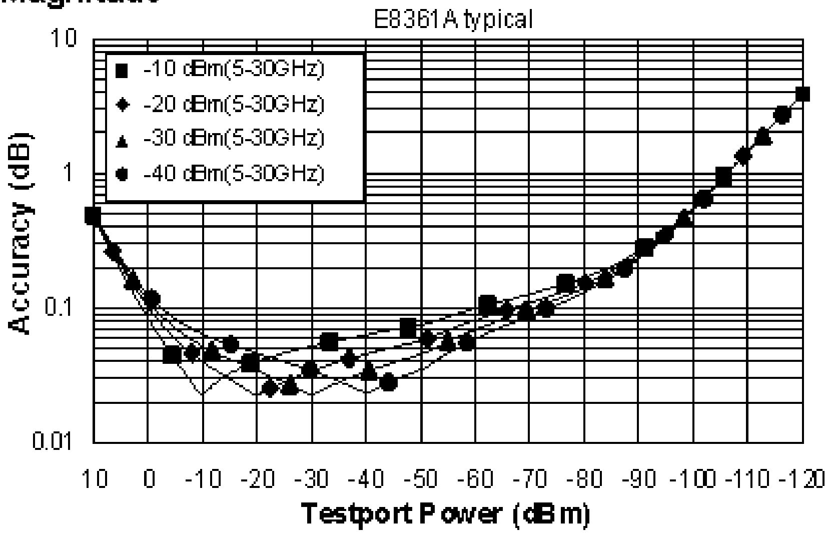
Magnitude



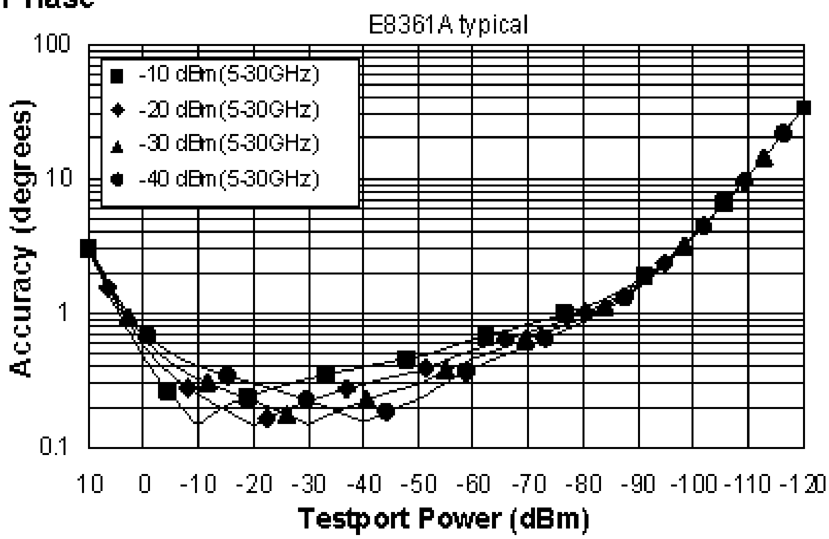
Phase



Magnitude

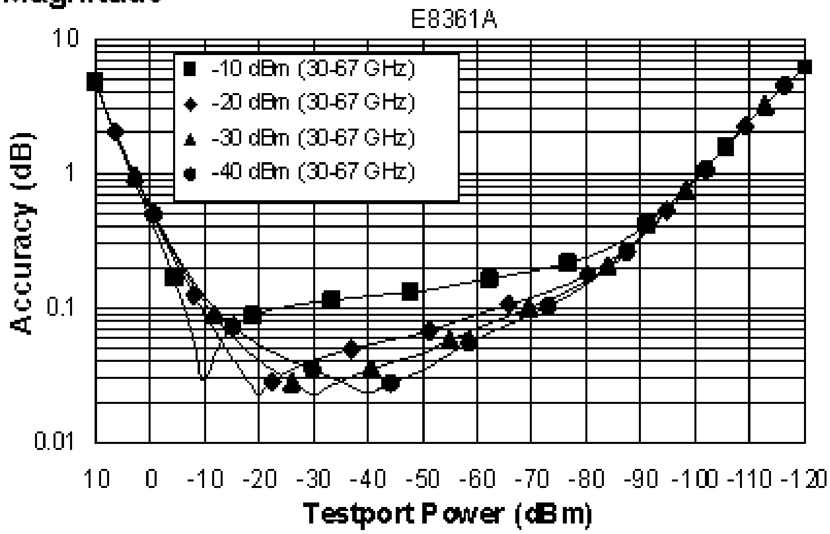


Phase

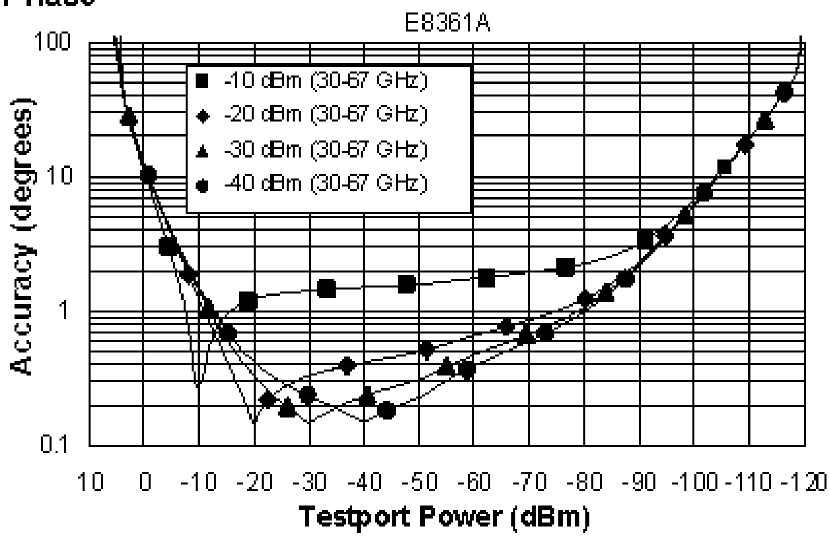


Dynamic Accuracy, 30 - 67 GHz

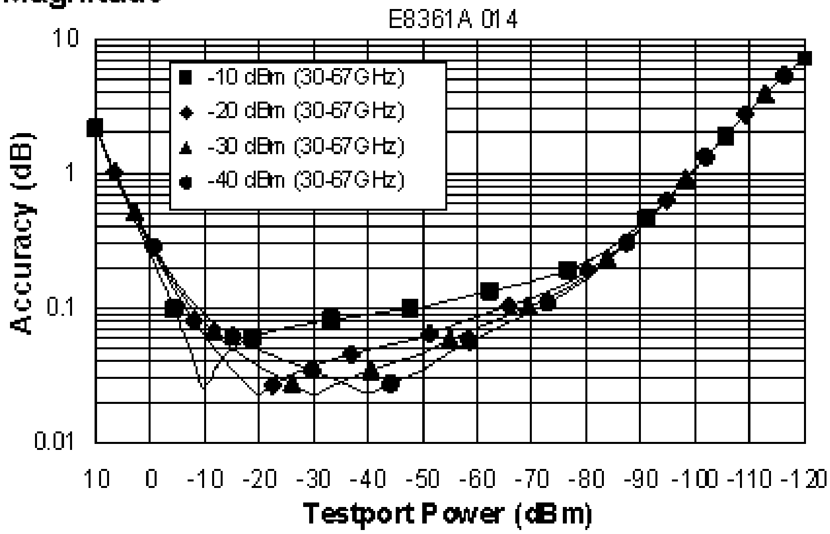
Magnitude



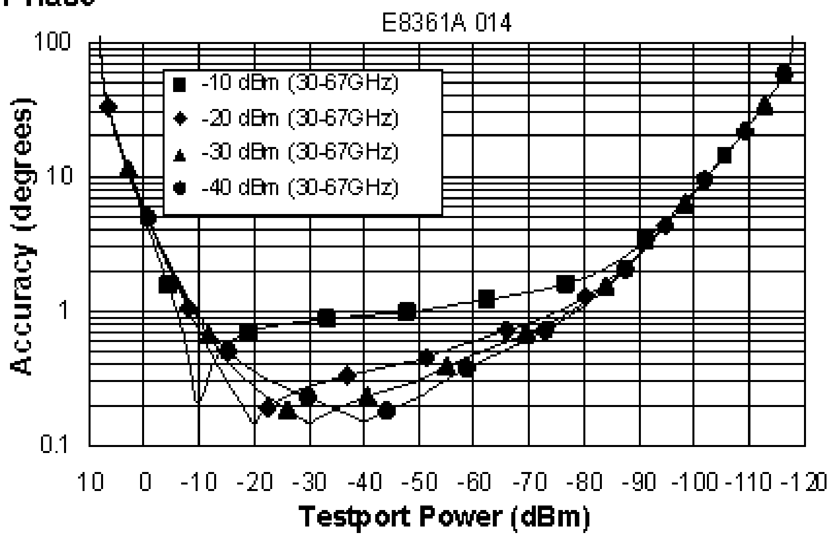
Phase



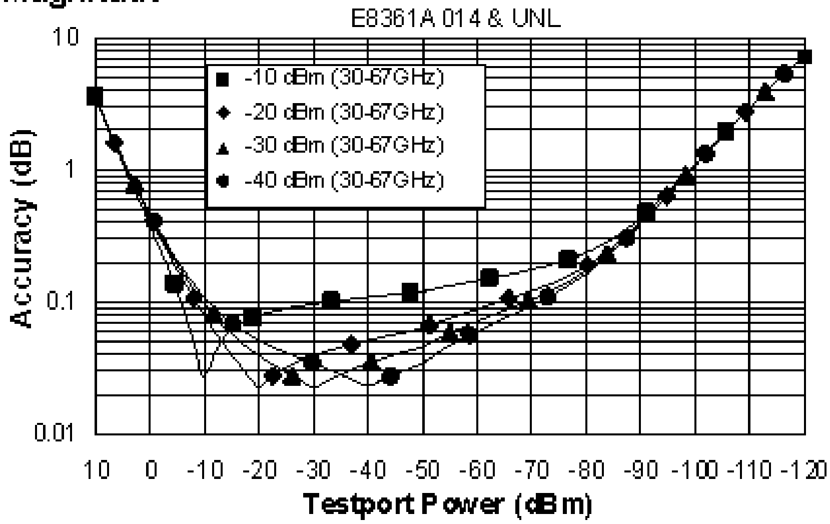
Magnitude



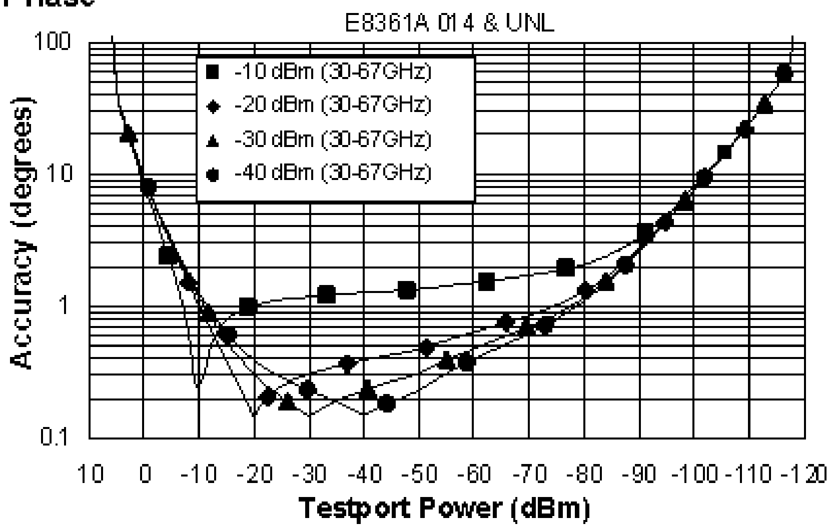
Phase



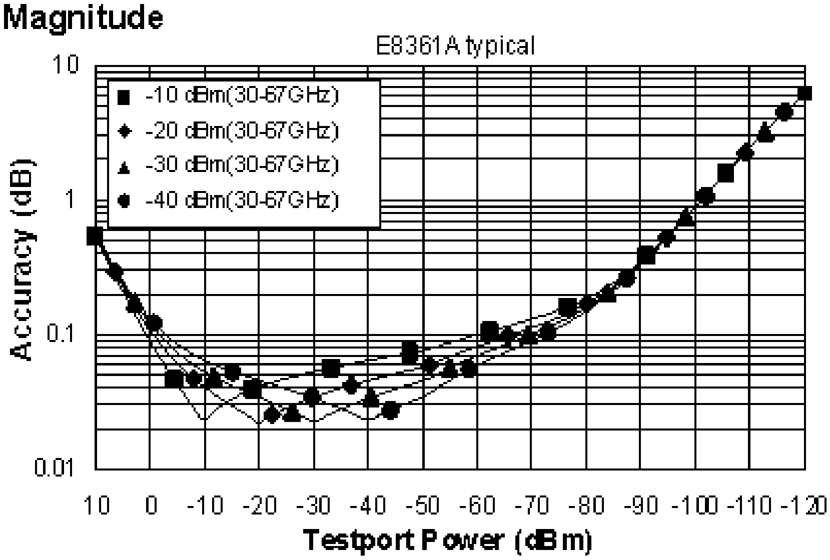
Magnitude



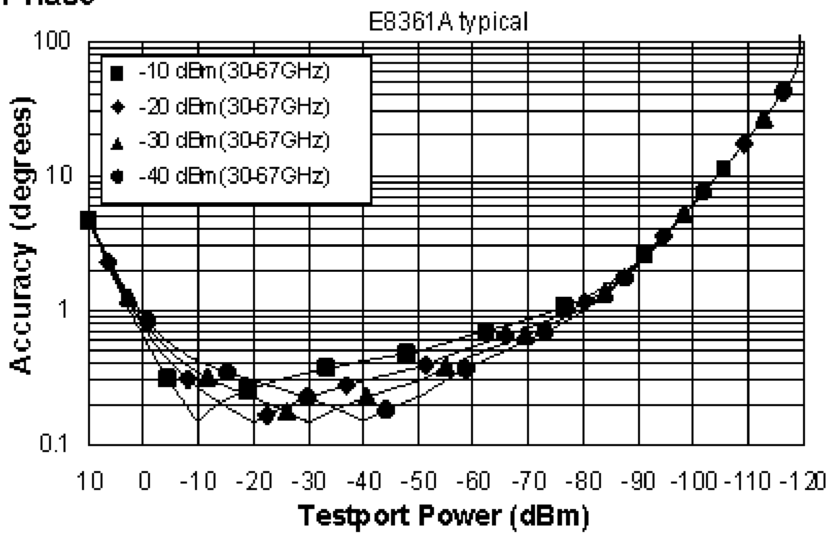
Phase



Magnitude

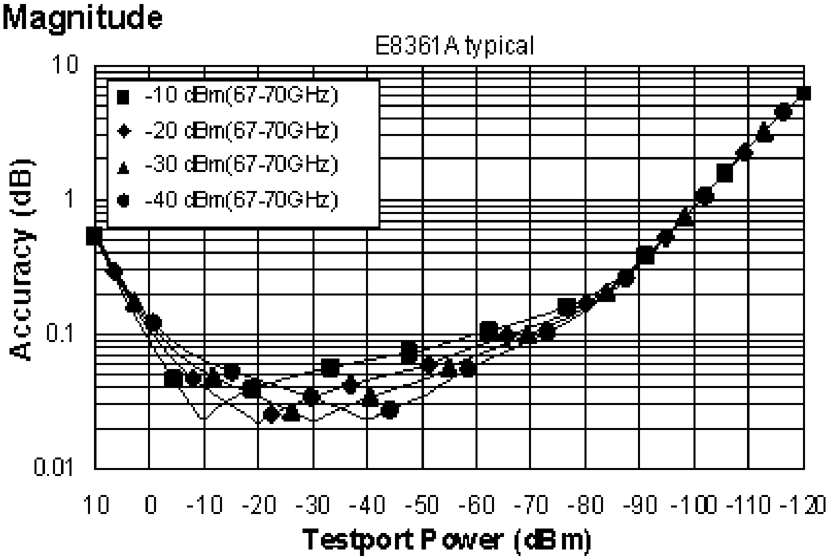


Phase

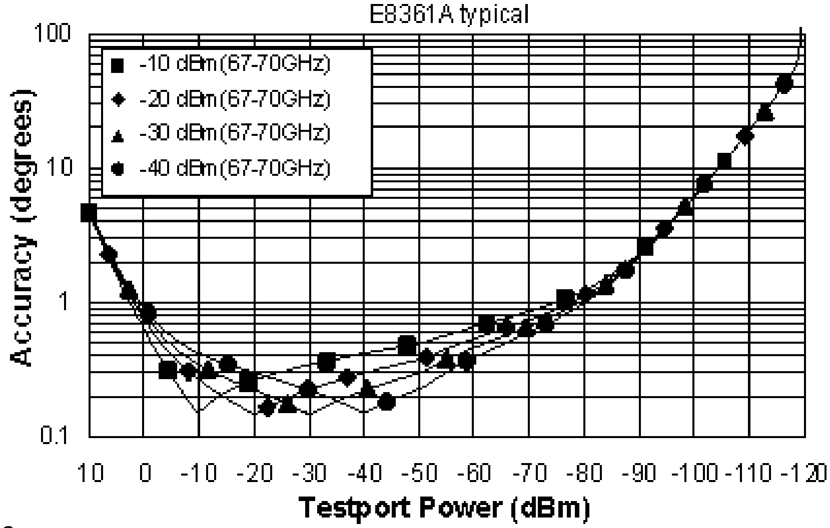


Dynamic Accuracy, 67 - 70 GHz

Magnitude



Phase

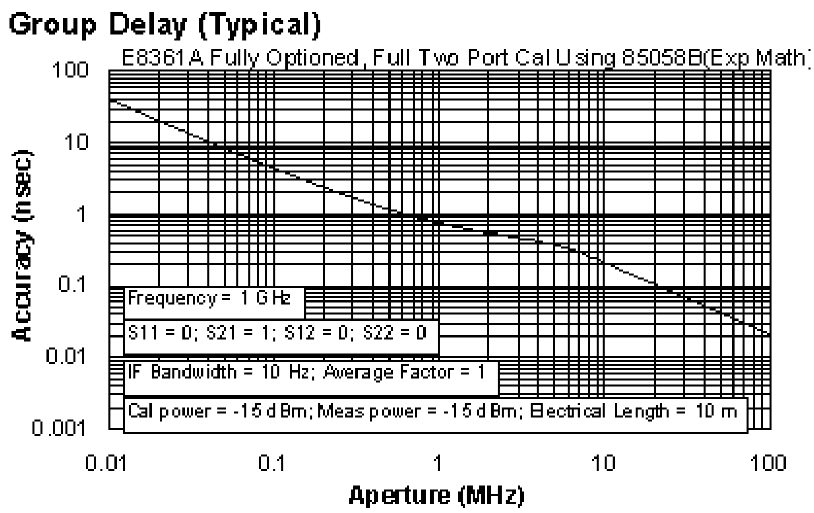


[a] Dynamic accuracy is verified with the following measurements:

- compression over frequency
- IF linearity at a single frequency of 1.195 GHz and a reference level of -20 dBm for an input power range of 0 to -120 dBm.

Table 14. Test Port Input (Group Delay)[a]

Description	Specification	Supplemental Information (typ.)
Aperture (selectable)	--	(frequency span)/(number of points -1)
Maximum Aperture	--	20% of frequency span
Range	--	0.5 x (1/minimum aperture)
Maximum Delay	--	Limited to measuring no more than 180° of phase change within the minimum aperture.)
Accuracy	--	See graph below. Char.
The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.		



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

- Miscellaneous Information
- Front Panel
- Rear Panel
- Environment and Dimensions

Table 15. Miscellaneous Information

Description	**Specification**	**Supplemental Information**
System IF Bandwidth Range	--	1 Hz to 40 kHz, nominal
CPU	--	Intel® 1.1 GHz Pentium® M with 1 GByte RAM.

Table 16. Front Panel Information

Description	Supplemental Information
RF Connectors	
E8361A	
Type	1.85 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
Display	
Size	21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480 (vertical) resolution
Refresh Rate	Vertical 59.83 Hz; Horizontal 31.41 kHz
Pixels	When running the analyzer's built-in Display Test, one or more of the following symptoms indicate a faulty display assembly: • A complete row or column of "stuck on" or "dark" pixels. • More than six "stuck on" pixels (but not more than three green) • More than twelve "dark" pixels (but not more than seven of the same color) • Two or more consecutive "stuck on" pixels or three or more consecutive "dark" pixels (but no more than one set of two consecutive "dark" pixels) • "Stuck on" or "dark" pixels less than 6.5 mm apart (excluding consecutive pixels)
Display Range	
Magnitude	±200 dB (at 20 dB/div), max
Phase	±500°, max
Polar	10 pUnits, min 1000 Units, max
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	0.01 mUnit, min; 0.01°,min

Table 17. Rear Panel Information

Description	Supplemental Information
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, typical
Input Level	-15 dBm to +20 dBm, typical
Input Impedance	200 Ω, nom.
10 MHz Reference Out	
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, typical
Signal Type	Sine Wave, typical
Output Level	+10 dBm ± 4 dB into 50 Ω, typical
Output Impedance	50 Ω, nominal
Harmonics	<-40 dBc, typical
Option H08 & H11 Rear Panel Connectors (Typical)	
IF Connectors	A, R1, R2, B (BNC Connectors)
IF Connector Input Frequency	8 1/3 MHz
Nominal Input Impedance at IF Inputs	50 Ω
RF Damage Level to IF Connector Inputs	-20.0 dBm
DC Damage Level to IF Connector Inputs	25 volts
0.1 dB Compression Point at IF Inputs	-27.0 dBm
Pulse Input Connectors[1]	A, R1, R2, B (BNC Connectors)
Nominal Input Impedance at Pulse Inputs	1 Kohm

Minimum IF Gate Width	20 ns for less than 1 dB deviation from theoretical performance[2].
DC Damage Level to Pulse Connector Inputs	5.5 volts
Drive Voltage	TTL (0, +5.0) Volts
Rear Panel LO Power - Test Port Frequency	
1.7 GHz to 20 GHz	-7 to -16 dBm
Rear Panel RF Power - Test Port Frequencies	
1.7 GHz to 20 GHz	-2 to -12 dBm (at -5 dBm test port power[3])
10 GHz to 16 GHz	0 to -8 dBm (at -5 dBm test port power[3])
16 GHz to 20 GHz	+5 to -1 dBm (at -5 dBm test port power[3])
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported:	
	Resolutions:
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480
Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowed, but with 640 X 480 resolution only. If you change resolution, you can only view the external display (internal display will "white out").
Bias Input Connectors (Option UNL)	
Bias current	500 mA, maximum
Bias voltage	40 Volts, maximum
Test Set IO	
	25-pin D-Sub connector, available for external test set control
Aux IO	

	25-pin D-Sub connector, male, analog and digital IO
Handler IO	
	36-pin parallel I/O port; all input/output signals are default set to negative logic; can be reset to positive logic via GPIB command
GPIB	
	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	
	25-pin D-Sub miniature connector, female; provides connection to printers or any other parallel port peripherals
Serial Port (COM 1)	
	9-pin D-Sub, male; compatible with RS-232
USB Port	
	One port on front panel and five ports on rear panel. Universal Serial Bus jack, Type A configuration (4 contacts inline, contact 1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground
LAN	
	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates
Line Power	
Frequency, Voltage	50/60/400 Hz for 100 -120 V 50/60 Hz for 220 - 240 V Power supply is auto switching
Max	350 Watts

1 Pulse input connectors are operational only with Option H08 (Pulse Measurement Capability) enabled.

2 Based on deviation from signal reduction equation: Signal Reduction (dB) = $20\log_{10}(\text{Duty\_cycle}) = 20\log_{10}(\text{pulse\_width/period})$. Measured at Pulse Repetition Frequency (PFR) of 1 MHz.

3 Test port power has to be at a high enough level such that the Drop Cal does not occur. If Drop Cal occurs then the power out of the rear panel RF connector will drop by about 15 dB.

Table 18. Analyzer Dimensions and Weight

Description	Supplemental Information		
Cabinet Dimensions			
	Height	**Width**	**Depth**
Excluding front and rear panel hardware and feet	267 mm 10.5 in	426 mm 16.75 in	427 mm 16.8 in
As shipped - includes front panel connectors, rear panel bumpers, and feet.	280 mm 11.0 in	435 mm 17.1 in	470 mm 18.5 in
As shipped plus handles	280 mm 11.0 in	458 mm 18 in	501 mm 19.7 in
As shipped plus rack-mount flanges	280 mm 11.0 in	483 mm 19 in	470 mm 18.5 in
As shipped plus handles and rack-mount flanges	280 mm 11.0 in	483 mm 19 in	501 mm 19.70 in
Weight			
Net			
E8361A	29 kg (64 lb), nominal		
Shipping			
E8361A	36.3 kg (80 lb), nominal		

Note: For Regulatory and Environmental information, refer to the PNA Series Installation and Quick Start Guide, located at http://cp.literature.agilent.com/litweb/pdf/E8356-90001.pdf.

Measurement Throughput Summary

- Typical Cycle Time for Measurement Completion
- Cycle Time vs IF Bandwidth
- Cycle Time vs Number of Points
- Data Transfer Time

Table 19 Typical Cycle Time[a,b] (ms) for Measurement Completion

	Number of Points			
	201	**401**	**1601**	**16,001**
Start 28 GHz, Stop 30 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	12	19	55	503
2-Port cal	29	44	124	1112
Start 10 MHz, Stop 10 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	86	93	121	583
2-Port cal	179	199	267	1301
Start 10 MHz, Stop 20 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	126	130	153	597
2-Port cal	264	275	335	1321
Start 10 MHz, Stop 40 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	185	190	213	621
2-Port cal	382	401	459	1374
Start 10 MHz, Stop 50 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	210	216	243	643
2-Port cal	436	450	522	1405
Start 10 MHz, Stop 67 GHz, 35 kHz IF bandwidth				
Uncorrected 1-port cal	244	254	300	645
2-Port cal	502	524	591	1423

a Typical performance.

b Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement.

Table 20. Cycle Time vs IF Bandwidth[a]

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 28 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

IF Bandwidth (Hz)	Cycle Time (ms)[b]	Cycle Time (ms) Option 080 enabled
40,000	11	100
35,000	12	101
30,000	13	102
20,000	16	106
10,000	30	127
7000	38	138
5000	50	152
3000	74	182
1000	274	326
300	694	782
100	1905	2054
30	6091	6355
10	17916	18372

a Typical performance.
b Cycle time includes sweep and retrace time.

Table 21. Cycle Time vs Number of Points[a]

Applies to the Preset condition (35 kHz IF bandwidth, correction off) except for the following changes:

- CF = 28 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Number of Points	Cycle Time (ms)[b]
3	6
11	6
51	7
101	9
201	12
401	18
801	30
1601	55
16,001	497

a Typical performance.
b Cycle time includes sweep and retrace time.

Table 22. Data Transfer Time (ms)[a]

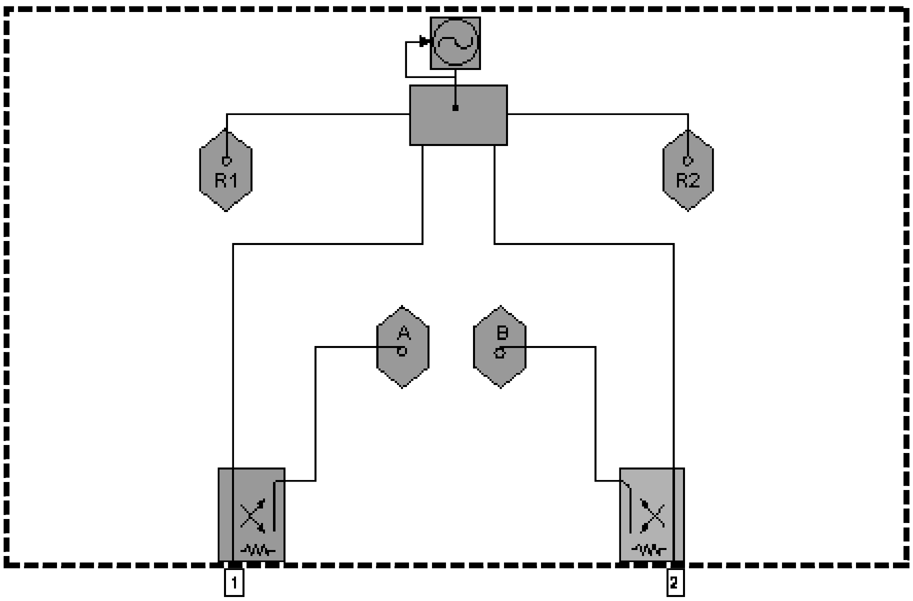
	Number of Points			
	201	401	1601	16,001
SCPI over GPIB (program executed on external PC)				
32-bit floating point	7	12	43	435
64-bit floating point	12	22	84	856
ASCII	64	124	489	5054
SCPI (program executed in the analyzer)				
32-bit floating point	1	2	3	30
64-bit floating point	2	2	4	40
ASCII	29	56	222	2220
COM (program executed in the analyzer)				
32-bit floating point	<0.4	0.4	0.5	1.9
Variant type	0.7	1	3	32
DCOM over LAN (program executed on external PC)				
32-bit floating point	<0.8	1	1.5	7.1

Variant type	1.8	2.7	8.5	80

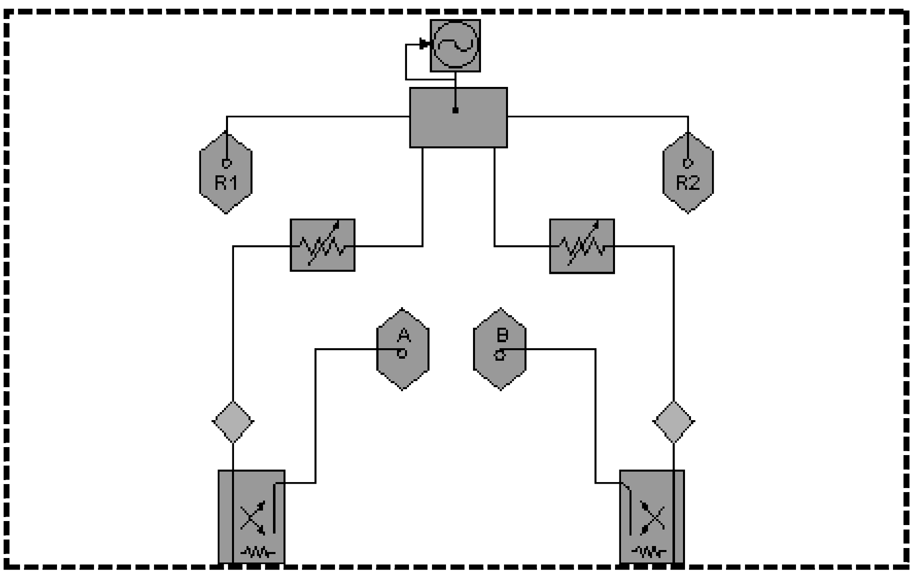
a Typical performance

Test Set Block Diagrams

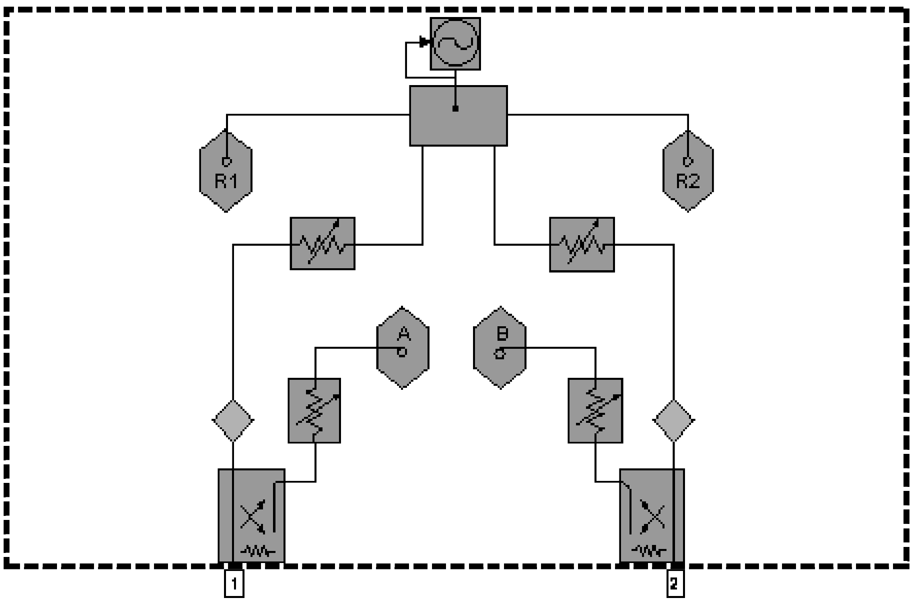
E8361A - Standard Configuration and Standard Power Range



E8361A - Option UNL Standard Configuration with Extended Power Range and Bias - Tees

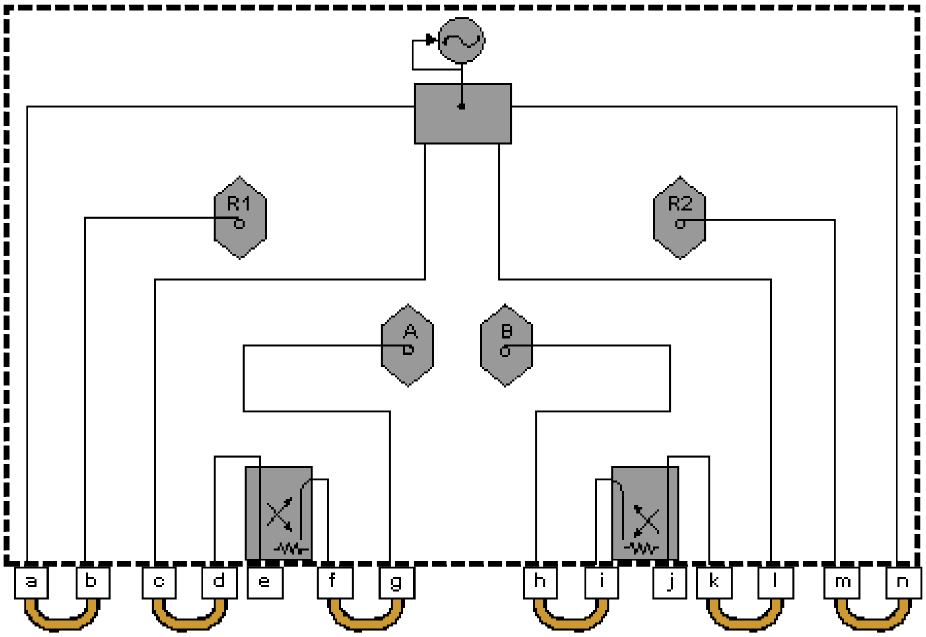


E8361A - Option UNL Standard Configuration with Extended Power Range and Bias - Tees, and Option 016, Receiver Attenuators



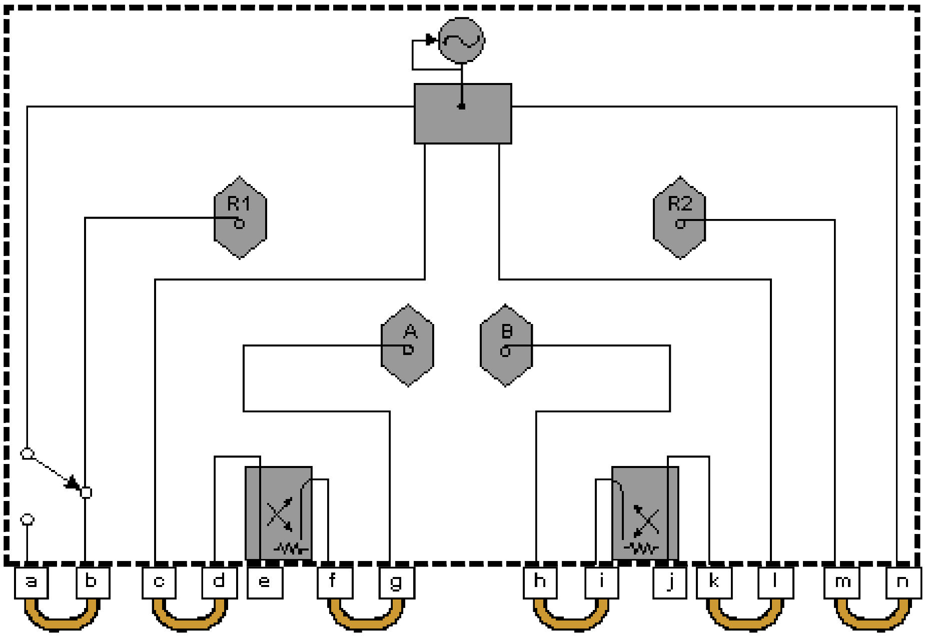
Test Set with Option 014 Block Diagrams

E8361A - Option 014 – Configurable Test Set and Standard Power Range



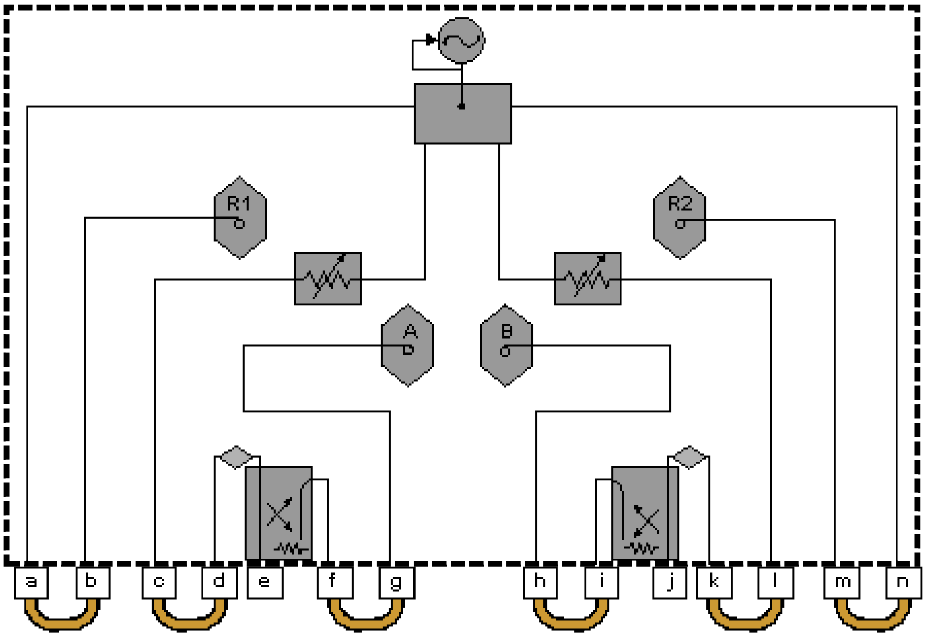
Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

E8361A - Option 014 – Configurable Test Set and Standard Power Range, and Option 081 Reference Channel Transfer Switch



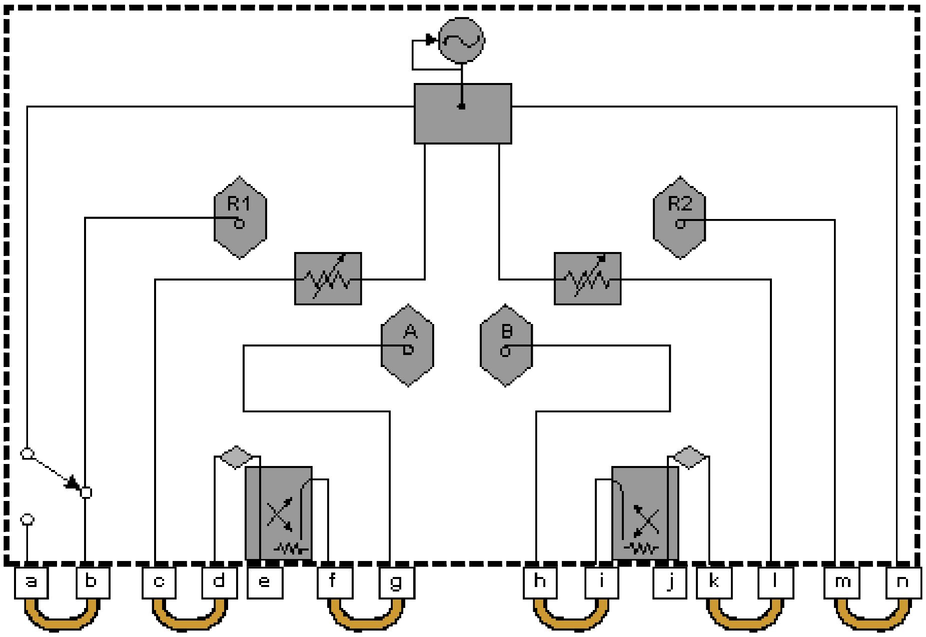
Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

E8361A - Option 014 Configurable Test Set, and Option UNL Extended Power Range and Bias - Tees



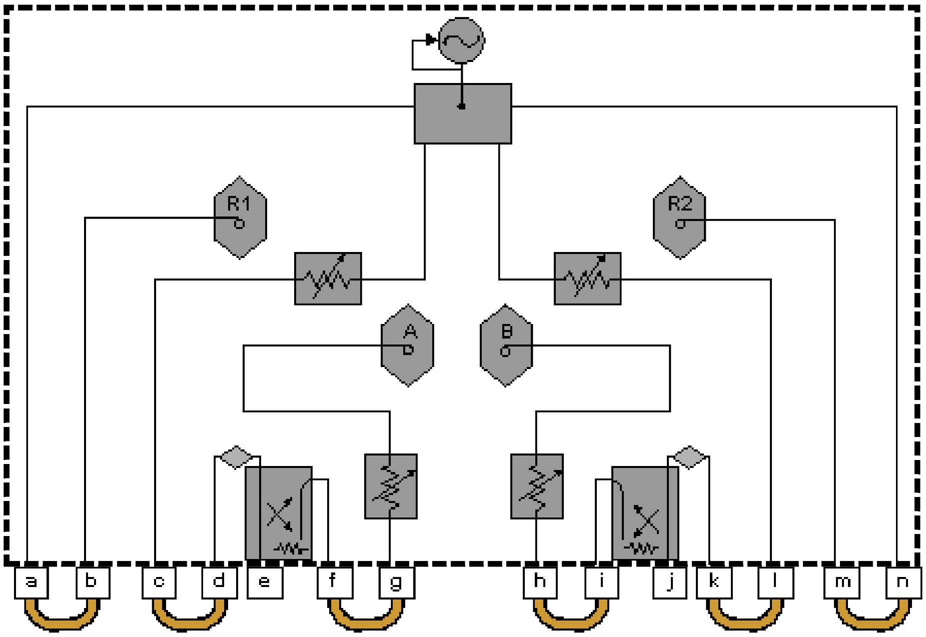
Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

E8361A - Option 014 Configurable Test Set, and Option UNL Extended Power Range and Bias - Tees, and Option 081 Reference Channel Transfer Switch



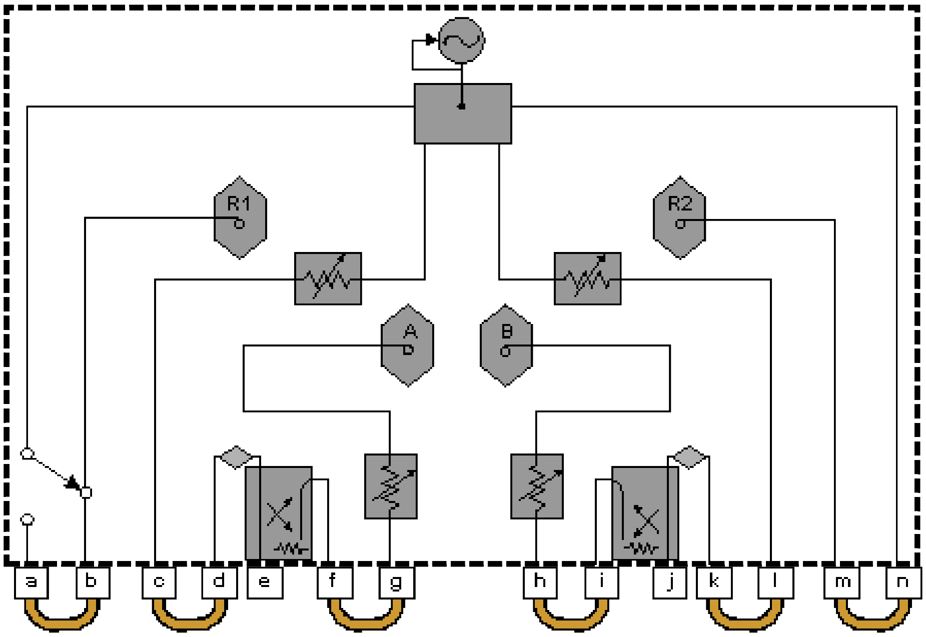
Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

E8361A - Option 014 Configurable Test Set and Option UNL, Extended Power Range and Bias - Tees and Option 016 Receiver Attenuators



Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

E8361A - Option 014 Configurable Test Set, and Option UNL Extended Power Range and Bias - Tees, and Option 016 Receiver Attenuators, and Option 081 Reference Channel Transfer Switch



Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

Last modified:

Jan. 10, 2007	Revised line power, and CPU values; moved regulatory, operating, and non-operating info to the I&QS Guide.
Oct. 05, 2006	Added 350W typical to line power
July 10, 2006	Previous revision

Technical Specifications for the E8362A, E8363A, E8364A

Because the E8362A, E8363A, and E8364A network analyzer is no longer produced, the technical specifications are stored only on the Internet. To view or print the .pdf version of the specifications, visit our web site at http://www.agilent.com/find/pna, and search for "E836xA Specifications"

The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

Technical Specifications for the E8362B, E8363B, E8364B

(Rev. 2007-10-11)

This is a complete list of the E8362B, E8363B, and E8364B network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the .pdf version of the specifications, visit our web site at http://www.agilent.com/find/pna, and search for "E836xB Specifications"
- The uncertainty curves contained in this document apply only to the setup conditions listed. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your PNA setup. View the equations used to generate the uncertainty curves.

- General Information
- Measurement Throughput Summary
- Front-panel Jumper Specs (Option 014 only)
- Test Set Block Diagrams
- Test Set with Option 014 Block Diagrams

See Specs for other PNA models

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the E836xB analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Isolation calibration with an averaging factor of 8

Table 1. System Dynamic Range[a]

Description	Specification (dB) at Test Port[b]	Typical (dB) at Direct Receiver Access Input[c]	Supplemental Information
Dynamic Range (in a 10 Hz BW)			
Standard Configuration and Standard Power Range (E836xB - Standard)			
10 MHz to 45 MHz[d]	79 (typical)	NA	--
45 MHz to 500 MHz[e]	94	NA	--
500 MHz to 2 GHz	119	NA	--
2 GHz to 10 GHz	122	NA	--
10 GHz to 20 GHz	123	NA	--
20 GHz to 30 GHz	114	NA	--
30 GHz to 40 GHz	110	NA	--
40 GHz to 45 GHz	109	NA	----
45 GHz to 50 GHz	104	NA	
Configurable Test Set and Standard Power Range (E836xB - Option 014)			

10 MHz to 45 MHz[d]	79 (typical)	129 (typical)	Option 016 degrades performance by 2 dB.
45 MHz to 500 MHz[e]	94	132	
500 MHz to 2 GHz	119	138	
2 GHz to 10 GHz	122	137	
10 GHz to 20 GHz	121	136	
20 GHz to 30 GHz	111	123	
30 GHz to 40 GHz	107	119	
40 GHz to 45 GHz	105	116	
45 GHz to 50 GHz	100	111	
Standard Configuration and Extended Power Range & Bias-Tees (E836xB - Option UNL)			
10 MHz to 45 MHz[d]	79 (typical)	NA	Option 016 degrades performance by 2 dB.
45 MHz to 500 MHz[e]	92	NA	
500 MHz to 2 GHz	117	NA	
2 GHz to 10 GHz	120	NA	
10 GHz to 20 GHz	121	NA	
20 GHz to 30 GHz	112	NA	
30 GHz to 40 GHz	108	NA	
40 GHz to 45 GHz	105	NA	
45 GHz to 50 GHz	99	NA	
Configurable Test Set and Extended Power Range & Bias-Tees (E836xB - Option 014/UNL)			
10 MHz to 45 MHz[d]	79 (typical)	129 (typical)	Option 016 degrades performance by 2 dB.
45 MHz to 500 MHz[e, f]	92	130	
500 MHz to 2 GHz[f]	117	136	
2 GHz to 10 GHz[f]	120	135	
10 GHz to 20 GHz[g]	119	134	
20 GHz to 30 GHz	109	121	
30 GHz to 40 GHz	105	117	
40 GHz to 45 GHz	101	112	

45 GHz to 50 GHz	95	106	

a The system dynamic range is calculated as the difference between the noise floor and the source maximum output power. System dynamic range is a specification when the source is set to Port 1, and a characteristic when the source is set to Port 2. The effective dynamic range must take measurement uncertainties and interfering signals into account as well as the insertion loss resulting from a thru cable connected between Port 1 and Port 2..

b The test port system dynamic range is calculated as the difference between the test port noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account as well as the insertion loss resulting from a thru cable connected between Port 1 and Port 2..

c The direct receiver access input system dynamic range is calculated as the difference between the receiver access input noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its damage level. When the analyzer is in segment sweep mode, the analyzer can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when receiver damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

d Typical performance.

e May be limited to 100 dB at particular frequencies below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

f E8362B only: Option H11 decreases value by 1 dB.

g E8362B only: Option H11 decreases value by 2 dB.

Table 2. Receiver Dynamic Range[a]

Description	Specification (dB) at Test Port[b]	Typical (dB) at Direct Receiver Access Input[c]	
Dynamic Range (in a 10 Hz BW)			
Standard Configuration and Standard Power Range (E836xB - Standard) **OR** **Standard Configuration and Extended Power Range & Bias Tees (E836xB - Option UNL)**			
10 MHz to 45 MHz[d]	82 (typical)	NA	--
45 MHz to 500 MHz[e]	94	NA	--
500 MHz to 2 GHz	119	NA	--
2 GHz to 10 GHz	122	NA	--
10 GHz to 20 GHz	125	NA	--
20 GHz to 30 GHz	114	NA	Option 016 degrades performance by 2 dB.
30 GHz to 40 GHz	111	NA	
40 GHz to 50 GHz	111	NA	
Configurable Test Set and Standard Power Range (E836xB - Option 014) **OR** **Configurable Test Set and Extended Power Range & Bias Tees (E836xB - Option 014/UNL)**			
10 MHz to 45 MHz[d]	82 (typical)	132 (typical)	--

45 MHz to 500 MHz[e]	94	132	--
500 MHz to 2 GHz	119	138	--
2 GHz to 10 GHz	122	137	--
10 GHz to 20 GHz	124	139	--
20 GHz to 30 GHz	113	125	Option 016 degrades performance by 2 dB.
30 GHz to 40 GHz	110	122	
40 GHz to 50 GHz	109	120	

a The receiver dynamic range is calculated as the difference between the noise floor and the receiver maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.
b The test port receiver dynamic range is calculated as the difference between the test port noise floor and the receiver maximum input level. The effective dynamic range must take measurement uncertainties and interfering signals into account.
c The direct receiver access input receiver dynamic range is calculated as the difference between the direct receiver access input noise floor and the receiver maximum input level. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its compression or damage level. When the analyzer is in segment sweep mode, the analyzer can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when compression or receiver damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.
d Typical performance.
e May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Note: This E836xB document provides technical specifications for the following calibration kits only: 85056A, 85056D, 85056K, 85052B, 85052C, 85052D, 85050B, 85050C, 85050D, 85054B, 85054D, K11644A, P11644A, R11644A, and the X11644A.

Table 33. Uncorrected System Performance[a]

Specifications apply over environmental temperature of 23° ±3 °C, with < 1 °C deviation from the calibration temperature

Description	Specification	Supplemental Information
Directivity		
10 MHz to 45 MHz[b]	--	11 db (typical)
45 MHz to 2 GHz	24 dB	--
2 GHz to 10 GHz	22 dB	--
10 GHz to 20 GHz	16 dB	--
20 GHz to 40 GHz	16 dB	--
40 GHz to 45 GHz	15 dB	--
45 GHz to 50 GHz	13 dB	--
Source Match - Standard		

10 MHz to 45 MHz[b]	--	11 db (typical)
45 MHz to 2 GHz	23 dB	--
2 GHz to 10 GHz	16 dB	--
10 GHz to 20 GHz	14 dB	--
20 GHz to 40 GHz	10 dB	--
40 GHz to 45 GHz	9 dB	--
45 GHz to 50 GHz	7.5 dB	--
Source Match - Opt UNL, 014 or 014/UNL		
10 MHz to 45 MHz[b]	--	11 db (typical)
45 MHz to 2 GHz	18 dB	--
2 GHz to 10 GHz	14 dB	--
10 GHz to 20 GHz	12 dB	--
20 GHz to 40 GHz	9 dB	--
40 GHz to 45 GHz	8 dB	--
45 GHz to 50 GHz	6 dB	--
Load Match - Standard		
10 MHz to 45 MHz[b]	--	11 db (typical)
45 MHz to 2 GHz	23 dB	--
2 GHz to 10 GHz	14 dB	--
10 GHz to 20 GHz	10 dB	--
20 GHz to 40 GHz	9 dB	--
40 GHz to 45 GHz	9 dB	--
45 GHz to 50 GHz	8 dB	--
Load Match - Opt UNL, 014 or 014/UNL		
10 MHz to 45 MHz[b]	--	11 db (typical)

45 MHz to 2 GHz	17 dB	--
2 GHz to 10 GHz	13 dB	--
10 GHz to 20 GHz	10 dB	--
20 GHz to 40 GHz	9 dB	--
40 GHz to 45 GHz	9 dB	--
45 GHz to 50 GHz	7 dB	--
Reflection Tracking		
	--	**Typical:**
10 MHz to 45 MHz	--	±1.5 dB
45 MHz to 20 GHz	--	±1.5 dB
20 GHz to 40 GHz	--	±1.5 dB
40 GHz to 50 GHz	--	±2.0 dB
Transmission Tracking[c]		
	--	**Typical:**
10 MHz to 45 MHz	--	±3.0 dB
45 MHz to 2 GHz	--	±1.5 dB
2 GHz to 10 GHz	--	±2.0 dB
10 GHz to 20 GHz	--	±2.5 dB
20 GHz to 40 GHz	--	±3.5 dB
40 GHz to 45 GHz	--	±4.0 dB
45 GHz to 50 GHz	--	±4.5 dB
Crosstalk[d] - Standard		
10 MHz to 45 MHz[b]	--	-65 dB (typical)
45 MHz to 1 GHz	-85 dB	--
1 GHz to 2 GHz	-100 dB	--

2 GHz to 20 GHz	-110 dB	--
20 GHz to 40 GHz	-108 dB	--
40 GHz to 45 GHz	-105 dB	--
45 GHz to 50 GHz	-100 dB	--
Crosstalk[d] - Option UNL or 014		
10 MHz to 45 MHz[b]	--	-65 dB (typical)
45 MHz to 1 GHz	-85 dB	--
1 GHz to 2 GHz	-100 dB	--
2 GHz to 20 GHz	-109 dB	--
20 GHz to 40 GHz	-106 dB	--
40 GHz to 45 GHz	-103 dB	--
45 GHz to 50 GHz	-98 dB	--
Crosstalk[d] - Option 014/UNL		
10 MHz to 45 MHz[b]	--	-65 dB (typical)
45 MHz to 1 GHz	-85 dB	--
1 GHz to 2 GHz	-98 dB	--
2 GHz to 10 GHz	-108 dB	--
10 GHz to 20 GHz	-107 dB	--
20 GHz to 40 GHz	-104 dB	--
40 GHz to 45 GHz	-100 dB	--
45 GHz to 50 GHz	-95 dB	--
Crosstalk - Option 080 enabled[b,e]		
	--	**Typical:**
10 MHz to 45 MHz	--	-65
45 MHz to 1 GHz	--	-85

1 GHz to 2 GHz	--	-100
2 GHz to 10 GHz	--	-109
10 GHz to 20 GHz	--	-110
20 GHz to 40 GHz	--	-106
40 GHz to 45 GHz	--	-103
45 GHz to 50 GHz	--	-98

a Specifications apply over environment temperature of 23°C +/- 3°C, with less than 1°C deviation from the calibration temperature.

b Typical performance.

cTransmission tracking performance is strongly dependent on cable used. These typical specifications are based on the use of the Agilent thru cable (part number 85133-60016).

d Measurement conditions: normalized to a thru, measured with two shorts, 10 Hz IF bandwidth, averaging factor of 16, alternate mode, source power set to the lesser of the maximum power out or the maximum receiver power.

e 0 Hz offset.

Table 34. Test Port Output

Description	**Specification**				**Supplemental**
Frequency Range					
	Standard	**Opt 014**	**Opt UNL**	**Opt 014/UNL**	--
E8362B	10 MHz to 20 GHz				--
E8363B	10 MHz to 40 GHz				--
E8364B	10 MHz to 50 GHz				--
Nominal Power[c]					
E8362B	0 dBm	-5 dBm	-5 dBm	-5 dBm	--
E8363/4B	-12 dBm	-17 dBm	-17 dBm	-17 dBm	--
Frequency Resolution					
	1 Hz				--
CW Accuracy					

	+/-1 ppm				--
Frequency Stability					
					+/-0.05 ppm. -10° to 70° C, typical; +/-0.1 ppm/yr maximum, typical
Power Level Accuracy[a]					
10 MHz to 45 MHz[b]	+/-2.0 dB (typical)	+/-2.0 dB (typical)	+/-2.0 dB (typical)	+/-2.0 dB (typical)	--
45 MHz to 10 GHz	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	Variation from nominal power in range 0 (step attenuator at 0 dB)
10 GHz to 20 GHz	+/-2.0 dB	+/-2.0 dB	+/-2.0 dB	+/-2.0 dB	
20 GHz to 40 GHz	+/-3.0 dB	+/-3.0 dB	+/-3.0 dB	+/-3.0 dB	
40 GHz to 45 GHz	+/-3.0 dB	+/-3.5 dB	+/-3.0 dB	+/-3.5 dB	
45 GHz to 50 GHz	+/-3.0 dB	+/-4.0 dB	+/-3.0 dB	+/-4.0 dB	
Power Level Linearity[d]					
10 MHz to 45 MHz[b]	+/-1.0 dB[g] (typical)				Test reference is at the nominal power level (step attenuator at 0 dB)
45 MHz to 20 GHz	+/-1.0 dB[g]				
20 GHz to 40 GHz	+/-1.0 dB[g]				
40 GHz to 50 GHz	+/-1.0 dB[g]				
Power Range[a, e, f]					
10 MHz to 45 MHz[b]	-25 to +2 dBm (typical)	-25 to +2 dBm (typical)	-87 to +2 dBm (typical)	-87 to +2 dBm (typical)	--

45 MHz to 10 GHz	-25 to +5 dBm	-25 to +5 dBm	-87 to +3 dBm	-87 to +3 dBm[h]	--
10 GHz to 20 GHz	-24 to +3 dBm	-25 to +2 dBm	-86 to +1 dBm	-87 to 0 dBm[i]	--
20 GHz to 30 GHz	-23 to 0 dBm	-25 to -2 dBm	-85 to -2 dBm	-87 to -4 dBm	--
30 GHz to 40 GHz	-23 to -4 dBm	-25 to -6 dBm	-85 to -6 dBm	-87 to -8 dBm	--
40 GHz to 45 GHz	-25 to -5 dBm	-27 to -7 dBm	-87 to -9 dBm	-87 to -11 dBm	--
45 GHz to 50 GHz	-25 to -10 dBm	-27 to -12 dBm	-87 to -15 dBm	-87 to -17 dBm	--
Power Sweep Range (ALC)					
10 MHz to 45 MHz[b]	27 dB (typical)	27 dB (typical)	29 dB (typical)	29 dB (typical)	--
45 MHz to 10 GHz	30 dB	30 dB	30 dB	30 dB[j]	ALC range starts at maximum leveled output power and decreases by power level indicated in the table.
10 GHz to 20 GHz	27 dB	27 dB	27 dB	27 dB[k]	
20 GHz to 30 GHz	23 dB	23 dB	23 dB	23 dB	
30 GHz to 40 GHz	19 dB	19 dB	19 dB	19 dB	
40 GHz to 45 GHz	20 dB	20 dB	18 dB	16 dB	
45 GHz to 50 GHz	15 dB	15 dB	12 dB	10 dB	
Power Resolution					
	0.01 dB				--
Phase Noise					
1 kHz offset from center frequency, nominal power at test port					
	--	--	--	--	**Typical:**
10 MHz to 10 GHz	--	--	--	--	-60 dBc

10 GHz to 20 GHz	--	--	--	--	-55 dBc
20 GHz to 50 GHz	--	--	--	--	-50 dBc
1 kHz offset from center frequency, nominal power at test port - Option 080 enabled					
	--	--	--	--	**Typical:**
10 MHz to 10 GHz	--	--	--	--	-60 dBc
10 GHz to 20 GHz	--	--	--	--	-60 dBc
20 GHz to 50 GHz	--	--	--	--	-50 dBc
10 kHz offset from center frequency, nominal power at test port					
	--	--	--	--	**Typical:**
10 MHz to 45 MHz	--	--	--	--	-70 dBc
45 MHz to 10 GHz					-70 dBc
10 GHz to 20 GHz	--	--	--	--	-65 dBc
20 GHz to 40 GHz	--	--	--	--	-55 dBc
40 GHz to 50 GHz	--	--	--	--	-55 dBc
10 kHz offset from center frequency, nominal power at test port - Option 080 enabled					
	--	--	--	--	**Typical:**
10 MHz to 45 MHz	--	--	--	--	-70 dBc
45 MHz to 10 GHz	--	--	--	--	-70 dBc
10 GHz to 20 GHz	--	--	--	--	-65 dBc
20 GHz to 40 GHz	--	--	--	--	-55 dBc
40 GHz to 50 GHz	--	--	--	--	-55 dBc
100 kHz offset from center frequency, nominal power at test port					
	--	--	--	--	**Typical:**
10 MHz to 10 GHz	--	--	--	--	-60 dBc
10 GHz to 20 GHz	--	--	--	--	-55 dBc

20 GHz to 50 GHz	--	--	--	--	-50 dBc
100 kHz offset from center frequency, nominal power at test port - Option 080 enabled					
	--	--	--	--	**--**
10 MHz to 10 GHz	--	--	--	--	-75 dBc
10 GHz to 20 GHz	--	--	--	--	-70 dBc
20 GHz to 50 GHz	--	--	--	--	-65 dBc
1 MHz offset from center frequency, nominal power at test port					
	--	--	--	--	**Typical:**
10 MHz to 10 GHz	--	--	--	--	-106 dBc
10 GHz to 20 GHz	--	--	--	--	-103 dBc
20 GHz to 50 GHz	--	--	--	--	-90 dBc
1 MHz offset from center frequency, nominal power at test port - Option 080 enabled					
	--	--	--	--	**Typical:**
10 MHz to 10 GHz	--	--	--	--	-103 dBc
10 GHz to 20 GHz	--	--	--	--	-97 dBc
20 GHz to 50 GHz	--	--	--	--	-85 dBc
Harmonics (2nd or 3rd)					
	--	--	--	--	-23 dBc typical, in power range 0
Non-Harmonic Spurious (at Nominal Output Power)					
10 MHz to 45 MHz	--	--	--	--	-50 dBc typical, for offset frequency > 1 kHz

45 MHz to 20 GHz	--	--	--	--	-50 dBc typical, for offset frequency > 1 kHz
20 GHz to 40 GHz	--	--	--	--	-30 dBc typical, for offset frequency > 1 kHz
40 GHz to 50 GHz	--	--	--	--	-30 dBc typical, for offset frequency > 1 kHz

a Test port output is a specification when the source is set to Port 1, and a characteristic when the source is set to Port 2.

b Typical performance.

c Preset power.

d Power Level Linearity is a specification when the source is set to Port 1, and a typical when the source is set to Port 2.

e Test port power is specified into nominal 50 ohms.

f Power to which the source can be set and phase lock is assured.

g +/-1.5 dB for power <= -23 dBm.

h E8362B only: Option H11 decreases maximum power level by 1 dB.

i E8362B only: Option H11 decreases maximum power level by 2 dB.

j E8362B only: Option H11 decreases power level by 1 dB.

k E8362B only: Option H11 decreases power level by 2 dB.

Table 35: Test Port Input

Description	**Specification**				**Supplemental**
	Standard	**Opt 014**	**Opt UNL**	**Opt 014/UNL**	
Test Port Noise Floor[a]					
10 Hz IF Bandwidth					
10 MHz to 45 MHz[b]	<-77 dBm (typical)	<-77 dBm (typical)	<-77 dBm (typical)	<-77 dBm (typical)	--
45 MHz to 500 MHz[c]	<-89 dBm	<-89 dBm	<-89 dBm	<-89 dBm	--

500 MHz to 2 GHz	<-114 dBm	<-114 dBm	<-114 dBm	<-114 dBm	--
2 GHz to 10 GHz	<-117 dBm	<-117 dBm	<-117 dBm	<-117 dBm	--
10 GHz to 20 GHz	<-120 dBm	<-119 dBm	<-120 dBm	<-119 dBm	--
20 GHz to 40 GHz	<-114 dBm	<-113 dBm	<-114 dBm	<-113 dBm	Option 016 degrades performance by 2 dB.
40 GHz to 50 GHz	<-114 dBm	<-112 dBm	<-114 dBm	<-112 dBm	
1 KHz IF Bandwidth					
10 MHz to 45 MHz[b]	<-57 dBm (typical)	<-57 dBm (typical)	<-57 dBm (typical)	<-57 dBm (typical)	--
45 MHz to 500 MHz[c]	<-69 dBm	<-69 dBm	<-69 dBm	<-69 dBm	--
500 MHz to 2 GHz	<-94 dBm	<-94 dBm	<-94 dBm	<-94 dBm	--
2 GHz to 10 GHz	<-97 dBm	<-97 dBm	<-97 dBm	<-97 dBm	--
10 GHz to 20 GHz	<-100 dBm	<-99 dBm	<-100 dBm	<-99 dBm	--
20 GHz to 40 GHz	<-94 dBm	<-93 dBm	<-94 dBm	<-93 dBm	Option 016 degrades performance by 2 dB.
40 GHz to 50 GHz	<-94 dBm	<-92 dBm	<-94 dBm	<-92 dBm	
Test Port Noise Floor[a,b] Option 080 enabled[d]					
10 Hz IF Bandwidth					
10 MHz to 45 MHz[b]	<-77 dBm (typical)	<-77 dBm (typical)	<-77 dBm (typical)	<-77 dBm (typical)	--

45 MHz to 500 MHz[c]	<-88 dBm	<-88 dBm	<-88 dBm	<-88 dBm	--
500 MHz to 2 GHz	<-113 dBm	<-113 dBm	<-113 dBm	<-113 dBm	--
2 GHz to 10 GHz	<-116 dBm	<-116 dBm	<-116 dBm	<-116 dBm	--
10 GHz to 20 GHz	<-118 dBm	<-118 dBm	<-118 dBm	<-118 dBm	--
20 GHz to 40 GHz	<-112 dBm	<-112 dBm	<-112 dBm	<-112 dBm	Option 016 degrades performance by 2 dB.
40 GHz to 50 GHz	<-111 dBm	<-111 dBm	<-111 dBm	<-111 dBm	
1 KHz IF Bandwidth					
10 MHz to 45 MHz[b]	<-57 dBm (typical)	<-57 dBm (typical)	<-57 dBm (typical)	<-57 dBm (typical)	--
45 MHz to 500 MHz[c]	<-68 dBm	<-68 dBm	<-68 dBm	<-68 dBm	--
500 MHz to 2 GHz	<-93 dBm	<-93 dBm	<-93 dBm	<-93 dBm	--
2 GHz to 10 GHz	<-96 dBm	<-96 dBm	<-96 dBm	<-96 dBm	--
10 GHz to 20 GHz	<-98 dBm	<-98 dBm	<-98 dBm	<-98 dBm	--
20 GHz to 40 GHz	<-92 dBm	<-92 dBm	<-92 dBm	<-92 dBm	Option 016 degrades performance by 2 dB.
40 GHz to 50 GHz	<-91 dBm	<-91 dBm	<-91 dBm	<-91 dBm	
Direct Receiver Access Input Noise Floor[a,b]					
10 Hz IF Bandwidth					

10 MHz to 45 MHz	--	<-127 dBm	--	<-127 dBm	--
45 MHz to 500 MHz[c]	--	<-127 dBm	--	<-127 dBm	--
500 MHz to 2 GHz	--	<-133 dBm	--	<-133 dBm	--
2 GHz to 10 GHz	--	<-132 dBm	--	<-132 dBm	--
10 GHz to 20 GHz	--	<-134 dBm	--	<-134 dBm	--
20 GHz to 40 GHz	--	<-125 dBm	--	<-125 dBm	Option 016 degrades performance by 2 dB.
40 GHz to 50 GHz	--	<-123 dBm	--	<-123 dBm	
1 KHz IF Bandwidth					
10 MHz to 45 MHz	--	<-107 dBm	--	<-107 dBm	--
45 MHz to 500 MHz[c]	--	<-107 dBm	--	<-107 dBm	--
500 MHz to 2 GHz	--	<-113 dBm	--	<-113 dBm	--
2 GHz to 10 GHz	--	<-112 dBm	--	<-112 dBm	--
10 GHz to 20 GHz	--	<-114 dBm	--	<-114 dBm	--
20 GHz to 40 GHz	--	<-105 dBm	--	<-105 dBm	Option 016 degrades performance by 2 dB.
40 GHz to 50 GHz	--	<-103 dBm	--	<-103 dBm	

Direct Receiver Access Input Noise Floor[a,b] - Option 080 enabled[d]					
10 Hz IF Bandwidth					
10 MHz to 45 MHz	--	<-127 dBm	--	<-127 dBm	--
45 MHz to 500 MHz[c]	--	<-126 dBm	--	<-126 dBm	--
500 MHz to 2 GHz	--	<-132 dBm	--	<-132 dBm	--
2 GHz to 10 GHz	--	<-131 dBm	--	<-131 dBm	--
10 GHz to 20 GHz	--	<-133 dBm	--	<-133 dBm	--
20 GHz to 40 GHz	--	<-124 dBm	--	<-124 dBm	Option 016 degrades performance by 2 dB.
40 GHz to 50 GHz	--	<-122 dBm	--	<-122 dBm	
1 KHz IF Bandwidth					
10 MHz to 45 MHz	--	<-107 dBm	--	<-107 dBm	--
45 MHz to 500 MHz[c]	--	<-106 dBm	--	<-106 dBm	--
500 MHz to 2 GHz	--	<-112 dBm	--	<-112 dBm	--
2 GHz to 10 GHz	--	<-111 dBm	--	<-111 dBm	--
10 GHz to 20 GHz	--	<-113 dBm	--	<-113 dBm	--
20 GHz to 40 GHz	--	<-104 dBm	--	<-104 dBm	Option 016 degrades performance by 2 dB.
40 GHz to 50 GHz	--	<-102 dBm	--	<-102 dBm	

Receiver Compression Level		
10 MHz to 20 GHz	<0.1 dB at -5 dBm[g] and <0.45 dB at +5 dBm	--
20 GHz to 30 GHz	<0.1 dB at -9.5 dBm[g] and <0.45 dB at 0 dBm	--
30 GHz to 40 GHz	<0.1 dB at -12.5 dBm[g] and <0.45 dB at -3 dBm	--
40 GHz to 50 GHz	<0.1 dB at -12.5 dBm[g] and <0.45 dB at -3 dBm	--
System Compression Level		
	maximum output power	See dynamic accuracy table
Third Order Intercept - Tone spacing from 100 kHz - 5 MHz		
		Typical
10 MHz to 150 MHz	--	+33 dBm
150 MHz to 300 MHz	--	+34 dBm
300 MHz to 500 MHz	--	+30 dBm
500 MHz to 20 GHz	--	+24 dBm
20 to 40 GHz	--	+18 dBm
40 to 50 GHz	--	+15 dBm
Third Order Intercept - Tone spacing from 5 MHz - 20 MHz		
		Typical
10 MHz to 500 MHz	--	+20 dBm
500 MHz to 20 GHz	--	+20 dBm

20 to 40 GHz	--	+16 dBm
40 to 50 GHz	--	+15 dBm
Third Order Intercept - Tone spacing from 20 MHz - 50 MHz		
	--	**Typical**
10 MHz to 500 MHz	--	+26 dBm
500 MHz to 20 GHz	--	+26 dBm
20 to 40 GHz	--	+20 dBm
40 to 50 GHz	--	+19 dBm
Trace Noise Magnitude 1 kHz IF bandwidth. Ratio measurement, nominal power at test port.		
10 MHz to 45 MHz[b]	--	<0.050 dB rms (typical)
45 MHz to 500 MHz[e]	<0.010 dB rms	--
500 MHz to 20 GHz	<0.006 dB rms	--
20 GHz to 40 GHz	<0.006 dB rms	--
40 GHz to 50 GHz	<0.006 dB rms	--
Trace Noise Magnitude - Option 080 enabled[b,d] 1 kHz IF bandwidth. Ratio measurement, nominal power at test port.		
10 MHz to 45 MHz[b]	--	<0.060 dB rms (typical)
45 MHz to 500 MHz[e]	<0.010 dB rms	--

500 MHz to 20 GHz	<0.006 dB rms	--
20 GHz to 40 GHz	<0.007 dB rms	--
40 GHz to 50 GHz	<0.008 dB rms	--
Trace Noise Phase 1 kHz IF bandwidth. Ratio measurement, nominal power at test port.		
10 MHz to 45 MHz[b]	--	<0.350° rms (typical)
45 MHz to 500 MHz	<0.100° rms	--
500 MHz to 20 GHz	<0.060° rms	--
20 GHz to 40 GHz	<0.100° rms	--
40 GHz to 50 GHz	<0.100° rms	--
Trace Noise Phase - Option 080 enabled[b,d] 1 kHz IF bandwidth. Ratio measurement, nominal power at test port.		
10 MHz to 45 MHz	<0.350° rms	--
45 MHz to 500 MHz[e]	<0.100° rms	--
500 MHz to 20 GHz	<0.060° rms	--
20 GHz to 40 GHz	<0.100° rms	--

40 GHz to 50 GHz	<0.100° rms				--
Reference Level Magnitude					
Range	+/-200 dB				--
Resolution	0.001 dB				--
Reference Level Phase					
Range	+/-500°				--
Resolution	0.01°				--
Stability Magnitude[d]					
Typical ratio measurement, made at the test port.					
10 MHz to 45 MHz	--	--	--	--	+/-0.05 dB/°C
45 MHz to 20 GHz	--	--	--	--	+/-0.02 dB/°C
20 GHz to 40 GHz	--	--	--	--	+/-0.03 dB/°C
40 GHz to 50 GHz	--	--	--	--	+/-0.04 dB/°C
Stability Phase[d]					
Typical ratio measurement, measured at the test port.					
10 MHz to 45 MHz	--	--	--	--	+/-0.5°/°C
45 MHz to 20 GHz	--	--	--	--	+/-0.2°/°C
20 GHz to 40 GHz	--	--	--	--	+/-0.5°/°C
40 GHz to 50 GHz	--	--	--	--	+/-0.8°/°C

Damage Input Level					
Test Port 1 and 2	--	--	--	--	+30 dBm or +/-40 VDC, typical
R1, R2 in	--	--	--	--	+15 dBm or +/-15 VDC, typical
A, B in	--	--	--	--	+15 dBm or +/-15 VDC, typical
Coupler Thru (Option 014 or UNL/014)	--	--	--	--	+30 dBm or +/-40 VDC, typical
Coupler Arm (Option 014 or UNL/014)	--	--	--	--	+30 dBm or +/-7 VDC, typical

aTotal average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

bTypical performance.

cNoise floor may be degraded by 10 dB at particular frequencies (multiples of 5 MHz) due to spurious receiver residuals.

d0 Hz offset

eTrace noise magnitude may be degraded to 20 mdB rms at harmonic frequencies of the first IF (8.33 MHz) below 80 MHz.

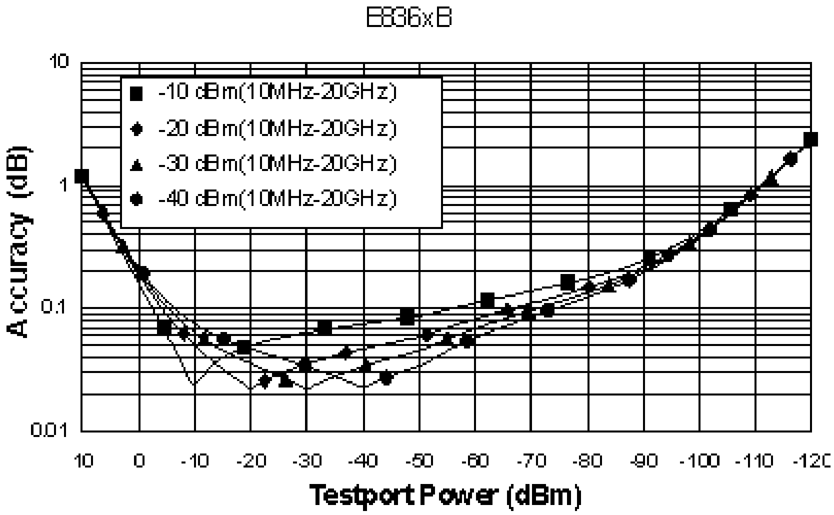
fStability is defined as a ratio measurement made at the test port.

g This compression level comes from the dynamic accuracy curve with -30 dBm reference test port power.

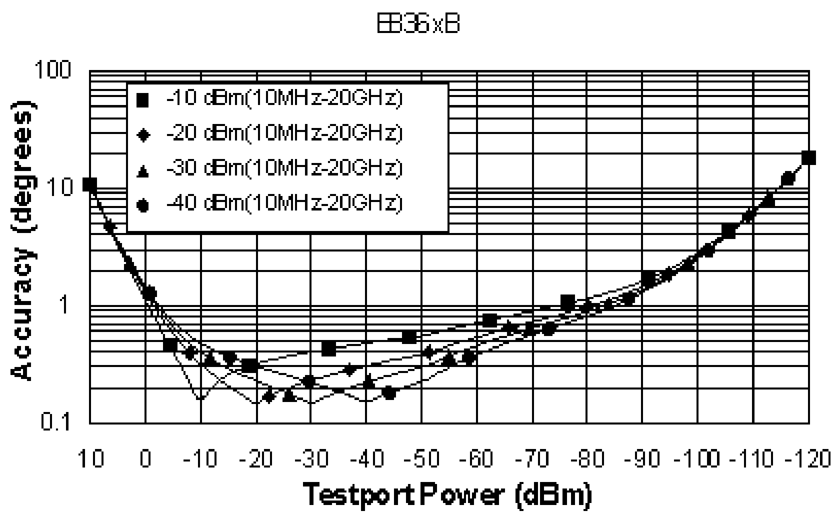
Table 36. Dynamic Accuracy (Specification[a])

Accuracy of the test port input power reading relative to the reference input power level.

Magnitude*

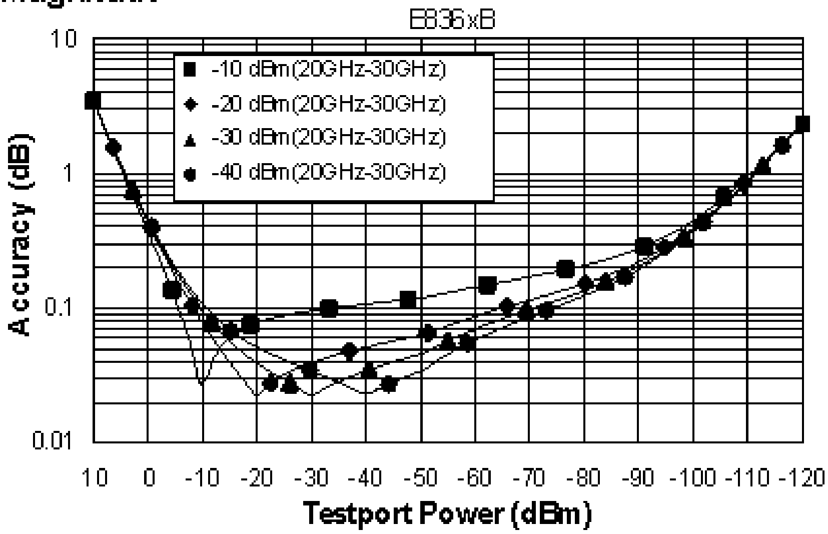


Phase*

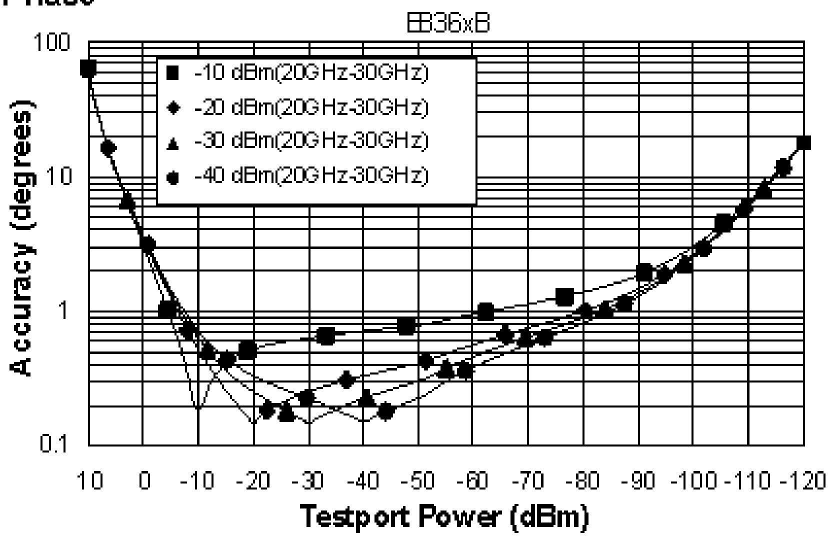


*Below 800 MHz the coupling factor rolls off 20 dB per decade causing a shift in the dynamic accuracy curves. Please see the Uncertainty Calculator (http://www.agilent.com/find/na_calculator) for detailed compression values.

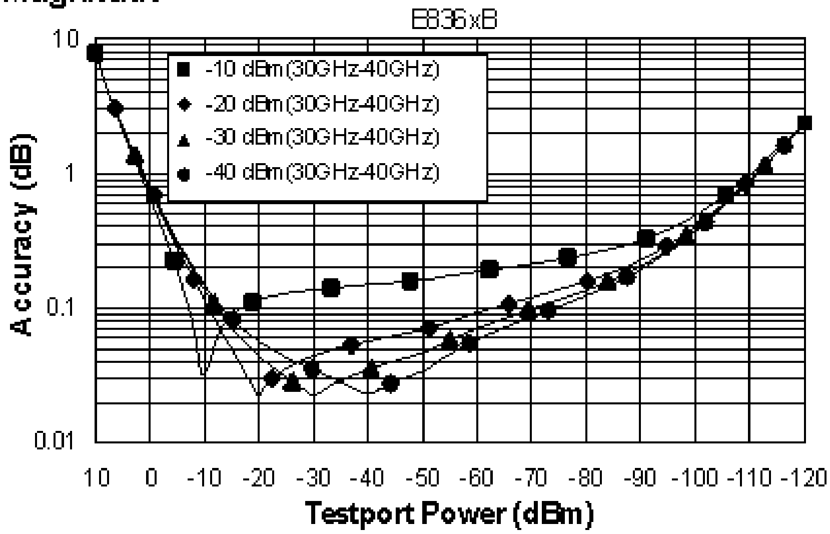
Magnitude



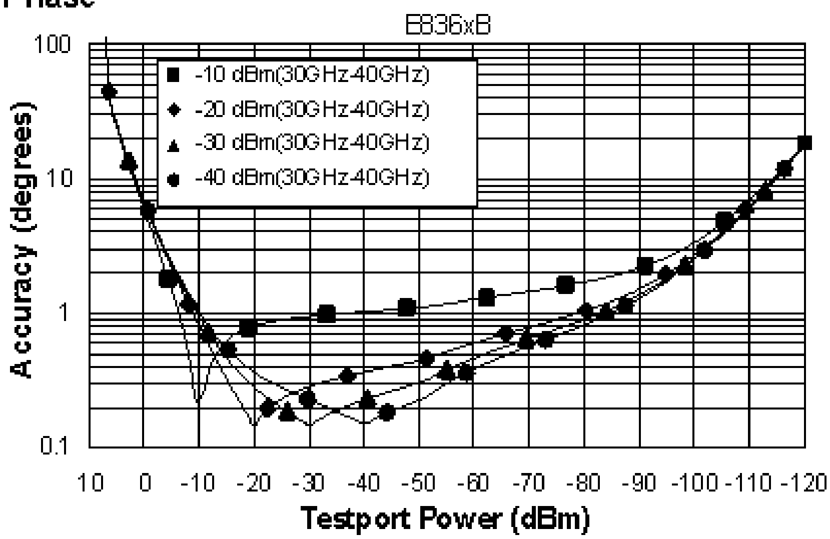
Phase



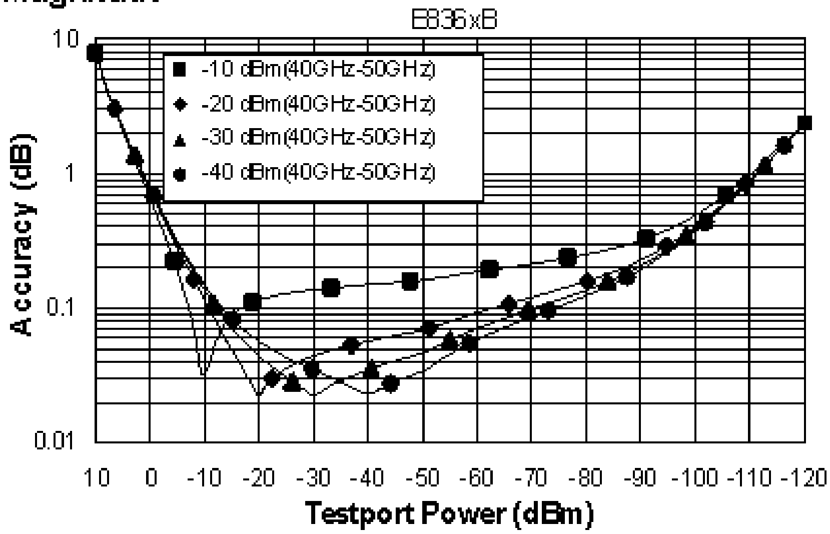
Magnitude



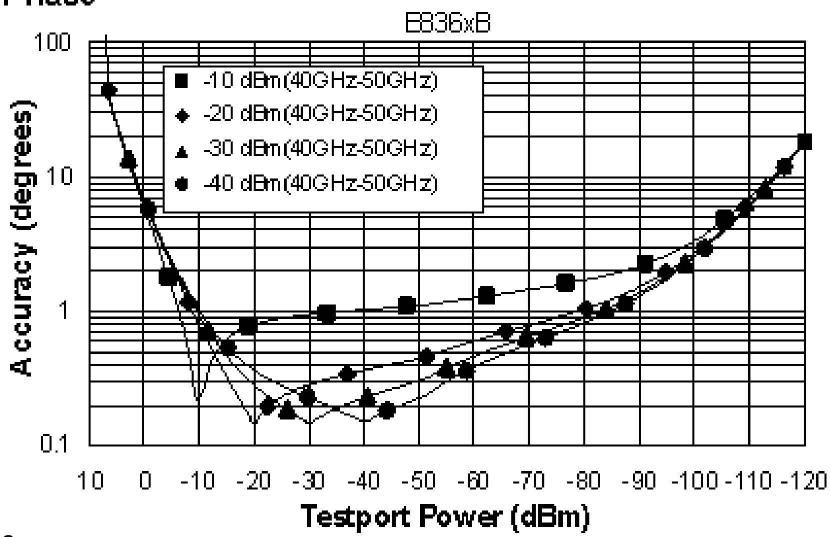
Phase



Magnitude



Phase



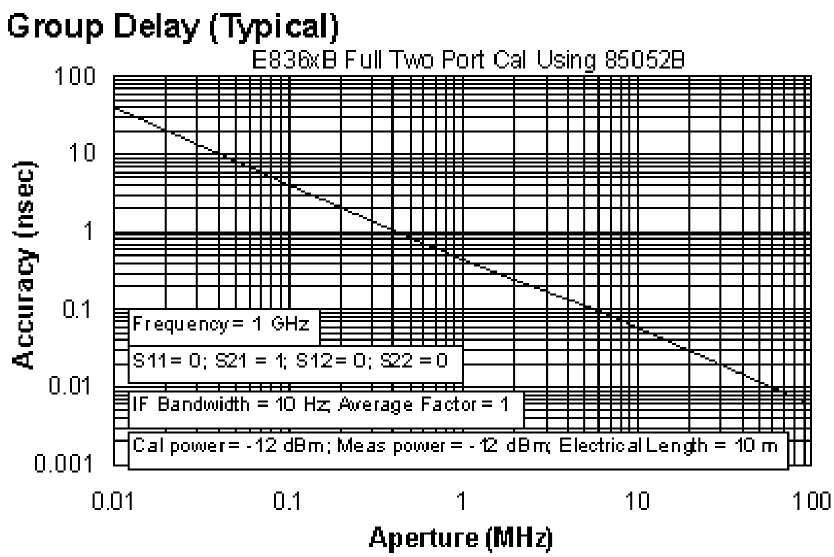
[a] Dynamic accuracy is verified with the following measurements:

- Compression over frequency.
- IF linearity at a single frequency of 1.195 GHz and a reference level of -20 dBm for an input power range of 0 to -120 dBm.

Table 37. Test Port Input (Group Delay)[a]

Description	Specification	Supplemental Information (typ.)
Aperture (selectable)	--	(frequency span)/(number of points -1)
Maximum Aperture	--	20% of frequency span
Range	--	0.5 x (1/minimum aperture)
Maximum Delay	--	Limited to measuring no more than 180° of phase change within the minimum aperture.)
Accuracy	--	See graph below. Char.

The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

- Miscellaneous Information
- Front Panel
- Rear Panel

- **Environment and Dimensions**

Table 38. Miscellaneous Information

Description	**Specification**	**Supplemental Information**
System IF Bandwidth Range	--	1 Hz to 40 kHz, nominal
CPU	--	Intel® 1.1 GHz Pentium® M with 1 GByte RAM

Table 39. Front Panel Information

Description	**Supplemental Information**
RF Connectors	
E8362B	
Type	3.5 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
E8363/4B	
Type	2.4 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
Display	
Size	21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480 (vertical) resolution; 59.83 Hz vertical refresh rate; 31.41 Hz horizontal refresh rate
Refresh Rate	Vertical 59.83 Hz; Horizontal 31.41 kHz
Display Range	
Magnitude	±200 dB (at 20 dB/div), max
Phase	±500°, max
Polar	10 pUnits, min 1000 Units, max
Pixels	When running the analyzer's built-in Display Test, one or more of the following symptoms indicate a faulty display assembly: • A complete row or column of "stuck on" or "dark" pixels.

	- More than six "stuck on" pixels (but not more than three green) - More than twelve "dark" pixels (but not more than seven of the same color) - Two or more consecutive "stuck on" pixels or three or more consecutive "dark" pixels (but no more than one set of two consecutive 'dark' pixels) "Stuck on" or "dark" pixels less than 6.5 mm apart (excluding consecutive pixels)
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	0.01 mUnit, min; 0.01°,min

Table 40. Rear Panel Information

Description	Supplemental Information
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, typical
Input Level	-15 dBm to +20 dBm, typical
Input Impedance	200 Ω, nom.
10 MHz Reference Out	
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, typical
Signal Type	Sine Wave, typical
Output Level	+10 dBm ± 4 dB into 50 Ω, typical
Output Impedance	50 Ω, nominal
Harmonics	<-40 dBc, typical

Option H08 & H11 Rear Panel Connectors (typical)	
IF Connectors	A, R1, R2, B (BNC Connectors)
IF Connector Input Frequency	8 1/3 MHz
Nominal Input Impedance at IF Inputs	50 Ω
RF Damage Level to IF Connector Inputs	-20.0 dBm
DC Damage Level to IF Connector Inputs	25 volts
0.1 dB Compression Point at IF Inputs	-27.0 dBm
Pulse Input Connectors[1]	A, R1, R2, B (BNC Connectors)
Nominal Input Impedance at Pulse Inputs	1 Kohm
Minimum IF Gate Width	20 ns for less than 1 dB deviation from theoretical performance[2]
DC Damage Level to Pulse Connector Inputs	5.5 volts
Drive Voltage	TTL (0, +5.0) Volts
Rear Panel LO Power (Typical)	
1.7 GHz- 20 GHz	-7 to -16 dBm
Rear Panel RF Power 8362B (Typical)	
1.7 GHz to 20 GHz	-5 to -16 dBm (at -5 dBm test port power[3])
Rear Panel RF Power 8363B/8364B (Typical)	
1.7 GHz to 10 GHz	-2 to -12 dBm (at -5 dBm test port power[3])
10 GHz to 16 GHz	0 to -8 dBm (at -5 dBm test port power[3])
16 GHz to 20 GHz	+5 to -1 dBm (at -5 dBm test port power[3])

VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported:	
	Resolutions:
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480
Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowed, but with 640 X 480 resolution only. If you change resolution, you can only view the external display (internal display will "white out").
Bias Input Connectors (Option UNL)	
Bias current	500 mA, maximum
Bias voltage	40 Volts, maximum
Test Set IO	
	25-pin D-Sub connector, available for external test set control.
Aux IO	
	25-pin D-Sub connector, male, analog and digital IO.
Handler IO	
	36-pin parallel I/O port; all input/output signals are default set to negative logic; can be reset to positive logic via GPIB command.
GPIB	
	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	
	25-pin D-Sub miniature connector, female; provides connection to printers or any other parallel port peripherals
Serial Port (COM 1)	
	9-pin D-Sub, male; compatible with RS-232
USB Port	

	One port on front panel and five ports on rear panel. Universal Serial Bus jack, Type A configuration (4 contacts inline, contact 1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground
LAN	
	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates
Line Power	
Frequency, Voltage	50/60/400 Hz for 100 - 120 V 50/60 Hz for 220 - 240 V Power supply is auto switching
Max	350 Watts

1 Pulse input connectors are operational only with Option H08 (Pulse Measurement Capability) enabled.

2 Based on deviation from signal reduction equation: Signal Reduction (dB) = $20\log_{10}$(Duty_cycle) = $20\log_{10}$(pulse_width/period). Measured at Pulse Repetition Frequency (PFR) of 1 MHz.

3 Test port power has to be at a high enough level such that the Drop Cal does not occur. If Drop Cal occurs then the power out of the rear panel RF connector will drop by about 15 dB.

Table 41. Analyzer Dimensions and Weight

Description	**Supplemental Information**

Cabinet Dimensions			
	Height	**Width**	**Depth**
Excluding front and rear panel hardware and feet	267 mm 10.5 in	426 mm 16.75 in	427 mm 16.8 in
As shipped - includes front panel connectors, rear panel bumpers, and feet.	280 mm 11.0 in	435 mm 17.1 in	470 mm 18.5 in
As shipped plus handles	280 mm 11.0 in	458 mm 18 in	501 mm 19.70 in
As shipped plus rack-mount flanges	280 mm 11.0 in	483 mm 19 in	470 mm 18.5 in
As shipped plus handles and flanges	280 mm 11.0 in	483 mm 19 in	501 mm 19.70 in
Weight			
Net			
E8362B	28.6 kg (63.5 lb), nominal		
E8363/4B	29 kg (64 lb), nominal		
Shipping			
E8362B	35.8 kg (79.5 lb), nominal		
E8363/4B	36.3 kg 80 lb), nominal		

Note: For Regulatory and Environmental information, refer to the PNA Series Installation and Quick Start Guide, located online at http://cp.literature.agilent.com/litweb/pdf/E8356-90001.pdf.

Measurement Throughput Summary

- Typical Cycle Time for Measurement Completion
- Cycle Time vs IF Bandwidth
- Cycle Time vs Number of Points
- Data Transfer Time

Table 42 Typical Cycle Time[a,b] (ms) for Measurement Completion

	Number of Points			
	201	**401**	**1601**	**16,001**
Start 28 GHz, Stop 30 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	12	19	55	503
2-Port cal	29	44	124	1112
Start 10 MHz, Stop 10 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	86	93	121	583
2-Port cal	179	199	267	1301
Start 10 MHz, Stop 20 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	126	130	153	597
2-Port cal	264	275	335	1321
Start 10 MHz, Stop 40 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	185	190	213	621
2-Port cal	382	401	459	1374
Start 10 MHz, Stop 50 GHz, 35 kHz IF bandwidth				
Uncorrected, 1-port cal	210	216	243	643
2-Port cal	436	450	522	1405
Start 10 MHz, Stop 67 GHz, 35 kHz IF bandwidth				
Uncorrected 1-Port cal	244	254	300	645
2-Port cal	502	524	591	1423

a Typical performance.

b Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S11) measurement.

Table 43. Cycle Time vs IF Bandwidth[a]

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 28 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

IF Bandwidth (Hz)	Cycle Time (ms)[b]	Cycle Time (ms) Option 080 enabled
40,000	11	100
35,000	12	101
30,000	13	102
20,000	16	106
10,000	30	127
7000	38	138
5000	50	152
3000	74	182
1000	274	326
300	694	782
100	1905	2054
30	6091	6355
10	17916	18372

a Typical performance.
b Cycle time includes sweep and retrace time.

Table 44. Cycle Time vs Number of Points[a]

Applies to the Preset condition (35 kHz IF bandwidth, correction off) except for the following changes:

- CF = 28 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Number of Points	Cycle Time (ms)[b]
3	6
11	6
51	7
101	9
201	12
401	18
801	30
1601	55
16,001	497

a Typical performance.
b Cycle time includes sweep and retrace time.

Table 45. Data Transfer Time (ms)[a]

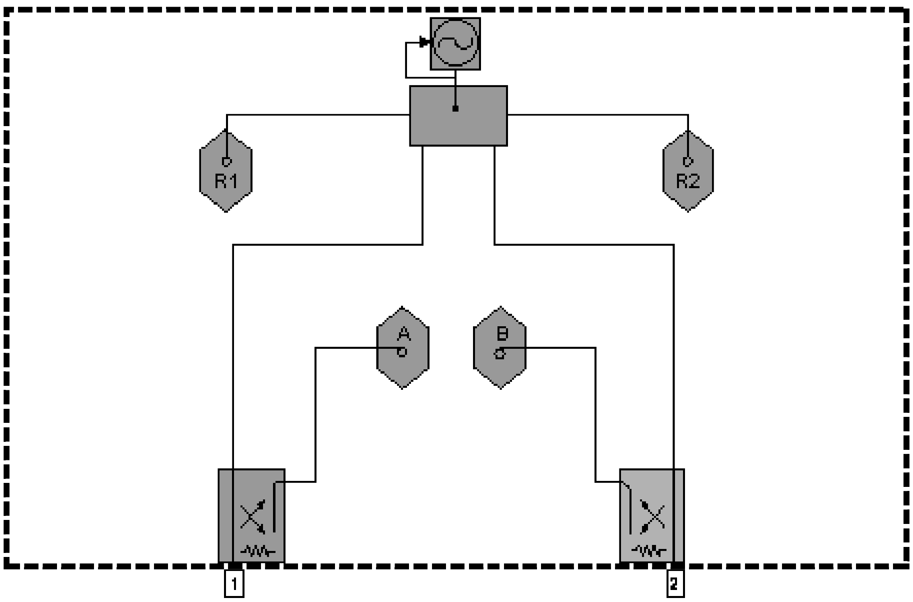
	Number of Points			
	201	401	1601	16,001
SCPI over GPIB (program executed on external PC)				
32-bit floating point	7	12	43	435
64-bit floating point	12	22	84	856
ASCII	64	124	489	5054
SCPI (program executed in the analyzer)				
32-bit floating point	1	2	3	30
64-bit floating point	2	2	4	40
ASCII	29	56	222	2220
COM (program executed in the analyzer)				
32-bit floating point	1	1	1	6
Variant type	1	2	6	68
DCOM over LAN (program executed on external PC)				

32-bit floating point	1	1	2	121
Variant type	3	6	19	939

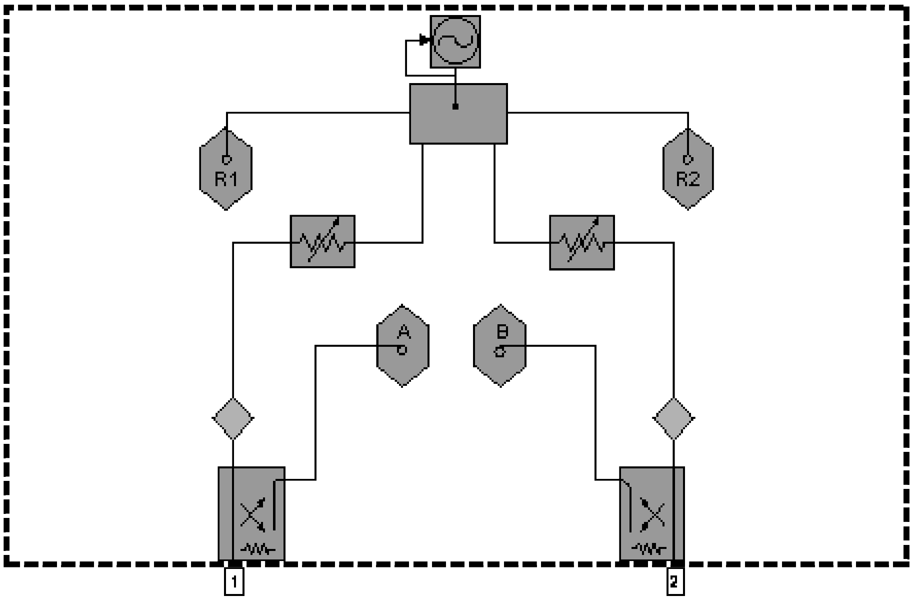
a Typical performance

Test Set Block Diagrams

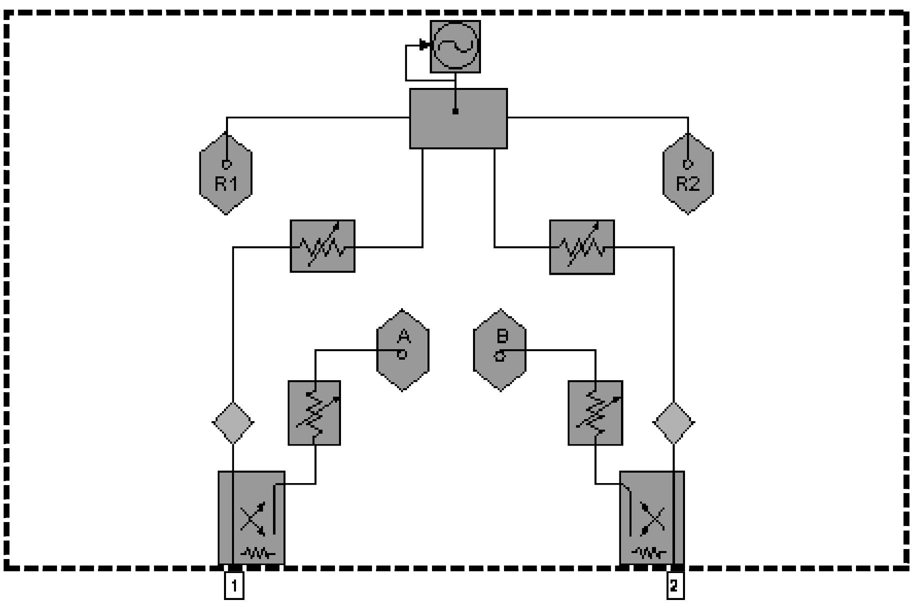
E836xB - Standard Configuration and Standard Power Range



E836xB - Option UNL Standard Configuration with Extended Power Range and Bias - Tees

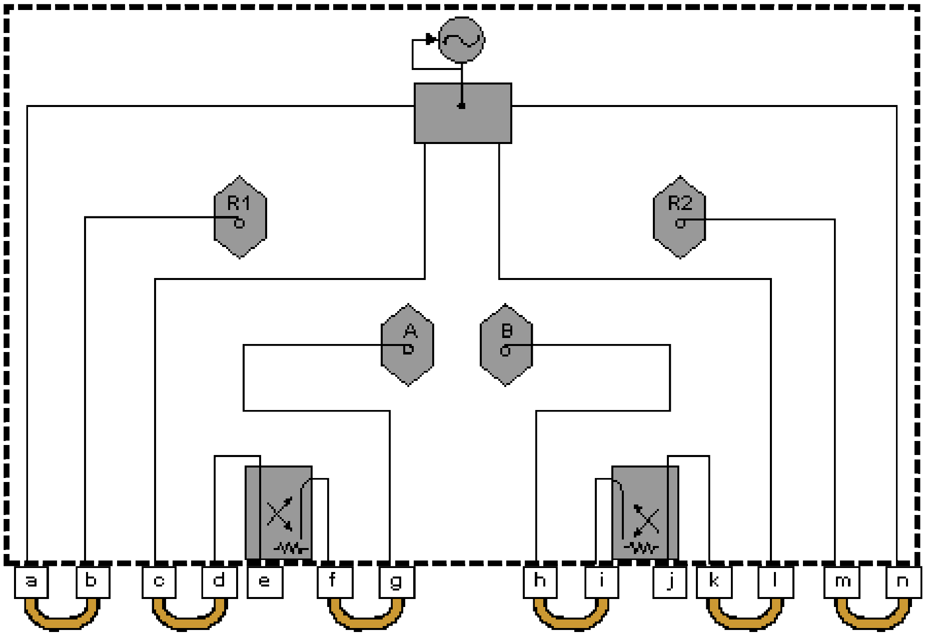


E836xB - Option UNL Standard Configuration with Extended Power Range and Bias - Tees, and Option 016, Receiver Attenuators



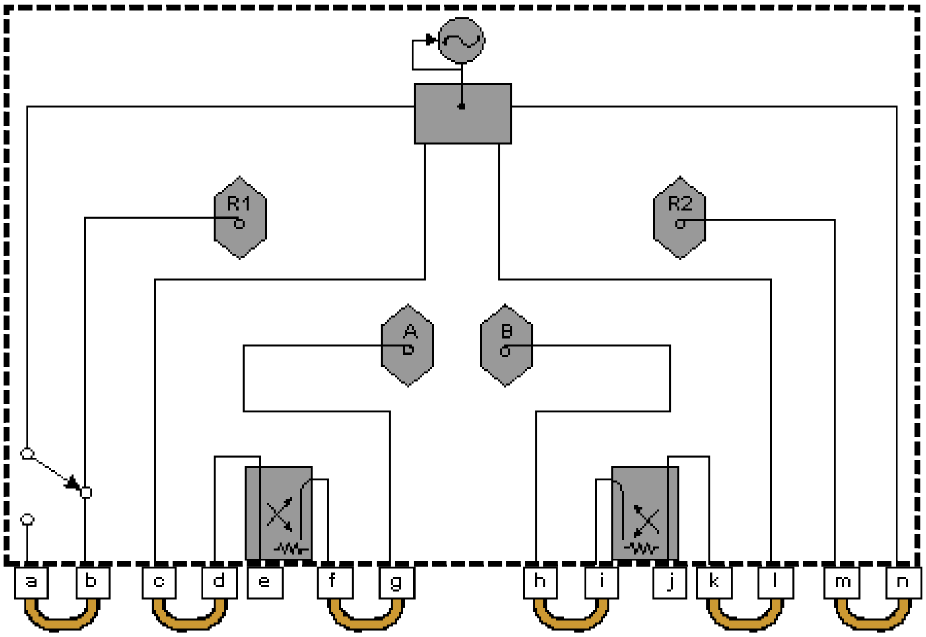
Test Set with Option 014 Block Diagrams

E836xB - Option 014 – Configurable Test Set and Standard Power Range



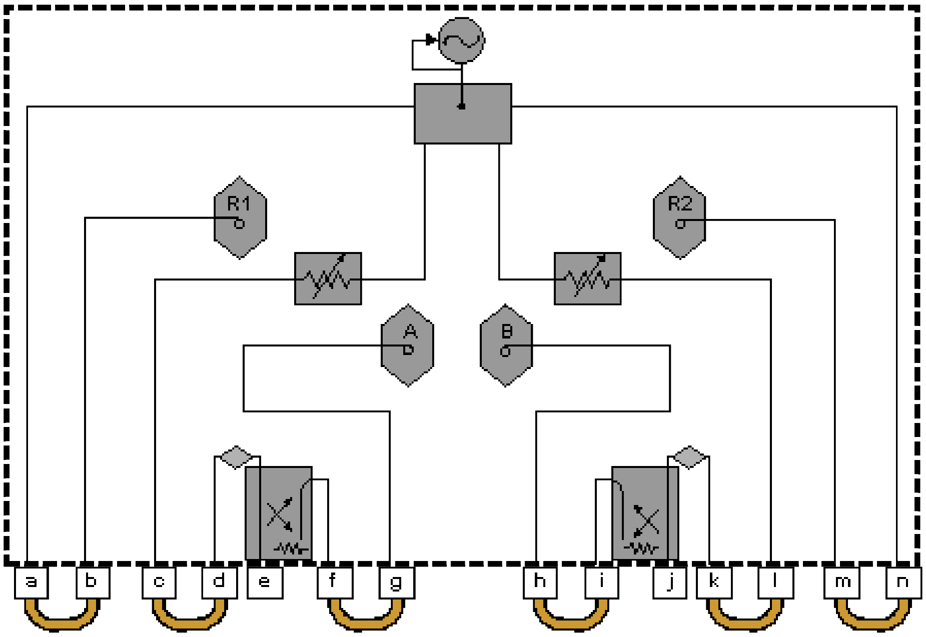
Item	Description	Item	Description
a	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
c	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
e	PORT 1	l	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT

E836xB - Option 014 – Configurable Test Set and Standard Power Range, and Option 081 Reference Channel Transfer Switch



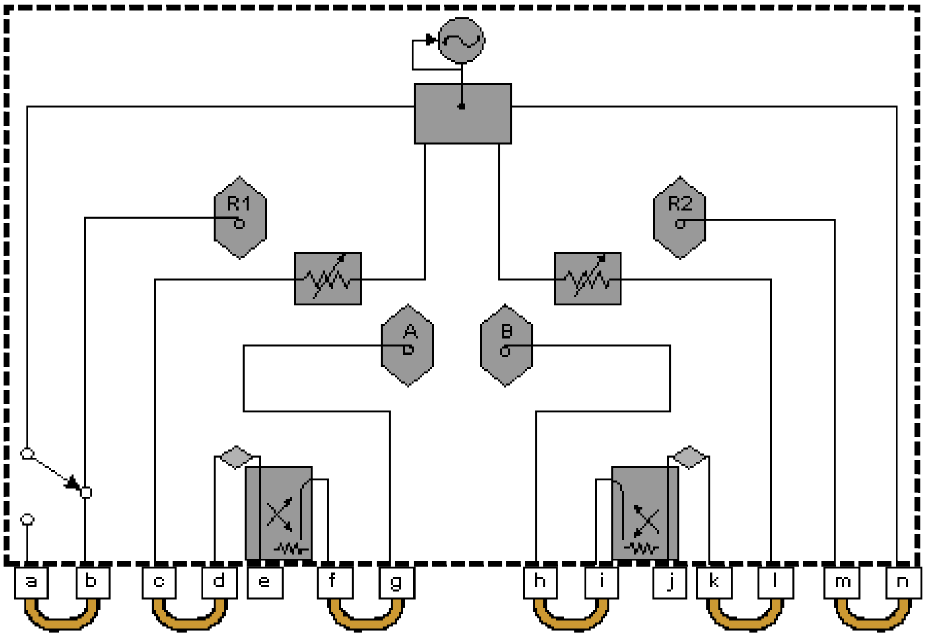
Item	Description	Item	Description
a	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
c	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
e	PORT 1	l	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT

E836xB - Option 014 Configurable Test Set, and Option UNL Extended Power Range and Bias - Tees



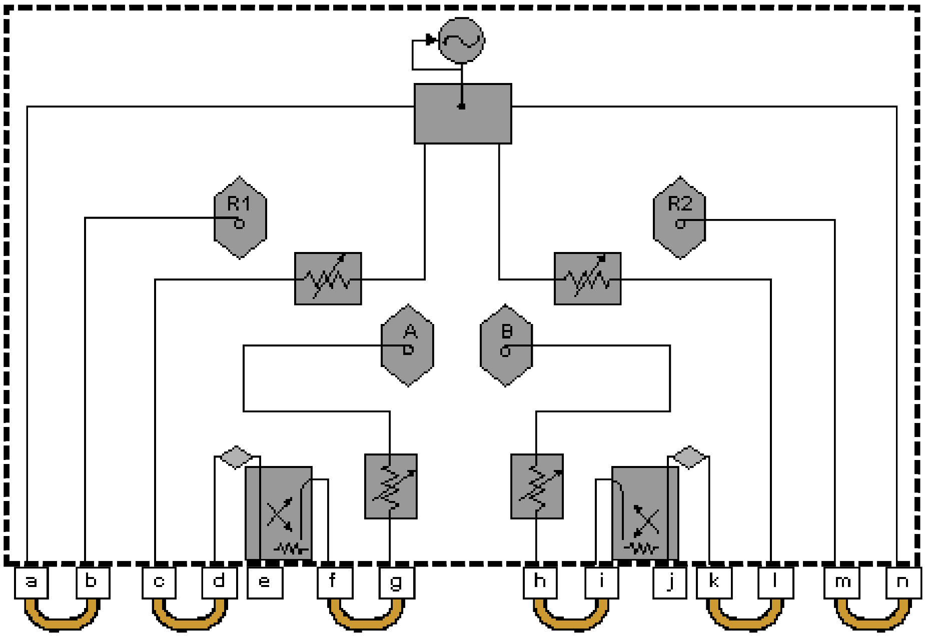
Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

E836xB - Option 014 Configurable Test Set, and Option UNL Extended Power Range and Bias - Tees, and Option 081 Reference Channel Transfer Switch



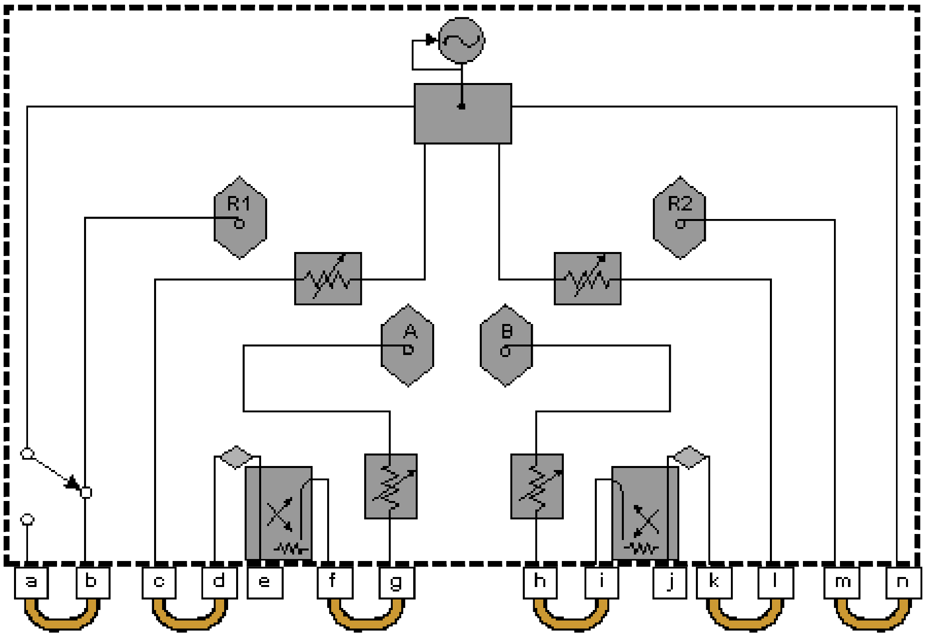
Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

E836xB - Option 014 Configurable Test Set and Option UNL, Extended Power Range and Bias - Tees and Option 016 Receiver Attenuators



Item	Description	Item	Description
a	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
c	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
e	PORT 1	l	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT

E836xB - Option 014 Configurable Test Set, and Option UNL Extended Power Range and Bias - Tees, and Option 016 Receiver Attenuators, and Option 081 Reference Channel Transfer Switch



Item	Description	Item	Description
a	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
c	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
e	PORT 1	l	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT

Last modified:

Jan. 10, 2007	Revised line power, and CPU values; moved regulatory, operating, and non-operating info to the I&QS Guide.
Oct. 5, 2006	Added 350W typical to line power
Oct. 28, 2005	Previous revision

Technical Specifications for the N5230A

Options 020/025, 120/125, 220/225, 420/425, or 520/525 (2-Port PNA)

(Rev. 2007-01-10)

This is a complete list of the N5230A Options 020, 025, 120, 125, 220, 225, 420, 425, 520, 525 network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the .pdf version of the specifications, visit our web site at http://www.agilent.com/find/pna, and search for "N5230A Specifications"
- This N5230A document provides technical specifications for the 85056A 2.4 mm, 85052B 3.5 mm, and 85032B Type-N calibration kits and the N4691A, and N4693A ECal modules. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your calibration kit and PNA setup.

- Option 020, or 120, or 220, or 420, or 520 (Standard Test Set and Standard Power Range) Analyzer Block Diagram
- Option 025, or 125, or 225, or 425, or 525 (Configurable Test Set and Extended Power Range) Analyzer Block Diagram

See Specs for other PNA models

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the N5230A analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Isolation calibration with an averaging factor of 8

- System Dynamic Range
- Extended Dynamic Range
- 3.5mm Connectors

- 2.4mm Connectors
- Type-N Connectors

Table 1. System Dynamic Range[1]

Description	Specification (dB) at Test Port				Typical (dB) at Test Port			
	Options 020, 120	Option 220	Option 420	Option 520	Options 020, 120	Option 220	Option 420	Option 520
Standard Configuration and Standard Power Range								
300 kHz to 3 MHz[3]	93[4]	--	--	--	--	--	--	--
3 MHz to 10 MHz	113	--	--	--	--	--	--	--
10 MHz to 45 MHz	122	--	--	--	--	103	89	89
45 MHz to 70 MHz[2]	122	101	90	90	--	--	--	--
70 MHz to 500 MHz[2]	122	105	90	90	--	--	--	--
500 MHz to 2 GHz	122	110	110	110	--	--	--	--
2 GHz to 6 GHz	122	110	110	110	--	--	--	--
6 GHz to 8 GHz	120	110	110	110	--	--	--	--
8 GHz to 9 GHz	120	110	100	100	--	--	--	--
9 GHz to 10.5 GHz	116	110	100	100	--	--	--	--
10.5 GHz to 12.5 GHz	111	110	100	100	--	--	--	--
12.5 GHz to 13.5 GHz	109	108	100	100	--	--	--	--
13.5 GHz to 20 GHz	--	108	100	100	--	--	--	--
20 GHz to 31.25 GHz	--	--	95	95	--	--	--	--
31.25 GHz to 40 GHz	--	--	90	90	--	--	--	--
40 GHz to 50 GHz	--	--	--	79	--	--	--	--

Table 1. System Dynamic Range[1] (Continued)

Description	Specification (dB) at Test Port				Typical (dB) at Test Port			
	Options 025, 125	**Option 225**	**Option 425**	**Option 525**	**Options 025, 125**	**Option 225**	**Option 425**	**Option 525**
Configurable Test Set and Extended Power Range								
300 kHz to 3 MHz[3]	92[4]	--	--	--	--	--	--	--
3 MHz to 10 MHz	112	--	--	--	--	--	--	--
10 MHz to 45 MHz	121	--	--	--	--	103	88	88
45 MHz to 70 MHz[2]	121	101	90	90	--	--	--	--
70 MHz to 500 MHz[2]	121	105	90	90	--	--	--	--
500 MHz to 2 GHz	121	110	110	110	--	--	--	--
2 GHz to 6 GHz	121	110	110	110	--	--	--	--
6 GHz to 8 GHz	120	110	110	110	--	--	--	--
8 GHz to 9 GHz	120	110	100	100	--	--	--	--
9 GHz to 10.5 GHz	116	110	100	100	--			
10.5 GHz to 12.5 GHz	111	110	100	100	--	--	--	--
12.5 GHz to 13.5 GHz	108	108	100	100	--	--	--	--
13.5 GHz to 20 GHz	--	108	100	100	--	--	--	--
20 GHz to 31.25 GHz	--	--	92	92	--	--	--	--
31.25 GHz to 40 GHz	--	--	87	87	--	--	--	--

40 GHz to 50 GHz	--	--	--	75	--	--	--	--

1 The system dynamic range is calculated as the difference between the noise floor and the specified source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.
2 May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

3 May be limited by Crosstalk at certain frequencies below 3MHz.

4 Value and frequency band changed July 2006.

Receiver Dynamic Range technical specifications are not provided in this N5230A specs document.

Table 2. Extended Dynamic Range[1]

Description	**Specification (dB) at Direct Receiver Access Input**				**Typical (dB) at Direct Receiver Access Input**			
	Option 025, 125	**Option 225**	**Option 425**	**Option 525**	**Option 025, 125**	**Option 225**	**Option 425**	**Option 525**
Configurable Test Set and Extended Power Range								
300 kHz to 3 MHz[3]	108[4]	--	--	--	--	--	--	--
3 MHz to 10 MHz	128	--	--	--	--	--	--	--
10 MHz to 45 MHz	137	--	--	--	--	115	109	109
45 MHz to 70 MHz[2]	137	113	111	111	--	--	--	--
70 MHz to 500 MHz[2]	137	117	111	111	--	--	--	--
500 MHz to 2 GHz	137	122	122	122	--	--	--	--
2 GHz to 6 GHz	137							
6 GHz to 8 GHz	136	122	122	122	--	--	--	--
8 GHz to 9 GHz	136							
9 GHz to 10.5 GHz	132	122	112	112	--	--	--	--
10.5 GHz to 12.5 GHz	127	122	112	112	--	--	--	--
12.5 GHz to 13.5 GHz	124	120	112	112	--	--	--	--
13.5 GHz to 20 GHz	--	120	112	112	--	--	--	--

20 GHz to 31.25 GHz	--	--	103	103	--	--	--	--
31.25 GHz to 40 GHz	--	--	98	98	--	--	--	--
40 GHz to 50 GHz	--	--	--	83	--	--	--	--

1 The direct receiver access input extended dynamic range is calculated as the difference between the direct receiver access input noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its compression or damage level. When the analyzer is in segment sweep mode, it can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when receiver compression or damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.
2 May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

3 May be limited by Crosstalk at certain frequencies below 3MHz.

4 Value and frequency band changed July 2006.

Corrected System Performance with 3.5mm Connectors (Tables 3 - 8)

Corrected System Performance with 2.4mm Connectors (Tables 9 - 12)

Corrected System Performance with Type-N Connectors (Tables 13 - 14)

Table 15. Uncorrected System Performance

Description	Specifications				Typical			
	Options 020, 025, 120, 125	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**	**Options 020, 025, 120, 125**	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**
Directivity								
300 kHz to 10 MHz	16 dB	--	--	--	--	23 dB	--	
10 MHz to 45 MHz	28 dB	--	--	--	--		20 dB	20 dB
45 MHz to 500 MHz	28 dB	24 dB	23 dB	23 dB	--	--	--	--

500 MHz to 1 GHz	28 dB	27 dB	23 dB	23 dB	--	--	--	--
1 GHz to 2 GHz	25 dB	27 dB	23 dB	23 dB	--	--	--	--
2 GHz to 3 GHz	25 dB	21 dB	21 dB	21 dB	--	--	--	--
3 GHz to 5 GHz	20 dB	21 dB	21 dB	21 dB	--	--	--	--
5 GHz to 8 GHz	17 dB	21 dB	21 dB	21 dB	--	--	--	--
8 GHz to 11.5 GHz	17 dB	16 dB	16 dB	16 dB	--	--	--	--
11.5 GHz to 13.5 GHz	15 dB	16 dB	16 dB	16 dB	--	--	--	--
13.5 GHz to 20 GHz	--	16 dB	16 dB	16 dB	--	--	--	--
20 GHz to 40 GHz	--	--	15 dB	15 dB	--	--	--	--
45 GHz to 50 GHz	--	--	--	13 dB	--	--	--	--
Source Match								
300 kHz to 10 MHz	18 dB	--	--	--	--	--	--	--
10 MHz to 45 MHz	25 dB	--	--	--	-	12 dB	11 dB	11 dB
45 MHz to 500 MHz	25 dB	20 dB	17 dB	17 dB	--	--	--	--
500 MHz to 2 GHz	21 dB	17 dB	17 dB	17 dB	--	--	--	--
2 GHz to 3 GHz	19 dB	12 dB	12 dB	12 dB	--	--	--	
3 GHz to 8 GHz	12 dB	12 dB	12 dB	12 dB	--	--	--	--

8 GHz to 9 GHz	12 dB	11 dB	11 dB	11 dB	--	--	--	
9 GHz to 12.5 GHz	10 dB	11 dB	11 dB	11 dB	--	--	--	--
12.5 GHz to 13.5 GHz	8 dB	10 dB	11 dB	11 dB	--	--	--	--
13.5 GHz to 20 GHz	--	10 dB	11 dB	11 dB	--	--	--	--
20 GHz to 40 GHz	--	--	7 dB	7 dB	--	--	--	--
40 GHz to 50 GHz	--	--	--	6 dB	--	--	--	--

Table 15. Uncorrected System Performance (Continued)

Description	Specifications				Typical			
	Options 020, 025, 120, 125	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**	**Options 020, 025, 120, 125**	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**
Load Match								
300 kHz to 10 MHz	17 dB	--	--	--	--	--	--	--
10 MHz to 45 MHz	22 dB	--	--	--	--	15 dB	13 dB	13 dB
45 MHz to 500 MHz	22 dB	22 dB	18 dB	18 dB	--	--	--	--
500 MHz to 2 GHz	17 dB	20 dB	18 dB	18 dB	--	--	--	--
2 GHz to 3 GHz	14 dB	12 dB	14 dB	14 dB	--	--	--	--
3 GHz to 8 GHz	10 dB	12 dB	14 dB	14 dB	--	--	--	--

8 GHz to 9 GHz	9 dB	10 dB	12 dB	12 dB	--	--	--	--
9 GHz to 12.5 GHz	9 dB	10 dB	12 dB	12 dB	--	--	--	--
12.5 GHz to 13.5 GHz	7 dB	9 dB	9 dB	9.5 dB	--	--	--	--
13.5 GHz to 20 GHz	--	9 dB	9 dB	9.5 dB	--	--	--	--
20 GHz to 40 GHz	--	--	8 dB	8.5 dB	--	--	--	--
40 GHz to 50 GHz	--	--	--	5 dB	--	--	--	--

Table 15. Uncorrected System Performance (Continued)

Description	Specifications				Typical			
	Options 020, 025, 120, 125	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**	**Options 020, 025, 120, 125**	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**
Crosstalk[1]								
300 kHz to 10 MHz	--	--	--	--	75 dB [2]	--	--	--
10 MHz to 45 MHz	--	--	--	--	115 dB	88 dB	88 dB	88 dB
45 MHz to 500 MHz	--	--	--	--	122 dB	95 dB	94 dB	94 dB
500 MHz to 2 GHz	--	--	--	--	122 dB	96 dB	95 dB	95 dB
2 GHz to 8 GHz	--	--	--	--	122 dB	110 dB	108 dB	108 dB
8 GHz to 10.5 GHz	--	--	--	--	120 dB	116 dB	113 dB	113 dB

10.5 GHz to 12.5 GHz	--	--	--	--	115 dB	116 dB	113 dB	113 dB
12.5 GHz to 13.5 GHz	--	--	--	--	109 dB	115 dB	112 dB	112 dB
13.5 GHz to 20 GHz	--	--	--	--	--	115 dB	112 dB	112 dB
20 GHz to 40 GHz	--	--	--	--	--	--	97 dB	97 dB
40 GHz to 50 GHz	--	--	--	--	--	--	--	89 dB

1 Measurement conditions: normalized to a thru, measured with two shorts, 10 Hz IF bandwidth, averaging factor of 8, alternate mode, source power set to the specified maximum power output or the minimum receiver input power specified by the 0.1 dB compression power.

6 Value changed July 2006

Table 16. Test Port Output[1]

Description	Specifications					Typicals			
	Options 020, 025	**Options 120, 125**	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**	**Options 020, 025, 120, 125**	**Options 220, 225**	**Options 420, 425**	**Options 520, 525**
Frequency Range									
N5230A	300kHz to 6 GHz	300kHz to 13.5 GHz	10 MHz to 20 GHz	10 MHz to 40 GHz	10 MHz to 50 GHz	--			
Nominal Power									
Preset power; attenuator switch point 10 dB below nominal power									
	0 dBm	0 dBm	-5 dBm	-10 dBm	-15 dBm	--			
Frequency Resolution									
	1 Hz					--			
CW Accuracy									

	+/-1 ppm	--
Frequency Stability		
	--	+/-0.05 ppm. -10° to 70° C +/-0.1 ppm/yr maximum

Table 16. Test Port Output[1] (Continued)

Description	**Specifications**					**Typical**		
	Options **020, 025, 120, 125**	**Options** **220, 225**	**Options** **420, 425**	**Option** **520**	**Option** **525**	**Options** **020, 025, 120, 125**	**Option** **220, 225**	**Option** **420, 425, 520, 525**
Power Level Accuracy								
Variation from nominal power in range 0								
300 kHz to 10 MHz	+/-1.0 dB	--	--	--	--	--	--	--
10 MHz to 45 MHz	+/-1.0 dB	--	--	--	--	--	+/-0.5 dB	+/-0.5 dB
45 MHz to 6 GHz	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--	--	--
6 GHz to 8 GHz	+/-1.5 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--	--	--
8 GHz to 9 GHz	+/-1.5 dB	+/-1.0 dB	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	--	--	--
9 GHz to 10.5 GHz	+/-1.5 dB	+/-1.0 dB	+/-1.5 dB	+/-1.5 dB	+/-1.5 dB	--	--	--

10.5 GHz to 13.5 GHz	+/-2.0 dB	+/-1.0 dB	+/-1.5 dB	+/-1.5 dB	+/- 1.5 dB	--	--	--
13.5 to 20 GHz	--	+/-1.0 dB	+/-1.5 dB	+/-1.5 dB	+/- 1.5 dB	--	--	--
20 GHz to 40 GHz	--	--	+/-2.5 dB	+/-2.5 dB	+/- 2.5 dB	--	--	--
40 GHz to 50 GHz	--	--	--	+/-3.5 dB	+/- 3.5 dB	--	--	--

Table 16. Test Port Output[1] (Continued)

	Specifications							Typical
	Options 020, 120	**Options 025, 125**	**Options 220, 225**	**Option 420**	**Option 425**	**Option 520**	**Option 525**	**Options 220, 225**
Max Leveled Power								
300 kHz to 10 MHz	10 dBm	9 dBm	--	--	--	--	--	--
10 MHz to 45 MHz	10 dBm	9 dBm	--	--	--	--	--	5 dBm
45 MHz to 6 GHz	10 dBm	9 dBm	5 dBm	0 dBm	0 dBm	0 dBm	0 dBm	--
6 GHz to 9 GHz	8 dBm	8 dBm	5 dBm	0 dBm	0 dBm	0 dBm	0 dBm	--
9 GHz to 12.5 GHz	4 dBm	4 dBm	5 dBm	0 dBm	0 dBm	0 dBm	0 dBm	--
12.5 GHz to 13.5 GHz	2 dBm	1 dBm	3 dBm	0 dBm	0 dBm	0 dBm	0 dBm	--
13.5 GHz to 20 GHz	--	--	3 dBm	0 dBm	0 dBm	0 dBm	0 dBm	--

20 GHz to 40 GHz	--	--	--	-5 dBm	-8 dBm	-5 dBm	-8 dBm	--
40 GHz to 50 GHz	--	--	--	--	--	-11 dBm	-15 dBm	--
Power Level Linearity[2]								**Options as Indicated**
Test reference is at the nominal power level								
300 kHz to 1 MHz	+/-4.5 dB	+/-4.5 dB	--	--	--	--	--	+/-2.0 dB (Opt 020, 025, 120, 125)
1 MHz to 10 MHz	+/-1.0 dB	+/-1.0 dB	--	--	--	--	--	--
10 MHz to 45 MHz	+/-2.0 dB	+/-2.0 dB	--	--	--	--	--	+/-0.35 dB (Opt 220 & 225) +/-0.40 dB (Opt 420, 425, 520, 525)
45 MHz to 1 GHz	+/-2.0 dB	+/-2.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--
1 GHz to 12.5 GHz	+/-1.5 dB	+/-1.5 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--
12.5 GHz to 13.5 GHz	+/-1.5 dB	+/-1.5 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--
13.5 GHz to 20 GHz	--	--	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--
20 GHz to 40 GHz	--	--	--	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	--
40 GHz to 50 GHz	--	--	--	--	--	+/-1.0 dB	+/-1.0 dB	--
Power Sweep Range (ALC)[3]								**Options 220, 225**

300 kHz to 10 MHz	37 dB	36 dB	--	--	--	--	--	--
10 MHz to 45 MHz	37 dB	36 dB	--	--	--	--	--	25 dB
45 MHz to 6 GHz	37 dB	36 dB	25 dB	25 dB	25 dB	25 dB	25 dB	--
6 GHz to 9 GHz	35 dB	35 dB	25 dB	25 dB	25 dB	25 dB	25 dB	--
9 GHz to 12.5 GHz	31 dB	31 dB	25 dB	25 dB	25 dB	25 dB	25 dB	--
12.5 GHz to 13.5 GHz	29 dB	28 dB	23 dB	25 dB	25 dB	25 dB	25 dB	--
13.5 GHz to 20 GHz	--	--	23 dB	25 dB	25 dB	25 dB	25 dB	--
20 GHz to 40 GHz	--	--	--	20 dB	17 dB	20 dB	17 dB	--
40 GHz to 50 GHz	--	--	--	--	--	14 dB	10 dB	--
Power Resolution								**Options as Indicated**
								0.01 dB (All Options)

Table 16. Test Port Output[1] (Continued)

Description	**Specifications**	**Typical**					
		Option 020, 120	**Option 025, 125**	**Option 220**	**Option 225**	**Option 420, 520**	**Option 425, 525**
Power Range							
300 kHz to 10 MHz	--	-30 to +10 dBm	-90 to +9 dBm	--	--	--	--

10 MHz to 45 MHz	--	-30 to +10 dBm	-90 to +9 dBm	-27 to +12 dBm	-87 to +12 dBm	-27 to +9 dBm	-87 to +8 dBm
45 MHz to 6 GHz	--	-30 to +10 dBm	-90 to +9 dBm	-27 to +12 dBm	-87 to +12 dBm	-27 to +8 dBm	-87 to +8 dBm
6 GHz to 9 GHz	--	-30 to +8 dBm	-90 to +8 dBm	-27 to +12 dBm	-87 to +12 dBm	-27 to +8 dBm	-87 to +8 dBm
9 GHz to 12.5 GHz	--	-30 to +4 dBm	-90 to +4 dBm	-27 to +12 dBm	-87 to +12 dBm	-27 to +8 dBm	-87 to +8 dBm
12.5 GHz to 13.5 GHz	--	-30 to +2 dBm	-90 to +1 dBm	-27 to +7 dBm	-87 to +7 dBm	-27 to +5 dBm	-87 to +4 dBm
13.5 GHz to 20 GHz	--	--	--	-27 to +7 dBm	-87 to +7 dBm	-27 to +5 dBm	-87 to +4 dBm
20 GHz to 40 GHz	--	--	--	--	--	-27 to +1 dBm	-87 to -2 dBm
40 GHz to 50 GHz	--	--	--	--	--	-27 to -5 dBm	-87 to -9 dBm
Power Settings							
Minimum Power Setting	--	-33 dBm	-93 dBm	-30 dBm	-90 dBm	-30 dBm	-90 dBm
Maximum Power Setting	--	+20 dBm					

Table 16. Test Port Output[1] (Continued)

Description	Specifications	Typical	
	--	**Options 020, 025, 120, 125**	**Options 220, 225, 420, 425, 520, 525**

Phase Noise (Nominal power at test port)							
	--	**10 kHz Offset**	**100 kHz Offset**	**1 MHz Offset**	**10 kHz Offset**	**100 kHz Offset**	**1 MHz Offset**
300 kHz to 10 MHz	--	-86 dBc/Hz	-86 dBc/Hz	-95 dBc/Hz	--	--	--
10 MHz to 1.5 GHz	--	-86 dBc/Hz	-91 dBc/Hz	-95 dBc/Hz	-77 dBc/Hz	-77 dBc/Hz	-89 dBc/Hz
1.5 GHz to 3.125 GHz	--	-83 dBc/Hz	-91 dBc/Hz	-95 dBc/Hz	-83 dBc/Hz	-91 dBc/Hz	-95 dBc/Hz
3.125 GHz to 6.25 GHz	--	-77 dBc/Hz	-85 dBc/Hz	-89 dBc/Hz	-77 dBc/Hz	-85 dBc/Hz	-89 dBc/Hz
6.25 GHz to 12.5 GHz	--	-71 dBc/Hz	-79 dBc/Hz	-83 dBc/Hz	-71 dBc/Hz	-79 dBc/Hz	-83 dBc/Hz
12.5 GHz to 13.5 GHz	--	-65 dBc/Hz	-73 dBc/Hz	-77 dBc/Hz	-65 dBc/Hz	-73 dBc/Hz	-77 dBc/Hz
13.5 GHz to 20 GHz	--	--	--	--	-65 dBc/Hz	-73 dBc/Hz	-77 dBc/Hz
20 GHz to 40 GHz	--	--	--	--	-59 dBc/Hz	-67 dBc/Hz	-71 dBc/Hz
40 GHz to 50 GHz	--	--	--	--	-59 dBc/Hz	-67 dBc/Hz	-71 dBc/Hz

Table 16. Test Port Output[1] (Continued)

Description	Specifications	Typicals
	--	**Options 020, 025, 120, 125, 220, 225, 420, 520, 425, 525**
Non-Harmonic Spurious (at Nominal Output Power)		
300 kHz to 10 MHz	--	-50 dBc for offset frequency > 1 kHz
10 MHz to 13.5 GHz	--	

13.5 GHz to 20 GHz	--	
20 GHz to 40 GHz	--	-30 dBc for offset frequency > 1 kHz
40 GHz to 50 GHz	--	

Table 16. Test Port Output[1] (Continued)

Description	Specifications	Typical			
	--	**Option 020, 025, 120, 125**	**Option 220, 225**	**Option 420, 520**	**Option 425, 525**
Harmonics (2nd or 3rd) at Maximum Output Power					
300 kHz to 10 MHz	--	-17 dBc	--	--	--
10 MHz to 500 MHz	--	-17 dBc	-22 dBc	-15 dBc	-15 dBc
500 MHz to 1 GHz	--	-17 dBc	-22 dBc	-15 dBc	-15 dBc
1 GHz to 13.5 GHz	--	-20 dBc	22 dBc	-20 dBc	-20 dBc
13.5 GHz to 20 GHz	--	--	-22 dBc	-20 dBc	-20 dBc
20 GHz to 40 GHz	--	--	--	-22 dBc	-22 dBc
40 GHz to 50 GHz	--	--	--	--	-22 dBc

1Performance specified on Port 1 only. Port 2 performance is a characteristic.

2Power level linearity specified on Port 1 only. Port 2 performance is Typical. Test reference is at the nominal power level.

3ALC range starts at maximum leveled power and decreases in power level by the dB amount specified here.

Table 17. Test Port Input

Description	Specification				Typical			
	Options **020, 025, 120, 125**	**Options** **220, 225**	**Options** **420, 425**	**Options** **520, 525**	**Options** **020, 025, 120, 125**	**Options** **220, 225**	**Options** **420, 425**	**Options** **520, 525**
Test Port Noise Floor[1]								
10 Hz IF Bandwidth [5]								
300 kHz to 3 MHz	<-83 dBm [6]	--	--	--	<-94 dBm [6]	--	--	--
3 MHz to 10 MHz	<-103 dBm	--	--	--	<-110 dBm	--	--	--
10 MHz to 45 MHz	<-112 dBm	--	--	--	<-116 dBm	<-89 dBm	<-80 dBm	<-80 dBm
45 MHz to 70 MHz	<-112 dBm	<-96 dBm	<-90 dBm	<-90 dBm	<-116 dBm	--	--	--
70 MHz to 500 MHz	<-112 dBm	<-100 dBm	<-90 dBm	<-90 dBm	<-116 dBm	--	--	--
500 MHz to 2 GHz	<-112 dBm	<-105 dBm	<-110 dBm	<-110 dBm	<-120 dBm	--	--	--
2 GHz to 4 GHz	<-112 dBm	<-105 dBm	<-110 dBm	<-110 dBm	<-120 dBm	--	--	--
4 GHz to 8 GHz	<-112 dBm	<-105 dBm	<-110 dBm	<-110 dBm	<-119 dBm	--	--	--
8 GHz to 10.5 GHz	<-112 dBm	<-105 dBm	<-100 dBm	<-100 dBm	<-119 dBm	--	--	--
10.5 GHz to 13.5 GHz	<-107 dBm	<-105 dBm	<-100 dBm	<-100 dBm	<-114 dBm	--	--	--
10.5 GHz to 13.5 GHz	--	<-105 dBm	<-100 dBm	<-100 dBm	--	--	--	--

13.5 GHz to 20 GHz	--	<-105 dBm	<-100 dBm	<-100 dBm	--	--	--	--
20 GHz to 31.25 GHz	--	--	<-100 dBm	<-100 dBm	--	--	--	--
31.25 GHz to 40 GHz	--	--	<-95 dBm	<-95 dBm	--	--	--	--
40 GHz to 50 GHz	--	--	--	<-90 dBm	--	--	--	--
1 kHz IF Bandwidth								
300 kHz to 3 MHz	<-73 dBm	--	--	--	<-83 dBm	--	--	--
3 MHz to 10 MHz	<-83 dBm	--	--	--	<-90 dBm	--	--	--
10 MHz to 45 MHz	<-92 dBm	--	--	--	<-96 dBm	<-69 dBm	<-60 dBm	<-60 dBm
45 MHz to 70 MHz	<-92 dBm	<-76 dBm	<-70 dBm	<-70 dBm	<-96 dBm	--	--	--
70 MHz to 500 MHz	<-92 dBm	<-80 dBm	<-70 dBm	<-70 dBm	<-96 dBm	--	--	--
500 MHz to 2 GHz	<-92 dBm	<-85 dBm	<-90 dBm	<-90 dBm	<-100 dBm	--	--	--
2 GHz to 4 GHz	<-92 dBm	<-85 dBm	<-90 dBm	<-90 dBm	<-100 dBm	--	--	--
4 GHz to 8 GHz	<-92 dBm	<-85 dBm	<-90 dBm	<-90 dBm	<-99 dBm	--	--	--
8 GHz to 10.5 GHz	<-92 dBm	<-85 dBm	<-80 dBm	<-80 dBm	<-99 dBm	--	--	--
10.5 GHz to 13.5 GHz	<-87 dBm	<-85 dBm	<-80 dBm	<-80 dBm	<-94 dBm	--	--	--
13.5 GHz to 20 GHz	--	<-85 dBm	<-80 dBm	<-80 dBm	--	--	--	--
20 GHz to 31.25 GHz	--	--	<-80 dBm	<-80 dBm	--	--	--	--

31.25 GHz to 40 GHz	--	--	<-75 dBm	<-75 dBm	--	--	--	--
40 GHz to 50 GHz	--	--	--	<-70 dBm	--	--	--	--

Table 17. Test Port Input (Continued)

Description	Specification				Typical			
	Options 025, 125	**Options 225**	**Options 425**	**Options 525**	**Options 025, 125**	**Options 225**	**Options 425**	**Options 525**
Direct Receiver Access Input Noise Floor[1] (Options 025, 125, 225, 425, and 525 only)								
10 Hz IF Bandwidth								
300 kHz to 3 MHz	<-99 dBm [6]	--	--	--	--	--	--	--
3 MHz to 10 MHz	<-119 dBm	--	--	--	--	--	--	--
10 MHz to 45 MHz	<-128 dBm	--	--	--	--	<-120 dBm	<-126 dBm	<-126 dBm
45 MHz to 70 MHz	<-128 dBm	<-108 dBm	<-111 dBm	<-111 dBm	--	--	--	--
70 MHz to 500 MHz	<-128 dBm	<-112 dBm	<-111 dBm	<-111 dBm	--	--	--	--
500 MHz to 2 GHz	<-128 dBm	<-117 dBm	<-122 dBm	<-122 dBm	--	--	--	--
2 GHz to 8 GHz	<-128 dBm	<-117 dBm	<-122 dBm	<-122 dBm	--	--	--	--
8 GHz to 10.5 GHz	<-128 dBm	<-117 dBm	<-112 dBm	<-112 dBm	--	--	--	--
10.5 GHz to 13.5 GHz	<-128 dBm	<-117 dBm	<-112 dBm	<-112 dBm	--	--	--	--

13.5 GHz to 20 GHz	<-123 dBm	<-117 dBm	<-112 dBm	<-112 dBm	--	--	--	--
20 GHz to 31.25 GHz	--	--	<-111 dBm	<-111 dBm	--	--	--	--
31.25 GHz to 40 GHz	--	--	<-106 dBm	<-106 dBm	--	--	--	--
40 GHz to 50 GHz	--	--	--	<-98 dBm	--	--	--	--
1 kHz IF Bandwidth								
300 kHz to 3 MHz	<-89 dBm	--	--	--	--	--	--	--
3 MHz to 10 MHz	<-99 dBm	--	--	--	--	--	--	--
10 MHz to 45 MHz	<-108 dBm	--	--	--	--	<-100 dBm	<-106 dBm	<-106 dBm
45 MHz to 70 MHz	<-108 dBm	<-88 dBm	<-91 dBm	<-91 dBm	--	--	--	--
70 MHz to 500 MHz	<-108 dBm	<-92 dBm	<-91 dBm	<-91 dBm	--	--	--	--
500 MHz to 2 GHz	<-108 dBm	<-97 dBm	<-102 dBm	<-102 dBm	--	--	--	--
2 GHz to 8 GHz	<-108 dBm	<-97 dBm	<-102 dBm	<-102 dBm	--	--	--	--
8 GHz to 10.5 GHz	<-108 dBm	<-97 dBm	<-92 dBm	<-92 dBm	--	--	--	--
10.5 GHz to 13.5 GHz	<-108 dBm	<-97 dBm	<-92 dBm	<-92 dBm	--			
13.5 GHz to 20 GHz	<-103 dBm	<-97 dBm	<-92 dBm	<-92 dBm	--	--	--	--
20 GHz to 31.25 GHz	--	--	<-91 dBm	<-91 dBm	--	--	--	--
31.25 GHz to 40 GHz	--	--	<-86 dBm	<-86 dBm	--	--	--	--

40 GHz to 50 GHz	--	--	--	<-78 dBm	--	--	--	--

Table 17. Test Port Input (Continued)

Description	Specification						Typical	
	Options 220, 225		Options 420, 520		Options 425, 525		Options 220, 225	
Compression Level								
	Power	Com-pression	Power	Com-pression	Power	Com-pression	Power	Com-pression
10 MHz to 45 MHz[2]	--	--	--	--	--	--	+5 dBm	0.10 dB
45 MHz to 500 MHz	+5 dBm	0.10 dB	+5 dBm	0.40 dB	+5 dBm	0.40 dB	--	--
500 MHz to 2 GHz	+5 dBm	0.15 dB	+5 dBm	0.77 dB	+5 dBm	0.67 dB	--	--
2 GHz to 8 GHz	+5 dBm	0.21 dB	+5 dBm	0.75 dB	+5 dBm	0.55 dB	--	--
8 GHz to 12.5 GHz	+5 dBm	0.21 dB	+5 dBm	0.56 dB	+5 dBm	0.51 dB	--	--
12.5 GHz to 20 GHz	+3 dBm	0.20 dB	+5 dBm	0.79 dB	+5 dBm	0.69 dB	--	--
20 GHz to 31.25 GHz	--	--	0 dBm	0.60 dB	0 dBm	0.50 dB	--	--
31.25 GHz to 40 GHz	--	--	-3 dBm	0.55 dB	-3 dBm	0.60 dB	--	--
40 GHz to 50 GHz	--	--	-3 dBm	0.66 dB	-3 dBm	0.71 dB	--	--

Table 17. Test Port Input (Continued)

Description	Specification		Typical		
	Options **020, 120, 025, 125**		**--**		
Compression Level (continued)					
	Power	**Com-pression**	--	--	--
300 kHz to 10 MHz	+8 dBm	1.0 dB (0.1 dB at +5 dBm typ.)	--	--	--
10 MHz to 50 MHz	+8 dBm	0.35 dB	--	--	--
50 MHz to 1GHz	+8 dBm	0.35 dB	--	--	--
1 GHz to 6 GHz	+8 dBm	0.25 dB	--	--	--
6 GHz to 8 GHz	+8 dBm	0.25 dB	--	--	--
8 GHz to 12.5 GHz	+8 dBm	0.30 dB	--	--	--
12.5 GHz to 13.5 GHz	+8 dBm	0.40 dB	--	--	--

Table 17. Test Port Input (Continued)

Description	Specification		Typical	
	--		**Options** 020, 120, 025, 125	
Test Port Compression - 0.1 dB				
	--	--	**Power**	**Compression**
300 kHz to 10 MHz	--	--	+5 dBm	0.1 dB
10 MHz to 1 GHz	--	--	+9 dBm	0.1 dB
1 GHz to 12.5 GHz	--	--	+10 dBm	0.1 dB
12.5 GHz to 13.5 GHz	--	--	+9 dBm	0.1 dB

Table 17. Test Port Input (Continued)

Description	Specification			Typical			
	Options 220, 225	**Options** 420, 425	**Options** 520, 525	**Option** 220	**Option** 225	**Options** 420, 425	**Options** 520, 525
Test Port Compression - 0.1 dB							
300 kHz to 10 MHz	--	--	--	--	--	--	--
10 MHz to 45 MHz[2]	--	--	--	+10 dBm	negligible	negligible	negligible
45 MHz to 500 MHz	--	--	--	+10 dBm	+10 dBm	0.0 dBm	+1 dBm

500 MHz to 2 GHz	--	--	--	+9 dBm	+9 dBm	0.0 dBm	+1 dBm
2 GHz to 12.5 GHz	--	--	--	+6 dBm	+6 dBm	0.0 dBm	+1.5 dBm
12.5 GHz to 13.5 GHz	--	--	--	+6 dBm	+6 dBm	-1.0 dBm	0.0 dBm
13.5 GHz to 20 GHz	--	--	--	+6 dBm	+6 dBm	-1.0 dBm	0.0 dBm
20 GHz to 31.25 GHz	--	--	--	--	--	-5.5 dBm	-3.0 dBm
31.25 GHz to 40 GHz	--	--	--	--	--	-8.5 dBm	-7.5 dBm
40 GHz to 50 GHz	--	--	--	--	--	--	-10 dBm

Table 17. Test Port Input (Continued)

Description	Specification			Typical		
	Options 220, 225	**Options 420, 520**	**Options 425, 525**	**Options 220, 225**	**Options 420, 520**	**Options 425, 525**
Trace Noise Magnitude[3] 1 kHz IF bandwidth, ratioed measurement, nominal power at test port.						
300 kHz to 10 MHz	--	--	--	--	--	--
10 MHz to 45 MHz	--	--	--	0.004 dB rms	0.015 dB rms	0.015 dB rms
45 MHz to 500 MHz	0.004 dB rms	0.010 dB rms	0.010 dB rms	--	--	--
500 MHz to 2 GHz	0.004 dB rms	0.006 dB rms	0.006 dB rms	--	--	--

2 GHz to 10.5 GHz	0.004 dB rms	0.006 dB rms	0.006 dB rms	--	--	--
10.5 GHz to 13.5 GHz	0.006 dB rms	0.010 dB rms	0.010 dB rms	--	--	--
13.5 GHz to 20 GHz	0.006 dB rms	0.010 dB rms	0.010 dB rms	--	--	--
20 GHz to 31.25 GHz	--	0.010 dB rms	0.010 dB rms	--	--	--
31.25 GHz to 40 GHz	--	0.020 dB rms	0.020 dB rms	--	--	--
40 GHz to 50 GHz	--	--	0.020 dB rms	--	--	--

Table 17. Test Port Input (Continued)

Description	Specification	Typical
	Options 020, 120, 025, 125	**Options 020, 120, 025, 125**
Trace Noise Magnitude[3] (continued)		
100 kHz IF bandwidth, ratioed measurement, nominal power at test port		
300 kHz to 10 MHz	12 mdB	--
10 MHz to 6 GHz	4 mdB	--
6 GHz to 10.5 GHz	4 mdB	--
10.5 GHz to 13.5 GHz	8 mdB	--
600 kHz IF bandwidth, ratioed measurement, nominal power at test port		
300 kHz to 10 MHz	**--**	20 mdB

10 MHz to 6 GHz	**--**	8 mdB
6 GHz to 10.5 GHz	**--**	8 mdB
10.5 GHz to 13.5 GHz	**--**	10 mdB

Table 17. Test Port Input (Continued)

Description	Specification			Typical		
	Options 220, 225	**Options 420, 520**	**Options 425, 525**	**Options 220, 225**	**Options 420, 520**	**Options 425, 525**
Trace Noise Phase[3] 1 kHz IF bandwidth, ratioed measurement, nominal power at test port.						
300 kHz to 10 MHz						
10 MHz to 45 MHz	--	--	--	0.025° rms	0.100° rms	0.100° rms
45 MHz to 500 MHz	0.060° rms	0.100° rms	0.100° rms	--	**--**	--
500 MHz to 2 GHz	0.060° rms	0.060° rms	0.060° rms	--	**--**	--
2 GHz to 10.5 GHz	0.060° rms	0.060° rms	0.060° rms	--	**--**	--
10.5 GHz to 13.5 GHz	0.060° rms	0.100° rms	0.100° rms			
13.5 GHz to 20 GHz	0.060° rms	0.100° rms	0.100° rms	--	**--**	--
20 GHz to 31.25 GHz	--	0.100° rms	0.100° rms	--	**--**	--
31.25 GHz to 40 GHz	--	0.200° rms	0.200° rms	--	**--**	--

40 GHz to 50 GHz	--	--	0.200° rms	--	--	--

Table 17. Test Port Input (Continued)

Description	Specification	Technical
	Options 020, 120, 025, 125	**Options 020, 120, 025, 125**
Trace Noise Phase[3] (continued)		
100 kHz IF bandwidth, ratioed measurement, nominal power at test port		
300 kHz to 10 MHz	80 mdeg	--
10 MHz to 6 GHz	30 mdeg	--
6 GHz to 10.5 GHz	30 mdeg	--
10.5 GHz to 13.5 GHz	60 mdeg	--
600 kHz IF bandwidth, ratioed measurement, nominal power at test port		
300 kHz to 10 MHz	--	100 mdeg
10 MHz to 6 GHz	--	60 mdeg
6 GHz to 10.5 GHz	--	60 mdeg
10.5 GHz to 13.5 GHz	--	80 mdeg

Table 17. Test Port Input (Continued)

Description	Specification	Typical

	Options 020, 025, 120, 125, 220, 225, 420, 425, 520, 525	**--**
Reference Level Magnitude		
Range	+/-200 dB	
Resolution	0.001dB	
Reference Level Phase		
Range	+/-500°	
Resolution	0.01°	

Table 17. Test Port Input (Continued)

Description	Specification				Typical		
	--	--	--	--	**Option 020, 025, 120, 125**	**Option 220, 225**	**Options 420, 425, 520, 525**
Stability Magnitude[4]							
300 kHz to 10 MHz	--	--	--	--	+/-0.015 dB/°C	--	--
10 MHz to 45 MHz	--	--	--	--	+/-0.010 dB/°C	+/-0.015 dB/°C	+/-0.015 dB/°C
45 MHz to 500 MHz	--	--	--	--	+/-0.010 dB/°C	+/-0.010 dB/°C	+/-0.010 dB/°C
500 MHz to 2 GHz	--	--	--	--	+/-0.010 dB/°C	+/-0.010 dB/°C	+/-0.010 dB/°C
2 GHz to 4 GHz	--	--	--	--	+/-0.015 dB/°C	+/-0.020 dB/°C	+/-0.010 dB/°C
4 GHz to 8 GHz	--	--	--	--	+/-0.020 dB/°C	+/-0.020 dB/°C	+/-0.010 dB/°C
4 GHz to 13.5 GHz	--	--	--	--	+/-0.020 dB/°C	+/-0.030 dB/°C	+/-0.015 dB/°C

13.5 GHz to 20 GHz	--	--	--	--	--	+/-0.030 dB/°C	+/-0.015 dB/°C
20 GHz to 40 GHz	--	--	--	--	--	--	+/-0.040 dB/°C
40 GHz to 50 GHz	--	--	--	--	--	--	+/-0.060 dB/°C
Stability Phase[4]							
300 kHz to 10 MHz	--	--	--	--	+/- 0.30°/°C	--	--
10 MHz to 45 MHz	--	--	--	--	+/- 0.025°/°C	+/- 0.25°/°C	+/-0.25°/°C
45 MHz to 500 MHz	--	--	--	--	+/- 0.035°/°C	+/- 0.20°/°C	+/-0.22°/°C
500 MHz to 2 GHz	--	--	--	--	+/- 0.050°/°C	+/- 0.15°/°C	+/-0.22°/°C
2 GHz to 4 GHz	--	--	--	--	+/- 0.10°/°C	+/- 0.15°/°C	+/-0.10°/°C
4 GHz to 8 GHz	--	--	--	--	+/- 0.15°/°C	+/- 0.15°/°C	+/-0.10°/°C
8 GHz to 13.5 GHz	--	--	--	--	+/- 0.30°/°C	+/- 0.45°/°C	+/-0.15°/°C
13.5 GHz to 20 GHz	--	--	--	--	--	+/- 0.45°/°C	+/-0.15°/°C
20 GHz to 40 GHz	--	--	--	--	--	--	+/-0.40°/°C
40 GHz to 50 GHz	--	--	--	--	--	--	+/-0.40°/°C

Table 17. Test Port Input (Continued)

Description	Specification	Typical				
		Options 020, 120	**Option 220**	**Option 420, 520**	**Options 025, 125**	**Options 225, 425, 525**
Damage Input Level						
Test Port 1 and 2	--	+27 dBm or +/- 16 VDC	+30 dBm or +/-25 VDC	+30 dBm or +/-40 VDC	+27 dBm or +/- 16 VDC	+27 dBm or +/- 7 VDC
R1, R2 in	--	--	--	--	+15 dBm or +/- 16 VDC	+15 dBm or +/-7 VDC
A, B in	--	--	--	--	+15 dBm or +/- 16 VDC	+15 dBm or +/-7 VDC
Coupler Thru	--	--	--	--	+27 dBm or +/- 16 VDC	+30 dBm or +/-40 VDC
Coupler Arm	--	--	--	--	+15 dBm or +/- 0 VDC	+30 dBm or +/-7 VDC

1Total average (rms) noise power calculated as the mean value of a 801 linear magnitude traces expressed in dBm.

2For Options 225, 420, 425, 520, 525 - Coupler roll-off will reduce compression to a negligible level below 45 MHz.

31 kHz IF BW, ratioed measurement, nominal power at the test port.

4Stability is defined as a ratio measurement made at the test port.

5 10Hz IFBW test port noise floor performance is mathematically derived from the 1kHz IFBW noise floor performance. The performance could be limited by crosstalk below 3MHz at certain frequencies. The measurement is defined as a single receiver measurement with loads on the ports at a given CW frequency with power set to the minimum plus 5dB.

6 Value and frequency band changed July 2006.

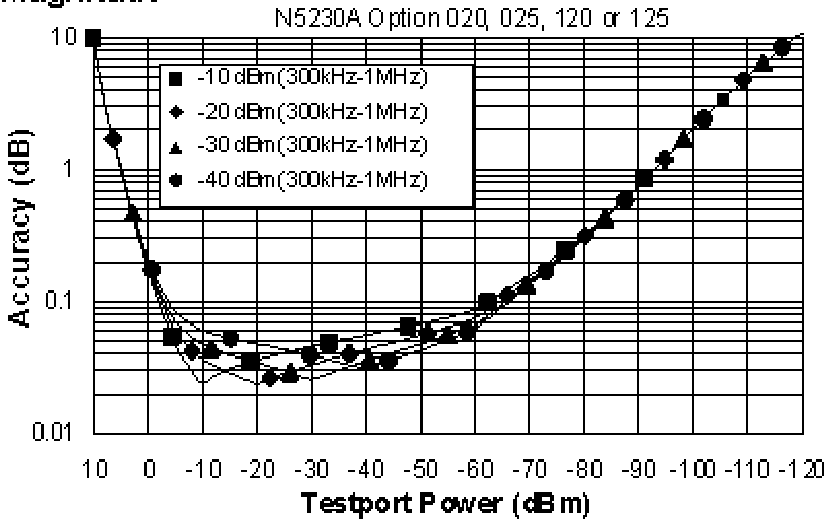
Table 18. Dynamic Accuracy (Specification[a])

Accuracy of the test port input power reading relative to the reference input power level.

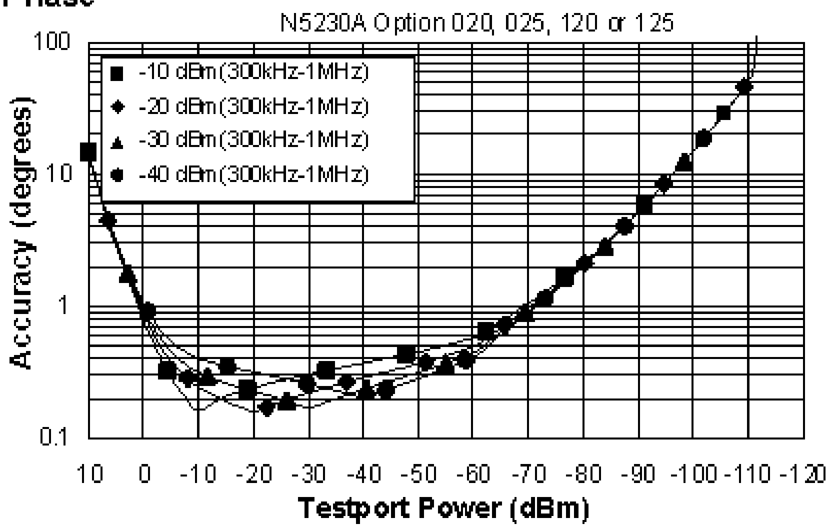
Options 020, 025, 120, 125

Dynamic Accuracy, 300 kHz - 1 MHz, Option 020, 025, 120, or 125

Magnitude

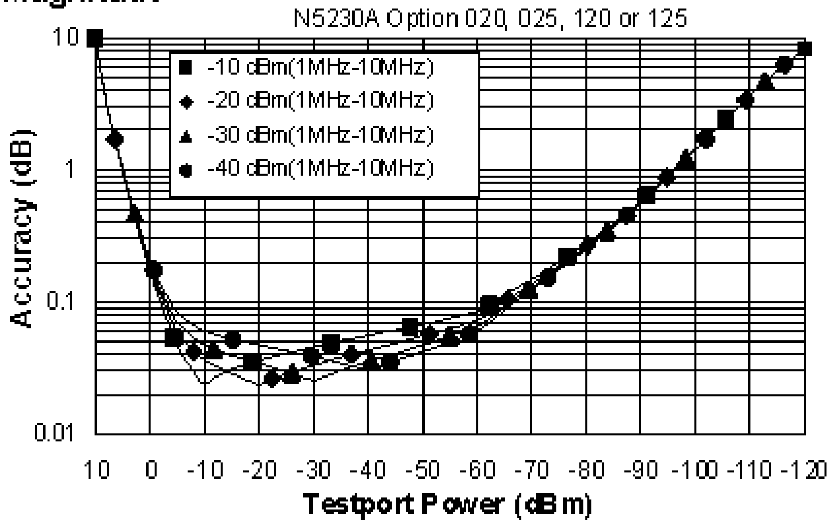


Phase

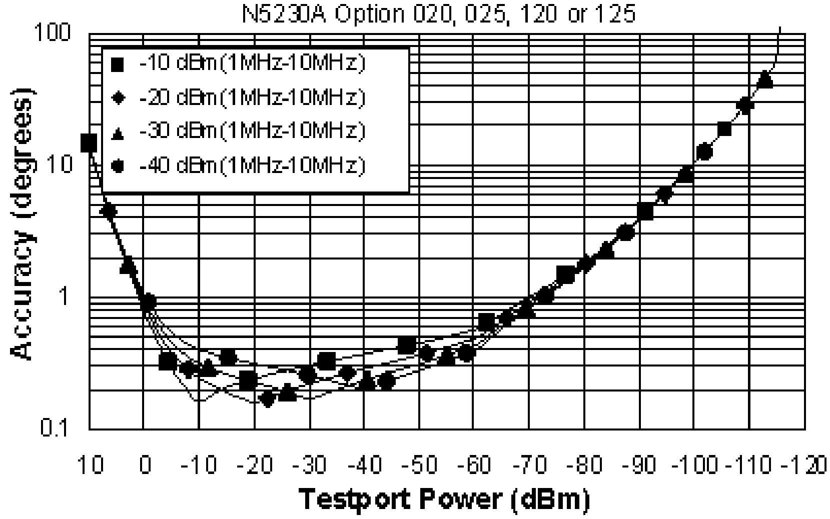


Dynamic Accuracy, 1 MHz- 10 MHz, Option 020, 025, 120, or 125

Magnitude

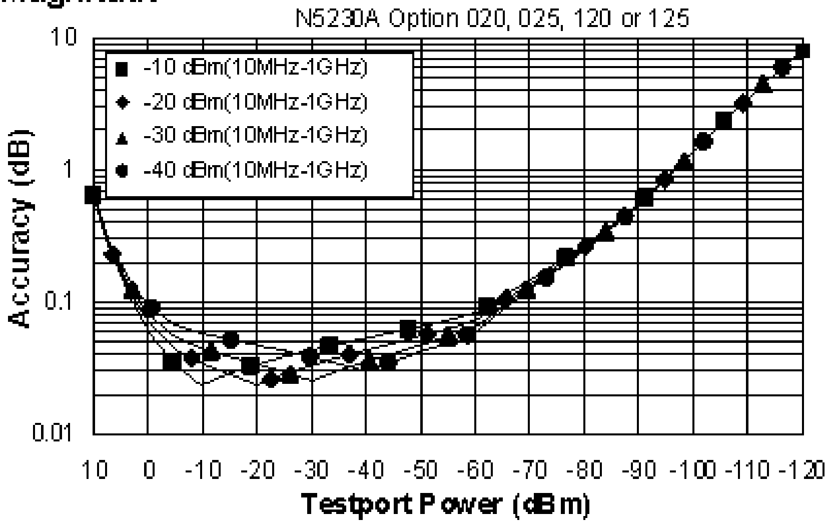


Phase

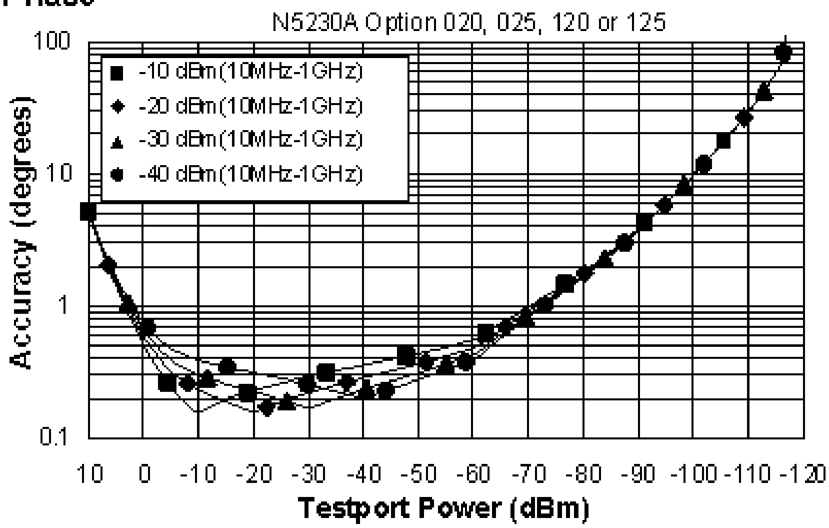


Dynamic Accuracy, 10 MHz- 1 GHz, Option 020, 025, 120, or 125

Magnitude

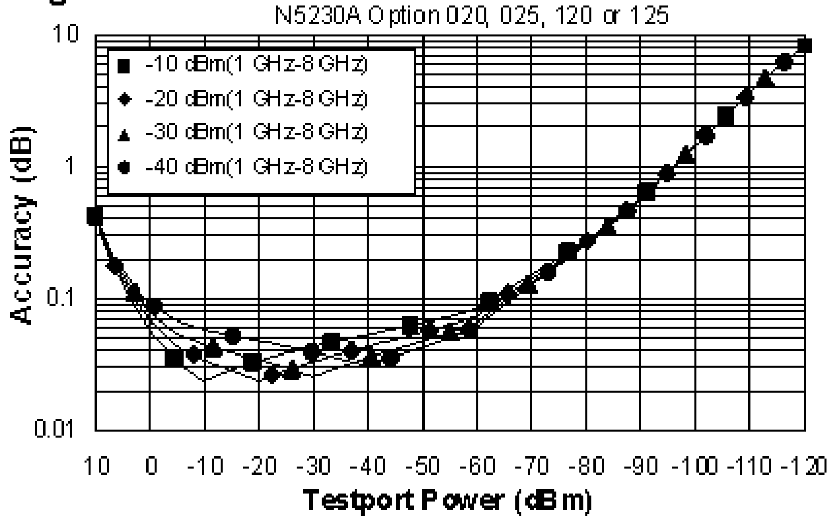


Phase

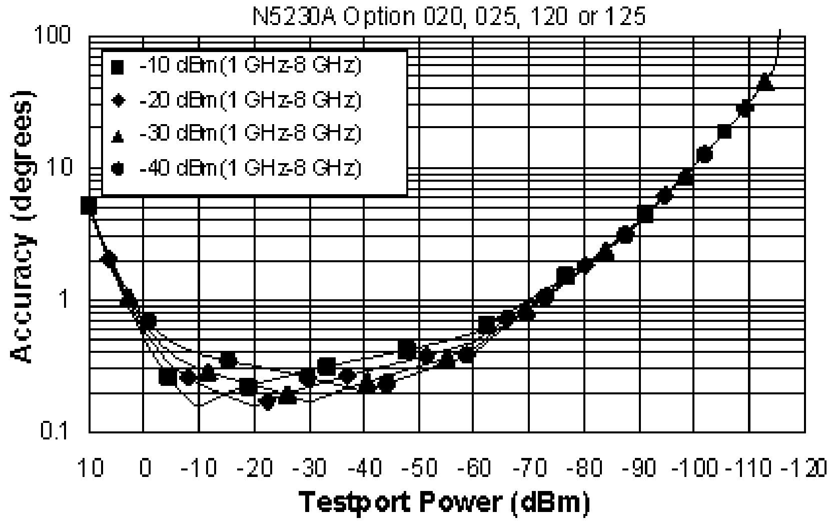


Dynamic Accuracy, 1 - 8 GHz, Option 020, 025, 120, or 125

Magnitude

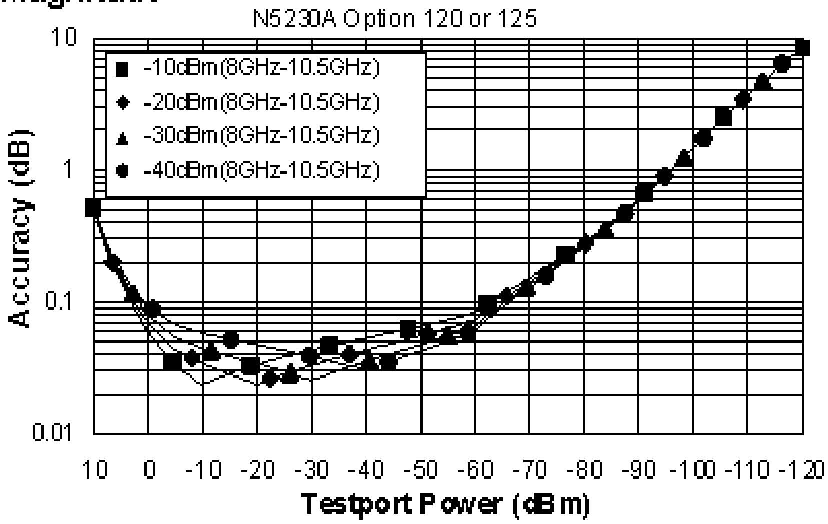


Phase

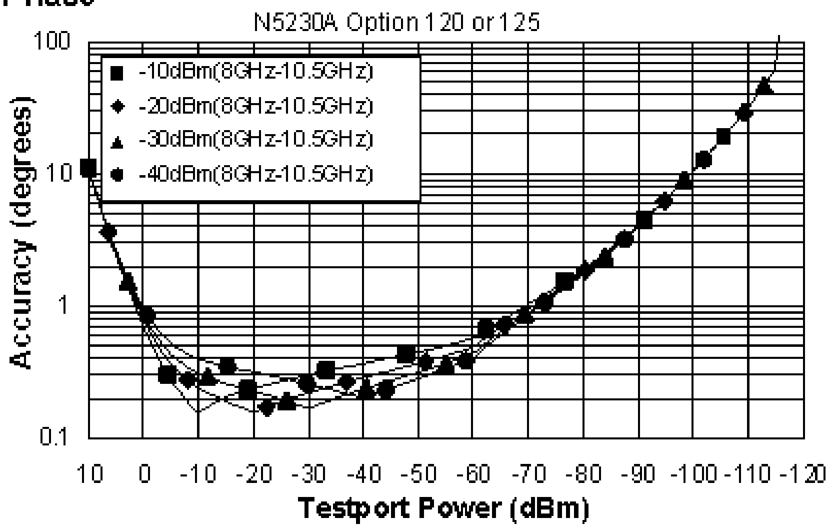


Dynamic Accuracy, 8 - 10.5 GHz, Option 120 or 125

Magnitude

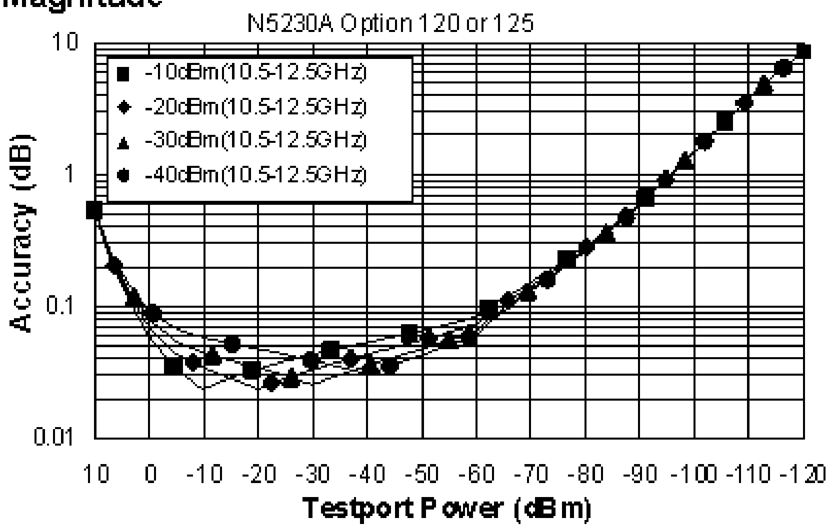


Phase

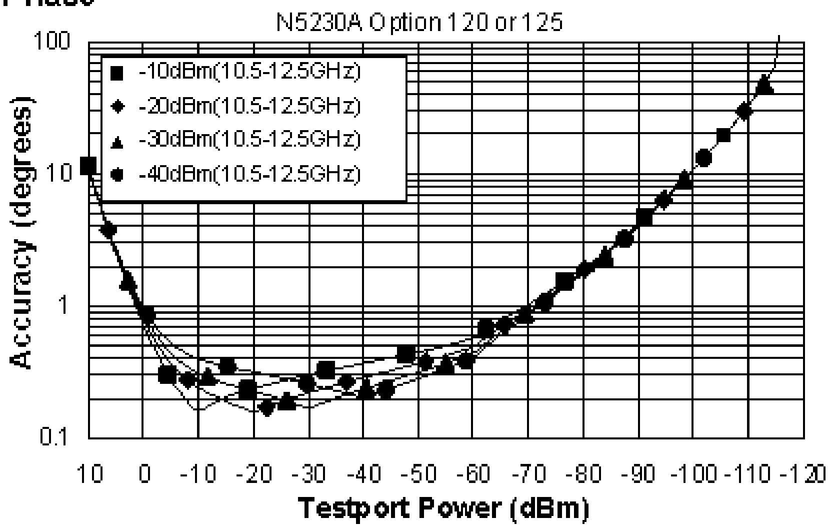


Dynamic Accuracy, 10.5 - 12.5 GHz, Option 120 or 125

Magnitude

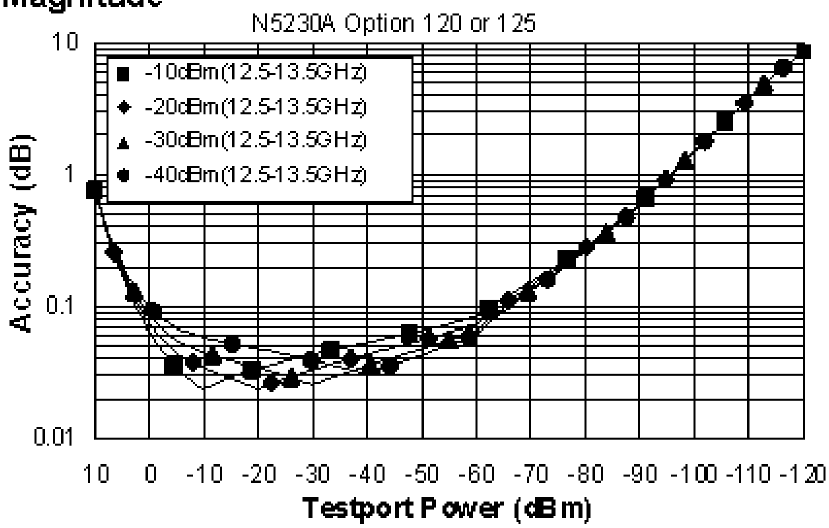


Phase

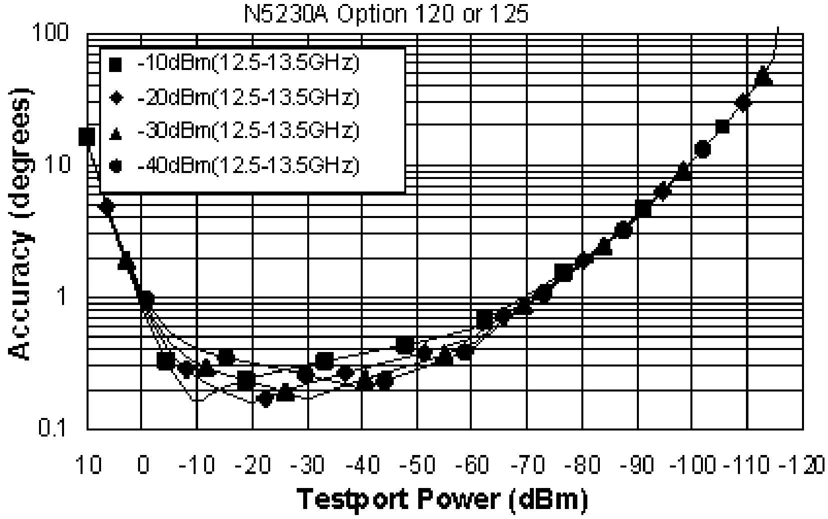


Dynamic Accuracy, 12.5 - 13.5 GHz, Option 120 or 125

Magnitude



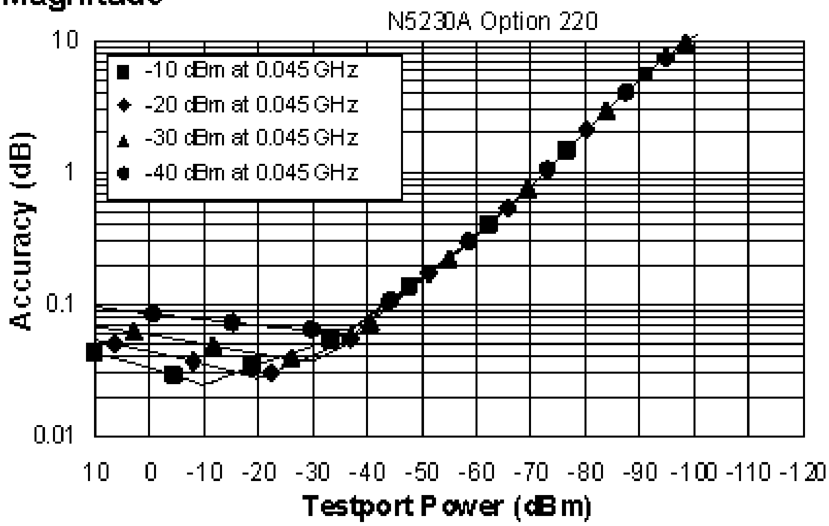
Phase



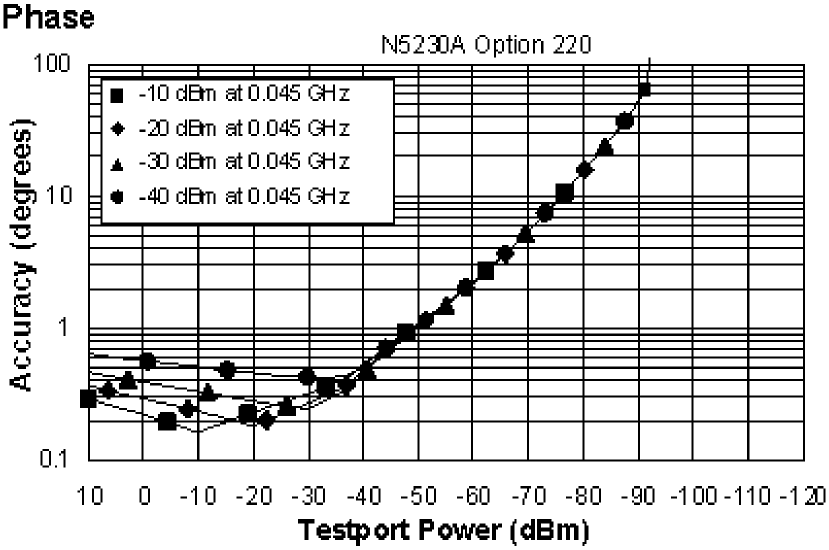
Options 220, 225

Dynamic Accuracy, 0.045 GHz, Option 220 or 225

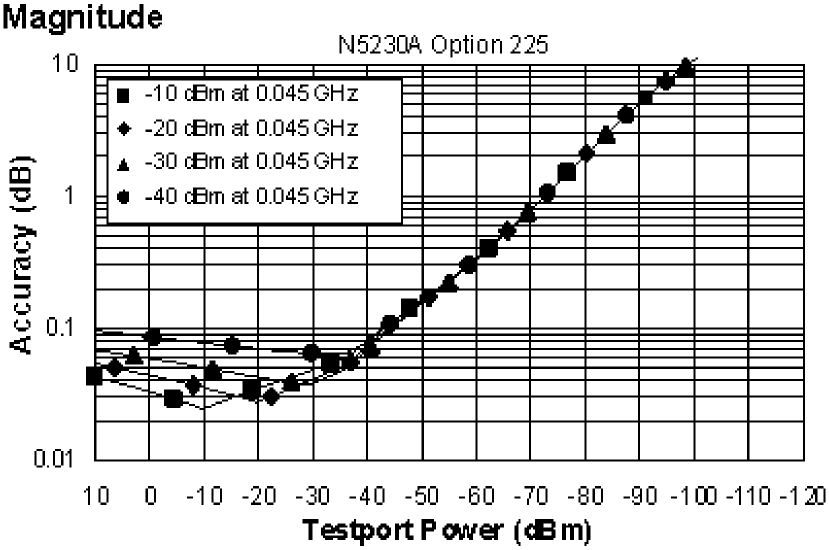
Magnitude



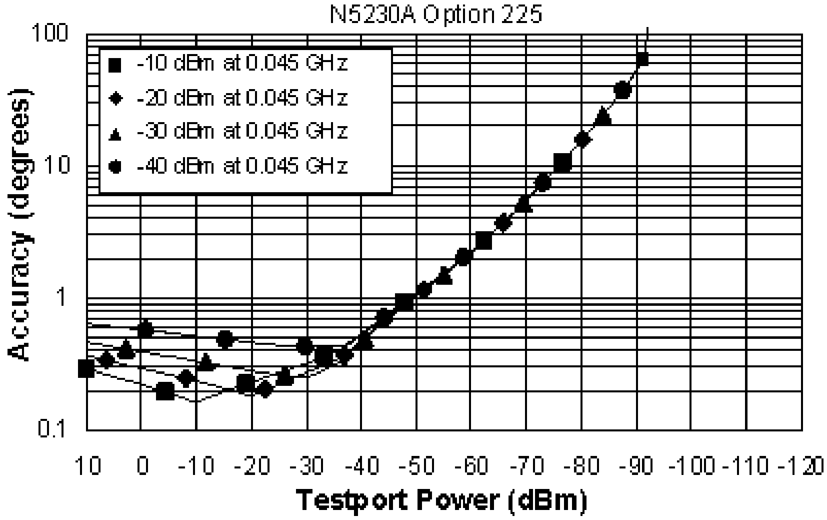
Phase



Magnitude

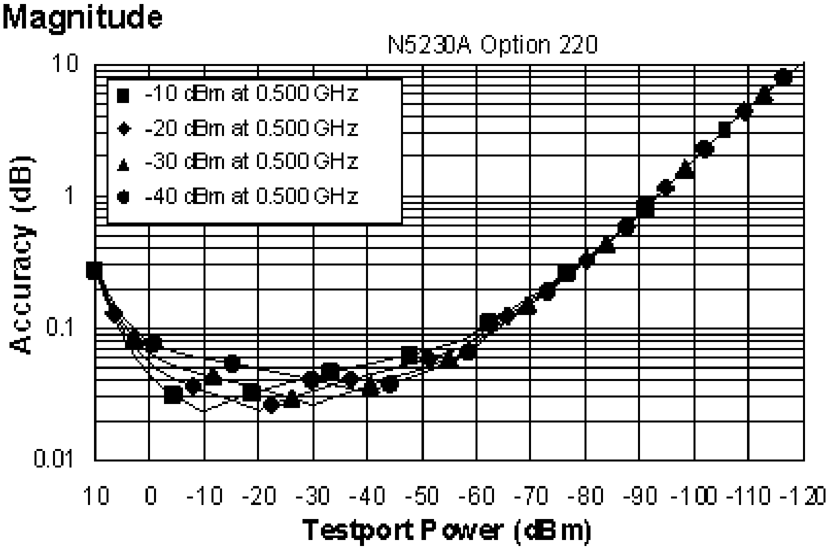


Phase

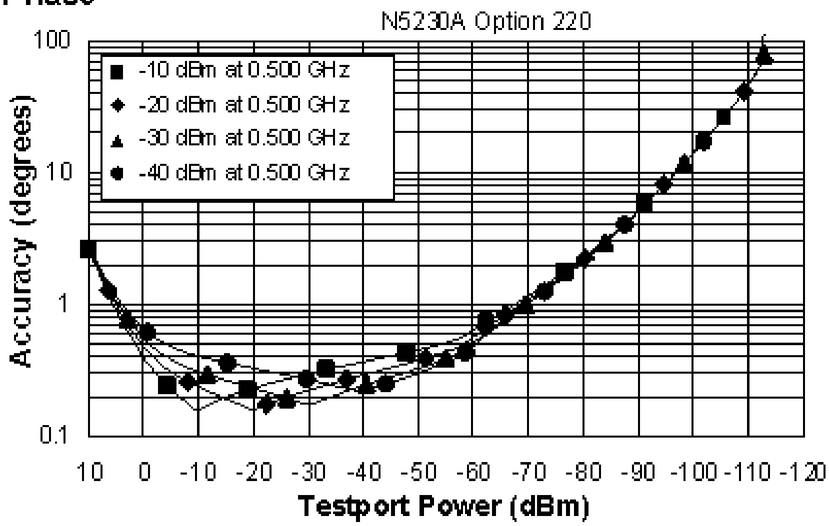


Dynamic Accuracy, 0.500 GHz, Option 220 or 225

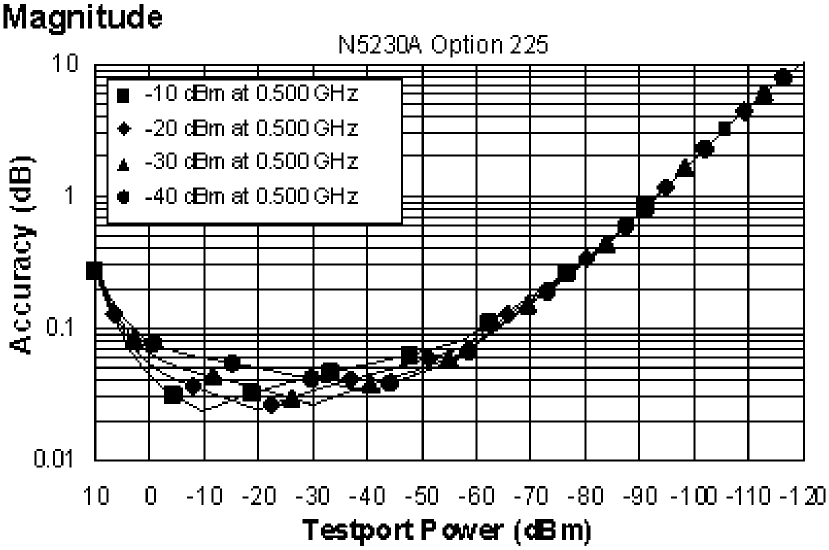
Magnitude



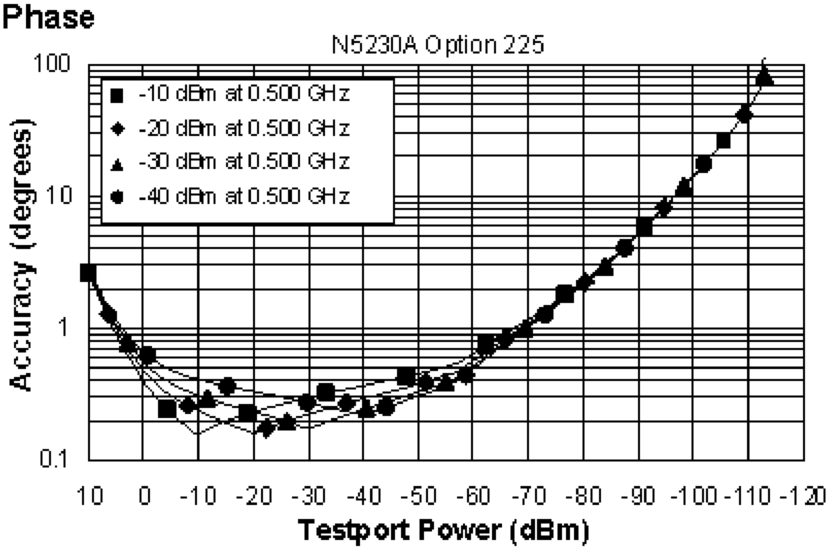
Phase



Magnitude

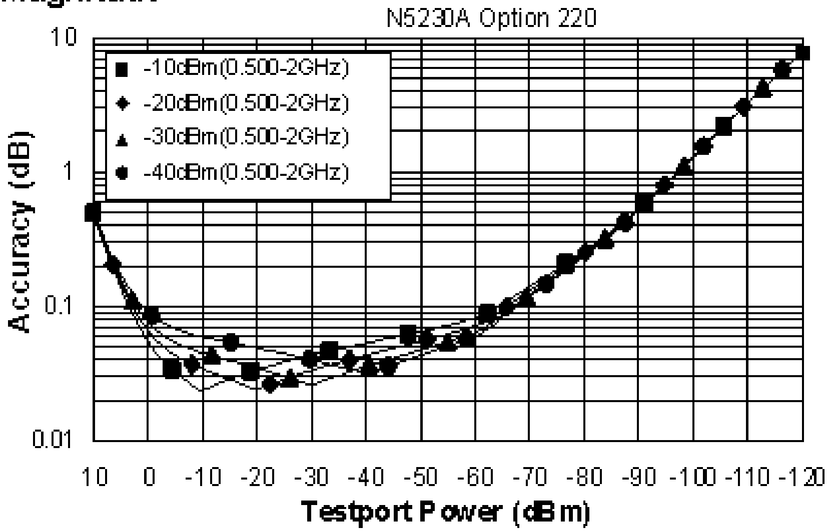


Phase

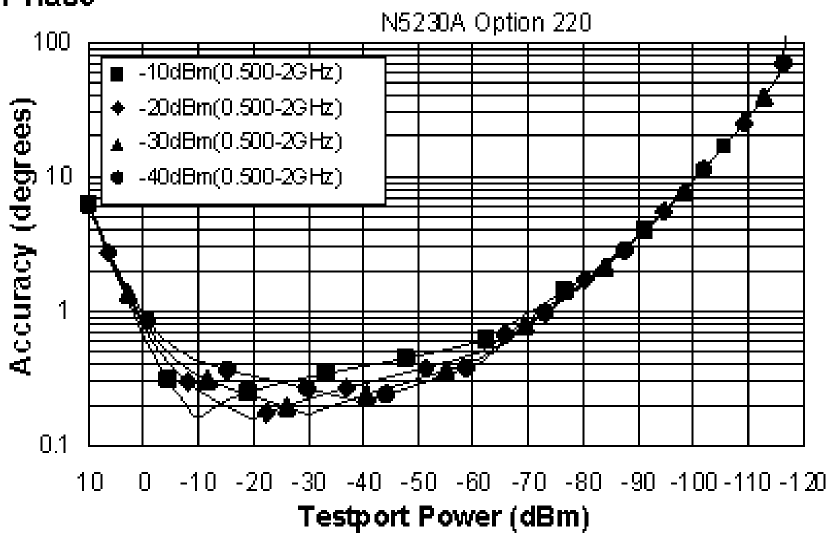


Dynamic Accuracy, 0.500 - 2 GHz, Option 220 or 225

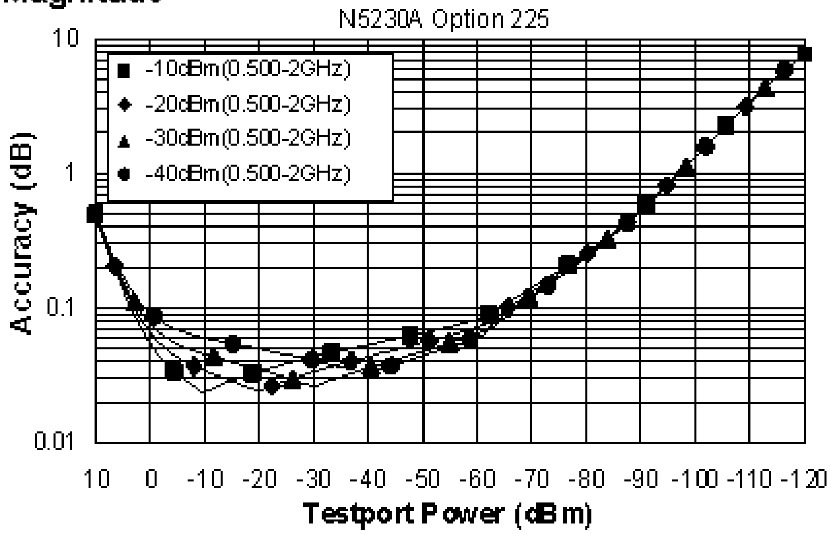
Magnitude



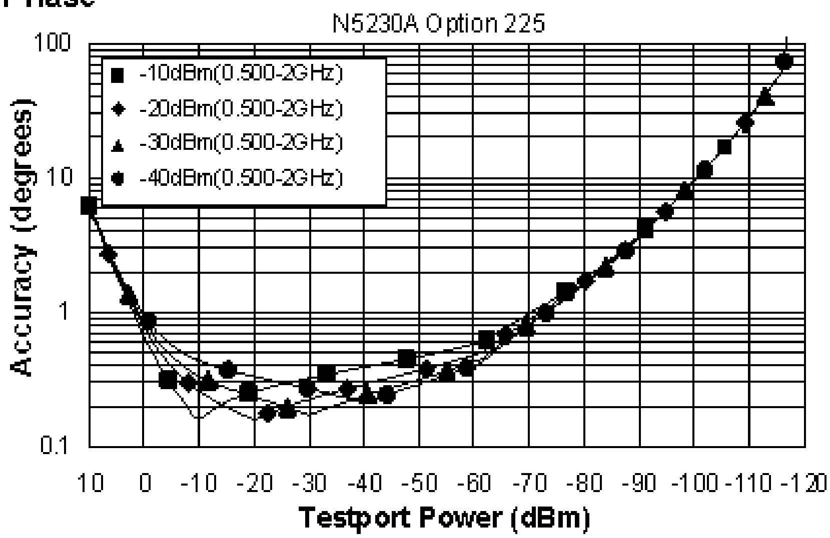
Phase



Magnitude

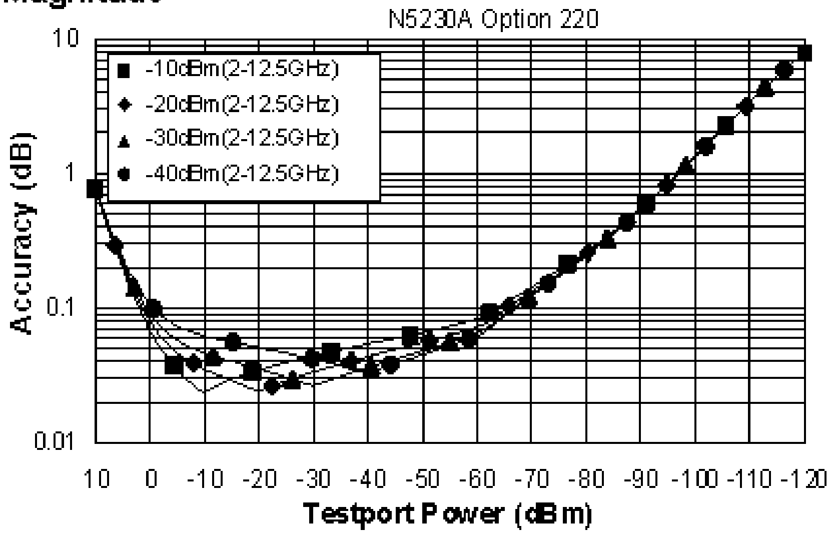


Phase

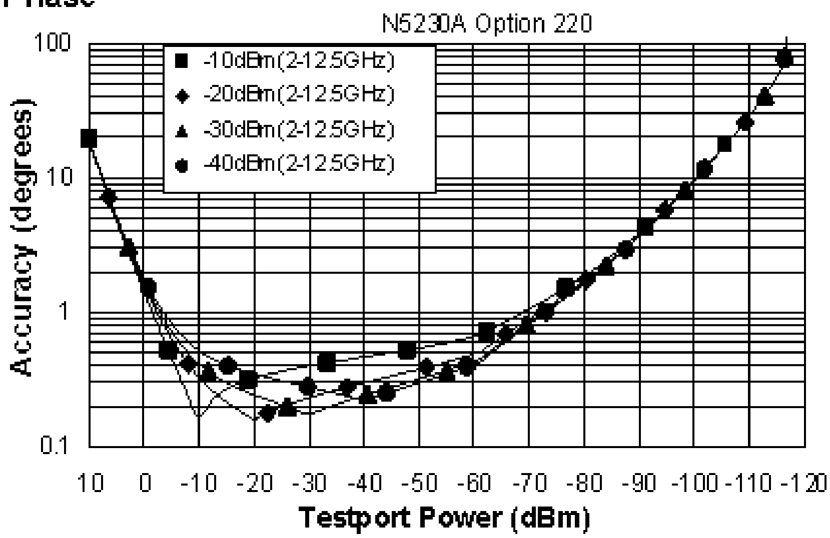


Dynamic Accuracy, 2 - 12.5 GHz, Option 220 or 225

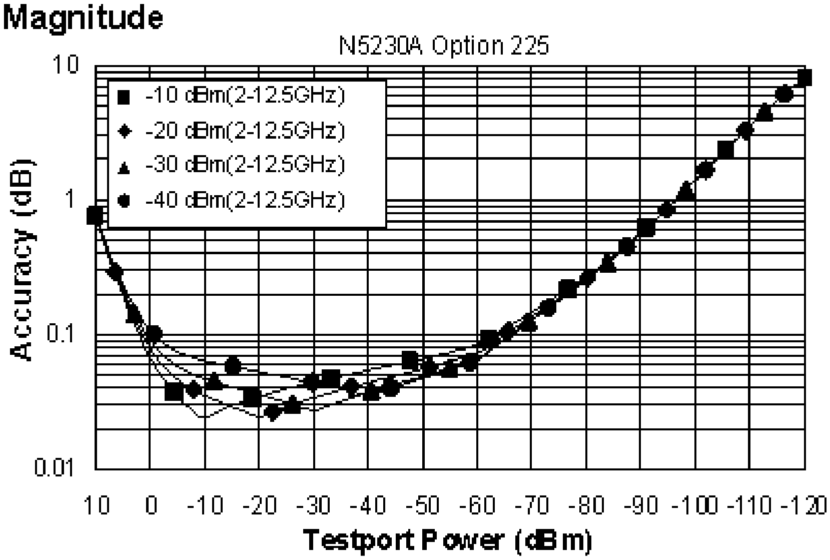
Magnitude



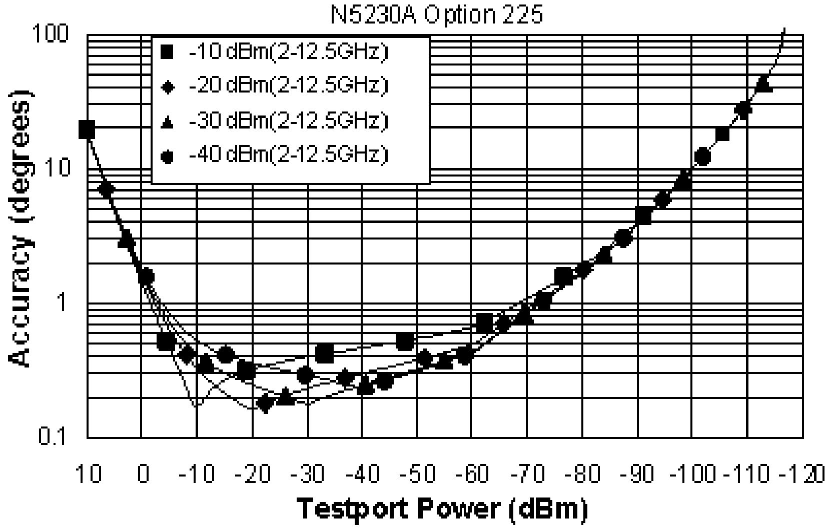
Phase



Magnitude

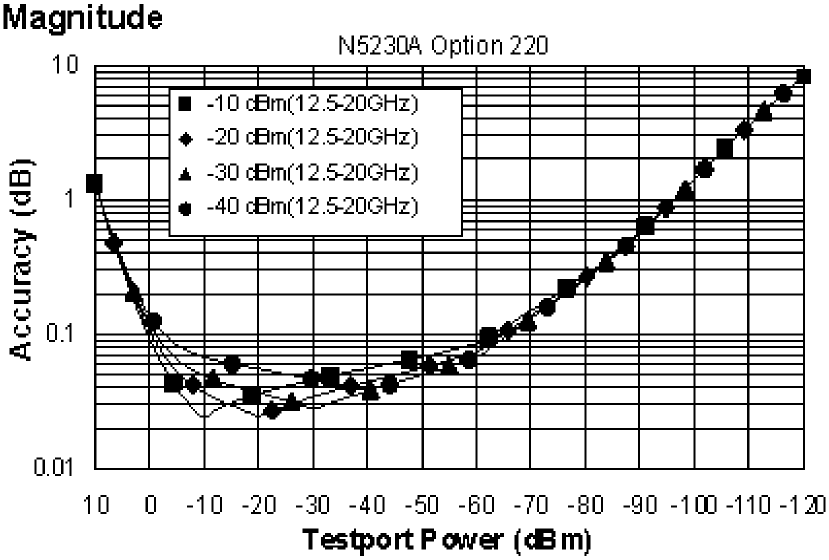


Phase

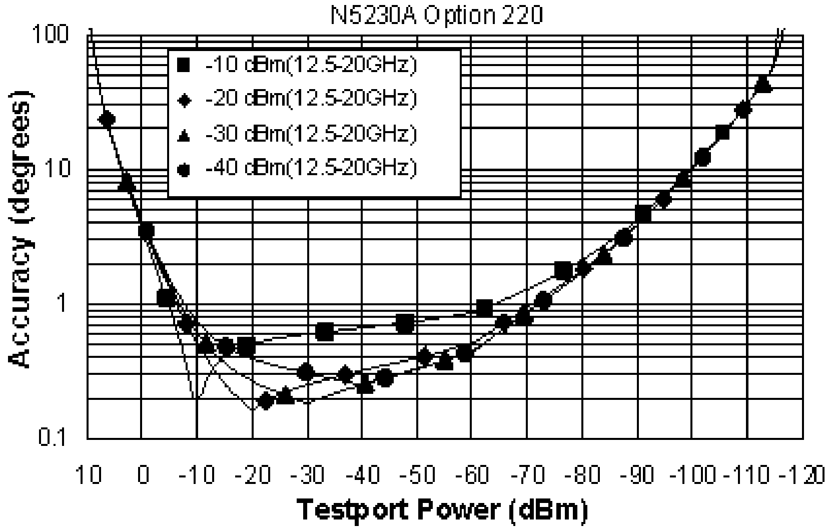


Dynamic Accuracy, 12.5 - 20 GHz, Option 220 or 225

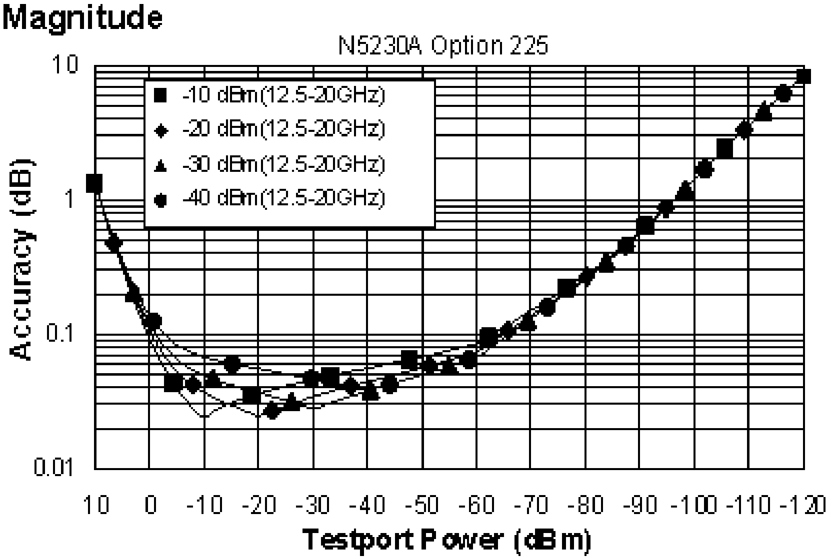
Magnitude



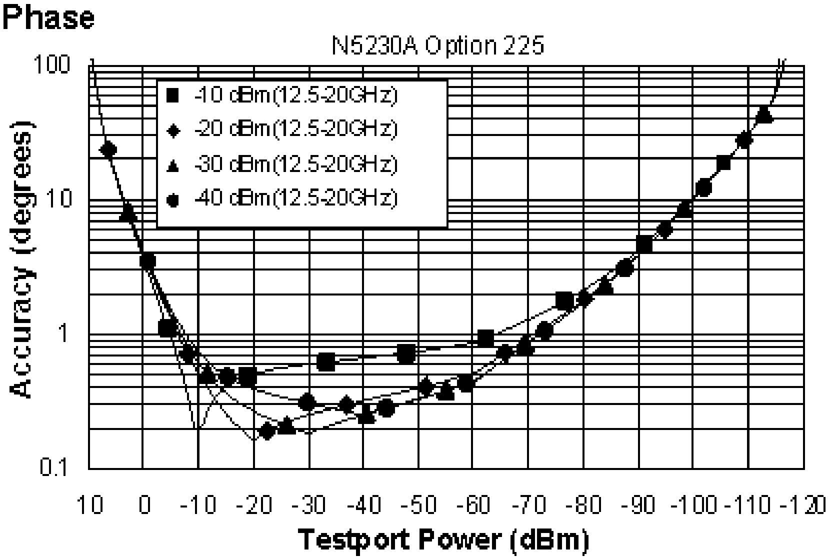
Phase



Magnitude



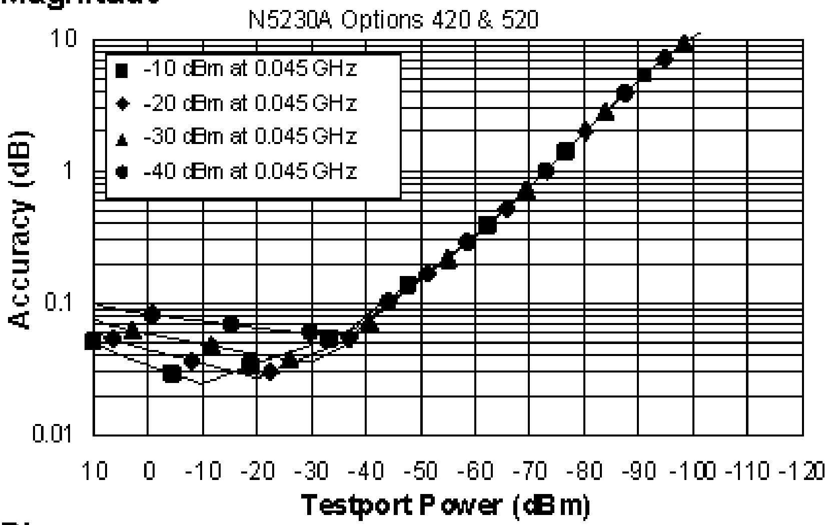
Phase



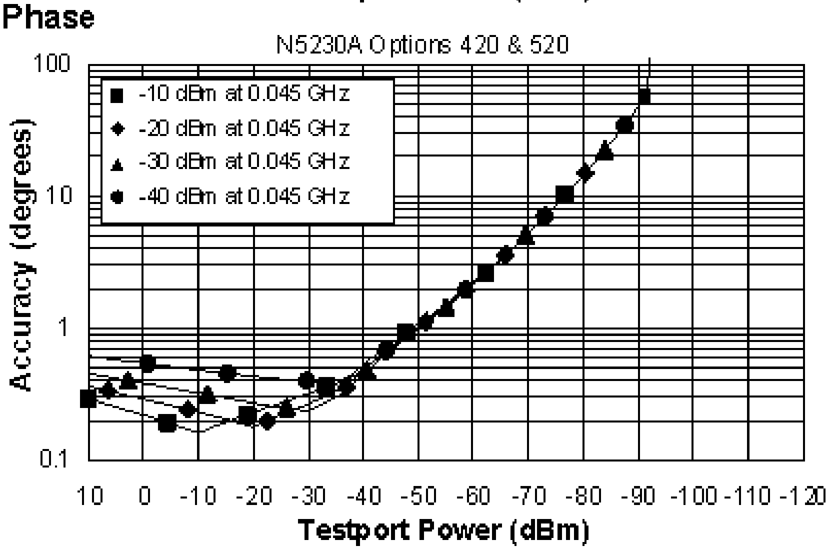
Options 420, 425, 520, 525

Dynamic Accuracy, 0.045 GHz, Option 420, 425, 520, or 525

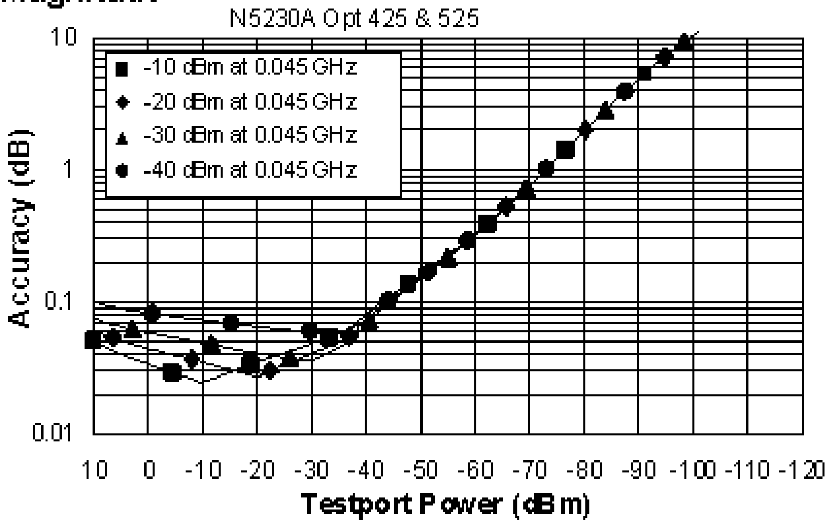
Magnitude



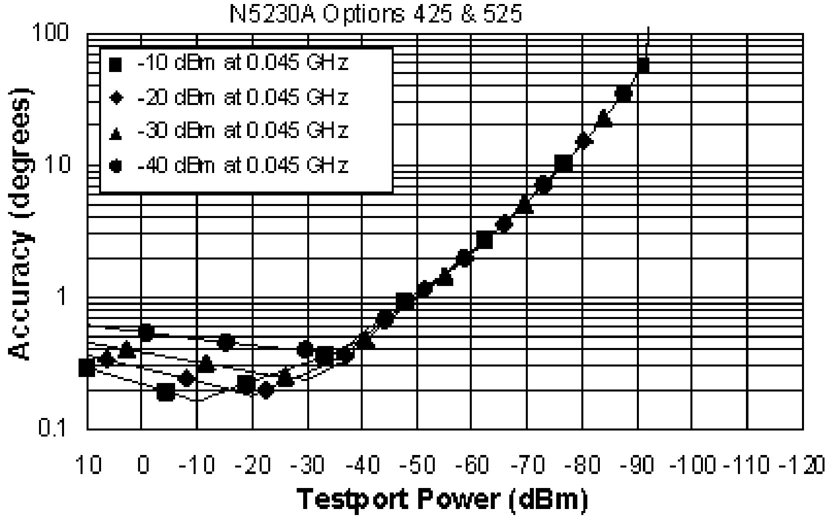
Phase



Magnitude

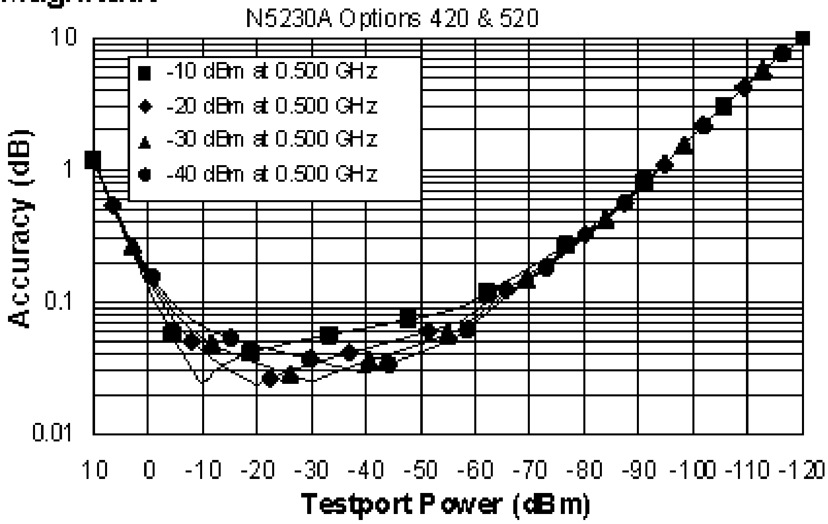


Phase

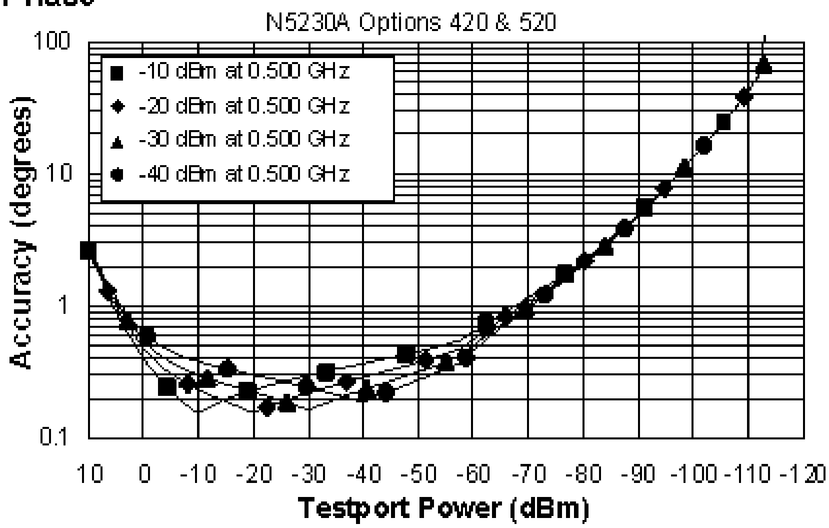


Dynamic Accuracy, 0.500 GHz, Option 420, 425, 520, or 525

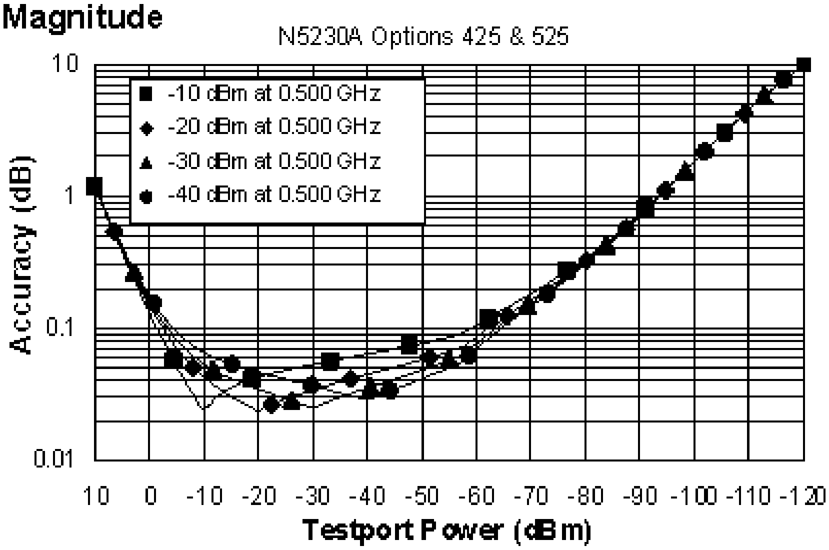
Magnitude



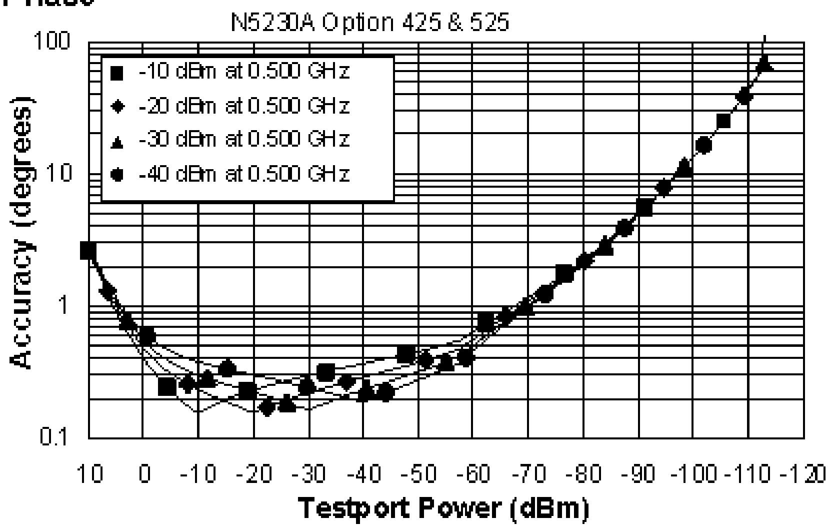
Phase



Magnitude

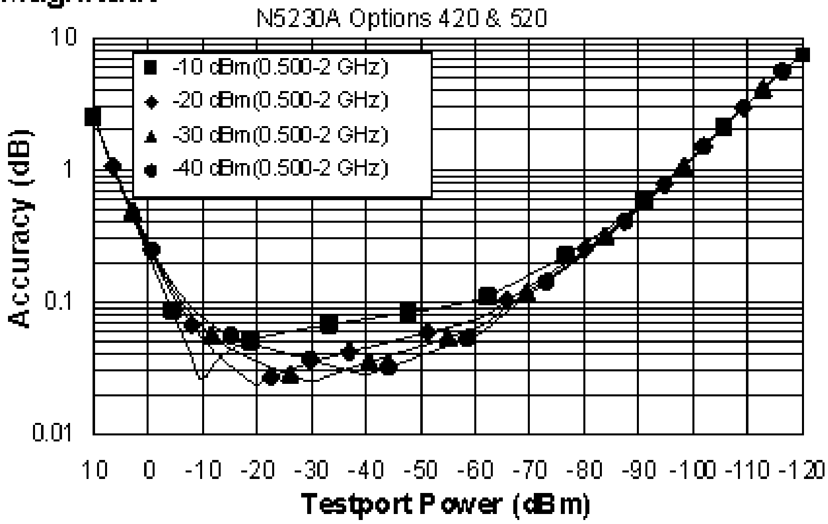


Phase

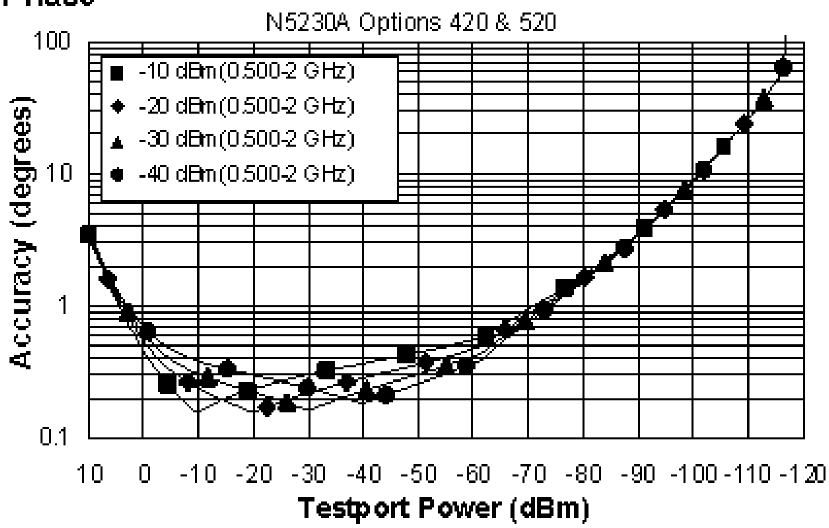


Dynamic Accuracy, 0.500 - 2 GHz, Option 420, 425, 520, or 525

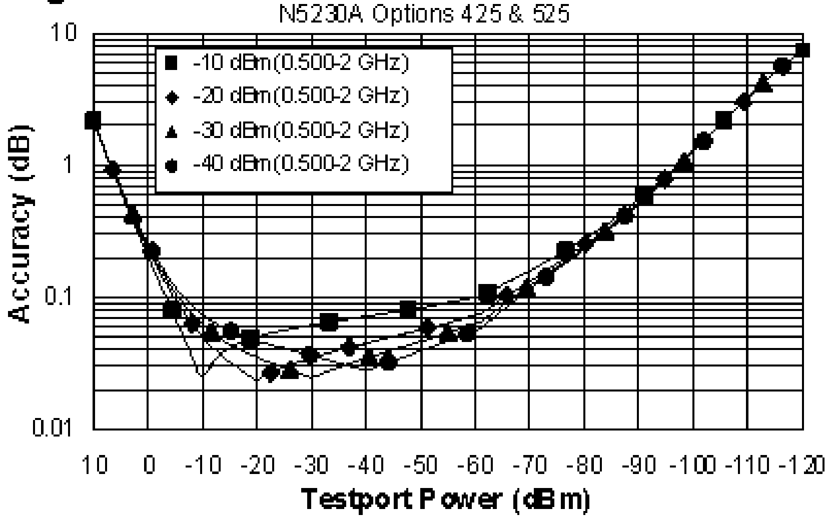
Magnitude



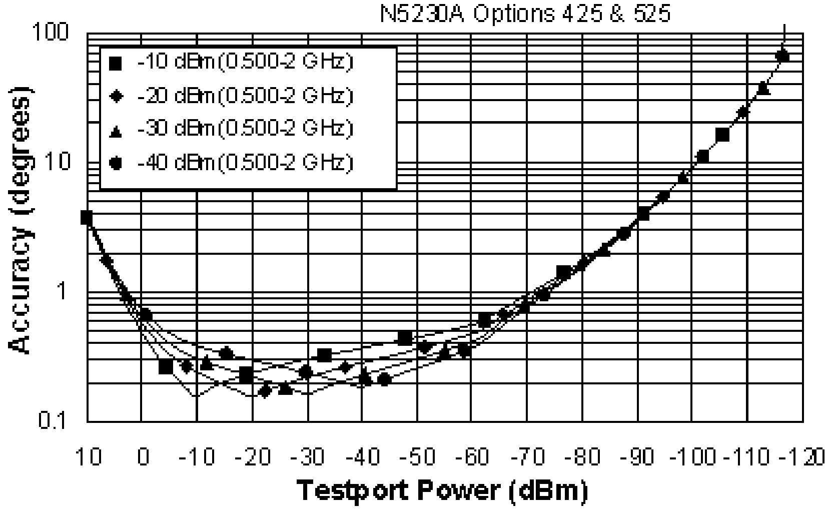
Phase



Magnitude

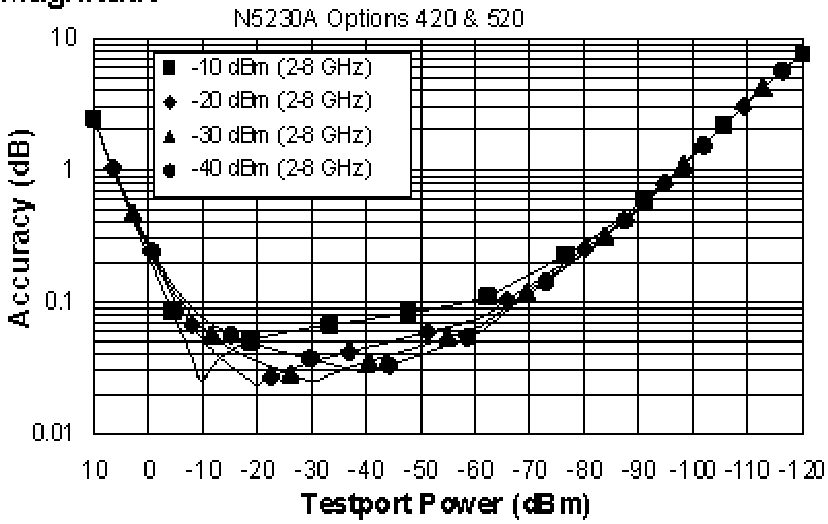


Phase

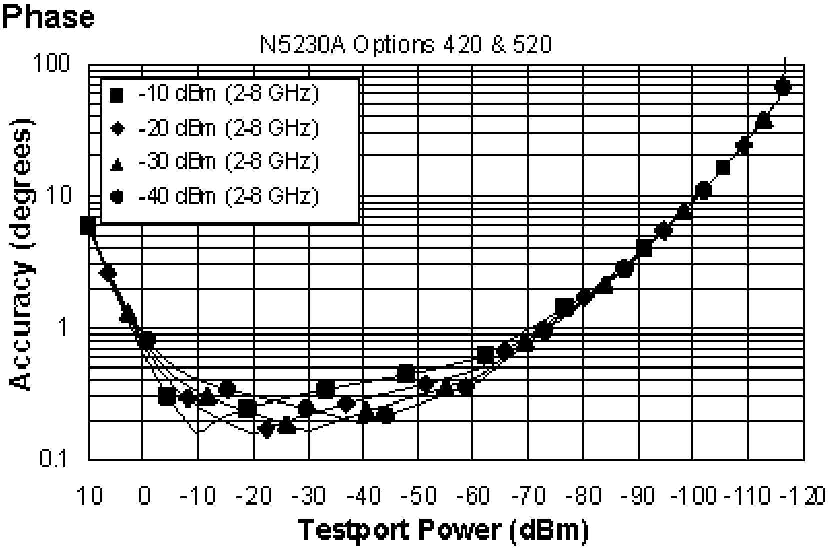


Dynamic Accuracy, 2 - 8 GHz, Option 420, 425, 520, or 525

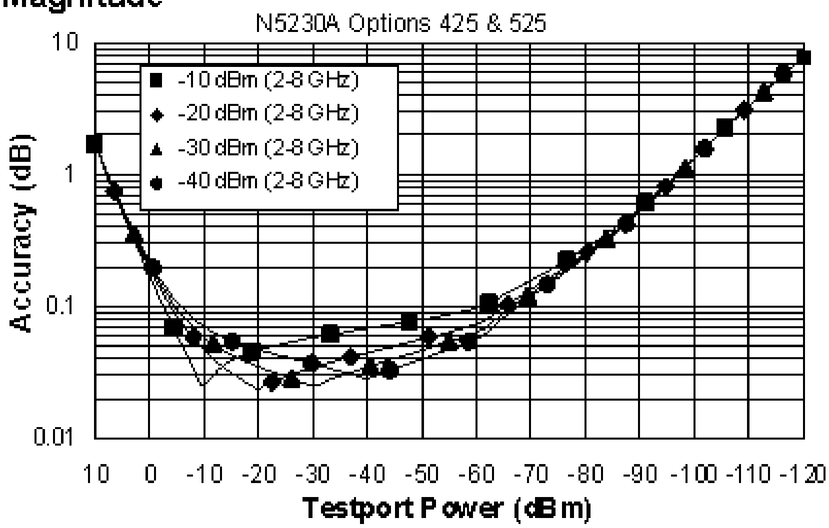
Magnitude



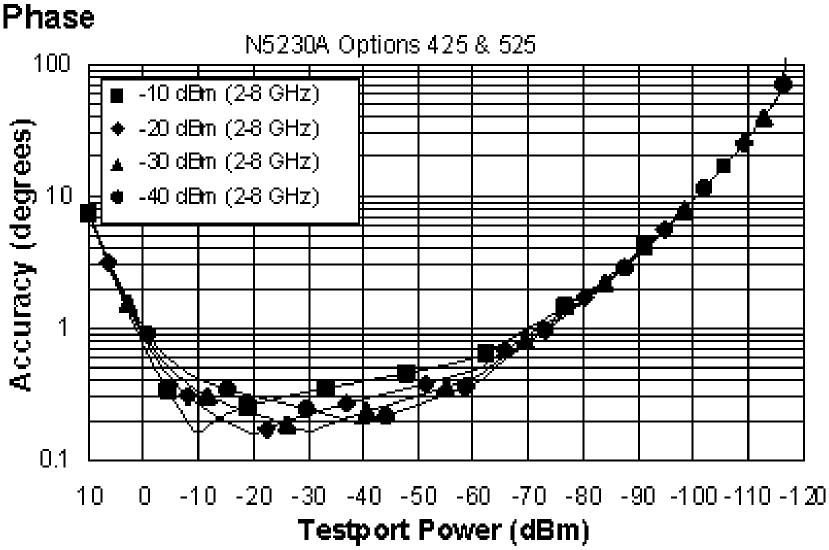
Phase



Magnitude

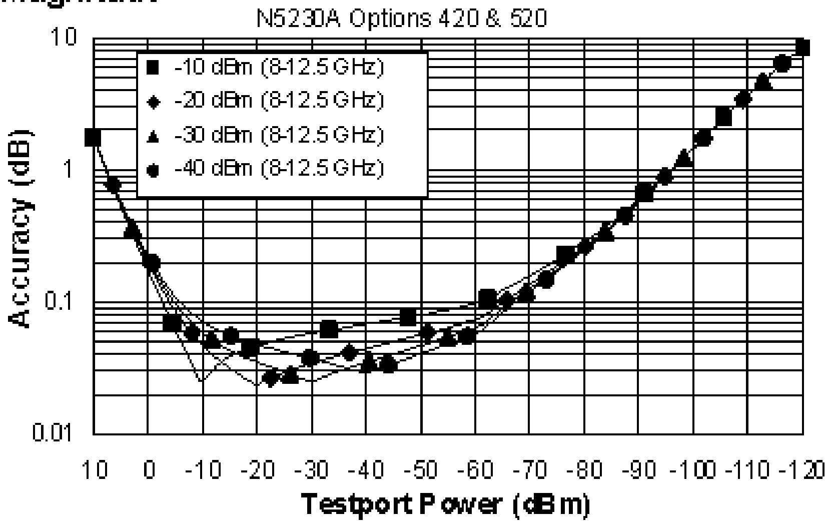


Phase

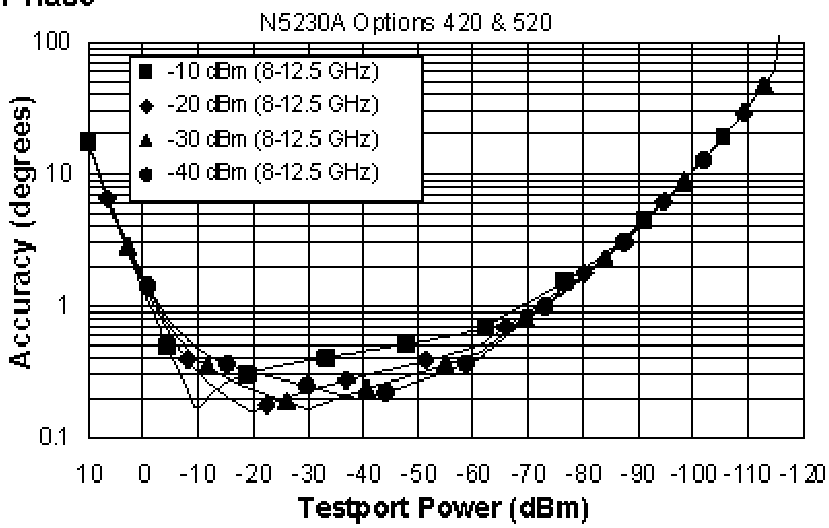


Dynamic Accuracy, 8 - 12.5 GHz, Option 420, 425, 520, or 525

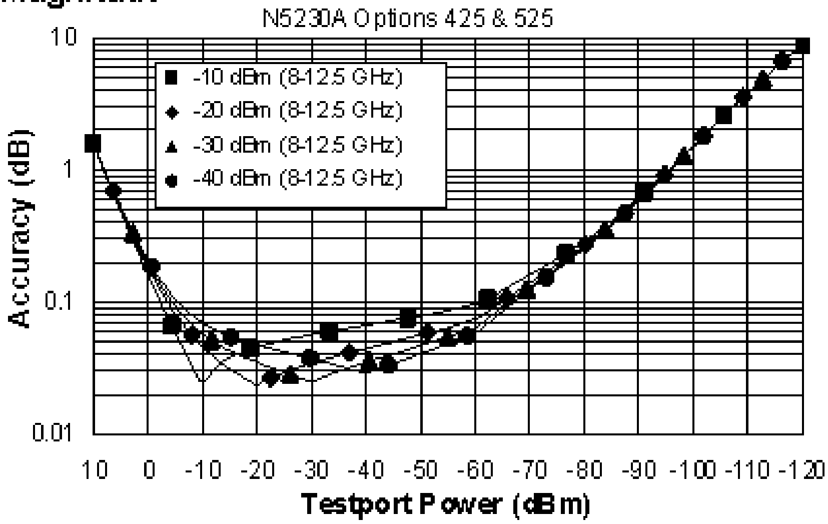
Magnitude



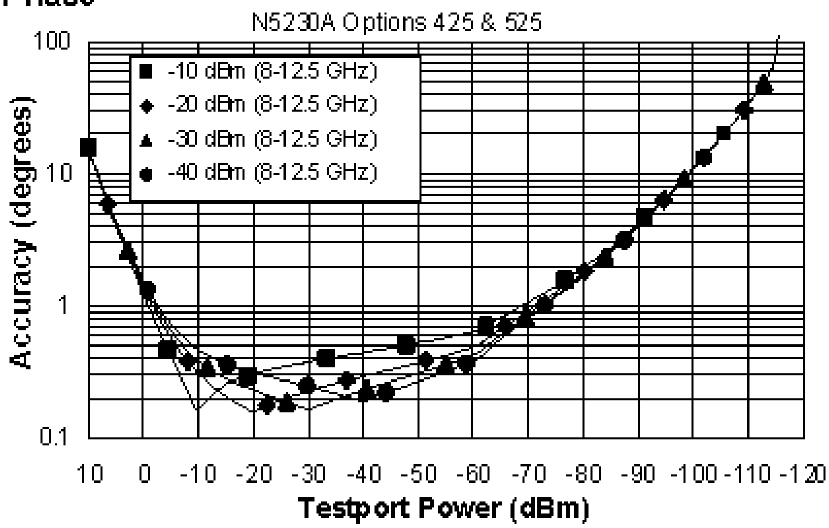
Phase



Magnitude

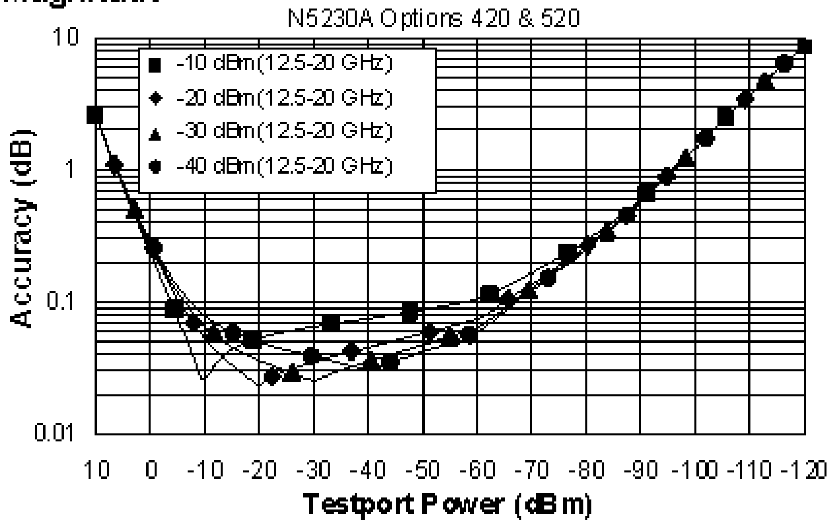


Phase

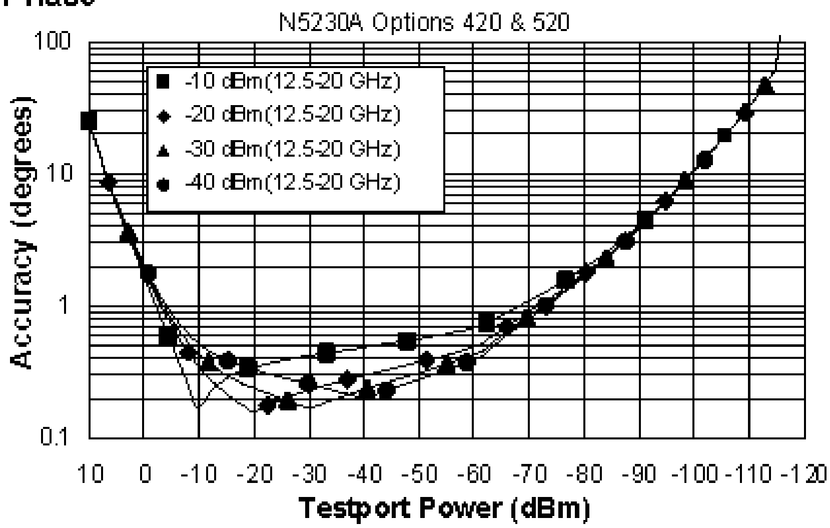


Dynamic Accuracy, 12.5 - 20 GHz, Option 420, 425, 520, or 525

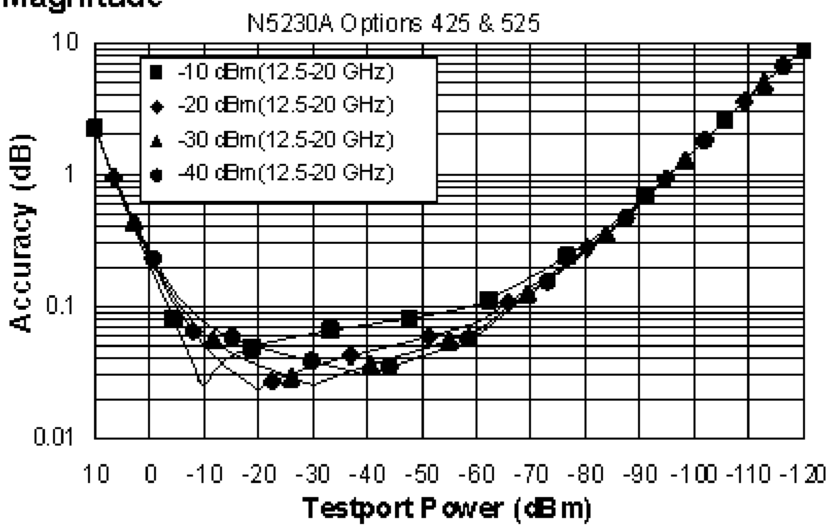
Magnitude



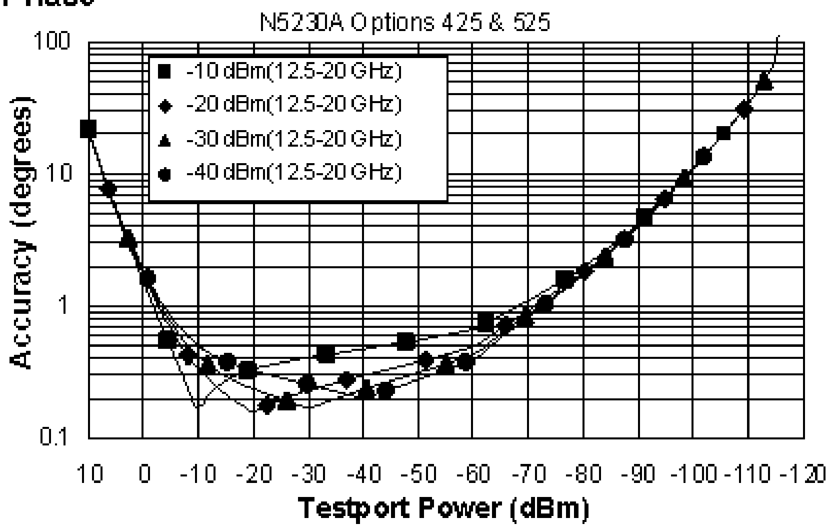
Phase



Magnitude

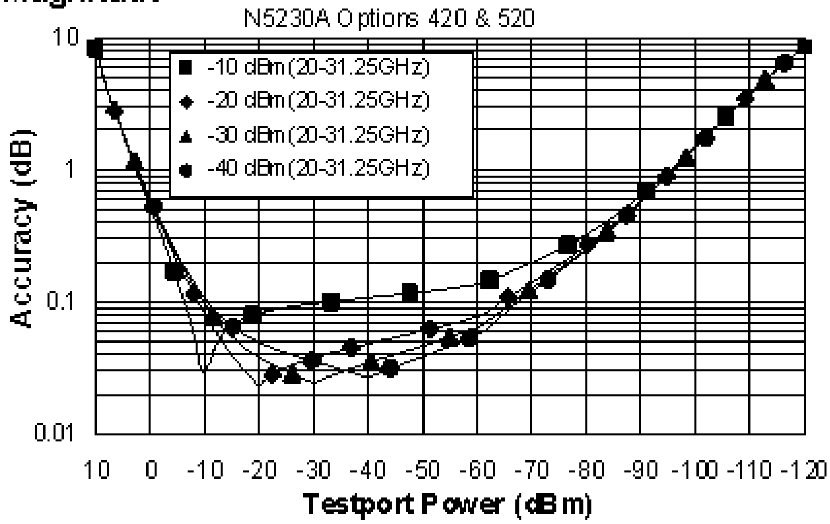


Phase

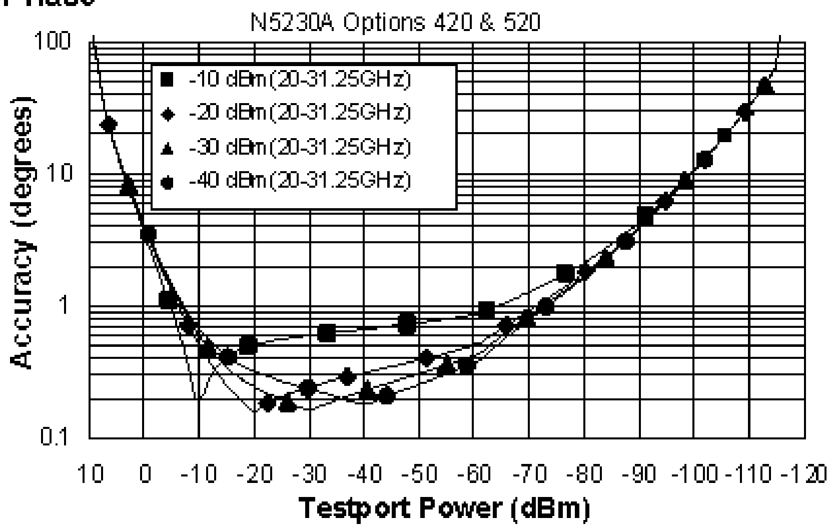


Dynamic Accuracy, 20 - 31.25 GHz, Option 420, 425, 520, or 525

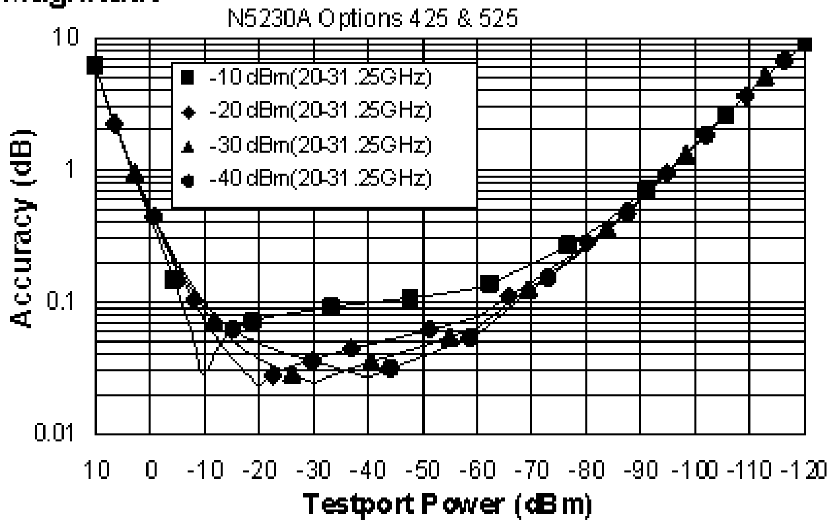
Magnitude



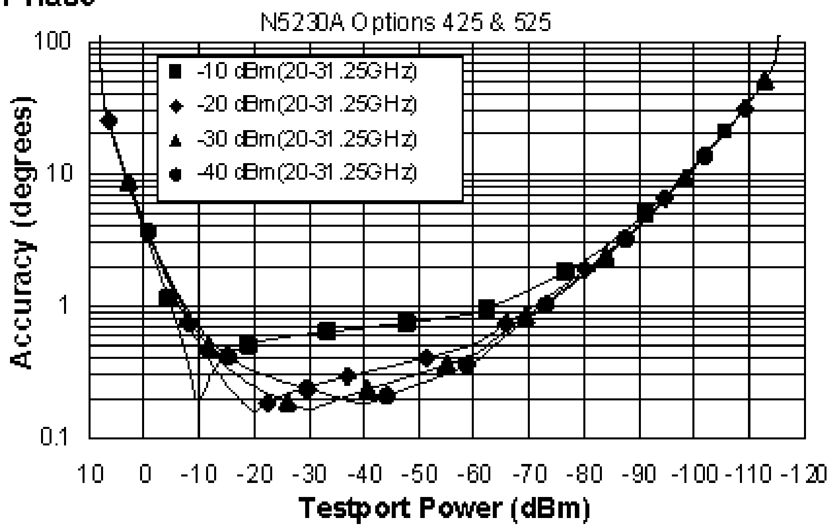
Phase



Magnitude

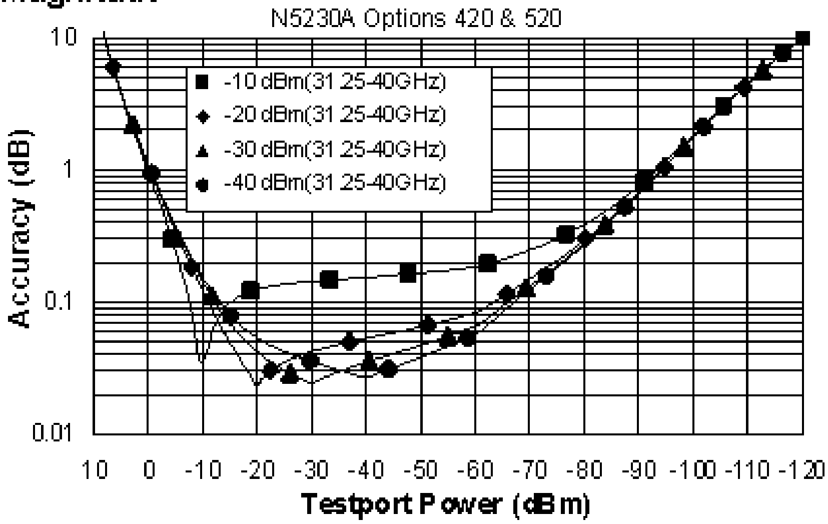


Phase

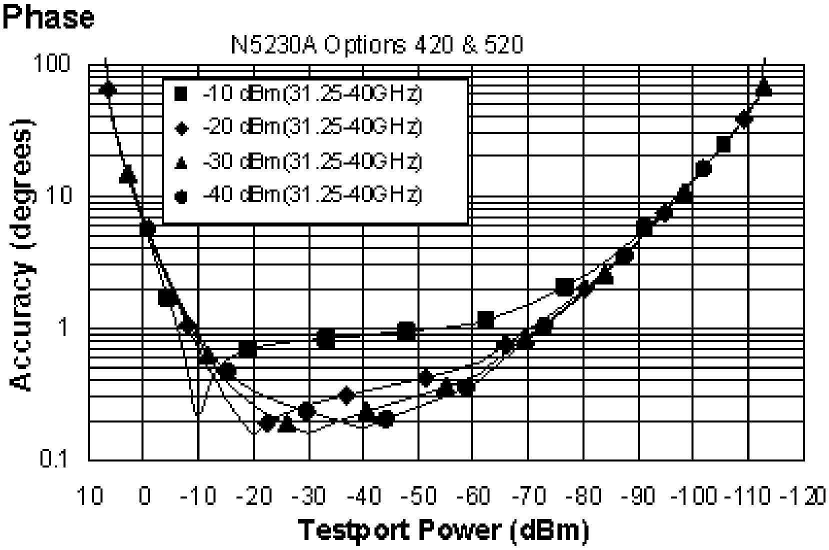


Dynamic Accuracy, 31.25 - 40 GHz, Option 420, 425, 520, or 525

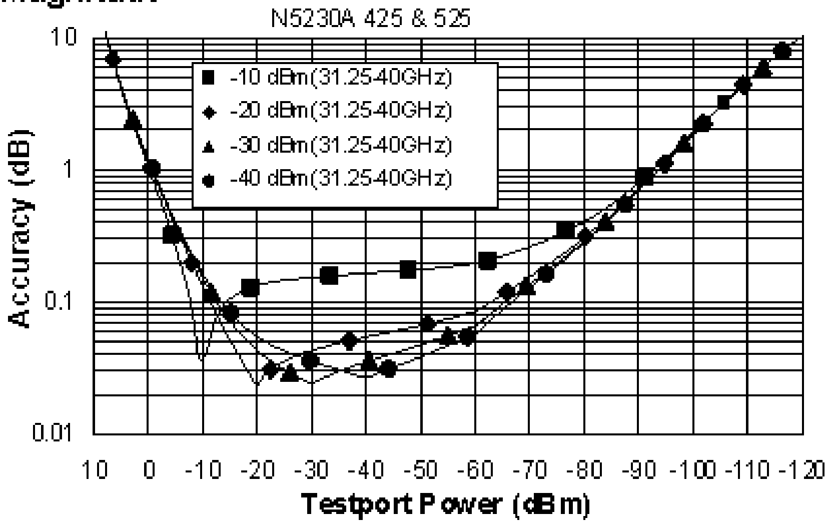
Magnitude



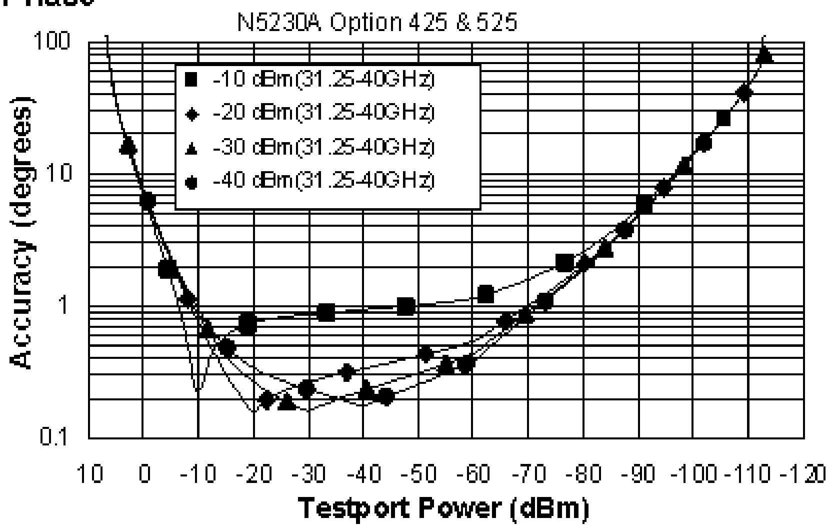
Phase



Magnitude

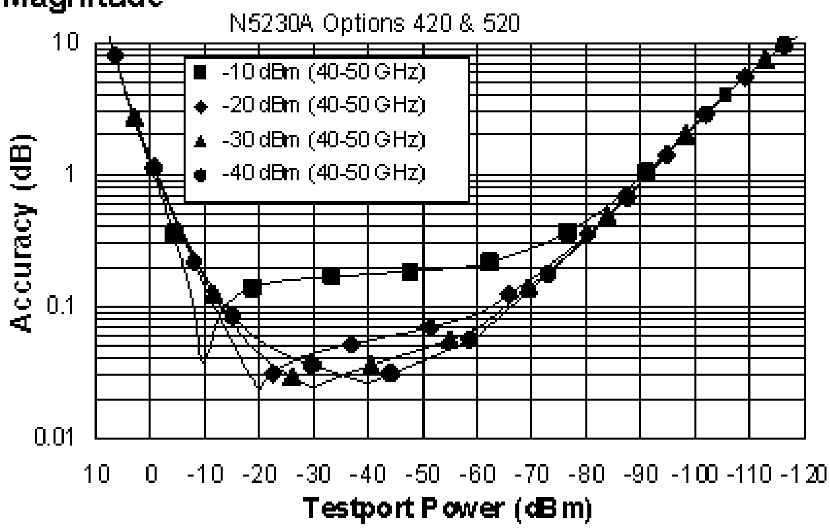


Phase

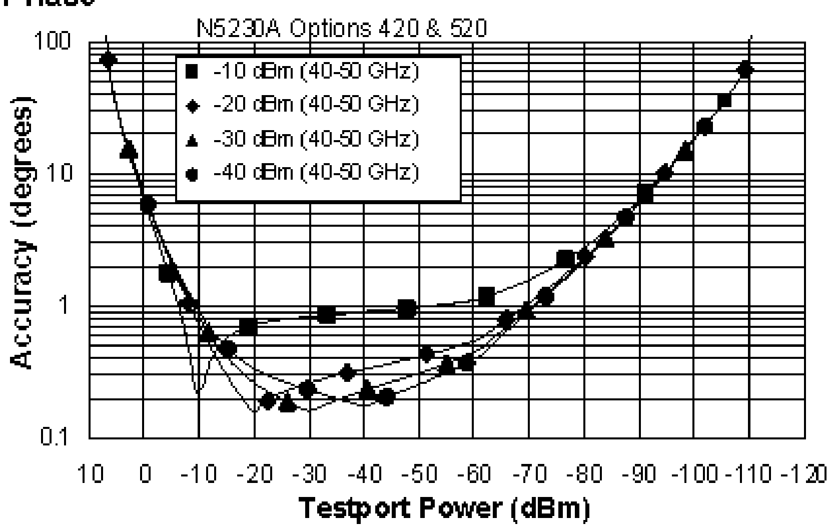


Dynamic Accuracy, 40 - 50 GHz, Option 520 or 525

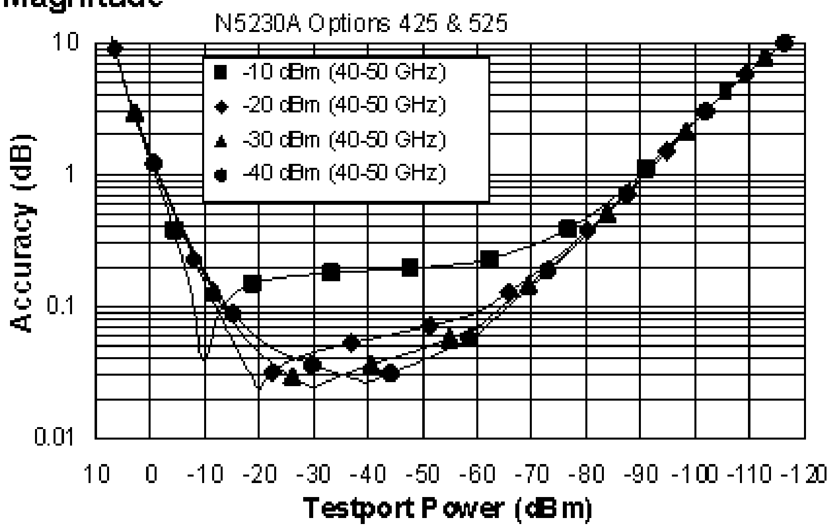
Magnitude



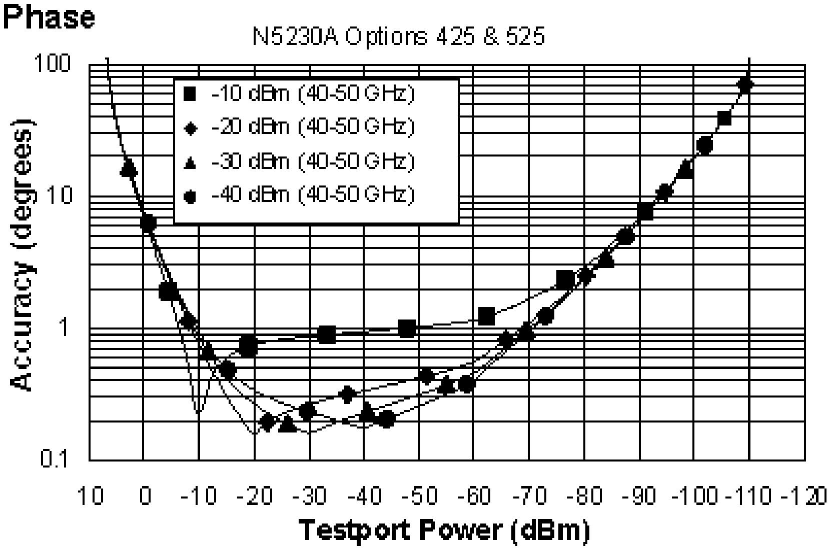
Phase



Magnitude



Phase



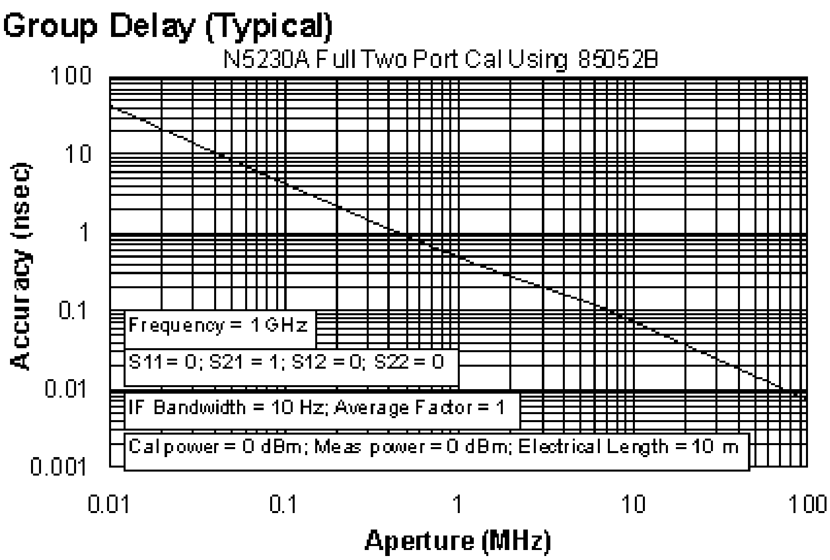
a Dynamic accuracy is verified with the following measurements:

- compression over frequency
- IF linearity at a single frequency of 1.195 GHz using a reference level of -20 dBm for an input power range of 0 to -110 dBm.

Table 19. Test Port Input (Group Delay)[a]

Description	Specification	Supplemental Information (typ.)
Aperture (selectable)		(frequency span)/(number of points -1)
Maximum Aperture		20% of frequency span
Range		0.5 x (1/minimum aperture)
Maximum Delay		Limited to measuring no more than 180° of phase change within the minimum aperture.)
Accuracy		See graph below. Char.

The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters.



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

- Miscellaneous Information
- Front Panel

- Rear Panel
- Environment and Dimensions

Table 20. Miscellaneous Information

Description	**Specification**	**Supplemental Information**
System IF Bandwidth Range		1 Hz to 250 kHz, nominal
CPU		Intel® 1.1 GHz Pentium® M with 1 GByte RAM

Table 21. Front Panel Information

Description	**Supplemental Information**
RF Connectors	
N5230A	
Type	Option 220 or 225: 3.5 mm (male), 50 ohm, (nominal) Option 420, 425, 520, or 525: 2.4 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
Display	
Size	21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480 (vertical) resolution
Refresh Rate	Vertical 59.83 Hz; Horizontal 31.41 kHz
Pixels	When running the analyzer's built-in Display Test, one or more of the following symptoms indicate a faulty display assembly: • A complete row or column of "stuck on" or "dark" pixels. • More than six "stuck on" pixels (but not more than three green) • More than twelve "dark" pixels (but not more than seven of the same color) • Two or more consecutive "stuck on" pixels or three or more consecutive "dark" pixels (but no more than one set of two consecutive "dark" pixels) • "Stuck on" or "dark" pixels less than 6.5 mm apart (excluding consecutive pixels)
Display Range	
Magnitude	±500 dB (at 20 dB/div), max
Phase	±500°, max

Polar	10 pUnits, min 1000 Units, max
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	0.01 mUnit, min; 0.01°,min

Table 22. Rear Panel Information

Description	**Supplemental Information**
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, Typical
Input Level	-15 dBm to +20 dBm, Typical
Input Impedance	200 Ω, nom.
10 MHz Reference Out	
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, Typical
Signal Type	Sine Wave, Typical
Output Level	+10 dBm ± 4 dB into 50 Ω, Typical
Output Impedance	50 Ω, nominal
Harmonics	<-40 dBc, Typical
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported:	
	Resolutions:
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480

Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowed, but with 640 X 480 resolution only. If you change resolution, you can only view the external display (internal display will "white out").
Test Set IO	
	25-pin D-Sub connector, available for external test set control
Aux IO	
	25-pin D-Sub connector, male, analog and digital IO
Handler IO	
	36-pin parallel I/O port; all input/output signals are default set to negative logic; can be reset to positive logic via GPIB command
GPIB	
	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	
	25-pin D-Sub miniature connector, female; provides connection to printers or any other parallel port peripherals
Serial Port (COM 1)	
	9-pin D-Sub, male; compatible with RS-232
USB Port	
	One port on front panel and five ports on rear panel. Universal Serial Bus jack, Type A configuration (4 contacts inline, contact 1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground

Table 22. Rear Panel Information (Continued)

Description	Supplemental Information
LAN	
	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates
Line Power	
Frequency, Voltage	50/60/400 Hz for 100 - 120 V 50/60 Hz for 220 - 240 V Power supply is auto switching
Max	350 Watts

Note: Option H08 and Option H11 are not available with the N5230A

Table 23. Analyzer Dimensions and Weight

Description	Supplemental Information		
Cabinet Dimensions			
	Height	**Width**	**Depth**
Excluding front and rear panel hardware and feet	267 mm 10.5 in	426 mm 16.75 in	427 mm 16.8 in
As shipped - includes front panel connectors, rear panel bumpers, and feet.	280 mm 11.0 in	435 mm 17.1 in	470 mm 18.5 in
As shipped plus handles	280 mm 11.0 in	458 mm 18 in	501 mm 19.7 in
As shipped plus rack-mount flanges	280 mm 11.0 in	483 mm 19 in	470 mm 18.5 in
As shipped plus handles and rack-mount flanges	280 mm 11.0 in	483 mm 19 in	501 mm 19.70 in
Weight			
Net			
N5230A	24.9 kg (55 lb), nominal		
Shipping			
N5230A	36.3 kg (80 lb), nominal		

Note: For Regulatory and Environmental information, refer to the PNA Series Installation and Quick Start Guide, located at http://cp.literature.agilent.com/litweb/pdf/E8356-90001.pdf.

Measurement Throughput Summary

- Typical Cycle Time for Measurement Completion
- Cycle Time vs IF Bandwidth
- Cycle Time vs Number of Points
- Data Transfer Time

Table 24. Typical Cycle Time[a] (ms) for Measurement Completion

Description	Typical				
	Number of Points				
	201	**401**	**801**	**1601**	**16,001**
Start 8 GHz, Stop 18 GHz, 30 kHz IF bandwidth					
Uncorrected	97.5	102.7	103.8	108.2	683.9
2-Port cal	203.7	213.5	218.5	234.6	1504.3
Start 10 MHz, Stop 10 GHz, 30 kHz IF bandwidth					
Uncorrected	112.6	120.6	124.8	138.2	738.4
2-Port cal	232.8	251.8	265.2	304.3	1623.4
Start 10 MHz, Stop 20 GHz, 30 kHz IF bandwidth					
Uncorrected	146	199.3	210.9	217.2	753.9
2-Port cal	302.3	410.5	438.7	462.5	1660.5
Start 8 GHz, Stop 18 GHz, 50 kHz IF bandwidth					
Uncorrected	79.1	81	81.7	86.6	482
2-Port cal	164.5	170.3	175.3	193.5	1104.7
Start 10 MHz, Stop 10 GHz, 50 kHz IF bandwidth					
Uncorrected	96.8	101.7	108.8	122.2	524.6
2-Port cal	202.1	215.6	236.7	276.7	1198.8
Start 10 MHz, Stop 20 GHz, 50 kHz IF bandwidth					

Uncorrected	141.6	163.9	170.7	179.7	546.5
2-Port cal	293.6	341	360	389.5	1248.8

a Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S_{11}) measurement.

Table 25. ***(Options 020/025, 120/125, only)*** Cycle Time vs IF Bandwidth

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 10 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Description	Typical Performance	
IF Bandwidth (Hz)	**Cycle Time (ms)[a]**	**Trace Noise (dB rms)**
600,000	7	0.0035
360,000	7	0.0026
280,000	7	0.0022
200,000	7	0.0021
150,000	7	0.0016
100,000	7	0.0012
70,000	7	0.0011
50,000	9	0.0009
30,000	11	0.0008
20,000	14	0.0006
15,000	17	0.0005
10,000	28	0.0004
7000	37	0.0004
5000	48	0.0003

3000	72	0.0003
2000	102	0.0002
1500	130	0.0001
1000	218	0.0001
700	294	0.0001
500	399	0.0001
300	636	0.0001
200	932	0
100	1826	0
30	6004	0
10	17903	0
1	178398	0

a Cycle time includes sweep and retrace time.

Table 26. ***(Options 220/225, 420/425, 520/525 only)*** Cycle Time vs IF Bandwidth

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 10 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Description	**Typical**	
IF Bandwidth (Hz)	**Cycle Time (ms)[a]**	**Cycle Time (ms)** **Option 080 enabled**
250,000	8.9	37.9
200,000	9.3	39.3
150,000	9.9	40.1

100,000	10.5	41.8
70,000	11.5	43.6
50,000	12.8	45.4
30,000	15.4	50
20,000	18.3	53.9
15,000	21	57.5
10,000	27	65.8
7000	34	75.4
5000	48.5	93
3000	72.8	124
2000	108.8	169
1500	126.8	187.1
1000	272.5	
700	357.7	
500	460	
300	697.7	
200	1003.5	
150	1307.8	
100	1917.6	
30	6173.8	
10	18214.8	
1	181699.2	

a Cycle time includes sweep and retrace time.

Table 27. ***(Options 020/025, 120/125, only)*** Cycle Time vs Number of Points

Applies to the Preset condition (correction off) except for the following changes:

- CF = 10 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Description	**Typical Performance**	
IF Bandwidth (Hz)	**Number of Points**	**Cycle Time (ms)[a]**
30,000	3	6.7
	11	7.4
	51	6.9
	101	7.8
	201	11.2
	401	18.3
	801	32.4
	1,601	59.4
	6,401	224.7
	16,001	556.9
100,000	3	6.7
	11	6.6
	51	6.8
	101	7
	201	7.5
	401	9
	801	13.5
	1,601	22.9
	6,401	75.3
	16,001	180.3
600,000	3	6.5
	11	6.6

	51	6.8
	101	6.9
	201	7.3
	401	8.1
	801	9.4
	1,601	12
	6,401	27.7
	16,001	59.3

a Cycle time includes sweep and retrace time.

Table 28. *(Options 220/225, 420/425, 520/525 only)* Cycle Time vs Number of Points

Applies to the Preset condition (correction off) except for the following changes:

- CF = 10 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Description	Typical	
IF Bandwidth (Hz)	**Number of Points**	**Cycle Time (ms)[a]**
30,000	3	8
	11	8
	51	9.38
	101	11.4
	201	15.5
	401	23.6
	801	39.9
	1,601	71.6
	6,401	265.4
	16,001	650.8
50,000	3	7.7
	11	7.7

	51	8.7
	101	10.1
	201	13
	401	18.6
	801	29.8
	1,601	52.3
	6,401	184.5
	16,001	448.8
250,000	101	8.7
	201	9.05
	401	10.85
	801	14.42
	1,601	21.63
	6,401	61.1
	16,001	147.7

a Cycle time includes sweep and retrace time.

Table 29. Data Transfer Time (ms)

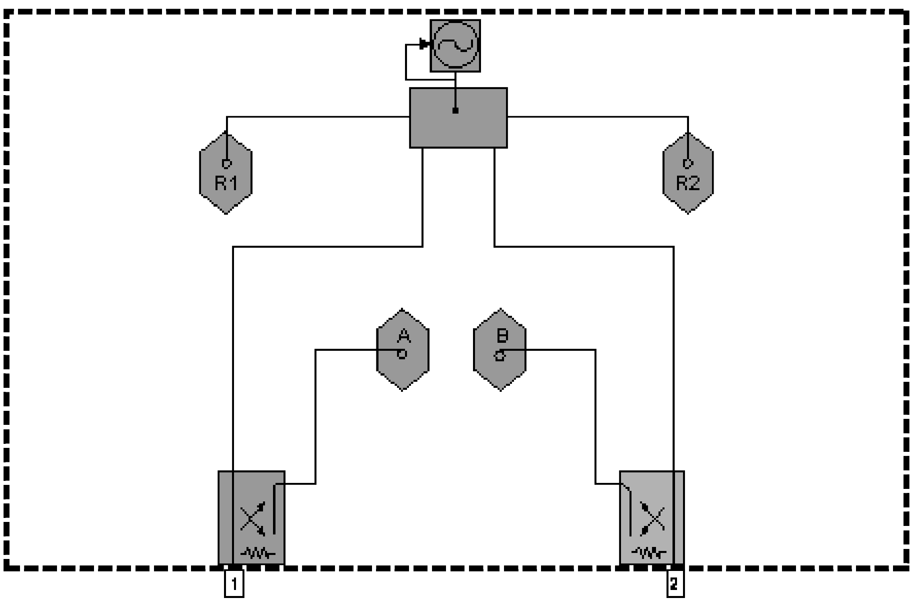
Description	**Typical**			
	Number of Points			
	201	401	1601	16,001
SCPI over GPIB **(program executed on external PC)**				
32-bit floating point	7	12	43	435
64-bit floating point	12	22	84	856
ASCII	64	124	489	5054
SCPI **(program executed in the analyzer)**				
32-bit floating point	1	2	3	30

64-bit floating point	2	2	4	40
ASCII	29	56	222	2220
COM (program executed in the analyzer)				
32-bit floating point	<0.4	0.4	0.5	1.9
Variant type	0.7	1	3	32
DCOM over LAN **(program executed on external PC)**				
32-bit floating point	<0.8	1	1.5	7.1
Variant type	1.8	2.7	8.5	80

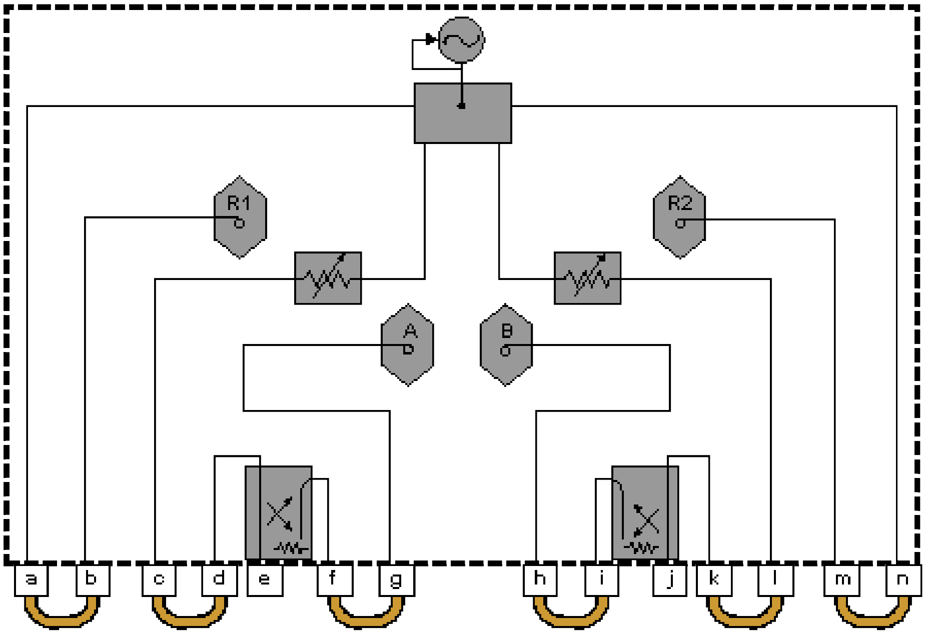
Tables 30 - 35 Front-panel Jumper Specs (Options 025, 125, 225, 425, 525)

Test Set Block Diagrams

N5230A Option 020, or 120, or 220, or 420, or 520 (Standard Test Set and Standard Power Range)



N5230A Option 025, or 125, or 225, or 425, or 525 (Configurable Test Set and Extended Power Range)



Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

Last modified:

Jan. 10, 2007 Updated line power; moved regulatory, operating, and non-operating info to I&QS Guide.

Technical Specifications for the N5230A

Options 140/145/146/240/245/246 (4-Port PNA-L)

Rev. 2007-01-10

This is a complete list of the N5230A Options 140, 145, 146, 240, 245, 246 network analyzer technical specifications.

- To optimize viewing of uncertainty curves, click the Maximize button.
- To view or print the .pdf version of the specifications, visit our web site at www.agilent.com , and search for "Technical Specifications for the N5230A".
- This N5230A document provides technical specifications for the 85052B calibration kit and the N4433A ECal module. Please download our free Uncertainty Calculator from http://www.agilent.com/find/na_calculator to generate the curves for your calibration kit and PNA setup.

See Specs for other PNA models

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and 90 minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable) errors.

Corrected (residual): Indicates performance after e rror c orrection (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration .

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the N5230A analyzer with the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Isolation calibration with an averaging factor of 8

- **System Dynamic Range**
- **Extended Dynamic Range**
- **3.5mm Connectors**

Table 1. System Dynamic Range at Test Port [1]

Description	Specification (dB) at Test Port	Typical (dB) at Test Port
Standard configuration and standard power range (Options 140 or 240)		
300 KHz to 10 MHz[2]	--	108 dB
10 MHz to 4 GHz[2]	120 dB	128 dB
4 GHz to 6 GHz	118 dB	129 dB
6 GHz to 10.5 GHz	115 dB	127 dB
10.5 GHz to 13.5 GHz	107 dB	119 dB
13.5 GHz to 15 GHz	107 dB	119 dB
15 GHz to 20 GHz	103 dB	116 dB
Configurable test set and extended power range (Options 145 or 245) **Configurable test set, extended power range, and internal second source (Option 146 or 246)**		
300 KHz to 10 MHz[2]	--	108 dB
10 MHz to 4 GHz[2]	120 dB	128 dB
4 GHz to 6 GHz	118 dB	128 dB
6 GHz to 10.5 GHz	113 dB	125 dB
10.5 GHz to 13.5 GHz	105 dB	117 dB
13.5 GHz to 15 GHz	105 dB	117 dB
15 GHz to 20 GHz	98 dB	115 dB

1 The system dynamic range is calculated as the difference between the noise floor and the specified source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account.

2 May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Table 2. Extended Dynamic Range at Direct Receiver Access Input [1]

Configurable test set and extended power range (Options 145/245) **Configurable test set, extended power range, and internal second source (Options 146/246)**		
	Specification (dB)	**Typical (dB)**
300 KHz to 10 MHz[2]	--	124 dB
10 MHz to 4 GHz[2]	136 dB	--
4 GHz to 6 GHz	134 dB	--
6 GHz to 10.5 GHz	129 dB	--
10.5 GHz to 13.5 GHz	121 dB	--
13.5 GHz to 15 GHz	121 dB	
15 GHz to 20 GHz	114 dB	--

1 The direct receiver access input extended dynamic range is calculated as the difference between the direct receiver access input noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exceed its compression or damage level. When the analyzer is in segment sweep mode, it can have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with high insertion loss), and reduced power when receiver compression or damage may occur (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

2 May be degraded by 10 dB at particular frequencies (multiples of 5 MHz) below 500 MHz due to spurious receiver residuals. Methods are available to regain the full dynamic range.

Corrected System Performance with 3.5mm Connectors (Tables 3 - 4)

Receiver Dynamic Range technical specifications are not provided in this N5230A specs document.

Table 5. Uncorrected System Performance [1]

Description	**Specification**	**Typical**
	Options 140/ 145/ 146/ 240/ 245/ 246	**Options 140/ 145/ 146/ 240/ 245/ 246**
Directivity		
300 KHz to 10 MHz	--	-23 dB
10 MHz to 1 GHz	-28 dB	--

1 GHz to 3 GHz	-25 dB	--
3 GHz to 5 GHz	-20 dB	--
5 GHz to 11.5 GHz	-17 dB	--
11.5 GHz to 13.5 GHz	-15 dB	
13.5 GHz to 20 GHz	-15 dB	--
Source Match		
300 KHz to 10 MHz	--	-8 dB
10 MHz to 1 GHz	-12 dB	--
1 GHz to 3 GHz	-12 dB	--
3 GHz to 5 GHz	-12 dB	--
5 GHz to 10.5 GHz	-12 dB	--
10.5 GHz to 11.5 GHz	-10 dB	--
11.5 GHz to 13.5 GHz	-8 dB	
13.5 GHz to 20 GHz	-8 dB	--
Load Match		
300 KHz to 10 MHz	--	-9 dB
10 MHz to 1 GHz	-20 dB	--
1 GHz to 3 GHz	-20 dB	--
3 GHz to 5 GHz	-18 dB	--
5 GHz to 11.5 GHz	-12 dB	--
11.5 GHz to 13.5 GHz	-7 dB	
13.5 GHz to 16 GHz	-7 dB	--
16 GHz to 20 GHz	-7.5 dB	--
Crosstalk[2]		
300 KHz to 5 MHz	--	-70 dB

5 MHz-10 MHz	--	-100 dB
10 MHz to 45 MHz	--	-110 dB
45 MHz to 4 GHz	--	-122 dB
4 GHz to 6 GHz	--	-123 dB
6 GHz to 10.5 GHz	--	-120 dB
10.5 GHz to 13.5 GHz	--	-115 dB
13.5 GHz to 15 GHz		-115 dB
15 GHz to 20 GHz	--	-110 dB

1 Specifications apply over environmental temperature of 25 °C ±5 °C, with less than 1°C variation from the calibration temperature.

2 Measurement conditions: normalized to a thru, measured with two shorts, 10 Hz IF bandwidth, averaging factor of 8, alternate mode, source power set to the lesser of the maximum power out or the maximum receiver power.

Table 6. Test Port Output [1]

Description	Specification		Typical	
	Opt 140/ 240	**Opt 145/ 146/ 245/ 246**	**Opt 140/ 240**	**Opt 145/ 1 245/ 246**
Frequency Range				
Options 140/ 145/ 146	300 KHz to 13.5 GHz		--	
Options 240/ 245/ 246	300 KHz to 20 GHz		--	
Nominal Power				
	-5 dBm	-8 dBm	Preset power; attenuator switch point 10 dB below nominal power	
Frequency Resolution				
	1 Hz		--	
CW Accuracy				
	+/-1 ppm		--	

Description	Specification		Typical	
Frequency Stability				
	--		+/-0.05 ppm. -10&#176 to 70&#176 C +/-0.1 ppm/yr maximum	
Description	**Specification**		**Typical**	
	Opt 140/ 240	**Opt 145/ 146/ 245/ 246**	**Opt 140/ 240**	**Opt 145/ 1 245/ 24**
Power Level Accuracy				
Variation from nominal power in range 0				
300 KHz to 10 MHz	--	--	+/-1.0 dB	+/-1.0 d
10 MHz to 2 GHz	+/-1.0 dB	+/-1.0 dB	--	--
2 GHz to 10.5 GHz	+/-1.5 dB	+/-1.5 dB	--	--
10.5 GHz to 13.5 GHz	+/-2.5 dB	+/-2.5 dB	--	--
13.5 GHz to 20 GHz	+/-2.5 dB	+/-2.5 dB	--	--
Max Leveled Power				
300 KHz to 10 MHz	--	--	+5 dBm	+5 dBm
10 MHz to 4 GHz	+8 dBm	+8 dBm	+12 dBm	+11 dB
4 GHz to 6 GHz	+6 dBm	+6 dBm	+10 dBm	+9 dBm
6 GHz to 10.5 GHz	+3 dBm	+1 dBm	+8 dBm	+6 dBm
10.5 GHz to 13.5 GHz	0 dBm	-2 dBm	+5 dBm	+3 dBm
13.5 GHz to 15 GHz	0 dBm	-2 dBm	+5 dBm	+3 dBm
15 GHz to 20 GHz	-3 dBm	-8 dBm	+2 dBm	-1 dBm
Power Level Linearity				
Refer to footnote 1.				
300 KHz to 10 MHz	--	--	+/-2.0 dB	+/-2.0 d
10 MHz to 1 GHz	+/-2.0 dB	+/-2.0 dB	--	--

1 GHz to 13.5 GHz	+/-1.5 dB	+/-1.5 dB	--	--
13.5 GHz to 20 GHz	+/-1.5 dB	+/-1.5 dB	--	--
Power Sweep Range (ALC)				
ALC range starts at maximum leveled power and decreases by the dB amount specified here.				
300 KHz to 10 MHz	--	--	32 dB	32 dB
10 MHz to 4 GHz	33 dB	33 dB	--	--
4 GHz to 6 GHz	31 dB	31 dB	--	--
6 GHz to 10.5 GHz	28 dB	26 dB	--	--
10.5 GHz to 13.5 GHz	25 dB	23 dB	--	--
13.5 GHz to 15 GHz	25 dB	23 dB	--	--
15 GHz to 20 GHz	22 dB	17 dB	--	--
Description	**Specification**		**Typical**	
	Opt 140/ 240	**Opt 145/ 146/ 245/ 246**	**Opt 140/ 240**	**Opt 145/ 1 245/ 246**
Power Resolution				
	0.01 dB	0.01 dB	--	--
Power Range				
300 KHz to 10 MHz	--	--	-27 to +5 dBm	-87 to +5 dI
10 MHz to 45MHz	--	--	-27 to +12 dBm	-87 to +11 c
45 MHz to 4 GHz	--	--	-27 to +12 dBm	-87 to +11 c
4 GHz to 6 GHz	--	--	-27 to +10 dBm	-87 to +9 dI
6 GHz to 10.5 GHz	--	--	-27 to +8 dBm	-87 to +6 dI

10.5 GHz to 13.5 GHz	--	--	-27 to +5 dBm	-87 to +3 dB
13.5 GHz to 15 GHz	--	--	-27 to +5 dBm	-87 to +3 dB
15 GHz to 20 GHz	--	--	-27 to +2 dBm	-87 to -1 dB
Power Settings				
Minimum Power Setting	--	--	-30 dBm	-90 dBm
Maximum Power Setting	--	--	+20 dBm	+20 dBm
Harmonics (2nd or 3rd) at Maximum Output Power				
In-band Source Harmonics				
300 KHz to 10 MHz	--	--	-17 dBc	
10 MHz to 1 GHz	--	--	-17 dBc	
1 GHz to 13.5 GHz	--	--	-20 dBc	
13.5 GHz to 20 GHz	--	--	-20 dBc	
Non-Harmonic Spurious (at Nominal Output Power)				
300 KHz to 13.5 GHz	--	--	-50 dBc for offset frequen 1 KHz	
13.5 GHz to 20 GHz	--	--	-50 dBc for offset frequen 1 KHz	

1 For Options 140/145/240/245, performance is specified on Port 1 only; Ports 2, 3, and 4 performance is typical. For Options 146/246, performance is specified on Ports 1 and 3 only; Ports 2 and 4 performance is typical. Test reference is at the nominal power level.

Table 6. Test Port Output (Continued)			
Phase Noise (Nominal power at test port)	**Typical Performance**		
	Options 140/145/146/240/245/246		
	10 kHz Offset	**100 kHz Offset**	**1 MHz Offset**
300 KHz to 10 MHz	-86 dBc/Hz	-86 dBc/Hz	-95 dBc/Hz
10 MHz to 1.5 GHz	-86 dBc/Hz	-91 dBc/Hz	-95 dBc/Hz
1.5 GHz to 3.125 GHz	-83 dBc/Hz	-91 dBc/Hz	-95 dBc/Hz
3.125 GHz to 6.25 GHz	-77 dBc/Hz	-85 dBc/Hz	-89 dBc/Hz
6.25 GHz to 12.5 GHz	-71 dBc/Hz	-79 dBc/Hz	-83 dBc/Hz
12.5 GHz to 13.5 GHz	-65 dBc/Hz	-73 dBc/Hz	-77 dBc/Hz
13.5 GHz to 20 GHz	-65 dBc/Hz	-73 dBc/Hz	-77 dBc/Hz

Table 7. Test Port Input

Description	**Specification**	**Typical**
	Opt 140/ 145/ 146/ 240/ 245/ 246	**Opt 140/ 145/ 146/ 240/ 245/ 246**
Test Port Noise Floor		
Total average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.		
10 Hz IF Bandwidth		
300 KHz to 10 MHz	--	<-103 dBm
10 MHz to 500 MHz	<-112 dBm	<-116 dBm
500 MHz to 4 GHz	<-112 dBm	<-120 dBm
4 GHz to 10.5 GHz	<-112 dBm	<-119 dBm

10.5 GHz to 13.5 GHz	<-107 dBm	<-114 dBm
13.5 GHz to 15 GHz	<-107 dBm	<-114 dBm
15 GHz to 20 GHz	<-106 dBm	<-114 dBm
1 KHz IF Bandwidth		
300 KHz to 10 MHz	--	<-83 dBm
10 MHz to 500 MHz	<-92 dBm	<-96 dBm
500 MHz to 4 GHz	<-92 dBm	<-100 dBm
4 GHz to 10.5 GHz	<-92 dBm	<-99 dBm
10.5 GHz to 13.5 GHz	<-87 dBm	<-94 dBm
13.5 GHz to 15 GHz	<-87 dBm	<-94 dBm
15 GHz to 20 GHz	<-86 dBm	<-94 dBm
Direct Receiver Access Input Noise Floor (Options 145/ 146/ 245/ 246)		
Total average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.		
10 Hz IF Bandwidth		
300 KHz to 10 MHz	--	<-119 dBm
10 MHz to 500 MHz	<-128 dBm	<-132 dBm
500 MHz to 4 GHz	<-128 dBm	<-136 dBm
4 GHz to 10.5 GHz	<-128 dBm	<-135 dBm
10.5 GHz to 13.5 GHz	<-123 dBm	<-130 dBm
13.5 GHz to 15 GHz	<-123 dBm	<-130 dBm
15 GHz to 20 GHz	<-122 dBm	<-130 dBm
1 KHz IF Bandwidth		
300 KHz to 10 MHz	--	<-99 dBm
10 MHz to 500 MHz	<-108 dBm	<-112 dBm
500 MHz to 4 GHz	<-108 dBm	<-116 dBm

4 GHz to 10.5 GHz	<-108 dBm	<-115 dBm
10.5 GHz to 13.5 GHz	<-103 dBm	<-110 dBm
13.5 GHz to 15 GHz	<-103 dBm	<-110 dBm
15 GHz to 20 GHz	<-102 dBm	<-110 dBm

Description	**Specification**		**Typical**	
	Opt 140/ 145/ 146/ 240/ 245/ 246		**Opt 140/ 145/ 146/ 240/ 245/ 246**	
Compression Level (at +8 dBm except as noted)				
	Power	**Com-pression**	**Power**	**Com-pression**
300 KHz to 10 MHz	--	--	+5 dBm	0.10 dB
10 MHz to 50 MHz	+8 dBm	0.35 dB	--	--
50 MHz to 1 GHz	+8 dBm	0.35 dB	--	--
1 GHz to 8 GHz	+8 dBm	0.25 dB	--	--
8 GHz to 12.5 GHz	+8 dBm	0.30 dB	--	--
12.5 GHz to 13.5 GHz	+8 dBm	0.55 dB	--	--
13.5 GHz to 20 GHz	+8 dBm	0.55 dB	--	--
Test Port Compression - 0.1 dB				
300 KHz to 10 MHz	--	--	+5 dBm	--
10 MHz to 1 GHz	--	--	+9 dBm	--
1 GHz to 12.5 GHz	--	--	+10 dBm	--
12.5 GHz to 13.5 GHz	--	--	+9 dBm	--
13.5 GHz to 20 GHz	--	--	+9 dBm	--

Table 7. Test Port Input (Continued)

Description	Specification			Typical		
	Opt 140/ 240	**Opt 145/ 245**	**Opt 146/ 246**	**Opt 140/ 240**	**Opt 145/ 245**	**Opt 146/ 246**
Trace Noise Magnitude						
Ratioed measurement, nominal power at test port.						
100 KHz IF bandwidth						
300 KHz to 10 MHz	--	--	--	.015 dB rms	.030 dB rms	.050 dB rms
10 MHz to 10.5 GHz	.006 dB rms	.008 dB rms	.016 dB rms	.004 dB rms	.005 dB rms	.013 dB rms
10.5 GHz to 13.5 GHz	.010 dB rms	.014 dB rms	.038 dB rms	.007 dB rms	.009 dB rms	.026 dB rms
10.5 GHz to 20 GHz	.010 dB rms	.014 dB rms	.038 dB rms	.007 dB rms	.009 dB rms	.026 dB rms
600 KHz IF bandwidth						
300 KHz to 10 MHz	--	--	--	.015 dB rms	.030 dB rms	.050 dB rms
10 MHz to 10.5 GHz	--	--	--	.013 dB rms	.015 dB rms	.032 dB rms
10.5 GHz to 13.5 GHz	--	--	--	.017 dB rms	.023 dB rms	.063 dB rms
13.5 GHz to 20 GHz	--	--	--	.017 dB rms	.023 dB rms	.063 dB rms
100 KHz IF bandwidth						
Measured at Maximum Specified Power						
300 KHz to 10 MHz	--	--	--	.005 dB rms	.010 dB rms	.012 dB rms
10 MHz to 2 GHz	--	--	--	.001 dB rms	.003 dB rms	.004 dB rms

2 GHz to 10.5 GHz	--	--	--	.002 dB rms	.003 dB rms	.004 dB rms
10.5 GHz to 13.5 GHz	--	--	--	.006 dB rms	.009 dB rms	.023 dB rms
13.5 GHz to 20 GHz	--	--	--	.006 dB rms	.009 dB rms	.023 dB rms
Trace Noise Phase						
Ratioed measurement, nominal power at test port.						
100 KHz IF bandwidth						
300 KHz to 10 MHz	--	--	--	0.110 deg rms	0.180 deg rms	0.280 deg rms
10 MHz to 10.5 GHz	0.05 deg rms	0.07 deg rms	0.13 deg rms	0.025 deg rms	0.035 deg rms	0.090 deg rms
10.5 GHz to 13.5 GHz	0.08 deg rms	0.10 deg rms	0.250 deg rms	0.050 deg rms	0.060 deg rms	0.170 deg rms
13.5 GHz to 20 GHz	0.08 deg rms	0.10 deg rms	0.250 deg rms	0.050 deg rms	0.060 deg rms	0.170 deg rms
600 KHz IF bandwidth						
300 KHz to 10 MHz	--	--	--	0.110 deg rms	0.180 deg rms	0.300 deg rms
10 MHz to 10.5 GHz	--	--	--	0.080 deg rms	0.100 deg rms	0.200 deg rms
10.5 GHz to 13.5 GHz	--	--	--	0.120 deg rms	0.160 deg rms	0.430 deg rms
13.5 GHz to 20 GHz	--	--	--	0.120 deg rms	0.160 deg rms	0.430 deg rms
100 KHz IF bandwidth						
Measured at Maximum Specified Power						
300 KHz to 10 MHz	--	--	--	0.040 deg rms	0.050 deg rms	0.075 deg rms

10 MHz to 2 GHz	--	--	--	0.007 deg rms	0.012 deg rms	0.013 deg rms
2 GHz to 10.5 GHz	--	--	--	0.012 deg rms	0.015 deg rms	0.030 deg rms
10.5 GHz to 13.5 GHz	--	--	--	0.040 deg rms	0.060 deg rms	0.150 deg rms
13.5 GHz to 20 GHz	--	--	--	0.040 deg rms	0.060 deg rms	0.150 deg rms
Stability Magnitude						
Stability is defined as a ratio measurement made at the test port.						
300 KHz to 10 MHz	--	--	--	+/-0.015 dB/&#176C		
10 MHz to 2 GHz	--	--	--	+/-0.010 dB/&#176C		
2 GHz to 4 GHz	--	--	--	+/-0.015 dB/&#176C		
4 GHz to 13.5 GHz	--	--	--	+/-0.020 dB/&#176C		
13.5 GHz to 16 GHz	--	--	--	+/-0.020 dB/&#176C		
16 GHz to 19 GHz	--	--	--	+/-0.025 dB/&#176C		
19 GHz to 20 GHz	--	--	--	+/-0.030 dB/&#176C		
Stability Phase						
Stability is defined as a ratio measurement made at the test port.						
300 KHz to 10 MHz	--	--	--	+/-0.360&#176/&#176C		
10 MHz to 45 MHz	--	--	--	+/-0.020/&#176C		
45 MHz to 500 MHz	--	--	--	+/-0.030&#176/&#176C		

500 MHz to 2 GHz	--	--	--	+/- 0.050&#176/&#176C	+/- 0.07&#176/&#176C
2 GHz to 4 GHz	--	--	--	+/- 0.100&#176/&#176C	+/-0.150°/°C
4 GHz to 8 GHz	--	--	--	+/- 0.150&#176/&#176C	+/-0.250°/°C
8 GHz to 13.5 GHz	--	--	--	+/- 0.300&#176/&#176C	+/-0.500°/°C
13.5 GHz to 16 GHz	--	--	--	+/- 0.300&#176/&#176C	+/-0.500°/°C
16 GHz to 20 GHz	--	--	--	+/- 0.350&#176/&#176C	+/-0.650°/°C

Table 7. Test Port Input (Continued)

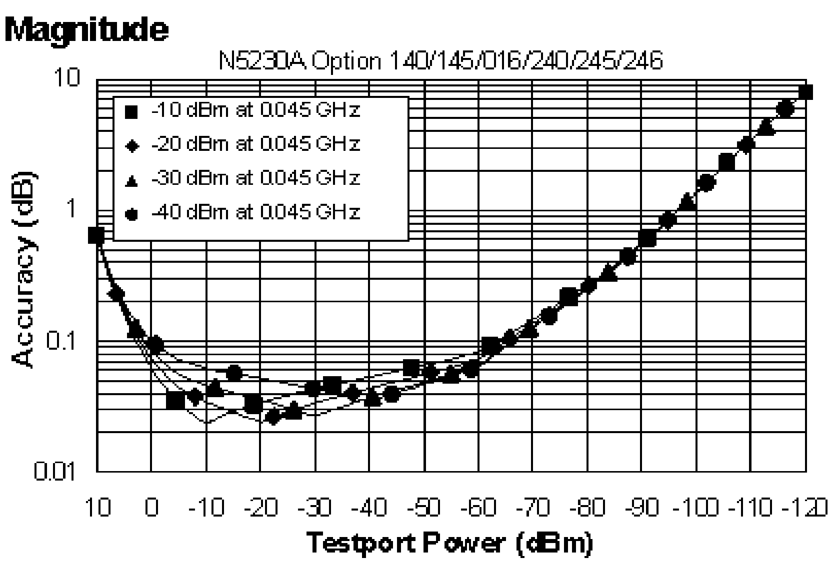
Description	**Specification**		**Typical**	
	Options 140/ 240	**Opt 145/ 146/ 245/ 246**	**Opt 140/ 240**	**Opt 145/ 146/ 245/ 246**
Reference Level Magnitude				
Range	+/-200 dB	+/-200 dB	--	--
Resolution	0.001dB	0.001dB	--	--
Reference Level Phase				
Range	+/-500&#176	+/-500&#176	--	--
Resolution	0.01&#176	0.01&#176	--	--

Table 7. Test Port Input (Continued)		
	Typical Performance	
Damage Input Level	**Opt 140/ 240**	**Opt 145/ 146/ 245/ 246**
Test Port 1,2,3, and 4	+27 dBm or +/-16 VDC	+27 dBm or +/-16 VDC
Receivers R,A,B,C,D	--	+15 dBm or +/-16 VDC
Source out (reference)	--	+27 dBm or +/-16 VDC
Source out (test ports)	--	+27 dBm or +/-16 VDC
Coupler Thru	--	+27 dBm or +/-16 VDC
Coupler Arm	--	+15 dBm or +/-0 VDC

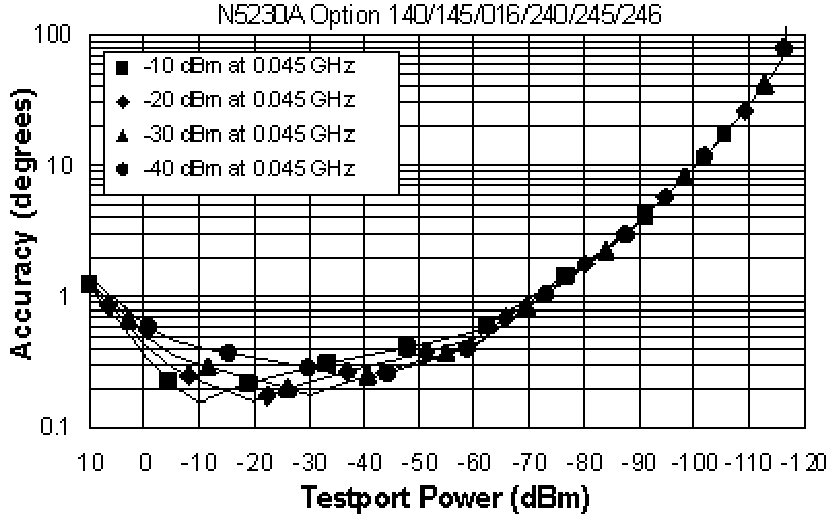
Table 8. Dynamic Accuracy (Specification [a])

Accuracy of the test port input power reading relative to the reference input power level.

Dynamic Accuracy, 0.045 GHz

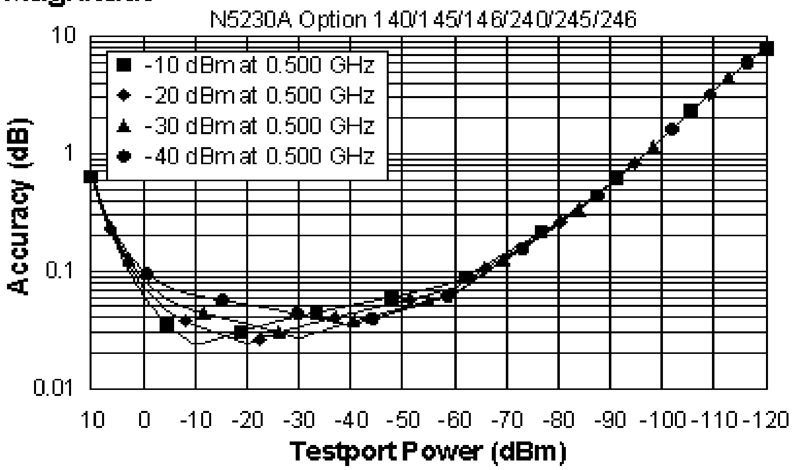


Phase

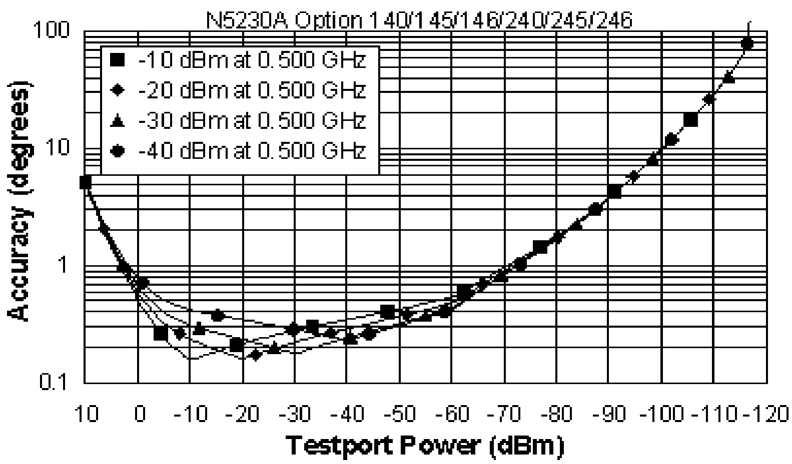


Dynamic Accuracy, 0.500 GHz

Magnitude

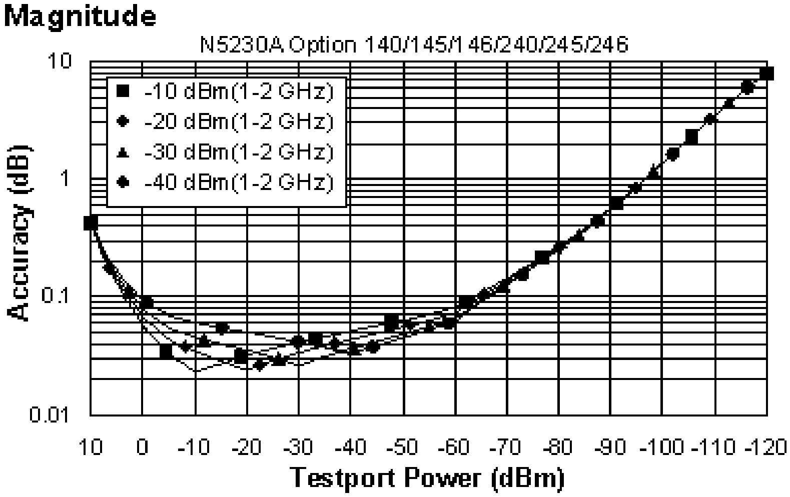


Phase

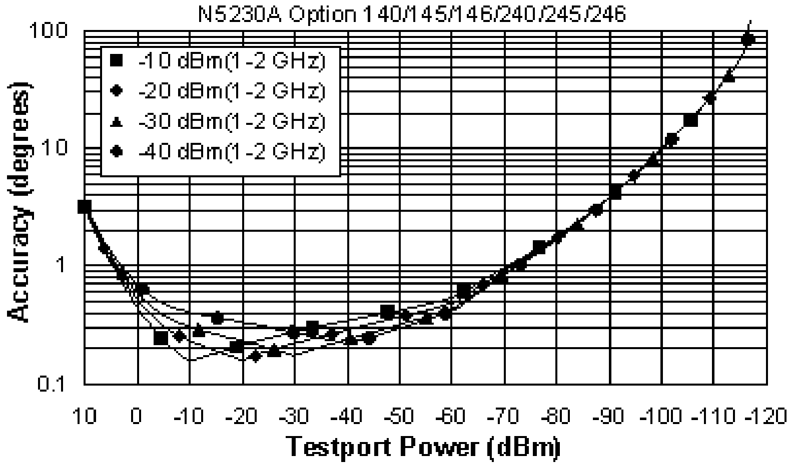


Dynamic Accuracy, 1- 2 GHz

Magnitude

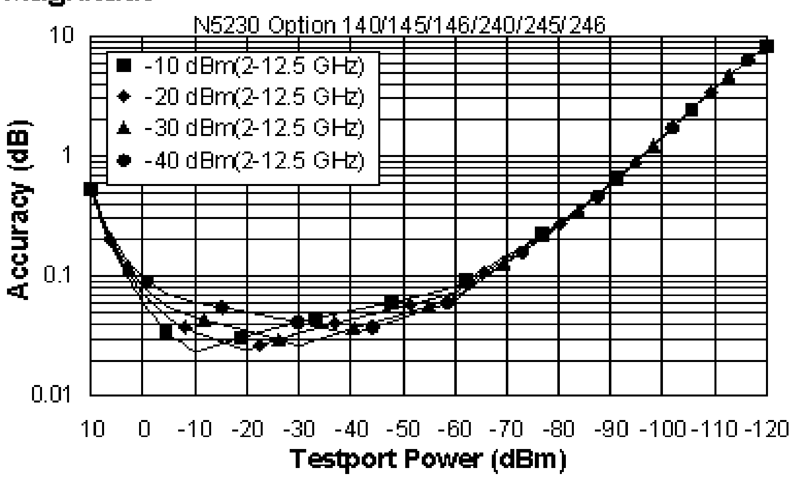


Phase

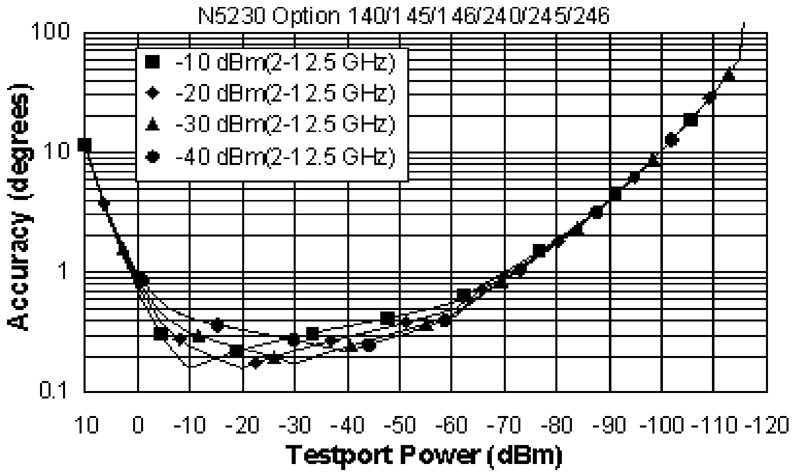


Dynamic Accuracy, 2 - 12.5 GHz

Magnitude

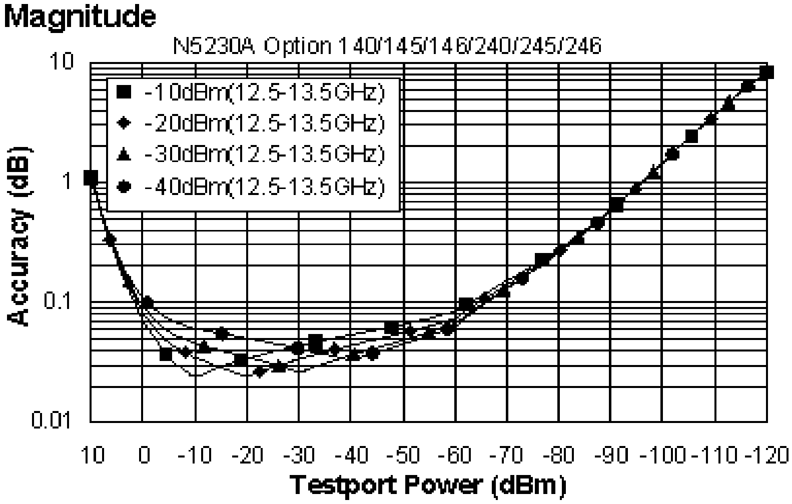


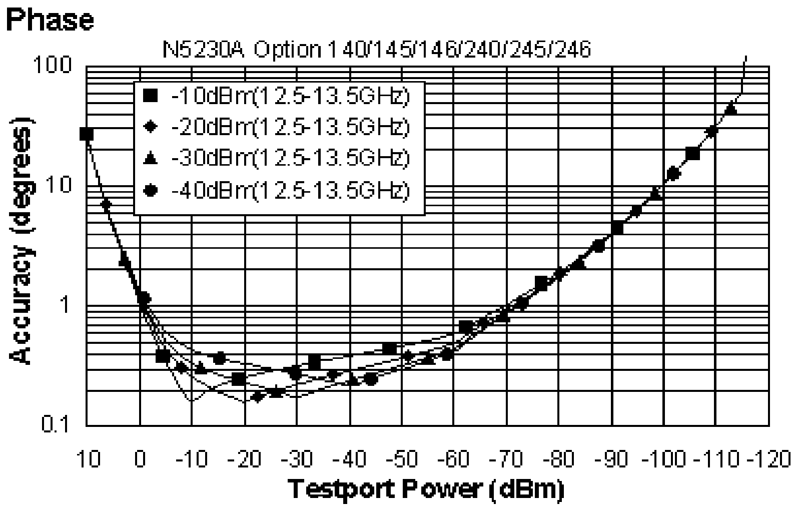
Phase



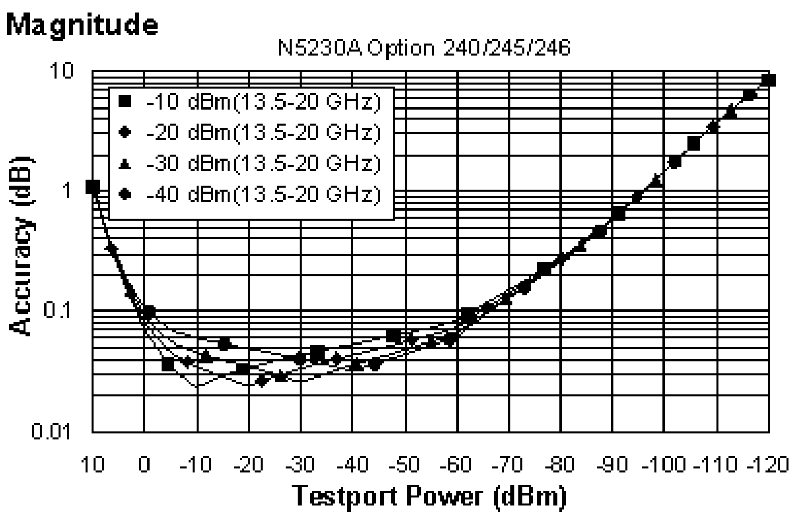
Dynamic Accuracy, 12.5 -13.5 GHz

Magnitude

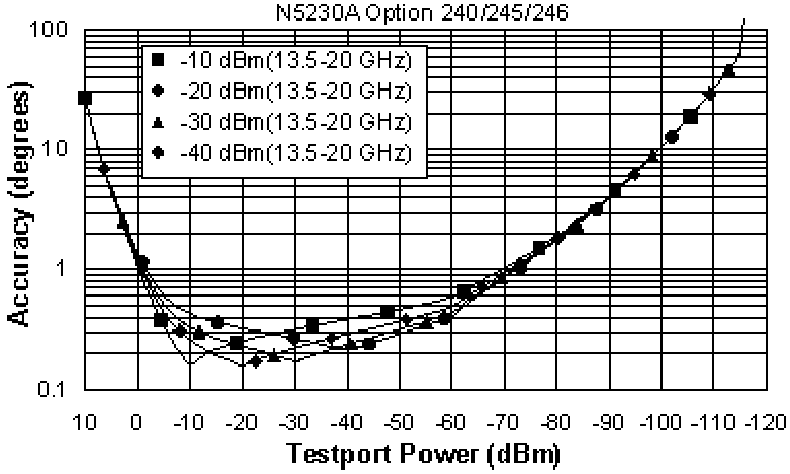




Dynamic Accuracy, 13.5 -20 GHz



Phase

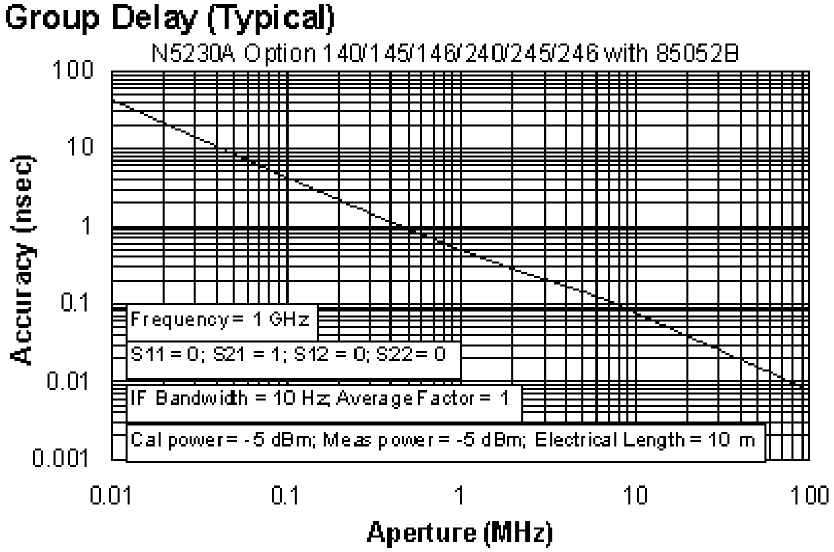


a Dynamic accuracy is verified with the following measurements:

- compression over frequency
- IF linearity at a single frequency of 1.195 GHz using a reference level of -20 dBm for an input power range of 0 to -110 dBm.

Table 9. Test Port Input (Group Delay) [a]

Description	**Supplemental Information (typ.)**
Aperture (selectable)	(frequency span)/(number of points -1)
Maximum Aperture	20% of frequency span
Range	0.5 x (1/minimum aperture)
Maximum Delay	Limited to measuring no more than 180° of phase change within the minimum aperture.)
Accuracy	See graph below. Char.
The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is assumed to be < 2 dB and electrical length to be ten meters. For any S_{ij} Group Delay measurement, S_{ii} = 0, S_{ij} = 1, S_{ji} = 0, S_{kl} = 0 for all kl ≠ ij	



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst case phase accuracy.

a Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and the number of points per sweep).

General Information

- **Miscellaneous Information**
- **Front Panel**
- **Rear Panel**
- **Environment and Dimensions**

Table 10. Miscellaneous Information

Description	Supplemental Information
System IF Bandwidth Range	1 Hz to 600 kHz, nominal
CPU	Intel® 1.1 GHz Pentium® M with 1 GByte RAM

Table 11. Front Panel Information

Description	Supplemental Information
RF Connectors	
Type	Options 140/ 145/ 146/ 240/ 245/ 246: 3.5 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
Display	
Note: The PNA display must remain in the 16 bit color setting in order to comply with international emissions regulations.	
Size	21.3 cm (8.4 in) diagonal color active matrix LCD; 640 (horizontal) X 480 (vertical) resolution
Refresh Rate	Vertical 59.83 Hz; Horizontal 31.41 kHz
Pixels	When running the analyzer's built-in Display Test , one or more of the following symptoms indicate a faulty display assembly: • A complete row or column of "stuck on" or "dark" pixels. • More than six "stuck on" pixels (but not more than three green) • More than twelve "dark" pixels (but not more than seven of the same color) • Two or more consecutive "stuck on" pixels or three or more consecutive "dark" pixels (but no more than one set of two consecutive "dark" pixels) • "Stuck on" or "dark" pixels less than 6.5 mm apart (excluding consecutive pixels)
Display Range	
Magnitude	±500 dB (at 20 dB/div), max
Phase	±500°, max
Polar	10 pUnits, min 1000 Units, max
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	0.01 mUnit, min; 0.01°,min

Table 12. Rear Panel Information

Description	**Supplemental Information**
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, Typical
Input Level	-15 dBm to +20 dBm, Typical
Input Impedance	200 Ω , nom.
10 MHz Reference Out	
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, Typical
Signal Type	Sine Wave, Typical
Output Level	+10 dBm ± 4 dB into 50 Ω , Typical
Output Impedance	50 Ω , nominal
Harmonics	<-40 dBc, Typical
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported	**Resolutions:**
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480
Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowed, but with 640 X 480 resolution only. If you change resolution, you can only view the external display (internal display will "white out").
Test Set IO	
	25-pin D-Sub connector, female, available for external test set control
Aux IO	
	25-pin D-Sub connector, male, analog and digital IO
Handler IO	
	36-pin parallel I/O port; all input/output signals are default set to negative logic; can be reset to positive logic via GPIB command female.

GPIB (two ports - dedicated controller and dedicated talker/listener)	
	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	
	25-pin D-Sub miniature connector, female; provides connection to printers or any other parallel port peripherals
Serial Port (COM 1)	
	9-pin D-Sub, male; compatible with RS-232
USB Port	
	One port on front panel and five ports on rear panel. Universal Serial Bus jack, Type A configuration (4 contacts inline, contact 1 on left); female
Contact 1	Vcc: 4.75 to 5.25 VDC, 500 mA, maximum
Contact 2	-Data
Contact 3	+Data
Contact 4	Ground
LAN	
	10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates
Line Power	
Frequency, Voltage	50/60/400 Hz for 100 - 120 V 50/60 Hz for 220 - 240 V Power supply is auto switching
Max	350 Watts

Note : Option H08 and Option H11 are not available with the N5230A network analyzer.

Table 13. Analyzer Dimensions and Weight

Description	Supplemental Information

Cabinet Dimensions			
	Height	Width	Depth
Excluding front and rear panel hardware and feet	267 mm 10.5 in	426 mm 16.75 in	427 mm 16.8 in
As shipped - includes front panel connectors, rear panel bumpers, and feet.	280 mm 11.0 in	435 mm 17.1 in	470 mm 18.5 in
As shipped plus handles	280 mm 11.0 in	458 mm 18 in	501 mm 19.7 in
As shipped plus rack-mount flanges	280 mm 11.0 in	483 mm 19 in	470 mm 18.5 in
As shipped plus handles and rack-mount flanges	280 mm 11.0 in	483 mm 19 in	501 mm 19.70 in
Weight			
Net	24.9 kg (55 lb), nominal		
Shipping	36.3 kg (80 lb), nominal		

Note: For Regulatory and Environmental information, refer to the PNA Series Installation and Quick Start Guide, located online at http://cp.literature.agilent.com/litweb/pdf/E8356-90001.pdf.

Measurement Throughput Summary

- **Typical Cycle Time for Measurement Completion**
- **Cycle Time vs IF Bandwidth**
- **Cycle Time vs Number of Points**
- **Data Transfer Time**

Table 14. Typical Cycle Time [a] (ms) for Measurement Completion

Description	Typical Performance				
	Number of Points				
	201	**401**	**801**	**1601**	**16,001**
Start 8 GHz, Stop 18 GHz, 600 kHz IF bandwidth					
Uncorrected	21.148	21.743	23.01	25.198	54.836
4-Port cal	74.597	82.296	296.5	307.75	538.646

Start 300 kHz, Stop 10 GHz, 600 kHz IF bandwidth					
Uncorrected	19.814	22.801	24.973	29.01	67.733
4-Port cal	69.752	85.111	100.125	129.347	480.711
Start 300 kHz, Stop 20 GHz, 600 kHz IF bandwidth					
Uncorrected	32.575	34.7	39.237	43.155	69.625
4-Port cal	121.254	133.626	157.506	179.223	487.779
Start 8 GHz, Stop 18 GHz, 100 kHz IF bandwidth					
Uncorrected	38.083	51.816	55.488	56.36	184.154
4-Port cal	143.271	201.814	215.056	230.133	934.161
Start 300 kHz, Stop 10 GHz, 100 kHz IF bandwidth					
Uncorrected	37.03	42.532	45.122	46.729	198.683
4-Port cal	137.431	162.37	194.13	192.182	906.768
Start 300 kHz, Stop 20 GHz, 100 kHz IF bandwidth					
Uncorrected	44.98	69.408	87.161	92.475	198.792
4-Port cal	169.041	268.877	343.898	369.526	914.963
Start 8 GHz, Stop 18 GHz, 50 kHz IF bandwidth					
Uncorrected	42.171	70.09	88.702	90.981	371.611
4-Port cal	157.107	271.791	351.517	368.02	1532.609
Start 300 kHz, Stop 10 GHz, 50 kHz IF bandwidth					
Uncorrected	43.713	61.41	66.878	69.373	385.04
4-Port cal	163.58	238.267	259.687	279.816	1580.761
Start 300 kHz, Stop 20 GHz, 50 kHz IF bandwidth					
Uncorrected	48.673	80.798	124.605	147.303	388.46
4-Port cal	184.429	313.392	493.142	587.548	1587.839

a Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S_{11}) measurement.

Table 15. Cycle Time vs IF Bandwidth

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 10 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Description	Typical Performance	
IF Bandwidth (Hz)	**Cycle Time (ms)** [a]	**Trace Noise**
600,000	3.13	0.00544
360,000	3.21	0.00602
280,000	3.17	0.00321
200,000	3.17	0.00259
150,000	3.19	0.00207
100,000	4.05	0.00155
70,000	4.99	0.00144
50,000	6.41	0.00121
30,000	8.78	0.00094
20,000	12.07	0.00080
15,000	14.91	0.00069
10,000	26.02	0.00052
7000	34.54	0.00047
5000	45.87	0.00044
3000	69.91	0.00032
2000	99.69	0.00029
1500	128.18	0.00010
1000	215.62	0.00009

700	291.58	0.00006
500	397.36	0.00007
300	633.86	0.00000
200	930.15	0.00000
100	1824.19	0.00000
30	6001.70	0.00000
10	17899.79	0.00000
1	178391.58	0.00000

a Cycle time includes sweep and retrace time.

Table 16. Cycle Time vs Number of Points

Applies to the Preset condition (correction off) except for the following changes:

- CF = 10 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Description	**Typical Performance**	
IF Bandwidth (Hz)	**Number of Points**	**Cycle Time (ms)[a]**
30,000	3	2.88
	11	3.50
	51	3.91
	101	5.29
	201	8.75
	401	15.66
	801	29.46
	1,601	57.73
	6,401	221.04
	16,001	549.71
100,000	3	2.87

	11	2.82
	51	2.86
	101	2.96
	201	4.02
	401	6.23
	801	10.65
	1,601	19.49
	6,401	70.96
	16,001	173.78
600,000	3	2.84
	11	2.84
	51	2.87
	101	3.03
	201	3.14
	401	3.51
	801	4.22
	1,601	6.22
	6,401	19.35
	16,001	45.12

a Cycle time includes sweep and retrace time.

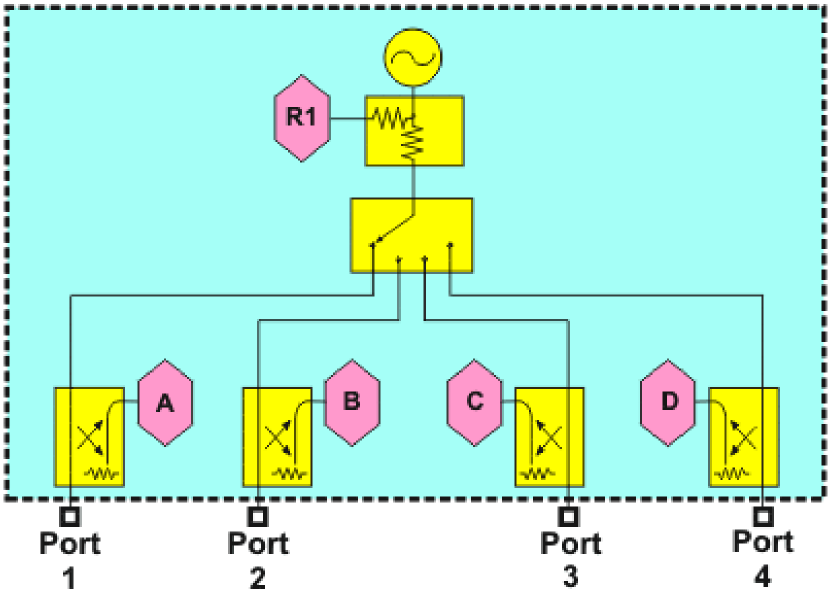
Table 17. Data Transfer Time (ms)

Description	Typical Performance			
	Number of Points			
	201	401	1601	16,001
SCPI over GPIB (program executed on external PC)				
32-bit floating point	6	10	33	313
64-bit floating point	10	18	65	622
ASCII	53	105	406	4032
SCPI over SICL/LAN or TCP/IP Socket (program executed in the analyzer)				
32-bit floating point	1	2	2.5	7
64-bit floating point	2	2	3	10
ASCII	11	20	73	720
COM (program executed in the analyzer)				
32-bit floating point	<0.2	0.2	0.3	0.9
Variant type	0.6	1	3.2	32
DCOM over LAN (program executed on external PC)				
32-bit floating point	<0.8	1	1.6	7.5
Variant type	1.9	3	8.9	82

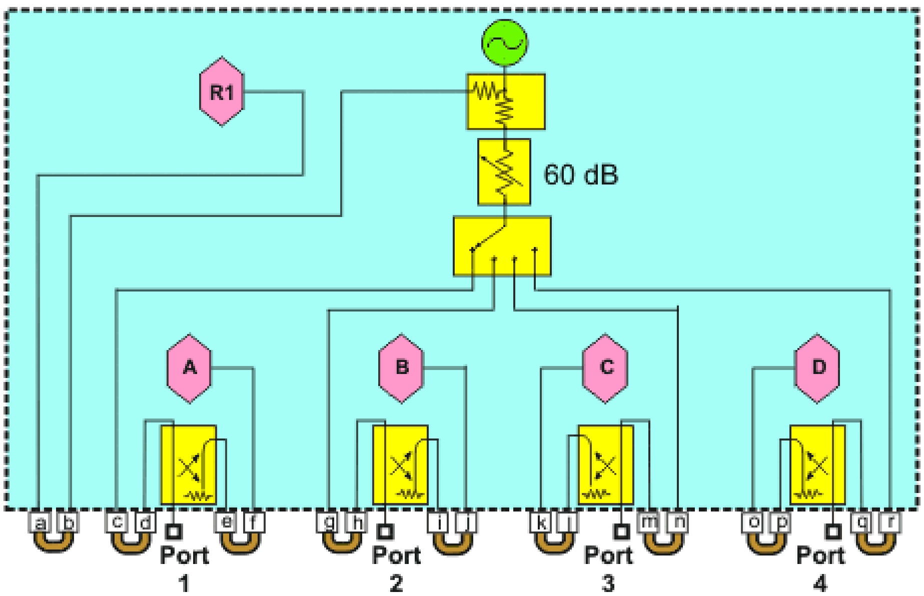
Tables 18 - 23 Front-panel Jumper Specs (Option 145/146/245/246)

Test Set Block Diagrams

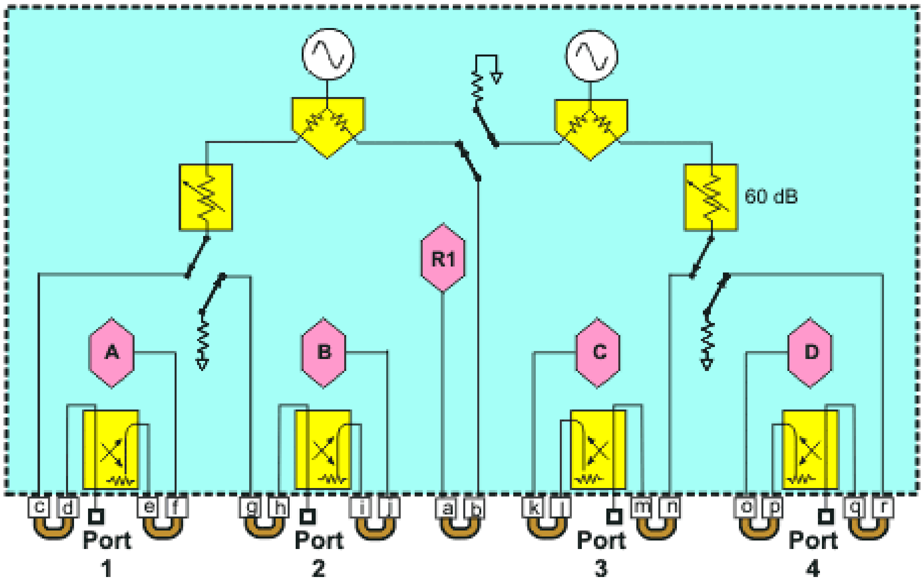
N5230A Option 140/ 240 (Standard Test Set and Standard Power Range)



N5230A Option 145/ 245 (Configurable Test Set and Extended Power Range)



N5230A Option 146/ 246 (Configurable Test Set and Extended Power Range; Second Source)



Item	Description	Item	Description	Item	Description
a	RCVR R IN	**h**	CPLR THRU	**o**	RCVR D IN
b	SOURCE OUT	**i**	CPLR ARM	**p**	CPLR ARM
c	SOURCE OUT	**j**	RCVR B IN	**q**	CPLR THRU
d	CPLR THRU	**k**	RCVR C IN	**r**	SOURCE OUT
e	CPLR ARM	**l**	CPLR ARM		
f	RCVR A IN	**m**	CPLR THRU		
g	SOURCE OUT	**n**	SOURCE OUT		

Last modified:

Jan. 10, 2007	Updated line power, moved regulatory, operating, and non-operating info to I&QS Guide.
Nov. 28, 2006	Updated for new model
Nov. 6, 2006	Added display note
Oct. 5, 2006	Added 350W typical to line power
July 10, 2006	Previous version

N5242A 10 MHz to 26.5 GHz

Data Sheet and Technical Specifications

Rev. March 7, 2008

This is a complete list of the technical specifications for the N5242A PNA-X network analyzer with the following options:

Option 029 , adds hardware and firmware for high-accuracy noise figure measurements, utilizing source correction techniques. It requi
for use as an impedance tuner, and a 346-series noise source for calibration. See the block diagram.

Option 200 , 2-port standard test set (includes six front-panel access loops) and power range. See the block diagram .

Option 219 , adds 2-port extended power range, source and receiver attenuators, and bias-tees (requires Option 200). See the block dia

Option 224 , adds an internal second source, a combiner, and mechanical switches to the 2-port analyzer (requires Option 200, 219, an

Option 400 , 4-port standard test set (includes twelve front-panel access loops), power range, and an internal second source (Option 0

Option 419 , adds 4-port extended power range, source and receiver attenuators, and bias-tees (requires Option 400). See the block dia

Option 423 , adds an internal combiner, and mechanical switches to the 4-port analyzer (requires Option 400, 419, and 080). See the bl

> Note
>
> This document provides technical specifications for the 85052B calibration kit, the N4433A 4-Port ECal module, and the N4691B 2-Po
> http://www.agilent.com/find/na_calculator to generate the curves for your calibration kit and PNA setup.

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and 90 minutes after t

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statist
performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, bu characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the

Nominal (nom.): A general, descriptive term that does not imply a level of performance. It is not covered by the proc

Calibration: The process of measuring known standards to characterize a network analyzer's systematic (repeatable)

Corrected (residual): Indicates performance after error correction (calibration). It is determined by the quality of ca stability, and noise.

Uncorrected (raw): Indicates instrument performance without error correction. The uncorrected performance affect

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Corrected System Performance

The specifications in this section apply for measurements made with the N5242A analyzer with the following conditi

- 10 Hz IF bandwidth
- No averaging applied to data
- Isolation calibration with an averaging factor of 8

Table 1a. System Dynamic Range at Test Port [1]

Option 200 or 400

Description	Specification (dB) at Test Port	
	Port 1 or 3 [2]	Port 2 or 4 [2]
10 MHz to 50 MHz[3]	93	93
50 MHz to 100 MHz[3]	103	103
100 MHz to 500 MHz[3]	117	117
500 MHz to 3.2 GHz	124	127
3.2 GHz to 10 GHz	127	127
10 GHz to 16 GHz	127	127
16 GHz to 20 GHz	127	124
20 GHz to 24 GHz	122	117
24 GHz to 26.5 GHz	112	109

1. The system dynamic range is calculated as the difference between the noise floor and the specified source maximum output pov into account.
2. Either port can be used as the source port. Any other port can be used as the receiver port.
3. May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 1b. System Dynamic Range at Test Port [1]

Option 219 or 419

Description	Specification (dB) at Test Port	
	Port 1 or 3 [2]	Port 2 or 4 [2]
10 MHz to 50 MHz[3]	93	93
50 MHz to 100 MHz[3]	103	103
100 MHz to 500 MHz[3]	117	117
500 MHz to 3.2 GHz	124	127
3.2 GHz to 10 GHz	127	127
10 GHz to 16 GHz	126	125
16 GHz to 20 GHz	124	122
20 GHz to 24 GHz	118	117
24 GHz to 26.5 GHz	110	106

[1] The system dynamic range is calculated as the difference between the noise floor and the specified source maximum output power. T account.

[2] Either port can be used as the source port. Any other port can be used as the receiver port.

[3] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 1c. System Dynamic Range at Test Port [1]

Option 224

Description	Specification (dB) at Test Port	
	Source 2, Out 1	Source 2, Out 2
10 MHz to 50 MHz[2]	98	93
50 MHz to 100 MHz[2]	108	107
100 MHz to 500 MHz[2]	122	121
500 MHz to 3.2 GHz	128	128
3.2 GHz to 10 GHz	132	132
10 GHz to 16 GHz	130	130
16 GHz to 20 GHz	129	127

20 GHz to 24 GHz	123	122
24 GHz to 26.5 GHz	114	112

[1] The system dynamic range is calculated as the difference between the noise floor and the specified source maximum output power. T
account.

[2] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 1d. System Dynamic Range at Test Port [1]

Option 224 or 423

Description	Specification (dB) at Test Port			
	Port 1 or 3 [2]	Port 2 or 4 [2]	Port 1 or 3 [2]	Port or 4
10 MHz to 50 MHz[3]	93	93	106	104
50 MHz to 100 MHz[3]	103	103	115	115
100 MHz to 500 MHz[3]	117	117	130	130
500 MHz to 3.2 GHz	124	127	130	134
3.2 GHz to 10 GHz	127	127	136	134
10 GHz to 16 GHz	126	124	132	131
16 GHz to 20 GHz	124	121	130	127
20 GHz to 24 GHz	117	115	127	124
24 GHz to 26.5 GHz	107	105	121	117

[1] The system dynamic range is calculated as the difference between the noise floor and the specified source maximum output power. T
account.

[2] Either port can be used as the source port. Any other port can be used as the receiver port.

[3] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 2a. Extended Dynamic Range at Direct Receiver Access Input[1]

Option 200 or 400

Description	
	Port 1 or 3 [2]
10 MHz to 50 MHz[3]	128
50 MHz to 100 MHz[3]	115
100 MHz to 500MHz[3]	129
500 MHz to 3.2 GHz	136
3.2 GHz to 10 GHz	139
10 GHz to 16 GHz	139
16 GHz to 20 GHz	139
20 GHz to 24 GHz	134
24 GHz to 26.5 GHz	124

[1] The direct receiver access input extended dynamic range is calculated as the difference between the direct receiver access input nois measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exc predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with devices with low insertion loss). The extended range is only available in one-path transmission measurements.

[2] Either port can be used as the source port. Any other port can be used as the receiver port.

[3] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 2b. Extended Dynamic Range at Direct Receiver Access Input[1]

Option 219 or 419

Description	
	Port 1 or 3 [2]
10 MHz to 50 MHz[3]	128
50 MHz to 100 MHz[3]	115
100 MHz to 500MHz[3]	129
500 MHz to 3.2 GHz	136
3.2 GHz to 10 GHz	139
10 GHz to 16 GHz	138
16 GHz to 20 GHz	136

20 GHz to 24 GHz	130
24 GHz to 26.5 GHz	122

[1] The direct receiver access input extended dynamic range is calculated as the difference between the direct receiver access input nois measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exc predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices with devices with low insertion loss). The extended range is only available in one-path transmission measurements.

[2] Either port can be used as the source port. Any other port can be used as the receiver port.

[3] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 2c. Extended Dynamic Range at Direct Receiver Access Input[1]

Option 224

Description	T
	Source 2, Out 1
10 MHz to 50 MHz[2]	133
50 MHz to 100 MHz[2]	120
100 MHz to 500MHz[2]	134
500 MHz to 3.2 GHz	140
3.2 GHz to 10 GHz	144
10 GHz to 16 GHz	142
16 GHz to 20 GHz	141
20 GHz to 24 GHz	135
24 GHz to 26.5 GHz	126

[1] The direct receiver access input extended dynamic range is calculated as the difference between the direct receiver access input nois measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exc have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

[2] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 2d. Extended Dynamic Range at Direct Receiver Access Input[1]

Option 224 or 423

Description			Typical (d
	Port 1 or 3 [2]	Port 2 or 4 [2]	Source
10 MHz to 50 MHz[3]	128	128	
50 MHz to 100 MHz[3]	115	115	
100 MHz to 500MHz[3]	129	129	
500 MHz to 3.2 GHz	136	139	
3.2 GHz to 10 GHz	139	139	
10 GHz to 16 GHz	138	136	
16 GHz to 20 GHz	136	133	
20 GHz to 24 GHz	129	127	
24 GHz to 26.5 GHz	119	121	

[1] The direct receiver access input extended dynamic range is calculated as the difference between the direct receiver access input nois measurement uncertainties and interfering signals into account. This set-up should only be used when the receiver input will never exc have predefined frequency segments which will output a higher power level when the extended dynamic range is required (i.e. devices (i.e. devices with low insertion loss). The extended range is only available in one-path transmission measurements.

[2] Either port can be used as the source port. Any other port can be used as the receiver port.

[3] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Receiver Dynamic Range technical specifications are not provided in this N5242A specs document.

N5242A Corrected System Performance with 3.5mm Connectors

All Options

Note: For any Sii reflection measurement:

- Sjj = 0.

For any Sij transmission measurement:

- Sji = Sij when Sij ≤ 1
- Sji = 1/Sij when Sij > 1
- Skk = 0 for all k

Table 3. 85052B Calibration Kit

N5242A All Options

Applies to the N5242A Option 200 or 219 or 224 or 400 or 419 or 423 analyzers, 85052B (3.5mm) calibration kit, 85131F flexible test por

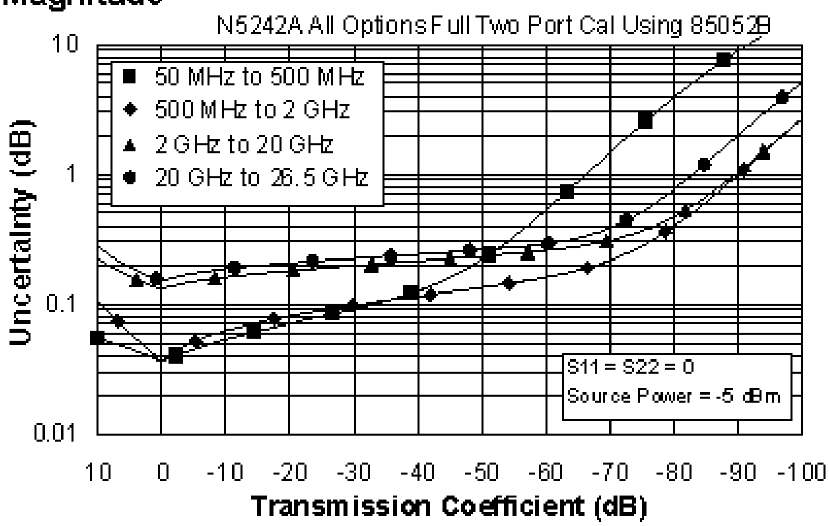
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)			
	50 MHz to 500 MHz	500 MHz to 2 GHz	2 to 20 GHz	20 to 26.5 GHz
Directivity	48	48	44	44
Source Match	40	40	31	31
Load Match	48	48	44	44
Reflection Tracking [1]	±0.003 +0.010/°C	±0.003 +0.010/°C	±0.006 +0.020/°C	±0.006 +0.030/°C
Transmission Tracking [1]	±0.017 +0.010/°C	±0.017 +0.010/°C	±0.104 +0.020/°C	±0.119 +0.030/°C

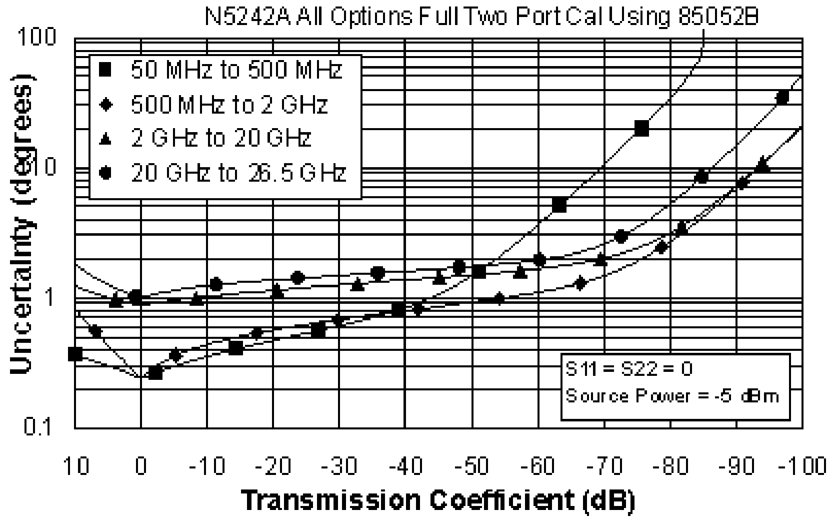
[1] Temperature deviation is a characteristic value.

Transmission Uncertainty (Specifications)

Magnitude

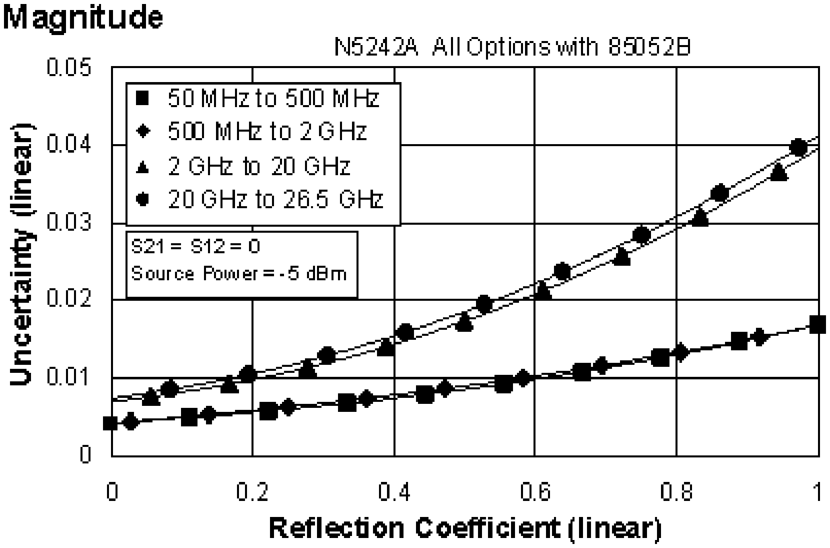


Phase



Reflection Uncertainty (Specifications)

Magnitude



Phase

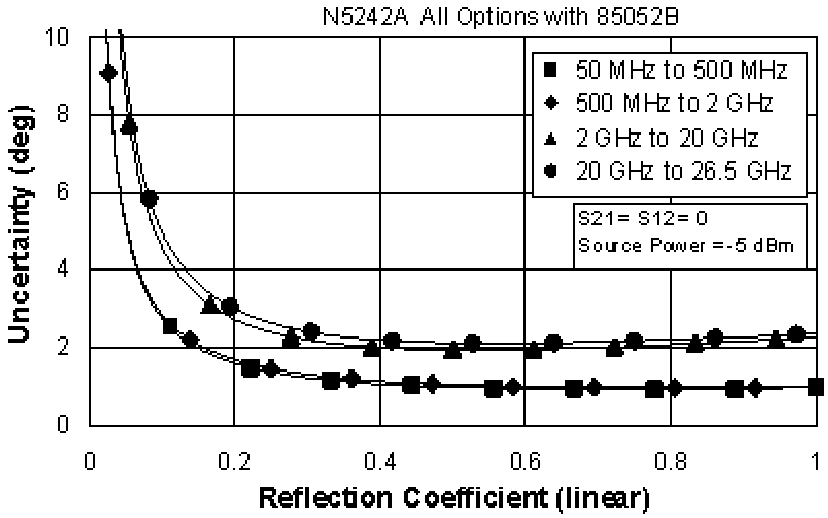


Table 4. N4433A 4-Port Electronic Calibration Module

N5242A All Options

Note : Uncertainty curves for the N4433A are created using a 2-port calibration. Multiport uncertainties are not supp

Applies to the N5242A Option 200 or 219 or 224 or 400 or 419 or 423 analyzers, N4433A (3.5mm) electronic calibra applies to the following condition:

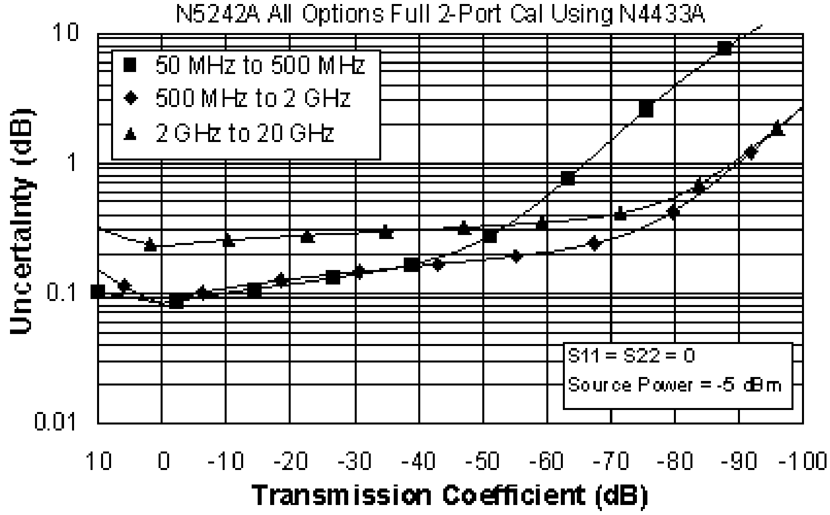
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)		
	50 MHz to 500 MHz	500 MHz to 2 GHz	2 to 20 GHz
Directivity	52	52	45
Source Match	42	42	31
Load Match	41	41	29
Reflection Tracking [1]	±0.060 +0.010/°C	±0.060 +0.010/°C	±0.180 +0.020/°C
Transmission Tracking [1]	±0.063 +0.010/°C	±0.063 +0.010/°C	±0.197 +0.020/°C

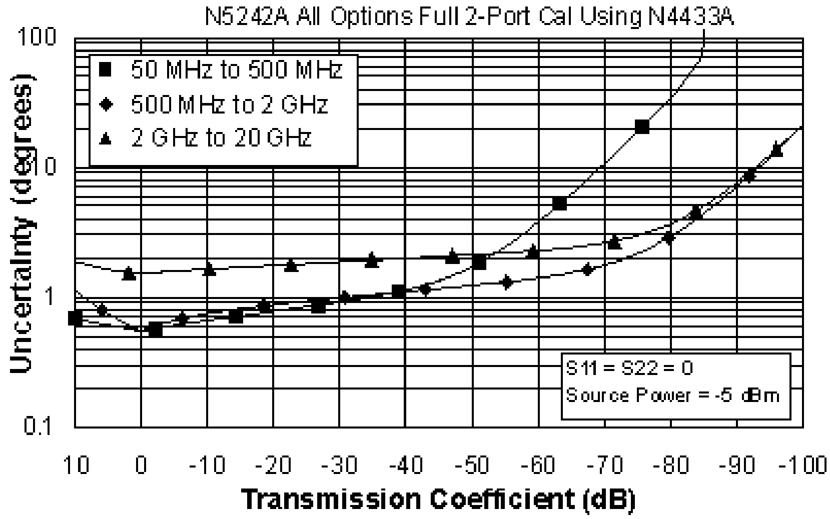
[1] Temperature deviation is a characteristic value.

Transmission Uncertainty (Specifications)

Magnitude

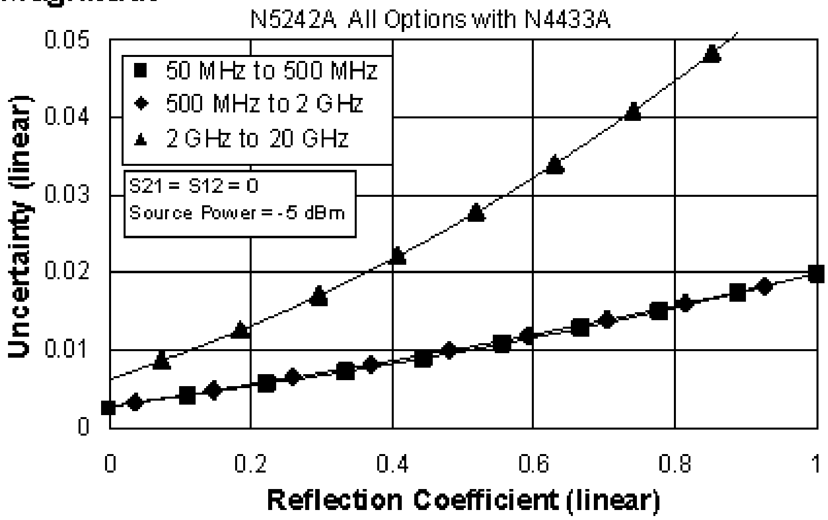


Phase



Reflection Uncertainty (Specifications)

Magnitude



Phase

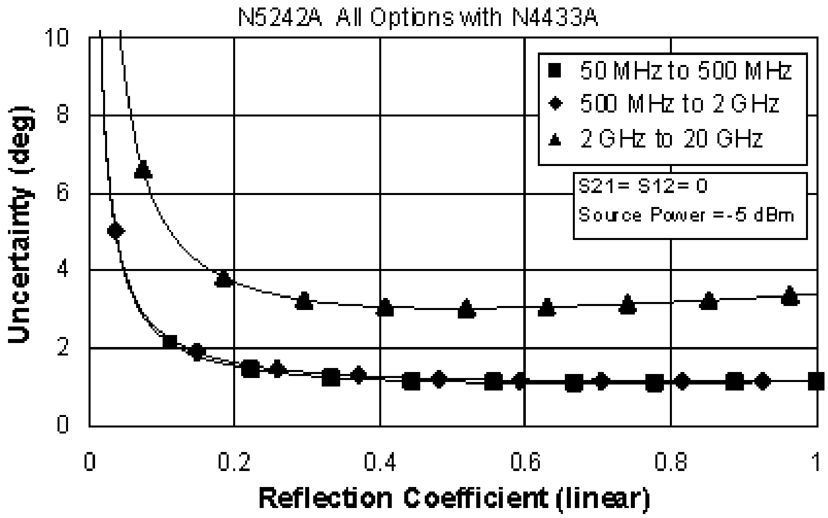


Table 5. N4691B 2- Port Electronic Calibration Module

N5242A All Options

Applies to the N5242A Option 200 or 219 or 224 or 400 or 419 or 423 analyzers, N4691B (3.5mm) electronic calibrati applies to the following condition:

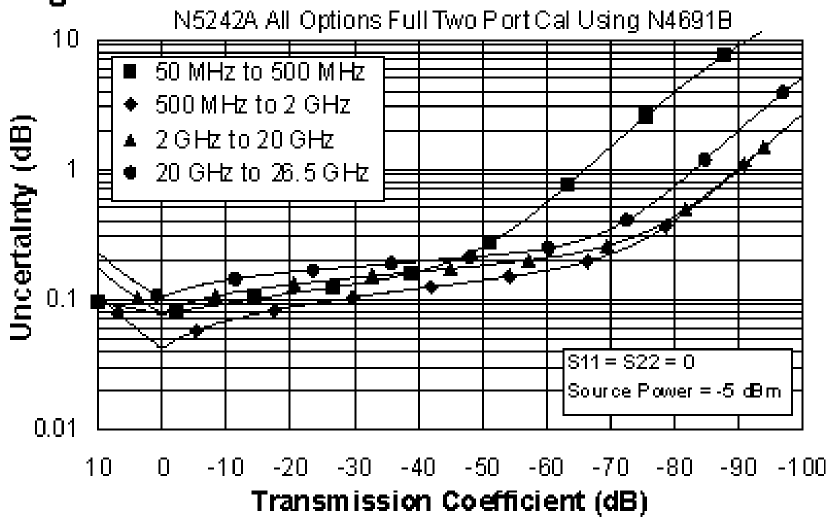
Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

Description	Specification (dB)			
	50 MHz to 500 MHz	500 MHz to 2 GHz	2 to 20 GHz	20 to 26.5 GHz
Directivity	46	56	48	44
Source Match	41	47	44	40
Load Match	40	46	42	38
Reflection Tracking [1]	±0.050 +0.010/°C	±0.020 +0.010/°C	±0.040 +0.020/°C	±0.050 +0.030/°C
Transmission Tracking [1]	±0.056 +0.010/°C	±0.022 +0.010/°C	±0.052 +0.020/°C	±0.072 +0.030/°C

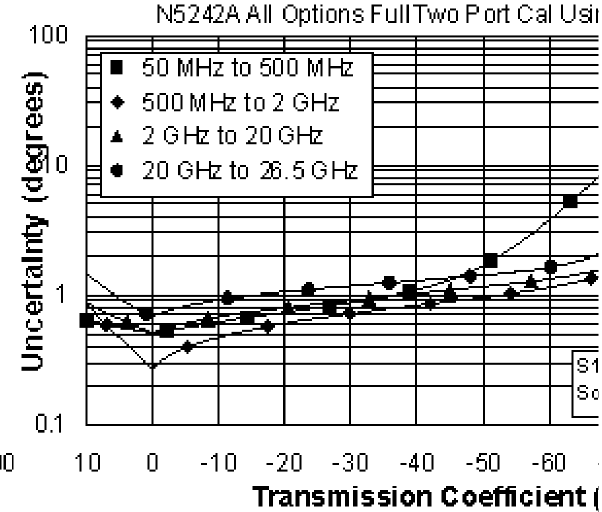
[1] Temperature deviation is a characteristic value.

Transmission Uncertainty (Specifications)

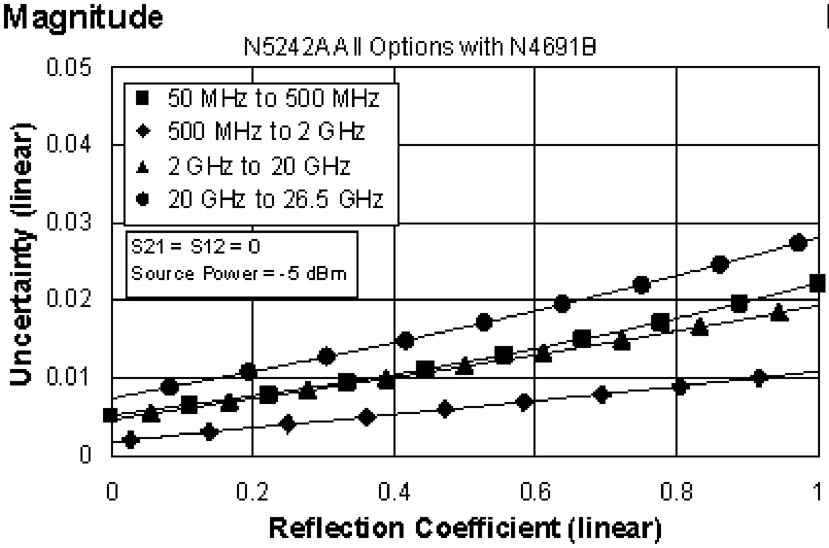
Magnitude

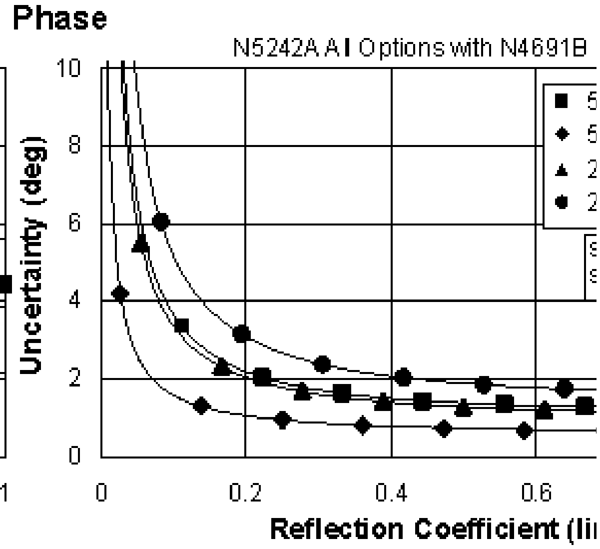


Phase



Reflection Uncertainty (Specifications)





This N5242A document does not present specifications for the 85052C or 85052D Calibration Kit. Please download our free Uncertaint for the 85052C or the 85052D Calibration Kit.

Uncorrected System Performance

Table 6. Error Terms[1]

Ports 1, 2, 3, 4. All Options. If Option 029 is included, see section Specifications: N5242A Option 029 .

Description	Specification	Typical
Directivity (dB)		
10 MHz to 50 MHz	16	23
50 MHz to 500 MHz	24	28
500 MHz to 3.2 GHz	24	32
3.2 GHz to 10 GHz	23	25
10 GHz to 16 GHz	16	22
16 GHz to 20 GHz	16	22
20 GHz to 24 GHz	16	22
24 GHz to 26.5 GHz	16	22
Source Match (dB)		
10 MHz to 50 MHz	11	14
50 MHz to 500 MHz	18	28
500 MHz to 3.2 GHz	18	22
3.2 GHz to 10 GHz	14	18
10 GHz to 16 GHz	12	16
16 GHz to 20 GHz	10	15
20 GHz to 24 GHz	10	14
24 GHz to 26.5 GHz	8	12

Table 6. (Continued) Error Terms[1]

Load Match (dB)		
10 MHz to 50 MHz	11	18
50 MHz to 500 MHz	17	25
500 MHz to 3.2 GHz	17	22
3.2 GHz to 10 GHz	13	17
10 GHz to 16 GHz	10	15
16 GHz to 20 GHz	9	14
20 GHz to 24 GHz	9	14
24 GHz to 26.5 GHz	8	13
Transmission Tracking[3] (dB)		
10 MHz to 50 MHz	--	+/-1.5
50 MHz to 500 MHz		
500 MHz to 3.2 GHz		
3.2 GHz to 10 GHz		
10 GHz to 16 GHz		
16 GHz to 20 GHz		
20 GHz to 24 GHz		
24 GHz to 26.5 GHz		
Reflection Tracking (dB)		
10 MHz to 50 MHz	--	+/-1.5
50 MHz to 500 MHz		
500 MHz to 3.2 GHz		
3.2 GHz to 10 GHz		
10 GHz to 16 GHz		
16 GHz to 20 GHz		
20 GHz to 24 GHz		

24 GHz to 26.5 GHz

Table 6 . (Continued) Error Terms [1]

Crosstalk[4] (dB)		
10 MHz to 50 MHz	--	-84
50 MHz to 100 MHz		-90
100 MHz to 500 MHz		-110
500 MHz to 3.2 GHz		-120
3.2 GHz to 20 GHz		-122
20 GHz to 24 GHz		-117
24 GHz to 26.5 GHz		-114

[1] Specifications apply over environmental temperature of 25 °C ±5 °C, with less than 1°C variation from the calibration temperature.

[3] Cable loss not included.

[4] Measurement conditions: normalized to a thru, measured with shorts on all ports, 10 Hz IF bandwidth, averaging factor of 8, alternate power.

Test Port Output

Table 7. Frequency Information

All Options

Description	Specification (dB)	Typical (dB)
Frequency Range	10 MHz to 26.5 GHz	--
Frequency Resolution	1 Hz	--
Frequency Accuracy	+/- 1 ppm	--
Frequency Stability	--	+/-0.05 ppm, -10° to 70° C +/-0.1 ppm/yr maximum

Table 8a. Maximum Leveled Power, Option 200 or 400

Description	Specification (dBm)		
	Port 1 or 3[1] Filtered Mode[2] See Figure 2 (Opt 200) or Figure 5 (Opt 400)	Port 1 or 3[1] Hi Pwr Mode[2] See Figure 3 (Opt 200) or Figure 6 (Opt 400)	Port 2 or 4[1]
10 MHz to 50 MHz	8	13	13
50 MHz to 500 MHz	10	13	13
500 MHz to 3.2 GHz	10	10	13
3.2 GHz to 10 GHz	13	13	13
10 GHz to 16 GHz	13	13	13
16 GHz to 20 GHz	13	13	10
20 GHz to 24 GHz	12	12	7
24 GHz to 26.5 GHz	5	5	2

[1] Either port can be used as the source port.

[2] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the filters to maximize outpu

Figure 1. Block Diagram, N5242A Option 200

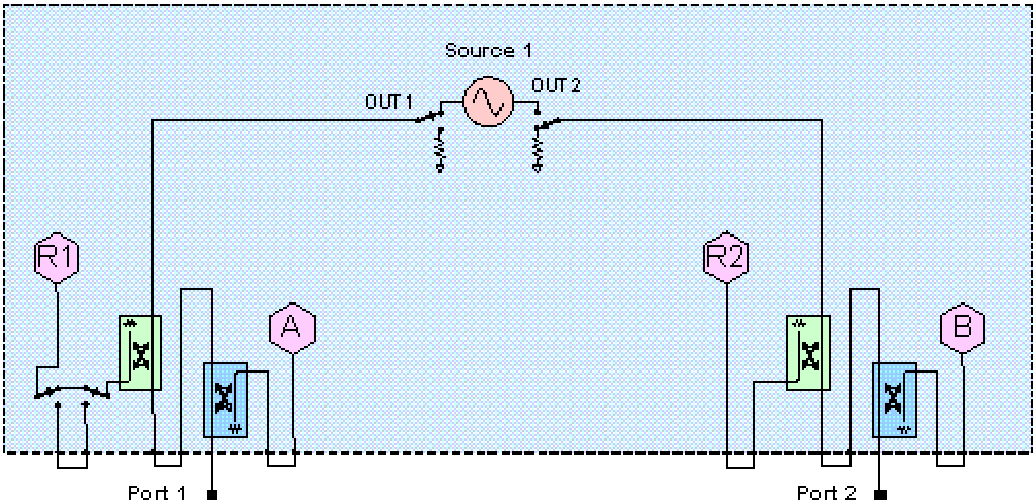


Figure 2. Path Configuration Diagram, N5242A Option 200, Port 1 Filtered Mode

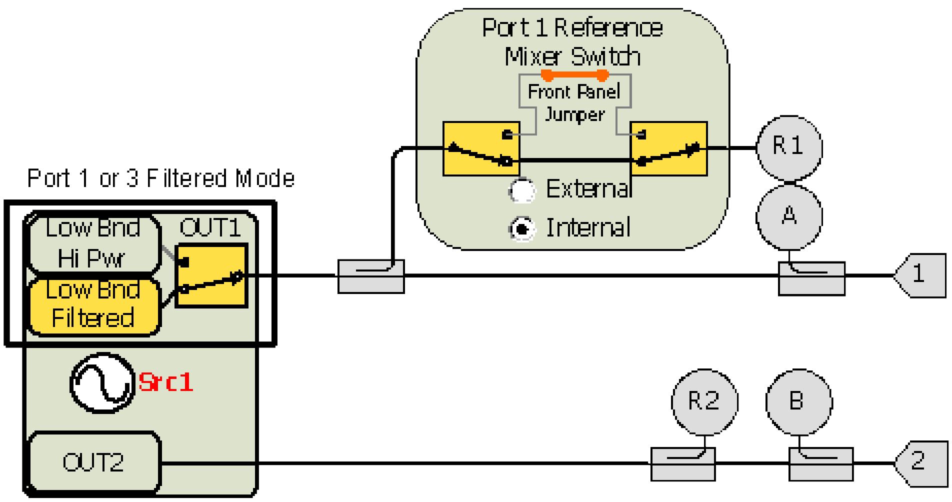


Figure 3. Path Configuration Diagram, N5242A Option 200, Port 1 Hi Pwr Mode

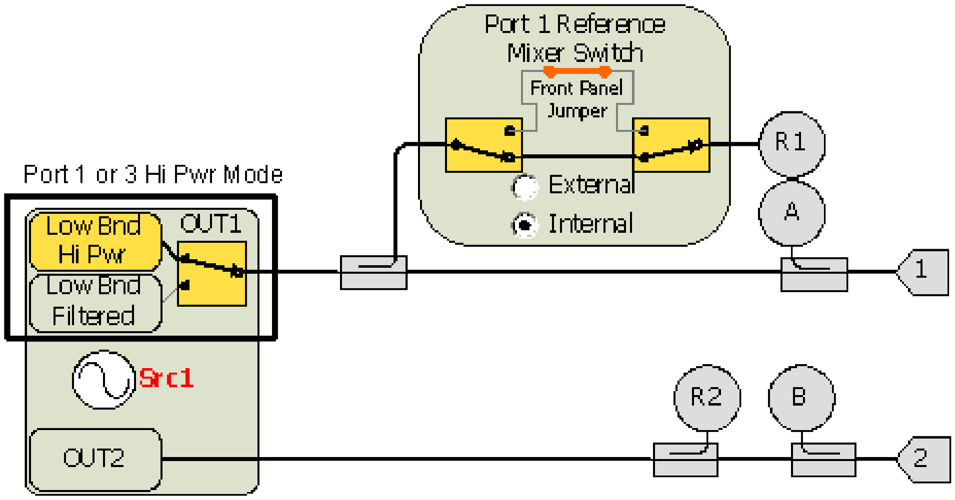


Figure 4. Block Diagram, N5242A Option 400

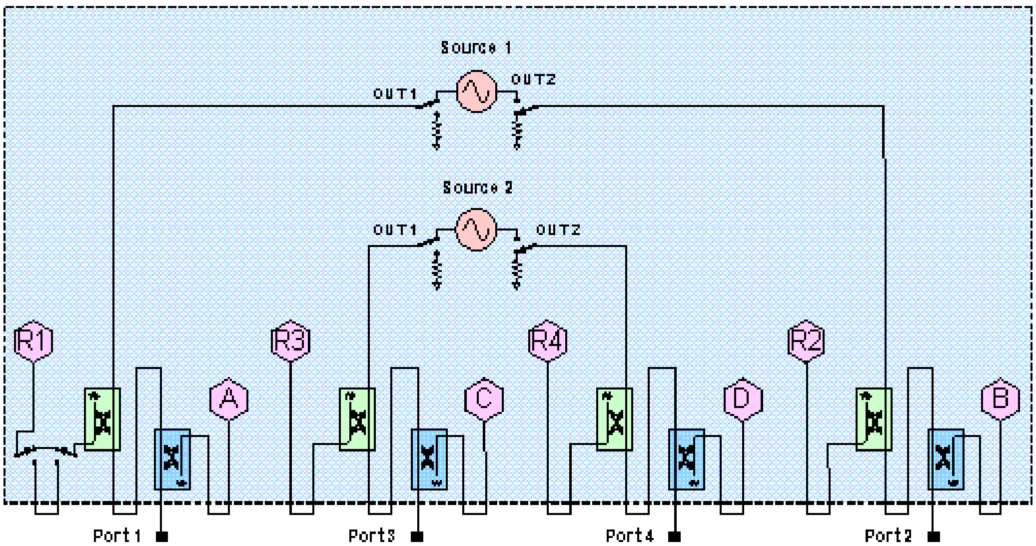


Figure 5. Path Configuration Diagram, N5242A Option 400, Port 1 or 3 Filtered Mode

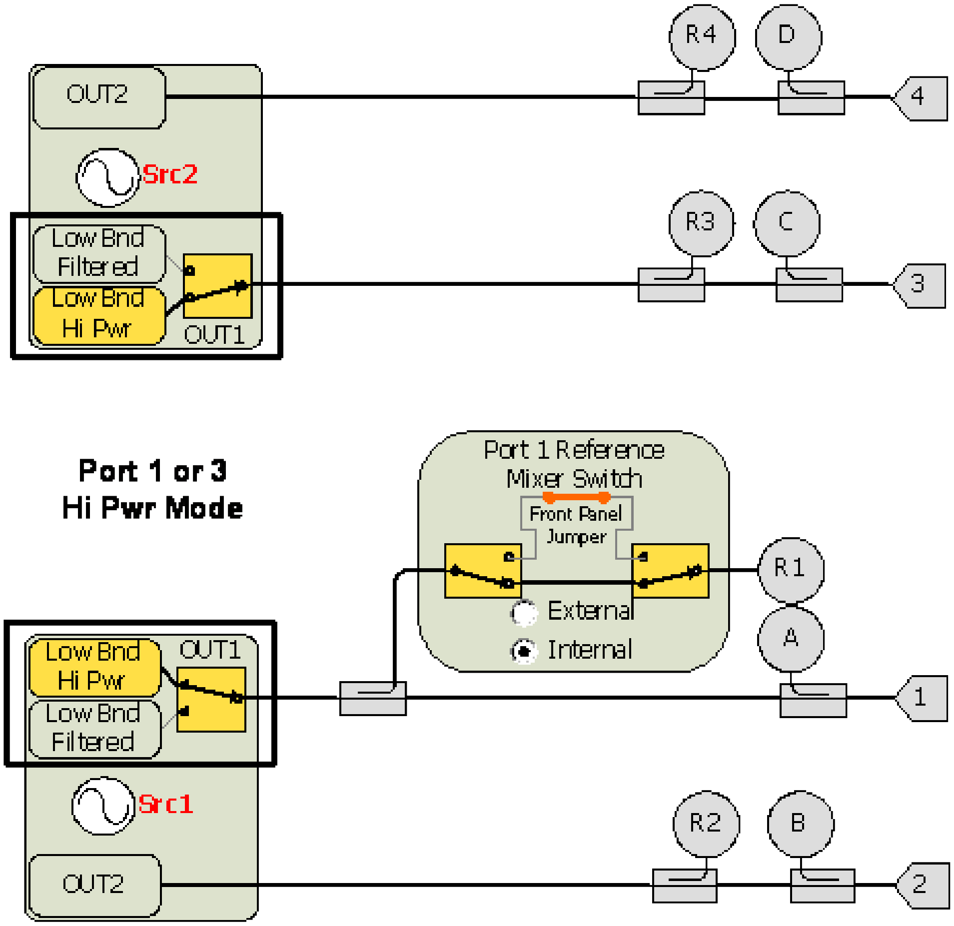


Figure 6. Path Configuration Diagram, N5242A Option 400, Port 1 or 3 Hi Pwr Mode

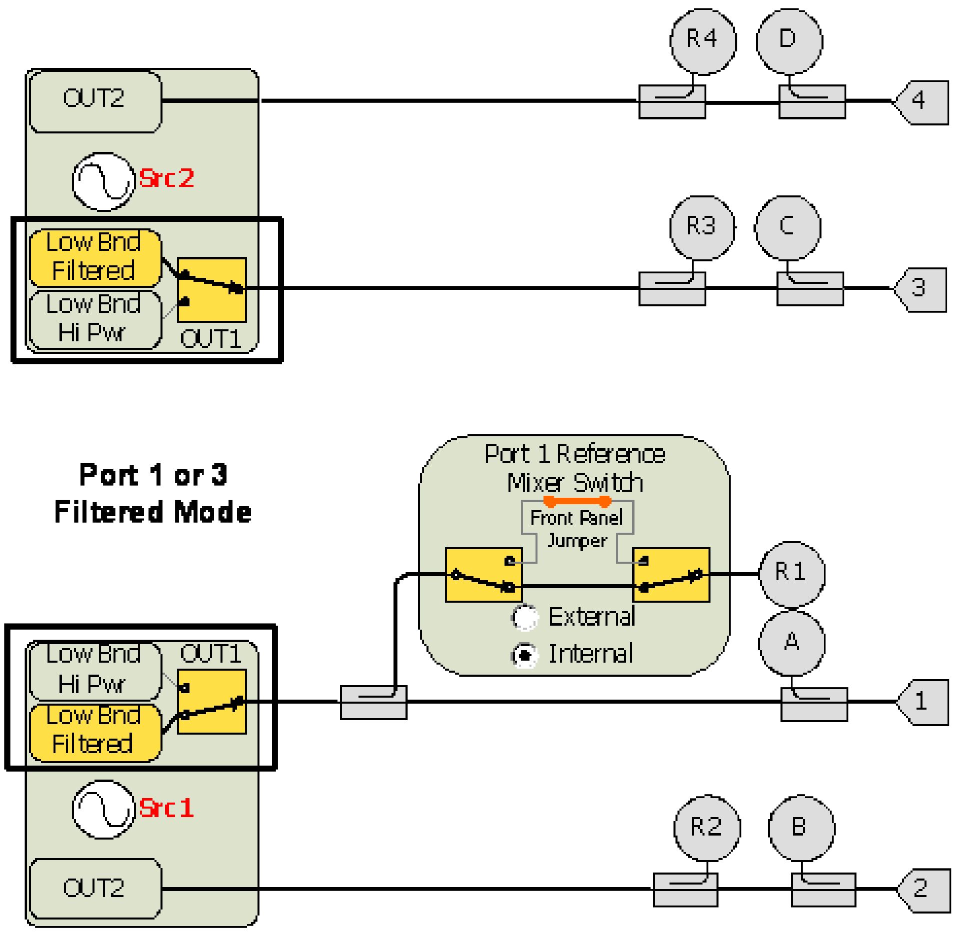


Table 8b. Maximum Leveled Power, Option 219 or 419

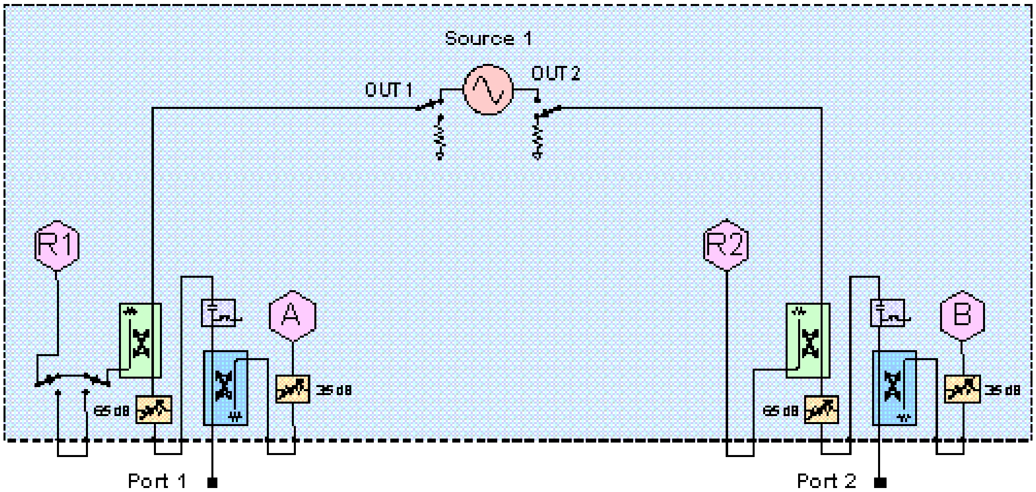
If Option 029 is included, see section Specifications: N5242A Option 029 .

Description	Specification (dBm)		
	Port 1 or 3 [1] Filtered Mode [2]	Port 1 or 3 [1] Hi Pwr Mode [2]	Port 2 or 4 [1]
10 MHz to 50 MHz	8	13	13
50 MHz to 500 MHz	10	13	13
500 MHz to 3.2 GHz	10	10	13
3.2 GHz to 10 GHz	13	13	13
10 GHz to 16 GHz	12	12	11
16 GHz to 20 GHz	10	10	8
20 GHz to 24 GHz	8	8	7
24 GHz to 26.5 GHz	3	3	-1

[1] Either port can be used as the source port.

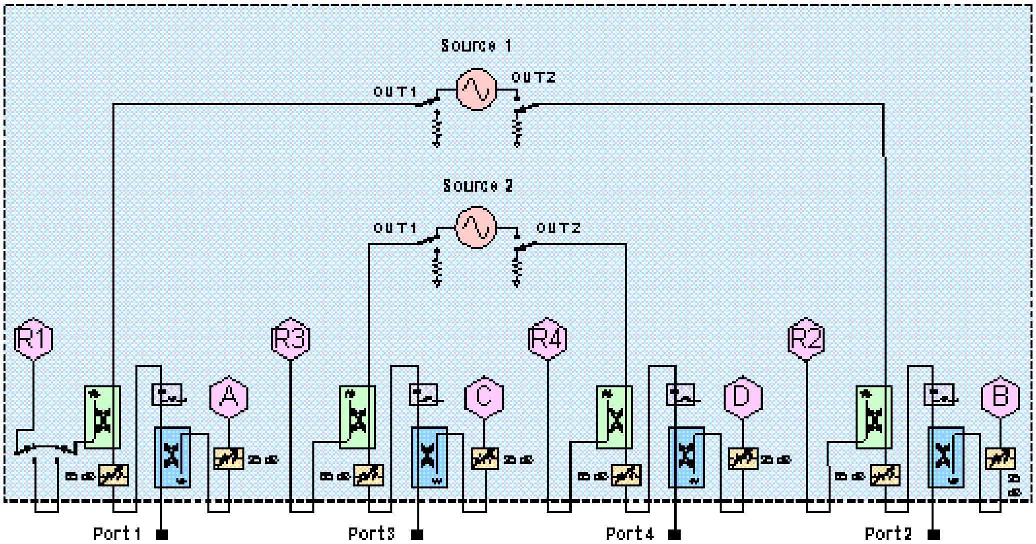
[2] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the

Figure 7. Block Diagram, N5242A Option 219



Note: The path configuration drawing for Option 219 is identical to the path configuration drawings for Option 200, which are shown in

Figure 8. Block Diagram, N5242A Option 419



Note: The path configuration drawing for Option 419 is identical to the path configuration drawings for Option 400, which are shown in

Table 8c. Maximum Leveled Power, Option 224

If Option 029 is included, see section Specifications: N5242A Option 029 .

Description	Specification (dBm)		
	Port 1 Filtered Mode [1]	Port 1 Hi Pwr Mode [1]	Port 2
10 MHz to 50 MHz	7	13	13
50 MHz to 500 MHz	8	13	13
500 MHz to 3.2 GHz	8	10	13
3.2 GHz to 10 GHz	13	13	13
10 GHz to 16 GHz	12	12	10
16 GHz to 20 GHz	10	10	7
20 GHz to 24 GHz	7	7	5
24 GHz to 26.5 GHz	0	0	-2

[1] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the

Table 8d. Maximum Leveled Power, Option 224

Description	Specification (dBm)		
	Source 2, Out 1 Filtered Mode [1]	Source 2, Out 1 Hi Pwr Mode [1]	Source 2 Out 2
10 MHz to 50 MHz	9	18	13
50 MHz to 500 MHz	11	18	17
500 MHz to 3.2 GHz	10	14	14
3.2 GHz to 10 GHz	18	18	18
10 GHz to 16 GHz	16	16	16
16 GHz to 20 GHz	15	15	13
20 GHz to 24 GHz	13	13	12
24 GHz to 26.5 GHz	7	7	5

[1] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the

Figure 9. Block Diagram: N5242A Option 224

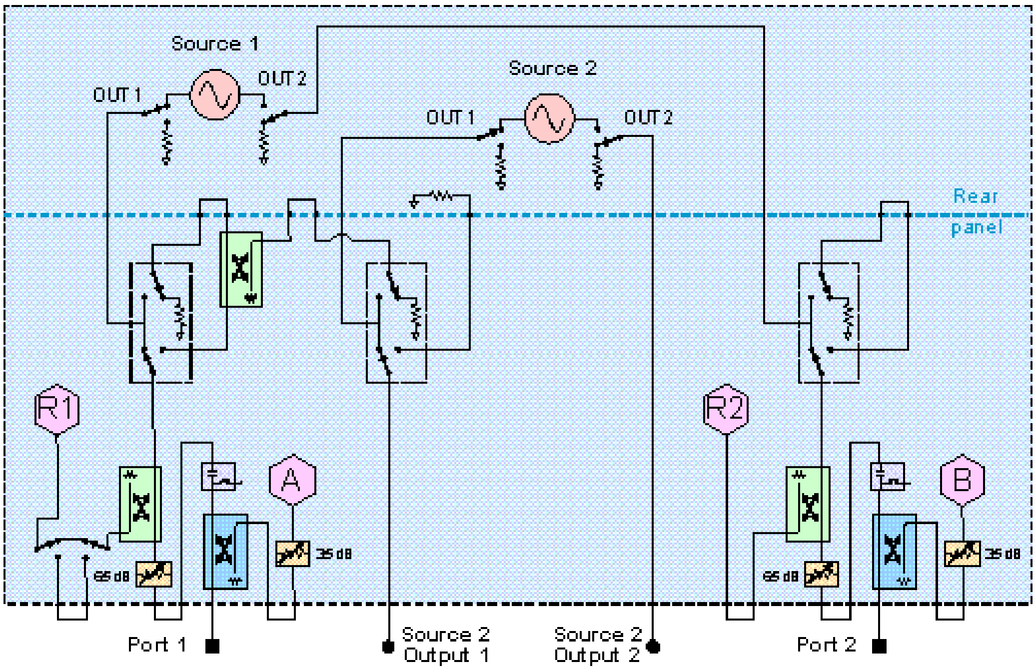


Figure 10. Path Configuration Diagram, N5242A Option 224

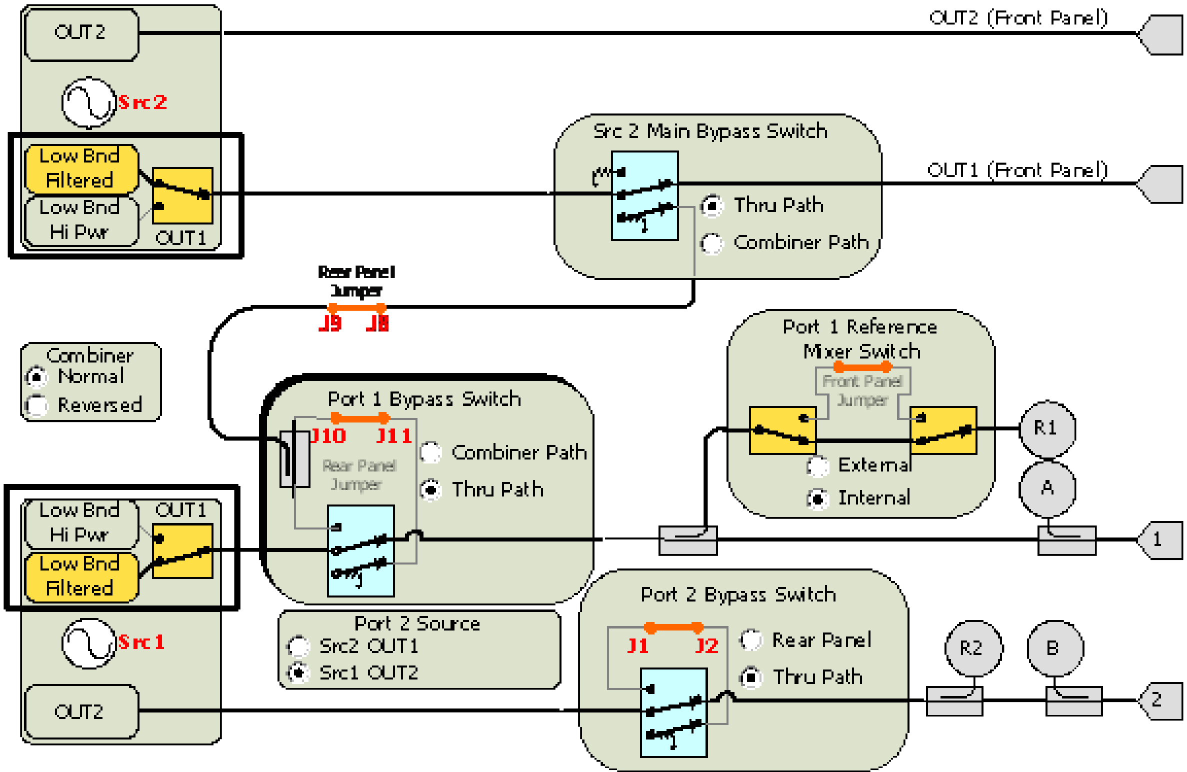


Table 8e. Maximum Leveled Power, Option 423

If Option 029 is included, see section Specifications: N5242A Option 029 .

Description	Specification (dBm)		
	Port 1 or 3 Filtered Mode[1]	Port 1 or 3 Hi Pwr Mode[1]	Port 2 or 4
10 MHz to 50 MHz	7	13	13
50 MHz to 500 MHz	8	13	13
500 MHz to 3.2 GHz	8	10	13
3.2 GHz to 10 GHz	13	13	13
10 GHz to 16 GHz	12	12	10
16 GHz to 20 GHz	10	10	7
20 GHz to 24 GHz	7	7	5

24 GHz to 26.5 GHz	0	0	-2

[1] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the

Table 8f. Maximum Leveled Power, Option 224 or 423

If Option 029 is included, see section Specifications: N5242A Option 029 .

Description		Ty
	Source 1, Port 1 Combine Mode Filtered Mode [1]	Source 1, Port 1 Combine Mode Hi Pwr Mode [1]
10 MHz to 50 MHz	7	17
50 MHz to 500 MHz	9	17
500 MHz to 3.2 GHz	9	10
3.2 GHz to 10 GHz	15	15
10 GHz to 16 GHz	11	11
16 GHz to 20 GHz	8	8
20 GHz to 24 GHz	6	6
24 GHz to 26.5 GHz	2	2

[1] In Filtered Mode, the signal path goes through filters to minimize harmonics below 3.2 GHz. In Hi Pwr Mode, the signal bypasses the

Figure 11. Block Diagram: N5242A Option 423

Figure 12. Path Configuration Diagram, N5242A Option 423

Table 9a. Power Level Accuracy

All Options

Description	Specification (dB)	
	Ports 1, 2, 3, 4[1]	Source 2, Out 1 Source 2, Out 2
10 MHz to 50 MHz	+/-1.0	+/-2.0
50 MHz to 500 MHz	+/-1.0	+/-2.0
500 MHz to 3.2 GHz	+/-1.0	+/-2.0
3.2 GHz to 10 GHz	+/-1.0	+/-2.0
10 GHz to 13 GHz	+/-1.2	+/-2.0
13 GHz to 18 GHz	+/-2.0	+/-2.5
18 GHz to 26.5 GHz	+/-2.5	+/-2.5

[1] Any port can be used as the source port. Source in filtered mode where applicable.

Table 9b. Power Level Linearity

All Options

Description	
	Port 1 or 3[1] -25dBm = P<-20dBm
10 MHz to 50 MHz	+/-2.0
50 MHz to 500 MHz	+/-1.5
500 MHz to 3.2 GHz	+/-1.0
3.2 GHz to 10 GHz	+/-1.0
10 GHz to 16 GHz	+/-1.0
16 GHz to 20 GHz	+/-1.0
20 GHz to 24 GHz	+/-1.0
24 GHz to 26.5 GHz	+/-1.0

[1] Either port can be used as the source port. Source in filtered mode.

Table 9c. (Continued) Power Level Linearity

All Options

Description	
	Port 2 or 4[1] -25dBm =P<-20dBm
10 MHz to 50 MHz	+/-5.0
50 MHz to 500 MHz	+/-4.0
500 MHz to 3.2 GHz	+/-2.5
3.2 GHz to 10 GHz	+/-2.0
10 GHz to 16 GHz	+/-1.5
16 GHz to 20 GHz	+/-1.0
20 GHz to 24 GHz	+/-1.0
24 GHz to 26.5 GHz	+/-1.0

[1] Either port can be used as the source port.

Table 9d. Power Level Linearity

Option 224

Description	
	Source 2, Out 1[1] P =-15dBm
10 MHz to 50 MHz	+/-1.0
50 MHz to 500 MHz	+/-1.0
500 MHz to 3.2 GHz	+/-1.0
3.2 GHz to 10 GHz	+/-1.0
10 GHz to 16 GHz	+/-1.0
16 GHz to 20 GHz	+/-1.0
20 GHz to 24 GHz	+/-1.0
24 GHz to 26.5 GHz	+/-1.0

[1] Source in filtered mode.

Table 10a. Power Sweep Range

Option 200 or 400

Description	Specification (dB)	
	Port 1 or 3 [1]	Port 2 or 4 [1]
10 MHz to 50 MHz	38	38
50 MHz to 500 MHz	38	38
500 MHz to 3.2 GHz	35	38
3.2 GHz to 10 GHz	38	38
10 GHz to 16 GHz	38	38
16 GHz to 20 GHz	38	35
20 GHz to 24 GHz	37	32
24 GHz to 26.5 GHz	30	27

[1] Either port can be used as the source port. Source in filtered mode where applicable.

Table 10b. Power Sweep Range

Option 219 or 419

Description	Specification (dB)	
	Port 1 or 3 [1]	Port 2 or 4 [1]
10 MHz to 50 MHz	38	38
50 MHz to 500 MHz	38	38
500 MHz to 3.2 GHz	35	38
3.2 GHz to 10 GHz	38	38
10 GHz to 16 GHz	37	36
16 GHz to 20 GHz	35	33
20 GHz to 24 GHz	33	32
24 GHz to 26.5 GHz	28	24

[1] Either port can be used as the source port. Source in filtered mode where applicable.

Table 10c. Power Sweep Range

Option 224 or 423

Description	Specification (dB)	
	Port 1 or 3 [1]	Port 2 or 4 [1]
10 MHz to 50 MHz	38	38
50 MHz to 500 MHz	38	38
500 MHz to 3.2 GHz	35	38
3.2 GHz to 10 GHz	38	38
10 GHz to 16 GHz	37	35
16 GHz to 20 GHz	35	32
20 GHz to 24 GHz	32	30
24 GHz to 26.5 GHz	25	23

[1] Either port can be used as the source port. Source in filtered mode where applicable.

Table 10d. Power Sweep Range

Option 224

Description	Specification (dB)	
	Source 2[1] Out 1	Source 2 Out 2
10 MHz to 50 MHz	33	28
50 MHz to 500 MHz	33	32
500 MHz to 3.2 GHz	29	29
3.2 GHz to 10 GHz	33	33
10 GHz to 16 GHz	31	31
16 GHz to 20 GHz	30	28
20 GHz to 24 GHz	28	27
24 GHz to 26.5 GHz	22	20

[1] Source in filtered mode where applicable.

Table 11. Nominal Power (Preset Power)

Description	Specification (dBm)		
	Option 200 or 400	Option 219 or 224 or 419 or 423	Option 224
		Ports 1, 2, 3, 4[1]	Source 2, Out 1
10 MHz to 26.5 GHz	0	-5	5

[1] Any port can be used as the source port. Any other port can be used as the receiver port.

Table 12. Power Resolution and Maximum / Minimum Settable Power

Description	Specification at Test Port	
	All Options	All Options
		P
Power Resolution	0.01 dB	--
Maximum Settable Power	--	30 dBm
Minimum Settable Power	--	--

[1] Any port can be used as the source port·

Table 13. Harmonics at Max Specified Power

All Options

(See Tables 8a - 8f Maximum Leveled Power)

Description	Typical (dBc)	
	Port 1 or 3 [1], [2] Source 2 Out 1 [3]	Port 2 or 4 [1] Source 2 Out 2
2nd Harmonics [4]		
10 MHz to 50 MHz	-51	-13
50 MHz to 2 GHz	-51	-13
2 GHz to 3.2 GHz	-60	-21
3.2 GHz to 10 GHz	-60	-21
10 GHz to 16 GHz	-60	-21
16 GHz to 20 GHz	-60	-21
20 GHz to 24 GHz	-60	-21
24 GHz to 26.5 GHz	-60	-21
3rd Harmonics [4]		
10 MHz to 50 MHz	-51	-13
50 MHz to 2 GHz	-51	-13
2 GHz to 3.2 GHz	-60	-21
3.2 GHz to 10 GHz	-60	-21
10 GHz to 16 GHz	-60	-21
16 GHz to 20 GHz	-60	-21
20 GHz to 24 GHz	-60	-21
24 GHz to 26.5 GHz	-60	-21

Table 13. Harmonics at Max Specified Power (continued)

1/2 and 1/4 Sub-Harmonics [4]		
10 MHz to 50 MHz	-73	-73
50 MHz to 2 GHz	-73	-73
2 GHz to 3.2 GHz	-73	-73
3.2 GHz to 10 GHz	-66	-63
10 GHz to 16 GHz	-66	-63
16 GHz to 20 GHz	-66	-63
20 GHz to 24 GHz	-61	-52
24 GHz to 26.5 GHz	-61	-52

[1] Any port can be used as the source port.

[2] < 3.2 GHz Filtered Mode

[3] At port 1 max specified power.

[4] Listed frequency is fundamental frequency; test at max specified power

Table 14. Non-Harmonic Spurs at nominal power

Description	Typical (dBc) at Test Port
	Ports 1, 2, 3, 4 Source 2 Out 1, Source 2 Out 2
Offset frequency = 30 kHz to 5 MHz	
10 MHz to 500 MHz	-50
500 MHz to 1 GHz	-60
1 GHz to 2 GHz	-60
2 GHz to 4 GHz	-57
4 GHz to 8 GHz	-51
8 GHz to 16 GHz	-45
16 GHz to 24 GHz	-39

24 GHz to 26.5 GHz	-33

Table 15. Phase Noise

All Options

Description		
		Ports 1, 2
	1 kHz Offset	10 kHz Offset
10 MHz to 500 MHz	-85	-85
500 MHz to 1 GHz	-105	-115
1 GHz to 2 GHz	-100	-110
2 GHz to 4 GHz	-95	-105
4 GHz to 8 GHz	-89	-100
8 GHz to 16 GHz	-83	-94
16 GHz to 26.5 GHz	-78	-89

Test Port Input

Ports 1, 2, 3, 4. All Options. If Option 029 is included, see section Specifications: N5242A Option 029 .

Table 16. Test Port Noise Floor[1] (dBm)

Description	Specification	Typical
10 Hz IFBW		
10 MHz to 50 MHz[2]	-80	-87
50 MHz to 100 MHz[2]	-90	-95
100 MHz to 500 MHz[2]	-104	-110
500 MHz to 2 GHz	-114	-117
2 GHz to 20 GHz	-114	-117
20 GHz to 24 GHz	-110	-115
24 GHz to 26.5 GHz	-107	-113

[1] Total average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

[2] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 17. Direct Receiver Access Input Noise Floor[1] (dBm)

Description	Specification	Typical
10 MHz to 50 MHz[2]	--	-130
50 MHz to 100 MHz[2]	--	-128
100 MHz to 500 MHz[2]	--	-132
500 MHz to 2 GHz	--	-133
2 GHz to 20 GHz	--	-129
20 GHz to 24 GHz	--	-122
24 GHz to 26.5 GHz	--	-119

[1] Total average (rms) noise power calculated as the mean value of a linear magnitude trace expressed in dBm.

[2] May typically be degraded at particular frequencies below 500 MHz due to spurious receiver residuals.

Table 18. Test Port Compression at 0.1 dB (dBm)

Description	Specification	Typical
10 MHz to 50 MHz	--	--
50 MHz to 500 MHz	--	--
500 MHz to 3.2 GHz	--	13
3.2 GHz to 10 GHz	--	13
10 GHz to 16 GHz	--	13
16 GHz to 20 GHz	--	12
20 GHz to 24 GHz	--	10.5
24 GHz to 26.5 GHz	--	10

Table 19. Test Port Compression @ 8 dBm Test Port Power (dB)

Description	Specification	Typical
10 MHz to 50 MHz[1]	--	--
50 MHz to 500 MHz[1]	--	--
500 MHz to 3.2 GHz	<0.17	--
3.2 GHz to 10 GHz	<0.17	--
10 GHz to 16 GHz	<0.17	--
16 GHz to 20 GHz	<0.23	--
20 GHz to 24 GHz	<0.23	--
24 GHz to 26.5 GHz	<0.29	--

[1] Test port receiver compression at specified input levels below 500 MHz is negligible due to coupler roll off in this frequency range.

Table 20. Trace Noise Magnitude (dB rms)

Description	Specification	Typical
Ratioed measurement, nominal power at test port.		
1 kHz IFBW		
10 MHz to 100 MHz	0.007	0.0039
100 MHz to 13.5 GHz	0.002	0.0005
13.5 GHz to 16 GHz	0.002	0.0005
16 GHz to 22.5 GHz	0.002	0.0006
22.5 GHz to 24 GHz	0.003	0.0014
24 GHz to 26.5 GHz	0.005	0.0020
100 kHz IFBW		
10 MHz to 100 MHz	--	0.040
100 MHz to 13.5 GHz	--	0.005
13.5 GHz to 16 GHz	--	0.005
16 GHz to 22.5 GHz	--	0.005
22.5 GHz to 24 GHz	--	0.008
24 GHz to 26.5 GHz	--	0.008
600 kHz IFBW		
10 MHz to 100 MHz	--	0.140
100 MHz to 13.5 GHz	--	0.011
13.5 GHz to 16 GHz	--	0.011
16 GHz to 22.5 GHz	--	0.012
22.5 GHz to 24 GHz	--	0.020
24 GHz to 26.5 GHz	--	0.020

Table 21. Trace Noise Phase (deg rms)

Description	Specification	Typical
Ratioed measurement, nominal power at test port.		
1 kHz IFBW		
10 MHz to 100 MHz	0.051	0.0261
100 MHz to 13.5 GHz	0.015	0.0041
13.5 GHz to 16 GHz	0.042	0.0124
16 GHz to 22.5 GHz	0.042	0.0135
22.5 GHz to 26.5 GHz	0.054	0.0225
100 kHz IFBW		
10 MHz to 100 MHz	--	0.266
100 MHz to 13.5 GHz	--	0.030
13.5 GHz to 16 GHz	--	0.030
16 GHz to 22.5 GHz	--	0.033
22.5 GHz to 26.5 GHz	--	0.057
600 kHz IFBW		
10 MHz to 100 MHz	--	1.053
100 MHz to 13.5 GHz	--	0.075
13.5 GHz to 16 GHz	--	0.075
16 GHz to 22.5 GHz	--	0.082
22.5 GHz to 26.5 GHz	--	0.139

Table 22. Reference Level Magnitude

Description	Specification	Typical
Range	+/-500 dB	--
Resolution	0.001 dB	--

Table 23. Reference Level Phase

Description	Specification	Typical
Range	+/-500°	--
Resolution	0.01°	--

Table 24. Stability Magnitude (dB/°C)

Description	Specification	Typical
Stability is defined as a ratio measurement made at the test port.		
10 MHz to 50 MHz	--	0.01
50 MHz to 500 MHz	--	0.01
500 MHz to 3.2 GHz	--	0.01
3.2 GHz to 10 GHz	--	0.02
10 GHz to 16 GHz	--	0.02
16 GHz to 20 GHz	--	0.03
20 GHz to 24 GHz	--	0.03
24 GHz to 26.5 GHz	--	0.04

Table 25. Stability Phase (°/°C)

Description	Specification	Typical
Stability is defined as a ratio measurement made at the test port.		
10 MHz to 50 MHz	--	0.29
50 MHz to 500 MHz	--	0.06
500 MHz to 3.2 GHz	--	0.07
3.2 GHz to 10 GHz	--	0.13
10 GHz to 16 GHz	--	0.13
16 GHz to 20 GHz	--	0.40
20 GHz to 24 GHz	--	0.54
24 GHz to 26.5 GHz	--	0.56

Table 26. Damage Input Level

Description	Specification	Typical
Test Port 1 or 2 or 3 or 4	> +30 dBm RF, 40 VDC	Test Port 1 or 2 or 3 or 4
(Option 224 only) Source 2 Out 1 or Source 2 Out 2	> +30 dBm RF, 0 VDC	(Option 224 only) Source 2 Out 1 or Source 2 Out 2

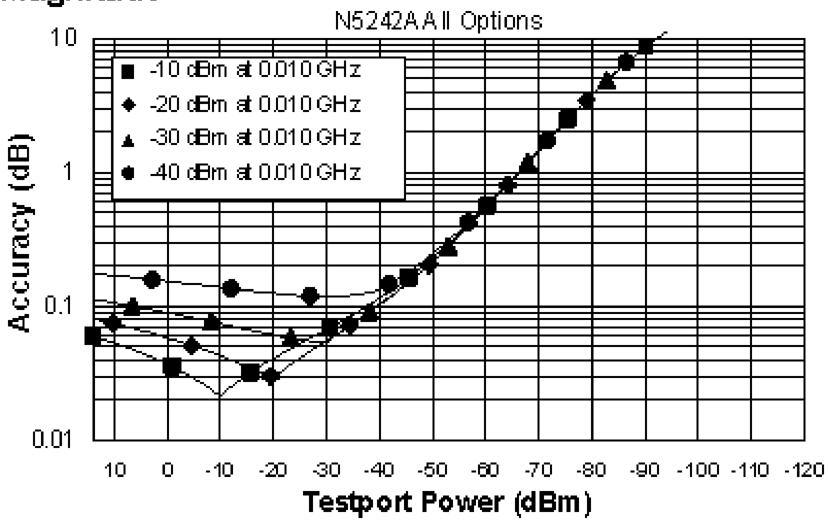
Dynamic Accuracy

Table 27. Dynamic Accuracy (Specification)

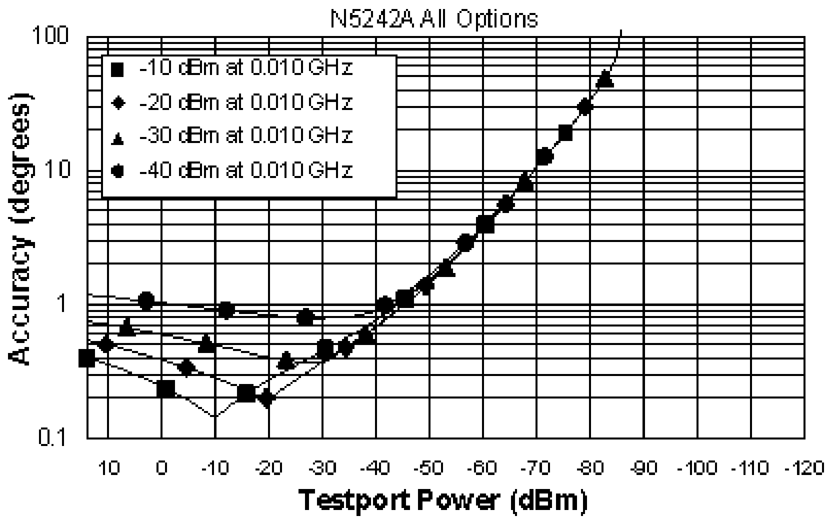
Accuracy of the test port input power reading relative to the reference input power level.

Dynamic Accuracy, 0.010 GHz

Magnitude

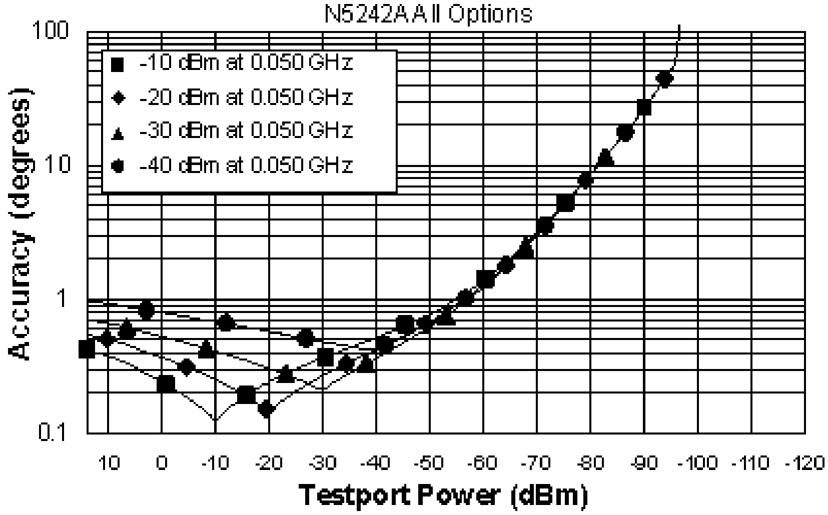


Phase

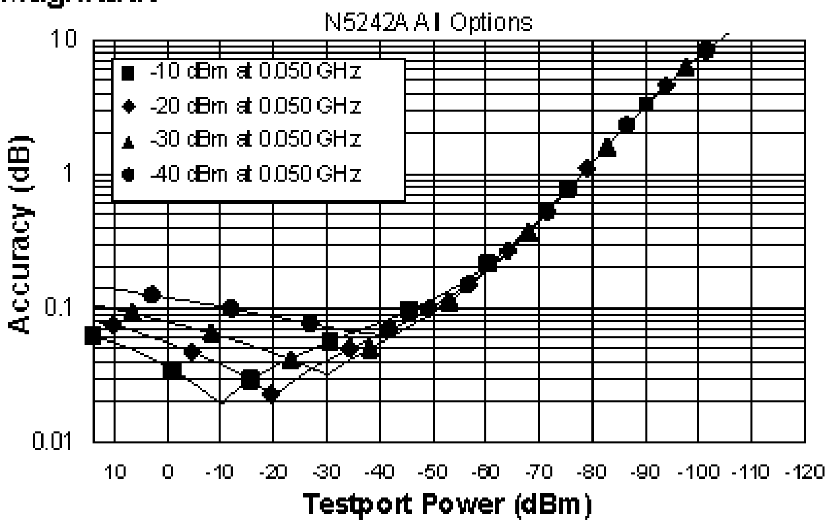


Dynamic Accuracy, 0.050 GHz

Phase

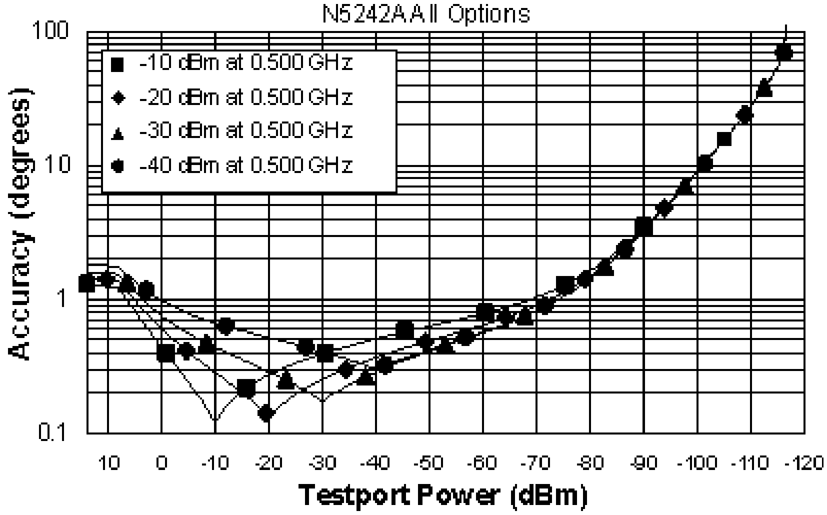


Magnitude

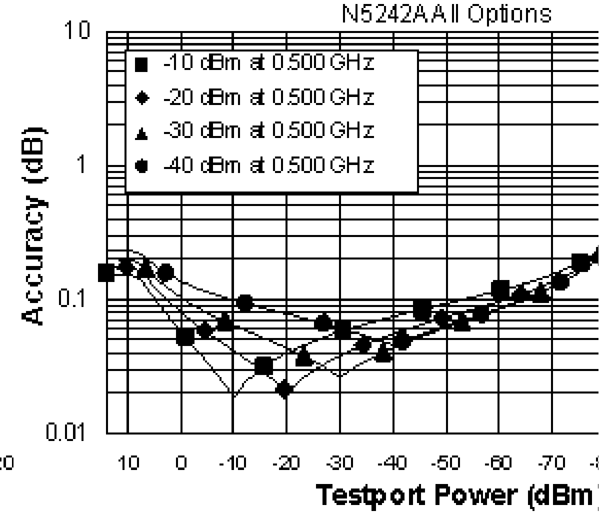


Dynamic Accuracy, 0.500 GHz

Phase

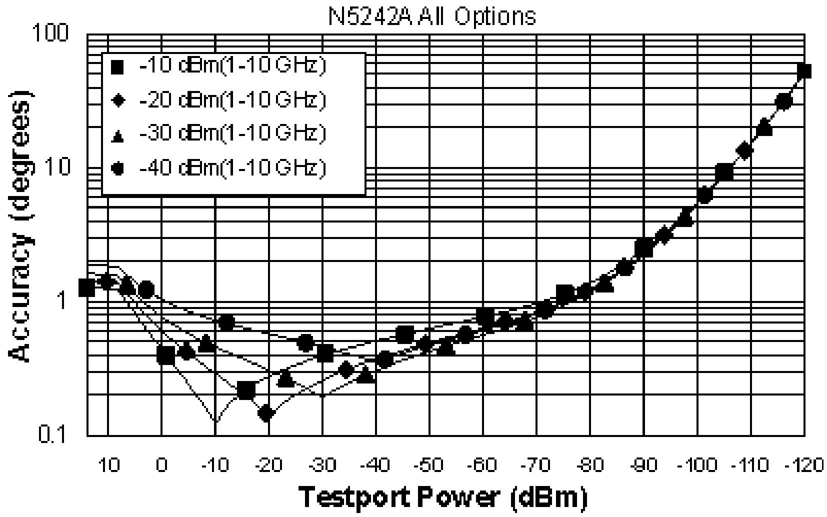


Magnitude

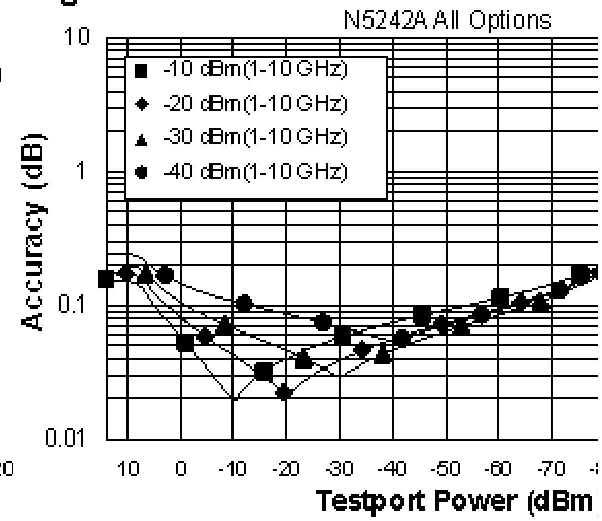


Dynamic Accuracy, 1- 10 GHz

Phase

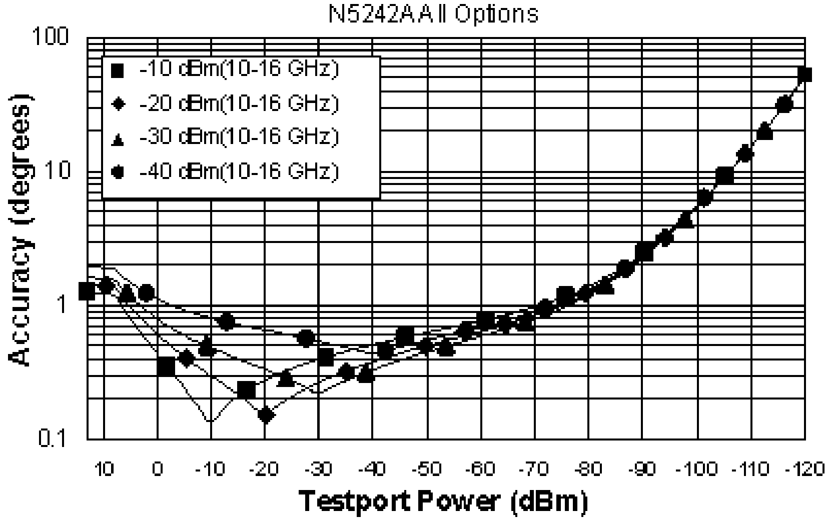


Magnitude

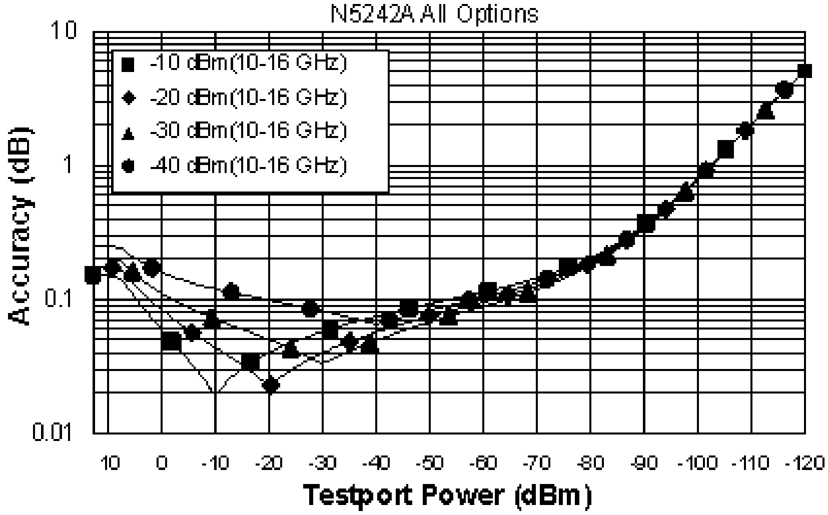


Dynamic Accuracy, 10 - 16 GHz

Phase

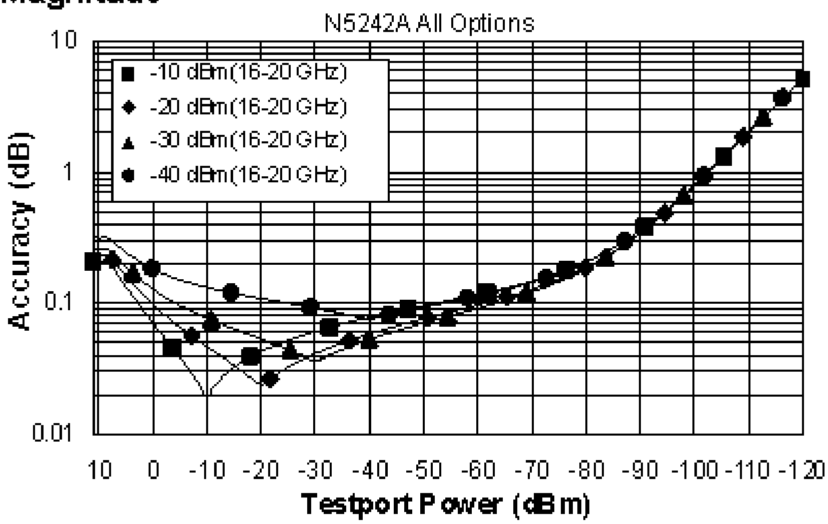


Magnitude

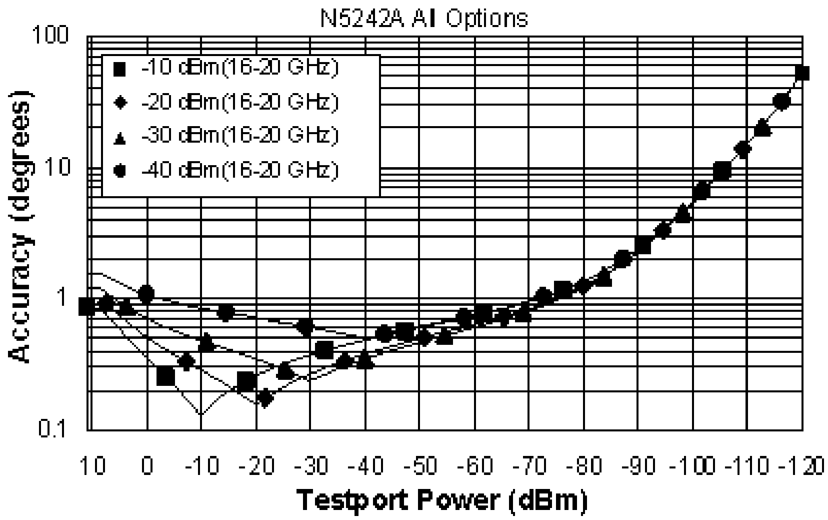


Dynamic Accuracy, 16 - 20 GHz

Magnitude

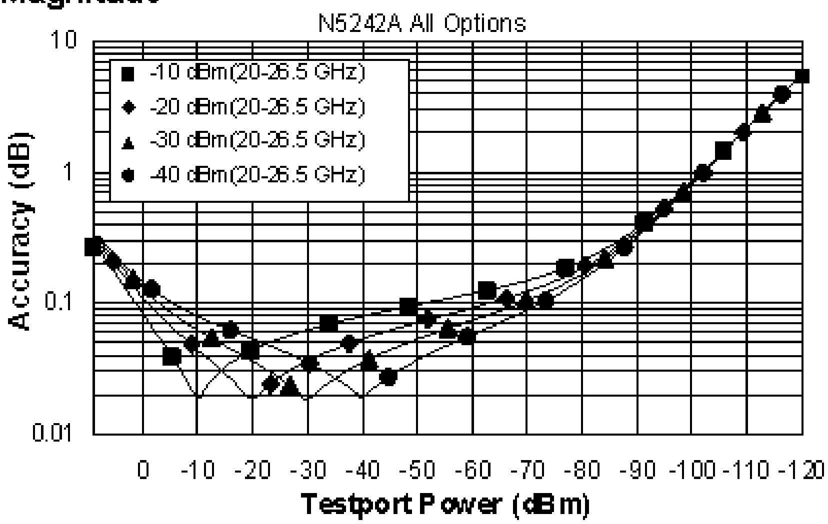


Phase

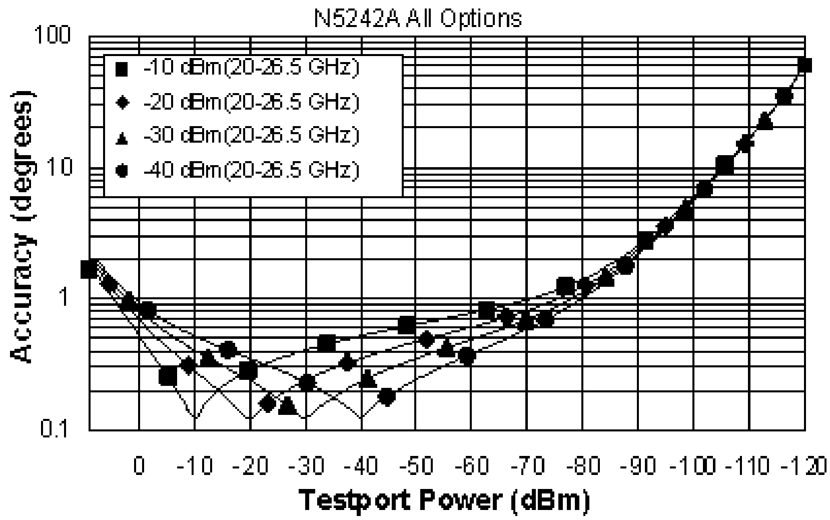


Dynamic Accuracy, 20 - 26.5 GHz

Magnitude



Phase



[2] Dynamic accuracy is verified with the following measurements:

Compression over frequency

IF linearity at a single frequency of 1.195 GHz using a reference level of -20 dBm for an input power range of 0 to -120 dBm.

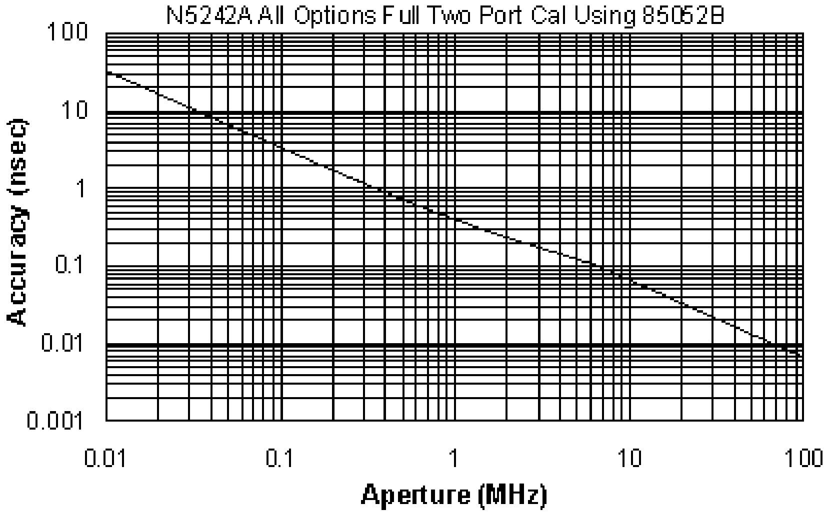
Table 28. Test Port Input (Group Delay)[a]

Description	Typical Performance
Aperture (selectable)	(frequency span)/(number of points -1)
Maximum Aperture	20% of frequency span
Range	0.5 x (1/minimum aperture)
Maximum Delay	Limited to measuring no more than 180° of phase ch
Accuracy	See graph below. Char.

The following graph shows characteristic group delay accuracy with full 2-port calibration and a 10 Hz IF bandwidth. Insertion loss is

For any S_{ij} Group Delay measurement, $S_{ii} = 0$, $S_{ij} = 1$, $S_{ji} = 0$, $S_{kl} = 0$ for all $kl \neq ij$

Group Delay (Typical)



In general, the following formula can be used to determine the accuracy, in seconds, of specific group delay measurement:

±Phase Accuracy (deg)/[360 × Aperture (Hz)]

Depending on the aperture and device length, the phase accuracy used is either incremental phase accuracy or worst-case phase ac

[a] Group delay is computed by measuring the phase change within a specified frequency step (determined by the frequency span and th

General Information

- Miscellaneous Information
- Front Panel
- Rear Panel
- Environment and Dimensions

Table 29. Miscellaneous Information

Description	Supplemental Information
System IF Bandwidth Range	1 Hz to 5 MHz, nominal
CPU	Intel® 1.6 GHz Pentium® M

Table 30. Front Panel Information

All Options

Description	Typical Performance
RF Connectors	
Type	Option 200 or 219 or 224 or 400 or 419 or 423: 3.5 mm (male), 50 ohm, (nominal)
Center Pin Recession	0.002 in. (characteristic)
USB 2.0 Ports	
Master (4 ports)	
Standard	Compatible with USB 2.0
Connector	USB Type-A female
Display	
Size	26.3 cm (10.4 in) diagonal color active matrix LCD; 1024 (horizontal) X 768 (vertical) resolution
Refresh Rate	Vertical 60 Hz; Horizontal 46.08 kHz
Pixels	A display is considered faulty if: More than 0.002% of the total pixels have a constant blue, green, red, or black appearance that will not change. Three or more consecutive pixels have a constant blue, green, red, or black

appearance that will not change.

Table 30. (Continued) Front Panel Information

Display Range	
Magnitude	+/-2500 dB (at 500 dB/div), max
Phase	+/-2500° (at 500 dB/div), max
Polar	10 pUnits, min 10,000 Units, max
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	10 pUnit, min

Table 31. Rear Panel Information

All Options

Description	Typical Performance
10 MHz Reference In	
Connector	BNC, female
Input Frequency	10 MHz ± 10 ppm, typical
Input Level	-15 dBm to +20 dBm, typical
Input Impedance	200 Ω , nom.
10 MHz Reference Out	
Connector	BNC, female
Output Frequency	10 MHz ± 1 ppm, typical
Signal Type	Sine Wave, typical
Output Level	+10 dBm ± 4 dB into 50 Ω
Output Impedance	50 Ω , nominal
Harmonics	<-40 dBc, typical
External IF Inputs	
Function	Allows use of external IF signals from remote mixers, bypassing the PNA's first converters
Connectors	SMA (female); A, B, C, D, R (4-port); A, B, R1, R2 (2-port)
Input Frequency Normal IF path: Narrowband IF path:	 RF < 53 MHz: IF = 2.535211 MHz RF >= 53 MHz: IF = 7.605634 MHz IF = 10.70 MHz
Input Impedance	50 Ω
RF Damage Level	
DC Damage Level	5.5 VDC
0.1 dB Compression Point	

Table **31.** (Continued) **R** ear **P** anel **I** nformation

Pulse Inputs (IF Gates)	
Function	Internal receiver gates used for point-in-pulse and pulse-profile measurements
Connectors	15-pin mini D-sub
Input Impedance	1 K Ohm
Minimum Pulse Width, Source Modulators	33 ns
Minimum Pulse Width, Receiver Gates	20 ns
DC Damage Level	5.5 VDC
Drive Voltage	0 V (off), +3.3 V (on), nominal
RF Pulse Modulator Input (Source Modulator)	
On / Off Ratio	
10 MHz to 3.2 GHz	-64
3.2 GHz to 26.5 GHz	-80
Pulse Period	
Minimum	33 ns
Maximum	70 s
External Test Set Driver	
Function	Used for driving remote mixers
Connections	SMA (female)
RF, LO Output Frequency Range	1.7 to 26.5 GHz

Table 31. (Continued) Rear Panel Information

Description	Typical (dBm)	
	Upper Limit (dBm)	Lower Limit (dBm)
Test Set Drivers (Continued)		
Rear Panel LO Power Full frequency range: 12.535 MHz to 26.5 GHz		
1.7 GHz to 18 GHz	0	-10
18 GHz to 22.5 GHz	2	-8
22.5 GHz to 26.5 GHz	6	-5
Rear Panel RF Power		
3.2 GHz to 20 GHz	-3	-8
20 GHz to 26.5 GHz	-8	-14

Table 31. (Continued) Rear Panel Information

Description	Typical Performance
VGA Video Output	
Connector	15-pin mini D-Sub; Drives VGA compatible monitors
Devices Supported:	
	Resolutions:
Flat Panel (TFT)	1024 X 768, 800 X 600, 640 X 480
Flat Panel (DSTN)	800 X 600, 640 X 480
CRT Monitor	1280 X 1024, 1024 X 768, 800 X 600, 640 X 480
	Simultaneous operation of the internal and external displays is allowe display (internal display will "white out").
Bias Tee Inputs	
Connectors	BNC(f) for ports 1, 2, 3 and 4
Fuse	500 mA
Maximum Bias Current	+/-200 mA
Maximum Bias Voltage	+/-40 VDC
Trigger Inputs/Outputs	BNC(f), TTL/CMOS compatible
Test Set IO	25-pin D-Sub connector, available for external test set control.
Power IO	9-pin D-Sub, female; analog and digital IO
Handler IO	36-pin parallel I/O port; all input/output signals are default set to neg

Table 31. (Continued) Rear Panel Information

GPIB (two ports - dedicated controller and dedicated talker/listener)	24-pin D-sub (Type D-24), female; compatible with IEEE-488.
Parallel Port (LPT1)	25-pin D-Sub miniature connector, female; provides connection to pri
Serial Port (COM 1)	9-pin D-Sub, male; compatible with RS-232
USB Port	Four ports on front panel (all Host) and five ports (four Host and one D USB 2.0 compatible.
LAN	10/100BaseT Ethernet, 8-pin configuration; auto selects between the
Line Power	
Frequency, Voltage	50/60 Hz for 100 240 VAC
	Power supply is auto switching
Max	450 watts

Note : Option H11 is not available with the N5242A network analyzer.

Table 32. Analyzer Dimensions and Weight

Cabinet Dimensions	Height	W
Excluding front and rear panel hardware and feet	266 mm 10.5 in	43 17
Excluding front and rear panel hardware and feet. Including rack-mount flanges.	266 mm 10.5 in EIA RU[1] = 6	48 19
As shipped - including front panel connectors, rear panel bumpers, and feet.	277 mm 10.9 in	43 17
As shipped including rack-mount flanges	277 mm 10.9 in	48 19
Weight		
	Option 200 or 219 or 224	O
Net	27 kg (60 lb), nominal	37
Shipping	43 kg (95 lb), nominal	53

[1] Network analyzer feet removed.

Note: For Regulatory and Environmental information, refer to the PNA Series Installation and Quick Start Guide, located online at http:/

Measurement Throughput Summary

- Typical Cycle Time for Measurement Completion
- Cycle Time vs. IF Bandwidth
- Cycle Time vs. Number of Points
- Data Transfer Time

Table 33. Typical Cycle Time[a] (ms) for Measurement Completion

All Options

Description	Typical Performance	
	Number of Points	
	201	401
Start 9 GHz, Stop 10 GHz, 600 kHz IF bandwidth		
Uncorrected	6	6.3
2-Port cal	20	21
Start 9 GHz, Stop 10 GHz, 10 kHz IF bandwidth		
Uncorrected	36	53
2-Port cal	80	115
Start 9 GHz, Stop 10 GHz, 1 kHz IF bandwidth		
Uncorrected	227	444
2-Port cal	460	900
Start 10 GHz, Stop 20 GHz, 600 kHz IF bandwidth		
Uncorrected	26	33
2-Port cal	62	77
Start 10 GHz, Stop 20 GHz, 10 kHz IF bandwidth		
Uncorrected	70	118
2-Port cal	149	245
Start 10 GHz, Stop 20 GHz, 1 kHz IF bandwidth		
Uncorrected	236	459

2-Port Cal	400	926

Table 33. (Continued) Typical Cycle Time[a] (ms) for Measurement Completion

Start 10 MHz, Stop 26.5 GHz, 600 kHz IF bandwidth		
Uncorrected	59	69
2-Port cal	125	147
Start 10 MHz, Stop 26.5 GHz, 10 kHz IF bandwidth		
Uncorrected	94	156
2-Port cal	196	320
Start 10 MHz, Stop 26.5 GHz, 1 kHz IF bandwidth		
Uncorrected	277	504
2-Port cal	561	1015

[a] Includes sweep time, retrace time and band-crossing time. Analyzer display turned off with DISPLAY:ENABLE OFF. Add 21 ms for display on. Data for one trace (S_{11}) measurement.

Note: Option H08 and Option H11 are not available with the N5242A network analyzer.

Table 34. Cycle Time vs. IF Bandwidth

Applies to the Preset condition (201 points, correction off) except for the following changes:

- CF = 10 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Description	Typical Performance	
IF Bandwidth (Hz)	Cycle Time (ms)[1]	Trace Noise
600,000	5.00	0.009
100,000	6.84	0.003
30,000	11.6	0.002
10,000	29.0	0.001
3,000	71.8	0.0007
1,000	222	0.0004
300	640	0.0003
100	1826	0.0002
30	5982	<0.0002
10	17830	<0.0002
3	60000	<0.0002

a Cycle time includes sweep and retrace time.

Table 35. Cycle Time vs. Number of Points

Applies to the Preset condition (correction off) except for the following changes:

- CF = 10 GHz
- Span = 100 MHz
- Display off (add 21 ms for display on)

Description	Typical Performance	
IF Bandwidth (Hz)	Number of Points	Cycle Time (ms)[1]
1,000	3	7.7
	11	16.6
	51	60
	101	115
	201	222
	401	436
	801	860
	1,601	1,700
	6,401	6,700
	16,001	16,000
10,000	3	5.44
	11	7.90
	51	10.7
	101	16.8
	201	29.0
	401	53.0
	801	102
	1,601	199
	6,401	780
	16,001	1950

Table **35** . (Continued) Cycle Time **V** s. Number of **P** oints

Description	Typical Performance	
IF Bandwidth (Hz)	Number of Points	Cycle Time (ms)[1]
30,000	3	5.7
	11	5.9
	51	6.5
	101	8.2
	201	11.8
	401	18.8
	801	32.8
	1,601	60.5
	6,401	228
	16,001	566
600,000	3	5.4
	11	5.4
	51	5.5
	101	5.6
	201	5.9
	401	6.3
	801	7.2
	1,601	9.6
	6,401	25
	16,001	56

a Cycle time includes sweep and retrace time.

Table 36. Data Transfer Time (ms)

Description	Typical Performance	
	Number of Points	
	201	401
SCPI over GPIB		
(Program executed on external PC[2])		
32-bit floating point	5.6	10.5
64-bit floating point	10.5	20.3
ASCII	46	92.5
SCPI over SICL / LAN or TCP / IP Socket		
(Program executed in the analyzer)		
32-bit floating point	0.18	0.21
64-bit floating point	0.22	0.28
ASCII	6.3	12.3
COM[3]		
(Program executed in the analyzer)		
32-bit floating point	<0.15	0.15
Variant type	0.75	1.2
DCOM over LAN[3]		
(Program executed on external PC)		
32-bit floating point	<1.0	1.2
Variant type	2.7	4.5

[1] Measured with the analyzer display off. Values will increase slightly if the analyzer display is on.

[2] Measured when using the SCPI command DISPlay: VISible OFF.

[3] Values are for real and imaginary pairs, with the analyzer display off.

Note : Specifications for Recall & Sweep Speed are not provided for the N5242A analyzers.

Specifications: Front-Panel Jumpers

Model N5242A (PNA-X)

Note: All PNA-X options have the following front-panel jumpers for each port.

- Measurement Receiver Inputs
- Reference Receiver Inputs
- Reference Outputs (Source Out)
- Source Outputs
- Coupler Inputs

Table 37. Measurement Receiver Inputs

(Rcvr A IN, Rcvr B IN, Rcvr C IN, Rcvr D IN) @ 0.1dB Typical Compression

Description	Typical
	All Options
Maximum Input Level	
10 MHz to 50 MHz[1]	--
50 MHz to 500 MHz[1]	--
500 MHz to 3.2 GHz	-2 dBm
3.2 GHz to 10 GHz	-2 dBm
10 GHZ to 16 GHz	-2 dBm
16 GHZ to 20 GHz	-2.5 dBm
20 GHZ to 24 GHz	-4 dBm
24 GHZ to 26.5 GHz	-4 dBm
Damage Level	
N5242A	+15 dBm
Maximum DC Level	
N5242A	0 V

[1] Test port receiver compression at specified input levels below 500 MHz is negligible due to coupler roll off in this frequency range.

Table 38. Reference Receiver Input

(RCVR R1 IN) @ Max Specified Output Power

Description			
	Option 200 or 400 Filtered Mode	Option 200 or 400 Hi Pwr Mode	Option 224 or 423 Filtered Mode
Maximum Input Level			
10 MHz to 50 MHz	-8 dBm	-3 dBm	-9 dBm
50 MHz to 500 MHz	-6 dBm	-3 dBm	-7 dBm
500 MHz to 3.2 GHz	-6 dBm	-6 dBm	-7 dBm
3.2 GHz to 10 GHz	-3 dBm	-3 dBm	-2 dBm
10 GHZ to 16 GHz	-4 dBm	-4 dBm	-3 dBm
16 GHZ to 20 GHz	-5 dBm	-5 dBm	-6 dBm
20 GHZ to 24 GHz	-7 dBm	-7 dBm	-9 dBm
24 GHZ to 26.5 GHz	-16 dBm	-16 dBm	-18 dBm
Damage Level			
	+15 dBm		
Maximum DC Level			
	+/-7 V		

Table 39. Reference Receiver Input

(RCVR R2 IN, RCVR R3 IN, RCVR R4 IN) @ Max Specified Output Power

Description	Typical		
	Option 400 RCVR R3 IN Filtered Mode	Option 400 RCVR R3 IN Hi Pwr Mode	Option 200 or 400 RCVR R2 IN RCVR R4 IN
Maximum Input Level			
10 MHz to 50 MHz	-6 dBm	-1 dBm	-1 dBm
50 MHz to 500 MHz	-4 dBm	-1 dBm	-1 dBm
500 MHz to 3.2 GHz	-4 dBm	-4 dBm	0 dBm
3.2 GHz to 10 GHz	0 dBm	0 dBm	0 dBm
10 GHZ to 16 GHz	1 dBm	1 dBm	0 dBm
16 GHZ to 20 GHz	1 dBm	1 dBm	-3 dBm
20 GHZ to 24 GHz	0 dBm	0 dBm	-6 dBm
24 GHZ to 26.5 GHz	-8 dBm	-8 dBm	-12 dBm
Damage Level			
	+15 dBm		
Maximum DC Level			
	+/-15 V		

Table 39. (Continued) Reference Receiver Input

(RCVR R2 IN, RCVR R3 IN, RCVR R4 IN) @ Max Specified Output Power

Description	Typical
	Option 423 RCVR R3 IN Filtered Mode
Maximum Input Level	
10 MHz to 50 MHz	-7 dBm
50 MHz to 500 MHz	-6 dBm
500 MHz to 3.2 GHz	-5 dBm
3.2 GHz to 10 GHz	1 dBm
10 GHZ to 16 GHz	1 dBm
16 GHZ to 20 GHz	0 dBm
20 GHZ to 24 GHz	-2 dBm
24 GHZ to 26.5 GHz	-10 dBm
Damage Level	
	+15 dBm
Maximum DC Level	
	+/-15 V

Table 40. Reference Output

(REF 1 SOURCE OUT) @ Max Specified Output Power

Description	Typical		
	Option 200 or 400 F iltered Mode	Option 200 or 400 Hi Pwr Mode	Option 219 or 419 F iltered Mode
Maximum Input Level			
10 MHz to 50 MHz	-8 dBm	-3 dBm	-8 dBm
50 MHz to 500 MHz	-6 dBm	-3 dBm	-6 dBm
500 MHz to 3.2 GHz	-6 dBm	-6 dBm	-5 dBm
3.2 GHz to 10 GHz	-3 dBm	-3 dBm	-2 dBm
10 GHZ to 16 GHz	-4 dBm	-4 dBm	-3 dBm
16 GHZ to 20 GHz	-5 dBm	-5 dBm	-6 dBm
20 GHZ to 24 GHz	-7 dBm	-7 dBm	-8 dBm
24 GHZ to 26.5 GHz	-16 dBm	-16 dBm	-15 dBm
Damage Level			
	+15 dBm		
Maximum DC Level			
	+/-7 V		

Table 41. Reference Output

(REF 2 SOURCE OUT, REF 3 SOURCE OUT, REF 4 SOURCE OUT) @ Max Specified Output Power

Description	Typical		
	Option 400 REF 3 Source Out Filtered Mode	Option 400 REF 3 Source Out Hi Pwr Mode	Option 200 or 400 REF 2 Source Out REF 4 Source Out Filtered Mode
Maximum Input Level			
10 MHz to 50 MHz	-6 dBm	-1 dBm	-1 dBm
50 MHz to 500 MHz	-4 dBm	-1 dBm	-1 dBm
500 MHz to 3.2 GHz	-4 dBm	-4 dBm	0 dBm
3.2 GHz to 10 GHz	0 dBm	0 dBm	0 dBm
10 GHZ to 16 GHz	1 dBm	1 dBm	0 dBm
16 GHZ to 20 GHz	1 dBm	1 dBm	-3 dBm
20 GHZ to 24 GHz	0 dBm	0 dBm	-6 dBm
24 GHZ to 26.5 GHz	-8 dBm	-8 dBm	-12 dBm
Damage Level			
	+15 dBm		
Maximum DC Level			
	0 V		

Table 41. (Continued) Reference Output

(REF 2 SOURCE OUT, REF 3 SOURCE OUT, REF 4 SOURCE OUT) @ Max Specified Output Power

Description	Typical
	Option423 REF 3 Source Out Filtered Mode
Maximum Input Level	
10 MHz to 50 MHz	-7 dBm
50 MHz to 500 MHz	-6 dBm
500 MHz to 3.2 GHz	-5 dBm
3.2 GHz to 10 GHz	1 dBm
10 GHZ to 16 GHz	1 dBm
16 GHZ to 20 GHz	0 dBm
20 GHZ to 24 GHz	-2 dBm
24 GHZ to 26.5 GHz	-10 dBm
Damage Level	
	+15 dBm
Maximum DC Level	
	0 V

Table 42. Source Outputs

(PORT 1 SOURCE OUT, PORT 2 SOURCE OUT, PORT 3 SOURCE OUT, PORT 4 SOURCE OUT) @ Max Specified Output Power

Description	Typical		
	Option 200 or 400 Port 1 Source Out Port 3 Source Out Filtered Mode	Option 200 or 400 Port 1 Source Out Port 3 Source Out Hi Pwr Mode	Option 200 or 400 Port 2 Source Out Port 4 Source Out
Maximum Input Level			
10 MHz to 50 MHz	8 dBm	13 dBm	13 dBm
50 MHz to 500 MHz	10 dBm	13 dBm	13 dBm
500 MHz to 3.2 GHz	11 dBm	11 dBm	13 dBm
3.2 GHz to 10 GHz	14 dBm	14 dBm	14 dBm
10 GHZ to 16 GHz	14 dBm	14 dBm	14 dBm
16 GHZ to 20 GHz	14 dBm	14 dBm	11 dBm
20 GHZ to 24 GHz	13 dBm	13 dBm	9 dBm
24 GHZ to 26.5 GHz	7 dBm	7 dBm	4 dBm
Damage Level			
	+30 dBm		
Maximum DC Level			
	0 V		

Table 42. (Continued) Source Outputs

(PORT 1 SOURCE OUT, PORT 2 SOURCE OUT, PORT 3 SOURCE OUT, PORT 4 SOURCE OUT) @ Max Specified Output Power

Description	Typical
	Option 224 or 423 Port 1 Source Out Port 3 Source Out Filtered Mode
Maximum Input Level	
10 MHz to 50 MHz	7 dBm
50 MHz to 500 MHz	8 dBm
500 MHz to 3.2 GHz	9 dBm
3.2 GHz to 10 GHz	14 dBm
10 GHZ to 16 GHz	14 dBm
16 GHZ to 20 GHz	12 dBm
20 GHZ to 24 GHz	9 dBm
24 GHZ to 26.5 GHz	2 dBm
Damage Level	
	+30 dBm
Maximum DC Level	
	0 V

Table 43. Coupler Inputs

(PORT 1 CPLR THRU, PORT 2 CPLR THRU, PORT 3 CPLR THRU, PORT 4 CPLR THRU) Insertion Loss of Coupler Thru

Description	Typical
	Option 200 or 400
Maximum Input Level	
10 MHz to 50 MHz	
50 MHz to 500 MHz	
500 MHz to 3.2 GHz	
3.2 GHz to 10 GHz	
10 GHZ to 16 GHz	
16 GHZ to 20 GHz	
20 GHZ to 24 GHz	
24 GHZ to 26.5 GHz	
Damage Level	
N5242A	+30 dBm
Maximum DC Level	
N5242A	+/-40 V

Specifications: N5242A Option 029

General specifications apply to Option 029 with the port 1 noise tuner switch set to the internal position except as stated below. By de
PNA instruments. Refer to the Noise Figure Application for information on setting the switch position.

Corrected System Performance with 3.5mm Connectors

Note: For any Sii reflection measurement:

- Sjj = 0.

For any Sij transmission measurement:

- Sji = Sij when Sij ≤ 1
- Sji = 1/Sij when Sij > 1
- Skk = 0 for all k

Table 44. 85052B Calibration Kit

N5242A Option 029

Applies to the N5242A analyzer with Option 029, an 85052B (3.5mm) calibration kit, an 85131F flexible test port cable set, and a full 2-p
configuration. Environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature

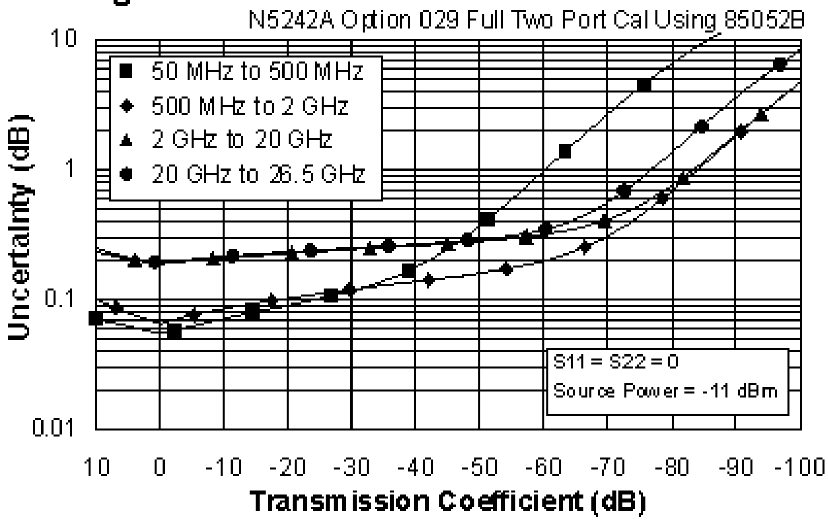
Description	Specification (dB)			
	50 MHz to 500 MHz	500 MHz to 2 GHz	2 to 20 GHz	20 to 26.5 GHz
Directivity	48	48	44	44
Source Match	40	40	31	31
Load Match	48	48	44	44
Reflection Tracking [1]	±0.003 +0.010/°C	±0.003 +0.010/°C	±0.006 +0.020/°C	±0.006 +0.030/°C
S_{21} Transmission Tracking [1]	±0.033 +0.010/°C	±0.045 +0.010/°C	±0.158 +0.020/°C	±0.159 +0.030/°C
S_{12} Transmission Tracking [1]	±0.044 +0.010/°C	±0.049 +0.010/°C	±0.159 +0.020/°C	±0.155 +0.030/°C

[1] Temperature deviation is a characteristic value.

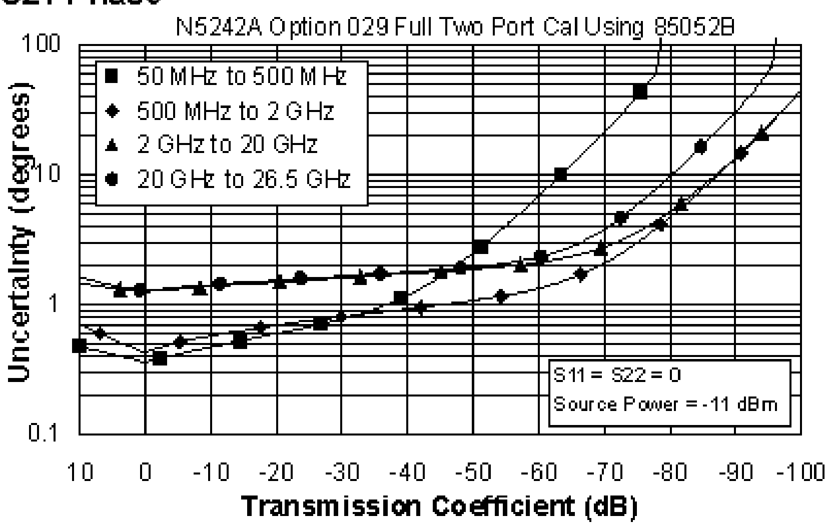
Specifications: N5242A Option 029 (continued)

S_{21} Transmission Uncertainty (Specifications)

S21 Magnitude

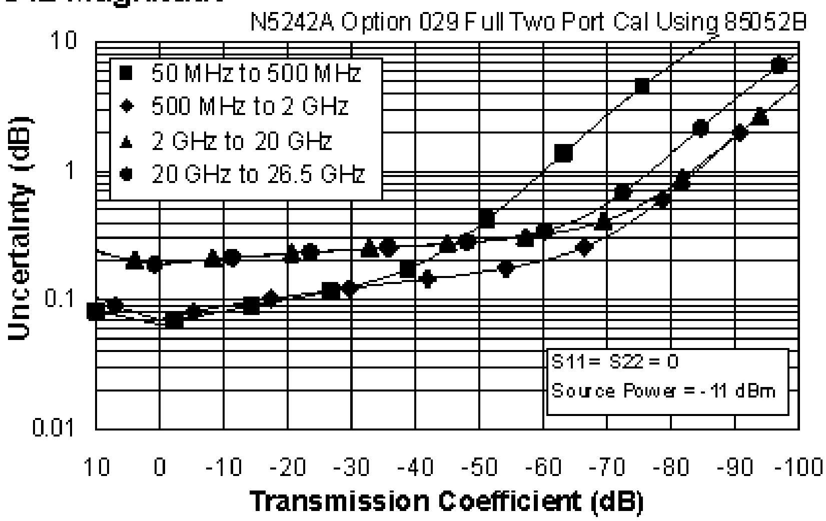


S21 Phase

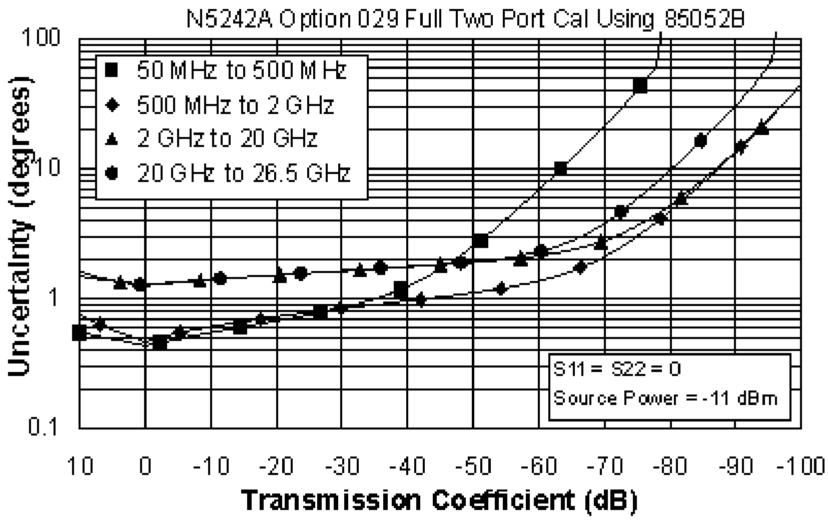


S_{12} Transmission Uncertainty (Specifications)

S12 Magnitude

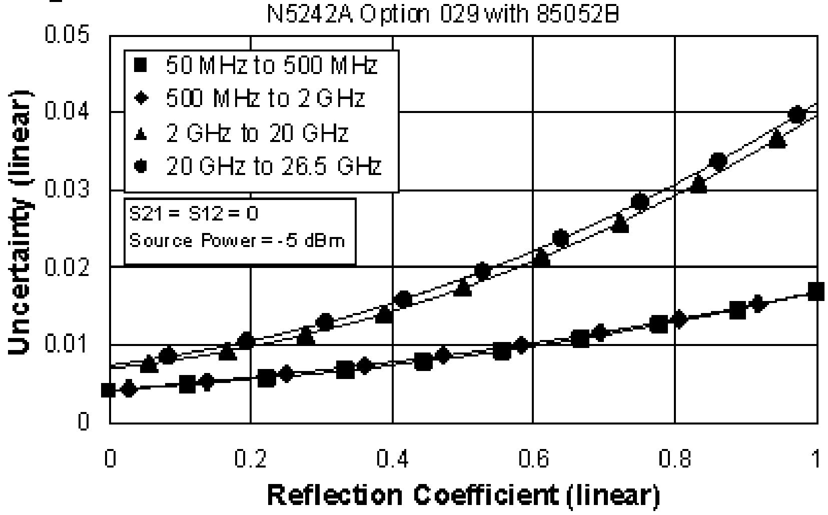


S12 Phase

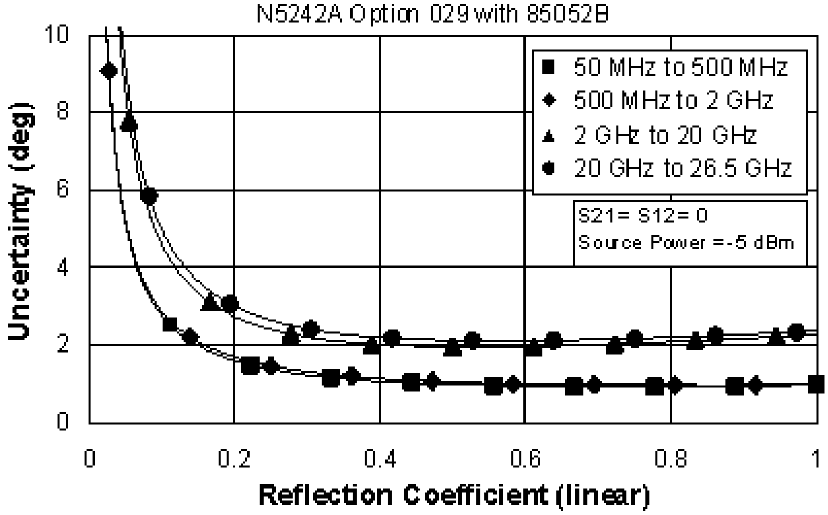


Reflection Uncertainty (Specifications)

Magnitude



Phase



Specifications: N5242A Option 029 (continued)

Table 45. N4433A 4-Port Electronic Calibration Module

N5242A Option 029

Note : Uncertainty curves for the N4433A are created using a 2-port calibration. Multiport uncertainties are not supported at this time.

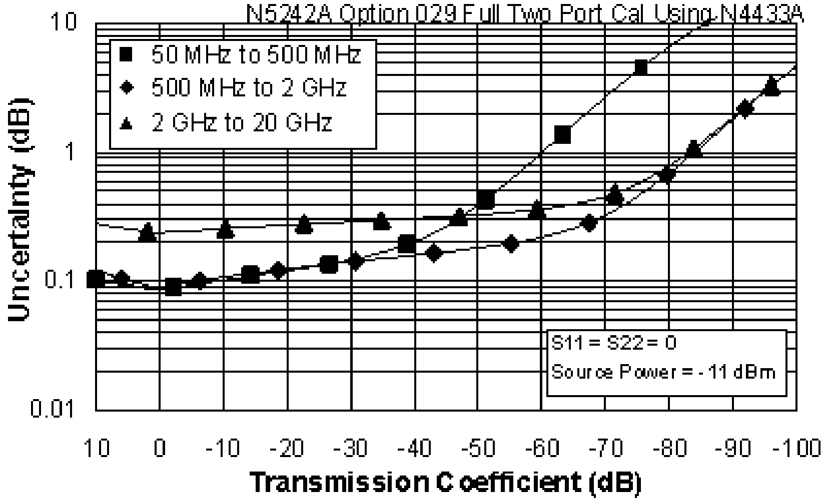
Applies to the N5242A analyzer with Option 029, an N4433A (3.5mm) electronic calibration module, an 85131F flexi
were made with the analyzer in the noise figure configuration. Environmental temperature 23° ±3 °C, with < 1 °C de

Description	Specification (dB)		
	50 MHz to 500 MHz	500 MHz to 2 GHz	2 to 20 GHz
Directivity	52	52	45
Source Match	42	42	31
Load Match	40	40	28
Reflection Tracking [1]	±0.060 +0.010/°C	±0.060 +0.010/°C	±0.180 +0.020/°C
S_{21} Transmission Tracking [1]	±0.065 +0.010/°C	±0.068 +0.010/°C	±0.205 +0.020/°C
S_{12} Transmission Tracking [1]	±0.069 +0.010/°C	±0.069 +0.010/°C	±0.206 +0.020/°C

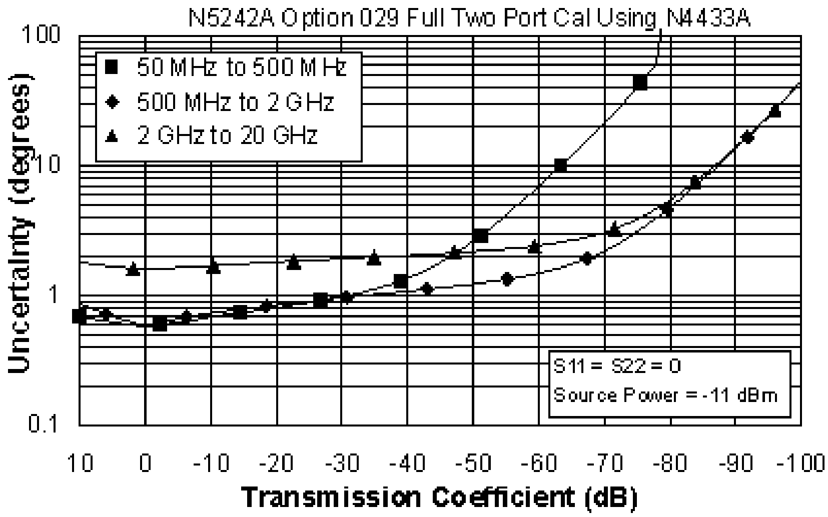
[1] Temperature deviation is a characteristic value.

S_{21} Transmission Uncertainty (Specifications)

S21 Magnitude



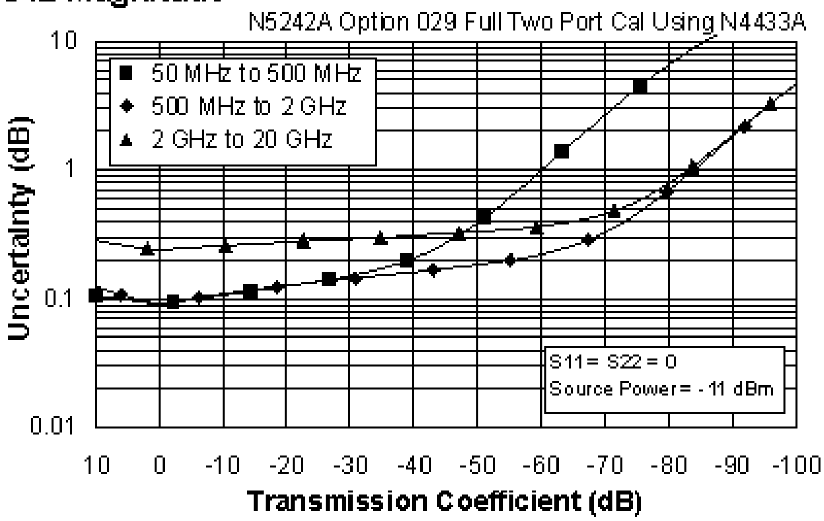
S21 Phase



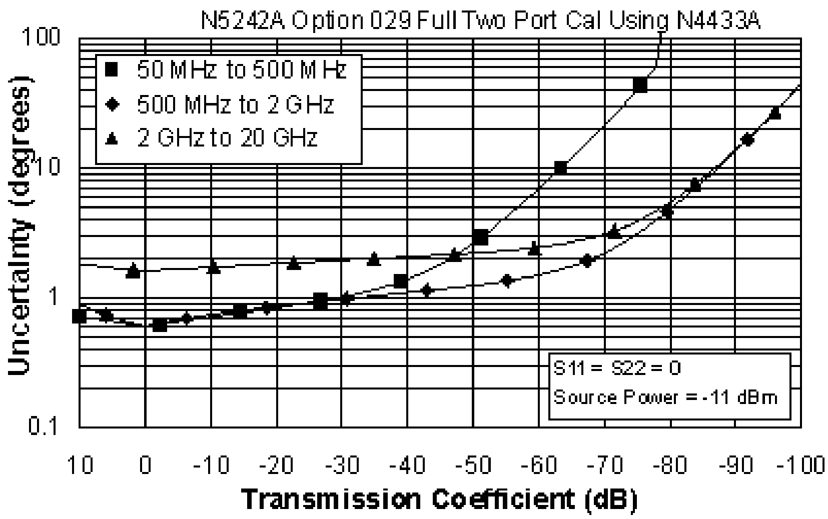
Specifications: N5242A Option 029 (continued)

S_{12} Transmission Uncertainty (Specifications)

S12 Magnitude



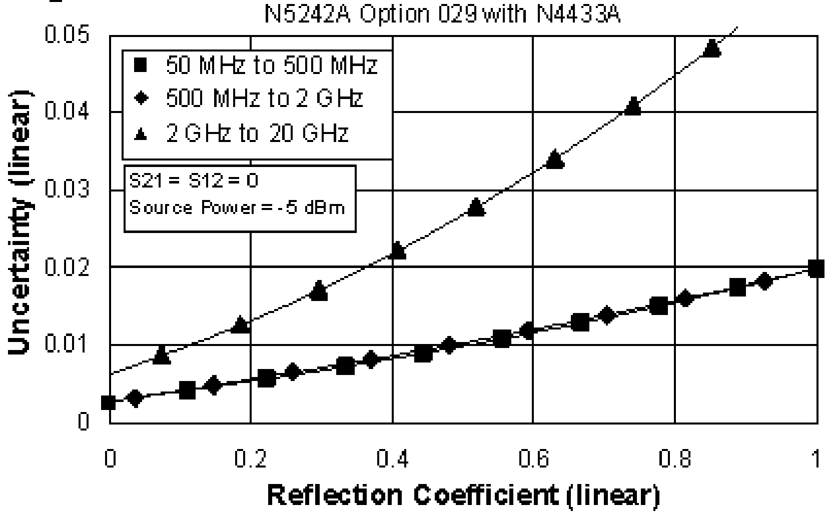
S12 Phase



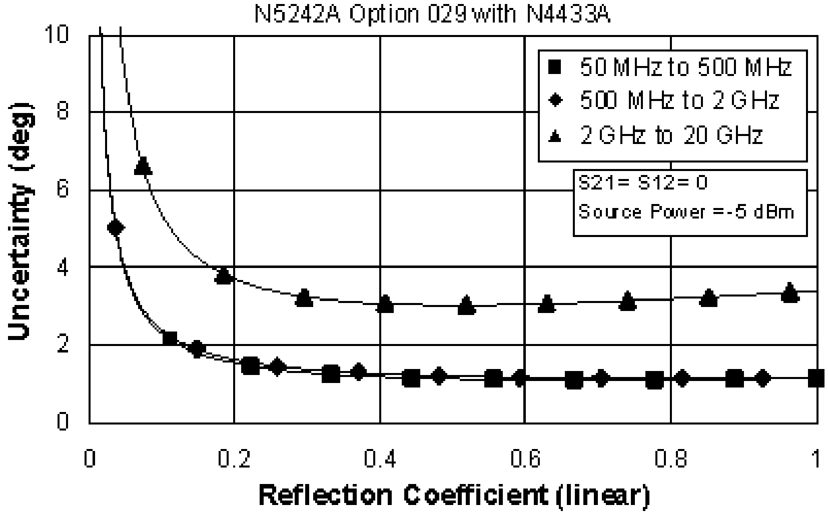
Specifications: N5242A Option 029 (continued)

Reflection Uncertainty (Specifications)

Magnitude



Phase



Specifications: N5242A Option 029 (continued)

Table 46. N4691B 2- Port Electronic Calibration Module

N5242A Option 029

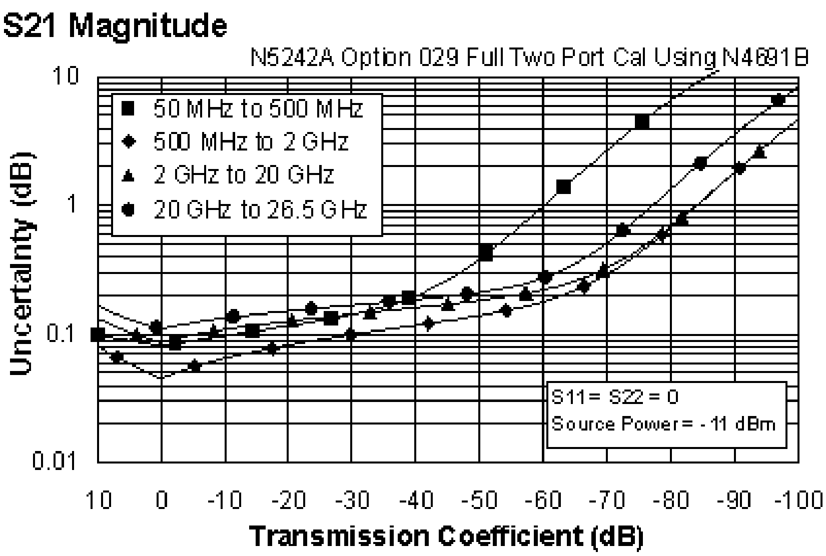
Applies to the N5242A analyzer with Option 029, an N4691B (3.5mm) electronic calibration module, an 85131F flexib
were made with the analyzer in the noise figure configuration. Environmental temperature 23° ±3 °C, with < 1 °C de

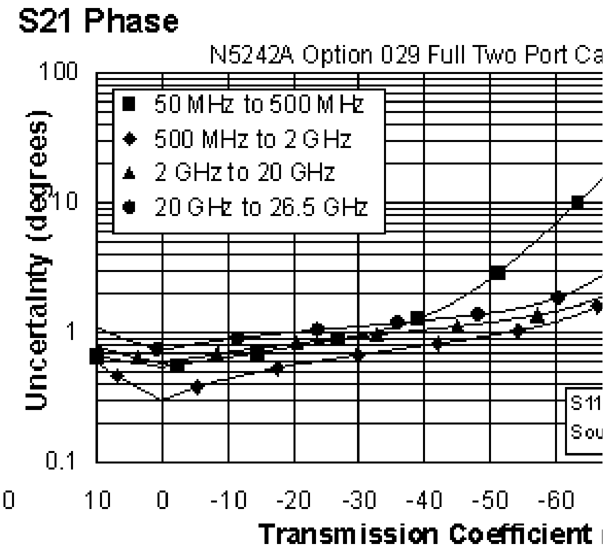
Description	Specification (dB)			
	50 MHz to 500 MHz	500 MHz to 2 GHz	2 to 20 GHz	20 to 26.5 GHz
Directivity	46	56	48	44
Source Match	41	47	44	40
Load Match	40	46	41	38
Reflection Tracking [1]	±0.050 +0.010/°C	±0.020 +0.010/°C	±0.040 +0.020/°C	±0.050 +0.030/°C
S_{21} Transmission Tracking [1]	±0.060 +0.010/°C	±0.025 +0.010/°C	±0.058 +0.020/°C	±0.079 +0.030/°C
S_{12} Transmission Tracking [1]	±0.068 +0.010/°C	±0.026 +0.010/°C	±0.059 +0.020/°C	±0.119 +0.030/°C

[1] Temperature deviation is a characteristic value.

Specifications: N5242A Option 029 (continued)

Transmission Uncertainty (Specifications)

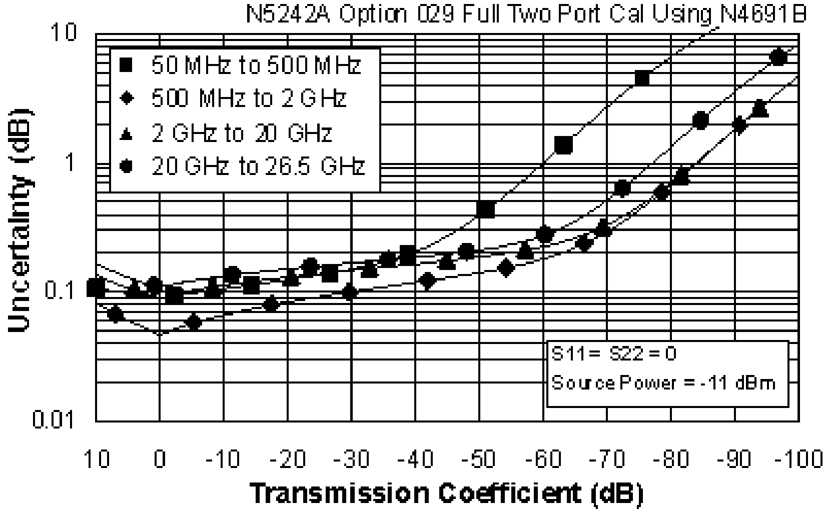




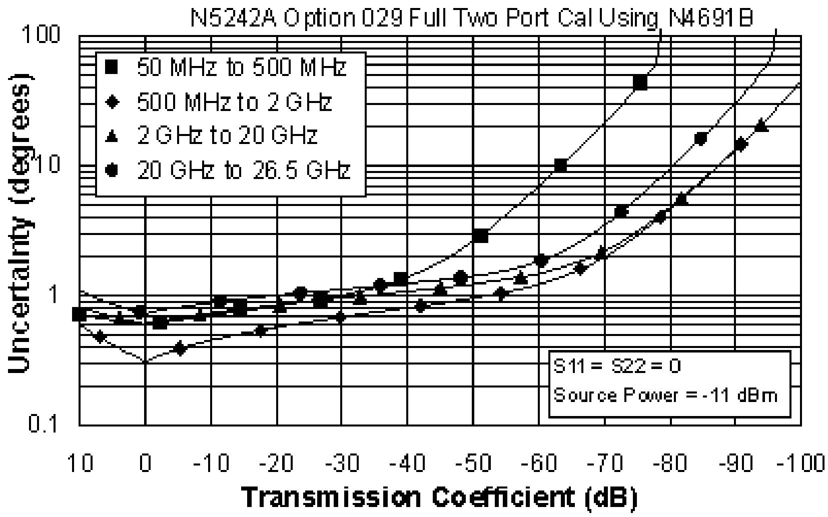
Specifications: N5242A Option 029 (continued)

Transmission Uncertainty (Specifications)

S12 Magnitude



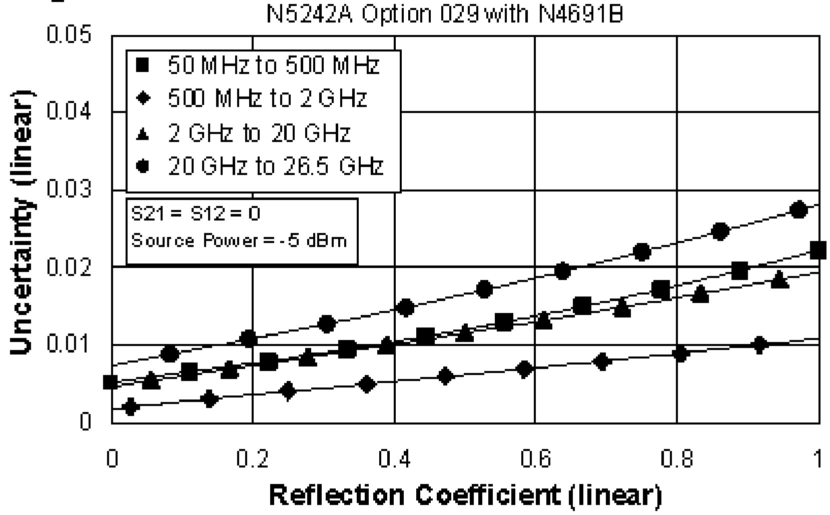
S12 Phase



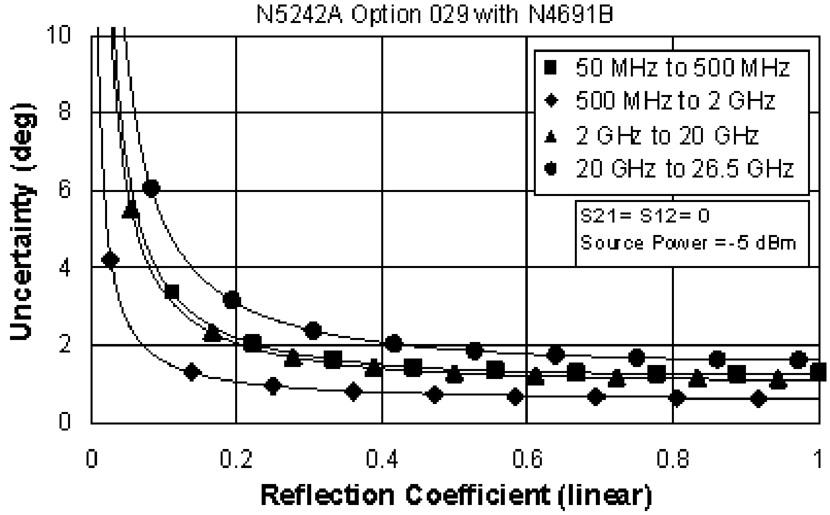
Specifications: N5242A Option 029 (continued)

Reflection Uncertainty (Specifications)

Magnitude



Phase



This N5242A document does not present specifications for the 85052C or 85052D Calibration Kit. Please download our free Uncertainty for the 85052C or the 85052D Calibration Kit.

Uncorrected System Performance, N5242A Option 029

Noise Error Terms: N5242A Option 029

Table 47. Noise State Directivity, Port 1 and Port 2[1] (dB)

Frequency	Specification	Typical
10 MHz to 50 MHz	-16	-22
50 MHz to 500 MHz	-24	-28
500 MHz to 3.2 GHz	-24	-32
3.2 GHz to 10 GHz	-23	-25
10 GHz to 16 GHz	-16	-20
16 GHz to 20 GHz	-15	-20
20 GHz to 24 GHz	-15	-20
24 GHz to 26.5 GHz	-15	-20

[1] Analyzer test set switches are set in accordance with the Figure 22 block diagram , but with a jumper replacing the ECal module.

Table 48. Noise State Load Match, Port 1[1] (dB)

Frequency	Specification	Typical
10 MHz to 50 MHz	-11	-18
50 MHz to 500 MHz	-17	-24
500 MHz to 3.2 GHz	-15	-19
3.2 GHz to 10 GHz	-10	-15
10 GHz to 16 GHz	-9	-15
16 GHz to 20 GHz	-8	-13
20 GHz to 24 GHz	-7	-13
24 GHz to 26.5 GHz	-7	-11

[1] Analyzer test set switches are set in accordance with the Figure 22 block diagram , but with a jumper replacing the ECal module.

Specifications: N5242A Option 029 (continued)

Table 49. Noise State Load Match, Port 2[1] (dB)

Frequency	Specification	Typical
10 MHz to 50 MHz	-9	-12
50 MHz to 500 MHz	-13	-15
500 MHz to 3.2 GHz	-9	-12
3.2 GHz to 10 GHz	-5.5	-7.5
10 GHz to 16 GHz	-5.5	-7.5
16 GHz to 20 GHz	-5.5	-7.5
20 GHz to 24 GHz	-5.5	-7.5
24 GHz to 26.5 GHz	-5.5	-7.5

[1] Analyzer test set switches are set in accordance with the Figure 22 block diagram , but with a jumper replacing the ECal module.

Table 50. Noise State Reflection Tracking (S_{11} and S_{22}), Min / Max (dB)

Frequency	Specification	Typical
10 MHz to 50 MHz	--	+/-1.5
50 MHz to 500 MHz	--	+/-1.5
500 MHz to 3.2 GHz	--	+/-1.5
3.2 GHz to 10 GHz	--	+/-1.5
10 GHz to 16 GHz	--	+/-1.5
16 GHz to 20 GHz	--	+/-1.5
20 GHz to 24 GHz	--	+/-1.5
24 GHz to 26.5 GHz	--	+/-1.5

Specifications: N5242A Option 029 (continued)

Table 51. Noise State Transmission Tracking, Min / Max (dB)

Frequency	Specification	Typical
10 MHz to 50 MHz	--	+/-1.5
50 MHz to 500 MHz	--	+/-1.5
500 MHz to 3.2 GHz	--	+/-1.5
3.2 GHz to 10 GHz	--	+/-1.5
10 GHz to 16 GHz	--	+/-1.5
16 GHz to 20 GHz	--	+/-1.5
20 GHz to 24 GHz	--	+/-1.5
24 GHz to 26.5 GHz	--	+/-1.5

Table 52. Noise State Source Match, Port 1[1] (dB)

Frequency	Specification	Typical
10 MHz to 50 MHz	-9	-13
50 MHz to 500 MHz	-18	-28
500 MHz to 3.2 GHz	-17	-22
3.2 GHz to 10 GHz	-12	-18
10 GHz to 16 GHz	-11	-16
16 GHz to 20 GHz	-9	-13
20 GHz to 24 GHz	-8	-13
24 GHz to 26.5 GHz	-7	-12

[1] Analyzer test set switches are set in accordance with the Figure 22 block diagram , but with a jumper replacing the ECal module.

Specifications: N5242A Option 029 (continued)

Table 53. Noise State Source Match, Port 2[1] (dB)

Frequency	Specification	Typical
10 MHz to 50 MHz	-9	-12
50 MHz to 500 MHz	-13	-15
500 MHz to 3.2 GHz	-9	-12
3.2 GHz to 10 GHz	-6	-7
10 GHz to 16 GHz	-6	-8
16 GHz to 20 GHz	-7	-9
20 GHz to 24 GHz	-6	-9
24 GHz to 26.5 GHz	-6	-9

[1] Analyzer test set switches are set in accordance with the Figure 22 block diagram , but with a jumper replacing the ECal module.

Test Port Input: Option 029

Table 54. Receiver Noise Figure, Port 2 (dB)

Frequency	Specification	Typical
800 kHz, 2 MHz, 4 MHz, 8 MHz BW, High Gain Setting[1]		
10 MHz to 200 MHz	9.0	--
200 MHz to 2 GHz	12.0	--
2 GHz to 20 GHz	14.5	--
20 GHz to 26.5 GHz	17.0	--
24 MHz BW, High Gain Setting[1]		
20 MHz to 200 MHz	9.0	--
200 MHz to 2 GHz	12.0	--
2 GHz to 20 GHz	14.5	--
20 GHz to 26.5 GHz	18.5	--

[1] Using Option 029 noise receivers.

Specifications: N5242A Option 029 (continued)

Table 55. Noise Jitter[1,2] (dB)

Frequency	Specification	Typical
4 MHz BW, Low Gain Setting		
10 MHz to 15 MHz	0.30	0.15
15 MHz to 3 GHz	0.10	0.07
3 GHz to 26.5 GHz	0.11	0.07
4 MHz BW, Medium Gain Setting		
10 MHz to 15 MHz	0.30	0.15
15 MHz to 3 GHz	0.10	0.07
3 GHz to 26.5 GHz	0.10	0.07
4 MHz BW, High Gain Setting		
10 MHz to 15 MHz	0.10	0.07
15 MHz to 3 GHz	0.10	0.07
3 GHz to 26.5 GHz	0.10	0.07

[1] 201 points, 1 noise average

[2] May typically be degraded at frequencies below 500 MHz due to spurious noise receiver residuals.

Table 56. Noise Receiver Linearity (dB)

Power Range	Specification	Typical
4 MHz BW, Low Gain Setting		
-34 dBm to -64 dBm	+/-0.05 dB	--
-64 dBm to -70 dBm	+/-0.10 dB	--
4 MHz BW, Medium Gain Setting		
-48 dBm to -76 dBm	+/-0.05 dB	--
-76 dBm to -86 dBm	+/-0.10 dB	
4 MHz BW, High Gain Setting		
-58 dBm to -84 dBm	+/-0.05 dB	--
-84 dBm to -92 dBm	+/-0.10 dB	--

Specifications: N5242A Option 029 (continued)

Table 57. Noise Receiver Input Range

--	Specification		
Power Range	High Gain Setting	Medium Gain Setting	Low Gain Setting
500 MHz to 3 GHz			
Max DUT NF + Gain (dB)	32 dB	44 dB	55 dB
Max Input Power (dBm) for <0.1 dB Compression[1]	<=-57 dBm	<=-45 dBm	<=-34 dBm
Max Operating Input Power (dBm)	-37 dBm Typical	-33 dBm Typical	-26 dBm Typical
Limit BW for full NF + Gain	400 MHz	400 MHz	400 MHz
3 GHz to 26.5 GHz			
Max DUT NF + Gain (dB)	46 dB	57 dB	68 dB
Max Input Power (dBm) for <0.1 dB Compression[1]	<=-43 dBm	<=-32 dBm	<=-21 dBm
Max Operating Input Power (dBm) Typical	-23 dBm	-20 dBm	-13 dBm
Limit BW for full NF + Gain	400 MHz	400 MHz	400 MHz

[1] Derived from 0.25 dB CW compression specification and -5 dB offset, derived from exponential model for device compression. Refere

Test Port Output: Option 029

Table 58. Max Leveled Power, Port 1 Filtered Mode – Option 219 / 029, 419 / 029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	7	9
50 MHz to 500 MHz	9	10
500 MHz to 3.2 GHz	9	10
3.2 GHz to 10 GHz	12	17
10 GHz to 16 GHz	12	15
16 GHz to 20 GHz	10	13
20 GHz to 24 GHz	8	12
24 GHz to 26.5 GHz	3	8

Specifications: N5242A Option 029 (continued)

Table 59. Max Leveled Power, Port 1 High Power Mode – Option 219/029, 419/029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	12	18
50 MHz to 500 MHz	12	19
500 MHz to 3.2 GHz	9	12
3.2 GHz to 10 GHz	12	17
10 GHz to 16 GHz	12	15
16 GHz to 20 GHz	10	13
20 GHz to 24 GHz	8	12
24 GHz to 26.5 GHz	3	8

Table 60. Max Leveled Power, Port 1 Filtered Mode – Option 224/029, 423/029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	6	8
50 MHz to 500 MHz	8	11
500 MHz to 3.2 GHz	8	11
3.2 GHz to 10 GHz	13	19
10 GHz to 16 GHz	12	15
16 GHz to 20 GHz	10	13
20 GHz to 24 GHz	6	11
24 GHz to 26.5 GHz	0	8

Table 61. Max Leveled Power, Port 1 High Power Mode – Option 224/029, 423/029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	12	18
50 MHz to 500 MHz	13	20
500 MHz to 3.2 GHz	10	13
3.2 GHz to 10 GHz	13	19
10 GHz to 16 GHz	12	15
16 GHz to 20 GHz	10	13
20 GHz to 24 GHz	6	11
24 GHz to 26.5 GHz	0	8

Table 62. Max Leveled Power, Port 1 Source 1, Combine Mode, Filtered Mode – Option 224/029, 423/029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	--	6
50 MHz to 500 MHz	--	9
500 MHz to 3.2 GHz	--	9
3.2 GHz to 10 GHz	--	15
10 GHz to 16 GHz	--	11
16 GHz to 20 GHz	--	8
20 GHz to 24 GHz	--	5
24 GHz to 26.5 GHz	--	0

Table 63. Max Leveled Power, Port 1 Source 1, Combine Mode, High Power Mode – Option 224/029, 423/029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	--	16
50 MHz to 500 MHz	--	17
500 MHz to 3.2 GHz	--	10
3.2 GHz to 10 GHz	--	15
10 GHz to 16 GHz	--	11
16 GHz to 20 GHz	--	8
20 GHz to 24 GHz	--	5
24 GHz to 26.5 GHz	--	0

Table 64. Max Leveled Power, Port 1 Source 2, Combine Mode, Filtered Mode – Option 224/029, 423/029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	--	-8
50 MHz to 500 MHz	--	-5
500 MHz to 3.2 GHz	--	-5
3.2 GHz to 10 GHz	--	2
10 GHz to 16 GHz	--	-2
16 GHz to 20 GHz	--	-4
20 GHz to 24 GHz	--	-7
24 GHz to 26.5 GHz	--	-11

Table 65. Max Leveled Power, Port 1 Source 2, Combine Mode, High Power Mode – Option 224 / 029, 423 / 029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	--	2
50 MHz to 500 MHz	--	4
500 MHz to 3.2 GHz	--	-4
3.2 GHz to 10 GHz	--	2
10 GHz to 16 GHz	--	-2
16 GHz to 20 GHz	--	-4
20 GHz to 24 GHz	--	-7
24 GHz to 26.5 GHz	--	-11

Table 66. Max Leveled Power, Port 2 – Option 219 / 029, 419 / 029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	13	17
50 MHz to 500 MHz	13	19
500 MHz to 3.2 GHz	13	18
3.2 GHz to 10 GHz	13	17
10 GHz to 16 GHz	9	12
16 GHz to 20 GHz	5	7
20 GHz to 24 GHz	2	4
24 GHz to 26.5 GHz	-2	3

Specifications: N5242A Option 029 (continued)

Table 67. Max Leveled Power, Port 2 – Option 224 / 029, 423 / 029 (dBm)

Frequency	Specification	Typical
10 MHz to 50 MHz	13	17
50 MHz to 500 MHz	13	20
500 MHz to 3.2 GHz	12	16
3.2 GHz to 10 GHz	13	17
10 GHz to 16 GHz	10	14
16 GHz to 20 GHz	6	9
20 GHz to 24 GHz	4	8
24 GHz to 26.5 GHz	-2	4

Test Set Block Diagrams

NOTE: For best readability, use a color printer for printing the following graphics.

Figure 13. 2-Port N5242A Base Unit (Option 200)

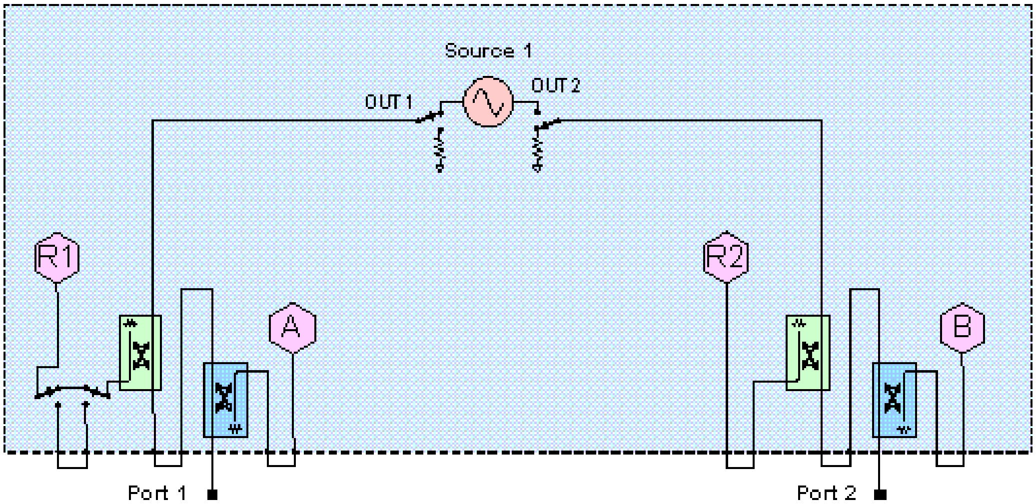


Figure 14. 2-Port N5242A (Option 219)

Figure 15. 2-Port N5242A (Option 224)

Figure 16. 4-Port N5242A Base Unit (Option 400)

Figure 17. 4-Port N5242A (Option 419)

Figure 18. 4-Port N5242A (Option 423)

Figure 19. 2-Port N5242A (Option 219, 224), Showing J-Designators for Rear Panel Connectors

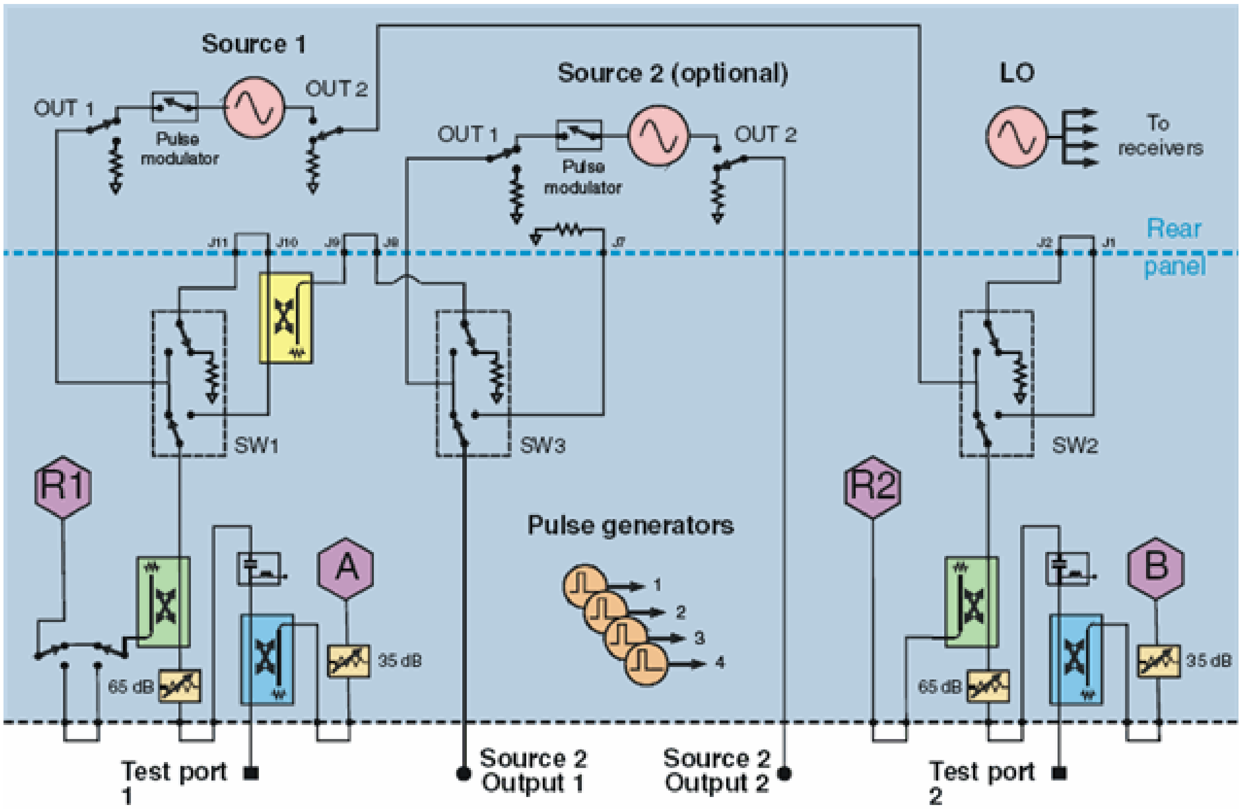


Figure 20. 4-Port N5242A (Option 419, 423), Showing J-Designators for Rear Panel Connectors

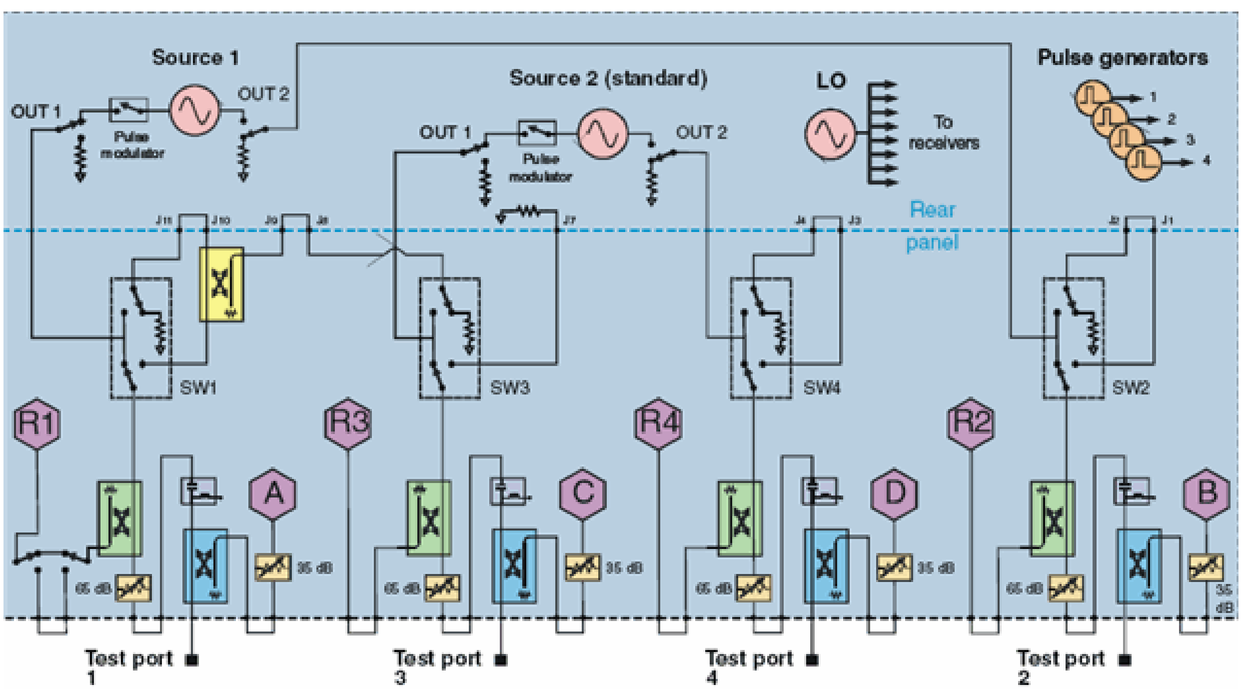


Figure 21. Receiver Block Diagram

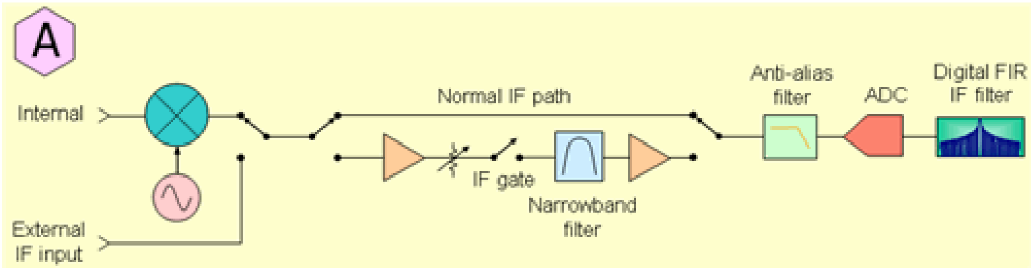
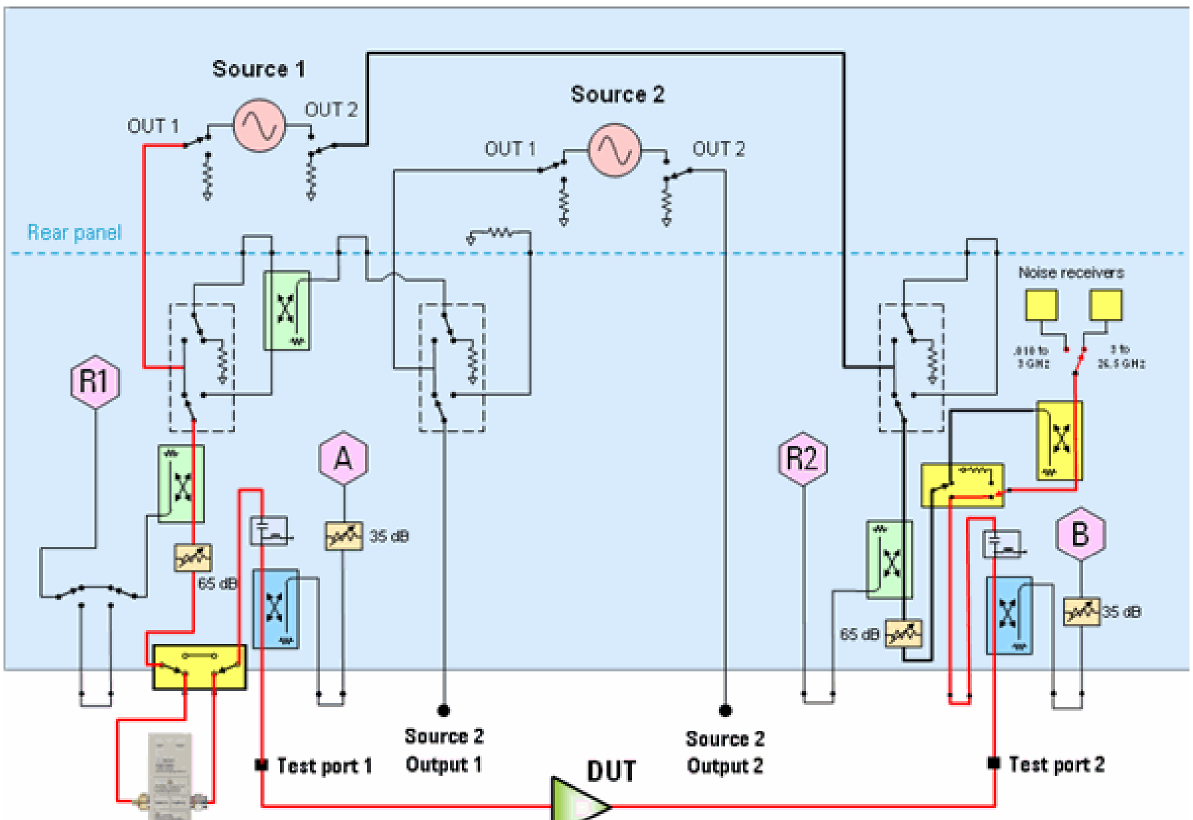


Figure 22. 2-Port PNA-X with Noise Figure Hardware (shown with Options 200, 219, 224, & 029).

On 4-Port analyzers (Option 419 or 423) with Option 029, ports 1 and 2 are the same as shown here.



- At test port 1 front panel loops, a noise tuner switch connects the noise tuner (ECal module) in series with Source 1, providing several different input impedances.
- At test port 2, a noise tuner switch and a coupler route the RF signal from the DUT output to two noise receivers. The appropriate receiver is automatically selected as required for the frequency measured.

Last Modified

6-Mar-08	Provided more resolution for RP IF input.
6-Mar-08	Show full freq range for RP LO output.

Typical System Performance for the N5250A

(Rev. 2004-08-02)

- This is a complete list of the N5250A network analyzer typical system performance.
- To view or print the .pdf version of this document, visit our web site at http://www.agilent.com, type 5988-9620EN in the Quick Search box, then click GO.

See Specs for other PNA models

Definitions

Typical : Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Standard: When referring to the analyzer, this includes no options unless noted otherwise.

Unlike the lengthy specifications documents for other PNA models, this document presents typical system performance for the following categories only:

- System Dynamic Range
- Test Port Power
- Noise Floor
- Test Port Damage Level
- Option H11 Rear Panel Connectors

Typical System Performance

Table 1. System Dynamic Range

Frequency	1.0 mm Test Port	1.85 mm PNA Test Port	Waveguide Port
10 MHz to 45 MHz	63 dB	65 dB	
45 MHz to 500 MHz	94 dB	97 dB	
500 MHz to 2 GHz	120 dB	123 dB	
2 GHz to 10 GHz	116 dB	123 dB	
10 GHz to 24 GHz	111 dB	121 dB	
24 GHz to 30 GHz	100 dB	112 dB	
30 GHz to 40 GHz	92 dB	107 dB	
40 GHz to 45 GHz	84 dB	101 dB	
45 GHz to 50 GHz	85 dB	103 dB	
50 GHz to 60 GHz	80 dB	100 dB	
60 GHz to 67 GHz	75 dB	95 dB	
67 GHz to 70 GHz	68 dB		82 dB
70 GHz to 75 GHz	74 dB		87 dB
75 GHz to 80 GHz	85 dB		98 dB
80 GHz to 100 GHz	89 dB		101 dB
100 GHz to 110 GHz	87 dB		98 dB

Table 2. Test Port Power

Frequency	1.0 mm Test Port (Std Configuration[a] or Opt 017[b])	1.85 mm PNA Port	Waveguide Port
10 MHz to 45 MHz	-8 dBm	-7 dBm	
45 MHz to 500 MHz	-3 dBm	-1 dBm	
500 MHz to 2 GHz	0 dBm	2 dBm	
2 GHz to 10 GHz	-2 dBm	2 dBm	
10 GHz to 24 GHz	-5 dBm	0 dBm	
24 GHz to 30 GHz	-7 dBm	0 dBm	

30 GHz to 40 GHz	-10 dBm	-1 dBm	
40 GHz to 45 GHz	-15 dBm	-5 dBm	
45 GHz to 50 GHz	-12 dBm	-1 dBm	
50 GHz to 60 GHz	-17 dBm	-4 dBm	
60 GHz to 67 GHz	-22 dBm	-8 dBm	
67 GHz to 70 GHz	-9 dBm		-2 dBm
70 GHz to 75 GHz	-7 dBm		0 dBm
75 GHz to 80 GHz	-6 dBm		+1 dBm
80 GHz to 100 GHz	-5 dBm		+1 dBm
100 GHz to 110 GHz	-8 dBm		-2 dBm

a Assumes a 30" cable from the PNA 1.85mm Test Port Out is used to provide the 10 MHz to 67 GHz source signal. The Standard configuration does not have a bias tee in the 1.0mm head.

b Assumes a 30" cable from the PNA Source Out bulkhead connector is used to provide the 10 MHz to 67 GHz source signal. Option 017 includes a bias tee in the 1.0mm head.

Table 3: Noise Floor

Frequency	1.0mm Test Port	1.85mm Test Port	Waveguide Port
10 MHz to 45 MHz	-71 dBm	-72 dBm	
45 MHz to 500 MHz	-97 dBm	-98 dBm	
500 MHz to 2 GHz	-120 dBm	-121 dBm	
2 GHz to 10 GHz	-118 dBm	-121 dBm	
10 GHz to 24 GHz	-116 dBm	-121 dBm	
24 GHz to 30 GHz	-107 dBm	-112 dBm	
30 GHz to 40 GHz	-102 dBm	-108 dBm	
40 GHz to 45 GHz	-99 dBm	-106 dBm	
45 GHz to 50 GHz	-97 dBm	-104 dBm	
50 GHz to 60 GHz	-97 dBm	-104 dBm	
60 GHz to 67 GHz	-92 dBm	-103 dBm	

67 GHz to 70 GHz	-77 dBm		-84 dBm
70 GHz to 75 GHz	-81 dBm		-87 dBm
75 GHz to 80 GHz	-91 dBm		-97 dBm
80 GHz to 100 GHz	-94 dBm		-100 dBm
100 GHz to 110 GHz	-95 dBm		-100 dBm

Table 4. Test Port Damage Level

Frequency	1.0mm Test Port	1.85mm Test Port	Waveguide Port
10 MHz to 110 GHz	27 dBm	27 dBm	27 dBm

Table 5 Option H08 & H11 Rear Panel Connectors (typical)

IF Connectors	A, R1, R2, B (BNC Connectors)
IF Connector Input Frequency	8 1/3 MHz
Nominal Input Impedance at IF Inputs	50 Ω
RF Damage Level to IF Connector Inputs	-20.0 dBm
DC Damage Level to IF Connector Inputs	25 volts
0.1 dB Compression Point at IF Inputs	-27.0 dBm
Pulse Input Connectors[1]	A, R1, R2, B (BNC Connectors)
Nominal Input Impedance at Pulse Inputs	1 Kohm
Minimum IF Gate Width	20 ns for less than 1 dB deviation from theoretical performance[2].
DC Damage Level to Pulse Connector Inputs	5.5 volts

Drive Voltage	TTL (0, +5.0) Volts
Rear Panel LO Power Test Port Frequency (see 836x H11 Specs for Test Port Frequencies up to 67 GHz)	
67 GHz to 110 GHz[3]	-7 to 13 dBm
Rear Panel RF Power - Test Port Frequencies (see 836x H11 Specs for Test Port Frequencies up to 67 GHz)	
67 GHz to 76 GHz2[4]	-4 to 10 dBm
76 GHz to 96 GHz[4]	+1 to 5 dBm
96 GHz to 110 GHz[4]	+5 to 1 dBm

1 Pulse input connectors are operational only with Option H08 (Pulse Measurement Capability) enabled.

2 Based on deviation from signal reduction equation: Signal Reduction (dB) = $20\log_{10}$(Duty_cycle) = $20\log_{10}$(pulse_width/period). Measured at Pulse Repetition Frequency (PFR) of 1 MHz.

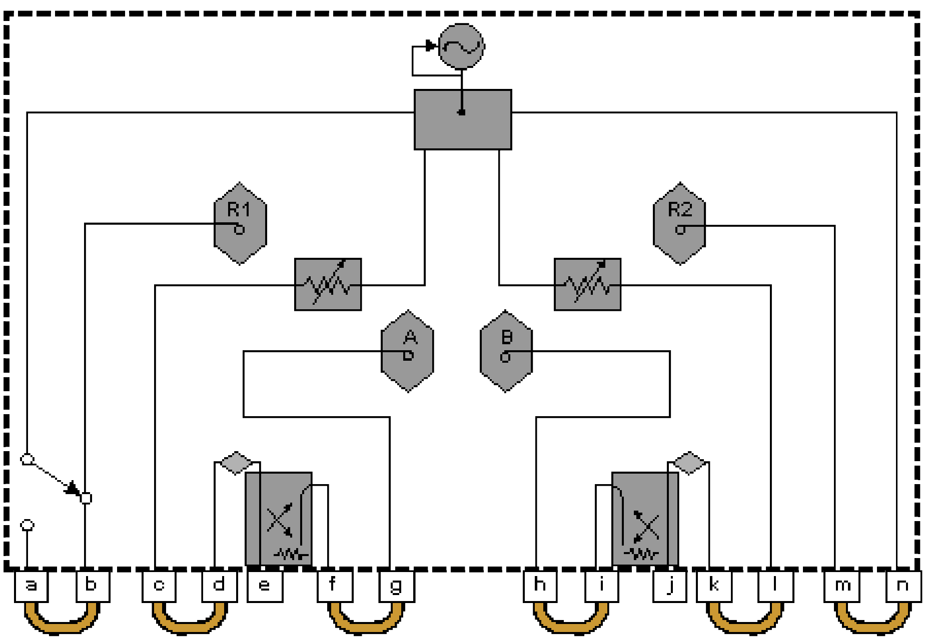
3 For rear panel LO port frequency, divide by 8

4 For rear panel RF port frequency, divide by 6

Note: Typical system performance for front panel jumpers is not provided for the N5250A.

Test Set Block Diagram

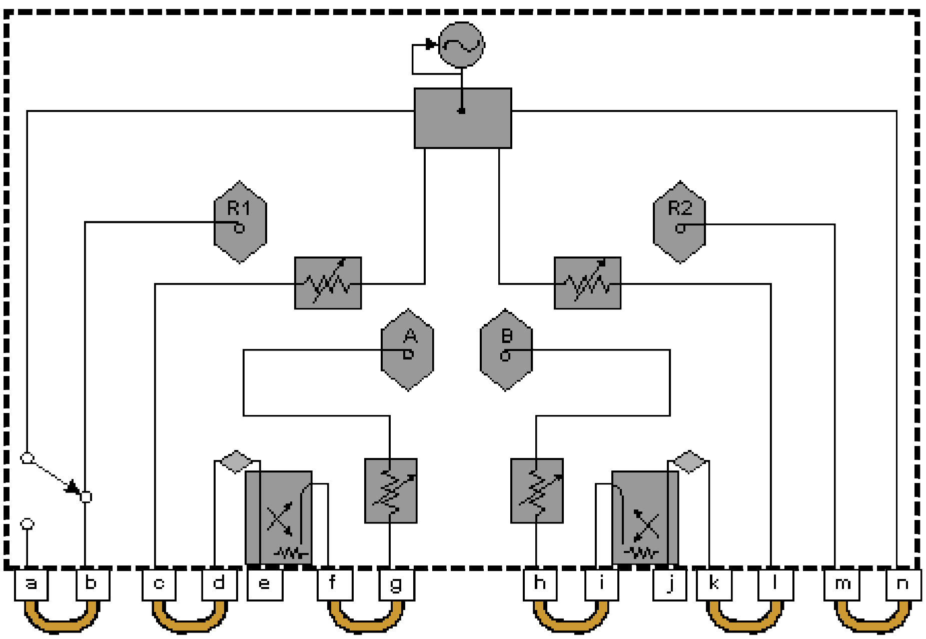
N5250A - Standard Network Analyzer



Item	Description	Item	Description
a	SOURCE OUT	**h**	RCVR B IN
b	RCVR R1 IN	**i**	CPLR ARM
c	SOURCE OUT	**j**	PORT 2
d	CPLR THRU	**k**	CPLR THRU
e	PORT 1	**l**	SOURCE OUT
f	CPLR ARM	**m**	RCVR R2 IN
g	RCVR A IN	**n**	SOURCE OUT

Test Set with Option 016 Block Diagram

N5250A - Option 016 Receiver Attenuators Network Analyzer



Item	Description	Item	Description
a	SOURCE OUT	h	RCVR B IN
b	RCVR R1 IN	i	CPLR ARM
c	SOURCE OUT	j	PORT 2
d	CPLR THRU	k	CPLR THRU
e	PORT 1	l	SOURCE OUT
f	CPLR ARM	m	RCVR R2 IN
g	RCVR A IN	n	SOURCE OUT

Glossary

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

12-Term Error Correction See Error Correction, 12-Term.

1-Port Device A device with a single connector or path to the device's circuitry. Examples include an oscillator and a load.

2-Port Calibration, Full See Error Correction, 12-Term.

2-Port Device A device with two connectors or other paths to the device's circuitry. Examples include filters, SAW devices, attenuators, matching pads, and amplifiers.

3-Term Error Correction See Error Correction, 3-Term.

A

Active Channel The highlighted channel affected by front panel functions.

Active Function Readout The area of a display screen where the active function and its state are displayed. The active function is the one that was completed by the last key selection or remote programming command.

Active Marker The marker on a trace that can be repositioned either by front panel controls or by programming commands.

Active Trace A trace that is being swept (updated) with incoming signal information.

ADC Analog to Digital Converter

Address The identification (represented by a name, label, or number) for a register, location in storage, or any other data source or destination. Examples are the location of a station in a communications network, or a device on the GP-IB.

ADM Add-Drop Multiplexer

Admittance (Y) The inverse of an impedance (i.e. the ratio of current to voltage). Complex admittances take the form Y = G + jB(t).

ALC Automatic Level Control. See Automatic Gain Control.

AM Amplitude Modulation

AM Group Delay A technique for the measurement of group delay through a device which utilizes an amplitude modulated (AM) source. Note: The actual delay of the modulation envelope is measured directly with an external scalar detector. Devices that distort the amplitude of a signal cannot be measured. These include amplifiers with automatic gain control (AGC) and devices subject to saturation or power limiting.

Amplitude Modulation The process, or result of the process, of varying the amplitude of a carrier signal. The resulting modulated carrier contains information that can be recovered by demodulation. See also Modulation.

Analog The general class of devices or circuits in which the output varies as a continuous function of the input.

Annotation The labeling of specific information on the display (such as frequency or power).

ANSI American National Standards Institute: A national membership organization (open to manufacturers, organizations, users, and communications carriers) that approves standards, accredits standards development groups and certificate programs, and represents and coordinates US interests in non-treaty and non-government standards bodies.

Aperture The frequency span of the network analyzer used for calculating group delay. The narrower the aperture, the finer the resolution of the group delay variations, but noise is reduced by increasing the aperture.

Array A set of numbers or characters that represents any given function.

ASCII American Standard Code for Information Interchange

Attenuation Denotes a reduction in signal amplitude. The difference between transmitted and received power due to loss through equipment, lines, or other transmission devices; usually expressed in decibels.

Attenuator An RF or microwave device used to reduce the power level of a signal by precise, incremental amounts over its entire frequency range.

Automatic Calibration System AutoCal: Feature offered on Rohde&Schwarz network analyzers.

Automatic Gain Control (AGC) A circuit used in amplifiers and other active devices to keep its RF power level constant as other parameters change, such as frequency. Synonym: Automatic Leveling Control (ALC)

Autoscale An analyzer feature that evaluates waveforms and adjusts controls to stable and enhance the display.

AUX Auxiliary; refers to rear-panel input connector.

Averaging A noise reduction technique that computes each data point based on consecutive sweeps and weighted by a user-specified averaging factor. Each new sweep is averaged into the trace until the total number of sweeps is equal to the averaging factor.

B

B/R The ratio of data sampled at B to the data sampled at R.

Band Pass A range of frequencies that are passed through a device, such as a filter. Frequencies not within the band pass are limited or attenuated. See also Cutoff Frequency.

Bandwidth (BW) The difference between the frequencies of a continuous frequency band within which performance of a device falls within specifications.

Bandwidth Limit The condition prevailing when the system bandwidth is exceeded and signal distortion occurs beyond specifications.

Bandwidth Selectivity A measure of a filter's ability to resolve signals unequal in amplitude. It is the ratio of the 60 dB bandwidth to the 3 dB bandwidth for a given resolution filter (IF). Bandwidth selectivity tells us how steep the filter skirts are. Bandwidth selectivity is sometimes called shape factor.

Binary A method of representing numbers in a scale of two (on or off, high-level or low-level, one or zero). A compact, fast format used to transfer information to and from the analyzer.

BMP Bit-Mapped

Brightness See Color Brightness.

Broadband Device A device that operates over a very wide frequency range and exhibits only small variations in response over that range.

Buffer A storage device used when transmitting information to compensate for a difference in the rate of flow of information between two devices.

Burst Carrier A carrier that is periodically turned off and on. A burst carrier may or may not be modulated.

BUS Basic Utility System

Bus One or more conductors used as a path to deliver transmitted information from any of several sources to any of several destinations.

BW Bandwidth

Byte Eight bits of data representing one character processed as a unit.

C

CAD Computer Aided Design

CAE Computer Aided Engineering

Calibration In HP instrumentation, the process of periodically (usually annually) verifying an instrument is performing to specifications. A calibration certificate is awarded after verification.

In network analyzers, the process of removing systematic errors from measurements. See Error Correction.

Calibration Kit Hardware and software required to perform error correction on a network analyzer for a specific measurement and/or test set.

Calibration, 2-Port See Error Correction,12-Term.

Calibration, Blackburn Calibrations of transmission path with corrected source match involving 15 calibration terms. Synonym: 15-term error correction

Calibration, Frequency Response The simplest error correction procedure to perform, but only corrects for a few of the twelve possible systematic error terms. Frequency response corrections can be made for reflection measurements, transmission measurements, and isolation measurements.

Calibration, Interpolation A user selectable network analyzer feature that calculates (interpolates) new error correction terms from existing terms when there is a change in network analyzer parameters, such as IF bandwidth, power, or sweep time. The resulting error correction is not as accurate as completing a full 2-port calibration.

Calibration, Port Extension See Port Extension.

Calibration, Reference Plane See Reference Plane.

Calibration, Set Z Sets the system impedance, usually 50 or 75 ohms.

Calibration, SOLT A calibration using four known standards: Short-Open-Load-Through. Also known as a full two-port calibration and 12-term error correction. See also Error Correction.

Calibration, TRL and LRM A calibration used in environments where the DUT cannot be connected directly to the network analyzer ports, (MMIC, microstrip, beam-lead diodes etc.). Thru-Reflect-Line (TRL) and M (Match) standards are fabricated and used because known high-quality standards are not readily available. The requirements for characterizing these standards are less stringent, but the calibration is not as accurate as the traditional full two-port calibration using S-O-L-T standards. The terms are used interchangeably (TRL, LRL, LRM etc.) but they all refer to the same basic calibration method.

Characteristic Impedance The impedance looking into the end of an infinitely long lossless transmission line.

Color Brightness A measure of the intensity (brightness) of a color.

Command A set of instructions that are translated into instrument actions. The actions are usually made up of individual steps that together can execute an operation.

Continuous Sweep Mode The analyzer condition where traces are automatically updated each time trigger conditions are met.

Controller A device capable of specifying the talker and listeners for an information transfer. An external computer connected to an instrument to control its operation.

Corrected Measurements made after performing error correction.

Coupler See Directional Coupler.

CPU Central Processing Unit

Crosstalk The occurrence of a signal at one port of a device being affected by a signal in any other path. Isolation is the measurement of crosstalk.

Cursor An electronically generated pointer that moves across the display to manipulate controls.

Cutoff Frequency In filters, the frequency at which attenuation is 3dB below the band pass signal level, known as the 3dB points.

CW Continuous wave: A single frequency (rather than a swept frequency).

D

DAC Digital to Analog Converter

dB Decibel: a relative unit of measure. The ratio in dB is given by: 10 $\log_{10}(P_1/P_2)$ where P_1 and P_2 are the measured powers. The dB is preferred instead of arithmetic ratios or percentages because when components are connected in series, their effect on power, expressed in dB, may be arithmetically added and subtracted. For example, if a 3dB attenuator is connected to a 10dB amplifier, the net gain of the two components is (-3dB + 10dB = +7dB).

dBm Absolute unit of measure in decibels: 0dBm = 1 mW. The conventions of the dB (adding and subtracting) continue to apply.

DBMS Database Management System

DC Direct Current

Default A known set of conditions used in the absence of user-defined conditions.

Delay See Group Delay.

Demodulation The process of recovering from a modulated carrier, information in the form of a signal having essentially the same characteristics as the original modulating signal. Recovery of the modulating signal accomplished by signal detection.

Detection The process of demodulating signal carriers. There are two basic ways of providing signal detection in network analyzers: Diode detectors (used in broadband applications) and heterodyning, (used in narrowband applications).

Detector, Diode A device used to convert a RF signal to a proportional DC level. If the signal is amplitude modulated, the diode strips the RF carrier signal from the modulation. Many sources used with scalar analyzers are amplitude modulated with a 27.778 kHz signal and then detected in the network analyzer. Phase information on the signal carrier is lost in diode detection.

Deviation from Linear Phase Linear phase refers to the nature of the phase shift of a signal through a device. The phase is linear if a plot of phase shift versus frequency is a straight line using linear scales. Deviation from linear phase causes signal distortion.

Digital Pertaining to the class of devices or circuits in which the output varies in discrete steps.

Digital Demodulation Describes a technique of extracting the information used to modulate a signal. Digital signal processing algorithms are used on the signal after it has been converted from an analog to a digital form (digitized).

Dimension To specify the size of an array. The number of array rows or columns.

Directivity In a 3-port directional coupler, the ratio of the power present at the auxiliary port when the signal is traveling in the forward direction to the power present at the auxiliary port when the same signal is traveling in the reverse direction.

Directional Coupler A 3-port device typically used for separately sampling the backward (reflected) wave in a transmission line.

Disk A circular, magnetic storage medium.

Display Noun: See Screen.

Verb: To show annotation and measurement data on the display.

Display Detector Mode The manner in which analog, video information is processed prior to being digitized and stored in memory.

Display Dynamic Accuracy The amplitude uncertainty, usually in dB, over the display dynamic range.

Display Dynamic Range The amplitude range, in dB, over which the display dynamic accuracy applies.

Display Formats Graphical formats for displaying measurement data. These include single channel, overlay (multiple traces on one graticule), split (each trace on separate graticules).

Display Modes The ways in which measurement data can be presented graphically. On a network analyzer, the choices are Cartesian/rectilinear (XY plot with log or linear magnitude, phase, group delay, SWR, real and imaginary, and dBV, dBmV and dBuV), polar (magnitude and angle), magnitude and phase, and Smith chart. Not all display modes are available on all network analyzers. In addition, displays can present this information in various combinations of traces. Common modes are dual, (the ability to display more than one trace, usually over the same frequency range), and alternate, (the ability to display more than one trace, each with different frequency range and type).

Display Phase Dynamic Accuracy The phase measurement uncertainty, usually in degrees, for measurements whose units are in degrees.

Display Points The total number of measurement points made in a single measurement. The points can be in units of frequency, power, or time. The number of points often dictates measurement speed, resolution, and aperture.

Display Trace Noise, Magnitude The amplitude uncertainty of the trace, in dB, due to random noise in the test system.

Display Trace Noise, Phase The phase uncertainty of the trace, in degrees, due to random noise in the test system.

Display Type The type of display screen built into the analyzer. Data can be displayed as a raster drawing (a computer-like dot map) or as a vector drawing (lines drawn on the display). Color and display standard can also be specified as monochrome (single color), or color (two or more colors). The format standard may also be specified, such as VGA or SVGA, for IBM-compatible personal computers.

Distortion Deterioration of a signal's quality due to the nonlinear characteristics of a device or system transfer function. Distortion is measured as a combination of the changes in amplitude, frequency and phase of signal at the output of a device or system as compared to the signal at the input.

Drift The slow change in signal frequency.

DSP Digital Signal Processing

DUT Device Under Test

DVM Digital Volt Meter

Dynamic Range In a receiver, the range of signal levels, from minimum to maximum, that can be reliably measured simultaneously. Dynamic range allows small signals to be measured in the presence of large signals. Source power and receiver compression usually limits the maximum boundary to dynamic range. Receiver residual responses and noise floor usually limit the minimum power boundary.

E

ECal See Electronic Calibration.

Electrical Delay A simulated variable length of lossless transmission line, added to or subtracted from a receiver input, to compensate for interconnecting cables. The firmware equivalent of mechanical or analog "line stretchers" in other network analyzers.

Electronic Calibration (ECal) A calibration system for electronic calibration of RF and microwave vector network analyzers. The electronic calibration system creates a twelve-term, two-port error model and then provides a confidence check of the calibration. The Ecal system consists of a repeatable, variable-impedance, solid-state calibration standard and a mainframe control unit which interfaces with the 8510, 8720 series, and the 8753 network analyzers or a USB module which interfaces with the PNA series network analyzers.

EMC Electro-Magnetic Compatibility

EMI Electro-Magnetic Interference: Unintentional interfering signals generated within or external to electronic equipment. Typical sources could be power-line transients, noise from switching-type power supplies and/or spurious radiation from oscillators. EMI is suppressed with power-line filtering, shielding, etc.

Engage To activate a function.

Enter The process of inputting information.

EPROM Electronically Programmable, Read-Only Memory

Error Correction In network analyzers, a process that removes or reduces systematic (repeatable) measurement errors by measuring known standards from a calibration kit. Synonym: measurement calibration

Error Correction, 3-Term Used to remove systematic measurement errors on a device with one port, such as a load.

Error Correction, 12-Term Correction for a two port device using six parameters:
Directivity
Source match
Load match
Reflection frequency response
Transmission frequency response
Isolation

To completely characterize a two-port device, these six parameters must be characterized in the forward and reverse directions, making a total of 12 terms. The user usually has the option of omitting isolation from the correction process. Synonym: Full two-port error correction

Error Correction, 1-Port Corrects a test set for port 1 or port 2 directivity, frequency response, and source match errors. The process requires three known standard terminations, for example, open, short, and load.

Error Message A message on a display that indicates an error condition. Missing or failed hardware, improper user operation, or other conditions that require additional attention can cause an error condition. Generally, the requested action or operation cannot be completed until the condition is resolved.

ESD Electro Static Discharge

Ethernet A network that adheres to the IEEE 802.3 Local Area Network standard.

Ethernet address A hexadecimal number which is used to identify a machine on a network. Each analyzer is assigned a unique Ethernet address at the factory and it is stored in the analyzer's ROM.

External trigger signal A TTL signal that is input to an analyzer and initiates a measurement sweep or similar event, making the measurements synchronous with the external triggering source.

F

Filter A passive device that allows some frequencies to pass and attenuates others, depending on the type and specifications. A high-pass filter passes frequencies above the cutoff frequency, a low-pass filter passes frequencies below the cutoff frequency, and a band-pass filter passes frequencies between two specific frequencies.

Firmware An assembly made up of hardware and instruction code. The hardware and instruction code is integrated and forms a functional set that cannot be altered during normal operation. The instruction code, permanently installed in the circuitry of the instrument, is classified as ROM (read only memory). The firmware determines the operating characteristics of the instrument or equipment.

Flatness The amplitude and phase response of a device under test (DUT), a signal source, a receiver, or a combination of these. See also Frequency Response.

FM Frequency Modulation

Frequency The number of periodic oscillations, vibrations, or waves per unit of time, usually expressed in cycles per second, or Hertz (Hz).

Frequency Accuracy The uncertainty with which the frequency of a signal or spectral component is indicated, either in an absolute sense or relative to another signal or spectral component. Absolute and relative frequency accuracies are specified independently.

Frequency Range The range of frequencies over which a device or instrument performance is specified.

Frequency Resolution The ability of a network analyzer to measure device characteristics at closely spaced frequencies and display them separately. Resolution of equal amplitude responses is determined by IF bandwidth. Resolution of unequal amplitude responses is determined by IF bandwidth and bandwidth selectivity.

Frequency Response The peak-to-peak variation in the displayed amplitude response over a specified center frequency range. Frequency response is typically specified in terms of dB, relative to the value midway between the extremes.

Frequency Span The magnitude of the displayed frequency component. Span is represented by the horizontal axis of the display. Generally, frequency span is given as the total span across the full display. Some analyzers represent frequency span (scan width) as a per-division value.

Frequency Stability The ability of a frequency component to remain unchanged in frequency or amplitude over short and long-term periods of time. Stability refers to an oscillator's ability to remain fixed at a particular frequency over time.

Front Panel Key Keys that are located on the front panel of an instrument. The key labels identify the function the key activities. Numeric keys and step keys are two examples of front panel keys.

Full 2-Port Calibration See Error Correction, 12-Term.

Function The action or purpose that a specific item is intended to perform or serve. The network analyzer contains functions that can be executed via front panel key selections, or through programming commands. The characteristics of these functions are determined by the firmware in the instrument. In some cases, a DLP (downloadable program) execution of a function allows you to execute the function from front panel key selections.

Fundamental Frequency In any waveform, the lowest frequency component; all other components are harmonics. A pure sinusoid has only one component, the fundamental.

G

Gb Gigabit

GB Gigabyte

GHz Gigahertz

GIF Graphics Interchange Format - Standard graphic format to store bitmapped graphics files.

Giga Prefix for one billion.

GP I/0 General Purpose Input / Output; a connector usually on the back of an instrument that allows communication with other test equipment, external test sets, switches, and computers that enable the instrument to be triggered or to trigger external equipment. An example is a foot switch that continues or cycles a measurement, allowing the operator to use both hands on the test hardware.

GPIB General Purpose Interface Bus - IEEE 488 bus is interconnect bus and protocol, allows linking of instruments and computer.

Graticule (or Grid) Enclosed area where waveform is displayed on instrument. Tick marks, on frame or axis, are a scaling aid for making visual measurements.

Group Delay A measure of the transit time of a signal through a DUT versus frequency. Group delay can be calculated by differentiating the DUT's insertion-phase response with respect to frequency. See also AM Group Delay and Deviation from Linear Phase.

GUI Graphical User Interface

H

Hardcopy Paper copy of data.

Hardkey A front-panel key, which engages a single analyzer function or presents a single menu of softkeys.

Horizontal Reference See Reference Level.

Horizontal Resolution The analyzer's ability to take closely spaced horizontal data points over the full sweep.

Host Computer A computer or device on a network that provides end users with services such as computation and database access and that usually performs network control functions.

Host Name A unique name that is used to identify each host machine on a network. The host name is directly linked to, and can usually be used in place of, the IP address. The user or the system administrator usually creates the host name.

HP Hewlett-Packard Company

HPGL Hewlett-Packard Graphics Language

HP-IB Hewlett-Packard Interface Bus. A parallel interface that allows "daisy chaining" of more than one device to a port on a computer or instrument. Interface protocol is defined in IEEE 488.2; equivalent to the industry standard GPIB.

HTTP HyperText Transfer Protocol: Used to carry World Wide Web (WWW) traffic.

Hue The dimension of color referred to a scale of perceptions ranging from red through yellow, green, and blue, and back to red. A particular gradation of color, tint, shade.

I

I/O Input/Output

I/O Path Input/Output Path

IEEE Institute of Electrical and Electronic Engineers

IF Intermediate Frequency: the frequency at which a signal is processed after mixing.

Impedance The ratio of voltage to current at a port of a circuit, expressed in ohms.

Initialize The process that assigns information locations to a disk to prepare the magnetic media to accept files.

Input A path intended for putting a signal into an instrument.

Most network analyzers have either 3 (labeled A, B, and R) or 4 inputs (labeled A, B, R1, and R2). Inputs are not the same as channels.

Input Attenuator An attenuator between the input connector and the first mixer of a spectrum analyzer (also called an RF attenuator). The input attenuator is used to adjust the signal level incident to the first mixer, and to prevent gain compression due to high-level or broadband signals. It is also used to set the dynamic range by controlling the degree of internally-generated distortion. For some analyzers, changing the input attenuator settings changes the vertical position of the signal on the display, which then changes the reference level accordingly. In Agilent microprocessor-controlled analyzers, the IF gain is changed to compensate for changes in input attenuator settings. Because of this, the signals remain stationary on the display, and the reference level is not changed.

Insertion Loss The difference between the power measured before and after the insertion of a device. The attenuation between the input and output of a device.

Intensity Brightness; emitting or reflecting light; luminosity.

Interface A connection that allows a common communication link between two or more instruments.

Intermodulation Distortion Undesired frequency components resulting from the interaction of two or more spectral components passing through a device having nonlinear behavior, such as a mixer or an amplifier. The undesired components are related to the fundamental components by sums and differences of the fundamentals and various harmonics. The algorithm is: f1 ±f2, 2xf1 ±f2, 2xf2±f1, 3xf1 ±2x f2, and so on.

Internet The connection of two or more distinct networks. Often a gateway or router is used to make the connection.

Interpolate To determine a value of a signal between to adjacent points by a procedure or algorithm.

IP Internet Protocol

IP Address Internet protocol address: a unique number that is assigned to each device which is to be connected to a TCP/IP network. Before using an analyzer on a network, your network administrator will need to assign an IP address. An IP address consists of a 32-bit value presented in decimal dot notation: 4 octets (bytes) separated by a dot.

ISDN Integrated Services Digital Network: A standard digital service capability that features one or more circuit-switched communication channels capable of carrying digital voice, data, or image signals, a packet-switched channel for out-of-band signaling and control. In addition, ISDN provides a collection of standard and optional features that support information productivity for the user, providing higher-speed Internet access than analog systems.

ISO International Standards Organization

Isolation A specification or measure of the immunity that one signal has to being affected by another adjacent signal. The occurrence is known as crosstalk.

Isolator An RF device used for providing isolation between paths and components. Made from a 3-port circulator, the third port being terminated in a 50ohm load.

J

K

Kilo Prefix for one thousand.

KB Kilobyte

Kb/s Kilobytes per second

L

LAN Local Area Network

LANS Local Area Network System

LCD Liquid Crystal Display

LED Light Emitting Diode

LIF Logical Interchange Format (used for older HP disk drives/computers)

Limit Lines Lines input by the user that overlay the analyzer's measurement data to allow automatic detection of data that is out of the acceptable range. Pass/Fail annotation, audio alarms, or electronic output can be triggered to notify the operator or on-line computer program of the over-limit condition.

Limit-Line File The user-memory file that contains the limit-line table entries.

Limit-Line Table The line segments of a limit line are stored in the limit-line table. The table can be recalled to edit the line segments, then restored in the limit-line file.

Linear Device A device in which the output is continuously proportional to the input.

LO Local Oscillator. In a superheterodyne system, the LO is mixed with the received signal to produce a sum or difference equal to the intermediate frequency (IF) of the receiver.

LO Feedthrough The response that in a superheterodyne system when the first local oscillator frequency is equal to the first IF.

Load A one port microwave device used to terminate a path in its characteristic impedance.

Load Match A measure of how close the device's terminating load impedance is to the ideal transmission line impedance. Match is usually measured as return loss or standing wave ratio (SWR) of the load.

Local Lock Out A condition or command that prevents analyzer front-panel entries (and disables the Local key).

Local Operation To operate manually from the front panel.

Log Logarithm

Log Display The display mode in which vertical deflection is a logarithmic function of the input signal amplitude. Log display is also called logarithmic display. The display calibration is set by selecting the value of the reference level position and scale factor in dB per division.

LRM Line-Reflect-Match. See Calibration, TRL, and LRM.

M

Magnitude The amplitude of a signal measured in its characteristic impedance without regard to phase. See also Scalar.

Marker A graphical symbol along a display trace that is annotated with measurement characteristics of that specific data point.

Marker Functions Mathematical or statistical computation on the data of one or more markers to provide the operator more information. For example, the marker delta function calculates and displays the difference between two markers.

Maximum Input Level The maximum signal power that may be safely applied to the input of an analyzer. The maximum input level is typically 1 W (+30 dBm) for Agilent spectrum analyzers.

MB Megabyte

Measurement Uncertainty The quantified amount of error in a measurement situation. Calibrations are intended to reduce the amount of uncertainty. The following are sources of measurement errors that lead to uncertainty:

- Systematic errors (imperfections in calibration standards, connectors, cables, and instrumentation)
- Random errors (noise, connector repeatability)
- Drift (source and instrumentation)

Mega Prefix for one million.

Memory A storage medium, device, or recording medium into which data can be stored and held until some later time, and from which the entire original data may be retrieved.

Memory Card A small memory device shaped like a credit card that can store data or programs.

Menu The analyzer functions that appear on the display and are selected by pressing front panel keys. These selections may invoke a series of other related functions that establish groups called menus.

MHz Megahertz

milli Prefix for one-thousandth.

Modem Modulator/Demodulator

Modulation The process, or the result of the process, of varying a characteristic of a carrier signal with an information-bearing signal, causing the carrier to contain the information. See AM and FM.

Monitor Any external display.

Monochrome Having only one color (chromaticity).

ms Millisecond

mW Milliwatt: one thousandth of a watt

Multisync A type of monitor that can synchronize its horizontal sweep to various frequencies within a specified range.

N

Narrowband In network analysis, the frequency resolution of the analyzer's receiver that is sufficiently narrow to resolve the magnitude and phase characteristics of narrowband devices. The reduced receiver bandwidth usually decreases the noise floor of the receiver, providing more measurement amplitude range.

Narrowband Device A device whose transfer characteristics are intended to operate over a very narrow frequency range and are designed to provide well-defined amplitude responses in that range, such as a band pass filter.

Network Analysis The characterization of a device, circuit, or system derived by comparing a signal input going into the device to a signal or signals coming out from the device.

NIST National Institute of Standards and Technology

Nit The unit of luminance (photometric brightness) equal to one candela per square meter.

Noise Random variations of unwanted or disturbing energy in a communications system from man-made and natural sources that affects or distorts the information carried by the signal. See also Signal-to-Noise Ratio.

Noise Figure (F): For a two-port device, a measure of how the noise generated inside the device degrades the signal-to-noise ratio of a signal passing through the device at 290 degrees, usually expressed in dB.

Noise Floor The analyzer's internal displayed noise. The noise level often limits how small a signal magnitude can be measured. In network analysis, noise floor is measured with the test ports terminated in loads, full two-port error correction, 10 Hz IF bandwidth, maximum test port power, and no averaging during the test.

Non-Insertable Devices In measurement calibration, a device that cannot be substituted for a Zero-Length Through Path. It has the same type and sex connectors on each port, or a different type of connector on each port.

Nonvolatile Memory Memory data that is retained in the absence of an ac power source. This memory is typically retained with a battery. Refer also to battery-backed RAM.

Normalize To subtract one trace from another to eliminate calibration data errors or to obtain relative information.

O

Offset To move or set off a determined amount. Used in instruments for offsetting frequencies, limits, delay, loss, impedance, etc.

Output Attenuation The ability to attenuate the signal, the source, in order to control its power level.

P

PC Personal Computer

PDF Portable Document Format (used on the Web)

Parser, Command Reads program messages from the input queue of a device in the order they were received from the controller. The parser determines what actions the analyzer should take. One of the most important functions of the command parser is to determine the position of a program message in the analyzer SCPI command tree. When the command parser is reset, the next element it receives is expected to arise from the base of the analyzer command tree.

Peak Search A function on an analyzer that searches for the largest response and places a marker on it.

Phase The fractional part of a cycle through which an oscillation has advanced, measured from an arbitrary starting point; usually measured in radians or degrees. In network analysis, the phase response of the device under test is the change in phase as a function of frequency between the input stimulus and the measured response.

Port The physical input or output connection of an instrument or device.

Port Extension Redefining the reference plane to other than that established at calibration. A new reference plane is defined in seconds of delay from the test set port.

Positive Peak The maximum, instantaneous value of an incoming signal.

Postscript (.ps files) Stores bitmapped graphics files in an encapsulated format for direct use by postscript printers.

Power, Max Input The upper limit to input power for which the specifications apply. Some specifications may have different levels of maximum inputs. For example, compression power maximum is usually higher than the harmonic distortion maximum.

Power, Safe Input The input power, usually in dBm, allowed without damaging the instrument.

Preset A pre-defined instrument state (that also runs an analyzer self-test). The action of pushing the Preset key.

Protocol A set of conventions that specify how information will be formatted and transmitted on a network, and how machines on a network will communicate.

Q

Q or Q Factor The ratio of energy stored to energy lost in a resonant circuit. High Q indicates a sharp resonance response over frequency.

Query Any analyzer programming command having the distinct function of returning a response. These commands may end with a question mark (?). Queried commands return information to the computer.

R

r + jx Expression for complex impedance, where r represents the resistive portion and x represents the reactive portion.

R Channel Reference Channel

RAM Random Access Memory, or read-write memory: A storage area allowing access to any of its storage locations. Data can be written to or retrieved from RAM, but data storage is only temporary. When the power is removed, the information disappears. User-generated information appearing on a display is RAM data.

ROM Read Only Memory: A storage area that can be read only; it cannot be written to or altered by the user. In instruments, the storage area that contains the "brains" or operational programming; the firmware.

Receiver A circuit or system designed for the reception and/or measurement of signals in a specified frequency spectrum.

Receiver Dynamic Range See Dynamic Range.

Reference Level An instrument function that allows the user to set the amplitude value at the reference position. On network analyzers, the reference position is also selectable. On some spectrum analyzers, the reference position is fixed at the top of the display.

Reference Plane The electrical location at which a network analyzer assumes the system connectors and fixturing ends and the DUT begins. The reference plane is set by using calibration standards with known electrical length. The closer the reference plane is to the device under test (DUT), the better the characterization of the device because of the elimination of test system uncertainties.

Reference Receiver In a network analyzer, the receiver that measures signals as they come out of the source, before they are incident on the test port and DUT. Typically, these signals are used to compare with the signal at the Test Port Receiver, to determine the affect that the DUT has on the signal. In a 2-port network analyzer, these are typically named 'R1' (port 1) and 'R2' (port 2). See a block diagram of the receivers in your PNA.

Reflection The phenomenon in which a traveling wave strikes a discontinuity and returns to the original medium.

Reflection Coefficient The ratio of the reflected voltage to the incident voltage into a transmission line or circuit. If a transmission line is terminated in its characteristic impedance, the reflection coefficient is zero. If the line is shorted or open the coefficient is 1. See also Return Loss and SWR.

Reflection Measurements Measurements that characterize the input and /or output behavior of the device under test (DUT). Measured as the ratio of the reflected signal to the incident signal as a function of frequency. Parameters are called return loss, reflection coefficient, impedance, and standing wave ratio (SWR), all as a function of frequency. See also S-Parameters.

Remote A mode of operation where another device (or computer) controls an instrument via the HP-IB. In this mode, the instrument front panel keys are disabled. Front panel operation is called local operation.

Remote Programming The automatic operation of an instrument by a computer, usually through a HP-IB, LAN, or RS-232 link.

Resolution The ability of a receiver to resolve two signals.

Resolution Bandwidth The ability of a spectrum analyzer to display adjacent responses discretely (Hertz, Hertz decibel down). This term is used to identify the width of the resolution bandwidth filter of a spectrum analyzer at some level below the minimum insertion loss point (maximum deflection' point on the display). Typically, it is the 3 dB resolution bandwidth that is specified, but in some cases the 6 dB resolution bandwidth is specified.

Return Loss The amount of dB that the reflected signal is below the incident signal. If zero signal is reflected, the impedance of the device is equal to the characteristic impedance of the transmission system, and return loss is infinite. If the entire incident signal is reflected, the return loss is zero. See also S-Parameters, Reflection Coefficient, and SWR.

Reverse Measurement The measurement of a device from output to input.

RF Radio Frequency (from approximately 50 kHz to approximately 3 GHz). Usually referred to whenever a signal is radiated through the air.

ROM Read Only Memory

S

S/N Signal-to-Noise Ratio

Sampler An electronic component that captures the signal level and phase across a known impedance at a uniform rate. In Network Analyzers, this sampling rate must be sufficiently high and precisely timed to make accurate measurements. Network analyzers typically have three or four samplers or mixers.

Sampler Bounce The leakage or crosstalk between a network analyzer's samplers. Delay in this crosstalk caused by leakage transmission propagation, give the interference its "bounce" appearance. Sampler bounce causes an increase in the noise level of the affected channel, reducing the sensitivity of the analyzer.

Saturation The degree of color purity, on a scale from white to pure color.

Scalar A quantity that has magnitude but no phase. A network analyzer capable of measuring only magnitude.

Scale Factor The display vertical axis calibration in terms of units per division.

SCPI Standard Commands for Programmable Instruments

Screen The physical surface of the CRT or flat panel upon which the measurement results, setup information, softkey definitions, and other instrument communication is presented.

Self-Test A group of tests performed at power-up (or at preset) that verify proper instrument operation.

Sensitivity The minimum input signal required to produce a specified output signal having a specified signal-to-noise ratio, or other specified criteria.

On a spectrum analyzer, the level of the smallest sinusoid that can be observed, usually under optimized conditions of minimum resolution bandwidth, 0 dB input attenuation, and minimum video bandwidth.

The normalized change in YIG component's center frequency resulting from a change in tuning coil current, specified in MHz/mA.

Serial Prefix The five-character prefix that begins an instrument serial number; used to represent versions of firmware or hardware changes that have occurred.

Server A device that is configured to provide a service to other devices on a network, such as shared access to a file system or printer.

Signal-to-Noise Ratio SNR: The ratio of the amplitude of the desired signal to the amplitude of noise signals, usually expressed in dB and in terms of peak values for impulse noise and root-mean-square values for random noise.

Single Sweep Mode The spectrum analyzer sweeps once when trigger conditions are met. Each sweep is initiated by pressing an appropriate front panel key, or by sending a programming command.

Small Signal Gain Compression A situation when the input signal's measured amplitude is less than its actual level due to overloading of the network analyzer's input mixer; the analyzer is operating nonlinearly. For broadband analyzer detectors, a signal other than the one under test can put the analyzer into this gain compressed mode, thereby making even lower level signals appear at a lower level than actual. The broadband mode measures all the power incident to the analyzer, not just the signals at the frequency of interest.

Smith Chart A graphical mapping of the complex reflection coefficient into normalized complex impedance. Circles on the chart represent constant resistance and radiating lines orthogonal to the circles represent constant reactance. The center of the chart represents the characteristic impedance of the transmission system. Any point on the chart defines a single complex impedance. A line on the chart represents changing impedance over frequency.

SOLT Short-Open-Load-Through calibration. See also Calibration, SOLT.

Source A device that supplies signal power; a sweep oscillator or synthesized sweeper.

Source Amplitude Accuracy The amplitude uncertainty, in dB, of the source power readout.

Source Amplitude Flatness The amplitude flatness, in dB, of the source power over the frequency range specified.

Source Frequency Resolution The smallest unit of frequency which can be set and/or measured, in Hz.

Source Frequency Time Base Accuracy A measure of the analyzer's frequency stability measured in parts per million (ppm. or 1 part in 10E6). For example, a stability of ±5.0 ppm means that an analyzer will measure 1 MHz to an accuracy of ±5 x 10-6 x 10E6 Hz = +5 Hz.

Source Frequency Time Base Stability A measure of the analyzer's time base accuracy over time and temperature. Typically the time base accuracy will be specified for 1 year. A typical temperature frequency stability is ±10 ppm for 250 C± 50 C.

Source Harmonics The level of harmonics generated by the analyzer's signal source, in dBc from the fundamental.

Source Match A measure of how close the signal source impedance is to the ideal transmission line impedance of the test system. Match is usually measured as return loss or standing wave ratio (SWR) of the source.

Span The stop frequency minus the start frequency. The span setting determines the horizontal-axis scale of the analyzer display.

Span Accuracy The uncertainty of the indicated frequency separation of any two signals on the display.

S-Parameters (Scattering Parameters) A convention used to characterize the way a device modifies signal flow using a network analyzer. A two port device has four S-parameters: forward transmission (S21), reverse transmission (S12), forward reflection (S11), and reverse reflection (S22).

Stop/Start Frequency Terms used in association with the stop and start points of the frequency measurement range. Together they determine the span of the measurement range.

Storage States The number of settings, programs, traces, and other parameters available to be saved, cataloged, and recalled at any one time.

Storage, Disk An internal or external digital storage disk for saving test data, instrument settings, IBASIC programs, and other measurement parameters. Storage formats include MS-DOS (R) and HPs standard LIF with binary, PCX, HP-GL, or ASCII data formats.

Structural Return Loss Poor return loss in cable due to a periodic fault such as a periodic dent caused by dropping the cable spool or by the cable pulling process during manufacture.

Supplemental Characteristics Typical but non-warranted performance parameters, denoted as "typical", "nominal" or "approximate".

Sweep The ability of the source to provide a specified signal level over a specified frequency range in a specified time period. Also see Sweep Mode and Sweep Type.

In data processing mode, a series of consecutive data point measurements, taken over a sequence of stimulus values.

Sweep Mode The way in which a sweep is initiated or selected, e.g., single, continuous, alternate, or chopped.

Sweep Type The method of sweeping the source, e.g., linear, log, or frequency step.

Sweeper A signal source that outputs a signal that varies continuously in frequency.

SWR Standing Wave Ratio, calculated as $(1 + \pi) / (1 - \pi)$ where π is the reflection coefficient.

Sync Synchronization, or Synchronized

Syntax The grammar rules that specify how commands must be structured for an operating system, programming language, or applications.

System Dynamic Range The difference between the maximum receiver input level and the receiver's noise floor. System dynamic range applies to transmission measurements only, since reflection measurements are limited by directivity.

T

T/R See Transmission/Reflection.

Termination A load connected to a transmission line or other device.

Test Limit The acceptable result levels for any given measurement.

Test Port See Port.

Test Port Receiver In a network analyzer, the receiver directly behind the test ports, used to measure the signal as it is reflected off, or transmitted through, the DUT. This signal is typically compared with the signal at the Reference Receiver to determine how the DUT affects a signal. In a 2-port network analyzer, these are typically named 'A' (port 1) and 'B' (port 2). See a block diagram of the receivers in your PNA.

Test Set The arrangement of hardware (switches, couplers, connectors and cables) that connect a test device input and output to the network analyzer's source and receiver to make s-parameter measurements.

Third Order Intercept TOI: The power input to a non-linear device that would cause third order distortion at the same power level. TOI is a measurement to determine the distortion characteristics of a mixer or receiver. The higher the value, the more immune the receiver to internal distortion.

Thru Through line: A calibration standard. See Calibration, SOLT.

Tint A shade of color; hue.

Toggle To switch states, usually to change a function from on to off, or off to on.

TOM Thru-Open-Match: A Rohde&Schwarz term to describe a calibration method.

Trace A series of data points containing frequency and response information. The series of data points is often called an array. The number of traces is specific to the instrument.

Tracking The ability of the analyzer's receiver to tune to the source frequency over the measurement frequency range. Poor tracking results in amplitude and phase errors due to the receiver IF circuits attenuating and delaying the device under test output.

Transfer Function The ratio of the output signal to the stimulus signal, both as a function of frequency.

Transmission See Transmission Measurements.

Transmission Intermodulation Spurious A measure of the capability of the transmitter to inhibit the generation of intermodulation distortion products. Intermodulation spurious is sometimes called intermodulation attenuation.

Transmission Measurements The characterization of the transfer function of a device, that is, the ratio of the output signal to the incident signal. Most common measurements include gain, insertion loss, transmission coefficient, insertion phase, and group delay, all measured over frequency. See also S-Parameters.

Transmission/Reflection (T/R) Refers to the suite of measurements made by a scalar or vector network analyzer to characterize a device's behavior over frequency. See also S-Parameters.

Transparent Something that is not visible to the user. Usually a procedure that occurs without the user's initiation or knowledge.

Trigger A signal that causes the instrument to make a measurement. The user can select several options for triggering, such as manual, continuous, or external (for synchronizing measurements to an external source).

TRL Through-Reflect-Line. See Calibration, TRL and LRM.

TTL Transistor-Transistor Logic

Two-Port Error Correction See Error Correction, 12-Term.

U

Uncorrected Measurements made without performing error correction.

Uncoupled Channels Stimulus or receiver settings allowed to be set independently for each channel.

UNI User-Network Interface: The point at which users connect to the network.

Units Dimensions on the measured quantities. Units usually refer to amplitude quantities because they can be changed. In analyzers with microprocessors, available units are dBm (dB relative to 1 mW dissipated in the nominal input impedance), dBmV (dB relative to 1 mV), dBW (dB relative to 1 1W), V (volts), W (watts).

V

Variable A symbol, the value of which changes either from one iteration of a program to the next, or within each iteration of a program.

Vector A quantity that has both magnitude and phase.

A network analyzer capable of measuring both magnitude and phase.

VEE Visual Engineering Environment (Agilent software product)

Velocity Factor A numerical value related the speed of energy through transmission lines with different dielectrics (.66 for polyethylene). Used in making time domain measurements.

Vertical Resolution The degree to which an instrument can differentiate amplitude between two signals.

Video An electrical signal containing timing, intensity, and often color information that, when displayed, gives a visual image.

Video Bandwidth In spectrum analyzers, the cutoff frequency (3 dB point) of an adjustable low-pass filter in the video circuit. When the video bandwidth is equal to or less than the resolution bandwidth, the video circuit cannot fully respond to the more rapid fluctuations of the output of the envelope detector. The result is a smoothing of the trace, or a reduction in the peak-to-peak excursion, of broadband signals such as noise and pulsed RF when viewed in broadband mode. The degree of averaging or smoothing is a function of the ratio of the video bandwidth to the resolution bandwidth.

Video Filter In spectrum analyzers, a post-detection, low-pass filter that determines the bandwidth of the video amplifier. It is used to average or smooth a trace. Refer also to Video Bandwidth.

VNA Vector Network Analyzer

W

Waveform A representation of a signal plotting amplitude versus time.

Wireless A term that refers to a broad range of technologies that provide mobile communications for home or office, and "in-building wireless" for extended mobility around the work area, campus, or business complex. It is also used to mean "cellular" for in-or out-of-building mobility services.

WWW World Wide Web

X

Y

Z

Zero-Length Through Path In a measurement calibration, when the two test cables mate together directly without using adapters or a thru-line. See also Non-Insertable Devices.

INDEX

D

T

U