Keysight X-Series Signal Analyzer

This help file provides documentation for the following X-Series Analyzers:
PXA Signal Analyzer N9030A
MXA Signal Analyzer N9020A
EXA Signal Analyzer N9010A

Remote Language Compatibility Measurement Application User's & Programmer's Reference

Notices

Acknowledgments

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Safety Notices

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Table Of Contents

1 Additional Documentation

This section lists all available documentation for the X-Series instruments.

All documents are available for download from the Keysight web site. In most cases, if your instrument has an internet connection, you can click on a hyperlink below to download the document directly. (If your instrument does not have an internet connection, see "Downloading PDF Files" on page 99 for alternative download methods.)

Except for Specifications Guides, all the documents listed here are included on the Documentation DVD shipped with your instrument.

Certain documents are also installed on the instrument's hard disk. For these items, you can click an "On-disk" hyperlink below to open the document directly.

For details of the types of documentation available, see "Documentation Categories" on page 98.

The available documentation is divided into 4 groups as listed below. Click on a link for a detailed list of the documents in each group.

- "Documentation Common to All Measurement Applications" on page 62
- "Documentation Specific to a Measurement Application or Option" on page 63
- "Application Notes & Other Documentation" on page 96
- "Specifications Guides" on page 97

KEYSIGHT TECHNOLOGIES

Documentation Common to All Measurement Applications

Click on any of the links below to open the document.

- Getting Started Guide
  - Keysight Web Site [N9020-90225.pdf]
- Instrument Messages Guide
  - Keysight Web Site [N9020-90095.pdf]
- CXA Functional Tests Guide [N9000-90017.pdf]
- EXA Functional Tests Guide [N9010-90013.pdf]
- MXA Functional Tests Guide [N9020-90086.pdf]
- PXA Functional Tests Guide [N9030-90018.pdf]
- Programmer's Guide [N9020-90112.pdf]
- Programming Conversion Guide [N9020-90090.pdf]
- PSA Programming Compatibility Guide [N9020-90192.pdf]

For details of the types of documentation available, see "Documentation Categories" on page 98.

Documentation Specific to a Measurement Application or Option

For a list of links to all documents for a specific Measurement Application, click on one of the links below.

- "N6141A & W6141A EMC Measurement Application" on page 65
- "N6149A iDEN/WiDEN/MotoTalk Measurement Application" on page 66
- "N6152A & W6152A Digital Cable TV Measurement Application" on page 67
- "N6153A & W6153A DVB-T/H with T2 Measurement Application" on page 68
- "N6155A & W6155A ISDB-T Measurement Application" on page 69
- "N6156A & W6156A DTMB (CTTB) Measurement Application" on page 70
- "N6158A & W6158A CMMB Measurement Application" on page 71
- "N9030A RTSA Option" on page 72
- "N9060A IQ Analyzer Mode" on page 73
- "N9060A Spectrum Analyzer Mode" on page 74
- "N9061A Remote Language Compatibility Measurement Application" on page 75
- "N9062A & W9062A SCPI Language Compatibility Measurement Application" on page 76
- "N9063A & W9063A Analog Demod Measurement Application" on page 77
- "N9064A & W9064A VXA Measurement Application" on page 78
- "N9068A & W9068A Phase Noise Measurement Application" on page 79
- "N9069A & W9069A Noise Figure Measurement Application" on page 80
- "N9071A & W9071A GSM/EDGE with EDGE Evolution Measurement Application" on page 81
- "N9072A & W9072A cdma2000 Measurement Application" on page 82
- "N9073A & W9073A W-CDMA & HSPA Measurement Application" on page 83
- "N9074A Single Acquisition Combined Fixed WiMAX Measurement Application" on page 84
- "N9075A & W9075A 802.16 OFDMA (WiMAX/WiBro) Measurement Application" on page 85
- "N9076A & W9076A 1xEV-DO Measurement Application" on page 86
- "N9077A Single Acquisition Combined WLAN Measurement Application" on page 87
- "N9077A & W9077A WLAN Measurement Application" on page 88
- "N9079A & W9079A TD-SCDMA with HSPA/8PSK Measurement Application" on page 89

- "N9080A & W9080A LTE (FDD) Measurement Application" on page 90
- "N9080B & W9080B LTE Advanced (FDD) Measurement Application" on page 91
- "N9081A & W9081A Bluetooth Measurement Application" on page 92
- "N9082A & W9082A LTE TDD Measurement Application" on page 93
- "N9082B & W9082B LTE Advanced TDD Measurement Application" on page 94
- "N9083A & W9083A Multi-Standard Radio (MSR) Measurement Application" on page 95

For details of the types of documentation available, see "Documentation Categories" on page 98.

N6141A & W6141A EMC Measurement Application

- User's & Programmer's Reference [N6141-90001.pdf]
- Measurement Guide [N6141-90002.pdf]

N6149A iDEN/WiDEN/MotoTalk Measurement Application

- User's & Programmer's Reference [N6149-90001.pdf]
- Measurement Guide [N6149-90002.pdf]

N6152A & W6152A Digital Cable TV Measurement Application

- User's & Programmer's Reference [N6152-90001.pdf]
- Measurement Guide [N6152-90002.pdf]

N6153A & W6153A DVB-T/H with T2 Measurement Application

- User's & Programmer's Reference [N6153-90003.pdf]
- Measurement Guide [N6153-90004.pdf]

N6155A & W6155A ISDB-T Measurement Application

- User's & Programmer's Reference [N6155-90001.pdf]
- Measurement Guide [N6155-90002.pdf]

N6156A & W6156A DTMB (CTTB) Measurement Application

- User's & Programmer's Reference [N6156-90003.pdf]
- Measurement Guide [N6156-90004.pdf]

N6158A & W6158A CMMB Measurement Application

- User's & Programmer's Reference [N6158-90001.pdf]
- Measurement Guide [N6158-90002.pdf]

N9030A RTSA Option

- User's & Programmer's Reference [N9030-90059.pdf]
- Measurement Guide [N9030-90060.pdf]

N9060A IQ Analyzer Mode

- User's & Programmer's Reference [N9060-90029.pdf]
- Spectrum Analyzer Mode Measurement Guide [N9060-90034.pdf]

Note that there is no separate Measurement Guide for IQ Analyzer Mode. Measurement setup information is included in the Spectrum Analyzer Mode Measurement Guide.

N9060A Spectrum Analyzer Mode

- User's & Programmer's Reference [N9060-90027.pdf]
- Measurement Guide [N9060-90034.pdf]

N9061A Remote Language Compatibility Measurement Application

- Remote Language Compatibility Guide [N9020-90119.pdf]

N9062A & W9062A SCPI Language Compatibility Measurement Application

- SCPI Language Compatibility Guide [N9062-90001.pdf]

N9063A & W9063A Analog Demod Measurement Application

- User's and Programmer's Reference [N9063-90005.pdf]
- Measurement Guide [N9063-90006.pdf]

N9064A & W9064A VXA Measurement Application

- User's and Programmer's Reference [N9064-90001.pdf]
- Measurement Guide [N9064-90002.pdf]

N9068A & W9068A Phase Noise Measurement Application

- User's and Programmer's Reference [N9068-90010.pdf]
- Measurement Guide [N9068-90011.pdf]

N9069A & W9069A Noise Figure Measurement Application

- User's and Programmer's Reference [N9069-90005.pdf]
- Measurement Guide [N9069-90006.pdf]

N9071A & W9071A GSM/EDGE with EDGE Evolution Measurement Application

- User's and Programmer's Reference [N9071-90015.pdf]
- Single Acquisition Combined GSM Measurement Application [N9071-90014.pdf]
- Measurement Guide [N9071-90016.pdf]

N9072A & W9072A cdma2000 Measurement Application

- User's and Programmer's Reference [N9072-90006.pdf]
- Measurement Guide and Programming Examples [N9072-90005.pdf]

N9073A & W9073A W-CDMA & HSPA Measurement Application

- User's and Programmer's Reference [N9073-90016.pdf]
- Single Acquisition Combined W-CDMA Measurement Application [N9073-90015.pdf]
- Measurement Guide [N9073-90017.pdf]

N9074A Single Acquisition Combined Fixed WiMAX Measurement Application

- User's and Programmer's Reference [N9074-90001.pdf]
- Measurement Guide [N9074-90002.pdf]

N9075A & W9075A 802.16 OFDMA (WiMAX/WiBro) Measurement Application

- User's and Programmer's Reference [N9075-90012.pdf]
- Measurement Guide [N9075-90013.pdf]

N9076A & W9076A 1xEV-DO Measurement Application

- User's and Programmer's Reference [N9076-90003.pdf]
- Measurement Guide [N9076-90004.pdf]

N9077A Single Acquisition Combined WLAN Measurement Application

- User's and Programmer's Reference [N9077-90001.pdf]
- Measurement Guide [N9077-90002.pdf]

N9077A & W9077A WLAN Measurement Application

- User's and Programmer's Reference [N9077-90003.pdf]
- Measurement Guide [N9077-90004.pdf]

N9079A & W9079A TD-SCDMA with HSPA/8PSK Measurement Application

- User's and Programmer's Reference [N9079-90007.pdf]
- Measurement Guide [N9079-90005.pdf]

N9080A & W9080A LTE (FDD) Measurement Application

- User's and Programmer's Reference [N9080-90005.pdf]
- Measurement Guide [N9080-90006.pdf]

N9080B & W9080B LTE Advanced (FDD) Measurement Application

- User's and Programmer's Reference [N9080-90007.pdf]
- Measurement Guide [N9080-90008.pdf]

N9081A & W9081A Bluetooth Measurement Application

- User's and Programmer's Reference [N9081-90001.pdf]
- Measurement Guide [N9081-90002.pdf]

N9082A & W9082A LTE TDD Measurement Application

- User's and Programmer's Reference [N9082-90001.pdf]
- Measurement Guide [N9082-90002.pdf]

N9082B & W9082B LTE Advanced TDD Measurement Application

- User's and Programmer's Reference [N9082-90003.pdf]
- Measurement Guide [N9082-90004.pdf]

N9083A & W9083A Multi-Standard Radio (MSR) Measurement Application

- User's and Programmer's Reference [N9083-90001.pdf]
- Measurement Guide [N9083-90002.pdf]

Application Notes & Other Documentation

Click on any of the links below to open the document in a new window.

- Application Note 57-1: Fundamentals of RF and Microwave Noise Figure Measurements [5952-8255E.pdf]
- Application Note 57-2: Noise Figure Measurement Accuracy - The Y-Factor Method [5952-3706E.pdf]
- Application Note 150: Spectrum Analysis Basics [5952-0292.pdf]
- Application Note 1325: Performing cdma2000 Measurements Today [5968-5858E.pdf]
- Application Note 1355: Designing & Testing 3GPP W-CDMA Base Transceiver Stations [5980-1239E.pdf]
- Application Note 1356: Designing & Testing 3GPP W-CDMA User Equipment [5980-1238E.pdf]
- Application Note 1357: Designing and Testing cdma2000 Base Stations [5980-1303E.pdf]
- Application Note 1358: Designing and Testing cdma2000 Mobile Stations [5980-1237E.pdf]
- Application Note 1398: Forward Link Measurements for 1xEV-DO Access Networks [5988-6125EN.pdf]
- Application Note 1414: Understanding Measurement of 1xEV-DO Access Terminals [5988-7694EN.pdf]
- Application Note 1578: IEEE 802.16e WiMAX OFDMA Signal Measurements and Troubleshooting [5989-2382EN.pdf]
- Application Note 1583: Maximizing Measurement Speed with Keysight's X-Series Signal Analyzers [5989-4947EN.pdf]
- Application Note 1585: Using Keysight X-Series Signal Analyzers for Measuring and Troubleshooting Digitally Modulated Signals [5989-4944EN.pdf]
- Application Note: Keysight 3GPP Long Term Evolution: System Overview, Product Development, and Test Challenges [5989-8139EN.pdf]
- Application Note: Mobile WiMAX™ PHY Layer (RF) Operation and Measurement [5989-8309EN.pdf]
- Application Note: Keysight Preamplifiers and System Noise Figure [5989-5742EN.pdf]
- Tips for Preventing Damage to Spectrum Analyzer [5989-8791EN.pdf]
- **Keysight VISA Help for I/O Libraries**

  This documentation is included in HTML Help (CHM) format in the Keysight I/O Libraries Suite installer, which may be downloaded from:

  www.agilent.com/find/iosuite

  After installing the library, you can access the help by clicking the IO taskbar icon, then selecting **Documentation** > **API Documentation** > **VISA Documentation** from the popup menus.

For details of the types of documentation available, see "Documentation Categories" on page 98.

Specifications Guides

Specifications documents are not located on the instrument's disk, but may be downloaded from the Keysight web site as PDF files. To download a copy, do the following:

1. Browse to one of the following URLs, according to the product name of your instrument:

   www.agilent.com/find/cxa

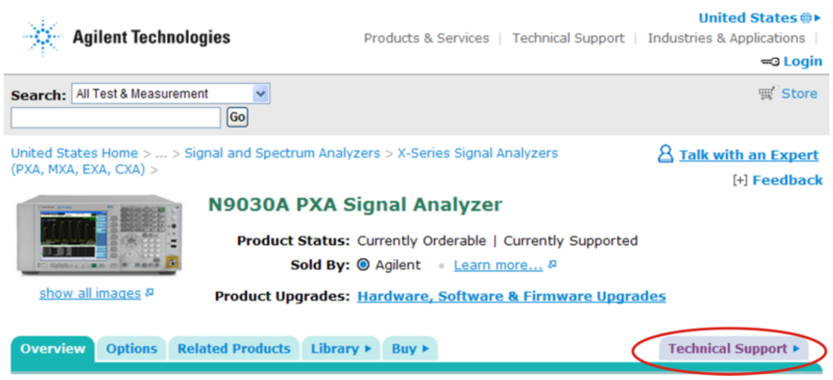
   www.agilent.com/find/exa

   www.agilent.com/find/mxa

   www.agilent.com/find/pxa

2. The home page for your instrument appears (in some cases, you may see an initial splash screen containing a button named View the Webpage, which you should click to display the home page).

3. Locate the Technical Support tab, at the top right of the screen, as highlighted in the example below, which shows the home page for the PXA.



4. Click the Technical Support tab, as highlighted above, to display the Technical Support page for your instrument.

5. Locate the Specifications tab on the Technical Support page, as highlighted in the PXA example below, and click the tab to display a list of available specification documents for the instrument.

6. Locate the "N90x0A Signal Analyzer Specifications Guide" in the list of available downloads, then click the title to open or copy the PDF file. (When the PDF is open, you can save it to your computer.)

Documentation Categories

All available documentation for X-Series instruments falls into one of the following categories.

Type	Description
"Getting Started Guide" on page 62	Turn on process, Windows operating system use/configuration, Front and Rear panel.
Specifications Guide	Specifications for all available Measurement Applications and optional hardware (for example, Spectrum Analyzer and W-CDMA). For details of how to obtain these documents, see Specifications Guides.
Functional Tests Guides	Quick checks to verify overall instrument operation. The following manuals are available: • CXA Functional Tests Guide • EXA Functional Tests Guide • MXA Functional Tests Guide • PXA Functional Tests Guide
Instrument Messages Guide	Descriptions of displayed messages of Information, Warnings and Errors.
Measurement Guides	Includes examples of measurements made using the front panel keys, or over a remote interface. Measurement Guides are specific to each Measurement Application: see "Documentation Specific to a Measurement Application or Option" on page 63.
Programmer's Guide	Provides information about how to program Keysight X-Series instruments using SCPI commands, and explains how to use the programming documentation. Describes programming examples, which are available in several languages.
User's and Programmer's References	Descriptions of front panel key functionality and the corresponding SCPI commands and queries. Also includes some concept information. User's and Programmer's Reference manuals are specific to each Measurement Application: see "Documentation Specific to a Measurement Application or Option" on page 63.

Downloading PDF Files

You can download any of the PDF files listed in this chapter by opening any internet browser program on an internet-connected computer, and entering a URL as follows.

1. Enter the following prefix:

   http://cp.literature.agilent.com/litweb/pdf/

2. Append the file name of the manual you want to download, including the .pdf extension, as specified in the main "Additional Documentation" on page 61 list. The file name for each manual appears in square brackets, following its title text.

   (Note that the name is case-sensitive; letters in the part number portion of the name must be upper-case.)

   For example, if you want to download the Measurement Guide for the "N9060A Spectrum Analyzer Mode" on page 74, the correct file name is: N9060-90034.pdf, so the complete URL would be:

   http://cp.literature.agilent.com/litweb/pdf/N9060-90034.pdf

3. Depending on your browser settings, the PDF file for the manual you specified will be downloaded and opened automatically, or a dialog will appear that allows you to download the file.

2 About the Instrument

The X-Series instrument measures and monitors complex RF and microwave signals. Analog baseband analysis is available on MXA. The instrument integrates traditional spectrum measurements with advanced vector signal analysis to optimize speed, accuracy, and dynamic range. The instrument has Microsoft Windows 7 built-in as an operating system, which expands its usability.

With a broad set of applications and demodulation capabilities, an intuitive user interface, outstanding connectivity and powerful one-button measurements, the instrument is ideal for both R&D and manufacturing engineers working on cellular, emerging wireless communications, general purpose, aerospace and defense applications.

This chapter includes the following topics:

KEYSIGHT
TECHNOLOGIES

Installing Application Software

If you want to install a measurement application after your initial hardware purchase, you need only to license it. All of the available applications are loaded in your instrument at the time of purchase.

Thus, when you purchase a new application, you will receive an entitlement certificate that you can use to obtain a license key for that application. To activate the new measurement application, enter the license key that you obtain into the instrument.

For the latest information on Keysight measurement applications and upgrade kits, visit the following web site:

http://www.agilent.com/find/sa_upgrades

This section includes the following topics:

- "Viewing a License Key" on page 102
- "Obtaining and Installing a License Key " on page 102
- "Updating Measurement Application Software" on page 103

Viewing a License Key

Measurement applications that you purchased with your instrument have been installed and activated at the factory before shipment. The instrument requires a unique License Key for every measurement application purchased. The license key is a hexadecimal string that is specific to your measurement application, instrument model number and serial number. It enables you to install, or reactivate, that particular application.

Press **System**, **Show**, **System** to display the measurement applications that are currently licensed in your instrument.

Go to the following location to view the license keys for the installed measurement applications:

C:\Program Files\Agilent\Licensing

You may want to keep a copy of your license key in a secure location. To do this, you can print out a copy of the display showing the license numbers. If you should lose your license key, call your nearest Keysight Technologies service or sales office for assistance.

Obtaining and Installing a License Key

If you purchase an additional application that requires installation, you will receive an "Entitlement Certificate", which may be redeemed for a license key for one instrument. To obtain your license key, follow the instructions that accompany the certificate.

Installing a license key for the selected application can be done automatically using a USB memory device. To do this, you copy the license file to the USB memory device, at the root level. Follow the instructions that come with your software installation kit.

Installing a license key can also be done manually using the built-in license management application, which may be found via the instrument front panel keys at **System**, **Licensing. . .** , or on-disk at:

C:\Programming Files\Agilent\Licensing

You can also use these procedures to reinstall a license key that has been accidentally deleted, or lost due to a memory failure.

Updating Measurement Application Software

All the software applications were loaded at the time of original instrument manufacture. It is a good idea to regularly update your software with the latest available version. This helps to ensure that you receive any improvements and expanded functionality.

Because the software was loaded at the initial purchase, further additional measurement applications may now be available. If the application you are interested in licensing is not available, you will need to do a software update. (To display a list of installed applications, press **System**, **Show**, **System**.)

Check the appropriate page of the Keysight web site for the latest available software versions, according to the name of your instrument, as follows:

- http://www.agilent.com/find/pxa_software
- http://www.agilent.com/find/mxa_software
- http://www.agilent.com/find/exa_software

You can load the updated software package into the instrument from a USB drive, or directly from the internet. An automatic loading program is included with the files.

X-Series Options and Accessories

You can view an online list of available Options and Accessories for your instrument as follows:

1. Browse to one of the following URLs, according to the product name of your instrument:
   - www.agilent.com/find/exa
   - www.agilent.com/find/mxa
   - www.agilent.com/find/pxa
2. The home page for your instrument appears (in some cases, you may see an initial splash screen containing a button named View the Webpage, which you should click to display the home page).
3. Locate the Options tab, as highlighted in the example below, which shows the home page for the MXA.

4. Click the Options tab, to display a list of available options and accessories for your instrument.

Front & Rear Panel Features

The instrument's front and rear panel features are fully detailed in the chapter "Front and Rear Panel Features" of the document:

"Getting Started Guide" on page 62

Display Annotations

Display Annotations are fully detailed under the chapter "Front and Rear Panel Features" of the document:

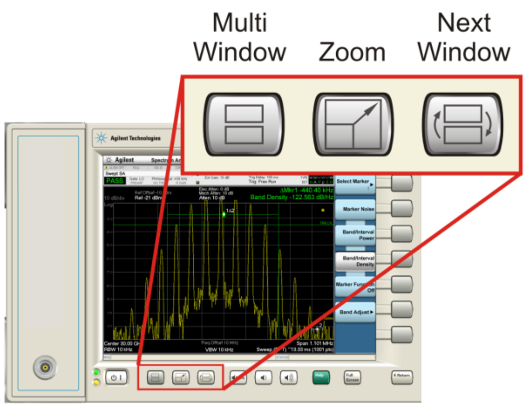
"Getting Started Guide" on page 62

Window Control Keys

The instrument provides three front-panel keys for controlling windows. These are:

- "Multi-Window" on page 107
- "Zoom" on page 107
- "Next Window" on page 108

These are all “immediate action” keys.



Multi-Window

The Multi-Window key can be found on the instrument's front panel, below the display screen.

Pressing the key toggles back and forth between the Normal View and the last Multi-Window View (Zone Span, Trace Zoom or Spectrogram) that you selected when using the Swept SA measurement of the Spectrum Analyzer Mode. The selected view is retained through a Preset. On a Restore Mode Defaults, the “previous view” is set to Zone Span.

Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

Zoom

The Zoom key can be found on the instrument's front panel, below the display screen.

Zoom is a toggle function. Pressing this key once increases the size of the selected window; pressing the key again returns the window to the original size.

When Zoom is on for a window, that window occupies the entire primary display area. The zoomed window, since it is the selected window, is outlined in green.

Zoom is local to each Measurement. Each Measurement remembers its Zoom state. The Zoom state of each Measurement is part of the Mode's state.

NOTE Data acquisition and processing for the other windows continues while a window is zoomed, as does all SCPI communication with the other windows.

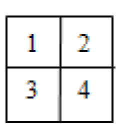
Remote Command	`:DISPlay:WINDow:FORMat:ZOOM`
Remote Command	`:DISPlay:WINDow:FORMat:TILE`
Example	:DISP:WIND:FORM:ZOOM sets zoomed :DISP:WIND:FORM:TILE sets un-zoomed
Preset	TILE
Initial S/W Revision	Prior to A.02.00

Next Window

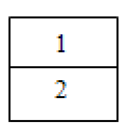
The Next Window key can be found on the instrument's front panel, below the display screen.

Pressing the key selects the next window of the current view. When the Next Window key is pressed, the next window in the order of precedence becomes selected. If the selected window was zoomed, the next window will also be zoomed.

The window numbers are as shown in the diagrams below. Note that these numbers also determine the order of precedence (that is, Next Window goes from 1 to 2, then 2 to 3, etc.):



Four window display



Two window display

Remote Command	`:DISPlay:WINDow[:SELect] <number>` `:DISPlay:WINDow[:SELect]?`
Example	:DISP:WIND 1
Preset	1

Min	1
Max	If <number> is greater than the number of windows, limit to <number of windows>
Initial S/W Revision	Prior to A.02.00

One and only one window is always selected. The selected window has the focus; this means that all window-specific key presses apply only to that window. You can tell which window is selected by the thick green border around it. If a window is not selected, its boundary is gray.

If a window in a multi-window display is zoomed, it is still outlined in green. If there is only one window, the green outline is not used. This allows the user to distinguish between a zoomed window and a display with only one window.

The selected window is local to each Measurement. Each Measurement remembers which window is selected. The selected window for each Measurement is remembered in the Mode state.

NOTE When this key is pressed with Help open, it toggles focus between the table of contents window and the topic pane window.

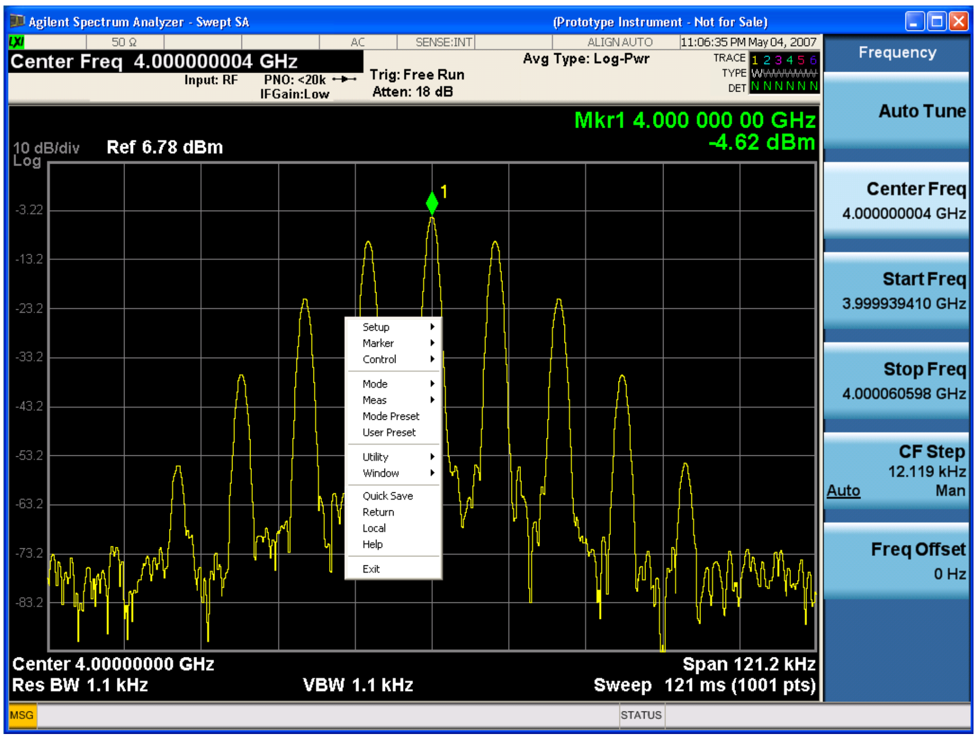
Mouse and Keyboard Control

If you do not have access to the instrument front-panel, there are several ways that a mouse and PC Keyboard can give you access to functions normally accessed using the front-panel keys.

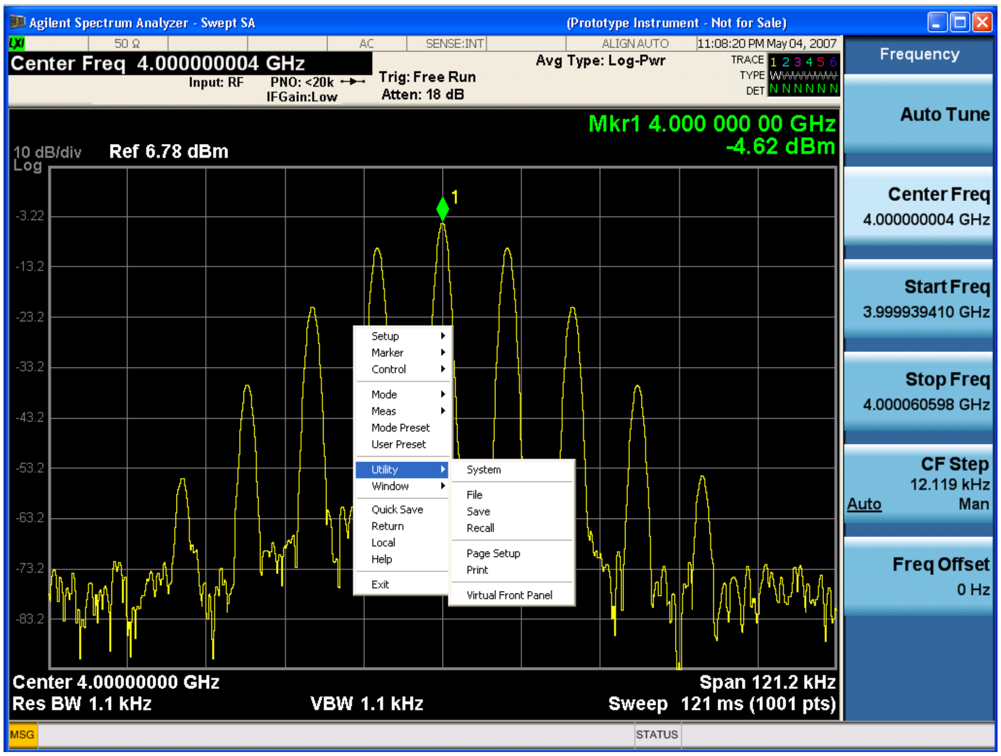
- "Right-Click" on page 110
- "PC Keyboard" on page 111

Right-Click

If you plug in a mouse, then right-click on the instrument screen, a menu appears as below:

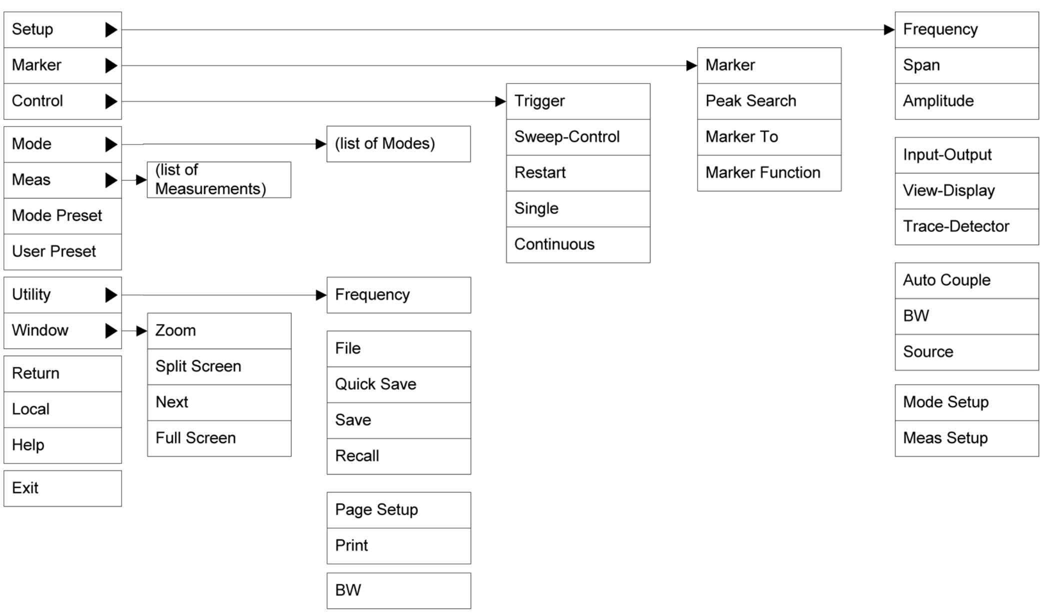


Placing the mouse on one of the rows marked with a right arrow symbol causes that row to expand, as in the example below, where the mouse is hovered over the “Utility” row:



This method can be used to access any of the front-panel keys by using a mouse; as for example if you are accessing the instrument via Remote Desktop.

The array of keys thus available is shown below:



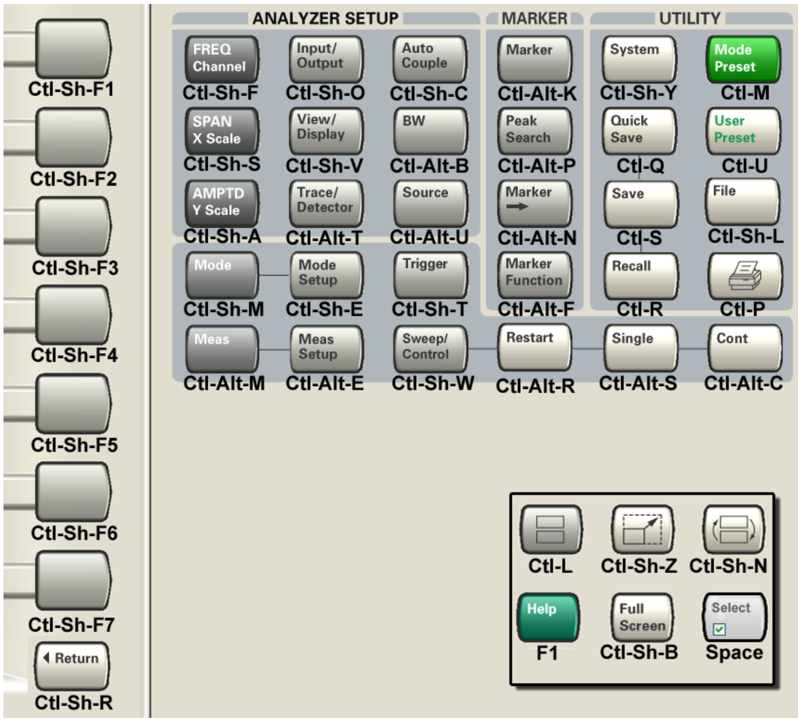
PC Keyboard

If you have a PC keyboard plugged into the instrument (or via Remote Desktop), certain key codes on the PC keyboard map to front-panel keys on the instrument. These key codes are listed below:

Front-panel key	Key code
Frequency	CTRL+SHIFT+F
Span	CTRL+SHIFT+S
Amplitude	CTRL+SHIFT+A
Input/Output	CTRL+SHIFT+O
View/Display	CTRL+SHIFT+V
Trace/Detector	CTRL+ALT+T
Auto Couple	CTRL+SHIFT+C
Bandwidth	CTRL+ALT+B
Source	CTRL+ALT-U
Marker	CTRL+ALT+K
Peak Search	CTRL+ALT+P
Marker To	CTRL+ALT+N
Marker Function	CTRL+ALT+F
System	CTRL+SHIFT+Y
Quick Save	CTRL+Q
Save	CTRL+S
Recall	CTRL+R
Mode Preset	CTRL+M
User Preset	CTRL+U
Print	CTRL+P
File	CTRL+SHIFT+L
Mode	CTRL+SHIFT+M
Measure	CTRL+ALT+M
Mode Setup	CTRL+SHIFT+E
Meas Setup	CTRL+ALT+E
Trigger	CTRL+SHIFT+T
Sweep/Control	CTRL+SHIFT+W
Restart	CTRL+ALT+R
Single	CTRL+ALT+S
Cont	CTRL+ALT+C
Zoom	CTRL+SHIFT+Z
Next Window	CTRL+SHIFT+N
Split Screen	CTRL+L
Full Screen	CTRL+SHIFT+B
Return	CTRL+SHIFT+R
Mute	Mute

Front-panel key	Key code
Inc Audio	Volume Up
Dec Audio	Volume Down
Help	F1
Control	CTRL
Alt	ALT
Enter	Return
Cancel	Esc
Del	Delete
Backspace	Backspace
Select	Space
Up Arrow	Up
Down Arrow	Down
Left Arrow	Left
Right Arrow	Right
Menu key 1	CTRL+SHIFT+F1
Menu key 2	CTRL+SHIFT+F2
Menu key 3	CTRL+SHIFT+F3
Menu key 4	CTRL+SHIFT+F4
Menu key 5	CTRL+SHIFT+F5
Menu key 6	CTRL+SHIFT+F6
Menu key 7	CTRL+SHIFT+F7
Backspace	BACKSPACE
Enter	ENTER
Tab	Tab
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
0	0

This is a pictorial view of the table:


ANALYZER SETUP
MARKER
UTILITY
FREQ Channel
Ctl-Sh-F
Input/ Output
Ctl-Sh-O
Auto Couple
Ctl-Sh-C
Marker
Ctl-Alt-K
System
Ctl-Sh-Y
Mode Preset
Ctl-M
SPAN X Scale
Ctl-Sh-S
View/ Display
Ctl-Sh-V
BW
Ctl-Alt-B
Peak Search
Ctl-Alt-P
Quick Save
Ctl-Q
User Preset
Ctl-U
AMPTD Y Scale
Ctl-Sh-A
Trace/ Detector
Ctl-Alt-T
Source
Ctl-Alt-U
Marker →
Ctl-Alt-N
Save
Ctl-S
File
Ctl-Sh-L
Mode
Ctl-Sh-M
Mode Setup
Ctl-Sh-E
Trigger
Ctl-Sh-T
Marker Function
Ctl-Alt-F
Recall
Ctl-R
Ctl-P
Meas
Ctl-Alt-M
Meas Setup
Ctl-Alt-E
Sweep/ Control
Ctl-Sh-W
Restart
Ctl-Alt-R
Single
Ctl-Alt-S
Cont
Ctl-Alt-C
Ctl-Sh-F1
Ctl-Sh-F2
Ctl-Sh-F3
Ctl-Sh-F4
Ctl-Sh-F5
Ctl-Sh-F6
Ctl-Sh-F7
Return
Ctl-Sh-R
Ctl-L
Ctl-Sh-Z
Ctl-Sh-N
Help
F1
Full Screen
Ctl-Sh-B
Select
Space

Instrument Security & Memory Volatility

If you are using the instrument in a secure environment, you may need details of how to clear or sanitize its memory, in compliance with published security standards of the United States Department of Defense, or other similar authorities.

For X-Series instruments, this information is contained in the document "Security Features and Document of Volatility". This document is not included in the Documentation DVD, or the instrument's on-disk library, but it may be downloaded from Keysight's web site.

To obtain a copy of the document, click on or browse to the following URL:

http://www.agilent.com/find/security

To locate and download the document, select Model Number "N9020A", then click Submit". Then, follow the on-screen instructions to download the file.

3 About the N9061A Measurement Application

This chapter provides general information about the N9061A application. It includes the following topics:

N9061A Application Description

N9061A is a Remote Language Compatibility application for Keysight Technologies X-Series instruments. It allows X-Series instruments to be controlled using many non-SCPI remote programming commands originally intended for the following analyzers:

- 8560 E/EC Series Portable Spectrum Analyzers, comprising:
- 8560E, 8560EC, 8561E, 8561EC, 8562E, 8562EC, 8563E, 8563EC, 8564E, 8564EC, 8565E, 8565EC
- 8566A/B
- 8568A/B

(The 8566A/B and the 8568A/B are not considered part of the 8560 series of analyzers.)

An X-Series instrument with N9061A installed can replace these analyzers in many automated systems with minimal or no modification to the existing measurement software.

There are two options for N9061A:

Option	Description
N9061A-1FP	8566A/B and 8568A/B remote language compatibility
N9061A-2FP	8560 Series remote language compatibility.

Documentation for the N9061A application

Scope of this Document

This manual does not provide a comprehensive guide to all legacy commands. It provides brief descriptions of legacy commands that are supported by N9061A, and highlights important functional or behavioral differences that you should be aware of when using existing legacy code to control your X-Series instrument. For a complete description of all legacy commands, refer to the manuals supplied with your original analyzer.

Where to Obtain this Document

When you purchase an X-Series instrument with the Remote Language Compatibility Application (N9061A), this manual (*N9061A Remote Language Compatibility Measurement Application User's & Programmer's Reference*, part number N9020-90119) is included on the documentation DVD. It may also be downloaded from the Keysight web site at:

http://cp.literature.agilent.com/litweb/pdf/N9020-90119.pdf

This document contains exactly the same content as the instrument's online Help file (CHM) for N9061A.

Instrument Updates

For the latest information about your X-Series instrument, including software upgrades, application information, and product information, please visit the URL below that corresponds to your instrument's product name:

- http://www.agilent.com/find/pxa/
- http://www.agilent.com/find/mxa/
- http://www.agilent.com/find/exa/

General Rules and Limitations

The N9061A application has been designed to emulate as closely as possible the operation of the specified spectrum analyzers. It is not, however, intended as a fully-compatible, direct replacement for these analyzers. This section highlights the following specific emulation differences and limitations:

- "AC/DC Coupling" on page 120
- "Couplings" on page 120
- "Markers" on page 121
- "Numeric Ranges" on page 121
- "Parsing" on page 121
- "Predefined Functions" on page 121
- "Remote Control" on page 121
- "Returning Data" on page 121
- "Units" on page 122
- "User-defined Functions" on page 122
- "Supported Commands" on page 122
- "EP Parameter" on page 122
- "OA Parameter" on page 122
- "Handling of Unsupported Commands and Queries" on page 122

AC/DC Coupling

The 44 GHz and 50 GHz X-Series instruments only have DC coupling. The X-Series instruments with a 26.5 GHz frequency range, and lower, default to AC coupling on preset. When the selected legacy instrument is HP8566A, HP8566B, HP8563, HP8564, or HP8565, N9061A defaults to DC coupling.

When AC coupled, the 8560E/61E/62E have a 100 kHz low frequency limit, whereas X-Series instruments have a 10 MHz limit.

For HP8568A/B compatibility and consistency, N9061A supports the I1 and I2 commands. These select AC or DC coupling at the RF input. Note that the HP8568A/B has two RF input ports, whereas X-Series instruments have only one.

Couplings

For optimal use of the X-Series instrument, N9061A uses the auto coupling features of the X-Series, and does not attempt to mimic the exact coupling behavior of the legacy analyzers. To eliminate the possibility of "Meas Uncal" errors between auto and manual values, values generally default to the X-Series auto settings where applicable (for example, Resolution Bandwidth). However, there are several exceptions, as follows:

To prevent timeout errors in the legacy code, the Resolution Bandwidth minimum matches the minimum in the legacy analyzer. Resolution Bandwidth steps and resolution, however, conform to X-Series values.

The Video Bandwidth couples to the Resolution Bandwidth according to the Video Bandwidth coupling offset value, specified by the VBO or VBR command. X-Series instruments set the Video Bandwidth according to the VBO or VBR setting, but use the X-Series instruments' available bandwidths, to prevent 'Meas Uncal' errors.

Markers

N9061A emulates the behavior of legacy products. If any program uses a marker state that is not available in the legacy instrument, further marker behavior is undefined, until a subsequent instrument preset occurs.

On systems that support MKACT, there are 4 completely different marker pairs, each with its own information. N9061A stores the currently active value of MKACT. For example, if MKACT is 2, then it uses Markers 3 and 4 instead of 1 and 2.

Numeric Ranges

Numeric ranges are limited to that of X-Series unless otherwise stated, although commands such as FS or IP that go to a default range use the range of the legacy instrument.

Parsing

For 8566B and 8568B emulation, N9061A remembers the active function and supports UP, DN, and OA, all of which change the active function. It also supports ?, which does not change the active function.

Note that 8566/68 parses a command (for example CF 10.3GZ) immediately when it recognizes a complete command (in this example, following GZ), whereas N9061A parses at the end of a line, when it sees the line termination sequence.

Predefined Functions

In the 8566/8568/8560 Series analyzers, a "Predefined Function" is a command that returns a number that can be operated on by other commands. "Predefined Variables" follow the same concept, except that the value to be passed as a parameter to the next command is stored in a variable.

N9061A does not support this type of behavior, so any commands that originally acted as Predefined Functions or Variables, or that accepted Predefined Functions or Variables as arguments in the 8566/8568/8560 Series, no longer do so.

Remote Control

N9061A supports remote operation via the GPIB interface. It does not support operation via LAN, USB or Telnet.

Returning Data

X-Series and legacy instruments adopt differing approaches when returning data to the controller.

X-Series and 8560-series analyzers operate a FIFO buffer for command return values. If a command returns a value that the controller does not read, the returned data is stored until such a time that the controller requires the value.

The 8566, 8568, and 8590-series legacy analyzers only store one value at a time. Any value stored is overwritten each time a command returns a value. N9061A handles this difference appropriately only within a single command string.

In the case of a query string, N9061A returns the query result for the last command in the string. For example, if CF?MA?FA? is sent, the result of FA? is returned. However, this rule does not apply if the query is located on either side of a TS command. When the command string MA;TS;CF? is sent, the result of CF? is returned in the next query.

Units

N9061A supports all units used in legacy products. The accepted units are HZ, KHZ, MHZ, GHZ, KZ, MZ, GZ, DBM, DBMV, DBUV, MV, UV, V, MW, UW, W, DB, DM, MS, US, SC, and S (case insensitive in 8566/68). A command terminator, such as ";", also acts as a unit terminator.

User-defined Functions

User-defined functions, traces, or variables (FUNCDEF, TRDEF or VARDEF) **cannot** be used as arguments or commands in programs for N9061A. In addition, the behavior of certain commands that rely on the "active functions" (UP, DN, etc.) may be slightly different.

Supported Commands

N9061A supports only a subset of 8566/8568/8560 Series commands. The list of supported commands was determined by feedback from customers, combined with technical considerations and constraints.

Device Clear is supported by N9061A, and causes a mode preset of the instrument.

EP Parameter

The EP (Enable Parameter) is supported by N9061A for the same active functions as the 8560 series. When used as a secondary keyword after a command, EP transfers control to the analyzer's front-panel.

EP is not displayed in any of the format diagrams for individual commands listed in "Legacy Command Descriptions" on page 251.

OA Parameter

N9061A supports the OA parameter, which is used in conjunction with several legacy commands, such as AT and CF. OA is equivalent to a query; for example, CF OA is equivalent to CF?.

Handling of Unsupported Commands and Queries

If a command is valid for legacy products but not supported by N9061A, no error message is generated, although a "Command Not Supported" comment is appended to the Command Log file. Note that this logging behavior can be controlled via the Logging menu, as described in "Logging" on page 881.

If N9061A receives a query that is valid for legacy products, but is not supported by N9061A, it returns a "0", to avoid the situation where a program would otherwise halt indefinitely waiting for a return value.

Hardware and Firmware Requirements for N9061A

For maximum compatibility, you should select an X-Series instrument that equals or exceeds the frequency range of the legacy analyzer you are replacing. The frequency limits of the legacy analyzers are listed below.

Frequency Ranges of Legacy Analyzers

Remote Language	Start Frequency	Stop Frequency
8560E/EC	30 Hz	2.9 GHz
8561E/EC	30 Hz	6.5 GHz
8562E/EC	30 Hz	13.2 GHz
8563E/EC	9 kHz	26.5 GHz
8564E/EC	9 kHz	40.0 GHz
8565E/EC	9 kHz	50.0 GHz
HP8566A	2 GHz	22 GHz
HP8566B	2 GHz	22 GHz
HP8568A	0 Hz	1.5 GHz
HP8568B	0 Hz	1.5 GHz

The following table lists the Upper Frequency Limits and minimum firmware revisions for Keysight X-Series instruments that support N9061A.

Compatible Keysight X-Series Instruments

Product Name	Instrument Model Number	Upper Frequency Limit	Firmware Revision
PXA	N9030A-503	3.6 GHz	Rev A.04.00 or later
	N9030A-508	8.4 GHz	
	N9030A-513	13.6 GHz	
	N9030A-526	26.5 GHz	
	N9030A-543	43 GHz	
	N9030A-544	44 GHz	
	N9030A-550	50 GHz	
MXA	N9020A-503	3.6 GHz	Rev A.01.64 or later
	N9020A-508	8.4 GHz	
	N9020A-513	13.6 GHz	
	N9020A-526	26.5 GHz	

Product Name	Instrument Model Number	Upper Frequency Limit	Firmware Revision
EXA	N9010A-503	3.6 GHz	Rev A.01.64 or later
	N9010A-507	7 GHz	
	N9010A-513	13.6 GHz	
	N9010A-526	26.5 GHz	
	N9010A-532	32 GHz	
	N9010A-544	44 GHz	

Installing the N9061A Application

N9061A is a licensed application for X-Series instruments. The option for 8560 Series emulation is N9061A-2FP, and the option for 8566/8568 emulation is N9061A-1FP. The application must be installed and licensed on a suitable X-Series instrument (PXA, MXA, or EXA) for it to work correctly.

Installation

The license is installed on the X-Series instrument in one of the following ways:

If you purchased a new X-Series instrument with N9061A, then the product is already installed and licensed, and is ready to use.

If you have an X-Series instrument and have subsequently purchased N9061A, then you can download N9061A from the Keysight website. N9061A is installed as part of a software upgrade. See the links below for instrument software upgrades. After upgrading your software you should then use your entitlement certificate to license the product (see "Licensing" on page 125 below).

The latest revision of the software may be downloaded from:

- http://www.agilent.com/find/pxa_software
- http://www.agilent.com/find/mxa_software
- http://www.agilent.com/find/exa_software

No calibration is required after N9061A is installed.

Licensing

For details of how to install and activate an N9061A license, see the section "Keysight X-Series Analyzer Licensing Options" in the chapter "Instrument Operating System" of the "Getting Started and Troubleshooting Guide", which may be downloaded in PDF format from the following location.

http://www.agilent.com/find/xseries_getting_started_guide_windows7

Verify the Installation

- Press System > Show > System, to display the list of installed applications.
- Verify that N9061A appears in the Option list.

If you require further assistance, please contact the Keysight support team.

- Online assistance: http://www.agilent.com/find/assist
- If you do not have access to the Internet, contact your local Keysight Technologies Sales and Service Office, or if in the United States, call 1-800-829-4444.

Setting up N9061A

To set up your X-Series instrument for emulation of one of the supported legacy analyzers, do the following:

Step	Action	Notes
1	Select the N9061A Measurement Application (Mode)	Press the Mode hardkey on the front panel, then press the sofkey for Remote Language Compatibility mode. If there are more than six modes on the instrument, you may need to use the More softkey to display the Remote Language Compatibility selection. For details of the menu, see "Mode" on page 857.
2	Select the legacy analyzer you wish to emulate	Press the Mode Setup hardkey on the front panel, then select the specific analyzer type from the keys in the submenu. For details of this menu, see "Mode Setup" on page 879.

Hints and Tips

This section provides hints and tips that will help you get the most from the X-Series N9061A application.

Compatibility (Speed and Consistency)

To maximize compatibility with your legacy analyzer, the N9061A application should be used on the instrument whose frequency range most closely matches the frequency range of your legacy analyzer. For example, the best match for the 8563E, which has a 26.5 GHz upper frequency limit, is an X-Series instrument that also has an upper frequency limit of 26.5 GHz.

Compatibility and Sweep Times

To maximize compatibility between X-Series instruments and legacy analyzers, use the Manual Swept mode for 8566A/B, 8568A/B analyzers. Manual Swept mode is the default setting on X-Series instruments with N9061A installed.

When analyzing stationary signals, you can change to the Best Speed setting, which is accessed from the Mode Setup > Preferences > Swp Type Rule menu. This results in faster sweep times on an X-Series instrument than on the legacy analyzers, due to the X-Series instrument's better performance. In the majority of applications, this faster speed would be desirable, but that is not always the case.

Timeout

Keysight recommends increasing the timeout on a serial poll (SPOLL) due to differences in Sweep Times on some settings. Note, however, that this may not be necessary when using the Best Speed setting on the Preferences > Swp Type Rule menu (accessed from the Mode Setup hardkey).

Synchronization (1)

To synchronize after an IP command, Keysight recommends that you use the DONE command. We also suggest that the DONE command be used in conjunction with a timeout of about 5 seconds, in case the instrument starts to Auto Align.

Alternatively, you can switch off auto alignment. To set auto alignment to Off, press System, Alignments, Auto Align on the front panel.

Synchronization (2)

Keysight recommends that synchronization (using the DONE command) be used with marker functions when signal tracking is turned on.

Changing Modes

After changing into or out of N9061A mode, allow at least a 1 second delay before sending subsequent commands.

AC and DC Coupling

The 8560 Series of legacy analyzers have one RF input port, and support AC and DC coupling through the command "COUPLE (Input Coupling)" on page 310.

The 8568A/B has two RF input ports:

- DC Coupled (with a BNC connector) to handle a frequency range of 100 Hz to 1.5 GHz
- AC Coupled (with an N Type connector) to handle a frequency range of 100 kHz to 1.5 GHz

If the input signal to the X-series instrument has a DC component, ensure that when you select legacy instrument emulation that involves a possible coupling change to DC, the input signal does not exceed the input specifications of the X-series instrument.

X-series instruments also have one RF input port. When using X-Series instruments, you must use DC coupling to see calibrated frequencies of less than 20 MHz. Signals of less than 20 MHz are not calibrated when using AC coupling on these instruments.

Service and Calibration

Since the Performance Verification and Adjustment Software uses the SCPI command language, you must exit the N9061A application and change to N9060A Spectrum Analyzer Mode, prior to calibration or service of your instrument.

4 Programming the Instrument

This section provides introductory information about the programming documentation included with your product.

What Programming Information is Available?

The X-Series Documentation can be accessed through the Additional Documentation page in the instrument Help system and is included on the Documentation DVD shipped with the instrument. It can also be found online at:

http://www.agilent.com/find/mxa_manuals.

The following resources are available to help you create programs for automating X-Series measurements:

Resource	Description
X-Series Programmer's Guide	Provides general SCPI programming information on the following topics: • Programming the X-Series Applications • Programming fundamentals • Programming examples Note that SCPI command descriptions for measurement applications are not in this book, but are in the User's and Programmer's Reference.
User's and Programmer's Reference manuals	Describes all front-panel keys and softkeys, including SCPI commands for a measurement application. Note that: • Each measurement application has its own User's and Programmer's Reference. • The content in this manual is duplicated in the instrument's Help (the Help that you see for a key is identical to what you see in this manual).
Embedded Help in your instrument	Describes all front-panel keys and softkeys, including SCPI commands, for a measurement application. Note that the content that you see in Help when you press a key is identical to what you see in the User's and Programmer's Reference.
X-Series Getting Started Guide	Provides valuable sections related to programming including: • Licensing New Measurement Application Software - After Initial Purchase • Configuring instrument LAN Hostname, IP Address, and Gateway Address • Using the Windows XP Remote Desktop to connect to the instrument remotely • Using the Embedded Web Server Telnet connection to communicate SCPI This printed document is shipped with the instrument.
Keysight Application Notes	Printable PDF versions of pertinent application notes.
Keysight VISA User's Guide	Describes the Keysight Virtual Instrument Software Architecture (VISA) library and shows how to use it to develop I/O applications and instrument drivers on Windows PCs.

List of Supported SCPI Commands

When the N9061A application has been selected, the X-Series instrument supports only a subset of SCPI commands.

The SCPI commands available while using the N9061A application are listed below. (Non-SCPI commands for legacy analyzers are **not** listed here; see instead "List of Legacy Analyzer Commands" on page 221.)

To find a command in the list, search according to its first alphanumeric character, ignoring any leading ":" or "[" characters. The sole exception to this is the asterisk [*] prefix, identifying IEEE 488.2 Common commands and queries; all these appear at the start of the list.

*

*CAL?	"All" on page 1219
*CLS	"Clear Status " on page 156
*ESE *ESE?	"Standard Event Status Enable " on page 156
*ESR?	"Standard Event Status Register Query " on page 157
*IDN?	"Identification Query " on page 157
*OPC *OPC?	"Operation Complete " on page 158
*OPT?	"Query Instrument Options " on page 159
*RCL	"Recall Instrument State " on page 159
*RST	"*RST (Remote Command Only)" on page 160
*SAV	"Save Instrument State " on page 160
*SRE *SRE?	"Service Request Enable " on page 160
*STB?	"Status Byte Query " on page 161
*TRG	"Trigger " on page 161
*TST?	"Self Test Query " on page 161
*WAI	"Wait-to-Continue " on page 162

A

:ABORt	"Abort (Remote Command Only)" on page 1195

C

:CALCulate:BWIDth|BANDwidth:NDB	"N dB Points " on page 830
:CALCulate:BWIDth|BANDwidth:RESult?	"N dB Points " on page 830
:CALCulate:BWIDth|BANDwidth[:STATe]	"N dB Points " on page 830
:CALCulate:CLIMits:FAIL?	"Limit Test Current Results (Remote Command Only)" on page 167

:CALCulate:DATA{0:50}?	"Data Query (Remote Command Only)" on page 167
:CALCulate:DATA{0:50}:COMPress?	"Calculate/Compress Trace Data Query (Remote Command Only)" on page 167
:CALCulate:DATA{0:50}:PEAKs?	"Calculate Peaks of Trace Data (Remote Command Only)" on page 172
:CALCulate:LIMit{1:6}:CLEar	"Limit Clear (Remote Command Only, SCPI standard conformance)" on page 829
:CALCulate:LIMit{1:6}:CONTrol[:DATA]	"Limit Line Control (Remote Command Only, SCPI standard conformance)" on page 826
:CALCulate:LIMit{1:6}:CONTrol:POINts?	"Limit Line Control (Remote Command Only, SCPI standard conformance)" on page 826
:CALCulate:LIMit{1:6}:FAIL?	"Limit Fail? (Remote Command Only, SCPI standard conformance)" on page 828
:CALCulate:LIMit{1:6}:LOWer[:DATA]	"Limit Line Upper / Lower (Remote Command Only, SCPI standard conformance)" on page 827
:CALCulate:LIMit{1:6}:LOWer:POINts?	"Limit Line Upper / Lower (Remote Command Only, SCPI standard conformance)" on page 827
:CALCulate:LIMit{1:6}:UPPer[:DATA]	"Limit Line Upper / Lower (Remote Command Only, SCPI standard conformance)" on page 827
:CALCulate:LIMit{1:6}:UPPer:POINts?	"Limit Line Upper / Lower (Remote Command Only, SCPI standard conformance)" on page 827
:CALCulate:LLINe{1:6}:ALL:DELete	"Delete All Limits" on page 824
:CALCulate:LLINe{1:6}:AMPLitude:CMODe:RELative	"Relative to RL" on page 811
:CALCulate:LLINe{1:6}:AMPLitude:INTerpolate:TYPE	"Amplitude Interpolation" on page 810
:CALCulate:LLINe{1:6}:BUILd	"Build from Trace" on page 820
:CALCulate:LLINe{1:6}:CMODe	"Fixed / Relative Limit (Remote Command Only)" on page 829
:CALCulate:LLINe{1:6}:COMMent	"Comment" on page 812
:CALCulate:LLINe{1:6}:CONTrol:DOMain	"X-Axis Unit" on page 824
:CALCulate:LLINe{1:6}:CONTrol:INTerpolate:TYPE	"Frequency Interpolation" on page 809
:CALCulate:LLINe{1:6}:COPY	"Copy from Limit" on page 817
:CALCulate:LLINe{1:6}:DATA	"Limit Line Data (Remote Command Only)" on page 825
:CALCulate:LLINe{1:6}:DATA:MERGe	"Merge Limit Line Data (Remote Command Only)" on page 825
:CALCulate:LLINe{1:6}:DELete	"Delete Limit" on page 823
:CALCulate:LLINe{1:6}:DISPlay	"Limit " on page 801
:CALCulate:LLINe{1:6}:FAIL?	"Limit Line Fail? (Remote Command Only)" on page 826
:CALCulate:LLINe{1:6}:FREQuency:CMODe:RELative	"Relative to CF" on page 811
:CALCulate:LLINe{1:6}:MARGin	"Margin" on page 813
:CALCulate:LLINe{1:6}:MARGin:STATe	"Margin" on page 813

:CALCulate:LLINe{1:6}:OFFSet:UPDate	"Apply Offsets to Limit Table" on page 822
:CALCulate:LLINe{1:6}:OFFSet:X	"X Offset" on page 821
:CALCulate:LLINe{1:6}:OFFSet:Y	"Y Offset" on page 821
:CALCulate:LLINe{1:6}:TEST	"Test Limits" on page 823
:CALCulate:LLINe{1:6}:TRACe	"Test Trace" on page 808
:CALCulate:LLINe{1:6}:TYPE	"Type" on page 808
:CALCulate:MAMarker:COUPling	"BW & Avg Type" on page 783
:CALCulate:MAMarker:DETector{1:3}	"Detectors" on page 765
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:STATus:QUEStionable:INTegrity:SIGNal:PTRansition	"Questionable Integrity Signal Positive Transition" on page 212

:STATus:QUEStionable:INTegrity:UNCalibrated:CONDition?	"Questionable Integrity Uncalibrated Condition" on page 213
:STATus:QUEStionable:INTegrity:UNCalibrated:ENABle	"Questionable Integrity Uncalibrated Enable" on page 213
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:STATus:QUEStionable:POWer:NTRansition	"Questionable Power Negative Transition" on page 217
:STATus:QUEStionable:POWer:PTRansition	"Questionable Power Positive Transition" on page 217
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:SYSTem:LKEY	"Licensing..." on page 1254
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:TRIGger[:SEQuence]:EXTernal{1:2}:LEVel	"Trigger Level " on page 1353
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IEEE 488.2 Common Commands

The instrument supports the following subset of IEEE 488.2 Common Commands, as defined in Chapter 10 of IEEE Standard 488.2–1992. As indicated in the detailed description of each command, some of these commands correspond directly to instrument front-panel key functionality, while others are available only as remote commands.

Commands	Description
*CAL?	"All" on page 1219
*CLS	"Clear Status " on page 156
*ESE <int> *ESE?	"Standard Event Status Enable " on page 156
*ESR?	"Standard Event Status Register Query " on page 157
*IDN?	"Identification Query " on page 157
*OPC *OPC?	"Operation Complete " on page 158
*OPT?	"Query Instrument Options " on page 159
*RCL <reg>	"Recall Instrument State " on page 159
*RST	"*RST (Remote Command Only)" on page 160
*SAV <reg>	"Save Instrument State " on page 160
*SRE <int> *SRE?	"Service Request Enable " on page 160
*STB?	"Status Byte Query " on page 161
*TRG	"Trigger " on page 161
*TST?	"Self Test Query " on page 161
*WAI	"Wait-to-Continue " on page 162

All

Immediately executes an alignment of all subsystems. The instrument stops any measurement currently underway, performs the alignment, then restarts the measurement from the beginning (similar to pressing the Restart key).

If an interfering user signal is present at the RF Input, the alignment is performed on all subsystems except the RF. After completion, the Error Condition message “Align skipped: 50 MHz interference” or “Align skipped: 4.8 GHz interference” is generated. In addition the Error Condition message “Align Now, RF required” is generated, and bits 11 and 12 are set in the Status Questionable Calibration register.

The query form of the remote commands (:CALibration[:ALL]? or *CAL?) invokes the alignment of all subsystems and returns a success or failure value. An interfering user signal is not grounds for failure; if the alignment was able to succeed on all portions but unable to align the RF because of an interfering signal, the resultant will be the success value.

Successful completion of Align Now, All will clear the “Align Now, All required” Error Condition, and clear bit 14 in the Status Questionable Calibration register. It will also begin the elapsed time counter for Last Align Now, All Time, and capture the Last Align Now, All Temperature.

If the Align RF subsystem succeeded in aligning (no interfering signal present), the elapsed time counter begins for Last Align Now, RF Time, and the temperature is captured for the Last Align Now, RF Temperature. In addition the Error Conditions “Align skipped: 50 MHz interference” and “Align skipped: 4.8 GHz interference” are cleared, the Error Condition “Align Now, RF required” is cleared, and bits 11 and 12 are cleared in the Status Questionable Calibration register

Align Now, All can be interrupted by pressing the Cancel (ESC) front-panel key or remotely with Device Clear followed by the :ABORt SCPI command. When this occurs the Error Condition message “Align Now, All required” is generated, and bit 14 is set in the Status Questionable Condition register. This is because new alignment data may be employed for an individual subsystem, but not a cohesive set of data for all subsystems.

In many cases, you might find it more convenient to change alignments to Normal, instead of executing Align Now, All. When the Auto Align process transitions to Normal, the analyzer will immediately start to update only the alignments that have expired, thus efficiently restoring the alignment process.

In models with the RF Preselector, such as the N9038A, the Align Now All alignment will immediately execute an alignment of all subsystems in the Spectrum Analyzer and partial subsystems of the RF Preselector. The additional alignments are the System Gain, Mechanical attenuator and Electronic attenuator alignments on the RF Preselector path. The purpose of these alignments is to improve the RF Preselector path amplitude variation compared to the bypass path.

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	`:CALibration[:ALL]` `:CALibration[:ALL]?`
Example	:CAL
Notes	:CALibration[:ALL]? returns 0 if successful :CALibration[:ALL]? returns 1 if failed :CALibration[:ALL]? is the same as *CAL? While Align Now, All is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. Successful completion will clear bit 14 in the Status Questionable Calibration register. An interfering user signal is not grounds for failure of Align Now, All. However, bits 11 and 12 are set in the Status Questionable Calibration register to indicate Align Now, RF is required. An interfering user supplied signal will result in the instrument requiring an Align Now, RF with the interfering signal removed.
Couplings	Initializes the time for the Last Align Now, All Time. Records the temperature for the Last Align Now, All Temperature. If Align RF component succeeded, initializes the time for the Last Align Now, RF Time.

	If Align RF component succeeded, records the temperature for the Last Align Now, RF Temperature.
Status Bits/OPC dependencies	Bits 11, 12, or 14 may be set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

Mode	All
Remote Command	`*CAL?`
Example	*CAL?
Notes	*CAL? returns 0 if successful *CAL? returns 1 if failed :CALibration[:ALL]? is the same as *CAL? See additional remarks described with :CALibration[:ALL]? Everything about :CALibration[:ALL]? is synonymous with *CAL? including all conditions, status register bits, and couplings
Initial S/W Revision	Prior to A.02.00

Clear Status

Clears the status byte register. It does this by emptying the error queue and clearing all bits in all of the event registers. The status byte register summarizes the states of the other registers. It is also responsible for generating service requests.

Key Path	No equivalent key. Related key System, Show Errors, Clear Error Queue
Remote Command	`*CLS`
Example	*CLS Clears the error queue and the Status Byte Register.
Notes	For related commands, see the SYSTem:ERRor[:NEXT]? command. See also the STATus:PRESet command and all commands in the STATus subsystem.
Status Bits/OPC dependencies	Resets all bits in all event registers to 0, which resets all the status byte register bits to 0 also.
Backwards Compatibility Notes	In general the status bits used in the X-Series status system will be backwards compatible with ESA and PSA. However, note that all conditions will generate events that go into the event log, and some will also generate status bits.
Initial S/W Revision	Prior to A.02.00

Standard Event Status Enable

Selects the desired bits from the standard event status enable register. This register monitors I/O errors and synchronization conditions such as operation complete, request control, query error, device dependent error, status execution error, command error, and power on. The selected bits are OR'd to become a summary bit (bit 5) in the byte register which can be queried.

The query returns the state of the standard event status enable register.

Key Path	No equivalent key. Related key System, Show Errors, Clear Error Queue
Remote Command	`*ESE <integer>` `*ESE?`
Example	*ESE 36 Enables the Standard Event Status Register to monitor query and command errors (bits 2 and 5). *ESE? Returns a 36 indicating that the query and command status bits are enabled.
Notes	For related commands, see the STATus subsystem and SYSTem:ERRor[:NEXT]? commands.
Preset	255
State Saved	Not saved in state.
Min	0
Max	255
Status Bits/OPC dependencies	Event Enable Register of the Standard Event Status Register.
Initial S/W Revision	Prior to A.02.00

Standard Event Status Register Query

Queries and clears the standard event status event register. (This is a destructive read.) The value returned is a hexadecimal number that reflects the current state (0/1) of all the bits in the register.

Remote Command	`*ESR?`
Example	*ESR? Returns a 1 if there is either a query or command error, otherwise it returns a zero.
Notes	For related commands, see the STATus subsystem commands.
Preset	0
Min	0
Max	255
Status Bits/OPC dependencies	Standard Event Status Register (bits 0 – 7).
Initial S/W Revision	Prior to A.02.00

Identification Query

Returns a string of instrument identification information. The string will contain the model number, serial number, and firmware revision.

The response is organized into four fields separated by commas. The field definitions are as follows:

- Manufacturer
- Model
- Serial number
- Firmware version

Key Path	No equivalent key. See related key System, Show System.
Remote Command	`*IDN?`
Example	*IDN? Returns instrument identification information, such as: Keysight Technologies, N9020A, US01020004, A.01.02
Initial S/W Revision	Prior to A.02.00

Operation Complete

The *OPC command sets bit 0 in the standard event status register (SER) to “1” when pending operations have finished, that is when all overlapped commands are complete. It does not hold off subsequent operations. You can determine when the overlapped commands have completed either by polling the OPC bit in SER, or by setting up the status system such that a service request (SRQ) is asserted when the OPC bit is set.

The *OPC? query returns a “1” after all the current overlapped commands are complete. So it holds off subsequent commands until the "1” is returned, then the program continues. This query can be used to synchronize events of other instruments on the external bus.

Remote Command	`*OPC` `*OPC?`
Example	INIT:CONT 0 Selects single sweeping. INIT:IMM Initiates a sweep. *OPC? Holds off any further commands until the sweep is complete.
Status Bits/OPC dependencies	Not global to all remote ports or front panel. *OPC only considers operation that was initiated on the same port as the *OPC command was issued from. *OPC is an overlapped command, but *OPC? is sequential.
Backwards Compatibility Notes	1. The ESA/PSA/VSA products do not meet all the requirements for the *OPC command specified by IEEE 488.2. This is corrected for X-Series. This will sometimes cause behavior that is not backward compatible, but it will work as customers expect. 2. Commands such as, *OPC/*OPC?/*WAI/*RST used to be global. They considered front panel operation in conjunction with the GPIB functionality. Now they are evaluated on a per channel basis. That is, the various rear panel remote ports and the front panel i/o are all considered separately. Only the functionality initiated on the port where the *OPC was sent, is considered for its operation. 3. *OPC used to hold off until the operation bits were cleared. Now it holds off until all overlapping commands are completed. Also, earlier instruments did not wait for completion of all processes, only the ones identified here (in the STATus:OPERation register): Calibrating: monitored by PSA, ESA, VSA (E4406A)

	Sweeping: monitored by PSA, ESA, VSA (E4406A) Waiting for Trigger: monitored by PSA, ESA, VSA (E4406A) Measuring: monitored by PSA and ESA (but not in all Modes). Paused: monitored by VSA (E4406A). Printing: monitored by VSA (E4406A). Mass memory busy: monitored by VSA (E4406A).
Initial S/W Revision	Prior to A.02.00

Query Instrument Options

Returns a string of all the installed instrument options. It is a comma separated list with quotes, such as: “503,P03,PFR”.

To be IEEE compliant, this command should return an arbitrary ascii variable that would not begin and end with quotes. But the quotes are needed to be backward compatible with previous SA products and software. So, the actual implementation will use arbitrary ascii. But quotes will be sent as the first and last ascii characters that are sent with the comma-separated option list.

Remote Command	*OPT?
Initial S/W Revision	Prior to A.02.00

Recall Instrument State

This command recalls the instrument state from the specified instrument memory register.

- If the state being loaded has a newer firmware revision than the revision of the instrument, no state is recalled and an error is reported
- If the state being loaded has an equal firmware revision than the revision of the instrument, the state will be loaded.
- If the state being loaded has an older firmware revision than the revision of the instrument, the instrument will only load the parts of the state that apply to the older revision.

Remote Command	*RCL <register #>
Example	*RCL 7 Recalls the instrument state that is currently stored in register 7.
Notes	Registers 0 through 6 are accessible from the front panel in menu keys for Recall Registers.
Min	0
Max	127
Status Bits/OPC dependencies	The command is sequential.
Initial S/W Revision	Prior to A.02.00

*RST (Remote Command Only)

*RST is equivalent to :SYST:PRES;:INIT:CONT OFF, which is a Mode Preset in the Single measurement state. This remote command is preferred over Mode Preset remote command - :SYST:PRES, as optimal remote programming occurs with the instrument in the single measurement state.

Remote Command	`*RST`
Example	*RST
Notes	Sequential Clears all pending OPC bits and the Status Byte is set to 0.
Couplings	A *RST will cause the currently running measurement to be aborted and cause the default measurement to be active. *RST gets the mode to a consistent state with all of the default couplings set.
Backwards Compatibility Notes	In legacy analyzers *RST did not set the analyzer to Single, but in the X-Series it does, for compliance with the IEEE 488.2 specification. In the X-Series, *RST does not do a *CLS (clear the status bits and the error queue). In legacy analyzers, *RST used to do the equivalent of SYSTem:PRESet, *CLS and INITiate:CONTinuous OFF. But to be 488.2 compliant, *RST in the X-Series does not do a *CLS.
Initial S/W Revision	Prior to A.02.00

Save Instrument State

This command saves the current instrument state and mode to the specified instrument memory register.

Remote Command	`*SAV <register #>`
Example	*SAV 9 Saves the instrument state in register 9.
Notes	Registers 0 through 6 are accessible from the front panel in menu keys for Save Registers.
Min	0
Max	127
Status Bits/OPC dependencies	The command is sequential.
Initial S/W Revision	Prior to A.02.00

Service Request Enable

This command enables the desired bits of the service request enable register.

The query returns the value of the register, indicating which bits are currently enabled.

Remote Command	`*SRE <integer>` `*SRE?`

Example	*SRE 22 Enables bits 1, 2, and 4 in the service request enable register.
Notes	For related commands, see the STATus subsystem and SYSTem:ERRor[:NEXT]? commands.
Preset	0
Min	0
Max	255
Status Bits/OPC dependencies	Service Request Enable Register (all bits, 0 – 7).
Initial S/W Revision	Prior to A.02.00

Status Byte Query

Returns the value of the status byte register without erasing its contents.

Remote Command	`*STB?`
Example	*STB? Returns a decimal value for the bits in the status byte register. For example, if a 16 is returned, it indicates that bit 5 is set and one of the conditions monitored in the standard event status register is set.
Notes	See related command *CLS.
Status Bits/OPC dependencies	Status Byte Register (all bits, 0 – 7).
Initial S/W Revision	Prior to A.02.00

Trigger

This command triggers the instrument. Use the :TRIGger[:SEQuence]:SOURce command to select the trigger source.

Key Path	No equivalent key. See related keys Single and Restart.
Remote Command	`*TRG`
Example	*TRG Triggers the instrument to take a sweep or start a measurement, depending on the current instrument settings.
Notes	See related command :INITiate:IMMediate.
Initial S/W Revision	Prior to A.02.00

Self Test Query

This query performs the internal self-test routines and returns a number indicating the success of the testing. A zero is returned if the test is successful, 1 if it fails.

Remote Command	`*TST?`

Example	*TST? Runs the self-test routines and returns 0=passed, 1=some part failed.
Initial S/W Revision	Prior to A.02.00

Wait-to-Continue

This command causes the instrument to wait until all overlapped commands are completed before executing any additional commands. There is no query form for the command.

Remote Command	`*WAI`
Example	INIT:CONT OFF; INIT;*WAI Sets the instrument to single sweep. Starts a sweep and waits for its completion.
Status Bits/OPC dependencies	Not global to all remote ports or front panel. *OPC only considers operation that was initiated on the same port as the *OPC command was issued from.
Initial S/W Revision	Prior to A.02.00

Remote Measurement Functions

This section contains the following topics:

- "Measurement Group of Commands" on page 163
- "Other Common Measurement Commands" on page 166
- "Data Format Commands" on page 174

Initial S/W Revision	Prior to A.02.00

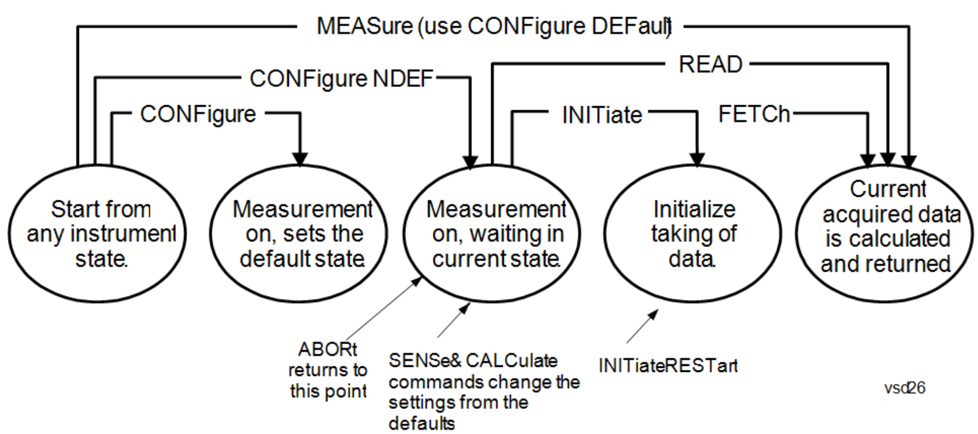
Measurement Group of Commands

The Measurement group of commands comprises the "MEASure Command" on page 163, which executes the entire measurement, plus the "CONFigure Commands" on page 164, "FETCh Command" on page 165, "INITiate Command" on page 165 and "READ Command" on page 166, which each accomplish only a part of the overall measurement. FETCh and READ are queries only.

You can optimize measurements by creating programs that call MEASure and CONFigure a minimum number of times, and that emphasize repeated READ, INITiate, and FETCh commands.

The diagram below illustrates the interactions between the Measurement family of commands: MEASure, CONFigure, FETCh, INITiate and READ.

NOTE Not all measurements support all the commands: MEASure, CONFigure, FETCh, INITiate and READ. For measurement-specific information, see the introductory description for each measurement in the User's and Programmer's References or online Help.



MEASure Command

:MEASure:<measurement>[n]?

This is a fast single-command way to make a measurement using the factory default instrument settings. These are the settings and units that conform to the Mode Setup settings (e.g. Radio Standard) that you have currently selected.

Sending this query:

- Stops the current measurement (if any) and sets up the instrument for the specified measurement using the factory defaults,
- Initiates the data acquisition for the measurement,
- Blocks other SCPI communication, waiting until the measurement is complete before returning results,
- Turns on averaging (if the function does averaging), and sets the number of averages to 10, 25, or 50, depending upon the current measurement,
- After the data is valid, returns the scalar results, or the trace data, for the specified measurement. The type of data returned may be defined by an [n] value that is sent with the command.

  If the optional [n] parameter is not included, or is set to 1, the scalar measurement results are returned. If the [n] parameter is set to a value other than 1, the selected trace data results are returned. For details of the types of scalar results or trace data results that are available, see the introductory description for each measurement in the User's and Programmer's References or online Help.

  ASCII is the default format for the data output. The binary data formats should be used for handling large blocks of data since they are more compact than the ASCII format. Refer to "Format Data: Numeric Data (Remote Command Only)" on page 174 for more information.

If you need to change some of the measurement parameters from the factory default settings, you can set up the measurement with the CONFigure command. Use the commands in the SENSe:<measurement> and CALCulate:<measurement> subsystems to change the settings. Then, use the READ? command to initiate the measurement and query the results.

If you need to repeatedly make a given measurement with settings other than the factory defaults, you can use the commands in the SENSe:<measurement> and CALCulate:<measurement> subsystems to set up the measurement. Then, use the READ? command to initiate the measurement and query results.

Measurement settings persist if you initiate a different measurement and then return to a previous one. If you want to use those persistent settings, use READ:<measurement>?. If you want to use the default settings, use MEASure:<measurement>?.

CONFigure Commands

:CONFigure:<measurement>

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using the factory default instrument settings. It does not initiate the taking of measurement data unless INITiate:CONTinuous is ON. If you change any measurement settings after using the CONFigure command, the READ command can be used to initiate a measurement without changing the settings back to their defaults.

In the Swept SA measurement in Spectrum Analyzer mode, the CONFigure command also turns the averaging function on and sets the number of averages to 10 for all measurements.

:CONFigure: <measurement>: NDEFault

Stops the current measurement and changes to the specified measurement. It does not change the settings to the defaults. It does not initiate the taking of measurement data unless INITiate:CONTinuous is ON.

CONFigure?

Returns the current measurement name.

CONFigure:CATalog?

Returns a quoted string of all licensed measurement names in the current mode. For example, "SAN, CHP, OBW, ACP, PST, TXP, SPUR, SEM, LIST".

FETCh Command

:FETCh:<measurement>[n]?

This command puts selected data from the most recent measurement into the output buffer. Use FETCh if you have already made a good measurement and you want to return several types of data (different [n] values, for example, both scalars and trace data) from a single measurement. FETCh saves you the time of re-making the measurement. You can only FETCh results from the measurement that is currently active, it will not change to a different measurement. An error message is reported if a measurement other than the current one is specified.

If you need to get new measurement data, use the READ command, which is equivalent to an INITiate followed by a FETCh.

The scalar measurement results will be returned if the optional [n] value is not included, or is set to 1. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used for handling large blocks of data since they are smaller and transfer faster than the ASCII format. (FORMat:DATA)

FETCh may be used to return results other than those specified with the original READ or MEASure command that you sent.

INITiate Command

:INITiate:<measurement>

This command is not available for measurements in all the instrument modes.

- Initiates a trigger cycle for the specified measurement, but does not output any data. You must then use the FETCh<meas> command to return data. If a measurement other than the current one is specified, the instrument will switch to that measurement and then initiate it.
- For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. If you send INIT:ACP? it will change from channel power to ACP and will initiate an ACP measurement.

- Does not change any of the measurement settings. For example, if you have previously started the ACP measurement and you send INIT:ACP? it will initiate a new ACP measurement using the same instrument settings as the last time ACP was run.
- If your selected measurement is currently active (in the idle state) it triggers the measurement, assuming the trigger conditions are met. Then it completes one trigger cycle. Depending upon the measurement and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle. It also holds off additional commands on GPIB until the acquisition is complete.

READ Command

:READ:<measurement>[n]?

- Does not preset the measurement to the factory default settings. For example, if you have previously initiated the ACP measurement and you send READ:ACP?, a new measurement is initiated using the same instrument settings.
- Initiates the measurement and puts valid data into the output buffer. If a measurement other than the current one is specified, the instrument switches to that measurement before it initiates the measurement and returns results.

  For example, suppose you have previously initiated the ACP measurement, but now you are running the Channel Power measurement. If you then send READ:ACPower?, the measurement changes from Channel Power back to ACP and, using the previous ACP settings, the measurement is initiated and results are returned.
- Blocks other SCPI communication, waiting until the measurement is complete before returning the results

  If the optional [n] value is not included, or is set to 1, the scalar measurement results are returned.

  If the [n] value is set to a value other than 1, the selected trace data results are returned. For details of what types of scalar results or trace data results are available, see the introductory description for each measurement in the User's and Programmer's References or online Help.

  The binary data formats should be used when handling large blocks of data since they are more compact than the ASCII format (for details, see "Format Data: Numeric Data (Remote Command Only)" on page 174).

Initial S/W Revision	Prior to A.02.00

Other Common Measurement Commands

This group includes commands that affect or apply to all modes and measurements. It comprises the following commands:

- "Current Measurement Query (Remote Command Only) " on page 167
- "Limit Test Current Results (Remote Command Only)" on page 167

- "Data Query (Remote Command Only)" on page 167
- "Calculate/Compress Trace Data Query (Remote Command Only)" on page 167
- "Calculate Peaks of Trace Data (Remote Command Only)" on page 172

Current Measurement Query (Remote Command Only)

This command returns the name of the measurement that is currently running.

Remote Command	`:CONFigure?`
Example	CONF?
Initial S/W Revision	Prior to A.02.00

Limit Test Current Results (Remote Command Only)

Queries the status of the current measurement limit testing.

- Returns a 0 if the measured results pass when compared with the current limits.
- Returns a 1 if the measured results fail any limit tests.

Remote Command	`:CALCulate:CLIMits:FAIL?`
Example	CALC:CLIM:FAIL? queries the current measurement to check whether it fails the defined limits. Returns 0 (pass) or 1 (fail).
Initial S/W Revision	Prior to A.02.00

Data Query (Remote Command Only)

Returns the designated measurement data for the currently selected measurement and subopcode.

- n = any valid subopcode for the current measurement. See the measurement command results table for your current measurement, for information about what data is returned for the subopcodes.

This command uses the data setting specified by the FORMat:BORDer (see "Format Data: Byte Order (Remote Command Only)" on page 175) and FORMat:DATA (see "Format Data: Numeric Data (Remote Command Only)" on page 174) commands, and can return real or ASCII data.

Remote Command	`:CALCulate:DATA[n]?`
Notes	The return trace depends on the selected measurement. n is any valid subopcode for the current measurement. This query returns the same data as FETCh:<meas>?, where <meas> is the current measurement.
Initial S/W Revision	Prior to A.02.00

Calculate/Compress Trace Data Query (Remote Command Only)

Returns compressed data for the currently selected measurement and sub-opcode [n].

- n = any valid sub-opcode for that measurement. See the MEASure:<measurement>? command description of your specific measurement for information on the data that can be returned.

The data is returned in the current Y Axis Unit of the instrument. The command is used with a sub-opcode <n> (default=1) to specify the trace. With trace queries, it is best if the instrument is not sweeping during the query. Therefore, it is generally advisable to be in Single Sweep, or Update=Off.

This command is used to compress or decimate a long trace to extract and return only the desired data. A typical example would be to acquire N frames of GSM data and return the mean power of the first burst in each frame. The command can also be used to identify the best curve fit for the data.

Remote Command	`:CALCulate:DATA<n>:COMPress? BLOCk | CFIT | MAXimum | MINimum | MEAN | DMEan | RMS | RMSCubed | SAMPle | SDEViation | PPHase [,<soffset>[,<length>[,<roffset>[,<rlimit>]]]]`
Example	To query the mean power of a set of GSM bursts: • Supply a signal that is a set of GSM bursts. • Select the IQ Waveform measurement (in IQ Analyzer Mode). • Set the sweep time to acquire at least one burst. • Set the triggers such that acquisition happens at a known position relative to a burst. • Then query the mean burst levels using, CALC:DATA2:COMP? MEAN, 24e-6, 526e-6 (These parameter values correspond to GSM signals, where 526e-6 is the length of the burst in the slot and you just want 1 burst.)
Notes	The command supports 5 parameters. Note that the last 4 (<soffset>,<length>,<roffset>,<rlimit>) are optional. But these optional parameters must be entered in the specified order. For example, if you want to specify <length>, then you must also specify <soffset>. See details below for a definition of each of these parameters. This command uses the data in the format specified by FORMat:DATA, returning either binary or ASCII data.
Initial S/W Revision	Prior to A.02.00

Option	Description
BLOCk	Block data Returns all the data points from the region of the trace data that you specify. For example, it could be used to return the data points of an input signal over several timeslots, excluding the portions of the trace data that you do not want. (The points are x,y pairs for trace data, or I,Q pairs for complex data.)
CFIT	Curve fit Applies curve fitting routines to the data. <soffset> and <length> are required to define the data that you want. <roffset> is an optional parameter for the desired order of the curve equation. The query returns the following values: the x-offset (in seconds) and the curve coefficients ((order + 1) values).
MINimum ("Note 1" on page 171)	Returns the minimum data point (y value) for the specified region(s) of trace data. For I/Q trace data, the minimum magnitude of the I/Q pairs is returned.
MAXimum	Returns the maximum data point (y value) for the specified region(s) of trace data. For I/Q trace data, the

Option	Description
("Note 1" on page 171)	maximum magnitude of the I/Q pairs is returned.
MEAN ("Note 1" on page 171)	Returns a single value that is the arithmetic mean of the data point values (in dB/ dBm) for the specified region(s) of trace data. For I/Q trace data, the mean of the magnitudes of the I/Q pairs is returned. See the following equations. **NOTE** If the original trace data is in dB, this function returns the arithmetic mean of those log values, not log of the mean power which is a more useful value. The mean of the log is the better measurement technique when measuring CW signals in the presence of noise. The mean of the power, expressed in dB, is useful in power measurements such as Channel Power. To achieve the mean of the power, use the RMS option. Equation 1: Mean Value of Data Points for Specified Region(s) $\mathrm{MEAN} = \frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} Xi$ where Xi is a data point value, and n is the number of data points in the specified region(s). Equation 2: Mean Value of I/Q Data Pairs for Specified Region(s) $\mathrm{MEAN} = \frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} \lvert Xi \rvert$ where |Xi| is the magnitude of an I/Q pair, and n is the number of I/Q pairs in the specified region(s).
DMEan ("Note 1" on page 171)	Returns a single value that is the mean power (in dB/ dBm) of the data point values for the specified region (s) of trace data. See the following equation: Equation 3: DMEan Value of Data Points for Specified Region(s) $\mathrm{DME} = 10 \times \log_{10}\left(\frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} 10^{\frac{Xi}{10}}\right)$
RMS ("Note 1" on page 171)	Returns a single value that is the average power on a root-mean-squared voltage scale (arithmetic rms) of the data point values for the specified region(s) of trace data. See the following equation. **NOTE** For I/Q trace data, the rms of the magnitudes of the I/Q pairs is returned. See the following equation. This function is very useful for I/Q trace data. However, if the original trace data is in dB, this function returns the rms of the log values which is not usually needed. Equation 4: RMS Value of Data Points for Specified Region(s)

Option	Description
	$$\mathrm{RMS} = \sqrt{\frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} Xi^2}$$ where Xi is a data point value, and n is the number of data points in the specified region(s). Equation 5: RMS Value of I/Q Data Pairs for Specified Region(s) $$\mathrm{RMS} = \sqrt{\frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} Xi\, Xi^*}$$ where Xi is the complex value representation of an I/Q pair, Xi* its conjugate complex number, and n is the number of I/Q pairs in the specified region(s). Once you have the rms value for a region of trace data (linear or I/Q), you may want to calculate the mean power. You must convert this rms value (peak volts) to power in dBm: $$10 \times \log[10 \times (\text{rms value})^2]$$
SAMPle ("Note 1" on page 171)	Returns the first data value (x,y pair) for the specified region(s) of trace data. For I/Q trace data, the first I/Q pair is returned.
SDEViation ("Note 1" on page 171)	Returns a single value that is the arithmetic standard deviation for the data point values for the specified region(s) of trace data. See the following equation. For I/Q trace data, the standard deviation of the magnitudes of the I/Q pairs is returned. See the following equation. Equation 6: Standard Deviation of Data Point Values for Specified Region(s) $$\mathrm{SDEV} = \sqrt{\frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} (Xi - \overline{X})^2}$$ where Xi is a data point value, X is the arithmetic mean of the data point values for the specified region(s), and n is the number of data points in the specified region(s). $$\mathrm{SDEV} = \sqrt{\frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} (\lvert Xi \rvert - \overline{X})^2}$$ where |Xi| is the magnitude of an I/Q pair, X is the mean of the magnitudes for the specified region(s), and n is the number of data points in the specified region(s).
PPHase ("Note 1" on page 171)	Returns the x,y pairs of both rms power (dBm) and arithmetic mean phase (radian) for every specified region and frequency offset (Hz). The number of pairs is defined by the specified number of regions. This parameter can be used for I/Q vector (n=0) in Waveform (time domain) measurement and all parameters are specified by data point in PPHase. The rms power of the specified region may be expressed as:

Option	Description
	Power = 10 x log [10 x (RMS I/Q value)] + 10. The RMS I/Q value (peak volts) is: $\sqrt{\frac{1}{n} \sum_{Xi \in \text{region}} Xi\, Xi^*}$ where Xi is the complex value representation of an I/Q pair, Xi* its conjugate complex number, and n is the number of I/Q pairs in the specified region. The arithmetic mean phase of the specified region may be expressed as: $\frac{1}{n} \sum_{Yi \in \text{region}} Yi$ where Yi is the unwrapped phase of I/Q pair with applying frequency correction and n is the number of I/Q pairs in the specified region. The frequency correction is made by the frequency offset calculated by the arithmetic mean of every specified region's frequency offset. Each frequency offset is calculated by the least square method against the unwrapped phase of I/Q pair.

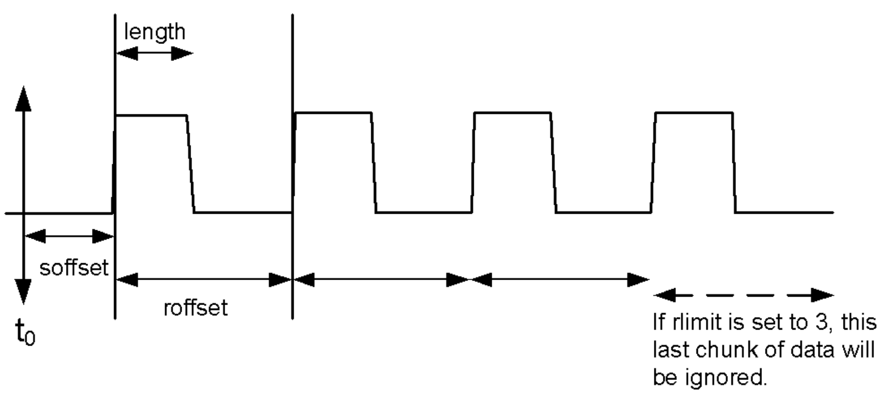
Note 1

MIN, MAX, MEAN, DME, RMS, RMSC, SAMP, SDEV and PPH return one data value for each specified region (or "Calculate/Compress Trace Data Query (Remote Command Only)" on page 167) of trace data, for as many regions as possible until you run out of trace data (using "Calculate/Compress Trace Data Query (Remote Command Only)" on page 167 to specify regions). Alternatively, they return the number of regions you specify (using "Calculate/Compress Trace Data Query (Remote Command Only)" on page 167), ignoring any data beyond that.

Sample Trace Data

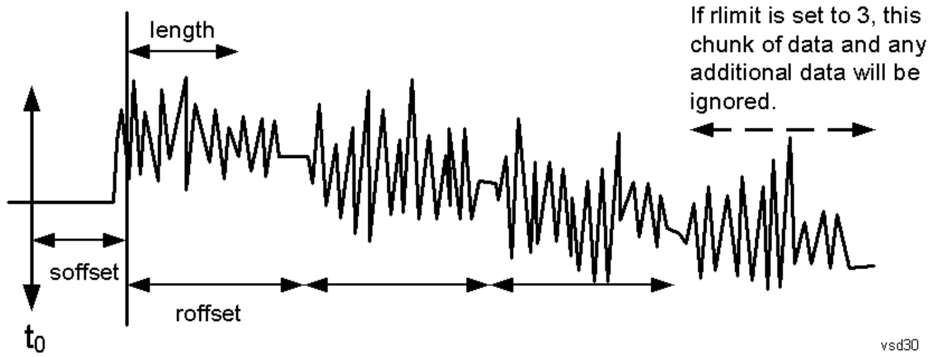
Constant Envelope

See table below for explanation of variables.



Non-Constant Envelope

See table below for explanation of variables.



Variable	Description
<soffset>	Start Offset is an optional real number. Its unit is seconds for time-domain traces, or a dimensionless index (0 to Npoints – 1) for frequency-domain traces. It specifies the amount of data at the beginning of the trace that will be ignored before the decimation process starts. It is the time or frequency change from the start of the trace to the point where you want to start using the data. The default value is zero.
<length>	An optional real number. Its unit is seconds for time-domain traces, or a dimensionless index (0 to Npoints – 1) for frequency-domain traces. It defines how much data will be compressed into one value. This parameter has a default value equal to the current trace length.
<roffset>	Repeat Offset is an optional real number. Its unit is seconds for time-domain traces, or a dimensionless index (0 to Npoints – 1) for frequency-domain traces. It defines the beginning of the next field of trace elements to be compressed. This is relative to the beginning of the previous field. This parameter has a default value equal to the <length> variable. Note that this parameter is used for a completely different purpose when curve fitting (see "CFIT" on page 168 above).
<rlimit>	Repeat Limit is an optional integer. It specifies the number of data items that you want returned, and ignores any additional items beyond that number. You can use the Start Offset and the Repeat Limit to pick out exactly which part of the data you want to use. The default value is all the data.

Calculate Peaks of Trace Data (Remote Command Only)

Returns a list of all the peaks for the currently selected measurement and subopcode [n]. The peaks must meet the requirements of the peak threshold and excursion values.

- n = any valid subopcode for the current measurement. See the MEASure:<measurement> command description of your specific measurement for information on the data that can be returned.

The command can only be used with specific subopcodes, and with measurement results that are trace data. Both real and complex traces can be searched, but complex traces are converted to magnitude in dBm. In many measurements, specifying subopcode n=0 retrieves the raw trace data, which cannot be searched for peaks. Specifying subopcode n=1 typically retrieves calculated results values, which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDer (see "Format Data: Byte Order (Remote Command Only)" on page 175) and FORMat:DATA (see "Format Data: Numeric Data (Remote Command Only)" on page 174) commands and can return real or ASCII data. If the format is set to INT,32, it returns REAL,32 data.

The command has four types of parameters:

- Threshold (in dBm)
- Excursion (in dB)
- Sorting order (amplitude, frequency, time)
- Optional in some measurements: Display line use (all, > display line, < display line)

Remote Command	For Swept SA measurement:
	`:CALCulate:DATA[1]|2|...6:PEAKs? <threshold>,<excursion>[,AMPLitude | FREQuency | TIME[,ALL | GTDLine | LTDLine]]`
	For most other measurements:
	`:CALCulate:DATA[1]|2|...6:PEAKs? <threshold>,<excursion>[,AMPLitude | FREQuency | TIME]`

Example	Example for Swept SA measurement in Spectrum Analyzer Mode: CALC:DATA4:PEAK? –40, 10, FREQ, GTDL This identifies the peaks of trace 4 that are above –40 dBm, with excursions of at least 10 dB. The peaks are returned in order of increasing frequency, starting with the lowest frequency. Only the peaks that are above the display line are returned. Query Results 1: With FORMat:DATA REAL, 32 selected, returns a list of floating-point numbers. The first value in the list is the number of peak points that are in the following list. A peak point consists of two values: a peak amplitude followed by its corresponding frequency (or time). If no peaks are found, then the peak list consists of only the number of peaks, (0).
Notes	• <n> - is the trace that will be used • <threshold> - is the level below which trace data peaks are ignored. Note that the threshold value is required and is always used as a peak criterion. To effectively disable the threshold criterion for this command, provide a substantially low threshold value such as –200 dBm. Also note that the threshold value used in this command is independent of and has no effect on the threshold value stored under the Peak Criteria menu. • <excursion> - is the minimum amplitude variation (rise and fall) required for a signal to be identified as peak. Note that the excursion value is required and is always used as a peak criterion. To effectively disable the excursion criterion for this command, provide the minimum value of 0.0 dB. Also note that the excursion value used in this command is independent of and has no effect on the excursion value stored under the Peak Criteria menu.

	Values must be provided for threshold and excursion, but the sorting and display line parameters are optional (defaults are AMPLitude and ALL).
	Note that there is always a Y-axis value for the display line, regardless of whether the display line state is on or off. It is the current Y-axis value of the display line, which is used by this command to determine whether a peak should be reported.
	• Sorting order:
	  • AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)
	  • FREQuency - lists the peaks in order of occurrence, left to right across the x-axis.
	  • TIME - lists the peaks in order of occurrence, left to right across the x-axis.
	• Peaks vs. Display Line:
	  • ALL - lists all of the peaks found (default if optional parameter not sent).
	  • GTDLine (greater than display line) - lists all of the peaks found above the display line.
	  • LTDLine (less than display line) - lists all of the peaks found below the display line.

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Data Format Commands

This group includes commands that control the formatting of data transfers between the instrument and the controller. It comprises the following commands:

- "Format Data: Numeric Data (Remote Command Only)" on page 174
- "Format Data: Byte Order (Remote Command Only)" on page 175

Format Data: Numeric Data (Remote Command Only)

This command specifies the format of the trace data input and output. It specifies the formats used for trace data during data transfer across any remote port. It affects only the data format for setting and querying trace data for the :TRACe[:DATA], TRACe[:DATA]?, :CALCulate:DATA[n]? and FETCh:SANalyzer[n]? commands and queries.

Remote Command	`:FORMat[:TRACe][:DATA] ASCii|INTeger,32|REAL,32 |REAL,64` `:FORMat[:TRACe][:DATA]?`
Notes	The query response is: ASCii: ASC,8 REAL,32: REAL,32 REAL,64: REAL,64 INTeger,32: INT,32 When the numeric data format is REAL or ASCii, data is output in the current Y Axis unit. When the data format is INTeger, data is output in units of m dBm (.001 dBm).

	The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.
Dependencies	Sending a data format spec with an invalid number (for example, INT,48) generates no error. The analyzer simply uses the default (8 for ASCii, 32 for INTeger, 32 for REAL). Sending data to the analyzer which does not conform to the current FORMat specified, results in an error. Sending ASCII data when a definite block is expected generates message –161 "Invalid Block Data" and sending a definite block when ASCII data is expected generates message –121 "Invalid Character in Number".
Preset	ASCii
Backwards Compatibility Notes	Note that the INT,32 format is only applicable to the command, TRACe:DATA. This preserves backwards compatibility for the Swept SA measurement. For all other commands/queries which honor FORMat:DATA, if INT,32 is sent the analyzer will behave as though it were set to REAL,32.
Initial S/W Revision	Prior to A.02.00

The specs for each output type follow:

- ASCii - Amplitude values are in ASCII, in the current Y Axis Unit, one ASCII character per digit, values separated by commas, each value in the form:

  SX.YYYYYEsZZ

  Where:

- S = sign (+ or -)
- X = one digit to left of decimal point
- Y = 5 digits to right of decimal point
- E = E, exponent header
- s = sign of exponent (+ or -)
- ZZ = two digit exponent
- REAL,32 - Binary 32-bit real values in the current Y Axis Unit, in a definite length block.
- REAL,64 - Binary 64-bit real values in the current Y Axis Unit, in a definite length block.

Format Data: Byte Order (Remote Command Only)

This command selects the binary data byte order for data transfer and other queries. It controls whether binary data is transferred in normal or swapped mode. This command affects only the byte order for setting and querying trace data for the :TRACe[:DATA], TRACe[:DATA]? , :CALCulate:DATA[n]? and FETCh:SANalyzer[n]? commands and queries.

By definition, any command that is dependent on FORMat:DATA uses **any** format supported by FORMat:DATA.

- NORMal order begins with the most significant byte (MSB) first, and ends with the least significant byte (LSB) last, in the sequence: 1|2|3|4.
- SWAPped order begins with the LSB first, and ends with the MSB last, in the sequence: 4|3|2|1.

Remote Command	`:FORMat:BORDer NORMal|SWAPped` `:FORMat:BORDer?`
Preset	NORMal
Initial S/W Revision	Prior to A.02.00

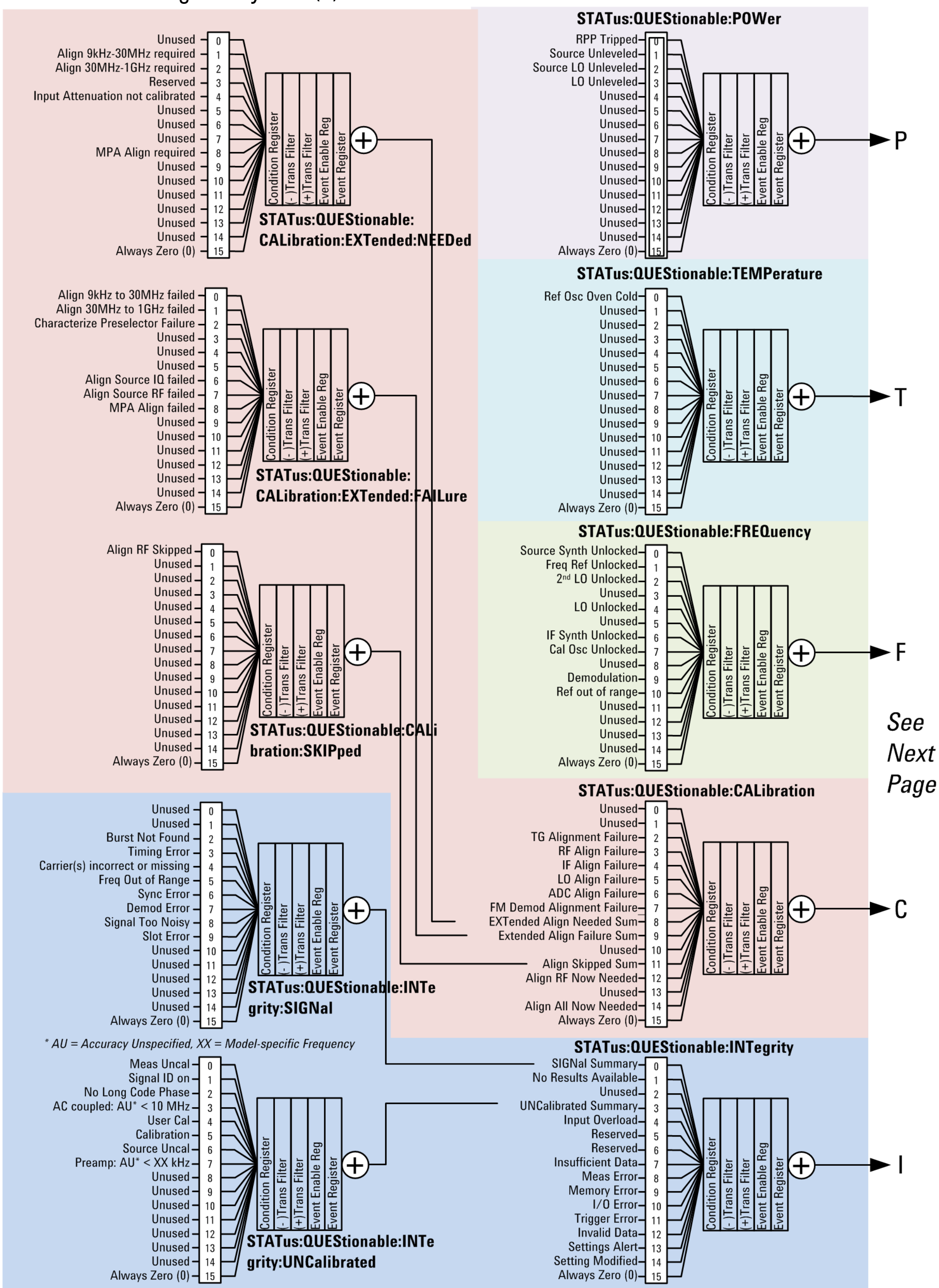
STATus Subsystem

The following diagram provides a graphical overview of the entire X-Series Status Register System.

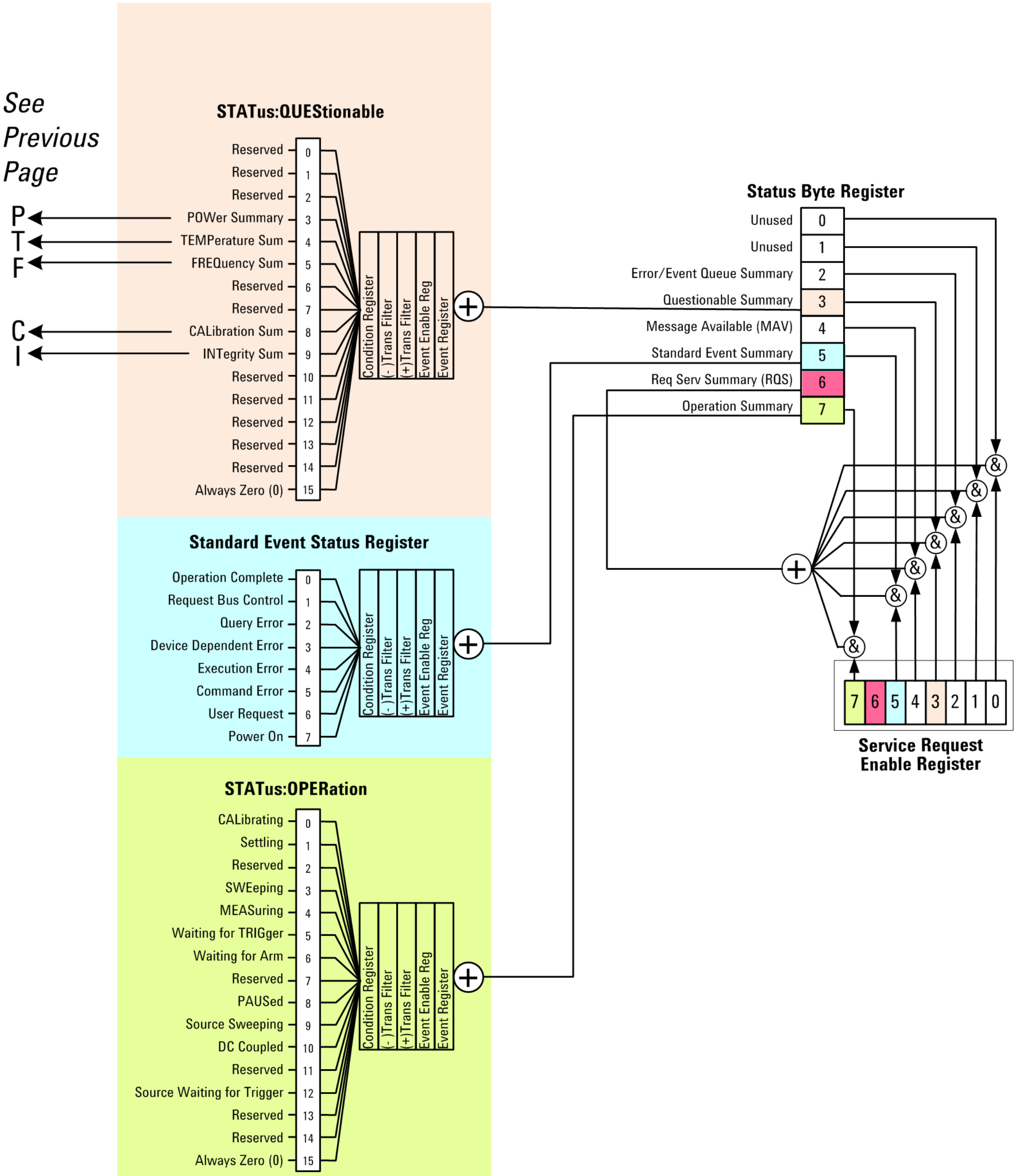
For readability, the diagram is split into two sections:

- "X-Series Status Register System (1) " on page 178
- "X-Series Status Register System (2) " on page 179

X-Series Status Register System (1)



X-Series Status Register System (2)



Detailed Description

The STATus subsystem remote commands set and query the status hardware registers. This system of registers monitors various events and conditions in the instrument. Software written to control the instrument may need to monitor some of these events and conditions.

NOTE All status register commands are sequential. Most commands can be started immediately and will overlap with any existing commands that are already running. This is not true of status commands. All the commands in the spectrum analyzer are assumed to be overlapped unless a command description specifically says that it is sequential.

What Are Status Registers

The status system contains multiple registers that are arranged in a hierarchical order. The lower-level status registers propagate their data to the higher-level registers in the data structures by means of summary bits. The status byte register is at the top of the hierarchy and contains general status information for the instrument's events and conditions. All other individual registers are used to determine the specific events or conditions. For a diagram of the registers and their interconnections, see above.

The operation and questionable status registers are sets of registers that monitor the overall instrument condition. They are accessed with the STATus:OPERation and STATus:QUEStionable commands in the STATus command subsystem. Each register set is made up of five registers:

- **Condition Register** Reports the real-time state of the signals monitored by this register set. There is no latching or buffering for a condition register.
- **Positive Transition Register** This filter register controls which signals will set a bit in the event register when the signal makes a low to high transition (when the condition bit changes from 0 to 1).
- **Negative Transition Register** This filter register controls which signals will set a bit in the event register when the signal makes a high to low transition (when the condition bit changes from 1 to 0).
- **Event Register** Latches any signal state changes, in the way specified by the filter registers. Bits in the event register are never cleared by signal state changes. Event registers are cleared when read. They are also cleared by *CLS and by presetting the instrument.
- **Event Enable Register** Controls which of the bits, being set in the event register, will be summarized as a single output for the register set. Summary bits are then used by the next higher register.

The STATus:QUEStionable registers report abnormal operating conditions. The status register hierarchy is:

1. The summary outputs from the six STATus:QUEStionable:<keyword> detail registers are inputs to the STATus:QUEStionable register.
2. The summary output from the STATus:QUEStionable register is an input to the Status Byte Register. See the overall system diagram in "STATus Subsystem " on page 177.

The STATus:OPERation register set has no summarized inputs. The inputs to the STATus:OPERation:CONDition register indicates the real time state of the instrument. The STATus:OPERation:EVENt register summary output is an input to the Status Byte Register.

What Are Status Register SCPI Commands

Most monitoring of the instrument conditions is done at the highest level using the IEEE common commands indicated below. Complete command descriptions can be found in the section "IEEE 488.2 Common Commands" on page 154. Individual status registers can be set and queried using the commands described in "STATus Subsystem Command Descriptions" on page 191.

- *CLS (clear status) clears the status byte by emptying the error queue and clearing all the event registers.

- *ESE, *ESE? (event status enable) sets and queries the bits in the enable register part of the standard event status register.
- *ESR? (event status register) queries and clears the event register part of the standard event status register.
- *OPC, *OPC? (operation complete) sets the standard event status register to monitor the completion of all commands. The query stops any new commands from being processed until the current processing is complete, then returns a '1'.
- *PSC, *PSC? (power-on state clear) sets the power-on state so that it clears the service request enable register and the event status enable register at power on.
- *SRE, *SRE? (service request enable) sets and queries the value of the service request enable register.
- *STB? (status byte) queries the value of the status byte register without erasing its contents.

How to Use the Status Registers

A program often needs to be able to detect and manage error conditions or changes in instrument status. There are two methods you can use to programmatically access the information in status registers:

- The polling method
- The service request (SRQ) method

In the polling method, the instrument has a passive role. It only tells the controller that conditions have changed when the controller asks the right question. In the SRQ method, the instrument takes a more active role. It tells the controller when there has been a condition change without the controller asking. Either method allows you to monitor one or more conditions.

The polling method works well if you do not need to know about changes the moment they occur. The SRQ method should be used if you must know immediately when a condition changes. To detect a change using the polling method, the program must repeatedly read the registers.

Use the SRQ method when:

- you need time-critical notification of changes
- you are monitoring more than one device which supports SRQs
- you need to have the controller do something else while waiting
- you can't afford the performance penalty inherent to polling

Use polling when:

- your programming language/development environment does not support SRQ interrupts
- you want to write a simple, single-purpose program and don't want the added complexity of setting up an SRQ handler

To monitor a condition:

a. Determine which register contains the bit that reports the condition.

b. Send the unique SCPI query that reads that register.

c. Examine the bit to see if the condition has changed.

You can monitor conditions in different ways.

- Check the current instrument hardware and firmware status.

  Do this by querying the condition registers which continuously monitor status. These registers represent the current state of the instrument. Bits in a condition register are updated in real time. When the condition monitored by a particular bit becomes true, the bit is set to 1. When the condition becomes false, the bit is reset to 0.

- Monitor a particular condition (bit).

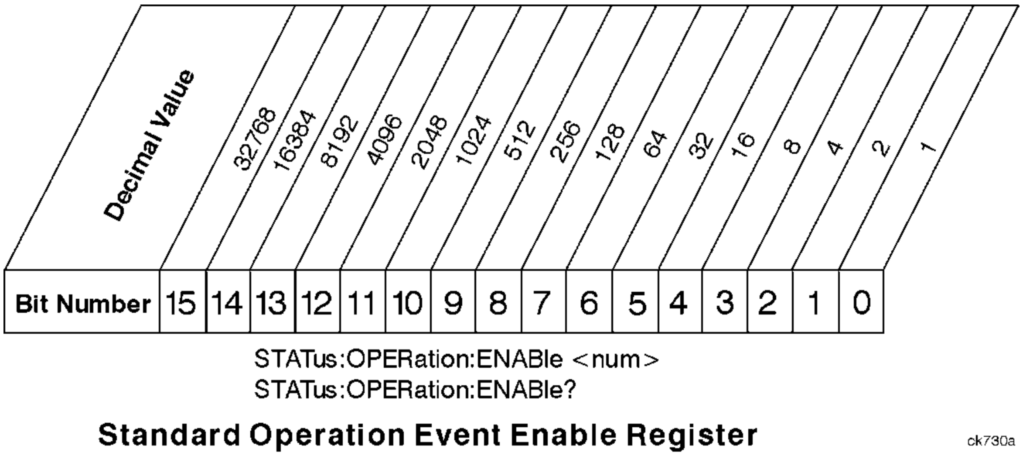
  You can enable a particular bit(s), using the event enable register. The instrument will then monitor that particular condition(s). If the bit becomes true (0 to 1 transition) in the event register, it will stay set until the event register is cleared. Querying the event register allows you to detect that this condition occurred even if the condition no longer exists. The event register can only be cleared by querying it or sending the *CLS command.

- Monitor a particular type of change in a condition (bit).
  - The transition registers are preset to register if the condition goes from 0 to 1 (false to true, or a positive transition),
  - This can be changed so the selected condition is detected if the bit goes from 1 to 0 (true to false, or a negative transition),
  - It can also be set for both types of transitions occurring,
  - Or it can be set for neither transition. If both transition registers are set to 0 for a particular bit position, that bit will not be set in the event register for either type of change.

Using a Status Register

Each bit in a register is represented by a numerical value based on its location. See figure below. This number is sent with the command to enable a particular bit. If you want to enable more than one bit, you would send the sum of all the bits that you want to monitor.

Figure: Status Register Bit Values



Bit 15 is not used to report status.

Example 1:

1. To enable bit 0 and bit 6 of standard event status register, you would send the command *ESE 65 because 1 + 64 = 65.
2. The results of a query are evaluated in a similar way. If the *STB? command returns a decimal value of 140, (140 = 128 + 8 + 4) then bit 7 is true, bit 3 is true and bit 2 is true.

Example 2:

1. Suppose you want to know if an Auto-trigger Timeout occurs, but you only cared about that specific condition. So you would want to know what was happening with bit 10 in the Status Questionable Integrity register, and not about any other bits.
2. It's usually a good idea to start by clearing all the status registers with *CLS.
3. Sending the STAT:QUES:INT:ENAB 1024 command lets you monitor only bit 10 events, instead of the default monitoring all the bits in the register. The register default is for positive transition events (0 to 1 transition). That is, when an auto-trigger timeout occurs. If instead, you wanted to know when the Auto-trigger timeout condition is cleared, then you would set STAT:QUES:INT:PTR 0 and STAT:QUES:INT:NTR 32767.
4. So now the only output from the Status Questionable Integrity register will come from a bit 10 positive transition. That output goes to the Integrity Sum bit 9 of the Status Questionable register.
5. You can do a similar thing with this register to only look at bit 9, using STAT:QUES:ENAB 512.
6. The Status Questionable register output goes to the "Status Questionable Summary" bit 3 of the Status Byte Register. The output from this register can be enabled using the *SRE 8 command.
7. Finally, you would use the serial polling functionality available for the particular bus/software that you are using to monitor the Status Byte Register. (You could also use *STB? to poll the Status Byte Register.)

Using the Service Request (SRQ) Method

Your language, bus, and programming environment must be able to support SRQ interrupts; for example, BASIC used with VXI–11.3 (GPIB over LAN).

When you monitor a condition with the SRQ method, you must:

1. Determine which bit monitors the condition.
2. Determine how that bit reports to the request service (RQS) bit of the status byte.
3. Send SCPI commands to enable the bit that monitors the condition and to enable the summary bits that report the condition to the RQS bit.
4. Enable the controller to respond to service requests.

When the condition changes, the instrument sets its RQS bit. The controller is informed of the change as soon as it occurs. As a result, the time the controller would otherwise have used to monitor the condition can be used to perform other tasks. Your program determines how the controller responds to the SRQ.

Generating a Service Request

To use the SRQ method, you must understand how service requests are generated. Bit 6 of the status byte register is the request service (RQS) bit. The *SRE command is used to configure the RQS bit to report changes in instrument status. When such a change occurs, the RQS bit is set. It is cleared when the status byte register is queried using *SRE? (with a serial poll.) It can be queried without erasing the contents with *STB?.

When a register set causes a summary bit in the status byte to change from 0 to 1, the instrument can initiate the service request (SRQ) process. However, the process is only initiated if both of the following conditions are true:

- The corresponding bit of the service request enable register is also set to 1.
- The instrument does not have a service request pending. (A service request is considered to be pending between the time the instrument’s SRQ process is initiated and the time the controller reads the status byte register.)

The SRQ process sets the SRQ true. It also sets the status byte’s request service (RQS) bit to 1. Both actions are necessary to inform the controller that the instrument requires service. Setting the SRQ line only informs the controller that some device on the bus requires service. Setting the RQS bit allows the controller to determine which instrument requires service.

If your program enables the controller to detect and respond to service requests, it should instruct the controller to perform a serial poll when the SRQ is set true. Each device on the bus returns the contents of its status byte register in response to this poll. The device who's RQS bit is set to 1 is the device that requested service.

When you read the instrument’s status byte register with a serial poll, the RQS bit is reset to 0. Other bits in the register are not affected.

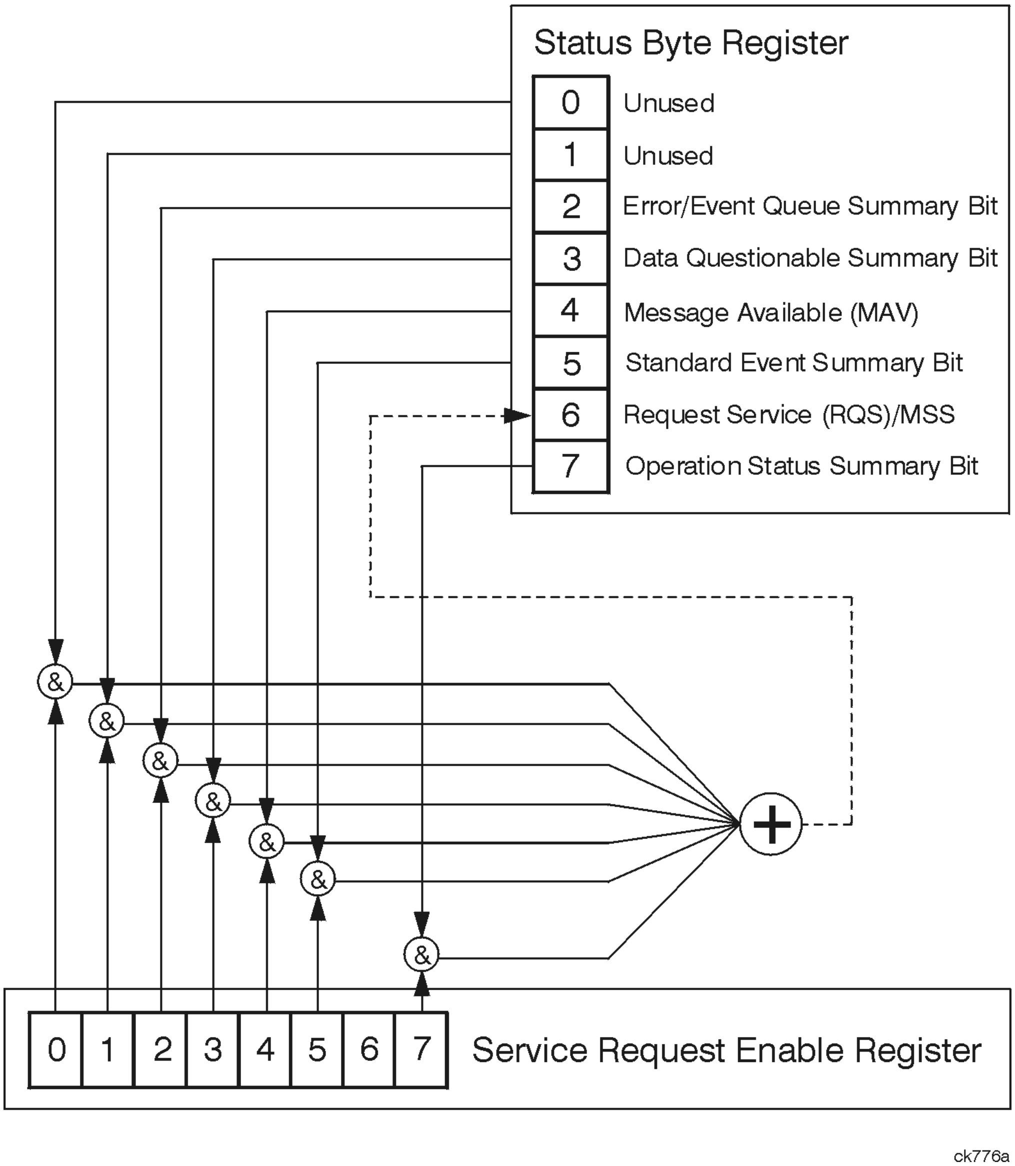
If the status register is configured to SRQ on end-of-measurement and the measurement is in continuous mode, then restarting a measurement (INITiate command) can cause the measuring bit to pulse low. This causes an SRQ when you have not actually reached the "end-of-measurement" condition. To avoid this:

1. Set INITiate:CONTinuous off.
2. Set/enable the status registers.
3. Restart the measurement (send INITiate).

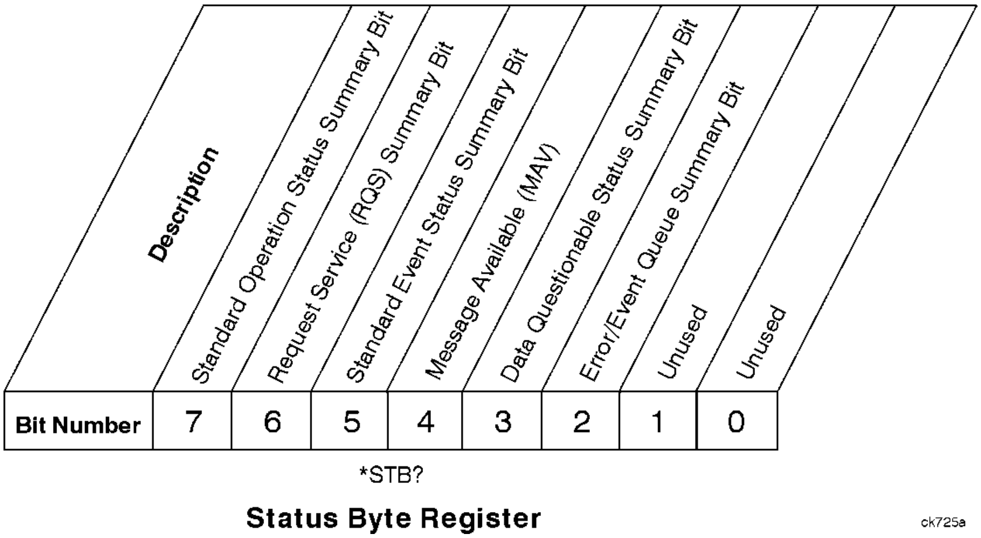
Status Register System

The hardware status registers are combined to form the instrument status system. Specific status bits are assigned to monitor various aspects of the instrument operation and status. See the diagram of the status system above for information about the bit assignments and status register interconnections.

The Status Byte Register



The RQS bit is read and reset by a serial poll. The same bit position (MSS) is read, non-destructively by the *STB? command. If you serial poll bit 6 it is read as RQS, but if you send *STB it reads bit 6 as MSS. For more information refer to Section 11 of IEEE Standard 488.2–1992.



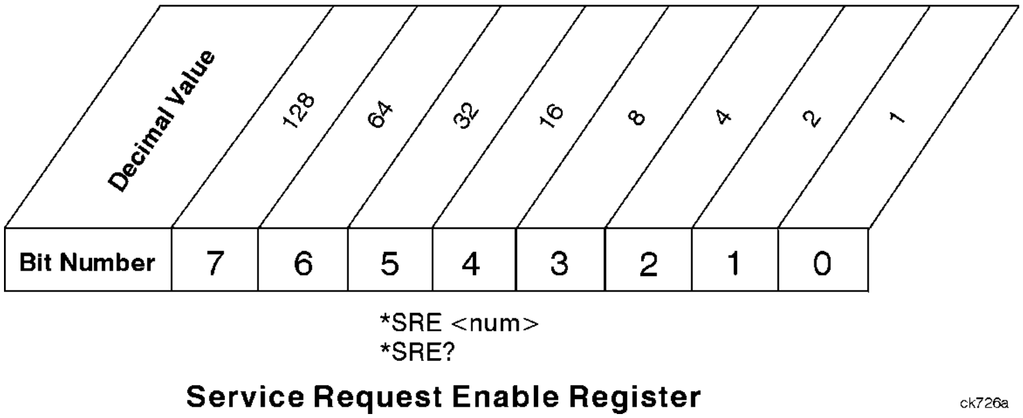
Bit	Description
0, 1	These bits are always set to 0.
2	A 1 in this bit position indicates that the SCPI error queue is not empty which means that it contains at least one error message.
3	A 1 in this bit position indicates that the data questionable summary bit has been set. The data questionable event register can then be read to determine the specific condition that caused this bit to be set.
4	A 1 in this bit position indicates that the instrument has data ready in the output queue. There are no lower status groups that provide input to this bit.
5	A 1 in this bit position indicates that the standard event summary bit has been set. The standard event status register can then be read to determine the specific event that caused this bit to be set.
6	A 1 in this bit position indicates that the instrument has at least one reason to report a status change. This bit is also called the master summary status bit (MSS).
7	A 1 in this bit position indicates that the standard operation summary bit has been set. The standard operation event register can then be read to determine the specific condition that caused this bit to be set.

To query the Status Byte register, send the command *STB? The response will be the decimal sum of the bits which are set to 1. For example, if bit number 7 and bit number 3 are set to 1, the decimal sum of the 2 bits is 128 plus 8, so the decimal value 136 is returned. The *STB command does not clear the status register.

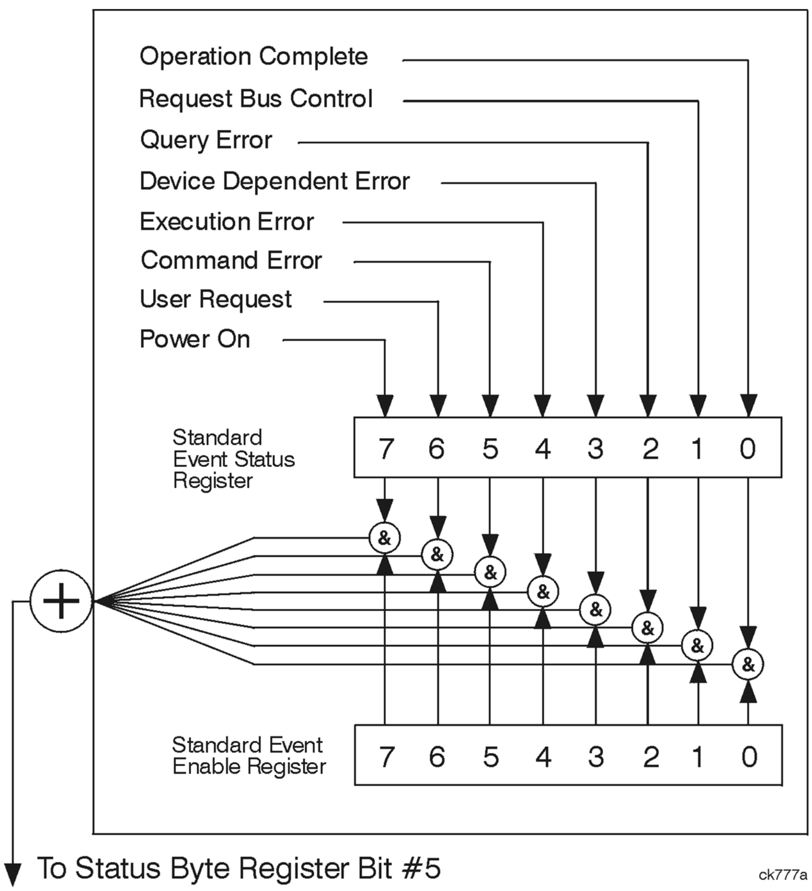
In addition to the Status Byte register, the status byte group also contains the Service Request Enable register. This register lets you choose which bits in the Status Byte register will trigger a service request.

Send the *SRE <integer> command where <integer> is the sum of the decimal values of the bits you want to enable plus the decimal value of bit 6. For example, assume that you want to enable bit 7 so that whenever the standard operation status register summary bit is set to 1 it will trigger a service request. Send the command *SRE 192 (because 192 = 128 + 64). You must always add 64 (the numeric value of RQS bit 6) to your numeric sum when you enable any bits for a service request. The query *SRE? returns the decimal value of the sum of the bits previously enabled with the *SRE <integer> command.

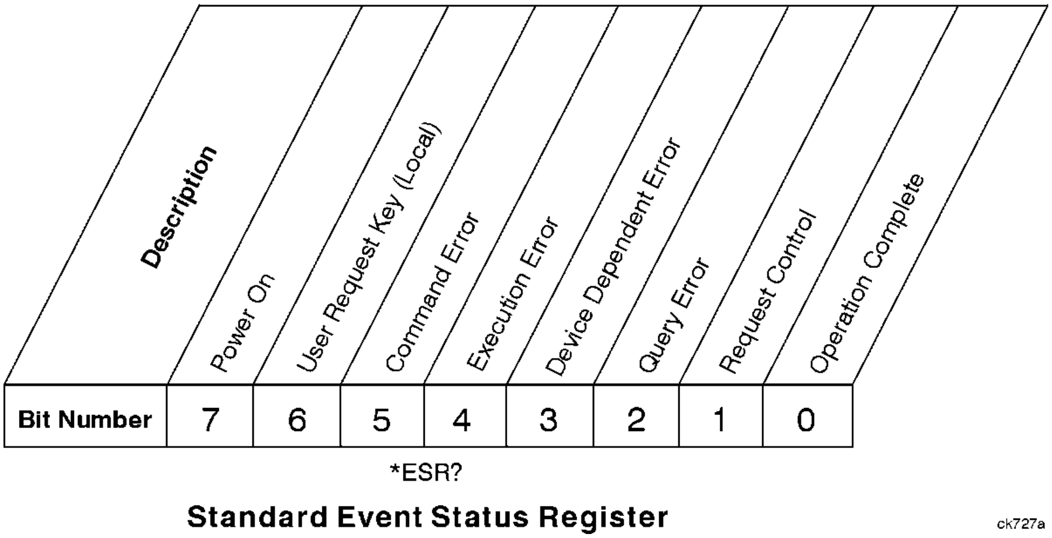
The service request enable register presets to zeros (0).



Standard Event Status Register



The Standard Event Status register contains the following bits:

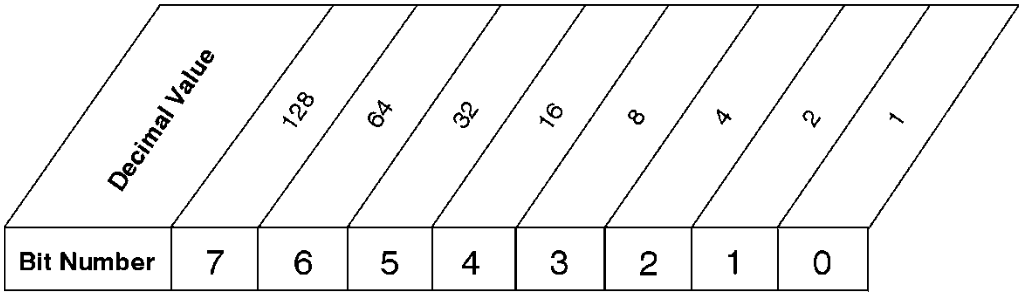


Bit	Description
0	A 1 in this bit position indicates that all pending operations were completed following execution of the *OPC command.
1	This bit is for GPIB handshaking to request control. Currently it is set to 0 because there are no implementations where the spectrum analyzer controls another instrument.
2	A 1 in this bit position indicates that a query error has occurred. Query errors have SCPI error numbers from –499 to –400.
3	A 1 in this bit position indicates that a device dependent error has occurred. Device dependent errors have SCPI error numbers from –399 to –300 and 1 to 32767.
4	A 1 in this bit position indicates that an execution error has occurred. Execution errors have SCPI error numbers from –299 to –200.
5	A 1 in this bit position indicates that a command error has occurred. Command errors have SCPI error numbers from –199 to –100.
6	A 1 in this bit position indicates that the Local key has been pressed. This is true even if the instrument is in local lockout mode.
7	A 1 in this bit position indicates that the instrument has been turned off and then on.

The Standard Event Status register is used to determine the specific event that set bit 5 in the Status Byte register. To query the Standard Event Status register, send *ESR?. The response will be the decimal sum of the bits that are enabled (set to 1). For example, if bit number 7 and bit number 3 are enabled, the decimal sum of the 2 bits is 128 plus 8, so the decimal value 136 is returned.

In addition to the Standard Event Status register, the standard event status group also contains a Standard Event Status Enable register. This register lets you choose which bits in the Standard Event Status register will set the summary bit (bit 5 of the status byte register) to 1. Send the *ESE <integer> command where <integer> is the sum of the decimal values of the bits you want to enable. For example, to enable bit 7 and bit 6 so that whenever either of those bits is set to 1, the standard event status summary bit of the status byte register will be set to 1, send the command *ESE 192 (128 + 64). The query *ESE? returns the decimal value of the sum of the bits previously enabled with the *ESE <integer> command.

The Standard Event Status Enable register presets to zeros (0).



*ESE <num>
*ESE?

Standard Event Status Enable Register

ck728a

Operation and Questionable Status Registers

The Operation and Questionable Status registers monitor the overall instrument condition. They are accessed with the STATus:OPERation and STATus:QUEStionable commands in the STATus command subsystem. See the diagram in "STATus Subsystem " on page 177.

Operation Status Register

The Operation Status register monitors the current instrument measurement state. It checks to see if the instrument is calibrating, sweeping, or waiting for a trigger. For more information see *OPC? located in the section "IEEE 488.2 Common Commands" on page 154.

Bit	Condition	Operation
0	Calibrating	The instrument is busy executing its Align Now process
3	Sweeping	The instrument is busy taking a sweep.
4	Measuring	The instrument is busy making a measurement. Measurements often require multiple sweeps. They are initiated by keys under the **Meas** key or with the MEASure group of commands. The bit is valid for most X-Series Modes.
5	Waiting for trigger	The instrument is waiting for the trigger conditions to be met, then it will trigger a sweep or measurement.

Questionable Status Register

The Questionable Status register monitors the instrument’s condition to see if anything questionable has happened to it. It is looking for anything that might cause an error or a bad measurement like a hardware problem, an out of calibration situation, or a unusual signal. All the bits are summary bits from lower-level event registers.

Bit	Condition	Operation
3	Power summary	The instrument hardware has detected a power unleveled condition.
4	Temperature summary	The instrument is still warming up.
5	Frequency summary	The instrument hardware has detected an unlocked condition or a problem with the external frequency reference.
8	Calibration summary	The instrument has detected a hardware problem while doing the automatic internal alignment process.
9	Integrity summary	The instrument has detected a questionable measurement condition such as: bad timing, bad signal/data, timeout problem, signal overload, or “meas uncal”.

STATus Subsystem Command Descriptions

The STATus subsystem controls the SCPI-defined instrument status reporting structures. Each status register has a set of five commands used for querying or masking that particular register.

Numeric values for bit patterns can be entered using decimal or hexadecimal representations, that is, decimal values 0 to 32767, which are equivalent to hexadecimal values #H0 to #H7FFF.)

Operation Register

The following commands and queries are available for this register:

- "Operation Condition Query" on page 191
- "Operation Enable" on page 192
- "Operation Event Query" on page 192
- "Operation Negative Transition" on page 193
- "Operation Positive Transition" on page 193

Operation Condition Query

This query returns the decimal value of the sum of the bits in the Status Operation Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:OPERation:CONDition?`
Example	STAT:OPER:COND?

Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Operation Enable

This command determines which bits in the Operation Event register, will set the Operation Status Summary bit (bit 7) in the Status Byte Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

NOTE The preset condition is to have all bits in this enable register set to 0. To have any Operation Events reported to the Status Byte Register, one or more bits need to be set to 1.

Mode	All
Remote Command	`:STATus:OPERation:ENABle <integer>` `:STATus:OPERation:ENABle?`
Example	STAT:OPER:ENAB 1 Sets the register so that Align Now operation will be reported to the Status Byte Register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Operation Event Query

This query returns the decimal value of the sum of the bits in the Operation Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:OPERation[:EVENt]?`
Example	STAT:OPER?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Operation Negative Transition

This command determines which bits in the Operation Condition register will set the corresponding bit in the Operation Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:OPERation:NTRansition <integer>` `:STATus:OPERation:NTRansition?`
Example	STAT:OPER:NTR 1 Align Now operation complete will be reported to the Status Byte Register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Operation Positive Transition

This command determines which bits in the Operation Condition register will set the corresponding bit in the Operation Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:OPERation:PTRansition <integer>` `:STATus:OPERation:PTRansition?`
Example	STAT:OPER:PTR 1 Align Now operation beginning will be reported to the Status Byte Register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Preset the Status Byte

Sets bits in most of the enable and transition registers to their default state.

Presets all the Transition Filters, Enable Registers, and the Error/Event Queue Enable.

Has no effect on Event Registers, Error/Event Queue, IEEE 488.2 ESE, and SRE Registers as described in IEEE Standard 488.2–1992.

Remote Command	`:STATus:PRESet`
Example	STAT:PRES
Initial S/W Revision	Prior to A.02.00

Questionable Register

The following commands and queries are available for this register:

- "Questionable Condition " on page 194
- "Questionable Enable " on page 194
- "Questionable Event Query " on page 195
- "Questionable Negative Transition " on page 195
- "Questionable Positive Transition" on page 196

Questionable Condition

This query returns the decimal value of the sum of the bits in the Questionable Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:CONDition?`
Example	STAT:QUES:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Enable

This command determines which bits in the Questionable Event register will set the Questionable Status Summary bit (bit3) in the Status Byte Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

NOTE The preset condition is all bits in this enable register set to 0. To have any Questionable Events reported to the Status Byte Register, one or more bits need to be set to 1. The Status Byte Event Register should be queried after each measurement to check the Questionable Status Summary (bit 3). If it is equal to 1, a condition during the test may have made the test results invalid. If it is equal to 0, this indicates that no hardware problem or measurement problem was detected by the analyzer.

Mode	All
Remote Command	`:STATus:QUEStionable:ENABle 16` `:STATus:QUEStionable:ENABle?`
Example	STAT:OPER:PTR 1 Align Now operation beginning will be reported to the Status Byte Register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Event Query

This query returns the decimal value of the sum of the bits in the Questionable Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable[:EVENt]?`
Example	STAT:QUES?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Negative Transition

This command determines which bits in the Questionable Condition register will set the corresponding bit in the Questionable Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:NTRansition 16` `:STATus:QUEStionable:NTRansition?`
Example	STAT:QUES:NTR 16 Temperature summary ‘questionable cleared’ will be reported to the Status Byte Register.
Preset	0
Min	0

Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Positive Transition

This command determines which bits in the Questionable Condition register will set the corresponding bit in the Questionable Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:PTRansition <integer>` `:STATus:QUEStionable:PTRansition?`
Example	STAT:QUES:PTR 16 Temperature summary 'questionable asserted' will be reported to the Status Byte Register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Register

The following commands and queries are available for this register:

- "Questionable Calibration Condition" on page 196
- "Questionable Calibration Enable" on page 197
- "Questionable Calibration Event Query" on page 197
- "Questionable Calibration Negative Transition" on page 198
- "Questionable Calibration Positive Transition" on page 198

Questionable Calibration Condition

This query returns the decimal value of the sum of the bits in the Questionable Calibration Condition register.

NOTE	The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:CONDition?`
Example	STAT:QUES:CAL:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Enable

This command determines which bits in the Questionable Calibration Condition Register will set bits in the Questionable Calibration Event register, which also sets the Calibration Summary bit (bit 8) in the Questionable Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:ENABle <integer>` `:STATus:QUEStionable:CALibration:ENABle?`
Example	STAT:QUES:CAL:ENAB 16384 Can be used to query if an alignment is needed, if you have turned off the automatic alignment process.
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Event Query

This query returns the decimal value of the sum of the bits in the Questionable Calibration Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration[:EVENt]?`
Example	STAT:QUES:CAL?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Negative Transition

This command determines which bits in the Questionable Calibration Condition register will set the corresponding bit in the Questionable Calibration Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:NTRansition <integer>` `:STATus:QUEStionable:CALibration:NTRansition?`
Example	STAT:QUES:CAL:NTR 16384 Alignment is not required.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Positive Transition

This command determines which bits in the Questionable Calibration Condition register will set the corresponding bit in the Questionable Calibration Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:PTRansition <integer>` `:STATus:QUEStionable:CALibration:PTRansition?`
Example	STAT:QUES:CAL:PTR 16384 Alignment is required.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Skipped Register

The following commands and queries are available for this register:

- "Questionable Calibration Skipped Condition" on page 199
- "Questionable Calibration Skipped Enable" on page 199

- "Questionable Calibration Skipped Event Query" on page 199
- "Questionable Calibration Skipped Negative Transition" on page 200
- "Questionable Calibration Skipped Positive Transition" on page 200

Questionable Calibration Skipped Condition

This query returns the decimal value of the sum of the bits in the Questionable Calibration Skipped Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:SKIPped:CONDition?`
Example	STAT:QUES:CAL:SKIP:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Skipped Enable

This command determines which bits in the Questionable Calibration Skipped Condition Register will set bits in the Questionable Calibration Skipped Event register, which also sets bit 11 of the Questionable Calibration Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:SKIPped:ENABle <integer>` `:STATus:QUEStionable:CALibration:SKIPped:ENABle?`
Example	STAT:QUES:CAL:SKIP:ENAB 1 Can be used to query if an EMI alignment skipped condition is detected
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Skipped Event Query

This query returns the decimal value of the sum of the bits in the Questionable Calibration Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:SKIPped[:EVENt]?`
Example	STAT:QUES:CAL:SKIP?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Skipped Negative Transition

This command determines which bits in the Questionable Calibration Skipped Condition register will set the corresponding bit in the Questionable Calibration Skipped Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:SKIPped:NTRansition <integer>` `:STATus:QUEStionable:CALibration:SKIPped:NTRansition?`
Example	STAT:QUES:CAL:SKIP:NTR 1 Align RF skipped is not required.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Skipped Positive Transition

This command determines which bits in the Questionable Calibration Skipped Condition register will set the corresponding bit in the Questionable Calibration Skipped Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:SKIPped:PTRansition <integer>` `:STATus:QUEStionable:CALibration:SKIPped:PTRansition?`
Example	STAT:QUES:CAL:SKIP:PTR 1 Align RF skipped is required.

Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Failure Register

The following commands and queries are available for this register:

- "Questionable Calibration Extended Failure Condition" on page 201
- "Questionable Calibration Extended Failure Enable" on page 201
- "Questionable Calibration Extended Failure Event Query" on page 202
- "Questionable Calibration Extended Failure Negative Transition" on page 202
- "Questionable Calibration Extended Failure Positive Transition" on page 203

Questionable Calibration Extended Failure Condition

This query returns the decimal value of the sum of the bits in the Questionable Calibration Extended Failure Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:FAILure:CONDition?`
Example	STAT:QUES:CAL:EXT:FAIL:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Failure Enable

This command determines which bits in the Questionable Calibration Extended Failure Condition Register will set bits in the Questionable Calibration Extended Failure Event register, which also sets bit 9 of the Questionable Calibration Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:FAILure:ENABle <integer>` `:STATus:QUEStionable:CALibration:EXTended:FAILure:ENABle?`

Example	STAT:QUES:CAL:EXT:FAIL:ENAB 1 Can be used to query if an EMI conducted alignment is needed.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Failure Event Query

This query returns the decimal value of the sum of the bits in the Questionable Calibration Extended Failure Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:FAILure[:EVENt]?`
Example	STAT:QUES:CAL:EXT:FAIL?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Failure Negative Transition

This command determines which bits in the Questionable Calibration Extended Failure Condition register will set the corresponding bit in the Questionable Calibration Extended Failure Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:FAILure:NTRansition <integer>` `:STATus:QUEStionable:CALibration:EXTended:FAILure:NTRansition?`
Example	STAT:QUES:CAL:EXT:FAIL:NTR 1 EMI conducted align failure is not required.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command

Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Failure Positive Transition

This command determines which bits in the Questionable Calibration Extended Failure Condition register will set the corresponding bit in the Questionable Calibration Extended Failure Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:FAILure:PTRansition <integer>` `:STATus:QUEStionable:CALibration:EXTended:FAILure:PTRansition?`
Example	STAT:QUES:CAL:EXT:FAIL:PTR 1 EMI conducted align failure is required.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Needed Register

The following commands and queries are available for this register:

- "Questionable Calibration Extended Needed Condition" on page 203
- "Questionable Calibration Extended Needed Enable" on page 204
- "Questionable Calibration Extended Needed Event Query" on page 204
- "Questionable Calibration Extended Needed Negative Transition" on page 205
- "Questionable Calibration Extended Needed Positive Transition" on page 205

Questionable Calibration Extended Needed Condition

This query returns the decimal value of the sum of the bits in the Questionable Calibration Extended Needed Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:NEEDed:CONDition?`
Example	STAT:QUES:CAL:EXT:NEED:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Needed Enable

This command determines which bits in the Questionable Calibration Extended Needed Condition Register will set bits in the Questionable Calibration Extended Needed Event register, which also sets bit 14 of the Questionable Calibration Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:NEEDed:ENABle <integer>` `:STATus:QUEStionable:CALibration:EXTended:NEEDed:ENABle?`
Example	STAT:QUES:CAL:EXT:NEED:ENAB 2 Can be used to query if an EMI conducted alignment is needed.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Needed Event Query

This query returns the decimal value of the sum of the bits in the Questionable Calibration Extended Needed Event register.

NOTE	The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:NEEDed[:EVENt]?`
Example	STAT:QUES:CAL:EXT:NEED?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Needed Negative Transition

This command determines which bits in the Questionable Calibration Extended Needed Condition register will set the corresponding bit in the Questionable Calibration Extended Needed Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:NEEDed:NTRansition <integer>` `:STATus:QUEStionable:CALibration:EXTended:NEEDed:NTRansition?`
Example	STAT:QUES:CAL:EXT:NEED:NTR 2 Align EMI conducted is not required.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Needed Positive Transition

This command determines which bits in the Questionable Calibration Extended Needed Condition register will set the corresponding bit in the Questionable Calibration Extended Needed Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:NEEDed:PTRansition <integer>` `:STATus:QUEStionable:CALibration:EXTended:NEEDed:PTRansition?`
Example	STAT:QUES:CAL:EXT:NEED:PTR 2 Align EMI conducted is required.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Frequency Register

The following commands and queries are available for this register:

- "Questionable Frequency Condition" on page 206
- "Questionable Frequency Enable" on page 206
- "Questionable Frequency Event Query" on page 207
- "Questionable Frequency Negative Transition" on page 207
- "Questionable Frequency Positive Transition" on page 207

Questionable Frequency Condition

This query returns the decimal value of the sum of the bits in the Questionable Frequency Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:FREQuency:CONDition?`
Example	STAT:QUES:FREQ:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Frequency Enable

This command determines which bits in the Questionable Frequency Condition Register will set bits in the Questionable Frequency Event register, which also sets the Frequency Summary bit (bit 5) in the Questionable Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:FREQuency:ENABle <integer>` `:STATus:QUEStionable:FREQuency:ENABle?`
Example	STAT:QUES:FREQ:ENAB 2 Frequency Reference Unlocked will be reported to the Frequency Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Frequency Event Query

This query returns the decimal value of the sum of the bits in the Questionable Frequency Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:FREQuency[:EVENt]?`
Example	STAT:QUES:FREQ?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Frequency Negative Transition

This command determines which bits in the Questionable Frequency Condition register will set the corresponding bit in the Questionable Frequency Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:FREQuency:NTRansition <integer>` `:STATus:QUEStionable:FREQuency:NTRansition?`
Example	STAT:QUES:FREQ:NTR 2 Frequency Reference ‘regained lock’ will be reported to the Frequency Summary of the Status Questionable register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Frequency Positive Transition

This command determines which bits in the Questionable Frequency Condition register will set the corresponding bit in the Questionable Frequency Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:FREQuency:PTRansition <integer>` `:STATus:QUEStionable:FREQuency:PTRansition?`
Example	STAT:QUES:FREQ:PTR 2 Frequency Reference 'became unlocked' will be reported to the Frequency Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Register

The following commands and queries are available for this register:

- "Questionable Integrity Condition" on page 208
- "Questionable Integrity Enable" on page 209
- "Questionable Integrity Event Query" on page 209
- "Questionable Integrity Negative Transition" on page 209
- "Questionable Integrity Positive Transition" on page 210

Questionable Integrity Condition

This query returns the decimal value of the sum of the bits in the Questionable Integrity Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:CONDition?`
Example	STAT:QUES:INT:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Enable

This command determines which bits in the Questionable Integrity Condition Register will set bits in the Questionable Integrity Event register, which also sets the Integrity Summary bit (bit 9) in the Questionable Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:ENABle <integer>` `:STATus:QUEStionable:INTegrity:ENABle?`
Example	STAT:QUES:INT:ENAB 8 Measurement Uncalibrated Summary will be reported to the Integrity Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Event Query

This query returns the decimal value of the sum of the bits in the Questionable Integrity Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity[:EVENt]?`
Example	STAT:QUES:INT?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Negative Transition

This command determines which bits in the Questionable Integrity Condition register will set the corresponding bit in the Questionable Integrity Event register when the condition register bit has a negative transition (1 to 0)
The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:NTRansition <integer>` `:STATus:QUEStionable:INTegrity:NTRansition?`
Example	STAT:QUES:INT:NTR 8 Measurement 'regained calibration' Summary will be reported to the Integrity Summary of the Status Questionable register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Positive Transition

This command determines which bits in the Questionable Integrity Condition register will set the corresponding bit in the Questionable Integrity Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:PTRansition <integer>` `:STATus:QUEStionable:INTegrity:PTRansition?`
Example	STAT:QUES:INT:PTR 8 Measurement 'became uncalibrated' Summary will be reported to the Integrity Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Signal Register

The following commands and queries are available for this register:

- "Questionable Integrity Signal Condition" on page 211
- "Questionable Integrity Signal Enable" on page 211
- "Questionable Integrity Signal Event Query" on page 212
- "Questionable Integrity Signal Negative Transition" on page 212
- "Questionable Integrity Signal Positive Transition" on page 212

Questionable Integrity Signal Condition

This query returns the decimal value of the sum of the bits in the Questionable Integrity Signal Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:SIGNal:CONDition?`
Example	STAT:QUES:INT:SIGN:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Signal Enable

This command determines which bits in the Questionable Integrity Signal Condition Register will set bits in the Questionable Integrity Signal Event register, which also sets the Integrity Summary bit (bit 9) in the Questionable Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:SIGNal:ENABle <integer>` `:STATus:QUEStionable:INTegrity:SIGNal:ENABle?`
Example	STAT:QUES:INT:SIGN:ENAB 4 Burst Not Found will be reported to the Integrity Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Signal Event Query

This query returns the decimal value of the sum of the bits in the Questionable Integrity Signal Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:SIGNal[:EVENt]?`
Example	STAT:QUES:INT:SIGN?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Signal Negative Transition

This command determines which bits in the Questionable Integrity Signal Condition register will set the corresponding bit in the Questionable Integrity Signal Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:SIGNal:NTRansition <integer>` `:STATus:QUEStionable:INTegrity:SIGNal:NTRansition?`
Example	STAT:QUES:INT:SIGN:NTR 4 Burst found will be reported to the Integrity Summary of the Status Questionable register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Signal Positive Transition

This command determines which bits in the Questionable Integrity Signal Condition register will set the corresponding bit in the Questionable Integrity Signal Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:SIGNal:PTRansition <integer>`

	:STATus:QUEStionable:INTegrity:SIGNal:PTRansition?
Example	STAT:QUES:INT:SIGN:PTR 4 Burst not found will be reported to the Integrity Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Uncalibrated Register

The following commands and queries are available for this register:

- "Questionable Integrity Uncalibrated Condition" on page 213
- "Questionable Integrity Uncalibrated Enable" on page 213
- "Questionable Integrity Uncalibrated Event Query" on page 214
- "Questionable Integrity Uncalibrated Negative Transition" on page 214
- "Questionable Integrity Uncalibrated Positive Transition" on page 215

Questionable Integrity Uncalibrated Condition

This query returns the decimal value of the sum of the bits in the Questionable Integrity Uncalibrated Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	:STATus:QUEStionable:INTegrity:UNCalibrated:CONDition?
Example	STAT:QUES:INT:UNC:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Uncalibrated Enable

This command determines which bits in the Questionable Integrity Uncalibrated Condition Register will set bits in the Questionable Integrity Uncalibrated Event register, which also sets the Data Uncalibrated Summary bit (bit 3) in the Questionable Integrity Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:UNCalibrated:ENABle` `:STATus:QUEStionable:INTegrity:UNCalibrated:ENABle?`
Example	STAT:QUES:INT:UNC:ENAB 1 Oversweep (Meas Uncal) will be reported to the Integrity Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Uncalibrated Event Query

This query returns the decimal value of the sum of the bits in the Questionable Integrity Uncalibrated Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:UNCalibrated[:EVENt]?`
Example	STAT:QUES:INT:UNC?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Uncalibrated Negative Transition

This command determines which bits in the Questionable Integrity Uncalibrated Condition register will set the corresponding bit in the Questionable Integrity Uncalibrated Event register when the condition register bit has a negative transition (1 to 0). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition <integer>` `:STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition?`
Example	STAT:QUES:INT:UNC:NTR 1

	Oversweep cleared will be reported to the Integrity Summary of the Status Questionable register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Integrity Uncalibrated Positive Transition

This command determines which bits in the Questionable Integrity Uncalibrated Condition register will set the corresponding bit in the Questionable Integrity Uncalibrated Event register when the condition register bit has a positive transition (0 to 1). The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition <integer>` `:STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition?`
Example	STAT:QUES:INT:UNC:PTR 1 Oversweep (Meas Uncal) occurred will be reported to the Integrity Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Power Register

The following commands and queries are available for this register:

- "Questionable Power Condition" on page 216
- "Questionable Power Enable" on page 216
- "Questionable Power Event Query" on page 216

- "Questionable Power Negative Transition" on page 217
- "Questionable Power Positive Transition" on page 217

Questionable Power Condition

This query returns the decimal value of the sum of the bits in the Questionable Power Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:POWer:CONDition?`
Example	STAT:QUES:POW:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Power Enable

This command determines which bits in the Questionable Power Condition Register will set bits in the Questionable Power Event register, which also sets the Power Summary bit (bit 3) in the Questionable Register.

The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:POWer:ENABle <integer>` `:STATus:QUEStionable:POWer:ENABle?`
Example	STAT:QUES:POW:ENAB 32 50 MHz Input Pwr too High for Cal will be reported to the Power Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Power Event Query

This query returns the decimal value of the sum of the bits in the Questionable Power Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared.

Mode	All
Remote Command	`:STATus:QUEStionable:POWer[:EVENt]?`
Example	STAT:QUES:POW?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Power Negative Transition

This command determines which bits in the Questionable Power Condition register will set the corresponding bit in the Questionable Power Event register when the condition register bit has a negative transition (1 to 0).

The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:POWer:NTRansition <integer>` `:STATus:QUEStionable:POWer:NTRansition?`
Example	STAT:QUES:POW:NTR 32 50 MHz Input Power became OK for Cal will be reported to the Power Summary of the Status Questionable register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Power Positive Transition

This command determines which bits in the Questionable Power Condition register will set the corresponding bit in the Questionable Power Event register when the condition register bit has a positive transition (0 to 1).

The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All

Remote Command	`:STATus:QUEStionable:POWer:PTRansition <integer>` `:STATus:QUEStionable:POWer:PTRansition?>`
Example	STAT:QUES:POW:PTR 32 50 MHz Input Power became too high for Cal will be reported to the Power Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Temperature Register

The following commands and queries are available for this register:

- "Questionable Temperature Condition" on page 218
- "Questionable Temperature Enable" on page 219
- "Questionable Temperature Event Query" on page 219
- "Questionable Temperature Negative Transition" on page 219
- "Questionable Temperature Positive Transition" on page 220

Questionable Temperature Condition

This query returns the decimal value of the sum of the bits in the Questionable Temperature Condition register.

NOTE The data in this register is continuously updated and reflects the current conditions.

Mode	All
Remote Command	`:STATus:QUEStionable:TEMPerature:CONDition?`
Example	STAT:QUES:TEMP:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Temperature Enable

This command determines which bits in the Questionable Temperature Condition Register will set bits in the Questionable Temperature Event register, which also sets the Temperature Summary bit (bit 4) in the Questionable Register.

The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:TEMPerature:ENABle <integer>` `:STATus:QUEStionable:TEMPerature:ENABle?`
Example	STAT:QUES:TEMP:ENAB 1 Reference Oscillator Oven Cold will be reported to the Temperature Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Temperature Event Query

This query returns the decimal value of the sum of the bits in the Questionable Temperature Event register.

NOTE The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register. The data in this register is latched until it is queried. Once queried, the register is cleared

Mode	All
Remote Command	`:STATus:QUEStionable:TEMPerature[:EVENt]?`
Example	STAT:QUES:TEMP?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Temperature Negative Transition

This command determines which bits in the Questionable Temperature Condition register will set the corresponding bit in the Questionable Temperature Event register when the condition register bit has a negative transition (1 to 0).

The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:TEMPerature:NTRansition <integer>` `:STATus:QUEStionable:TEMPerature:NTRansition?`
Example	STAT:QUES:TEMP:NTR 1 Reference Oscillator Oven not cold will be reported to the Temperature Summary of the Status Questionable register.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Temperature Positive Transition

This command determines which bits in the Questionable Temperature Condition register will set the corresponding bit in the Questionable Temperature Event register when the condition register bit has a positive transition (0 to 1).

The variable <integer> is the sum of the decimal values of the bits that you want to enable.

Mode	All
Remote Command	`:STATus:QUEStionable:TEMPerature:PTRansition <integer>` `:STATus:QUEStionable:TEMPerature:PTRansition?`
Example	STAT:QUES:TEMP:PTR 1 Reference Oscillator Oven became cold will be reported to the Temperature Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

5 List of Legacy Analyzer Commands

The following table ("Alphanumeric List of all Legacy Commands with N9061A Support" on page 223) lists all legacy analyzer programming commands (that is, commands for 8566A/B, 8568A/B, and the 8560 Series), and indicates which are supported by N9061A.

For more detailed information about each supported command, click on the link in the "More Information" column of the table to go to the relevant section in the "Legacy Command Descriptions" on page 251

(SCPI commands supported by N9061A are **not** listed here; see instead "List of Supported SCPI Commands" on page 133.)

Key to Table Columns "8566", "8568", and "8560 Series"

The entries in these columns have the following significance:

Entry	Significance
N/A	This command is not available in this legacy instrument.
No	This command is available in this legacy instrument, but is not supported by N9061A. This situation may occur due to architectural differences between legacy and X-Series instruments, which make support of the command either unnecessary or technically unfeasible.
Yes	This command is available in this legacy instrument, and is supported by N9061A.
Ext	This is an "extension" command. It is supported by N9061A when emulating this legacy instrument, but does not appear in the native command set of the legacy instrument.

Alphanumeric List of all Legacy Commands with N9061A Support

Command	Description	8566	8568	8560 Series	More Information
A1	Clear-writes trace A	Yes	Yes	Yes	"A1 [one] (Clear Write for Trace A)" on page 255
A2	Max Holds trace A	Yes	Yes	Yes	"A2 [two] (Maximum Hold for Trace A)" on page 256
A3	View trace A	Yes	Yes	Yes	"A3 [three] (View Mode for Trace A)" on page 257
A4	Blanks trace A	Yes	Yes	Yes	"A4 [four] (Blank Trace A)" on page 258
ABORT	Interrupt operation of all user-defined functions	N/A	N/A	No	
ABS	Absolute	No	No	No	
ACP	Performs the adjacent channel power measurement	N/A	N/A	N/A	
ACPACCL	Accelerate adjacent channel power measurement	N/A	N/A	No	Not required in N9061A, because ACP measurement is faster than in legacy analyzers
ACPALPHA	Adjacent channel power alpha weighting	N/A	N/A	Yes	"ACPALPHA (Adjacent Channel Power Alpha Weighting)" on page 259
ACPALTCH	Adjacent channel power alternate channels	N/A	N/A	Yes	"ACPALTCH (Adjacent Channel Power Alternate Channels)" on page 260
ACPBRPER	Adjacent channel power burst period	N/A	N/A	Yes	"ACPBRPER (Adjacent Channel Power Burst Period)" on page 261
ACPBRWID	Adjacent channel power burst width	N/A	N/A	Yes	"ACPBRWID (Adjacent Channel Power Burst Width)" on page 262
ACPBW	Specifies channel bandwidth for ACP measurement	N/A	N/A	Yes	"ACPBW (Adjacent Channel Power Bandwidth)" on page 263
ACPCOMPUTE	Compute adjacent channel power	N/A	N/A	Yes	"ACPCOMPUTE (Adjacent Channel Power Compute)" on page 264
ACPCONTM	Performs ACP measurement in continuous sweep	N/A	N/A	N/A	
ACPE	Adjacent channel power extended	N/A	N/A	N/A	
ACPERR	ACP measurement error query	N/A	N/A	N/A	
ACPFRQWT	Adjacent channel power frequency weighting	N/A	N/A	Yes	"ACPFRQWT (Adjacent Channel Power Frequency Weighting)" on page 265

Command	Description	8566	8568	8560 Series	More Information
ACPGR	Adjacent channel power graph on or off	N/A	N/A	N/A	
ACPGRAPH	Compute adjacent channel power graph	N/A	N/A	No	
ACPLOWER	Lower adjacent channel power	N/A	N/A	Yes	"ACPLOWER (Lower Adjacent Channel Power)" on page 266
ACPMAX	Maximum adjacent channel power	N/A	N/A	Yes	"ACPMAX (Maximum Adjacent Channel Power)" on page 267
ACPMEAS	Measure adjacent channel power	N/A	N/A	Yes	"ACPMEAS (Measure Adjacent Channel Power)" on page 268
ACPMETHOD	Adjacent channel power measurement method	N/A	N/A	No	
ACPMK	Adjacent channel power marker on or off	N/A	N/A	N/A	
ACPMSTATE	Adjacent channel power measurement state	N/A	N/A	Yes	"ACPMSTATE (Adjacent Channel Power Measurement State)" on page 269
ACPPAR	ACP manual or auto	N/A	N/A	N/A	
ACPPWRTX	Total power transmitted	N/A	N/A	Yes	"ACPPWRTX (Adjacent Channel Power Total Power Transmitted)" on page 271
ACPRSLTS	Adjacent channel power measurement results	N/A	N/A	Yes	"ACPRSLTS (Adjacent Channel Power Measurement Results)" on page 272
ACPSNGLM	Performs ACP measurement in single sweep	N/A	N/A	N/A	
ACPSP	Channel spacing	N/A	N/A	Yes	"ACPSP (Adjacent Channel Power Channel Spacing)" on page 274
ACPT	Adjacent channel power T weighting	N/A	N/A	Yes	"ACPT (Adjacent Channel Power T Weighting)" on page 275
ACPUPPER	Upper adjacent channel power	N/A	N/A	Yes	"ACPUPPER (Upper Adjacent Channel Power)" on page 276
ACTDEF	Give user-defined function active status	N/A	N/A	N/A	
ACTVF	Active function	N/A	N/A	N/A	
ACTVFUNC	Creates a user defined active function	N/A	N/A	No	
ADD	Add	No	No	No	
ADJALL	LO & IF adjustment	N/A	N/A	Yes	"ADJALL (LO and IF Adjustments)" on page 277

Command	Description	8566	8568	8560 Series	More Information
ADJCRT	Adjust CRT alignment	N/A	N/A	No	
ADJIF	Adjust IF	N/A	N/A	No	
AMB	Trace A - trace B -> trace A	Yes	Yes	Yes	"AMB (A minus B into A)" on page 278
AMBPL	Trace A - trace B + Display Line -> trace A	Yes	Yes	Yes	"AMBPL (A minus B plus Display Line into A)" on page 279
AMPCOR	Applies amplitude correction at specified frequencies	N/A	N/A	No	
AMPCORDATA	Amplitude correction data	N/A	N/A	No	
AMPCORRCL	Amplitude correction recall	N/A	N/A	No	
AMPCORSAVE	Save amplitude correction data	N/A	N/A	No	
AMPCORSIZE	Amplitude correction data array size	N/A	N/A	No	
AMPLEN	Amplitude correction length	N/A	N/A	N/A	
ANLGPLUS	Turns on or off the Analog+ display mode	N/A	N/A	N/A	
ANNOT	Display Annotation	Yes	Yes	Yes	"ANNOT (Annotation)" on page 280
APB	Trace A + trace B -> trace A	Yes	Yes	Yes	"APB (Trace A Plus Trace B to A)" on page 281
ARRAYDEF	Defines an array	N/A	N/A	No	
AT	Input Attenuation	Yes	Yes	Yes	"AT (Input Attenuation)" on page 282
AUNITS	Amplitude Units	Yes	Yes	Yes	"AUNITS (Absolute Amplitude Units)" on page 283
AUTO	Auto couple	N/A	N/A	N/A	
AUTOCPL	Auto couple	N/A	N/A	Yes	"AUTOCPL (Auto Coupled)" on page 285
AUTOEXEC	Turns on or off the function defined with AUTOFUNC	N/A	N/A	No	
AUTOFUNC	Defines a function for automatic execution	N/A	N/A	No	
AUTOSAVE	Automatically saves trace	N/A	N/A	No	
AVG	Average	No	No	No	
AXB	Exchange Traces A & B	Yes	Yes	Yes	"AXB (Exchange Trace A and Trace B)"

Command	Description	8566	8568	8560 Series	More Information
					on page 286
B1	Clear-writes trace B	Yes	Yes	Yes	"B1 [one] (Clear Write for Trace B)" on page 287
B2	Max Holds trace B	Yes	Yes	Yes	"B2 [two] (Maximum Hold for Trace B)" on page 288
B3	View trace B	Yes	Yes	Yes	"B3 [three] (View Mode for Trace B)" on page 289
B4	Blanks trace B	Yes	Yes	Yes	"B4 [four] (Blank Trace B)" on page 290
BAUDRATE	Baud rate of spectrum analyzer	N/A	N/A	N/A	
BIT	Return or receive state of bit	N/A	N/A	N/A	
BITF	Bit flag	N/A	N/A	N/A	
BL	Trace B - Display line -> trace B	Yes	Yes	N/A	"BL (Trace B minus Display Line to Trace B)" on page 291
BLANK	Blanks specified trace	Yes	Yes	Yes	"BLANK (Blank Trace)" on page 292
BML	Trace B - Display line -> trace B	Yes	Yes	Yes	"BML (Trace B Minus Display Line)" on page 293
BRD	Bus Read	No	No	N/A	
BTC	Transfer trace B to C	Yes	Yes	N/A	"BTC (Transfer Trace B to Trace C)" on page 294
BWR	Bus Write	No	No	N/A	
BXC	Exchange Traces B & C	Yes	Yes	N/A	"BXC (Exchange Trace B and Trace C)" on page 295
C1	Turns off A - B	Yes	Yes	Yes	"C1 [one] (Set A Minus B Mode Off)" on page 296
C2	A - B -> A	Yes	Yes	Yes	"C2 [two] (A Minus B Into A)" on page 297
CA	Couples Attenuation	Yes	Yes	Yes	"CA (Couple Attenuation)" on page 298
CAL	Calibrate	N/A	N/A	N/A	
CARDLOAD	Copies data from memory card to module memory	N/A	N/A	No	
CARDSTORE	Copies data to memory card	N/A	N/A	No	
CARROFF	Carrier off power	N/A	N/A	Yes	"CARROFF (Carrier Off Power)" on page 299
CARRON	Carrier on power	N/A	N/A	Yes	"CARRON (Carrier On Power)" on page 300

Command	Description	8566	8568	8560 Series	More Information
CAT	Catalog	N/A	N/A	N/A	
CATALOG	Catalog	N/A	N/A	No	
CF	Center Frequency	Yes	Yes	Yes	"CF (Center Frequency)" on page 301
CHANNEL	Channel selection	N/A	N/A	Yes	"CHANNEL (Channel Selection)" on page 303
CHANPWR	Channel power	N/A	N/A	Yes	"CHANPWR (Channel Power)" on page 304
CHP	Performs the channel power measurement	N/A	N/A	N/A	
CHPGR	Channel power graph on or off	N/A	N/A	N/A	
CHPWRBW	Channel power bandwidth	N/A	N/A	Yes	"CHPWRBW (Channel Power Bandwidth)" on page 305
CLRAVG	Reset avg. counter to 1	Yes	Yes	N/A	"CLRAVG (Clear Average)" on page 306
CLRBOX	Clears a rectangular area on the analyzer display	N/A	N/A	N/A	
CLRDSP	Clear display	N/A	N/A	No	
CLRSCHED	Clears autosave & autoexec schedule buffer	N/A	N/A	No	
CLRW	Clear-writes specified trace	Yes	Yes	Yes	"CLRW (Clear Write)" on page 307
CLS	Clear status byte	N/A	N/A	N/A	
CMDERRQ	Command error query	N/A	N/A	N/A	
CNF	Confidence test	N/A	N/A	N/A	
CNTLA	Auxiliary interface control line A	N/A	N/A	No	
CNTLB	Auxiliary interface control line B	N/A	N/A	No	
CNTLC	Auxiliary interface control line C	N/A	N/A	No	
CNTLD	Auxiliary interface control line D	N/A	N/A	No	
CNTLI	Auxiliary interface control line input	N/A	N/A	No	
CNVLOSS	Selects ref level offset to calibrate amplitude display	No	N/A	No	
COMB	Turns the comb generator	N/A	N/A	N/A	

Command	Description	8566	8568	8560 Series	More Information
	on or off				
COMPRESS	Compress	No	No	N/A	
CONCAT	Concat	No	No	N/A	
CONTS	Continuous sweep mode	Yes	Yes	Yes	"CONTS (Continuous Sweep)" on page 309
CORREK	Correction factors on	N/A	N/A	N/A	
COUPLE	Selects AC or DC coupling	N/A	N/A	Yes	"COUPLE (Input Coupling)" on page 310
CR	Couples Resolution BW	Yes	Yes	Yes	"CR (Couple Resolution Bandwidth)" on page 311
CRTHPOS	Horizontal position of CRT display	N/A	N/A	N/A	
CRTVPOS	Vertical position of CRT display	N/A	N/A	N/A	
CS	Couples Step Size	Yes	Yes	N/A	"CS (Couple Frequency Step Size)" on page 312
CT	Couples Sweep Time	Yes	Yes	N/A	"CT (Couple Sweep Time)" on page 313
CTA	Converts display units to dBm	No	No	N/A	
CTM	Converts dBm to display units	No	No	N/A	
CTRLHPIB	Allows SA to control HP-IB	N/A	N/A	No	
CV	Couples Video Bandwidth	Yes	Yes	N/A	"CV (Couple Video Bandwidth)" on page 314
D1	Sets display to normal size	No	No	N/A	
D2	Sets display to full CRT size	No	No	N/A	
D3	Sets display to expanded size	No	No	N/A	
DA	Display Memory Address	Yes	Yes	N/A	"DA (Display Address)" on page 315
DATEMODE	Set the date display format	N/A	N/A	No	
DD	Display write binary	No	No	N/A	
DELMKBW	Occupied power bandwidth within delta marker	N/A	N/A	Yes	"DELMKBW (Occupied Power Bandwidth Within Delta Marker)" on page 316

Command	Description	8566	8568	8560 Series	More Information
DEMOD	Turns the demodulator on or off	N/A	N/A	No	
DEMODAGC	Demodulation automatic gain control	N/A	N/A	No	
DEMODT	Demodulation time	N/A	N/A	No	
DET	Detection Mode	Yes	Yes	Yes	"DET (Detection Mode)" on page 317
DISPOSE	Frees Memory	No	No	No	
DIV	Divide	No	No	No	
DL	Display Line Level	Yes	Yes	Yes	"DL (Display Line)" on page 318
DLE	Turns the display line on/off	Yes	Yes	N/A	"DLE (Display Line Enable)" on page 320
DLYSWP	Delay sweep	N/A	N/A	Yes	"DLYSWP (Delay Sweep)" on page 321
DN	Reduces the active function by applicable step size	N/A	N/A	N/A	
DONE	Synchronizing function	Yes	Yes	Yes	"DONE (Done)" on page 322
DOTDENS	Sets the dot density value in Analog+ display mode	N/A	N/A	N/A	
DR	Display Memory Address Read	Yes	Yes	N/A	"DR (Display Read)" on page 323
DRAWBOX	Draws a rectangular box on analyzer display	N/A	N/A	N/A	
DSPLY	Display	No	No	No	
DT	Define Terminator	No	No	N/A	
DW	Display Memory Address Write	No	No	N/A	
E1	Active marker to maximum signal	Yes	Yes	Yes	"E1 [one] (Peak Marker)" on page 324
E2	Active marker to center frequency	Yes	Yes	Yes	"E2 [two] (Marker to Center Frequency) " on page 325
E3	Active marker frequency to CF step size	Yes	Yes	Yes	"E3 [three] (Delta Marker Step Size)" on page 326
E4	Active marker to reference level	Yes	Yes	Yes	"E4 [four] (Marker to Reference Level)" on page 327
EDITDONE	Indicates limit line editing is complete	N/A	N/A	Yes	"EDITDONE (Edit Done)" on page 328
EDITLIML	Allows current limit line to be edited	N/A	N/A	No	"EDITLIML (Edit Limit Line)" on page 329

Command	Description	8566	8568	8560 Series	More Information
EE	Enable entry	No	No	N/A	
EK	Enable knob	No	No	N/A	
ELSE	Conditional Programming (If...then...else...endif)	No	No	No	
EM	Erase trace C memory	No	No	No	
ENDIF	Conditional Programming (If...then...else...endif)	No	No	N/A	
ENTER	Enter from HP-IB	No	No	No	
EP	Enter parameter function	N/A	N/A	N/A	
ERASE	User memory & registers erased	N/A	No	N/A	
ERR	Queries the error queue	Yes	Yes	Yes	"ERR (Error)" on page 330
ET	Elapsed time	N/A	N/A	Yes	"ET (Elapsed Time)" on page 332
EX	Exchanges trace A & B	Yes	Yes	Yes	"EX (Exchange Trace A and Trace B)" on page 333
EXP	Exponential	No	No	No	
EXTMXR	Presets external mixing mode	No	N/A	No	
FA	Start frequency	Yes	Yes	Yes	"FA (Start Frequency)" on page 334
FB	Stop frequency	Yes	Yes	Yes	"FB (Stop Frequency)" on page 336
FDIAG	Frequency diagnostics	N/A	N/A	No	
FDSP	Frequency display off	N/A	N/A	Yes	"FDSP (Frequency Display Off)" on page 337
FFT	Fast fourier transform	No	No	No	
FFTAUTO	Marker to Auto FFT	N/A	N/A	N/A	
FFTCLIP	FFT signal clipped	N/A	N/A	N/A	
FFTCONTS	FFT continuous sweep	N/A	N/A	N/A	
FFTKNL	Fast fourier transform kernel	No	No	N/A	
FFTMKR	FFT markers	N/A	N/A	N/A	
FFTMM	FFT marker to midscreen	N/A	N/A	N/A	
FFTMS	FFT marker to FFT stop frequency	N/A	N/A	N/A	
FFTOFF	FFT off	N/A	N/A	N/A	
FFTPCTAM	FFT percent amplitude modulation	N/A	N/A	N/A	
FFTPCTAMR	FFT percent amplitude modulation readout	N/A	N/A	N/A	

Command	Description	8566	8568	8560 Series	More Information
FFTSNGLS	FFT single sweep	N/A	N/A	N/A	
FFTSTAT	FFT status	N/A	N/A	N/A	
FFTSTOP	FFT stop frequency	N/A	N/A	N/A	
FMGAIN	FM gain	N/A	N/A	N/A	
FOFFSET	Frequency offset	Yes	Yes	Yes	"FOFFSET (Frequency Offset)" on page 338
FORMAT	Erase & format the selected memory device	N/A	N/A	No	
FPKA	Fast preselector peak	Yes	N/A	N/A	"FPKA (Fast Preselector Peak)" on page 340
FREF	Frequency reference	N/A	N/A	Yes	"FREF (Frequency Reference)" on page 341
FS	Full frequency span	Yes	Yes	Yes	"FS (Full Span)" on page 342
FULBAND	Set start/stop freq for ext mixing bands	No	N/A	No	
FUNCDEF	Function definition	No	No	No	
GATE	Turn time-gating on or off	N/A	N/A	Yes	"GATE (Gate)" on page 344
GATECTL	Gate control	N/A	N/A	Yes	"GATECTL (Gate Control)" on page 345
GC	Gate preset	N/A	N/A	N/A	
GD	Gate delay	N/A	N/A	Yes	"GD (Gate Delay)" on page 346
GDRVCLPAR	Clear pulse parameters	N/A	N/A	N/A	
GDRVGDEL	Gate Delay for the frequency window	N/A	N/A	N/A	
GDRVGLEN	Gate length for frequency & time windows	N/A	N/A	N/A	
GDRVGT	Turns gate in frequency window on or off	N/A	N/A	N/A	
GDRVGTIM	Gate trigger to marker position for time window	N/A	N/A	N/A	
GDRVPRI	Pulse repetition interval	N/A	N/A	N/A	
GDRVPWID	Pulse width	N/A	N/A	N/A	
GDRVRBW	Couple resolution bandwidth to pulse width	N/A	N/A	N/A	
GDRVREFE	Enter reference edge	N/A	N/A	N/A	
GDRVST	Couple sweep time to pulse repetition interval	N/A	N/A	N/A	
GDRVSWAP	Update the time or frequency window	N/A	N/A	N/A	

Command	Description	8566	8568	8560 Series	More Information
GDRVSWDE	Delay sweep for time window	N/A	N/A	N/A	
GDRVSWP	Sweep time for the time window	N/A	N/A	N/A	
GDRVUTIL	Turns the gate utility on or off	N/A	N/A	N/A	
GDRVVBW	Couple video bandwidth to the gate length	N/A	N/A	N/A	
GETPLOT	Get plot	N/A	N/A	N/A	
GETPRNT	Get print	N/A	N/A	N/A	
GL	Gate length	N/A	N/A	Yes	"GL (Gate Length)" on page 347
GP	Sets the polarity (positive/negative) of the gate trigger	N/A	N/A	Yes	"GP (Gate Polarity)" on page 348
GR	Plot GPIB input as Graphs	No	No	N/A	
GRAT	Graticule on/off	Yes	Yes	Yes	"GRAT (Graticule)" on page 349
HAVE	Checks for options installed	N/A	N/A	N/A	
HD	Holds data entry	Yes	Yes	Yes	"HD (Hold Data Entry)" on page 350
HN	Harmonic number	N/A	N/A	N/A	
HNLOCK	Harmonic lock	No	N/A	No	
HNUNLK	Harmonic band unlock	No	N/A	No	
I1	Sets the RF coupling to AC	N/A	Yes	N/A	"I1 [one] (Set RF Coupling to DC)" on page 351
I2	Sets the RF coupling to DC	N/A	Yes	N/A	"I2 [two] (Set RF Coupling to AC)" on page 353
IB	Input to trace B memory	No	No	N/A	
ID	Instrument identification	Yes	Yes	Yes	"ID (Identify)" on page 355
IDCF	Identified signal to center frequency	N/A	N/A	No	
IDFREQ	Identified signal frequency	N/A	N/A	No	
IDSTAT	Signal identifier status	No	N/A	N/A	
IF	Conditional Programming (If...then...else...endif)	No	No	No	
IFTKNL	16 bit discrete fourier transform	No	No	N/A	
INT	Integer	No	No	No	

Command	Description	8566	8568	8560 Series	More Information
INZ	Input impedance	N/A	N/A	N/A	
IP	Instrument preset	Yes	Yes	Yes	"IP (Instrument Preset)" on page 356
KEYCLR	Clear user defined keys	N/A	N/A	No	
KEYCMD	Define function & label of softkey	N/A	N/A	N/A	
KEYDEF	Assign function to soft key	No	No	No	
KEYENH	Key enhance	N/A	N/A	N/A	
KEYEXC	Executes specified soft key	No	No	N/A	
KEYLBL	Relabels softkey without changing its function	N/A	N/A	N/A	
KS,	Mixer level	Yes	Yes	N/A	"KS, (Mixer Level)" on page 357
KS=	HP8566: Selects factory preselector setting HP8568: Marker counter frequency resolution	Yes	Yes	N/A	"KS= (8566A/B: Automatic Preselector Tracking, 8568A/B: Marker Counter Resolution)" on page 358
KS(	Locks the save registers	Yes	Yes	N/A	"KS((Lock Registers)" on page 359
KS)	Unlocks the save registers	Yes	Yes	N/A	"KS) (Unlock Registers)" on page 360
KS>	Specifies preamp gain for signal input 2	N/A	No	N/A	
KS<	Specifies preamp gain for signal input 1	N/A	No	N/A	
KS|	Display memory address write	No	No	N/A	
KS#	Turns off YTX self-heating correction	No	N/A	N/A	
KS/	Allows preselector to be peaked manually	No	N/A	N/A	
KS39	Writes display memory address in fast binary	No	No	N/A	
KS43	Sets SRQ 102 when frequency limit exceeded	No	No	N/A	
KS91	Returns the amplitude error	No	No	N/A	
KS92	Specifies value DL, TH, active mkr in display units	No	No	N/A	
KS94	Returns code for	No	No	N/A	

Command	Description	8566	8568	8560 Series	More Information
	harmonic number in binary				
KS123	Returns up to 1001 words display memory	No	No	N/A	
KS125	Writes up to 1001 display memory words	No	No	N/A	
KS126	Returns every Nth value of a trace	No	No	N/A	
KS127	Sets analyzer to accept binary display write	No	No	N/A	
KSA	Sets amplitude units to dBm	Yes	Yes	N/A	"KSA (Amplitude in dBm)" on page 361
KSa	Selects normal detection	Yes	Yes	N/A	"KSa (Normal Detection)" on page 362
KSB	Sets amplitude units to dBmV	Yes	Yes	N/A	"KSB (Amplitude in dBmV)" on page 363
KSb	Selects positive peak detection	Yes	Yes	N/A	"KSb (Positive Peak Detection)" on page 364
KSC	Sets amplitude units to dBuV	Yes	Yes	N/A	"KSC (Amplitude in dBμV)" on page 365
KSc	Trace A + trace B -> trace A	Yes	Yes	N/A	"KSc (A Plus B to A)" on page 366
KSD	Sets amplitude units to V	Yes	Yes	N/A	"KSD (Amplitude in Volts)" on page 367
KSd	Selects negative peak detection	Yes	Yes	N/A	"KSd (Negative Peak Detection)" on page 368
KSE	Sets the analyzer title mode	Yes	Yes	N/A	"KSE (Title Mode)" on page 369
KSe	Selects sample detection	Yes	Yes	N/A	"KSe (Sample Detection)" on page 370
KSF	HP8566: Shifts the YTO HP8568: Measures the Sweep Time	No	No	N/A	
KSf	Recover last instrument state at power on	No	No	N/A	
KSG	Turns on video averaging	Yes	Yes	N/A	"KSG (Video Averaging On)" on page 371
KSg	Turns off the display	Yes	Yes	N/A	"KSg (Display Off)" on page 372
KSH	Turns off video averaging	Yes	Yes	N/A	"KSH (Video Averaging Off)" on page 373
KSh	Turns on the display	Yes	Yes	N/A	"KSh (Display On)" on page 374

Command	Description	8566	8568	8560 Series	More Information
KSI	Allows the reference level to be extended	Yes	Yes	N/A	"KSI (Extend Reference Level)" on page 375
KSi	Exchanges traces B & C	Yes	Yes	N/A	"KSi (Exchange Trace B and Trace C)" on page 376
KSJ	Manual control of DACs	No	No	N/A	
KSj	Views trace C	Yes	Yes	N/A	"KSj (View Trace C)" on page 377
KSK	HP8566: Active Mkr to next highest peak HP8568: Counts pilot IF at marker	Yes	No	N/A	"KSK (Marker to Next Peak)" on page 378
KSk	Blanks trace C	Yes	Yes	N/A	"KSk (Blank Trace C)" on page 379
KSL	Turns off marker noise function	Yes	Yes	N/A	"KSL (Marker Noise Off)" on page 380
KSl	Moves trace B into trace C	Yes	Yes	N/A	"KSl (Transfer Trace B to Trace C)" on page 381
KSM	Turns on marker noise function	Yes	Yes	N/A	"KSM (Marker Noise On)" on page 382
KSm	Turns off the graticule	Yes	Yes	N/A	"KSm (Graticule Off)" on page 383
KSN	Marker minimum value detected	Yes	No	N/A	"KSN (Marker Minimum)" on page 384
KSn	Turns on the graticule	Yes	Yes	N/A	"KSn (Graticule On)" on page 385
KSO	Marker span	Yes	Yes	N/A	"KSO (Marker Span)" on page 386
KSo	Turns off the annotation	Yes	Yes	N/A	"KSo (Annotation Off)" on page 387
KSP	GPIB address	Yes	Yes	N/A	"KSP (GPIB Address)" on page 388
KSp	Turns on the annotation	Yes	Yes	N/A	"KSp (Annotation On)" on page 389
KSQ	Unlocks frequency band	No	No	N/A	
KSq	Decouples IF gain and input attenuation	No	No	N/A	
KSR	Turns on service diagnostics	No	No	N/A	
KSr	Sets service request 102	No	No	N/A	
KSS	HP8566: Fast GPIB operation HP8568: Determine second LO frequency	No	No	N/A	
KST	HP8566: Fast preset HP8568: Shifts second LO down	Yes	No	N/A	"KST (Fast Preset)" on page 390
KSt	HP8566: Locks	No	No	N/A	

Command	Description	8566	8568	8560 Series	More Information
	frequency band HP8568: Continues sweep from marker				
KSU	HP8566: External mixer preset HP8568: Shift second LO up	No	No	N/A	
KSu	Stops the sweep at the active marker	No	No	N/A	
KSV	Frequency offset	Yes	Yes	N/A	"KSV (Frequency Offset)" on page 391
KSv	HP8566: External mixer frequency identifier HP8568: Inhibits phase lock	No	No	N/A	
KSW	Amplitude error correction routine	No	No	N/A	
KSw	Displays amplitude error correction routine	No	No	N/A	
KSX	Amplitude correction factors on	No	No	N/A	
KSx	Sets trigger mode to external	Yes	Yes	N/A	"KSx (External Trigger)" on page 392
KSY	Amplitude correction factors off	No	No	N/A	
KSy	Sets trigger mode to video	Yes	Yes	N/A	"KSy (Video Trigger)" on page 393
KSZ	Reference level offset	Yes	Yes	N/A	"KSZ (Reference Level Offset)" on page 394
KSz	Sets the display storage address	No	No	N/A	
L0	Turns off the display line	Yes	Yes	Yes	"L0 [zero] (Display Line Off)" on page 395
LB	Writes text label	No	No	No	
LCLVAR	Defines a local variable for use	N/A	N/A	No	
LF	Preset 0-2.5GHz	Yes	N/A	N/A	"LF (Low Frequency Preset)" on page 396
LG	Selects log scale	Yes	Yes	Yes	"LG (Logarithmic Scale)" on page 397
LIMD	Delta amplitude value for limit line segment	N/A	N/A	Yes	
LIMF	Frequency value for limit-	N/A	N/A	Yes	"LIMF (Limit Line Frequency Value)" on

Command	Description	8566	8568	8560 Series	More Information
	line segment				page 398
LIMIDEL	Erase contents of limit line table	N/A	N/A	N/A	
LIMIDISP	Controls when the limit line(s) are displayed	N/A	N/A	N/A	
LIMIFAIL	Limit line fail	N/A	N/A	Yes	"LIMIFAIL (Limits Failed)" on page 399
LIMIFT	Select frequency or time limit line	N/A	N/A	N/A	
LIMIHI	Upper limit	N/A	N/A	N/A	
LIMILINE	Limit line	N/A	N/A	N/A	
LIMILO	Lower limit	N/A	N/A	N/A	
LIMIMIRROR	Mirror limit line	N/A	N/A	N/A	
LIMIMODE	Limit line entry mode	N/A	N/A	N/A	
LIMIPURGE	Disposes of current limit line, not limit line table	N/A	N/A	Yes	"LIMIPURGE (Delete Current Limit Line)" on page 401
LIMIRCL	Load stored limit line into limit line table	N/A	N/A	Yes	"LIMIRCL (Recall Limit Line)" on page 402
LIMIREL	Determine whether limit line values absolute/relative	N/A	N/A	Yes	"LIMIREL (Relative Limit Lines)" on page 403
LIMISAV	Save contents of limit line table for recall	N/A	N/A	Yes	"LIMISAV (Save Limit Line)" on page 404
LIMISEG	Define slope & offset of limit line segments	N/A	N/A	N/A	
LIMISEGT	Enter limit line segment for sweep time	N/A	N/A	N/A	
LIMITST	Compare active trace data to limit line parameters	N/A	N/A	Yes	"LIMITST (Activate Limit Line Test Function)" on page 407
LIML	Amplitude value for limit line segment in lower limit line	N/A	N/A	Yes	"LIML (Lower-Limit Amplitude)" on page 405
LIMM	Middle amplitude value for limit-line segment	N/A	N/A	Yes	
LIMTFL	Specifies a flat limit-line segment	N/A	N/A	Yes	"LIMTFL (Flat Limit Line)" on page 406
LIMTSL	Specifies a sloped limit-line segment	N/A	N/A	Yes	"LIMTSL (Slope Limit Line)" on page 408
LIMU	Amplitude value for limit line segment in upper	N/A	N/A	Yes	"LIMU (Upper-Limit Amplitude)" on page 409

Command	Description	8566	8568	8560 Series	More Information
	limit line				
LINFILL	Line fill	N/A	N/A	N/A	
LL	Provides lower left recorder output voltage at rear	No	No	N/A	
LN	Selects linear scale	Yes	Yes	Yes	"LN (Linear Scale)" on page 410
LOAD	Load article/file into internal memory	N/A	N/A	N/A	
LOG	Log	No	No	No	
LOLIMOFF	LO Limit Off	No	No	N/A	
LSPAN	Last span	N/A	N/A	N/A	
M1	Turns off all markers	Yes	Yes	N/A	"M1 [one] (Marker Off)" on page 411
M2	Marker Normal	Yes	Yes	N/A	"M2 [two] (Marker Normal)" on page 412
M3	Marker Delta	Yes	Yes	N/A	"M3 [three] (Delta Marker)" on page 414
M4	Marker zoom	Yes	Yes	N/A	"M4 [four] (Marker Zoom)" on page 416
MA	Returns the amplitude of active marker	Yes	Yes	Yes	"MA (Marker Amplitude Output)" on page 417
MBIAS	Mixer bias	No	No	N/A	
MBRD	Processor memory block read	No	No	N/A	
MBWR	Processor memory block write	No	No	N/A	
MC0	Turns off the marker frequency counter	N/A	Yes	N/A	"MC0 [zero] (Marker Frequency Counter Off)" on page 418
MC1	Turns on the marker frequency counter	N/A	Yes	N/A	"MC1 [one] (Marker Frequency Counter On)" on page 419
MDS	Measurement data size	Yes	Yes	N/A	"MDS (Measurement Data Size)" on page 420
MDU	Measurement data units	Yes	Yes	N/A	"MDU (Measurement Data Units)" on page 421
MEAN	Returns mean value of trace in display units	Yes	Yes	Yes	"MEAN (Trace Mean)" on page 422
MEANPWR	Mean power measurement	N/A	N/A	Yes	"MEANPWR (Mean Power measurement)" on page 423

Command	Description	8566	8568	8560 Series	More Information
MEANTH	Trace mean above threshold	N/A	N/A	N/A	
MEAS	Measurement status	Yes	Yes	Yes	"MEAS (Meas)" on page 424
MEASOFF	Measurement off	No	No	N/A	
MEASURE	Measure mode	N/A	N/A	N/A	
MEM	Returns amount of memory available	No	No	No	
MENU	Menu	N/A	N/A	No	
MERGE	Merge two traces	No	No	N/A	
MF	Returns frequency of the active marker	Yes	Yes	Yes	"MF (Marker Frequency Output)" on page 425
MIN	Minimum	No	No	No	
MINH	Min Hold	N/A	N/A	Yes	"MINH (Minimum Hold)" on page 426
MINPOS	Returns the minimum position in the trace	Yes	Yes	N/A	"MINPOS (Minimum X Position)" on page 427
MIRROR	Mirror image of the trace	No	No	N/A	
MKA	Amplitude of the active marker	Yes	Yes	Yes	"MKA (Marker Amplitude)" on page 428
MKACT	Specifies the active marker	Yes	Yes	N/A	"MKACT (Activate Marker)" on page 429
MKACTV	Marker as the active function	N/A	N/A	N/A	
MKBW	Marker bandwidth	N/A	N/A	Yes	"MKBW (Marker Bandwidth)" on page 430
MKCF	Moves the active marker to center frequency	Yes	Yes	Yes	"MKCF (Marker to Center Frequency)" on page 431
MKCHEDGE	Marker to channel edge	N/A	N/A	No	
MKCONT	Continues sweeping from the marker after stop	No	No	N/A	
MKD	Delta marker	Yes	Yes	Yes	"MKD (Marker Delta)" on page 432
MKDELCHBW	Delta markers to channel power bandwidth	N/A	N/A	No	
MKDLMODE	Marker delta display line mode	N/A	N/A	N/A	
MKDR	Reciprocal of marker delta	N/A	N/A	No	
MKF	Specifies the frequency of the active marker	Yes	Yes	Yes	"MKF (Marker Frequency)" on page 434
MKFC	Turns the marker	N/A	Yes	Yes	"MKFC (Marker Counter)" on page 435

Command	Description	8566	8568	8560 Series	More Information
	frequency counter on or off				
MKFCR	Specifies the marker frequency counter resolution	N/A	Yes	Yes	"MKFCR (Marker Counter Resolution)" on page 436
MKMCF	Marker mean to center frequency	N/A	N/A	No	
MKMIN	Moves active marker to minimum signal detected	Yes	Yes	Yes	"MKMIN (Marker Minimum)" on page 438
MKN	Normal marker	Yes	Yes	Yes	"MKN (Marker Normal)" on page 439
MKNOISE	Marker noise function	Yes	Yes	Yes	"MKNOISE (Marker Noise)" on page 441
MKOFF	Turns all markers or the active marker off	Yes	Yes	Yes	"MKOFF (Marker Off)" on page 442
MKP	Specifies the horizontal position of the marker	Yes	Yes	N/A	"MKP (Marker Position)" on page 443
MKPAUSE	Pauses the sweep at the active marker	No	No	N/A	
MKPK	Marker peak	Yes	Yes	Yes	"MKPK (Marker Peak)" on page 444
MKPT	Marker peak threshold	N/A	N/A	Yes	"MKPT (Marker Threshold)" on page 445
MKPX	Marker peak excursion	Yes	Yes	Yes	"MKPX (Marker Peak Excursion)" on page 446
MKREAD	Specifies marker readout mode	Yes	Yes	N/A	"MKREAD (Marker Readout)" on page 447
MKRL	Moves the active marker to reference level	Yes	Yes	Yes	"MKRL (Marker to Reference Level)" on page 449
MKSP	Marker span	Yes	Yes	Yes	"MKSP (Marker Span)" on page 450
MKSS	Marker step size	Yes	Yes	Yes	"MKSS (Marker to Step Size)" on page 451
MKSTOP	Stops the sweep at the active marker	No	No	N/A	
MKT	Position marker in units of time	N/A	N/A	Yes	"MKT (Marker Time)" on page 452
MKTBL	Marker table	N/A	N/A	N/A	
MKTRACE	Marker trace	Yes	Yes	N/A	"MKTRACE (Marker Trace)" on page 453
MKTRACK	Turns the marker signal track on or off	Yes	Yes	Yes	"MKTRACK (Marker Track)" on page 454
MKTYPE	Specifies the type of	Yes	Yes	N/A	"MKTYPE (Marker Type)" on page 455

Command	Description	8566	8568	8560 Series	More Information
	active marker to be used				
ML	Mixer Level	Yes	Yes	Yes	"ML (Mixer Level)" on page 456
MOD	Modulo	No	No	No	
MODRCLT	Recalls trace from module memory	N/A	N/A	No	
MODSAVT	Saves trace in module memory	N/A	N/A	No	
MOV	Move	No	No	No	
MPY	Multiply	No	No	No	
MRD	Memory Read	No	No	N/A	
MRDB	Memory read byte	No	No	N/A	
MSDEV	Specifies mass storage device	N/A	N/A	No	
MSI	Mass storage interface	N/A	N/A	N/A	
MT0	Turns off marker signal track	Yes	Yes	N/A	"MT0 [zero] (Marker Track Off)" on page 458
MT1	Turns on marker signal track	Yes	Yes	N/A	"MT1 [one] (Marker Track On)" on page 459
MWR	Memory Write	No	No	N/A	
MWRB	Memory write byte	No	No	N/A	
MXM	Maximum	No	No	No	
MXMH	Max Hold	Yes	Yes	Yes	"MXMH (Maximum Hold)" on page 460
MXRMODE	Mixer mode	N/A	N/A	No	
NDB	Number of dB	N/A	N/A	N/A	
NDBPNT	Turns the N dB points function on or off	N/A	N/A	N/A	
NDBPNTR	N dB points bandwidth	N/A	N/A	N/A	
NORMLIZE	Normalize trace data	N/A	N/A	Yes	"NORMLIZE (Normalize Trace Data)" on page 461
NRL	Normalized reference level	N/A	N/A	Yes	"NRL (Normalized Reference Level)" on page 462
NRPOS	Normalized reference position	N/A	N/A	Yes	"NRPOS (Normalized Reference Position)" on page 463
NSTART	Start harmonic	No	N/A	N/A	
NSTOP	Stop harmonic	No	N/A	N/A	
O1	Output format	Yes	Yes	N/A	"O1 [one] (Format - Display Units)" on page 464

Command	Description	8566	8568	8560 Series	More Information
O2	Output format	Yes	Yes	N/A	"O2 [two] (Format - Two 8-Bit Bytes)" on page 465
O3	Output format	Yes	Yes	N/A	"O3 [three] (Format - Real Amplitude Units)" on page 466
O4	Output format	Yes	Yes	N/A	"O4 [four] (Format - One 8-Bit Byte)" on page 467
OA	Returns the active function value	Yes	Yes	N/A	"OA or ? (Query Active Function)" on page 468
OBW	Occupied bandwidth	N/A	N/A	N/A	
OBWBW	Bandwidth measured by occupied bandwidth	N/A	N/A	N/A	
OBWFERR	Occupied bandwidth transmit frequency error	N/A	N/A	N/A	
OBWLOWER	Relative lower frequency limit of occupied bandwidth	N/A	N/A	N/A	
OBWPCT	Occupied bandwidth percent	N/A	N/A	N/A	
OBWPWR	Total power in the occupied bandwidth	N/A	N/A	N/A	
OBWUPPER	Relative upper frequency limit of occupied bandwidth	N/A	N/A	N/A	
OCCUP	Percent occupied power bandwidth	N/A	N/A	Yes	"OCCUP (Percent Occupied Power Bandwidth)" on page 469
OL	Output learn string	Yes	Yes	N/A	"OL (Output Learn String)" on page 470
ONCYCLE	On cycle	N/A	N/A	N/A	
ONDELAY	On delay	N/A	N/A	N/A	
ONEOS	On end of sweep	No	No	No	
ONMKR	On marker pause	N/A	N/A	N/A	
ONMKRU	On marker update	N/A	N/A	N/A	
ONPWRUP	On power up	N/A	N/A	N/A	
ONSRQ	On service request	N/A	N/A	N/A	
ONSWP	On sweep	No	No	N/A	
ONTIME	On time	N/A	N/A	N/A	
OP	Output parameters	No	No	No	
OR	Set position of origin	N/A	N/A	No	
OT	Output trace annotations	Yes	Yes	N/A	"OT (Output Trace Annotations)" on

Command	Description	8566	8568	8560 Series	More Information
					page 472
OUTPUT	Output - sending data to the GPIB from function	No	No	No	
PA	Plot absolute	No	No	No	
PARSTAT	Parallel status	N/A	N/A	N/A	
PCTAM	Turns the percent AM measurement on or off	N/A	N/A	N/A	
PCTAMR	Percent AM response	N/A	N/A	N/A	
PD	Pen down	No	No	No	
PDA	Probability distribution amplitude	No	No	No	
PDF	Probability distribution frequency	No	No	No	
PEAKS	Sorts the signal peaks by amplitude/frequency	Yes	Yes	Yes	"PEAKS (Peaks)" on page 474
PKDLMODE	Peak table delta display line mode	N/A	N/A	N/A	
PKPOS	Peak position	N/A	Yes	N/A	"PKPOS (Peak Position)" on page 475
PKRES	Peak result	N/A	N/A	N/A	
PKSORT	Selects how to sort signal peaks listed in peak table	N/A	N/A	N/A	
PKTBL	Turns the peak table on or off	N/A	N/A	N/A	
PKZMOK	Peak zoom okay	N/A	N/A	N/A	
PKZOOM	Peak zoom	N/A	N/A	N/A	
PLOT	Prints the screen	Yes	Yes	Yes	"PLOT (Plot)" on page 476
PLOTORG	Display origins	N/A	N/A	No	
PLOTSRC	Plot source	N/A	N/A	No	
PLTPRT	Plot port	N/A	N/A	N/A	
POWERON	Power on state	N/A	N/A	N/A	
PP	Peaks the preselector	Yes	N/A	Yes	"PP (Preselector Peak)" on page 477
PR	Plot relative	No	No	No	
PREAMPG	External preamplifier gain	N/A	N/A	N/A	
PREFX	Change user memory entries file prefix	N/A	N/A	N/A	
PRINT	Print	N/A	N/A	Yes	"PRINT (Print)" on page 478
PRNPRT	Print port	N/A	N/A	N/A	

Command	Description	8566	8568	8560 Series	More Information
PRNTADRS	Print address	N/A	N/A	N/A	
PS	Skip page	No	No	N/A	
PSDAC	Preselector DAC number	N/A	N/A	No	
PSTATE	Protect state	N/A	N/A	No	
PU	Pen up	No	No	No	
PURGE	Purge file	N/A	N/A	N/A	
PWRBW	Power bandwidth	Yes	Yes	Yes	"PWRBW (Power Bandwidth)" on page 479
PWRUPTIME	Power up time	N/A	N/A	N/A	
Q0	Sets detector to EMI Peak detection	N/A	Yes	N/A	"Q0 [zero] (Set Detector to EMI Peak Detection)" on page 480
Q1	Sets detector to Quasi Peak detection	N/A	Yes	N/A	"Q1 [one] (Set Detector to Quasi Peak Detection)" on page 481
R1	Resets service request 140	Yes	Yes	N/A	"R1 [one] (Illegal Command SRQ)" on page 482
R2	Allows service request 140 & 104	Yes	Yes	N/A	"R2 [two] (End-of-Sweep SRQ)" on page 483
R3	Allows service request 140 & 110	Yes	Yes	N/A	"R3 [three] (Hardware Broken SRQ)" on page 484
R4	Allows service request 140 & 102	Yes	Yes	N/A	"R4 [four] (Units-Key-Pressed SRQ)" on page 485
RB	Resolution bandwidth	Yes	Yes	Yes	"RB (Resolution Bandwidth)" on page 486
RBR	Resolution bandwidth/Span ratio	N/A	N/A	Yes	"RBR (Resolution Bandwidth to Span Ratio)" on page 488
RC	Recalls state register	Yes	Yes	Yes	"RC (Recall State)" on page 489
RCLOSCAL	Recall open/short average	N/A	N/A	No	
RCLS	Recall state	Yes	Yes	Yes	"RCLS (Recall State)" on page 490
RCLT	Recall trace	N/A	N/A	No	
RCLTHRU	Recall internal thru-reference trace into trace B	N/A	N/A	No	
RELHPIB	Release control of GPIB	N/A	N/A	No	
REPEAT	Conditional Programming (Repeat ... Until ...)	No	No	No	
RESETRL	Reset reference level	N/A	N/A	N/A	
RETURN	Return to user defined function origination point	N/A	N/A	No	

Command	Description	8566	8568	8560 Series	More Information
REV	Returns the revision string to the controller	Yes	Yes	Yes	"REV (Revision)" on page 491
RL	Reference level	Yes	Yes	Yes	"RL (Reference Level)" on page 492
RLCAL	Reference level calibration	N/A	N/A	No	
RLPOS	Reference level position	N/A	N/A	N/A	
RMS	Root mean square	Yes	Yes	N/A	"RMS (Root Mean Square Value)" on page 494
ROFFSET	Reference level offset	Yes	Yes	Yes	"ROFFSET (Reference Level Offset)" on page 495
RQS	SRQ mask	Yes	Yes	Yes	"RQS (Request Service Conditions)" on page 497
S1	Continuous sweep mode	Yes	Yes	N/A	"S1[one] (Continuous Sweep)" on page 499
S2	Single sweep mode	Yes	Yes	N/A	"S2 [two] (Single Sweep)" on page 500
SADD	Adds a limit line segment	N/A	N/A	Yes	"SADD (Add Limit Line Segment)" on page 501
SAVEMENU	Save menu	N/A	N/A	N/A	
SAVES	Saves analyzer state to specified register	Yes	Yes	Yes	"SAVES (Save State)" on page 502
SAVET	Save trace	N/A	N/A	No	
SAVRCLF	Save or recall flag	N/A	N/A	N/A	
SAVRCLN	Save or recall number	N/A	N/A	N/A	
SAVRCLW	Save or recall data	N/A	N/A	N/A	
SDEL	Deletes a limit line segment	N/A	N/A	Yes	"SDEL (Delete Limit Line Segment)" on page 503
SDON	Indicates limit line segment is done	N/A	N/A	Yes	"SDON (Terminate SEDI Command)" on page 504
SEDI	Edits limit line segment	N/A	N/A	Yes	"SEDI (Edit Limit Line Segment)" on page 505
SEGDEL	Delete specified segment from limit line tables	N/A	N/A	N/A	
SENTER	Segment entry for frequency limit lines	N/A	N/A	No	
SENTERT	Segment entry for sweep time limit lines	N/A	N/A	N/A	
SER	Serial number	N/A	N/A	Yes	"SER (Serial Number)" on page 506
SETDATE	Set the date of spectrum	N/A	N/A	Yes	"SETDATE (Set Date)" on page 507

Command	Description	8566	8568	8560 Series	More Information
	analyzer				
SETTIME	Set the time of spectrum analyzer	N/A	N/A	Yes	"SETTIME (Set Time)" on page 508
SHOWMENU	Shows menu	N/A	N/A	No	
SIGDEL	Signal amplitude delta	No	N/A	N/A	
SIGID	External mixing frequency bands signal identifier	No	N/A	No	
SKYCLR	Clears user softkey	N/A	N/A	No	
SKYDEF	Defines user softkey	N/A	N/A	No	
SMOOTH	Smooths given trace over specified number points	Yes	Yes	N/A	"SMOOTH (Smooth Trace)" on page 509
SNGLS	Single sweep mode	Yes	Yes	Yes	"SNGLS (Single Sweep)" on page 510
SP	Frequency Span	Yes	Yes	Yes	"SP (Frequency Span)" on page 511
SPEAKER	Turns the internal speaker on or off	N/A	N/A	N/A	
SPZOOM	Span Zoom	N/A	N/A	N/A	
SQLCH	Sets the squelch threshold	N/A	N/A	N/A	
SQR	Square root	No	No	No	
SQUELCH	Adjusts squelch level	N/A	N/A	No	
SRCALC	Selects internal or external level control	N/A	N/A	No	
SRCAT	Attenuate source output level	N/A	N/A	N/A	
SRCCRSTK	Coarse tracking adjust	N/A	N/A	No	
SRCFINTK	Fine tracking adjust	N/A	N/A	No	
SRCNORM	Source normalization	N/A	N/A	N/A	
SRCPOFS	Offset source power level	N/A	N/A	No	
SRCPSTP	Select source power step size	N/A	N/A	No	
SRCPSWP	Select sweep range of source output	N/A	N/A	No	
SRCPWR	Select source power level	N/A	N/A	No	
SRCTK	Adjust tracking of source output with SA sweep	N/A	N/A	N/A	
SRCTKPK	Auto adjust tracking of source output with SA sweep	N/A	N/A	No	

Command	Description	8566	8568	8560 Series	More Information
SRQ	Service request	Yes	Yes	Yes	"SRQ (Service Request)" on page 513
SS	Frequency Step Size	Yes	Yes	Yes	"SS (Center Frequency Step Size)" on page 514
ST	Sweep Time	Yes	Yes	Yes	"ST (Sweep Time)" on page 516
STB	Status byte query	N/A	N/A	Yes	"STB (Status Byte Query)" on page 518
STDEV	Standard deviation of trace amplitude	Yes	Yes	N/A	"STDEV (Standard Deviation of Trace Amplitudes)" on page 519
STOR	Store file	N/A	N/A	N/A	
STOREOPEN	Save current instrument state	N/A	N/A	No	
STORESHORT	Store short	N/A	N/A	No	
STORETHRU	Store thru-calibration trace in trace B	N/A	N/A	No	
SUB	Subtract	No	No	No	
SUM	Sum of trace element amplitudes in display units	No	No	Yes	"SUM (Sum)" on page 520
SUMSQR	Squares trace element amplitudes & returns sum	No	No	No	
SV	Saves state	Yes	Yes	N/A	"SV (Save State)" on page 521
SW	Skip to next control instruction	No	No	N/A	
SWPCPL	Sweep couple	N/A	N/A	Yes	"SWPCPL (Sweep Couple)" on page 522
SWPOUT	Sweep output	N/A	N/A	No	
SYNCMODE	Synchronize mode	N/A	N/A	N/A	
T0	Turns the threshold level off	Yes	Yes	N/A	"T0 [zero] (Turn Off Threshold Level)" on page 523
T1	Sets the trigger mode to free run	Yes	Yes	N/A	"T1 [one] (Free Run Trigger)" on page 524
T2	Sets the trigger mode to line	Yes	Yes	N/A	"T2 [two] (Line Trigger)" on page 525
T3	Sets the trigger mode to external	Yes	Yes	N/A	"T3 [three] (External Trigger)" on page 526
T4	Sets the trigger mode to video	Yes	Yes	N/A	"T4 [four] (Video Trigger)" on page 527
T7	Sets the trigger mode to level	N/A	N/A	N/A	
T8	Sets the trigger mode to	N/A	N/A	N/A	

Command	Description	8566	8568	8560 Series	More Information
	edge				
TA	Returns trace A amplitude values to controller	Yes	Yes	N/A	"TA (Trace A)" on page 528
TB	Returns trace B amplitude values to controller	Yes	Yes	N/A	"TB (Trace B)" on page 529
TDF	Trace data format	Yes	Yes	Yes	"TDF (Trace Data Format)" on page 530
TEXT	Writes text on the analyzer screen	No	No	No	
TH	Threshold	Yes	Yes	Yes	"TH (Threshold)" on page 531
THE	Turns the threshold on or off	Yes	Yes	N/A	"THE (Threshold Enable)" on page 533
THEN	Conditional Programming (If...then...else...endif)	No	No	No	
TIMEDATE	Allows setting of time & date for analyzer	N/A	N/A	Yes	"TIMEDATE (Time Date)" on page 534
TIMEDSP	Enables display of time & data on analyzer display	N/A	N/A	N/A	
TITLE	Title entry	N/A	N/A	Yes	"TITLE (Title)" on page 535
TM	Trigger Mode	Yes	Yes	Yes	"TM (Trigger Mode)" on page 536
TOI	Third order intermodulation measurement	N/A	N/A	N/A	
TOIR	Third order intermodulation response	N/A	N/A	N/A	
TRA	Returns trace A amplitude values to controller	Yes	Yes	Yes	"TRA (Trace Data Input and Output)" on page 537
TRB	Returns trace B amplitude values to controller	Yes	Yes	Yes	"TRB (Trace Data Input and Output)" on page 538
TRC	Returns trace C amplitude values to controller	Yes	Yes	N/A	"TRC (Trace Data Input and Output)" on page 539
TRCMEM	Trace C memory	N/A	N/A	N/A	
TRDEF	Trace define	No	No	No	
TRDSP	Trace display	Yes	Yes	N/A	"TRDSP (Trace Display)" on page 540
TRGRPH	Trace graph display	No	No	N/A	

Command	Description	8566	8568	8560 Series	More Information
TRIGPOL	Trigger polarity	N/A	N/A	Yes	"TRIGPOL (Trigger Polarity)" on page 541
TRMATH	Executes specified trace math at end of sweep	No	No	N/A	
TRPRST	Sets trace operations to their preset values	No	No	N/A	
TRSTAT	Returns current trace states to controller	Yes	Yes	N/A	"TRSTAT (Trace State)" on page 542
TS	Takes a sweep	Yes	Yes	Yes	"TS (Take Sweep)" on page 543
TVLINE	Selects which horizontal line of video to trigger on	N/A	N/A	N/A	
TVLSFRM	Selects the type of video frame to trigger on	N/A	N/A	N/A	
TVSTND	TV standard	N/A	N/A	N/A	
TVSYNC	Selects polarity of video modulation to trigger on	N/A	N/A	N/A	
TWNDOW	Formats trace information for FFT.	N/A	N/A	No	
UNTIL	Conditional Programming (Repeat...Until...)	No	No	No	
UP	Increases active function value by applicable step	N/A	N/A	N/A	
UR	Upper right x-y recorder output voltage at rear	No	No	N/A	
USERREV	Modifies response to query "REV (Revision)" on page 491	Ext	Ext	Ext	"USERREV" on page 544
USTATE	Configures user defined states	No	No	N/A	
VARDEF	Variable definition	No	No	No	
VARIANCE	Returns the amplitude variance of specified trace	No	No	No	
VAVG	Turns video averaging on or off	Yes	Yes	Yes	"VAVG (Video Average)" on page 545
VB	Video Bandwidth	Yes	Yes	Yes	"VB (Video Bandwidth)" on page 547
VBO	Video Bandwidth Coupling Offset	Yes	Yes	N/A	"VBO (Video Bandwidth Coupling Offset)" on page 549
VBR	Video Bandwidth Ratio	N/A	N/A	Yes	"VBR (Video Bandwidth to Resolution Bandwidth Ratio)" on page 550

Command	Description	8566	8568	8560 Series	More Information
VIEW	Stores and views the specified trace	Yes	Yes	Yes	"VIEW (View Trace)" on page 551
VTL	Video trigger level	N/A	N/A	Yes	"VTL (Video Trigger Level)" on page 552
WAIT	Suspend program operation for specified time	N/A	N/A	N/A	
WINNEXT	Next window	N/A	N/A	N/A	
WINOFF	Turns off the window display mode	N/A	N/A	N/A	
WINON	Turns on the window display mode	N/A	N/A	N/A	
WINZOOM	Window zoom	N/A	N/A	N/A	
XCH	Exchanges the two specified traces.	Yes	Yes	N/A	"XCH (Exchange)" on page 553
ZMKCNTR	Zone marker at center frequency	N/A	N/A	N/A	
ZMKPKNL	Zone marker for next peak left	N/A	N/A	N/A	
ZMKPKNR	Zone marker for next peak right	N/A	N/A	N/A	
ZMKSPAN	Zone marker span	N/A	N/A	N/A	

6 Legacy Command Descriptions

This chapter describes all the supported 8560 Series, 8566A/B and 8568A/B commands, and gives brief details of their syntax and operation. The commands are sorted alphabetically. For more detailed information about these commands, see the User’s Guides for the 8566A/B, 8568A/B, and 8560 Series.

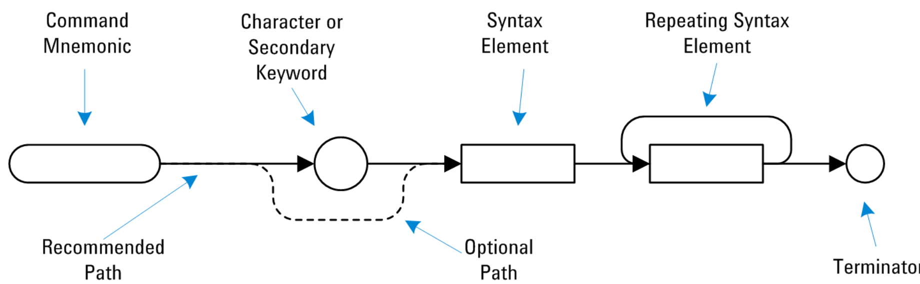
For a summary of all commands, see "List of Legacy Analyzer Commands" on page 221.

For explanations of the entries in this chapter, see:

- "Command Syntax" on page 252
- "Command Description Notes" on page 254

Command Syntax

Command syntax is represented pictorially.



- Ovals enclose command mnemonics. The command mnemonic must be entered as shown, with the exception that the case can be upper or lower.
- Uppercase is recommended for entering all commands unless otherwise noted.
- Circles and ovals surround secondary keywords or special numbers and characters. The characters in circles and ovals are considered reserved words and must be entered as shown with the exception that the case can be upper or lower.
- Rectangles contain the description of a syntax element defined in the table below.
- A loop above a syntax element indicates that the syntax element can be repeated.
- Solid lines represent the recommended path.
- Dotted lines indicate an optional path for bypassing secondary keywords or using alternate units.
- Arrows and curved intersections indicate command path direction.
- Semicolons are the recommended command terminators. Using semicolons makes programs easier to read, prevents command misinterpretation, and is recommended by IEEE-728-1982 (Recommended Practice for code and Format Conventions for IEEE Standard 488).
- Syntax Elements are shown in the syntax diagrams as elements within rectangles. In the syntax diagrams, characters and secondary keywords are shown within circles or ovals.

Syntax Elements

Syntax Component	Definition/Range
Analyzer command	Any command in this chapter, with required parameters and terminators.
Character	SP 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 databyte.
Character	8-bit byte containing only character data and followed by end-or-identify (EOI) condition, where the EOI control line

Syntax Component	Definition/Range
& EOI	on GPIB is asserted to indicate the end of the transmission. END signifies the EOI condition.
Character string	A list of characters.
Data byte	8-bit byte containing numeric or character data.
Data byte & EOI	8-bit byte containing numeric or character data followed by end-or-identify (EOI) condition, where the EOI control line on GPIB is asserted to indicate the end of the transmission. END signifies the EOI condition.
Delimiter	| \ @ ˆ $ % ; ! Matching characters that mark the beginning and end of a character string, or a list of commands. Choose delimiting characters that are not used within the string they delimit.
Digit	0 1 2 3 4 5 6 7 8 9
lsb length	Represents the least significant byte of a two-byte word that describes the number of bytes returned or transmitted. See msb length.
msb length	Represents the most significant byte of a two-byte word that describes the number of bytes returned or transmitted. See lsb length.
Number	Expressed as integer, decimal, or in exponential (E) form. Integer Number Range: –32,768 through +32,767 General formatting restrictions: Real Number Range: $\pm$ 1.797693134862315 x 10^{308}, including 0. Up to 15 significant figures allowed. Numbers may be as small as $\pm$ 2.225073858507202 x 10^{-308}
Output termination	Line feed (LF) and end-or-identify (EOI) condition. ASCII code 10 (line feed) is sent via GPIB and the end-or-identify control line on GPIB sets to indicate the end of the transmission.
Units	Represent standard scientific units: Frequency Units: GZ, GHZ, MZ, MHZ, KZ, KHZ, HZ Amplitude Units: DB, DBMV, DM, DBM, DBUV, V, MV, UV, W, MW, UW Time Units: SC, S, MS, US

Command Description Notes

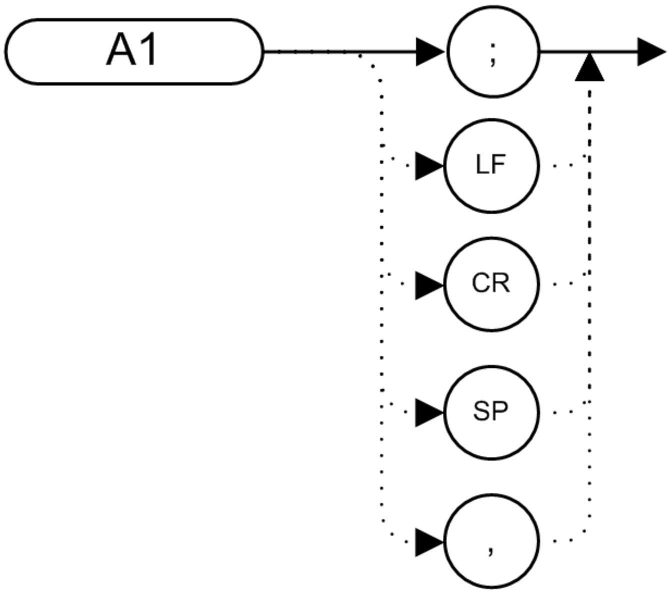
All supported commands are listed here, with descriptions and cross-references to similar commands.

The information here does not provide a comprehensive guide to all 8566A/B, 8568A/B, 8560 Series commands. It gives brief descriptions of the supported commands, and highlights important functional or behavioral differences that you should be aware of when transferring existing 8566A/B, 8568A/B, 8560 Series code to your X-Series instrument. For a complete description of the commands, refer to the 8566A/B, 8568A/B, 8560 Series Operating and Programming Manual.

To avoid confusion between numbers and letters, all commands that incorporate numbers have the number spelled out and placed in square brackets after the command. For example, the command I1 is shown as ‘I1 [one]’ - that is, the capital letter ‘I’ followed by the number ‘1’, and then the word ‘one’ in square brackets. The word in brackets does not form part of the command.

A1 [one] (Clear Write for Trace A)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

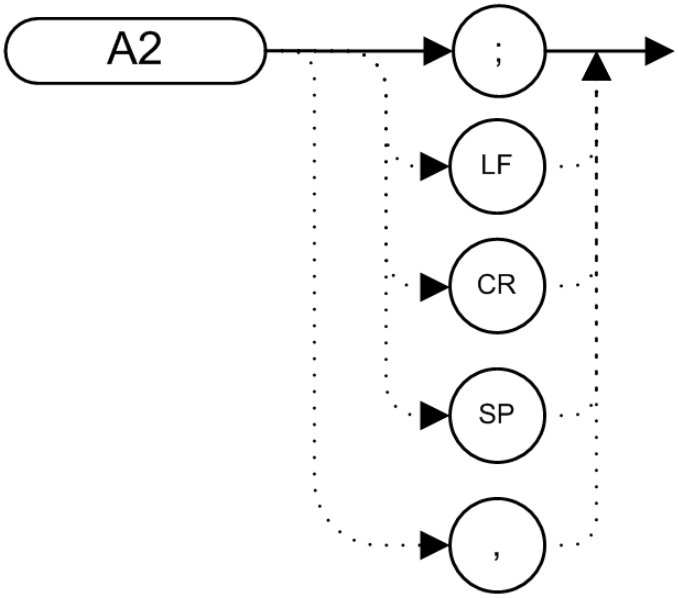
Description

Sets Trace A to clear write, which means that it continuously displays any signal present at the instrument input. This command initially clears Trace A, setting all elements to zero.

Format	A1
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of command A1 are identical to the command "CLRW (Clear Write)" on page 307.

A2 [two] (Maximum Hold for Trace A)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

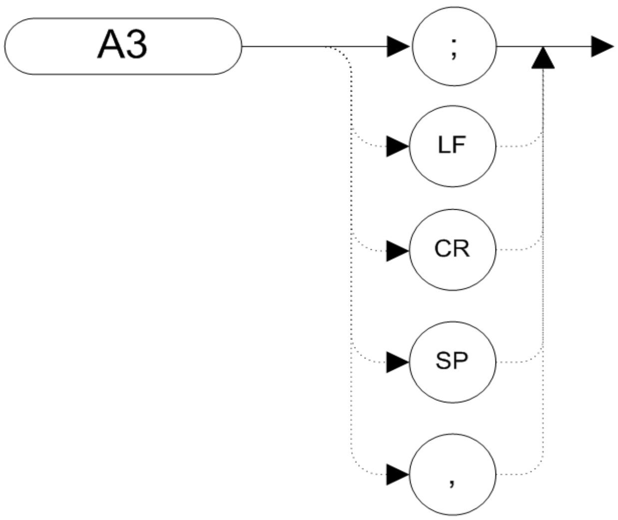
Description

Updates each trace element with the maximum level detected during the period that the trace has been active.

Format	A2
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of the command A2 are identical to the MXMH TRA command. See "MXMH (Maximum Hold)" on page 460.

A3 [three] (View Mode for Trace A)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

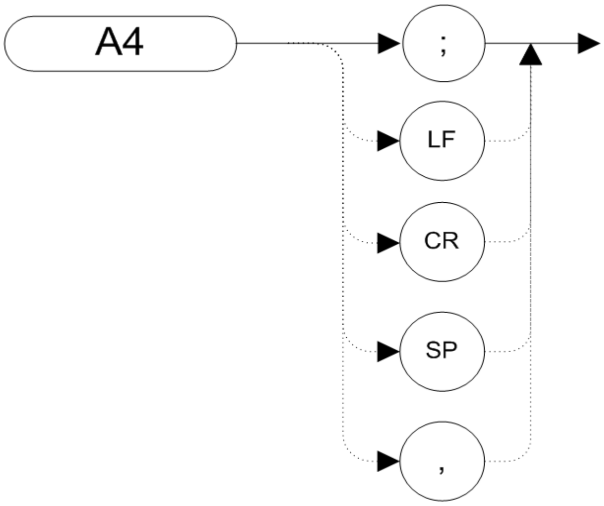
Description

Displays Trace A and then stops the sweep if no other traces are active. Trace A does not get updated with new data.

Format	A3
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of the command A3 are identical to the VIEW TRA command. See "VIEW (View Trace)" on page 551.

A4 [four] (Blank Trace A)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

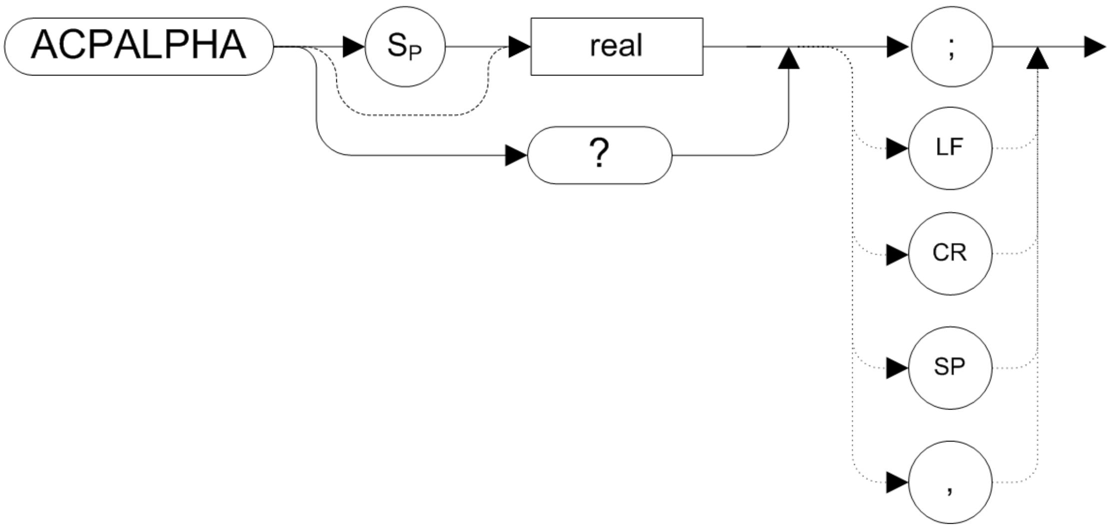
Description

Blanks Trace A and stops the sweep if no other traces are active. Trace A is not updated.

Format	A4
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of the command A4 are identical to the BLANK TRA command. See "BLANK (Blank Trace)" on page 292.

ACPALPHA (Adjacent Channel Power Alpha Weighting)

Syntax



Legacy Products

8560 series

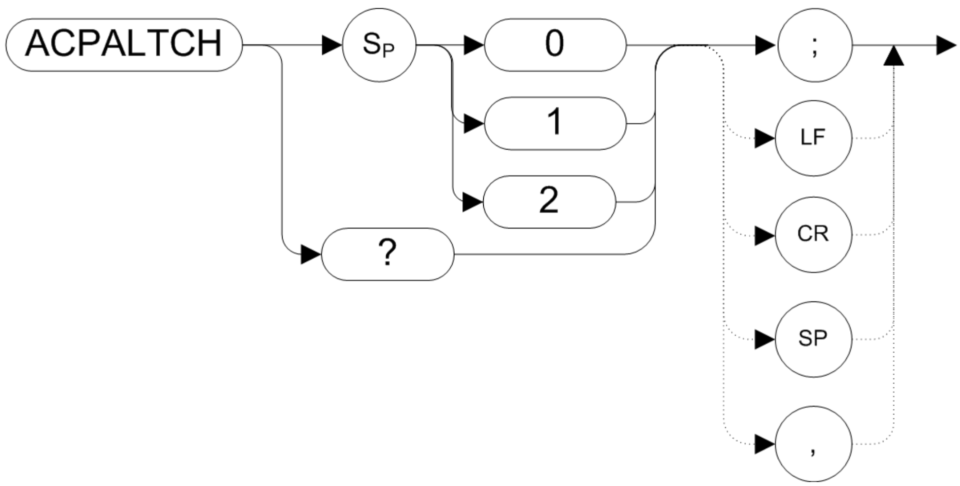
Description

Sets the alpha weighting for ACP measurements.

Format	ACPALPHA <real> (Valid Range from 0 to 1) ACPALPHA?
Query Data Type	<real> (Valid Range from 0 to 1)
SCPI Equivalent Commands	None
Preset	Default – 0.35 Not affected by preset or Power Cycle
Couplings	
Errors	
Notes	The functions of the command A2 are identical to the MXMH TRA command. See "MXMH (Maximum Hold)" on page 460.

ACPALTCH (Adjacent Channel Power Alternate Channels)

Syntax



Legacy Products

8560 series

Description

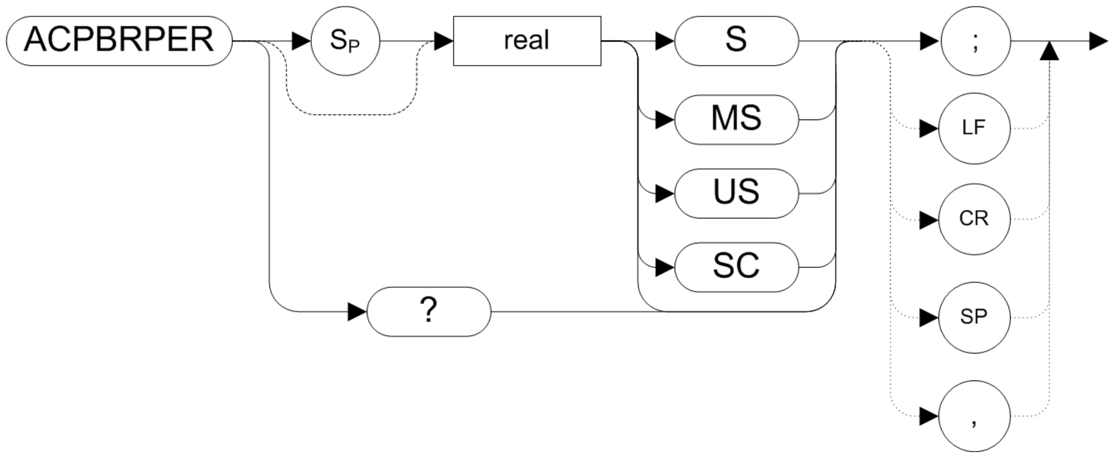
Sets the number of alternate channels to be measured by an adjacent channel power measurement to either 0, 1, or 2. The number of alternate channels is used with the command "ACPRSLTS (Adjacent Channel Power Measurement Results)" on page 272.

Specifying parameter value 0 makes the measurement with the adjacent channel pair, but no alternate channels. Specifying 1 selects the first alternate channel pair, which is centered at ±2 times the channel spacing away from the center frequency of the main channel. Specifying 2 selects the second alternate pair, which is at ±3 times the channel spacing.

Format	ACPALTCH <integer> (Valid Range: 0, 1, 2) ACPALTCH?
Query Data Type	<integer> (Valid Range: 0, 1, 2)
SCPI Equivalent Commands	None
Preset	Default: 0. Not affected by preset or Power Cycle.

ACPBRPER (Adjacent Channel Power Burst Period)

Syntax



Legacy Products

8560 series

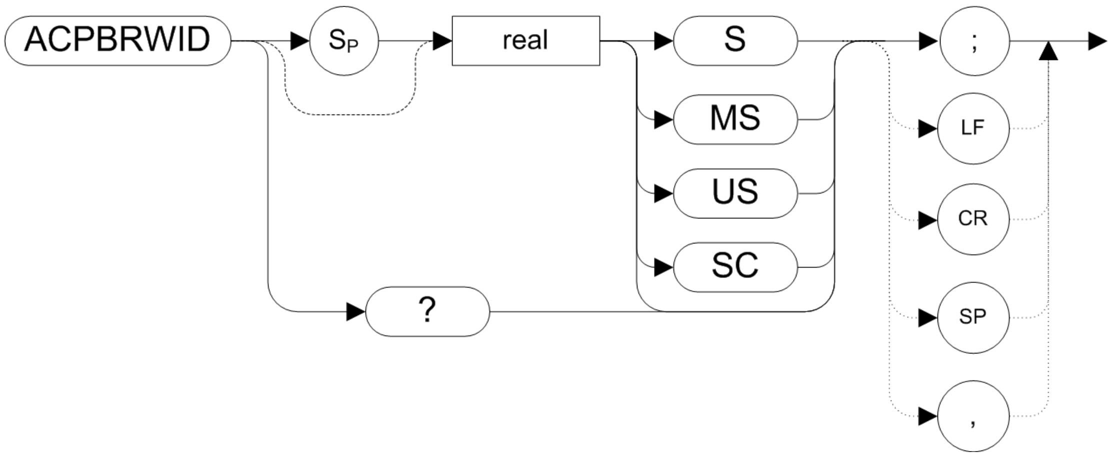
Description

Sets the cycle time (period) of the burst RF signal. The cycle time is needed to set the sweep times when using the peak, two bandwidth, burst power, and gated methods for adjacent channel power measurements.

Format	ACPBRPER <real> (in time unit) ACPBRPER?
Query Data Type	<real>
SCPI Equivalent Commands	None
Preset	Default: 0. Not affected by preset or Power Cycle.
Notes	N9061A supports the ACP measurement using the ANALOG method only and therefore, although you can set ACPBRPER, it has no effect.

ACPBRWID (Adjacent Channel Power Burst Width)

Syntax



Legacy Products

8560 series

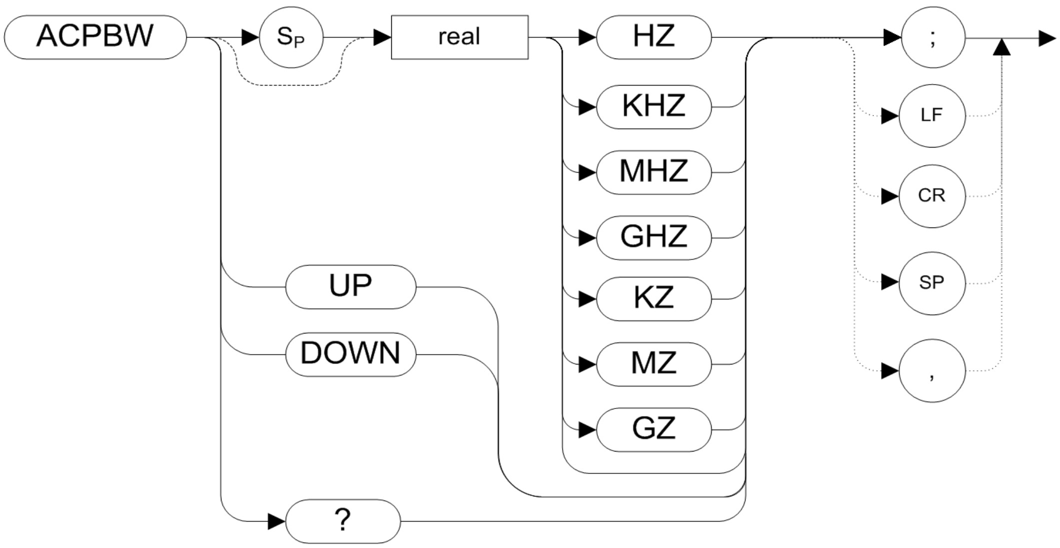
Description

Sets the on-time (pulse width) of the burst RF signal. The pulse width is needed to set the gating times when using the gated method for adjacent channel power measurements.

Format	Range: 5 µs to 9.5 seconds.
Query Data Type	<real> (in time units)
SCPI Equivalent Commands	None
Preset	Default: 0. Not affected by preset or Power Cycle.
Notes	N9061A supports the ACP measurement using the ANALOG method only and therefore, although you can set ACPBRWID, it has no effect.

ACPBW (Adjacent Channel Power Bandwidth)

Syntax



Legacy Products

8560 series

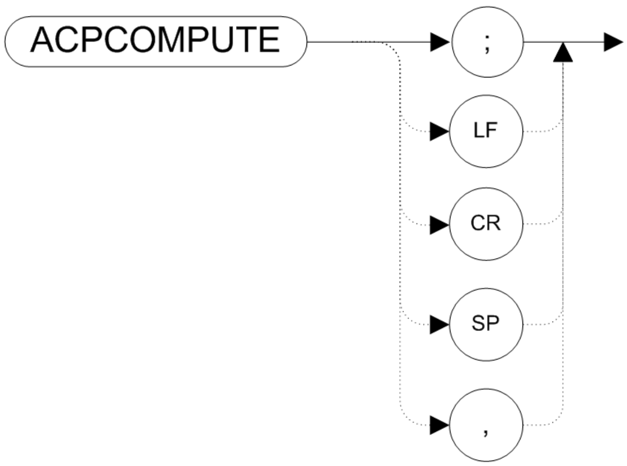
Description

Sets the bandwidth of the channels as an active function for the commands "ACPMEAS (Measure Adjacent Channel Power)" on page 268 and "ACPCOMPUTE (Adjacent Channel Power Compute)" on page 264.

Format	ACPBW <frequency> with frequency unit ACPBW? Range: <frequency>: 200 Hz to the double of max frequency range. UP: original value x 1.1. DN: original value x 0.9.
Query Data Type	Frequency in Hz
SCPI Equivalent Commands	None
Preset	Default: 8.5 kHz. Not affected by preset or Power Cycle.
Couplings	Channel spacing does not couple with channel bandwidth.

ACPCOMPUTE (Adjacent Channel Power Compute)

Syntax



Legacy Products

8560 series

Description

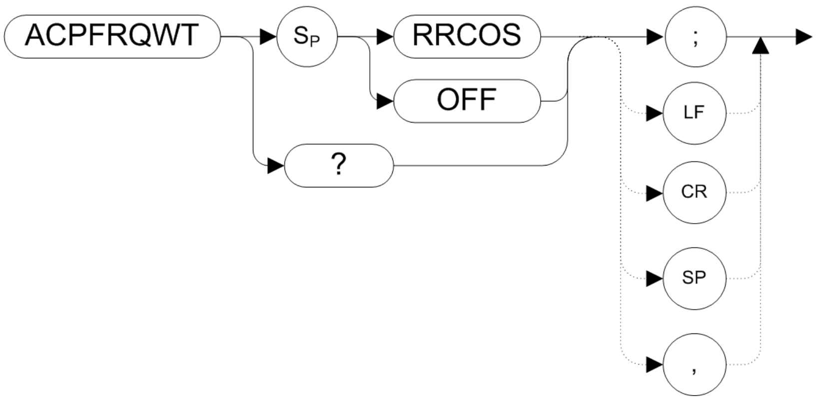
Calculates the ACP of a transmitter based on data on the display. This function does not make a new measurement before computing. The measurement must have been made with ANALOG or PEAK method selected so the appropriate data is available for the calculation.

This function is useful for recalculating ACP results on the same trace with different parameter settings.

Format	ACPCOMPUTE
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ACPFRQWT (Adjacent Channel Power Frequency Weighting)

Syntax



Legacy Products

8560 series

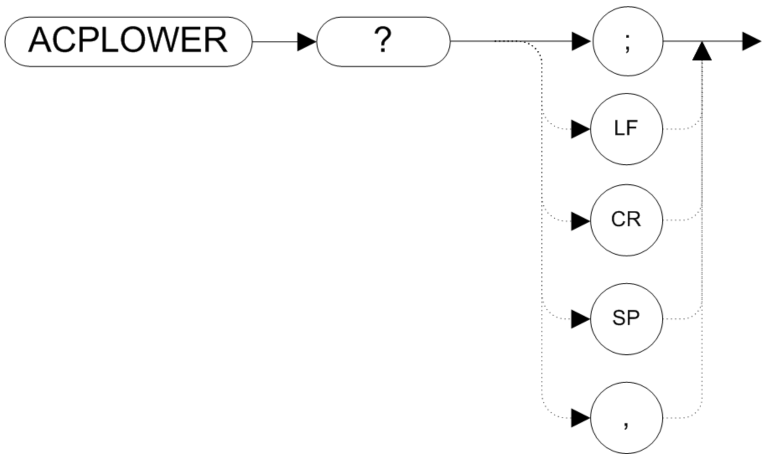
Description

This command is used to control the frequency weighting when making an Adjacent Channel Power measurement. Weighting is not used in the measurement if OFF has been selected. Root-raised-cosine weighting is selected with the RRCOS parameter.

Format	ACPFRQWT RRCOS|OFF ACPFRQWT?
Query Data Type	RRCOS|OFF
SCPI Equivalent Commands	None
Preset	Default: OFF. Not affected by preset or Power Cycle.
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ACPLOWER (Lower Adjacent Channel Power)

Syntax



Legacy Products

8560 series

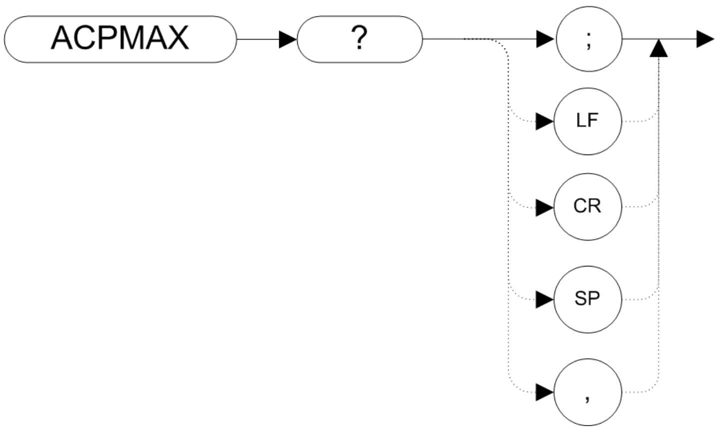
Description

Returns the power ratio result of the Adjacent Channel Power measurement for the lower frequency channel.

Format	ACPLOWER?
Query Data Type	The power ratio result in dB.
SCPI Equivalent Commands	None
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ACPMAX (Maximum Adjacent Channel Power)

Syntax



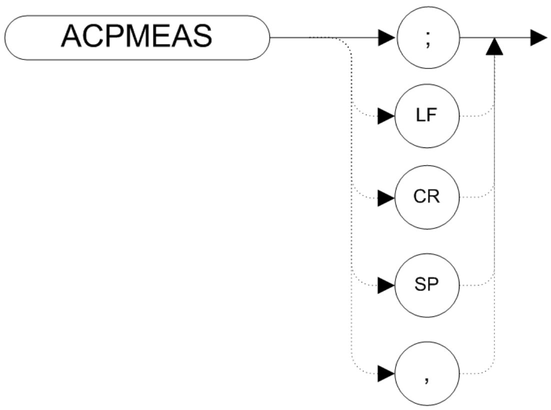
Description

Returns the maximum adjacent channel power of the adjacent channel power measurement.

Format	ACPMAX?
Query Data Type	The maximum adjacent channel power in dB.
SCPI Equivalent Commands	None
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ACPMEAS (Measure Adjacent Channel Power)

Syntax



Legacy Products

8560 series

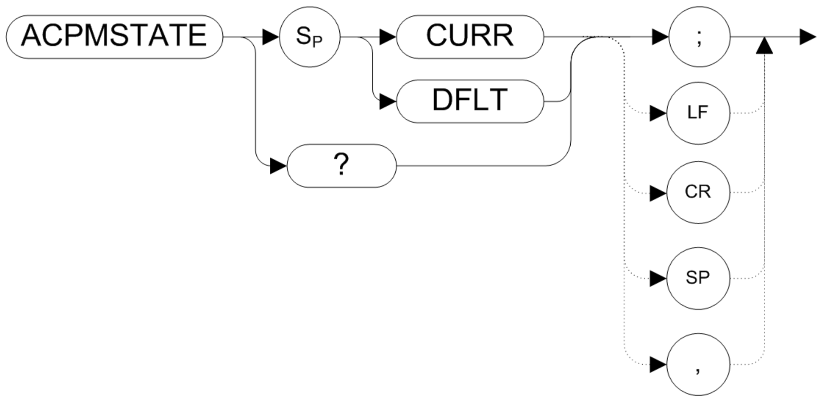
Description

Makes a measurement and calculates the adjacent channel power (ACP) of a transmitter. The measurement determines the leakage power that is in the channels adjacent to the carrier. The result is the ratio of the leakage power in the channel adjacent to the total power transmitted by the transmitter.

Format	ACPMEAS
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ACPMSTATE (Adjacent Channel Power Measurement State)

Syntax



Legacy Products

8560 series

Description

Sets the parameters of the measurement state to either the default state (determined by the setup) or the current state. The state parameters that could change between the default state and a current state include:

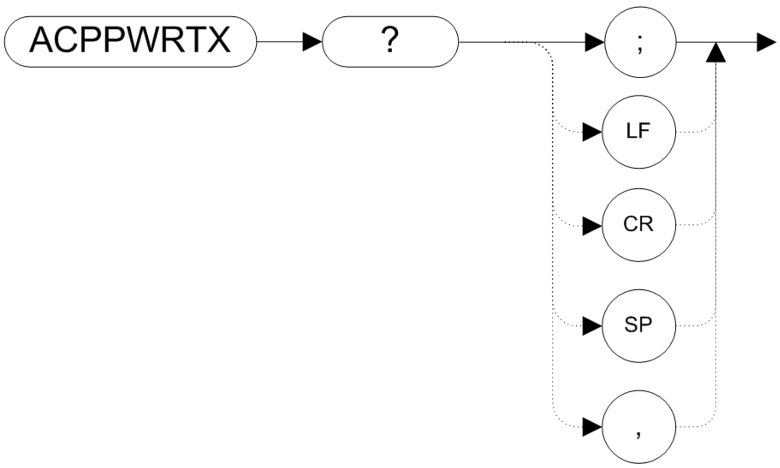
- Resolution bandwidth
- Video bandwidth
- Span
- Sweep time
- Detector mode
- Gating parameters
- Trigger parameters
- Video averaging

Format	ACPMSTATE CURR|DFLT ACPMSTATE?
Query Data Type	CURR|DFLT
SCPI Equivalent Commands	None
Preset	Default: DFLT. Not affected by preset or Power Cycle.

Couplings	Changes the following parameters: • Resolution bandwidth • Video bandwidth • Span • Sweep time • Detector mode • Gating parameters • Trigger parameters • Video averaging
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ACPPWRTX (Adjacent Channel Power Total Power Transmitted)

Syntax



Legacy Products

8560 series

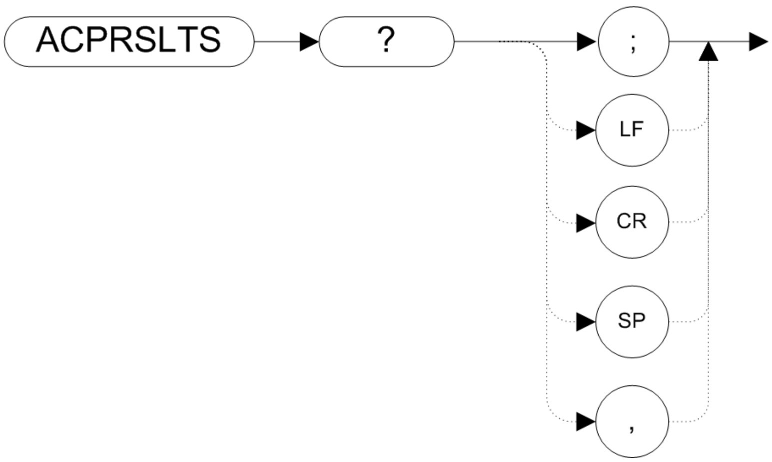
Description

Returns the result of the total power transmitted calculation of the adjacent channel power measurement.

Format	ACPPWRTX?
Query Data Type	A variable that contains the total transmit band carrier power. Unit is determined by command "AUNITS (Absolute Amplitude Units)" on page 283.
SCPI Equivalent Commands	None
Notes	The measurement must be made with the analog or burst power method selected, but the N9061A application supports the ACP measurement using the ANALOG method only.

ACPRSLTS (Adjacent Channel Power Measurement Results)

Syntax



Legacy Products

8560 series

Description

Returns an array of power data resulting from an ACP measurement of an RF signal. The number of alternate channel pairs selected by the command "ACPALTCH (Adjacent Channel Power Alternate Channels)" on page 260 determines the size of the array.

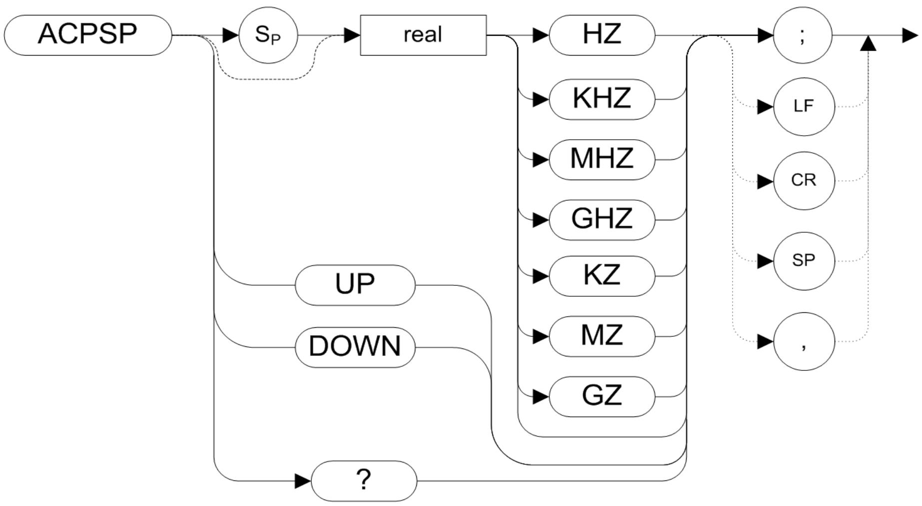
Format	ACPRSLTS?
Query Data Type	(Analog Method) Number of Results per Set: 2. See "Query Data Type Details" on page 273 below. Results (in order of output): • ACP ratio (lower channel) • ACP ratio (upper channel)
SCPI Equivalent Commands	None
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

Query Data Type Details

Alternate Channels	Channels used for Calculation	Number of Values Returned
0	• Main channel • Lower adjacent channel • Upper adjacent channel	1 set
1	Above channels plus: • First alternate lower channel • First alternate upper channel	2 sets
2	Above channels plus: • Second alternate lower channel • Second alternate upper channel	3 sets

ACPSP (Adjacent Channel Power Channel Spacing)

Syntax



Legacy Products

8560 series

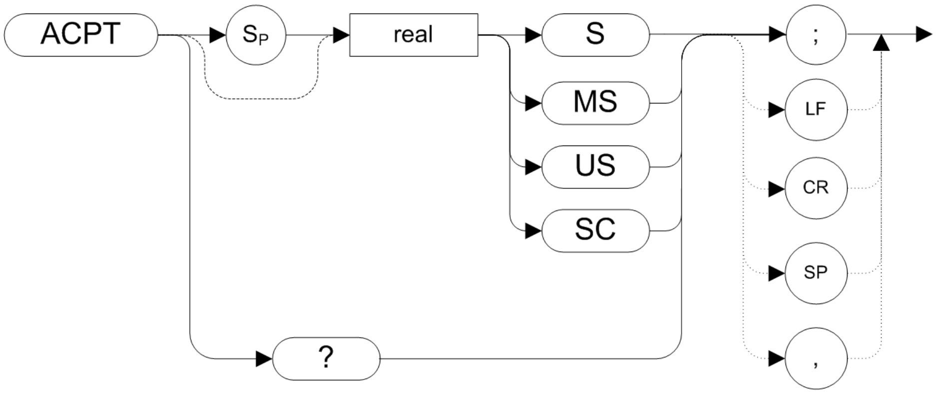
Description

Sets the channel spacing for the commands "ACPMEAS (Measure Adjacent Channel Power)" on page 268 and "ACPCOMPUTE (Adjacent Channel Power Compute)" on page 264.

Format	ACP <real> with frequency units ACP? Range: <real>: Minimum: 100 Hz. Maximum: 25 GHz. UP: original value x 1.1. DN: original value x 0.9.
Query Data Type	<real> in Hz
SCPI Equivalent Commands	None
Preset	Default: 12.5 kHz. Not affected by preset or Power Cycle.
Couplings	Channel spacing does not couple with channel bandwidth.
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ACPT (Adjacent Channel Power T Weighting)

Syntax



Legacy Products

8560 series

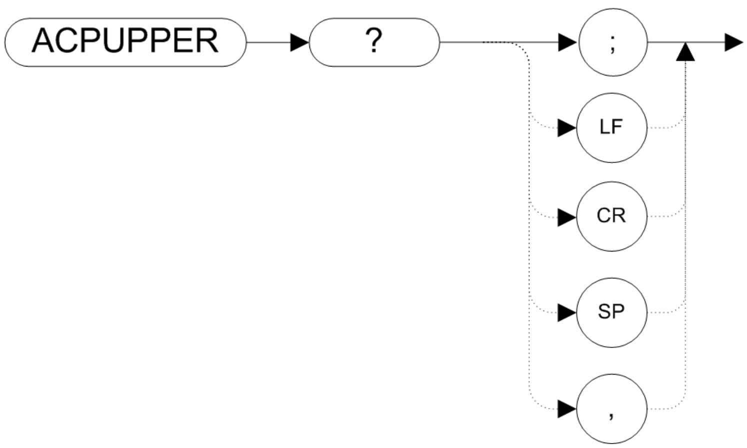
Description

This command is used to set the T used in weighting for an adjacent channel power measurement.

Format	ACPT <real> in time units ACPT? Range: 1 µs to 1 s.
Query Data Type	Real number in sec.
SCPI Equivalent Commands	None
Preset	Default: 341 µs. Not affected by preset or Power Cycle.
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ACPUPPER (Upper Adjacent Channel Power)

Syntax



Legacy Products

8560 series

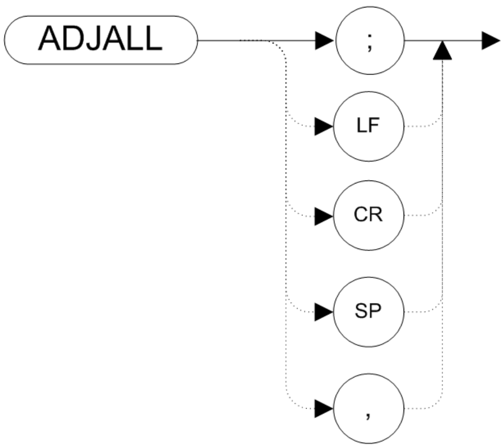
Description

Returns the power ratio result of the adjacent channel power measurement for the upper frequency channel.

Format	ACPUPPER?
Query Data Type	The power ratio result in dB.
SCPI Equivalent Commands	None
Notes	The N9061A application supports the ACP measurement using the ANALOG method only.

ADJALL (LO and IF Adjustments)

Syntax



Legacy Products

8560 series

Description

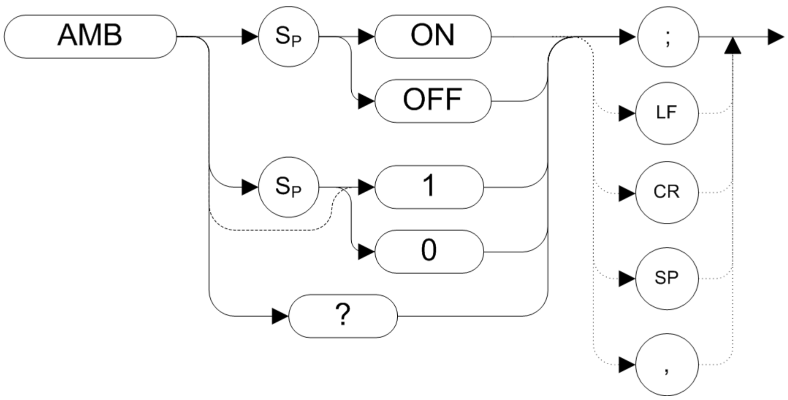
Activates the RF local oscillator (LO) and intermediate frequency (IF) alignment routines. These are the same routines that occur when the instrument is switched on. They are also the same routines that are performed when you press System, Alignments, Align Now, All.

Commands following ADJALL are not executed until after the instrument has finished the alignment routines.

Format	ADJALL;
Query Data Type	N/A
SCPI Equivalent Commands	:CALibration[:ALL] (see "All" on page 1219)

AMB (A minus B into A)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

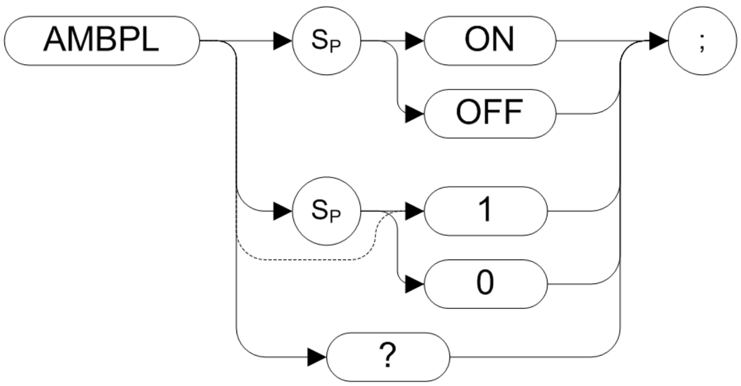
Subtracts the points in Trace B from the corresponding points in Trace A, and sends the results to Trace A. Thus, AMB can restore the original trace after an "APB (Trace A Plus Trace B to A)" on page 281 or a "KSc (A Plus B to A)" on page 366 command has been executed.

The query AMB? returns different responses depending on the language being used. The 8560 Series languages return either a 1 or a 0 to indicate the On or Off status.The 8566, 8568 Series languages all return either ON or OFF.

Format	AMB 0|1|OFF|ON AMB?
Query Data Type	1 or 0, indicating ON or OFF state respectively.
SCPI Equivalent Commands	None
Preset	OFF
Couplings	Sets Trace B to View mode and turns "AMBPL (A minus B plus Display Line into A)" on page 279 (Normalize) OFF. All trace math is mutually exclusive, so turning one on turns the other off and vice versa. Similarly, when AMB is on and you change Trace B to Clearwrite or Maxhold, it turns AMB off.
Notes	The functions of the command AMB are identical to the command "C2 [two] (A Minus B Into A) " on page 297.

AMBPL (A minus B plus Display Line into A)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

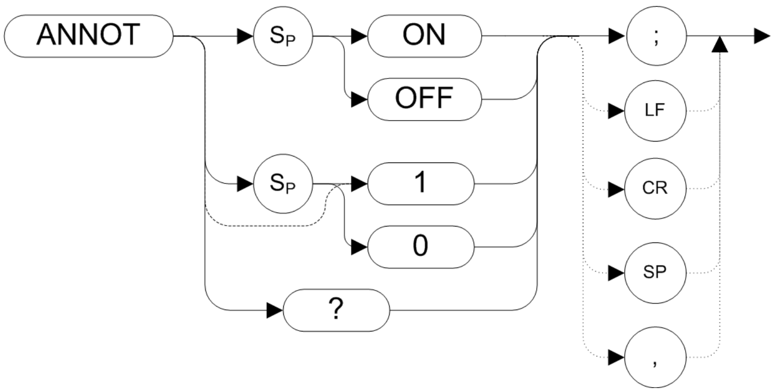
Does a point-by-point subtraction of Trace B from Trace A, and then adds the display line point values to the difference. The results are sent to Trace A.

The query command AMBPL? returns different responses depending on the language being used.

Format	AMBPL (0|1|OFF|ON) AMBPL?
Query Data Type	8560: 1 or 0, indicating ON or OFF state respectively. 8566A/B, 8568A/B: ON or OFF.
SCPI Equivalent Commands	None
Preset	OFF
Couplings	AMBPL sets Trace B to View mode and turns AMB (Normalize) OFF. All trace math is mutually exclusive, so turning one on turns the other off and vice versa. Similarly, when AMBPL is on and you change Trace B to Clearwrite or Maxhold, it turns AMBPL off.

ANNOT (Annotation)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

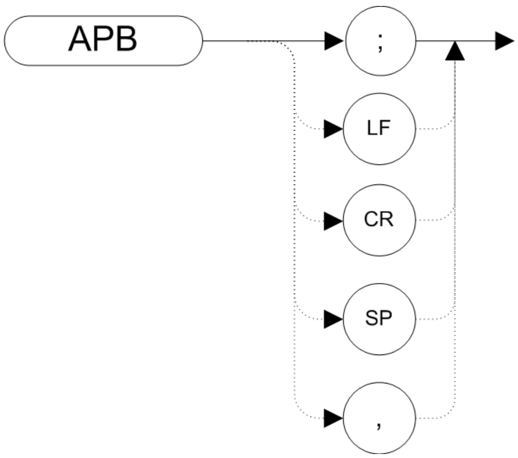
Description

Turns on or off all annotation on the instrument display. Softkey labels are not affected by this command and remain displayed.

Format	ANNOT (0|1|ON|OFF)
Query Data Type	1 or 0, indicating ON or OFF state respectively.
SCPI Equivalent Commands	DISPlay:ANNotation:SCReen[:STATe] OFF|ON|0|1 DISPlay::ANNotation:SCReen[:STATe]? (See "Screen" on page 1373)
Preset	ON
Couplings	Following FDSP, ANNOT does nothing until instrument preset.
Notes	The functions of ANNOT are identical to the commands "KSo (Annotation Off)" on page 387 and "KSp (Annotation On)" on page 389. The two alternative commands, KSo and KSp, are only valid when the remote language is either HP8566A, HP8566B, HP8568A, or HP8568B.

APB (Trace A Plus Trace B to A)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

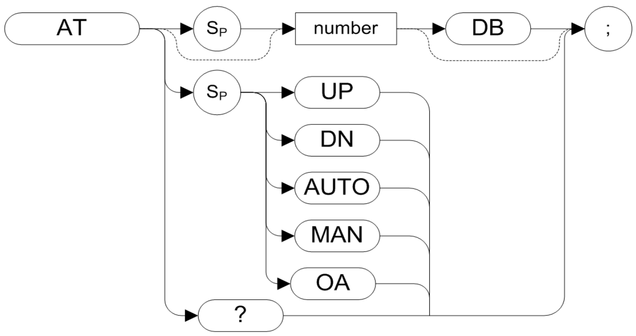
Description

Does a point-by-point addition of Trace A and Trace B, and sends the results to Trace A. Thus, APB can restore the original trace after an "AMB (A minus B into A)" on page 278 or a "C2 [two] (A Minus B Into A)" on page 297 command has been executed.

Format	APB
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of APB are identical to the command "KSc (A Plus B to A)" on page 366. The alternative command, KSc, is only valid when the remote language is either HP8566A, HP8566B, HP8568A, or HP8568B.

AT (Input Attenuation)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Specifies the RF input attenuation.

Although the attenuation level in the X-series instruments can be specified using absolute values, you can never set attenuation below 10 dB using the DN parameter. This is a safety feature to prevent inadvertent setting of attenuation to a level that could damage the instrument.

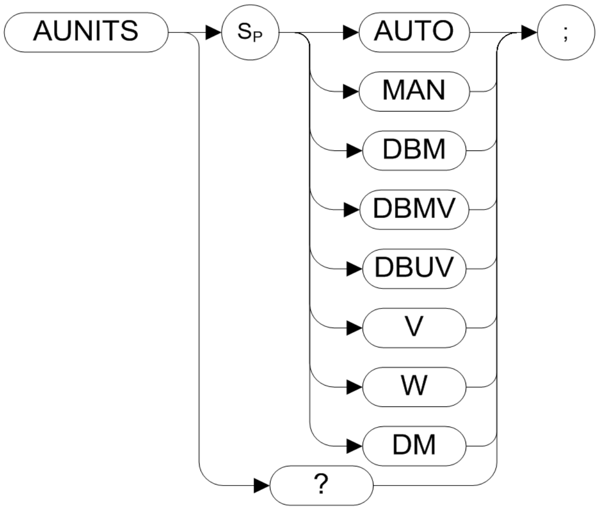
Signal levels above +30 dBm will damage the instrument.

Format	AT <number> DB <number>: any real number or integer. If the value you enter is not a valid value for the instrument you are using, it switches automatically to the closest valid setting. Default unit: dB. Range: 0 to 70 dB specified absolutely, and 10 to 70 dB in 10 dB steps. (If 8564E/EC or 8565E/EC is selected, the range is limited to 0 to 60 dB.) AT OA|DN|UP|AUTO|MAN (AUTO|MAN available for 8560 Series only) AT? (Step Increment: 10 dB)
Query Data Type	<real> in dB.
SCPI Equivalent Commands	[:SENSE]:POWer[:RF]:ATTenuation:STEP[:INCRement] 10dB (on mode entry or preset: see "(Mech) Atten Step" on page 569) [:SENSE]:POWer[:RF]:ATTenuation:AUTO (OFF|ON|0|1) (see "(Mech) Atten " on page 562)
Preset	10 dB
Notes	In PXA/MXA, the auto attenuation range is 6-70 dB. In EXA, it is 6-60 dB. You cannot step down below 10 dB. To set levels below 10 dB, you must specify the attenuation absolutely. For example, to set attenuation to 0 dB, you must use the command AT 0DB.

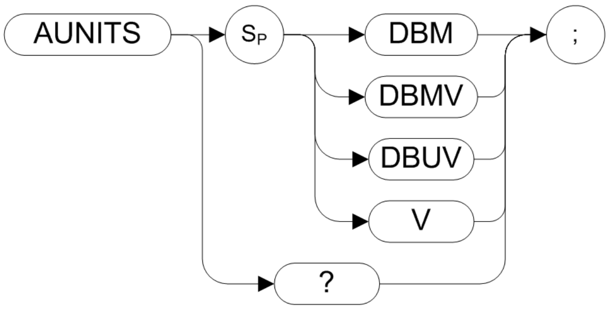
AUNITS (Absolute Amplitude Units)

Syntax

8560 series



8566A/B, 8568A/B



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Specifies the amplitude readout units for the reference level, the marker, and the display line.

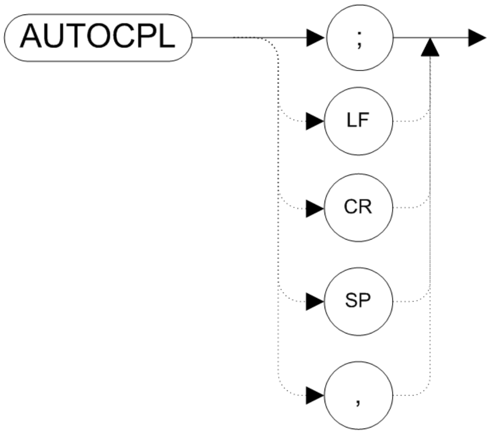
If your selected remote language is any of the 8560 Series analyzers, and if the AUNITS setting is AUTO, then a change from log scale (LG) to linear scale (LN) automatically changes the AUNITS setting. For all other settings, no change to AUNITS occurs, even when the scale is changed.

Format	AUNITS AUTO|MAN|DBM|DBMV|DBUV|V|W|DM AUNITS?
Query Data Type	DBM|DBMV|DBUV|V

SCPI Equivalent Commands	:UNIT:POWer (DBM|DBMV|DBUV|V|W) :UNIT:POWer? (See "Y Axis Unit" on page 573)
Preset	DBM
Notes	The functions of AUNITS are identical to the commands "KSA (Amplitude in dBm)" on page 361, "KSB (Amplitude in dBmV)" on page 363, "KSC (Amplitude in dBµV)" on page 365, and "KSD (Amplitude in Volts)" on page 367. The four alternative commands, KSA, KSB, KSC, and KSD are only valid when the remote language is HP8566A/B or HP8568A/B.

AUTOCPL (Auto Coupled)

Syntax



Legacy Products

8560 series

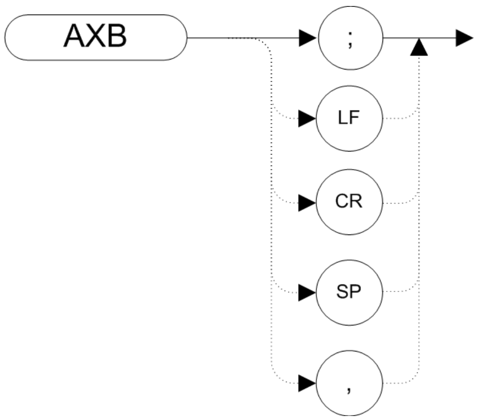
Description

Sets video bandwidth, resolution bandwidth, input attenuation, sweep time and center frequency step-size to coupled mode.

Format	AUTOCPL
Query Data Type	N/A
SCPI Equivalent Commands	:COUPle ALL (See "Auto Couple" on page 586)

AXB (Exchange Trace A and Trace B)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

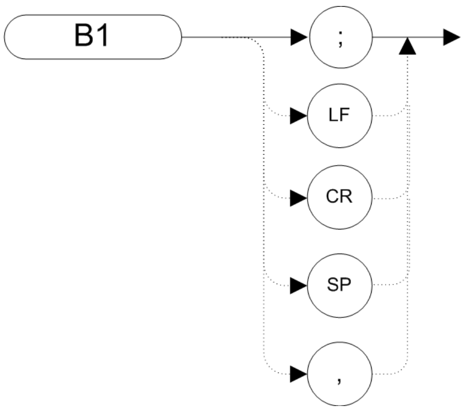
Description

Exchanges Trace A and Trace B, point by point.

Format	AXB
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of the command AXB are identical to the command "EX (Exchange Trace A and Trace B)" on page 333 and to the XCH TRA,TRB form of the command "XCH (Exchange)" on page 553.

B1 [one] (Clear Write for Trace B)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

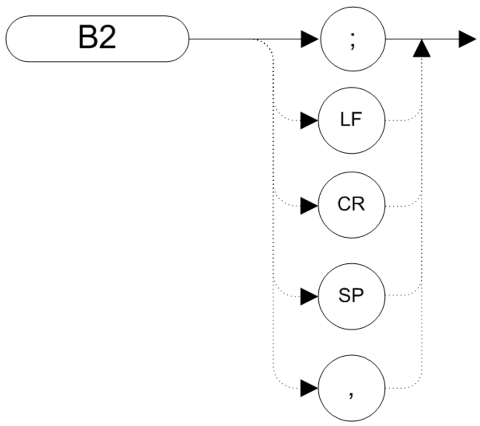
Description

Sets Trace B to clear write. That is, it continuously displays any signal present at the instrument input. The B1 command initially clears Trace B, setting all elements to zero. The sweep trigger then signals the start of the sweep, and Trace B is continually updated as the sweep progresses. Subsequent sweeps send new amplitude information to the display addresses.

Format	B1
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of B1 are identical to the CLRW TRB form of the command "CLRW (Clear Write)" on page 307.

B2 [two] (Maximum Hold for Trace B)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

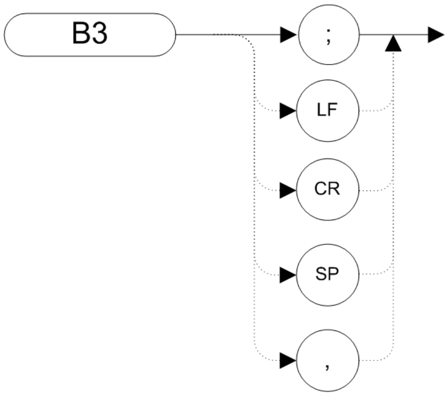
Description

Updates each trace element with the maximum level detected while the trace is active.

Format	B2
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of B2 are identical to the MXMH TRB form of the command "MXMH (Maximum Hold)" on page 460.

B3 [three] (View Mode for Trace B)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

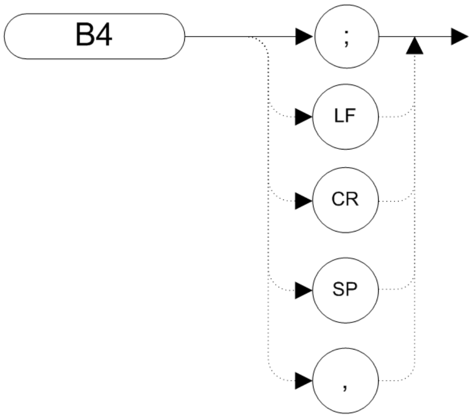
Description

Displays Trace B and then stops the sweep if no other traces are active. Trace B does not get updated.

Format	B3
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of B3 are identical to the VIEW TRB form of the command "VIEW (View Trace)" on page 551.

B4 [four] (Blank Trace B)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

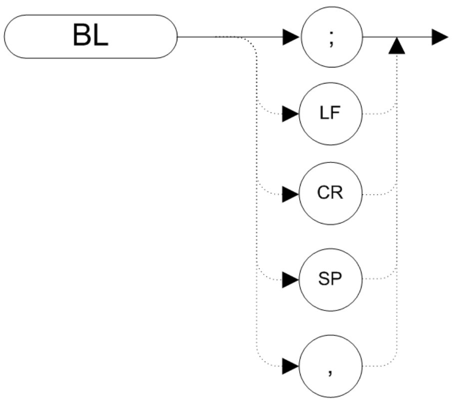
Description

Blanks Trace B and stops the sweep if no other traces are active. Trace B is not updated.

Format	B4
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of B4 are identical to the BLANK TRB form of the command "BLANK (Blank Trace)" on page 292.

BL (Trace B minus Display Line to Trace B)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Subtracts the display line from Trace B and sends the results to Trace B.

The command BL is calculated differently depending on the language being used; for the 8560 Series the calculation is performed in units of dBm.

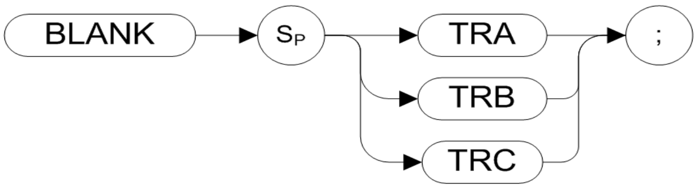
8560 Series	The calculation is performed in units of dBm.
8566A/B 8568A/B	The calculation is performed in display units.

Format	BL
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of BL are identical to the command "BML (Trace B Minus Display Line)" on page 293.

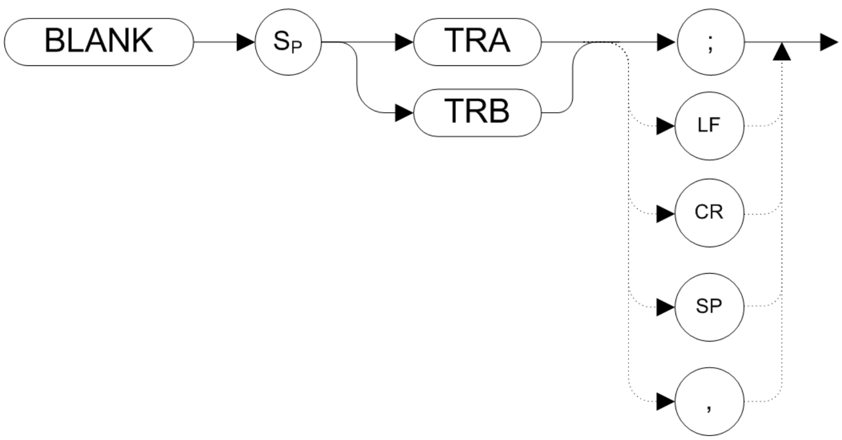
BLANK (Blank Trace)

Syntax

8560 Series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

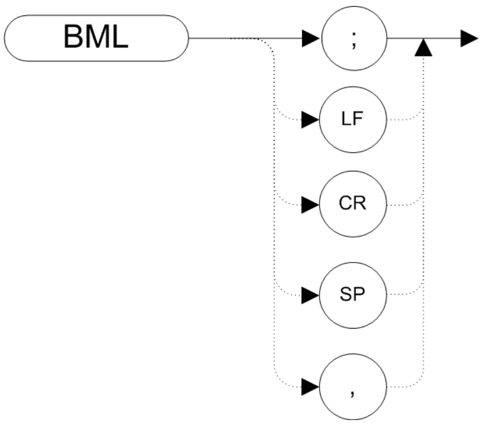
Description

Blanks Trace 1 or trace 2 and stops taking new data into the specified trace. TRA corresponds to Trace 1, TRB corresponds to Trace 2, and so on.

Format	8566A/B, 8568A/B: BLANK TRA|TRB|TRC 8560 Series: BLANK TRA|TRB
Query Data Type	N/A
SCPI Equivalent Commands	TRACe[1|2|3|4|5|6]:UPDate[:STATe] OFF TRACe[1|2|3|4|5|6]:DISPlay[:STATe] OFF (See "View/Blank " on page 1284)
Preset	TRB, TRC Blank.
Notes	The functions of BLANK are identical to the commands "A4 [four] (Blank Trace A)" on page 258, "B4 [four] (Blank Trace B)" on page 290, KSJ, and "KSk (Blank Trace C)" on page 379.

BML (Trace B Minus Display Line)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Subtracts the display line from trace B (point by point), and sends the difference to trace B. Trace B corresponds to Trace 2.

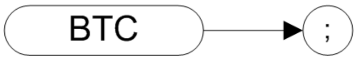
The command BML is calculated differently depending on the language being used:

- For the 8560 Series the calculation uses units of dBm.
- For the 8566A/B, 8568A/B, the calculation uses display units.

Format	BML
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of BML are identical to the command "BL (Trace B minus Display Line to Trace B)" on page 291.

BTC (Transfer Trace B to Trace C)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Transfers Trace B data to Trace C

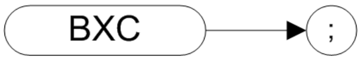
Trace C cannot be an active trace. This means that the data in Trace C cannot be updated as the instrument sweeps. To ensure that the current settings of the instrument are reflected in the data transferred from Trace B to Trace C, you must follow the four step process below.

1. Select single sweep mode (S2 or SNGLS command)
2. Select the desired instrument settings
3. Take one complete sweep
4. Transfer the data

Format	BTC
Query Data Type	N/A
SCPI Equivalent Commands	:TRACe:COPY TRACE2, TRACE3 (see "Copy/Exchange" on page 1312)
Notes	The functions of BTC are identical to the command "KSl (Transfer Trace B to Trace C)" on page 381.

BXC (Exchange Trace B and Trace C)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Exchanges Trace B data with Trace C data.

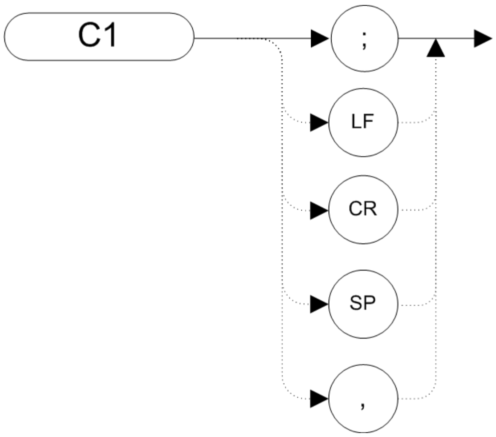
Trace C must not be an active trace. This means that the data in Trace C cannot be updated as the instrument sweeps. To ensure that the current settings of the instrument are reflected in the data exchanged between Trace B and Trace C, you must follow the four step process below.

1. Select single sweep mode (S2 or SNGLS command)
2. Select the desired instrument settings
3. Take one complete sweep
4. Exchange the data

Format	BXC
Query Data Type	N/A
SCPI Equivalent Commands	TRACe3:TYPe? TRACe3:UPDate? TRACe3:DISPlay? TRACe2:TYPe? TRACe2:UPDate? TRACe2:DISPlay? TRACe:EXCHange TRACE2, TRACE3 (See "View/Blank " on page 1284, etc.)
Couplings	Trace Update is set to Off and Trace Display is set to On.
Notes	The functions of BXC are identical to the command "KSi (Exchange Trace B and Trace C)" on page 376 and to the XCH TRB,TRC form of the command "XCH (Exchange)" on page 553.

C1 [one] (Set A Minus B Mode Off)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

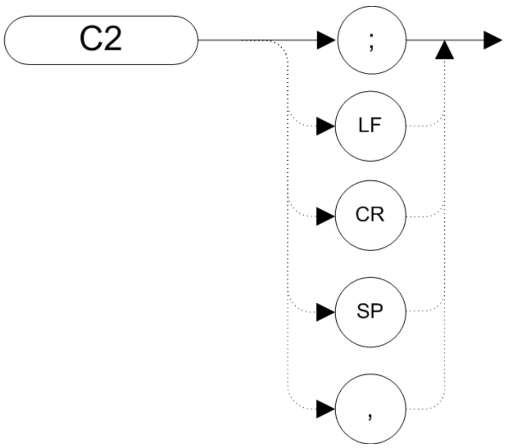
Description

Turns the A Minus B mode off. That is, it switches off the functionality that was switched on by the command "C2 [two] (A Minus B Into A)" on page 297 or by the AMB ON form of the command "AMB (A minus B into A)" on page 278.

Format	C1
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MATH TRACE4, OFF (see "Math" on page 1299)
Notes	The functions of C1 are identical to the AMB OFF form of the command "AMB (A minus B into A)" on page 278.

C2 [two] (A Minus B Into A)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

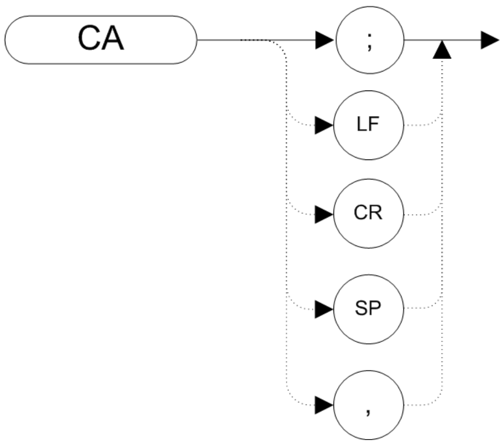
Description

Subtracts the points in Trace B from the corresponding points in Trace A, and sends the results to Trace A. Thus, if your input signal remains unchanged, C2 can restore the original trace after an "APB (Trace A Plus Trace B to A)" on page 281 or a "KSc (A Plus B to A)" on page 366 command has been executed.

Format	C2
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of C2 are identical to the AMB ON form of the command "AMB (A minus B into A) " on page 278.

CA (Couple Attenuation)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

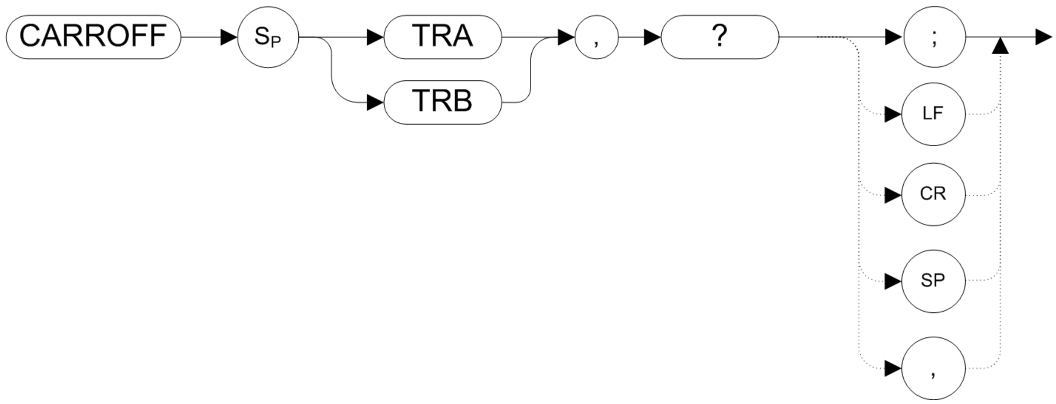
During normal operation, the instrument's input attenuation is coupled to the reference level. This coupling keeps the mixer input at a level such that a continuous wave signal displayed at the reference level is at or below –10 dBm (or the value specified in the ML command.)

The CA command sets the threshold to –10 dBm (or to the value specified by the commands "ML (Mixer Level)" on page 456 or "KS, (Mixer Level)" on page 357). The counterpart to the CA command is "AT (Input Attenuation)" on page 282, which allows levels less than the threshold value at the mixer input.

Format	CA
Query Data Type	N/A
SCPI Equivalent Commands	[:SENse]:POWer[:RF]:ATTenuation:AUTO ON (see "(Mech) Atten " on page 562)

CARROFF (Carrier Off Power)

Syntax



Legacy Products

8560 series

Description

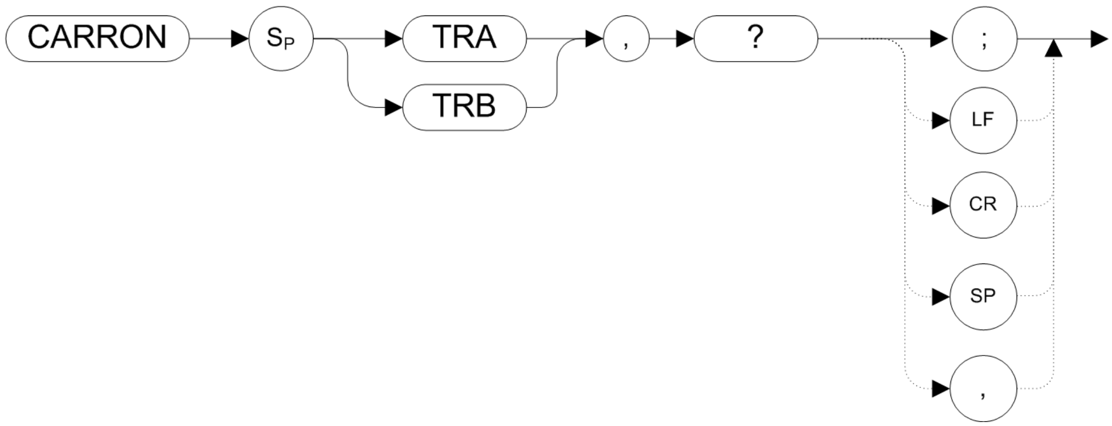
Measures the average and peak power of the carrier during the portion of time when the power is off (when it is not within 20 dB of its peak level). The powers are combined to provide a calculation of the leakage power.

The measurement must be in zero span for the measurement to run.

Format	CARROFF TRA|TRB,?
Query Data Type	<ampl> in dBm.
SCPI Equivalent Commands	None

CARRON (Carrier On Power)

Syntax



Legacy Products

8560 series

Description

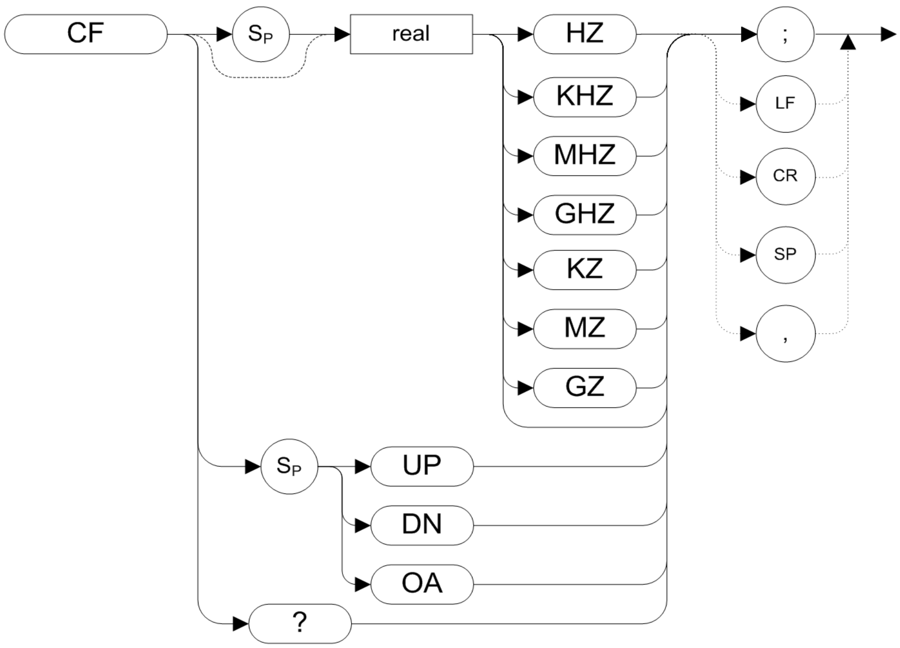
Measures the average power of the carrier during the portion of time when it is on and within 20 dB of its peak level.

The measurement needs to be in zero span for the measurement to run.

Format	CARRON TRA|TRB,?
Query Data Type	<ampl> in dBm.
SCPI Equivalent Commands	None

CF (Center Frequency)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Specifies the value of the center frequency.

The step size depends on whether the frequency has been coupled to the span width using the command "CS (Couple Frequency Step Size)" on page 312

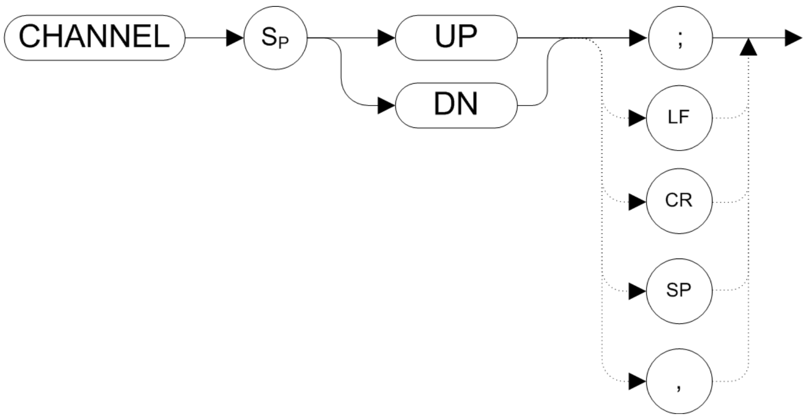
- When coupled, the step size is 10% of the span, or one major graticule division.
- When uncoupled, the step size is determined by the command "SS (Center Frequency Step Size)" on page 514.

Format	CF <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ Range: Frequency range of the instrument Default unit is HZ. CF UP CF DN Step size: see Description above. CF OA CF?

Query Data Type	<freq> in Hz. ASCII “0” if 0, otherwise scientific notation with precision to 1 Hz.
SCPI Equivalent Commands	[:SENSe]:FREQuency:CENTer <freq> [:SENSe]:FREQuency:CENTer? (See "Center Freq" on page 607)
Notes	Although the instrument allows entry of frequencies not in the specified frequency range, using frequencies outside the frequency span of the instrument is not recommended and is not warranted to meet specifications.

CHANNEL (Channel Selection)

Syntax



Legacy Products

8560 series

Description

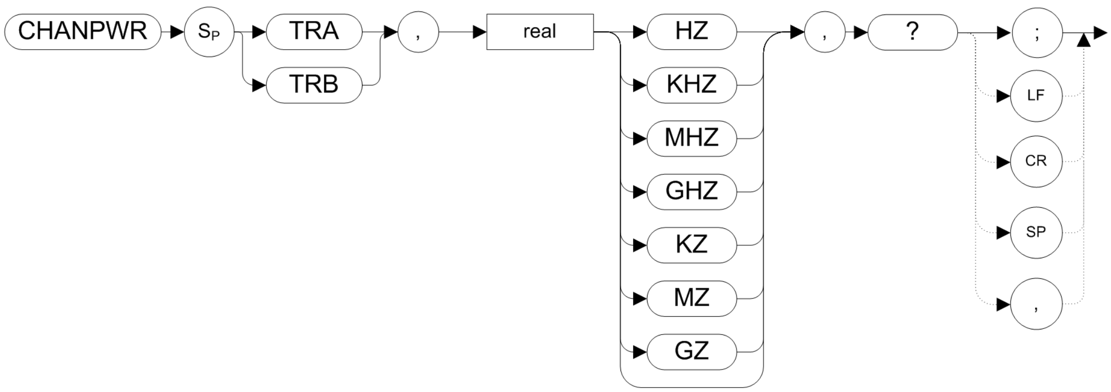
Increments or decrements the instrument center frequency by one channel spacing.

The channel spacing value is set using the command "ACPSP (Adjacent Channel Power Channel Spacing)" on page 274.

Format	CHANNEL UP|DN
Query Data Type	N/A
SCPI Equivalent Commands	[:SENSe]:FREQuency:CENTer <freq> [:SENSe]:FREQuency:CENTer? (See "Center Freq" on page 607)

CHANPWR (Channel Power)

Syntax



Legacy Products

8560 series

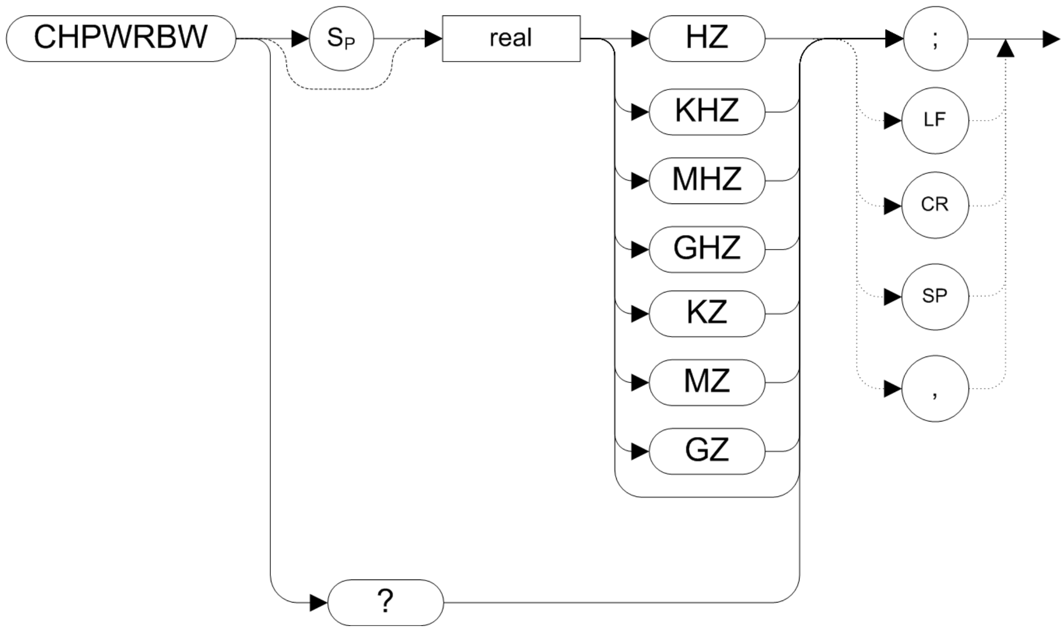
Description

Measures the power within the specified channel bandwidth.

Format	CHANPWR TRA|TRB, <frequency> with frequency unit,?
Query Data Type	<amplitude> in dBm (without explicit units).
SCPI Equivalent Commands	None

CHPWRBW (Channel Power Bandwidth)

Syntax



Legacy Products

8560 series

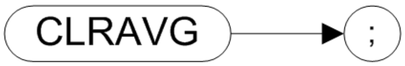
Description

Queries or sets the current value of the channel power bandwidth. Channel power can be measured with the command "CHANPWR (Channel Power)" on page 304.

Format	CHPWRBW <frequency> with frequency unit CHPWRBW?
Query Data Type	<frequency>, 2 digits to the right of the decimal place.
SCPI Equivalent Commands	None
Preset	3 GHz

CLRAVG (Clear Average)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

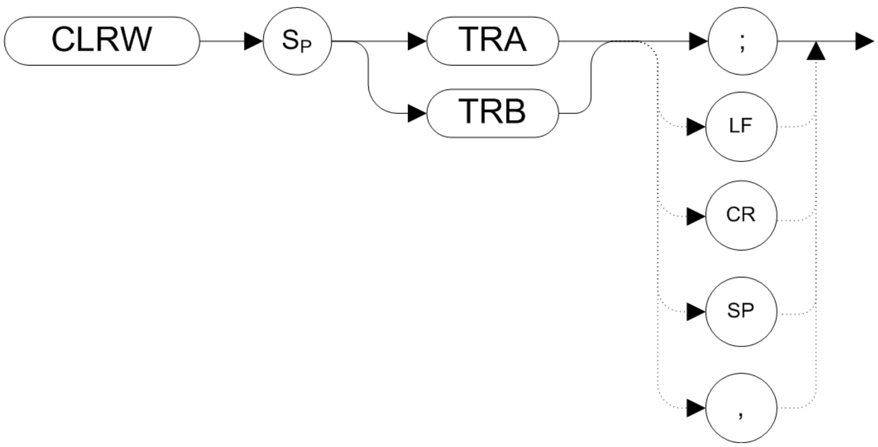
Restarts the VAVG command by resetting the number of averaged sweeps to one. The video averaging routine resets the number of sweeps, but does not stop video averaging. Use VAVG OFF to stop video averaging.

Format	CLRAVG
Query Data Type	N/A
SCPI Equivalent Commands	[:SENSe]:AVERage:CLEar (see "Average/Hold Number" on page 794)

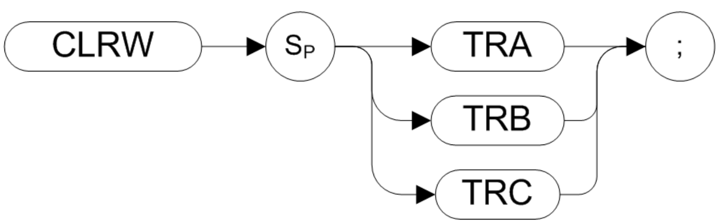
CLRW (Clear Write)

Syntax

8560 series



8566A/B, 8568A/B



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Clears the specified trace and enables trace data acquisition. The CLRW command places the indicated trace in clear-write mode. Data acquisition begins at the next sweep. (See the command "TS (Take Sweep) " on page 543 for more information about data acquisition.)

TRA corresponds to Trace 1 and TRB corresponds to Trace 2.

In the 8560 series, 8566A/B, and 8568A/B analyzers, the trace settings are controlled by the trace mode parameters, CLRW, VIEW, BLANK, MINH and MAXH and the averaging settings by VAVG. In the X-series the same settings are controlled by the Trace/Detector and View/Blank parameters.

The following table describes the parameters set by N9061A in the X-series instrument when the legacy commands for trace mode and averaging are sent.

Legacy Products command mapping to X-series for trace/detector settings

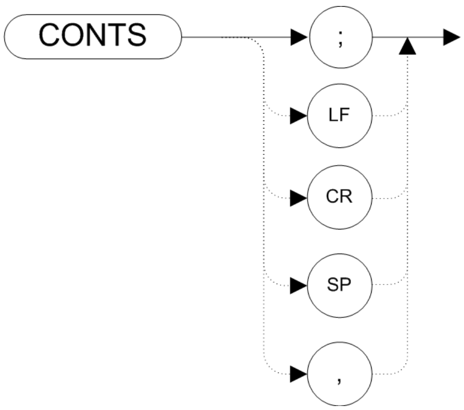
Legacy Products			X-series		
Trace Commands	**Averaging (VAVG)**	**Detector (DET)**	**Trace/Detector Trace Type**	**View/Blank**	**Detector**
CLRW	Off	Normal	ClearWrite	On	Last set
CLRW	On	Sample	Trace Average	On	Sample
MXMH	Off	Peak	Max Hold	On	Peak
MXMH	On	Sample	Trace Average	On	Peak
MINH	Off	NegPeak	Min Hold	On	NegPeak
MINH	On	Sample	Trace Average	On	NegPeak
VIEW	Off	Normal	No change	View	No change
VIEW	On	Sample	Trace Average	View	Sample
BLANK	Off	Normal	No change	Blank	No change
BLANK	On	Sample	Trace Average	Blank	Sample

For example, if an 8560 series analyzer receives CLRW, and averaging is set to ON, then the analyzer's detector is automatically set to Sample. In the same circumstances, N9061A sets the X-series instrument trace type to Trace Average, View/Blank to On, and the Detector to Sample.

Format	CLRW TRA|TRB Preset: CLRW TRA
Query Data Type	N/A
SCPI Equivalent Commands	:TRACe1|2|3|4|5|6:TYPE WRITe (see "Trace/Detector" on page 1264)
Preset	TRA (after a preset, only trace A is set to clearwrite)
Notes	The functions of CLRW are identical to the command "A1 [one] (Clear Write for Trace A)" on page 255 and "B1 [one] (Clear Write for Trace B)" on page 287.

CONTS (Continuous Sweep)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

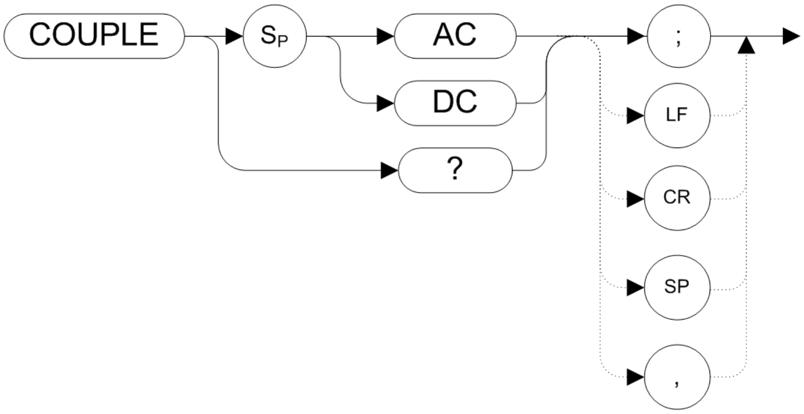
Description

Sets the instrument to continuous sweep mode. In the continuous sweep mode, the instrument takes its next sweep as soon as possible after the current sweep (as long as the trigger conditions are met). A sweep may temporarily be interrupted by data entries made over the remote interface or from the front panel.

Format	CONTS Preset: CONTS
Query Data Type	N/A
SCPI Equivalent Commands	:INITiate:CONTinuous 1 (see "Cont (Continuous Measurement/Sweep)" on page 599)
Notes	The functions of CONTS are identical to "S1[one] (Continuous Sweep)" on page 499.

COUPLE (Input Coupling)

Syntax



Legacy Products

8560 series

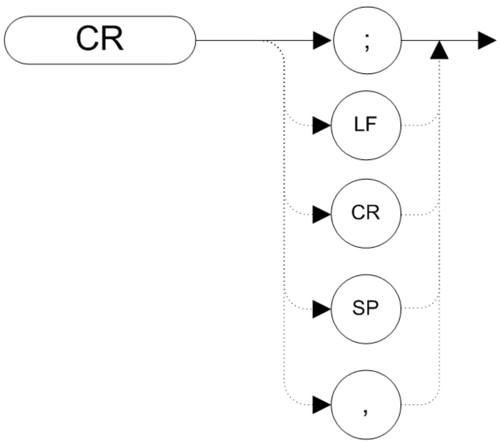
Description

Selects AC or DC coupling.

Format	COUPLE AC|DC COUPLE?
Query Data Type	AC|DC
SCPI Equivalent Commands	:INPut:COUPling AC|DC :INPut:COUPling? (See "RF Coupling" on page 622)
Preset	AC (when possible)
Notes	When using the X-series instruments, you must use DC coupling to see calibrated frequencies of less than 20 MHz. Signals of less than 20 MHz are not calibrated when using AC coupling on these instruments.

CR (Couple Resolution Bandwidth)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

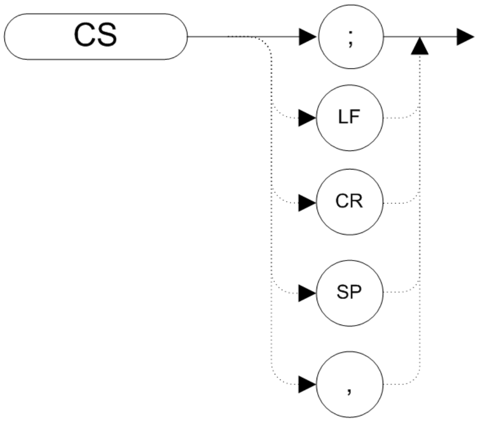
Couples the resolution bandwidth to the span.

The counterpart to the CR command is the command "RB (Resolution Bandwidth)" on page 486 which breaks the coupling. Use the CR command to re-establish coupling after executing an RB command.

Format	CR
Query Data Type	N/A
SCPI Equivalent Commands	[:SENse]:BANDwidth[:RESolution]:AUTO ON (see "Res BW " on page 588)
Preset	ON
Notes	CR uses the legacy instrument settings for resolution bandwidth only if Mode Setup > Preferences> Limit RBW/VBW is set to ON.

CS (Couple Frequency Step Size)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

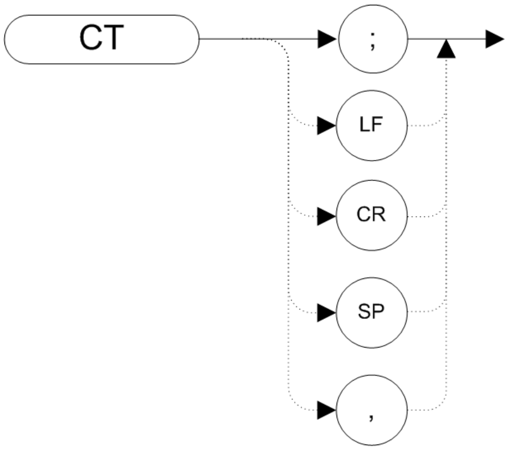
Couples the center frequency step size to the span width, so that the step size equals 10% of the span width, or one major graticule division.

The counterpart to the CS command is "SS (Center Frequency Step Size)" on page 514 which breaks the coupling. Use the CS command to re-establish coupling after an SS command has been executed.

Format	CS
Query Data Type	N/A
SCPI Equivalent Commands	[:SENSe]:FREQuency:CENTer:STEP:AUTO ON (see "CF Step" on page 616)
Preset	ON

CT (Couple Sweep Time)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

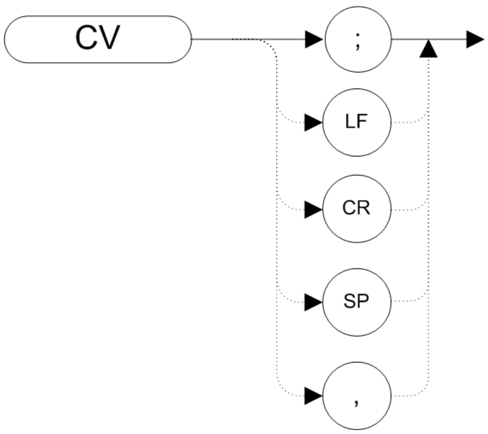
Couples the sweep time to the span, resolution bandwidth and video bandwidth.

The counterpart to the CT command is "ST (Sweep Time)" on page 516 which breaks the coupling. Use the CT command to re-establish coupling after an ST command has been executed.

Format	CT
Query Data Type	N/A
SCPI Equivalent Commands	:SWEep:TIME:AUTO ON (see "Sweep Time Rules" on page 1119)
Preset	ON

CV (Couple Video Bandwidth)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

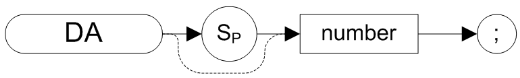
Couples the video bandwidth to the resolution bandwidth.

The counterpart to the CV command is "VB (Video Bandwidth)" on page 547, which breaks the coupling. Use the CV command to re-establish coupling after executing a VB command.

Format	CV
Query Data Type	N/A
SCPI Equivalent Commands	[:SENse]:BANDwidth:VIDeo:AUTO ON (see "Video BW " on page 590)
Preset	ON
Notes	CV uses the legacy signal analyzer settings for video bandwidth only if Mode Setup > Preferences> Limit RBW/VBW is set to ON.

DA (Display Address)

Syntax



Legacy Products

8566A/B, 8568A/B

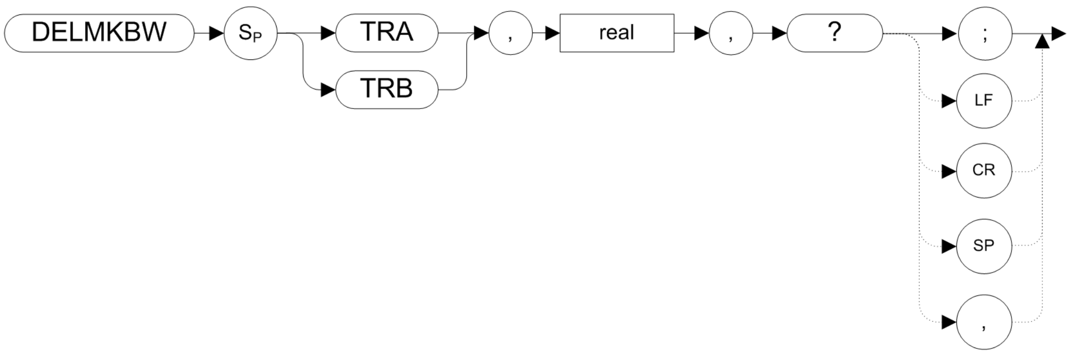
Description

Returns the contents of the given display address to the controller.

Format	DA 1 (sets TRA) DA 1025 (sets TRB) DA 3073 (sets TRC)
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	This command only supports the use of DA 1, DA 1025, and DA 3073; these display addresses contain the trace data and are equivalent to using the queries and commands"TRA (Trace Data Input and Output)" on page 537, "TRB (Trace Data Input and Output)" on page 538, "TRC (Trace Data Input and Output)" on page 539, "TA (Trace A)" on page 528 and "TB (Trace B)" on page 529.

DELMKBW (Occupied Power Bandwidth Within Delta Marker)

Syntax



Legacy Products

8560 series

Description

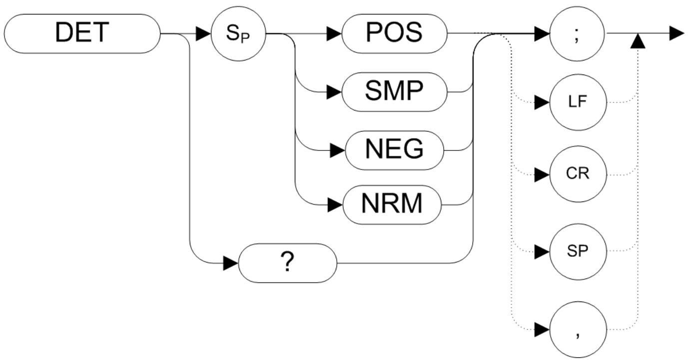
Calculates the OBW with respect to the power between the displayed delta markers. The power between the displayed markers is then used as the reference, rather than using the total power in the frequency span as is done in the command "PWRBW (Power Bandwidth)" on page 479.

If the DELMKBW command is used when no marker is active, a delta marker is activated at the center frequency, and the returned bandwidth is 0. If the active marker is a normal marker when the DELMKBW command is used, the marker type is changed to delta, and the returned bandwidth is 0.

Format	DELMKBW TRA|TRB,<real>,?
Query Data Type	<frequency> in Hz
SCPI Equivalent Commands	None

DET (Detection Mode)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Selects the type of instrument detection (NEGative peak, NoRMal, POSitive peak, or SaMPle).

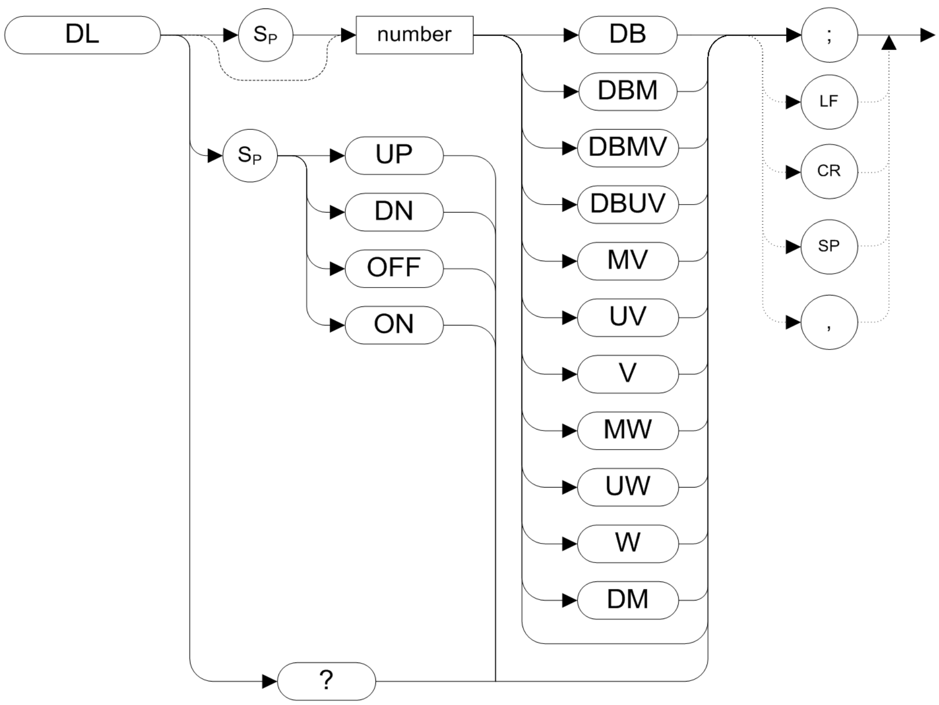
NEG	Enables negative peak detection.
NRM	Enables the 'rosenfell' detection algorithm that selectively chooses between positive and negative values.
POS	Enables positive-peak detection, which displays the maximum video signal detected over a number of instantaneous samples for a particular frequency.
SMP	Enables sample detection, which uses the instantaneous video signal value. Video averaging and noise-level markers, when activated, activate sample detection automatically.

Format	DET NEG|NRM|POS|SMP (For option descriptions, see table above) DET?
Query Data Type	NEG|NRM|POS|SMP
SCPI Equivalent Commands	[:SENSe]:DETector[:FUNCtion] (NEGative|NORMal|POSitive|SAMPle) [:SENSe]:DETector[:FUNCtion]? (See "Detector" on page 1287)
Preset	NRM
Notes	The functions of DET are identical to the commands"KSa (Normal Detection)" on page 362, "KSb (Positive Peak Detection)" on page 364, "KSd (Negative Peak Detection)" on page 368, and "KSe (Sample Detection)" on page 370.

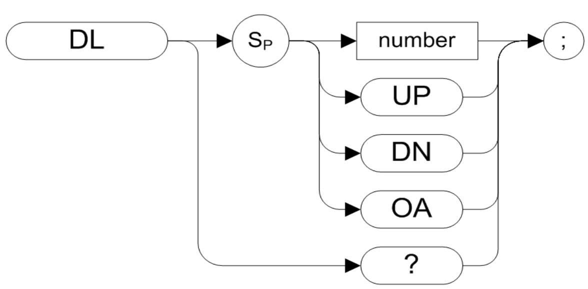
DL (Display Line)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

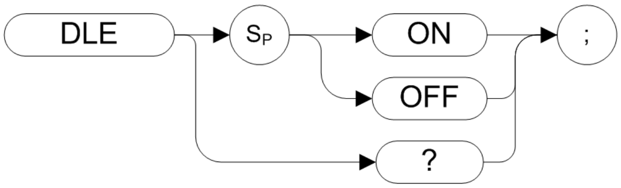
Defines the level of the display line and displays it on the instrument screen.

Format	DL <number> DB|DBM|DBMV|DBUV|MV|UV|V|MW|UW|W|DM Default units are DBM

	Range: dependent on the reference level DL UP DL DN (Step Increment: 1 major graticule division) DL ON|OFF DL OA DL?
Query Data Type	<number> (Unit: V in LN, DBM in LG)
SCPI Equivalent Commands	:DISPlay:WINDow:TRACe:Y:DLINe <ampl> :DISPlay:WINDow:TRACe:Y:DLINe:STATE (ON|OFF) :DISPlay:WINDow:TRACe:Y:DLINe:STATE? (See "Display Line" on page 1376)
Preset	OFF

DLE (Display Line Enable)

Syntax



Legacy Products

8566A/B, 8568A/B

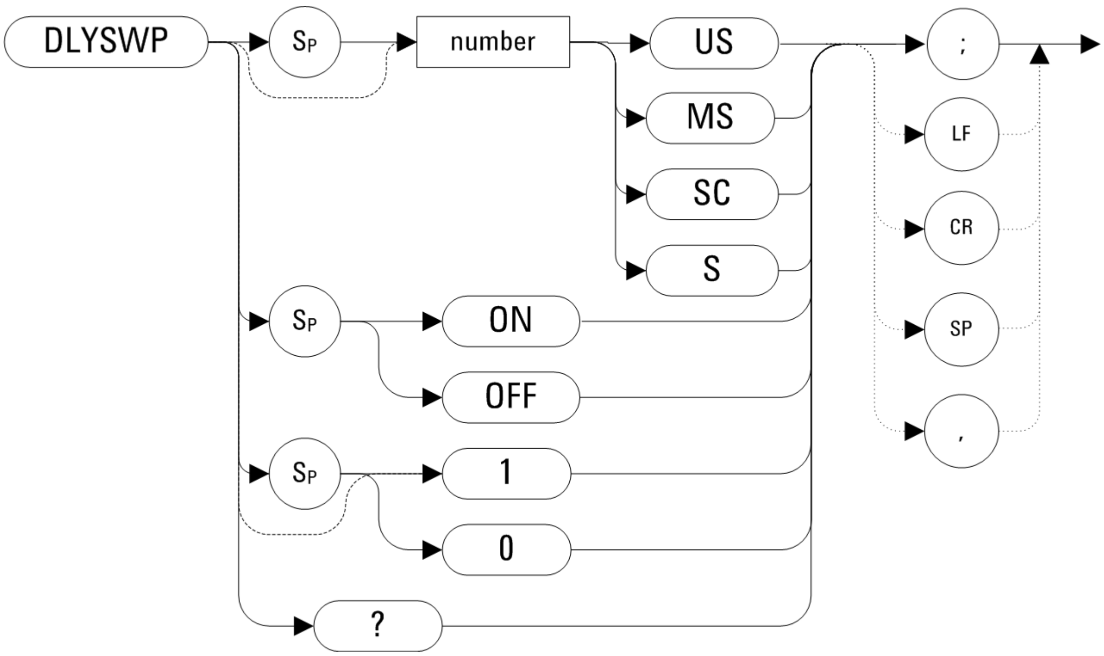
Description

Enables or disables the display line.

Format	DLE ON|OFF DLE?
Query Data Type	ON|OFF
SCPI Equivalent Commands	:DISPlay:WINDow:TRACe:Y:DLINe:STATE ON|OFF (see "Display Line" on page 1376)
Preset	OFF
Couplings	Turning DL OFF, then ON again does not reset DL level.

DLYSWP (Delay Sweep)

Syntax



Legacy Products

8560 series

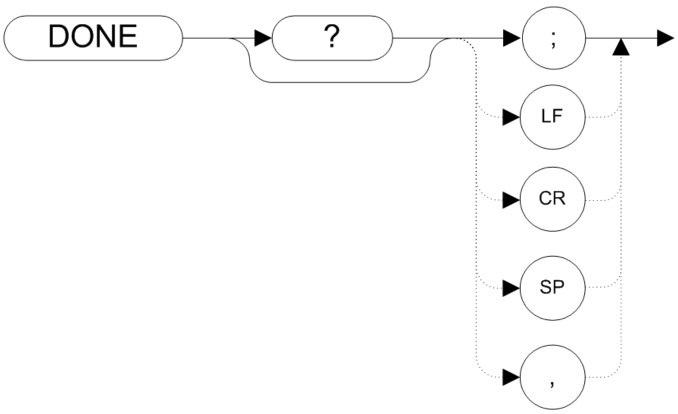
Description

Delays the start of the sweep until the specified time after the trigger event has elapsed.

Format	DLYSWP <number>US|MS|SC|S Range: 2 µS to 65.535 S DLYSWP ON|OFF|1|0 DLYSWP?
Query Data Type	Returns the value of the sweep delay length in seconds, or a '0' indicating the delay sweep is turned OFF.
SCPI Equivalent Commands	:TRIGger[:SEQuence]:DELay <time> :TRIGger[:SEQuence]:DELay? :TRIGger[:SEQuence]:DELay:STATe (OFF|ON|0|1) :TRIGger[:SEQuence]:DELay:STATe? (See "Trig Delay " on page 1336)
Preset	OFF, 2 µS

DONE (Done)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

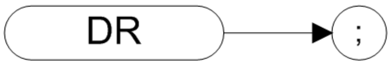
Allows you to determine when the instrument has parsed a list of commands and has executed all commands prior to and including DONE. The DONE command returns a value of "1" when all commands in a command string or command list have been completed.

If a "TS (Take Sweep)" on page 543 command precedes the command list, the TS command acts as a synchronizing function, since the command list execution begins after the sweep has been completed.

Format	DONE?
Query Data Type	1
SCPI Equivalent Commands	*WAI or *OPC? (see "Wait-to-Continue " on page 162)

DR (Display Read)

Syntax



Legacy Products

8566A/B, 8568A/B

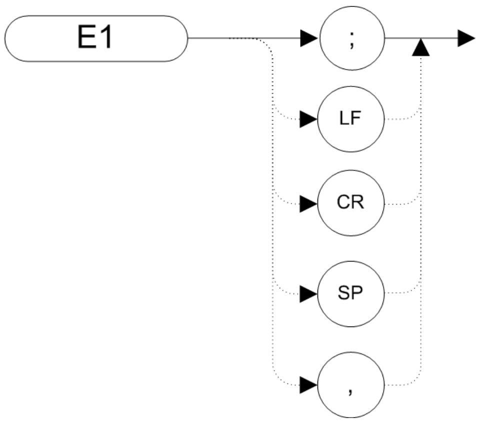
Description

Sends the contents of the current display address to the controller.

Format	DR
Query Data Type	N/A
SCPI Equivalent Commands	None

E1[one] (Peak Marker)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

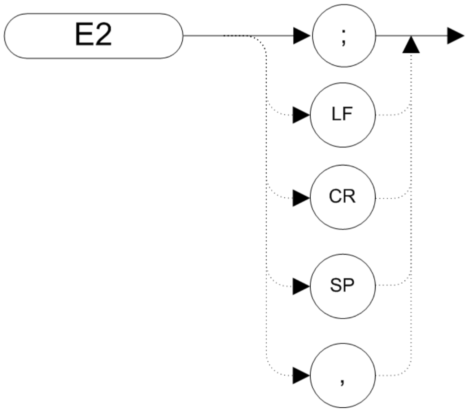
Description

Positions the marker at the signal peak.

Format	E1
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:MAXimum (see "Peak Search" on page 887)
Notes	The functions of E1 are identical to MKPK (without secondary keyword) and MKPK HI. See "MKPK (Marker Peak)" on page 444.

E2 [two] (Marker to Center Frequency)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

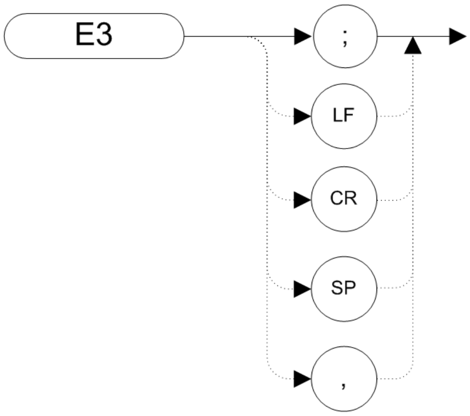
Description

Positions the marker on the screen at the center frequency position.

Format	E2
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2|3|4|5|6[:SET]:CENTer (see "Mkr->CF " on page 785)
Notes	Unlike "MKCF (Marker to Center Frequency)" on page 431, which moves the CF to the current position of the active marker, E2 centers the active marker to the center frequency on the instrument screen.

E3 [three] (Delta Marker Step Size)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

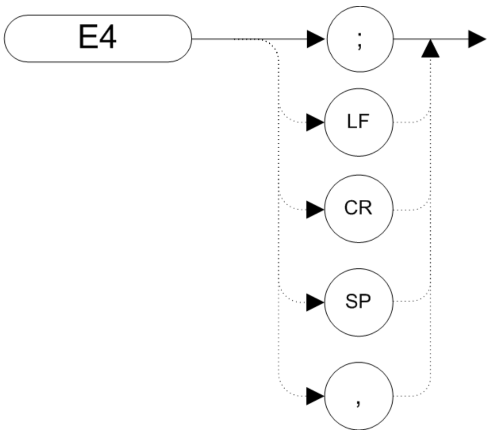
Description

Establishes the center frequency step size as being the frequency difference between the delta marker and the active marker.

Format	E3
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2[:SET]:STEP (see "Mkr->CF Step" on page 785)
Notes	The functions of E3 are identical to the command"MKSS (Marker to Step Size)" on page 451.

E4 [four] (Marker to Reference Level)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

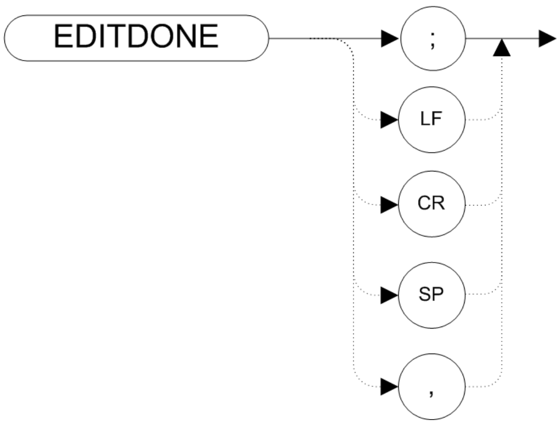
Description

Moves the active marker to the reference level.

Format	E4
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2[:SET]:RLEVel (see "Mkr->Ref Lvl" on page 787)
Notes	Unlike "MKRL (Marker to Reference Level)" on page 449, this command moves to the level of the delta Marker when in delta Marker mode.

EDITDONE (Edit Done)

Syntax



Legacy Products

8560 series

Description

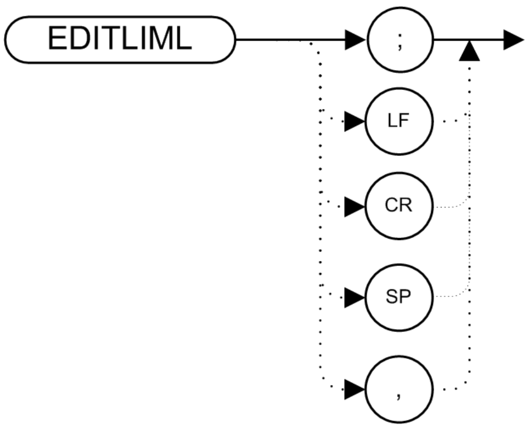
This command is used at the completion of limit-line editing, following an EDITLIML command.

You can enter the limit line data between the limit line commands beginning with "EDITLIML (Edit Limit Line)" on page 329 and ending with EDITDONE.

Format	EDITDONE
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:LLINe[1]|2:DATA <x>,<ampl>,<connect>,... (see "Limit Line Data (Remote Command Only)" on page 825)
Couplings	"EDITLIML (Edit Limit Line)" on page 329, "LIMIREL (Relative Limit Lines)" on page 403, "LIMF (Limit Line Frequency Value)" on page 398, "LIMU (Upper-Limit Amplitude)" on page 409, "LIML (Lower-Limit Amplitude)" on page 405, "LIMTSL (Slope Limit Line)" on page 408

EDITLIML (Edit Limit Line)

Syntax



Legacy Products

8560 series

Description

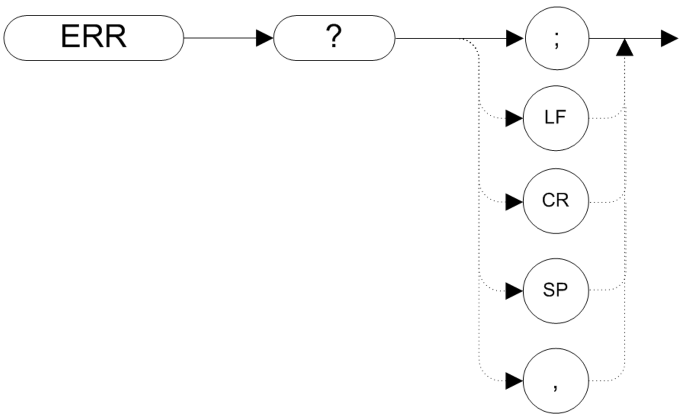
This command is used to initiate limit-line editing.

You can enter the limit line data between the limit line commands beginning with EDITLIML and ending with "EDITDONE (Edit Done)" on page 328.

Format	EDITLIML
Query Data Type	N/A
SCPI Equivalent Commands	None
Couplings	"EDITDONE (Edit Done)" on page 328, "LIMIREL (Relative Limit Lines)" on page 403, "LIMF (Limit Line Frequency Value)" on page 398, "LIMU (Upper-Limit Amplitude)" on page 409, "LIML (Lower-Limit Amplitude)" on page 405, "LIMTSL (Slope Limit Line)" on page 408

ERR (Error)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

The ERR? query returns a list of three-digit error codes if errors are present. A return value of “0” means that there are no errors present. Executing ERR? clears all GPIB errors.

If a command is a valid legacy command but not accepted by the N9061A application, no error message is generated and the response to ERR? is 0. However, if logging is enabled, the N9061A application command log registers a “Cmd not Supported” error.

If a command is not a valid legacy command, a command error is generated; CMD ERR is displayed on the front panel and the response to ERR? is 112. If logging is enabled then "Cmd Error" is written to the command error log.

Error codes are provided in N9061A mode for some X-series errors such as external reference, hardware and alignment errors. The X-series error codes are translated to 8560 series error codes so that an error query returns the legacy instrument error code. To review the error via the front panel, select the System > Show > Errors.

The following table shows the X-series error codes and the translated value.

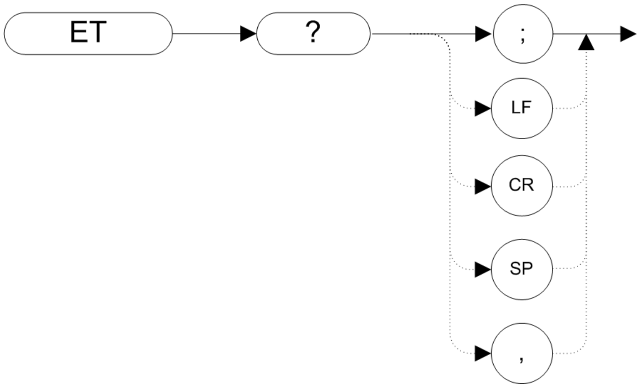
X-Series Error Code	Description	8560 Series Error Code	Description
40	TG Alignment Failure	758	SYSTEM: Unknown system error
42	RF Alignment Failure	758	SYSTEM: Unknown system error
44	IF Alignment Failure	758	SYSTEM: Unknown system error
46	LO Alignment Failure	758	SYSTEM: Unknown system error

X-Series Error Code	Description	8560 Series Error Code	Description
48	ADC Alignment Failure	758	SYSTEM: Unknown system error
50	FM Demod Alignment Failure	758	SYSTEM: Unknown system error
54	Extended Align Failure Sum	758	SYSTEM: Unknown system error
71	Characterize Preselector Failure	758	SYSTEM: Unknown system error
-200.3310	Execution Error; Preselector Centering failed	758	SYSTEM: Unknown system error
503	Frequency Reference Unlocked	336	10 MHz Ref Cal oscillator failed to lock when going to internal 10 MHz reference.
505	2nd LO Unlocked	336	10 MHz Ref Cal oscillator failed to lock when going to internal 10 MHz reference.
509	LO Unlocked	300	YTO UNL: YTO (1st LO) phase-locked loop (PLL) is unlocked.
513	IF Synthesizer Unlocked	450	IF SYSTM: IF hardware failure. Check other error messages.
515	Calibration Oscillator Unlocked	336	10 MHz Ref: Cal oscillator failed to lock when going to internal 10 MHz reference
521	External Ref missing or out of range	905,333	EXT REF: Unable to lock cal oscillator when set to external reference. Check that the external reference is within tolerance. 600 UNLK: 600 MHz reference oscillator PLL is unlocked

Format	ERR?
Query Data Type	0 if no error present. 3-digit number if error present. For valid codes, see table above.
SCPI Equivalent Commands	None
Preset	Remote error list cleared. Persistent errors are re-entered into the error list.

ET (Elapsed Time)

Syntax



Legacy Products

8560 series

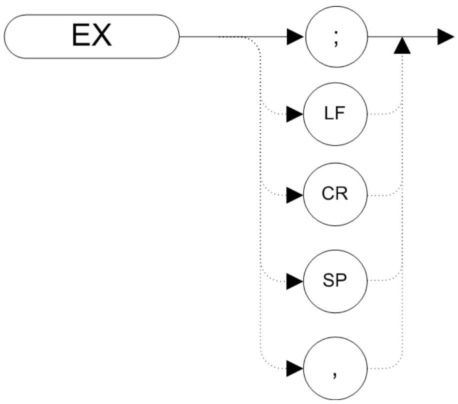
Description

Returns to the controller the elapsed time (in hours) of instrument operation.

Format	ET?
Query Data Type	<number> in hours.
SCPI Equivalent Commands	:SYSTem:PON:ETIMe? (see "Query the Elapsed Time since First Power-On" on page 1260)

EX (Exchange Trace A and Trace B)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

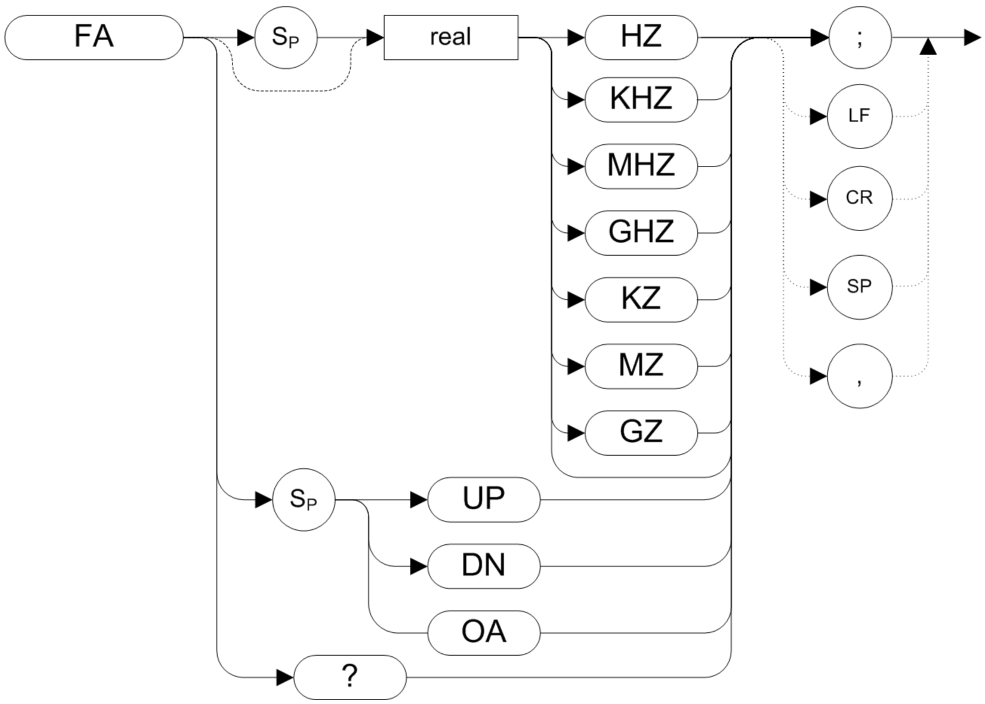
Description

This command exchanges Trace A and Trace B, point by point.

Format	EX
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of EX are identical to "AXB (Exchange Trace A and Trace B)" on page 286 and to the XCH TRA,TRB form of "XCH (Exchange)" on page 553.

FA (Start Frequency)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Specifies the start frequency value. The start frequency is equal to the center frequency minus the span divided by two (FA = CF – SP/2). Changing the start frequency changes the center frequency and span.

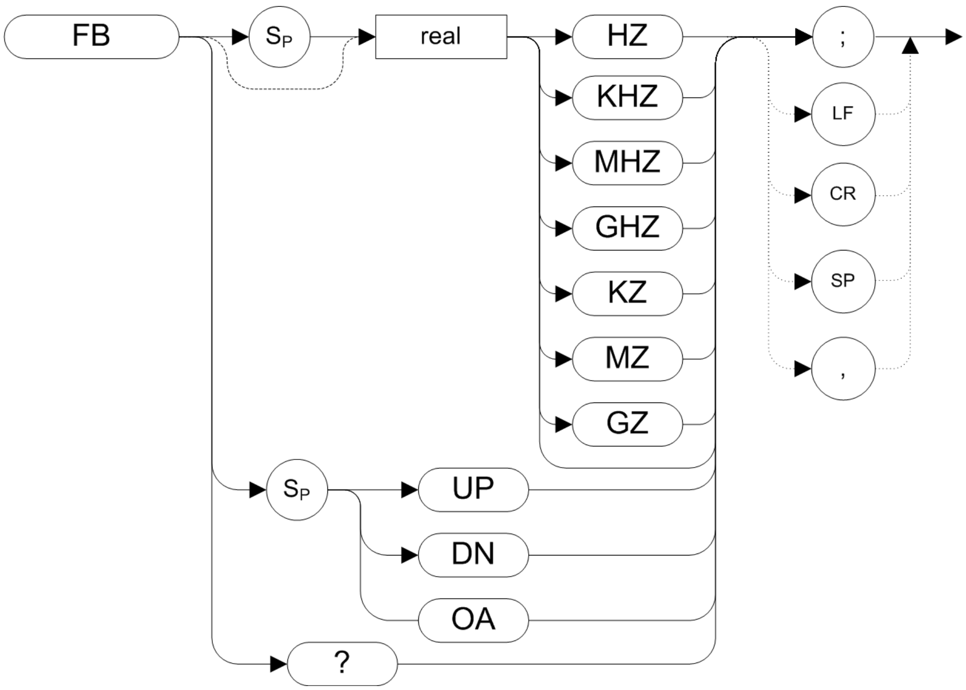
Format	FA <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ <real>: Default unit is Hz. Range: frequency range of the instrument. FA UP|DN Step Increment: Frequency span divided by 10. FA OA Specifying OA returns only the current value to the controller. It does not set the active function to the start frequency. FA?
Query Data Type	<real> in HZ.
SCPI Equivalent Commands	[:SENSE]:FREQuency:STARt <number> (HZ|KHZ|MHZ|GHZ) [:SENSE]:FREQuency:STARt? [:SENSE]:FREQuency:CENTer:STEP:AUTO?

[:SENSE]:FREQuency:CENTer:STEP?

(See "Start Freq" on page 612)

FB (Stop Frequency)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

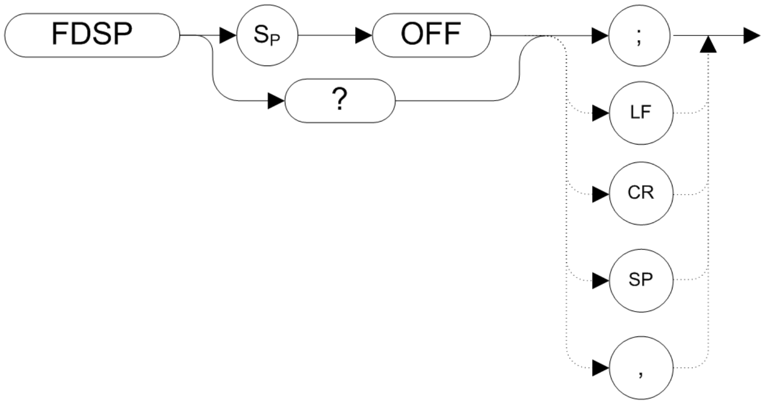
Description

Specifies the stop frequency value. The stop frequency is equal to the center frequency plus the span divided by two (FB = CF + SP/2). Changing the stop frequency changes the center frequency and span.

Format	FB <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ <real>: Default unit is Hz. Range: frequency range of the instrument. FB UP|DN Step Increment: Frequency span divided by 10. FB OA Specifying OA returns only the current value to the controller. It does not set the active function to the start frequency. FB?
Query Data Type	<real> in HZ.
SCPI Equivalent Commands	[:SENSE]:FREQuency:STOP <real> (HZ|KHZ|MHZ|GHZ) (see "Stop Freq" on page 614)
Preset	Instrument maximum frequency.
Notes	The OA parameter only returns the current value to the controller. It does not set the active function to the stop frequency.

FDSP (Frequency Display Off)

Syntax



Legacy Products

8560 series

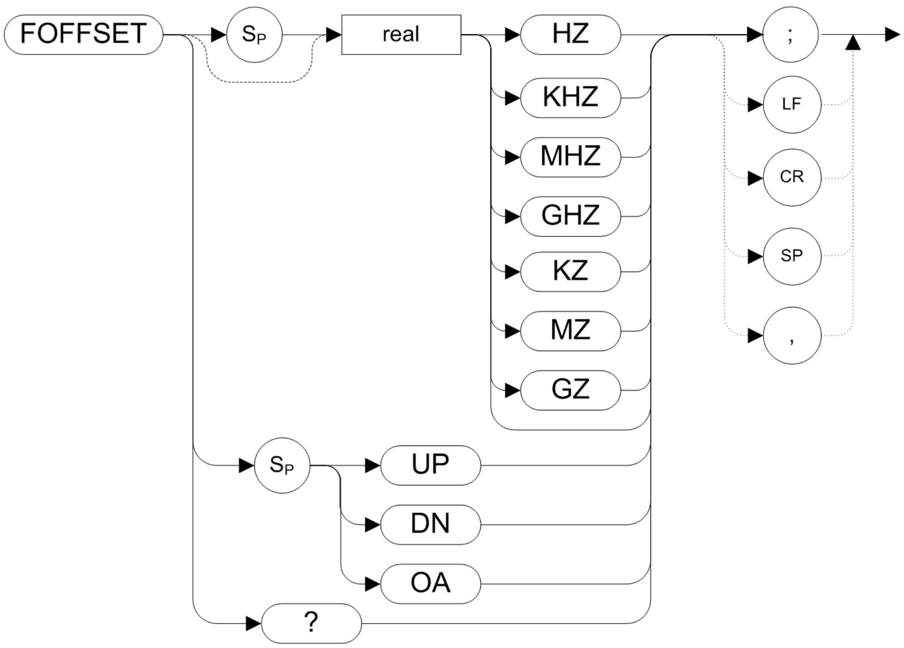
Description

Turns the frequency annotation OFF.

Format	FDSP OFF FDSP?
Query Data Type	'1' or '0', indicating ON or OFF.
SCPI Equivalent Commands	See "ANNOT (Annotation)" on page 280.
Preset	ON
Couplings	It is not possible enable or disable the frequency annotation alone, leaving other annotation unaffected. Thus, the FDSP command behaves in the same way as "ANNOT (Annotation)" on page 280. If the FDSP command has been used to disable the frequency annotation, sending the command ANNOT ON does **not** re-enable the display annotation. The display annotation is only enabled by sending the command "IP (Instrument Preset)" on page 356.

FOFFSET (Frequency Offset)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Selects a value that offsets the frequency scale for all absolute frequency readouts (for example, center frequency). Relative values such as span and marker delta are not offset.

When an offset is in effect, it is displayed beneath the bottom graticule line on the instrument screen.

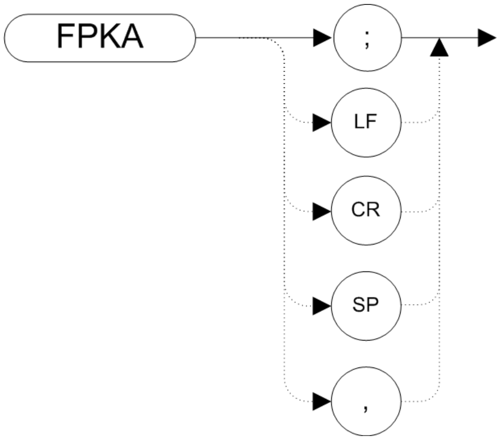
Execute FOFFSET 0 or IP to turn off the offset.

Format	FOFFSET <real> HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ <real>: Default unit is Hz. FOFFSET UP|DN UP or DN changes by 10% of Span. FOFFSET OA FOFFSET?
Query Data Type	<real>
SCPI Equivalent Commands	[:SENSE]:FREQuency:OFFSet <number> [:SENSE]:FREQuency:OFFSet? (See "Freq Offset" on page 617)

Preset	0 Hz
Notes	The functions of FOFFSET are identical to "KSV (Frequency Offset)" on page 391.

FPKA (Fast Preselector Peak)

Syntax



Legacy Products

8566A/B

Description

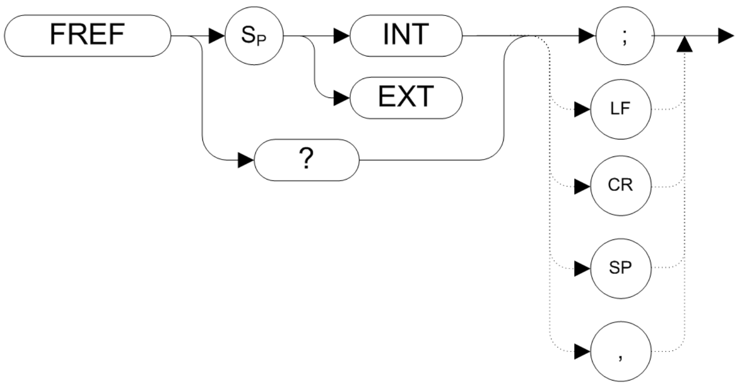
Automatically adjusts the preselector frequency to yield the greatest signal level at the active marker. The FPKA command peaks the preselector faster than the preselector-peak command, PP Although this command can be executed in all frequency spans, it performs best when the instrument is in zero span. Use the standard preselector peak for all other frequency spans.

The FPKA command also returns the amplitude value of active marker.

Format	FPKA
Query Data Type	Amplitude value of active marker.
SCPI Equivalent Commands	[:SENSe]:POWer[:RF]:PCENter (see "Presel Center" on page 571)

FREF (Frequency Reference)

Syntax



Legacy Products

8560 series

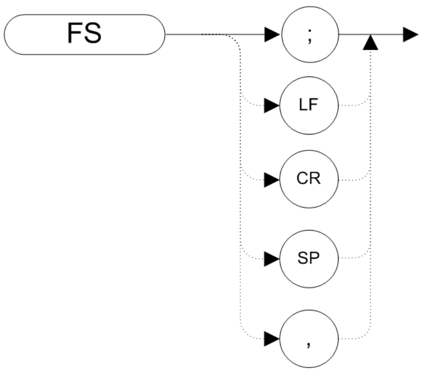
Description

Specifies whether an external source or an internal source is being used.

Format	FREF INT|EXT FREF?
Query Data Type	INT|EXT
SCPI Equivalent Commands	[:SENSe]:ROSCillator:SOURce:TYPE INTernal|EXTernal|SENSe [:SENSe]:ROSCillator:SOURce:TYPE? (See "Freq Ref In " on page 665)

FS (Full Span)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

- 8560 series: Sets the frequency span of the instrument to full span. Resolution bandwidth, video bandwidth, and sweep time are all set to auto-coupled.
- 8566A/B, 8568A/B: Does an instrument preset, then sets the low band.

Whenever the frequency range of the instrument you are using does not match the remote language's own range, the span is limited by the capabilities of the replacement instrument. The tables below list the frequency ranges for all the supported remote languages when running on any supported X-series instrument.

Format	FS Range: see tables below
Query Data Type	N/A
SCPI Equivalent Commands	[:SENse]:FREQuency:CENTer (see "Center Freq" on page 607) [:SENSe]:FREQuency:SPAN (see "Span " on page 1108)
Notes	The functions of FS are identical to "LF (Low Frequency Preset)" on page 396.

PXA Series - Frequency Ranges Set by the FS Command

	N9030A-503	N9030A-508	N9030A-513	N9030A-526
Remote Language	**Frequency Range**	**Frequency Range**	**Frequency Range**	**Frequency Range**
8560E/EC	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz
8561E/EC	0 Hz - 3.6 GHz	0 Hz - 6.5 GHz	0 Hz - 6.5 GHz	0 Hz - 6.5 GHz
8562E/EC	0 Hz - 3.6 GHz	0 Hz - 8.4 GHz	0 Hz - 13.2 GHz	0 Hz - 13.2 GHz

	N9030A-503	N9030A-508	N9030A-513	N9030A-526
Remote Language	**Frequency Range**	**Frequency Range**	**Frequency Range**	**Frequency Range**
8563E/EC	0 Hz - 3.6 GHz	0 Hz - 8.4 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8564E/EC	0 Hz - 3.6 GHz	0 Hz - 8.4 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8565E/EC	0 Hz - 3.6 GHz	0 Hz - 8.4 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8566A	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz
8566B	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz
8568A	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz
8568B	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz

MXA Series - Frequency Ranges Set by the FS Command

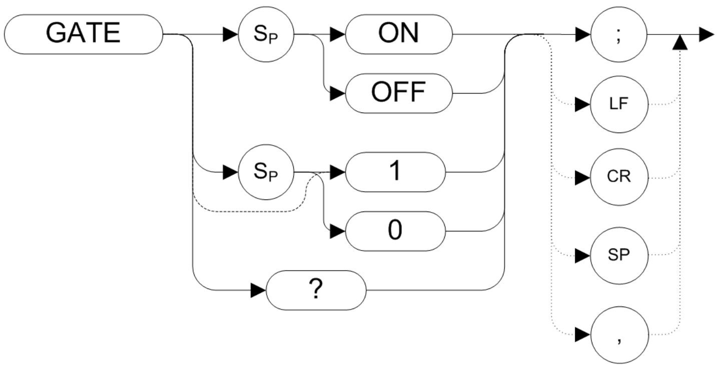
	N9020A-503	N9020A-508	N9020A-513	N9020A-526
Remote Language	**Frequency Range**	**Frequency Range**	**Frequency Range**	**Frequency Range**
8560E/EC	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz
8561E/EC	0 Hz - 3.6 GHz	0 Hz - 6.5 GHz	0 Hz - 6.5 GHz	0 Hz - 6.5 GHz
8562E/EC	0 Hz - 3.6 GHz	0 Hz - 8.4 GHz	0 Hz - 13.2 GHz	0 Hz - 13.2 GHz
8563E/EC	0 Hz - 3.6 GHz	0 Hz - 8.4 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8564E/EC	0 Hz - 3.6 GHz	0 Hz - 8.4 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8565E/EC	0 Hz - 3.6 GHz	0 Hz - 8.4 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8566A	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz
8566B	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz
8568A	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz
8568B	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz

EXA Series - Frequency Ranges Set by the FS Command

	N9010A-503	N9010A-507	N9010A-513	N9010A-526
Remote Language	**Frequency Range**	**Frequency Range**	**Frequency Range**	**Frequency Range**
8560E/EC	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz	0 Hz - 2.9 GHz
8561E/EC	0 Hz - 3.6 GHz	0 Hz - 6.5 GHz	0 Hz - 6.5 GHz	0 Hz - 6.5 GHz
8562E/EC	0 Hz - 3.6 GHz	0 Hz - 7.0 GHz	0 Hz - 13.2 GHz	0 Hz - 13.2 GHz
8563E/EC	0 Hz - 3.6 GHz	0 Hz - 7.0 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8564E/EC	0 Hz - 3.6 GHz	0 Hz - 7.0 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8565E/EC	0 Hz - 3.6 GHz	0 Hz - 7.0 GHz	0 Hz - 13.6 GHz	0 Hz - 27.0 GHz
8566A	0 Hz - 1.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz
8566B	0 Hz - 1.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz	0 Hz - 2.5 GHz
8568A	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz
8568B	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz	0 Hz - 1.5 GHz

GATE (Gate)

Syntax



Preset State: GATE OFF

Legacy Products

8560 series

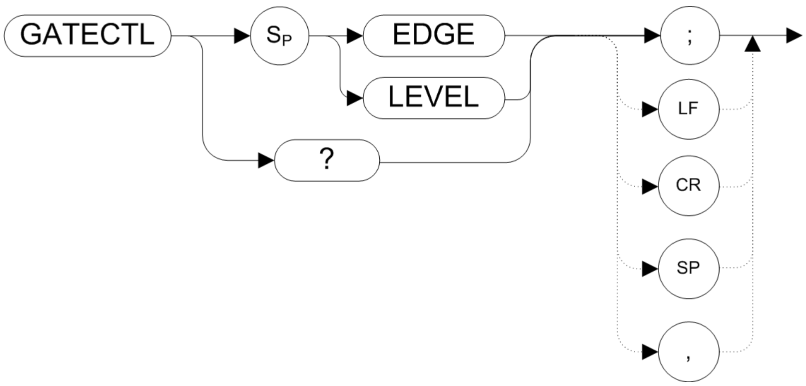
Description

Turns the time-gating function on or off. When the time-gating function is turned on, the instrument activates the time gate circuitry according to the parameters controlled by gate length ("GL (Gate Length)" on page 347), gate delay ("GD (Gate Delay)" on page 346) and the gate trigger input.

Format	GATE ON|OFF|1|0 GATE?
Query Data Type	1|0
SCPI Equivalent Commands	[:SENSe]:SWEep:EGATe[:STATe] OFF|ON|0|1 (see "Gate On/Off " on page 1155)
Preset	OFF

GATECTL (Gate Control)

Syntax



Legacy Products

8560 series

Description

Selects between the edge and level mode for time gate function.

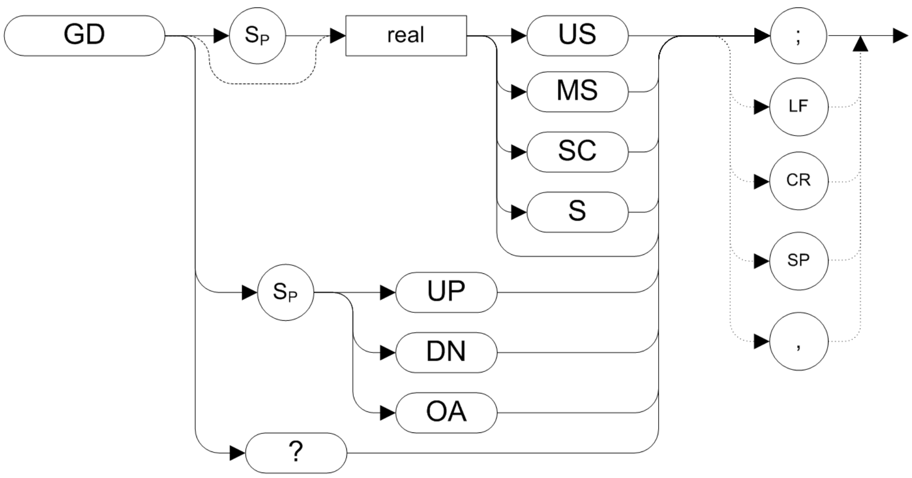
- In the edge mode, a specified trigger edge starts the gate delay timer that in turn starts the gate length timer.
- In the level mode, the gate follows the trigger input level.

The gate delay timer ("GD (Gate Delay)" on page 346) and the gate time length ("GL (Gate Length)" on page 347) are operational in the edge mode, but not in the level mode.

Format	GATECTL EDGE|LEVEL GATECTL?
Query Data Type	EDGE|LEVEL
SCPI Equivalent Commands	None
Preset	EDGE

GD (Gate Delay)

Syntax



Legacy Products

8560 series

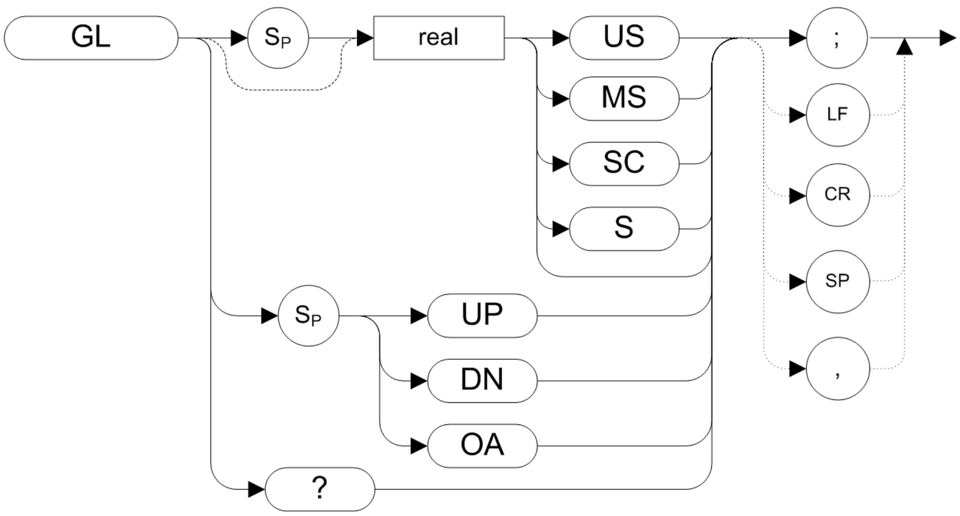
Description

Sets the delay time from when the gate trigger occurs to when the gate is turned on. GD only applies if "GATECTL (Gate Control)" on page 345 is set to EDGE.

Format	GD <real>US|MS|SC|S GD UP|DN GD OA GD?
Query Data Type	<real> S
SCPI Equivalent Commands	[:SENSe]:SWEep:EGATe:DELay <time> (see "Gate Delay " on page 1161)
Preset	3 µs

GL (Gate Length)

Syntax



Legacy Products

8560 series

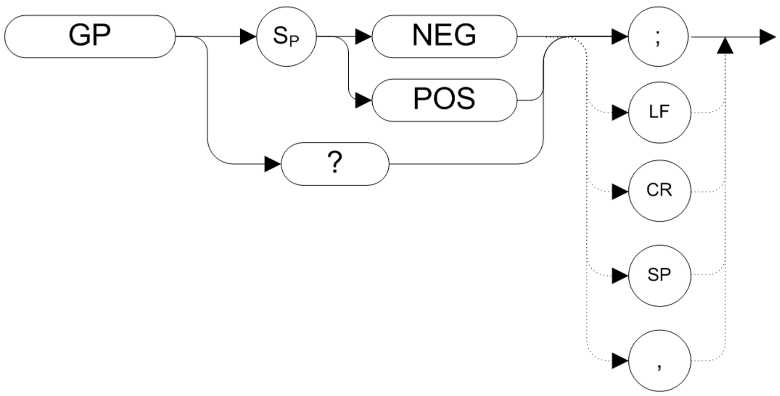
Description

Sets the length of time the time gate is turned on. GL only applies if "GATECTL (Gate Control)" on page 345 is set to EDGE.

Format	GL <real>US|MS|SC|S GL UP|DN GL OA GL?
Query Data Type	<real> S
SCPI Equivalent Commands	[:SENSe]:SWEep:EGATe:LENGth <time> (see "Gate Length " on page 1162)
Preset	1 µs

GP (Gate Polarity)

Syntax



Legacy Products

8560 series

Description

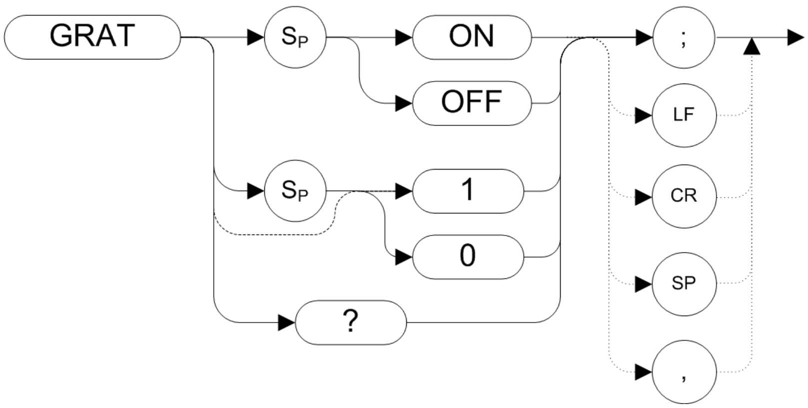
Sets the polarity (positive or negative) for the gate trigger.

- If the "GATECTL (Gate Control)" on page 345 is in EDGE mode, the gate delay timer can be triggered on either a positive or negative edge of the trigger input.
- If the Gate Control is in LEVEL mode and POSitive is selected, the gate is on when the trigger input is high. If the Gate Control is in LEVEL mode and NEGative is selected, the gate is on when the trigger is low.

Format	GP NEG|POS GP?
Query Data Type	NEG|POS
SCPI Equivalent Commands	:SWEep:EGATe:POLarity NEG|POS (see "Gate Polarity (Remote Command Only)" on page 1191)
Preset	POS

GRAT (Graticule)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

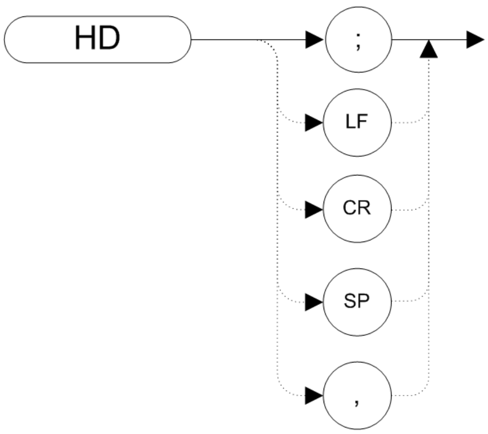
Description

Turns the graticule on or off.

Format	GRAT ON|OFF|1|0 GRAT?
Query Data Type	ON|OFF|1|0
SCPI Equivalent Commands	:DISPlay:WINDow[1]:TRACe:GRATicule:GRID[:STATE] (OFF|ON|0|1) (see "Graticule " on page 1376)
Preset	ON
Notes	The functions of GRAT are identical to "KSm (Graticule Off)" on page 383 and "KSn (Graticule On)" on page 385.

HD (Hold Data Entry)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

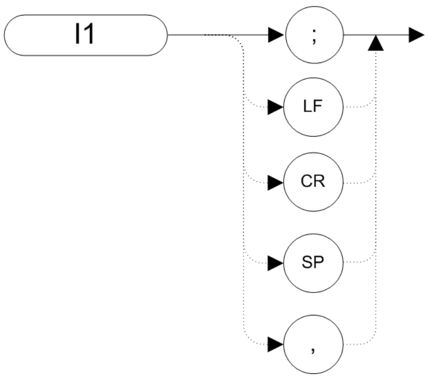
Description

Disables data entry via the instrument numeric keypad, knob, or step keys. The active function readout is blanked, and any active function is deactivated.

Format	HD
Query Data Type	N/A
SCPI Equivalent Commands	None

I1 [one] (Set RF Coupling to DC)

Syntax



Legacy Products

8568A/B

Description

Sets the RF coupling to DC.

The tables below list the frequency specifications for all X-Series instruments, for both DC and AC coupling.

8568A/B Analyzer Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Analyzer Model	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
8568A/B	100 Hz	1.5 GHz	100 kHz	1.5 GHz

EXA Series Instrument Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Instrument Model (N9010A)	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
Option 503	9 kHz	3.6 GHz	10 MHz	3.6 GHz
Option 507	9 kHz	7.0 GHz	10 MHz	7.0 GHz
Option 513	9 kHz	13.6 GHz	10 MHz	13.6 GHz
Option 526	9 kHz	26.5 GHz	10 MHz	26.5 GHz

MXA Series Instrument Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Instrument Model (N9020A)	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
Option 503	20 Hz	3.6 GHz	10 MHz	3.6 GHz
Option 508	20 Hz	8.4 GHz	10 MHz	8.4 GHz
Option 513	20 Hz	13.6 GHz	10 MHz	13.6 GHz
Option 526	20 Hz	26.5 GHz	10 MHz	26.5 GHz

PXA Series Instrument Frequency Coupling Specifications

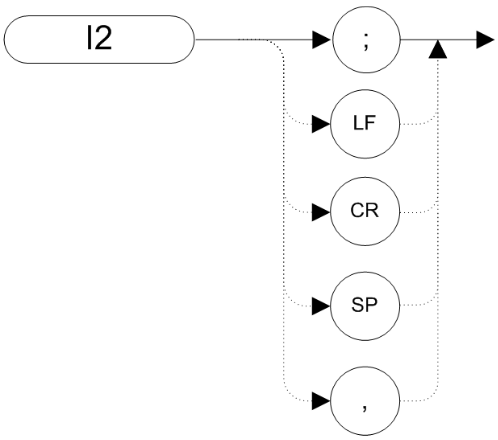
	DC Coupled Range		AC Coupled Range	
Instrument Model (N9030A)	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
Option 503	3 Hz	3.6 GHz	10 MHz	3.6 GHz
Option 508	3 Hz	8.4 GHz	10 MHz	8.4 GHz
Option 513	3 Hz	13.6 GHz	10 MHz	13.6 GHz
Option 526	3 Hz	26.5 GHz	10 MHz	26.5 GHz

The X-Series instruments only have a single RF input port.

Format	I1
Query Data Type	N/A
SCPI Equivalent Commands	:INPut:COUPling DC (see "RF Coupling" on page 622)

I2 [two] (Set RF Coupling to AC)

Syntax



Legacy Products

8568A/B

Description

Sets the RF coupling to AC.

The tables below list the frequency specifications for all X-Series instruments for both DC and AC coupling.

8568A/B Analyzer Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Analyzer Model	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
8568A/B	100 Hz	1.5 GHz	100 kHz	1.5 GHz

EXA Series Instrument Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Instrument Model (N9010A)	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
Option 503	9 kHz	3.6 GHz	10 MHz	3.6 GHz
Option 507	9 kHz	7.0 GHz	10 MHz	7.0 GHz
Option 513	9 kHz	13.6 GHz	10 MHz	13.6 GHz
Option 526	9 kHz	26.5 GHz	10 MHz	26.5 GHz

MXA Series Instrument Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Instrument Model (N9020A)	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
Option 503	20 Hz	3.6 GHz	10 MHz	3.6 GHz
Option 508	20 Hz	8.4 GHz	10 MHz	8.4 GHz
Option 513	20 Hz	13.6 GHz	10 MHz	13.6 GHz
Option 526	20 Hz	26.5 GHz	10 MHz	26.5 GHz

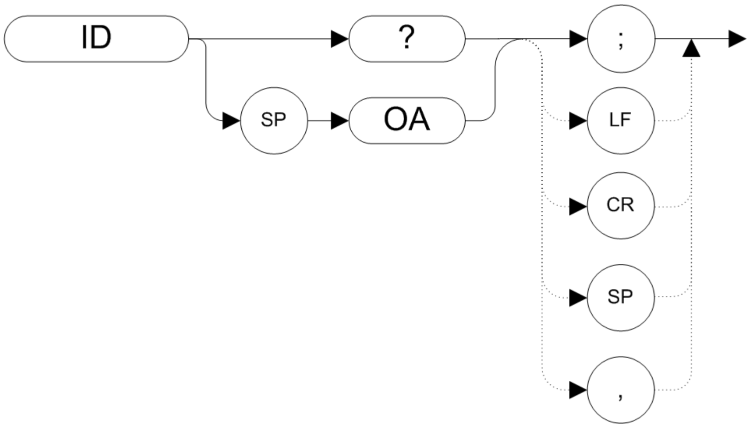
PXA Series Instrument Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Instrument Model (N9030A)	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
Option 503	3 Hz	3.6 GHz	10 MHz	3.6 GHz
Option 508	3 Hz	8.4 GHz	10 MHz	8.4 GHz
Option 513	3 Hz	13.6 GHz	10 MHz	13.6 GHz
Option 526	3 Hz	26.5 GHz	10 MHz	26.5 GHz

Format	I2
Query Data Type	N/A
SCPI Equivalent Commands	:INPut:COUPling AC (see "RF Coupling" on page 622)
Notes	The X-Series instruments only have a single RF input port.

ID (Identify)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

The ID? query returns the current remote language to the controller (for example, “HP8563E”).

The response value is determined by your remote language selection. This is configured via the selection in the front-panel Mode Setup menu when in N9061A mode. The remote language selection can also be set using the SCPI command :SYSTem:LANGuage (see "Mode Setup" on page 879).

ID? also works when the instrument is not in N9061A mode. In this case the instrument model number is returned. The string that is returned is identical to the second field of text that is returned from the *IDN? command.

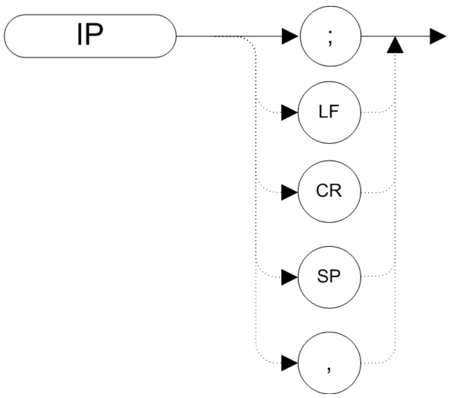
For more information see:

- "Setting up N9061A" on page 126
- "List of Supported SCPI Commands" on page 133

Format	ID OA ID?
Query Data Type	See Description above.
SCPI Equivalent Commands	*IDN? is similar; see "Identification Query " on page 157.

IP (Instrument Preset)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Performs an instrument preset, setting the instrument back to its factory settings. IP does not affect the contents of any data or trace registers or stored preselector data. IP does not clear the input or output data buffers on the 8560-series analyzers, but does clear them on the 8566A/B, 8568A/B.

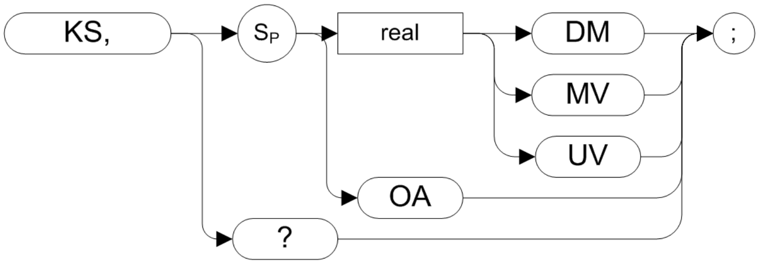
Instrument preset automatically occurs when you turn on the instrument. IP is a good starting point for many measurement processes. When IP is executed remotely, the instrument does not necessarily execute a complete sweep, however. You should execute a "TS (Take Sweep)" on page 543 to ensure that the trace data is valid after an IP.

N9061A executes this command after any language switch on the X-Series instrument.

Format	IP
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of IP are identical to the command "KST (Fast Preset)" on page 390. If the external amplifier gain has been set, executing IP does not reset this value. This is to protect the instrument.

KS, (Mixer Level)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level.

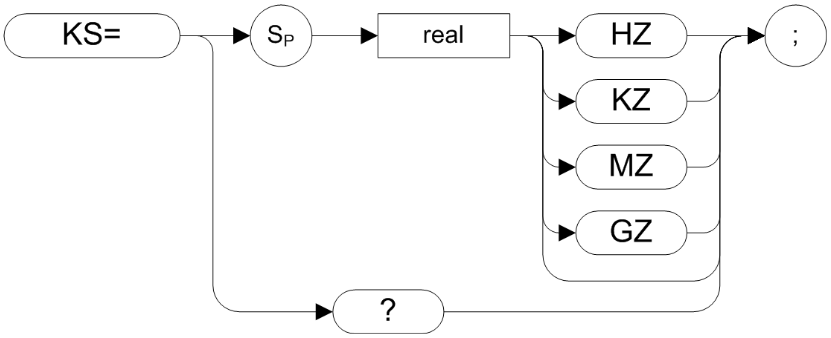
The effective mixer level is equal to the reference level minus the input attenuator setting. When KS, is activated, the effective mixer level can be set from –10 dBm to –70 dBm in 10 dB steps.

As the reference level is changed, the coupled input attenuator automatically changes to limit the maximum signal at the mixer input to your specified setting for signals less than or equal to the reference level.

Format	KS, <real>DM|MV|UV KS, OA KS,?
Query Data Type	<real>
SCPI Equivalent Commands	[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <real> dBm :[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer]? (See "Max Mixer Level" on page 570)
Preset	– 10 dBm
Notes	The functions of KS, are identical to "ML (Mixer Level)" on page 456. If the external amplifier gain has been set, executing IP does not reset this value. This is to protect the instrument.

KS= (8566A/B: Automatic Preselector Tracking, 8568A/B: Marker Counter Resolution)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

- 8566A/B: Reinstates automatic preselector tracking, after KS/ has been executed. Normally, the center of the preselector filter automatically tracks signal responses in the four frequency bands of the 2 to 22 GHz range.

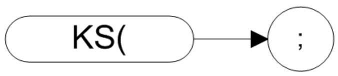
  The KS/ command allows manual adjustment of the preselector tracking. X-Series instruments can consume this command with no action.

- 8568A/B: Specifies the resolution of the marker frequency counter.

Format	KS= <real>HZ|KZ|MZ|GZ KS=?
Query Data Type	<real>
SCPI Equivalent Commands	:CALCulate:MARKer[1]:FCOunt:RESolution <freq> (see "Gate Time " on page 739)
Notes	For 8568A/B, the functions of KS= are identical to "MKFCR (Marker Counter Resolution)" on page 436.

KS((Lock Registers)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Secures the contents of state registers one through six. When the registers are secured, the commands "SV (Save State)" on page 521 and "SAVES (Save State)" on page 502 cannot save more instrument states in the registers, but instead cause the display of "SAVE LOCK" on the instrument display.

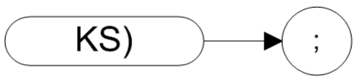
To save an instrument state in a locked register, first execute "KS) (Unlock Registers)" on page 360 to unlock the registers.

The recall function of the instrument is not affected by this function.

Format	KS(
Query Data Type	N/A
SCPI Equivalent Commands	None
Preset	Unlocked
Couplings	This state is not affected by IP.

KS) (Unlock Registers)

Syntax



Legacy Products

8566A/B, 8568A/B

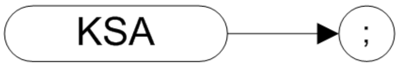
Description

Unlocks the state registers, where instrument states are stored with "SV (Save State)" on page 521 and "SAVES (Save State)" on page 502.

Format	KS)
Query Data Type	N/A
SCPI Equivalent Commands	None
Preset	Unlocked
Couplings	This state is not affected by IP.

KSA (Amplitude in dBm)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Sets the amplitude readout (reference level, marker, display line and threshold) to dBm units.

Format	KSA
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of the KSA command are identical to AUNITS DBM . See "AUNITS (Absolute Amplitude Units)" on page 283.

KSa (Normal Detection)

Syntax

Legacy Products

8566A/B, 8568A/B

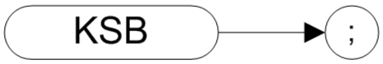
Description

Selects normal input detection. That is, it enables the *Rosenfell* detection algorithm that selectively chooses between positive and negative values.

Format	KSa
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSa are identical to DET NRM. See "DET (Detection Mode)" on page 317.

KSB (Amplitude in dBmV)

Syntax



Legacy Products

8566A/B, 8568A/B

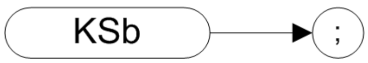
Description

Sets the amplitude readout (reference level, marker, display line and threshold) to dBmV units.

Format	KSB
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSB are identical to AUNITS DBMV. See "AUNITS (Absolute Amplitude Units)" on page 283.

KSb (Positive Peak Detection)

Syntax



Legacy Products

8566A/B, 8568A/B

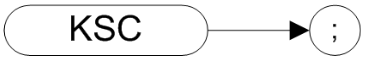
Description

Enables positive peak input detection for displaying trace information. Trace elements are only updated when the detected signal level is greater than the previous signal level.

Format	KSb
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSb are identical to DET POS. See "DET (Detection Mode)" on page 317.

KSC (Amplitude in dBµV)

Syntax



Legacy Products

8566A/B, 8568A/B

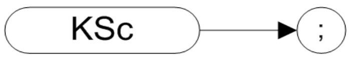
Description

Sets the amplitude readout (reference level, marker, display line and threshold) to dBµV units.

Format	KSC
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSC are identical to AUNITS DBUV. See "AUNITS (Absolute Amplitude Units)" on page 283.

KSc (A Plus B to A)

Syntax



Legacy Products

8566A/B, 8568A/B

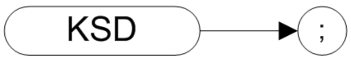
Description

Performs a point-by-point addition of Trace A and Trace B, and sends the results to Trace A. Thus, if your input signal remains unchanged, KSc can restore the original trace after an AMB or a C2 command has been executed.

Format	KSc
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSc are identical to "APB (Trace A Plus Trace B to A)" on page 281.

KSD (Amplitude in Volts)

Syntax



Legacy Products

8566A/B, 8568A/B

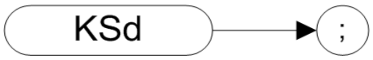
Description

Sets the amplitude readout (reference level, marker, display line and threshold) to voltage units.

Format	KSD
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSD are identical to AUNITS V. See "AUNITS (Absolute Amplitude Units)" on page 283.

KSd (Negative Peak Detection)

Syntax



Legacy Products

8566A/B, 8568A/B

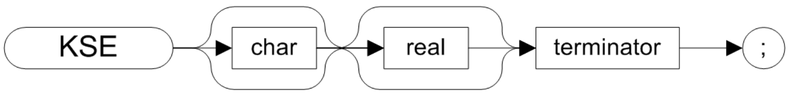
Description

Selects negative-peak input detection for displaying trace information. Each trace element is updated with the minimum value detected during the sweep.

Format	KSd
Query Data Type	N/A
SCPI Equivalent Commands	[:SENSe]:DETector[:FUNCtion] NEGative (see "Detector" on page 1287)
Notes	The functions of KSd are identical to DET NEG. See "DET (Detection Mode)" on page 317.

KSE (Title Mode)

Syntax



Legacy Products

8566A/B, 8568A/B

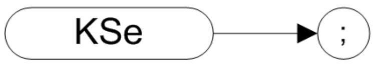
Description

Activates the title mode, writing a message to the top line of the display.

Format	KSE <char><real><terminator> The only characters that N9061A accepts as <terminator> are ‘@’ and Carriage Return.
Query Data Type	N/A
SCPI Equivalent Commands	:DISPlay:ANNotation:TITLe:DATA “text” (see "Change Title " on page 1375)

KSe (Sample Detection)

Syntax



Legacy Products

8566A/B, 8568A/B

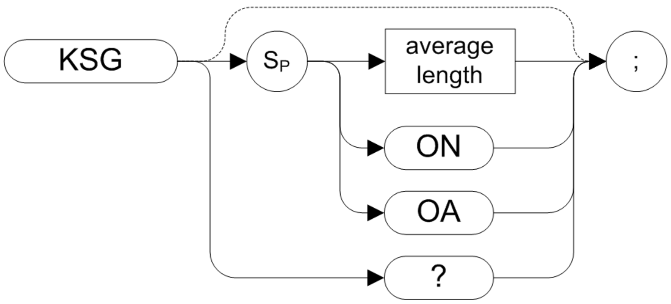
Description

Selects sample input detection for displaying trace information.

Format	KSe
Query Data Type	N/A
SCPI Equivalent Commands	[:SENSe]:DETector[:FUNCtion] SAMPle (see "Detector" on page 1287)
Notes	The functions of KSe are identical to DET SMP. See "DET (Detection Mode)" on page 317.

KSG (Video Averaging On)

Syntax



Legacy Products

8566A/B, 8568A/B

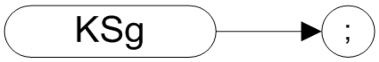
Description

Enables video averaging. The averaged trace is displayed in Trace A.

Format	KSG <average length> KSG ON KSG OA KSG? If video averaging is off when either KSG? or KSG OA is sent to the instrument, video averaging is turned ON and the current average count is returned to the controller.
Query Data Type	Current average count.
SCPI Equivalent Commands	:TRACe:COPY TRACE#,TRACE3 :TRACe3:TYPE WRITe [:SENSe]:DETector[:FUNCtion] SAMPle :TRACe#:TYPE AVERage [:SENSe]:AVERage:COUNT <integer> (See "Copy/Exchange" on page 1312, "Detector" on page 1287, etc.)
Preset	Preset state is OFF. If ON, <average length> is preset to 100.
Notes	The functions of KSG are identical to VAVG ON. See "VAVG (Video Average)" on page 545.

KSg (Display Off)

Syntax



Legacy Products

8566A/B, 8568A/B

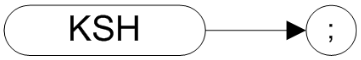
Description

Turns the instrument’s display Off.

Format	KSg
Query Data Type	N/A
SCPI Equivalent Commands	:DISPlay:ENABle OFF (see "Display Enable (Remote Command Only)" on page 1389)
Notes	On the legacy spectrum analyzers, this command turned the CRT beam power off to avoid unnecessary wear on the CRT. Although this command is supported, displays used on the X-Series instruments have a much longer life than the CRTs used in the legacy spectrum analyzers.

KSH (Video Averaging Off)

Syntax



Legacy Products

8566A/B, 8568A/B

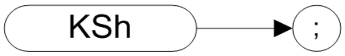
Description

Switches video averaging Off.

Format	KSH
Query Data Type	N/A
SCPI Equivalent Commands	:TRACe3:MODE BLANk :TRACe#:TYPE WRITe (See "View/Blank " on page 1284)
Notes	The functions of KSH are identical to VAVG OFF. See "VAVG (Video Average)" on page 545.

KSh (Display On)

Syntax



Legacy Products

8566A/B, 8568A/B

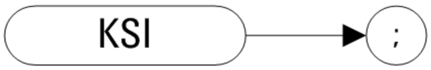
Description

Turns the instrument's display On.

Format	KSh
Query Data Type	N/A
SCPI Equivalent Commands	:DISPlay:ENABle ON (see "Display Enable (Remote Command Only)" on page 1389)
Notes	On the early models of spectrum analyzers, CRT beam power was often switched Off to prevent wear of the CRT. This command was used to turn the CRT beam power on again. Although this command is supported, displays used on the X-Series instruments have a much longer life than the CRTs used in the legacy spectrum analyzers.

KSI (Extend Reference Level)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

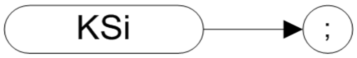
In legacy analyzers, KSI extends the reference level range to maximum limits of –139.9 dBm and +60 dBm.

N9061A accepts this command but takes no action, because the standard reference level lower limit of X-Series instruments covers the “extended” range of the legacy instruments.

Format	KSI
Query Data Type	N/A
SCPI Equivalent Commands	None
Preset	Off

KSi (Exchange Trace B and Trace C)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Exchanges Trace B data with Trace C data.

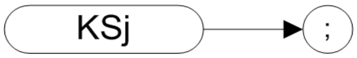
Trace C cannot be an active trace. This means that the data in Trace C cannot be updated as the instrument sweeps. To ensure that the current settings of the instrument are reflected in the data exchanged between Trace B and Trace C, you must follow the four step process below.

1. Select single sweep mode ("S2 [two] (Single Sweep)" on page 500 or "SNGLS (Single Sweep)" on page 510)
2. Select the desired instrument settings
3. Take one complete sweep using the command "TS (Take Sweep)" on page 543
4. Exchange the data

Format	KSi
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSi are identical to "BXC (Exchange Trace B and Trace C)" on page 295 and the XCH TRB,TRC form of "XCH (Exchange)" on page 553.

KSj (View Trace C)

Syntax



Legacy Products

8566A/B, 8568A/B

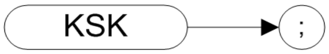
Description

Displays Trace C.

Format	KSj
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSj are identical to VIEW TRC. See "VIEW (View Trace)" on page 551.

KSK (Marker to Next Peak)

Syntax



Legacy Products

8566A/B, 8568A/B

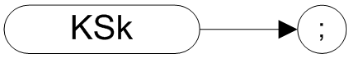
Description

If there is a marker on the screen, this command moves this marker to the next signal peak of lower amplitude.

Format	KSK
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:MAXimum:NEXT :CALCulate:MARKer:PEAK:EXCursion <rel_ampl> :CALCulate:MARKer:PEAK:THReshold <ampl> (See "Pk Excursion " on page 891)
Notes	The functions of KSK are similar to the MKPK NH form of "MKPK (Marker Peak)" on page 444, except that KSK does not take into account the marker peak threshold value or the marker peak excursion value. For more details on marker peak threshold, see the command "MKPT (Marker Threshold)" on page 445 and "TH (Threshold)" on page 531. For more details on marker peak excursion, see the command "MKPX (Marker Peak Excursion) " on page 446.

KSk (Blank Trace C)

Syntax



Legacy Products

8566A/B, 8568A/B

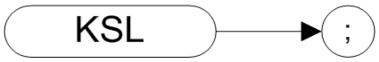
Description

Blanks Trace C.

Format	KSk
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSk are identical to BLANK TRC. See "BLANK (Blank Trace)" on page 292)

KSL (Marker Noise Off)

Syntax



Legacy Products

8566A/B, 8568A/B

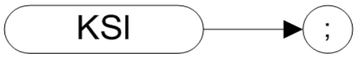
Description

Disables the noise density function which displays the RMS noise density at the marker. KSL does not blank the marker.

Format	KSL
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:FUNCtion OFF (see "Marker Function" on page 742)
Notes	The functions of KSL are identical to MKNOISE OFF. See "MKNOISE (Marker Noise)" on page 441.

KSl (Transfer Trace B to Trace C)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Transfers Trace B data to Trace C

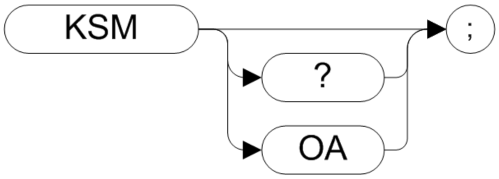
Trace C cannot be an active trace. This means that the data in Trace C cannot be updated as the instrument sweeps. To ensure that the current settings of the instrument are reflected in the data transferred from Trace B to Trace C, you must follow the four step process below.

1. Select single sweep mode ("S2 [two] (Single Sweep)" on page 500 or "SNGLS (Single Sweep)" on page 510)
2. Select the desired instrument settings
3. Take one complete sweep using the command "TS (Take Sweep)" on page 543
4. Transfer the data

Format	KSl
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSl are identical to "BTC (Transfer Trace B to Trace C)" on page 294.

KSM (Marker Noise On)

Syntax



Legacy Products

8566A/B, 8568A/B

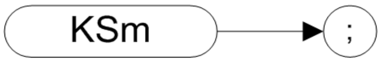
Description

Displays the noise density at the marker. The noise density is normalized to a 1 Hz bandwidth.

Format	KSM OA KSM?
Query Data Type	Noise density at the marker.
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:FUNCtion NOISe (see "Marker Function" on page 742)
Notes	The functions of KSM are identical to MKNOISE ON. See "MKNOISE (Marker Noise)" on page 441.

KSm (Graticule Off)

Syntax



Legacy Products

8566A/B, 8568A/B

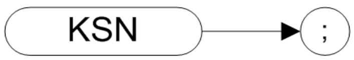
Description

Blanks the graticule on the instrument display.

Format	KSm
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSm are identical to GRAT OFF. See "GRAT (Graticule)" on page 349.

KSN (Marker Minimum)

Syntax



Legacy Products

8566A/B, 8568A/B

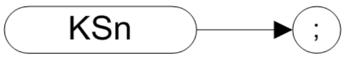
Description

Moves the marker to the minimum value detected.

Format	KSN
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:MINimum (see "Min Search " on page 900)
Notes	The functions of KSN are identical to "MKMIN (Marker Minimum)" on page 438.

KSn (Graticule On)

Syntax



Legacy Products

8566A/B, 8568A/B

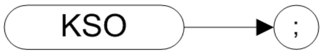
Description

Turns on the graticule on the instrument display.

Format	KSn
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSn are identical to GRAT ON. See "GRAT (Graticule)" on page 349.

KSO (Marker Span)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

This command operates only when the delta marker is On (see "MKD (Marker Delta)" on page 432 or "M3 [three] (Delta Marker)" on page 414).

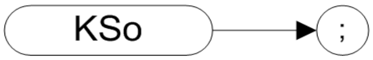
When the delta marker is on and KSO is executed, the left marker specifies the start frequency, and the right marker specifies the stop frequency.

If the delta marker is off, the command does nothing.

Format	KSO
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer2[:SET]:DELTA:SPAN (see "MkrΔ->Span" on page 789)
Notes	The functions of KSO are identical to "MKSP (Marker Span)" on page 450. If the active marker is not a delta marker, there is no change in its position.

KSo (Annotation Off)

Syntax



Legacy Products

8566A/B, 8568A/B

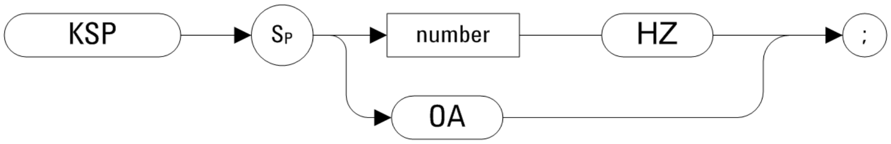
Description

Blanks the annotation on the instrument display.

Format	KSo
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSo are identical to ANNOT OFF. See "ANNOT (Annotation)" on page 280.

KSP (GPIB Address)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

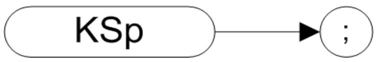
Allows you to display or change the current read/write HP-IB address of the instrument.

Note that the “HZ” in the command format string is required.

Format	KSP OA KSP <integer> HZ
Query Data Type	<integer>
SCPI Equivalent Commands	:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <integer> (see "GPIB Address" on page 1241)
Preset	Factory preset address: 18

KSp (Annotation On)

Syntax



Legacy Products

8566A/B, 8568A/B

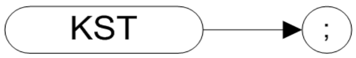
Description

Activates the annotation on the instrument display.

Format	KSp
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSp are identical to ANNOT ON. See "ANNOT (Annotation)" on page 280.

KST (Fast Preset)

Syntax



Legacy Products

8566A/B, 8568A/B

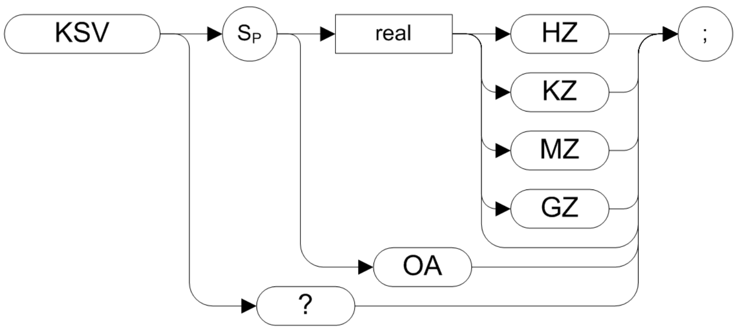
Description

Performs an instrument preset, setting the instrument back to its factory settings.

Format	KST
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	There is no fast preset for X-Series instruments. Instead, the Code Compatibility software performs an instrument preset (IP) when the KST command is issued. The functions of KST are therefore identical to "IP (Instrument Preset)" on page 356.

KSV (Frequency Offset)

Syntax



Legacy Products

8566A/B, 8568A/B

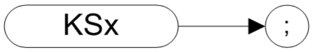
Description

Allows you to specify a value that offsets the frequency scale for all absolute frequency readouts, for example, center frequency. Relative values, for example, span and delta marker, are not offset.

Format	KSV
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSV are identical to "FOFFSET (Frequency Offset)" on page 338.

KSx (External Trigger)

Syntax



Legacy Products

8566A/B, 8568A/B

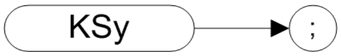
Description

Activates the normal external trigger mode. When KSx is executed, the RF input signal is only displayed when the external trigger level exceeds the trigger threshold level.

Format	KSx
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSx are identical to TM EXT. See "TM (Trigger Mode)" on page 536. If an 8566A/B or an 8568A/B analyzer is in zero span and the sweep time is less than 20 msec, the display is refreshed only when a fresh trace has been taken. This can cause the displayed trace to flicker. In X-Series instruments, all traces are displayed continuously, so are therefore free of flicker.

KSy (Video Trigger)

Syntax



Legacy Products

8566A/B, 8568A/B

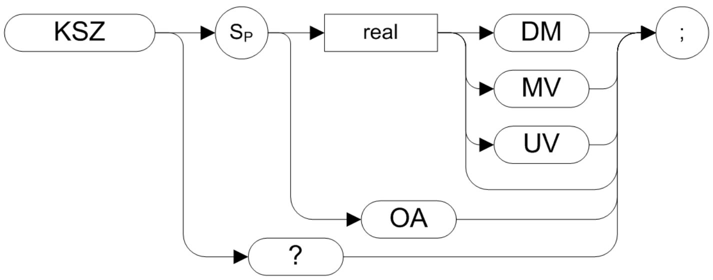
Description

Activates the normal video trigger mode. When KSy is executed, the RF input signal is only displayed when the video trigger signal, which is internally triggered off the input signal, exceeds the trigger threshold level.

Format	KSy
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of KSy are identical to the TM VID form of "TM (Trigger Mode)" on page 536 and to "T4 [four] (Video Trigger)" on page 527. If an 8566A/B or an 8568A/B analyzer is in zero span and the sweep time is less than 20 msec, the display is refreshed only when a fresh trace has been taken. This can cause the displayed trace to flicker. In X-Series instruments, all traces are displayed continuously, so are therefore free of flicker.

KSZ (Reference Level Offset)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Offsets all amplitude readouts on the display but without affecting the trace.

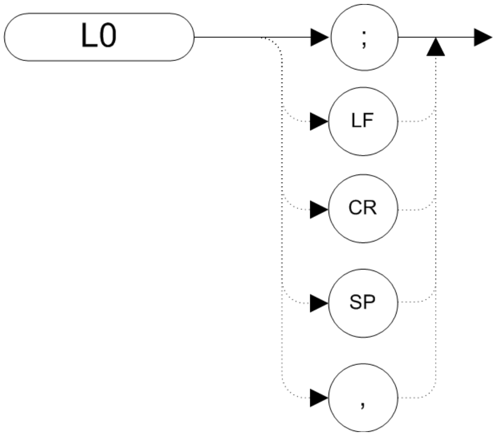
Once activated, KSZ displays the amplitude offset on the left side of the screen.

Sending KSZ 0, or presetting the instrument, eliminates an amplitude offset.

Format	KSZ <real> DM|MV|UV 8566A/B only supports unit DM KSZ OA KSZ?
Query Data Type	<real>
SCPI Equivalent Commands	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet <rel_ampl> :DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet? (See "Reference Level" on page 559)
Preset	0
Notes	The functions of KSZ are identical to "ROFFSET (Reference Level Offset)" on page 495.

L0 [zero] (Display Line Off)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

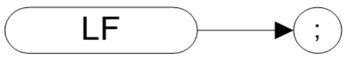
Description

Disables the display line.

Format	L0
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of L0 are identical to DLE OFF. See "DLE (Display Line Enable)" on page 320.

LF (Low Frequency Preset)

Syntax



Legacy Products

8566A/B

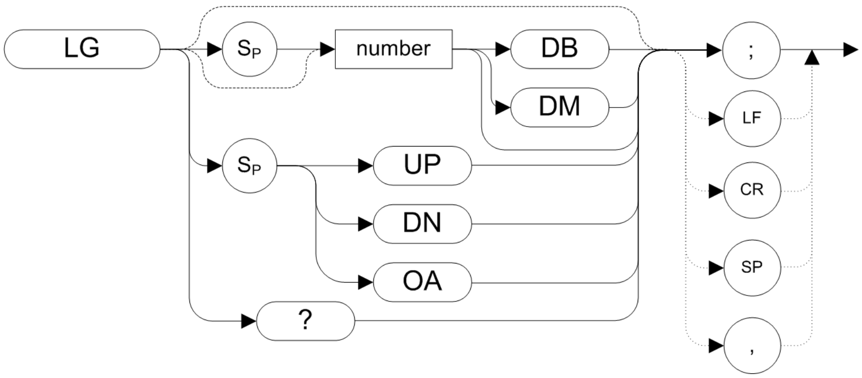
Description

Performs a low frequency preset. That is, it selects a Start Frequency of 0 Hz and a Stop Frequency of 2.5 GHz, a Reference Level of 0 dBm, and sets all coupled functions to automatic.

Format	LF
Query Data Type	N/A
SCPI Equivalent Commands	None

LG (Logarithmic Scale)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

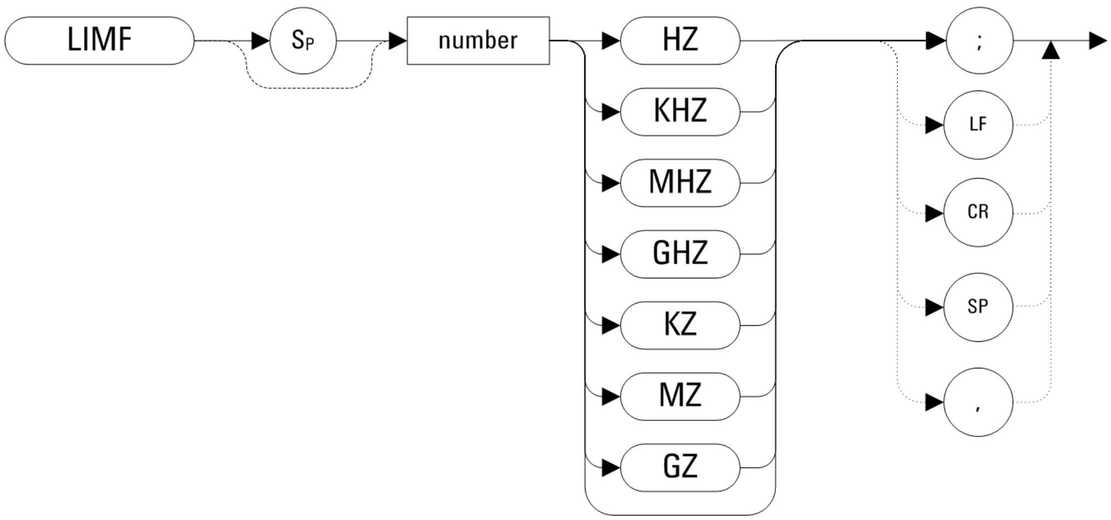
Description

Specifies the amplitude (vertical graticule divisions) as logarithmic units, without changing the reference level.

Format	LG <number>DB|DM Range: 1, 2, 5, and 10 LG UP|DN LG OA LG?
Query Data Type	<number> DB When in linear mode, LG? returns "0".
SCPI Equivalent Commands	:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:SPACing LINear|LOGarithmic :DISPlay:WINDow[1]:TRACe:Y[:SCALe]:SPACing? :DISPlay:WINDow[1]:TRACe:Y[:SCALe]:PDIVision <ampl> dB :DISPlay:WINDow[1]:TRACe:Y[:SCALe]:PDIVision? (See "Scale / Div" on page 570)
Preset	10 dB

LIMF (Limit Line Frequency Value)

Syntax



Legacy Products

8560 series

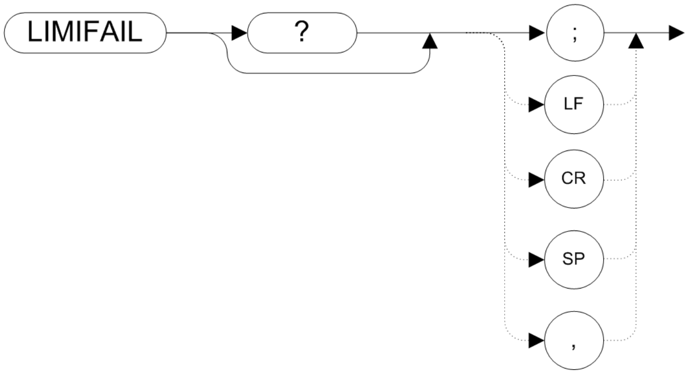
Description

This command is used to enter a frequency value for a limit-line segment.

Format	LIMF <number>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ The response to the query LIMF? is **not** supported by N9061A.
Query Data Type	N/A
SCPI Equivalent Commands	None
Preset	N/A
Couplings	"EDITLIML (Edit Limit Line)" on page 329, "EDITDONE (Edit Done)" on page 328

LIMIFAIL (Limits Failed)

Syntax



Legacy Products

8560 series

Description

Returns a number between 0 and 3, which specifies whether the active trace passed or failed the upper and lower limit line tests.

Format	LIMIFAIL?
Query Data Type	The meanings of the returned numbers (0-3) are shown in the "Query Data Type Codes" on page 400 table below.
SCPI Equivalent Commands	:CALCulate:LLINe[1]|2:FAIL? (see "Limit Line Fail? (Remote Command Only)" on page 826)

Query Data Type Codes

Results of the LIMIFAIL Query

Result	Meaning
0	The active trace passed both the upper and the lower limit tests. This value is also returned if there are no limits, or if LIMITST is OFF.
1	The active trace failed the lower limit test.
2	The active trace failed the upper limit test.
3	The active trace failed both the upper and the lower limit tests.

LIMIPURGE (Delete Current Limit Line)

Syntax

Legacy Products

8560 series

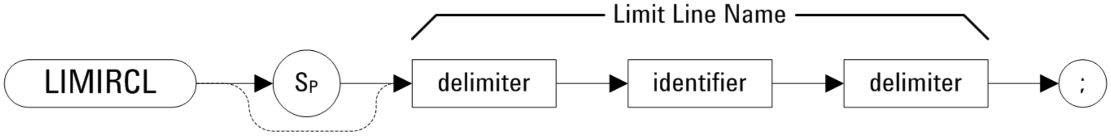
Description

Deletes the current limit line.

Format	LIMIPURGE
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:LLINe:ALL:DELete (see "Delete All Limits" on page 824)

LIMIRCL (Recall Limit Line)

Syntax



Legacy Products

8560 series

Description

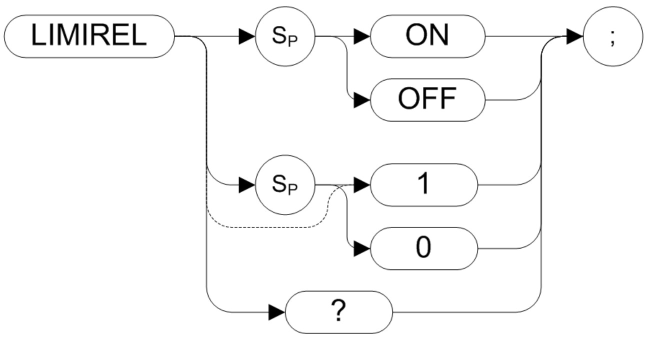
Recalls a limit-line set from the limit-line table in the module user memory. The table is stored in user memory with the command "LIMISAV (Save Limit Line)" on page 404. The command displays a limit line, which is recalled by the name assigned to it. A limit line may be saved and given a name using LIMISAV, or entered from the front panel with the screen-title function.

To display the line, send the command LIMITST 1 (see "LIMITST (Activate Limit Line Test Function)" on page 407).

Format	LIMIRCL delimeter identifier delimiter
Query Data Type	N/A
SCPI Equivalent Commands	MMEMory:LOAD:LIMit LLINE1|LLINE2, <“filename”> (see "Limit" on page 976)

LIMIREL (Relative Limit Lines)

Syntax



Legacy Products

8560 series

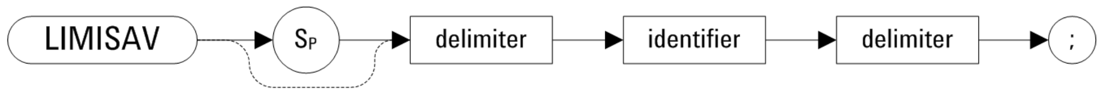
Description

Specifies whether the current limit lines are fixed or relative.

Format	LIMIREL ON|OFF|1|0 LIMIREL?
Query Data Type	1|0
SCPI Equivalent Commands	:CALCulate:LLINe:CMODe FIXed|RELative (see "Fixed / Relative Limit (Remote Command Only) " on page 829)
Preset	OFF

LIMISAV (Save Limit Line)

Syntax



Legacy Products

8560 series

Description

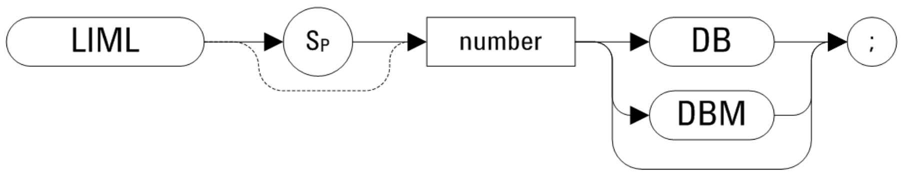
Saves the active limit line to module memory under the name assigned to it. Any previously existing limit line having the same name is overwritten with the new limit-line table data.

Refer also to the command "LIMIRCL (Recall Limit Line)" on page 402.

Format	LIMISAV delimeter identifier delimiter
Query Data Type	N/A
SCPI Equivalent Commands	MMEMory:STORe:LIMit LLINE1|LLINE2, <“filename”> (see "Limit " on page 1030)

LIML (Lower-Limit Amplitude)

Syntax



Legacy Products

8560 series

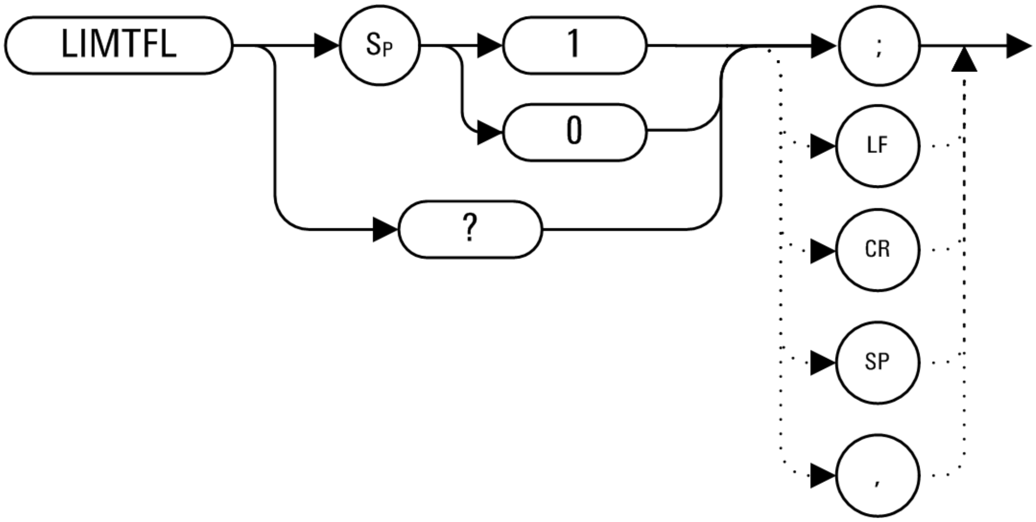
Description

Assigns the lower-limit amplitude value to a limit-line segment.

Format	LIML <number>DB|DBM
Query Data Type	N/A. The query is not supported by N9061A.
SCPI Equivalent Commands	None

LIMTFL (Flat Limit Line)

Syntax



Legacy Products

8560 series

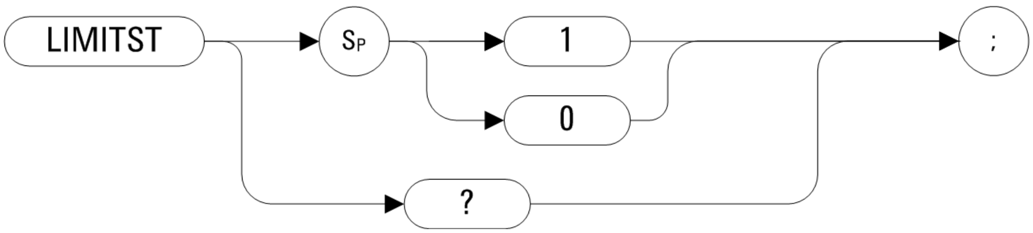
Description

Used with the command "SEDI (Edit Limit Line Segment)" on page 505 to make the selected limit-line segment flat.

Format	LIMTFL 0|1 LIMTFL?
Query Data Type	0|1
SCPI Equivalent Commands	None

LIMITST (Activate Limit Line Test Function)

Syntax



Legacy Products

8560 series

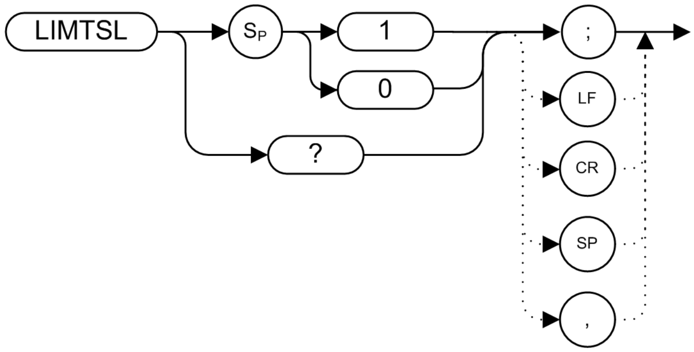
Description

Activates the limit-line test function, which compares the trace data in the current sweep with the limits set up in the limit table of the active limit line. The results of the current active trace compared with the active limit line can be read using the command "LIMIFAIL (Limits Failed)" on page 399. When this option is set to 1 (ON), the active limit-line test limits are displayed on-screen, along with a LIMIT FAILED message if the trace data fails.

Format	LIMITST 1|0 LIMITST?
Query Data Type	1|0
SCPI Equivalent Commands	:CALCulate:LLINe[1]|2:DISPlay OFF|ON|0|1 (see "Limit " on page 801) :CALCulate:LLINe:TEST OFF|ON|0|1 (see "Test Limits" on page 823)
Preset	0

LIMTSL (Slope Limit Line)

Syntax



Legacy Products

8560 series

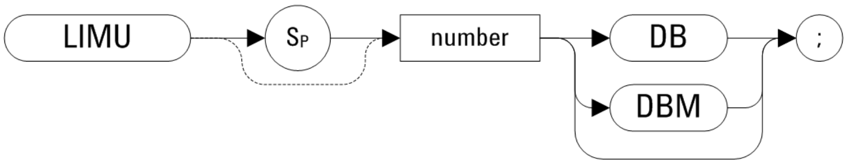
Description

Makes the selected limit-line segment sloped.

Format	LIMTSL 0|1 LIMTSL?
Query Data Type	0|1
SCPI Equivalent Commands	None
Preset	1 (Sloped)

LIMU (Upper-Limit Amplitude)

Syntax



Legacy Products

8560 series

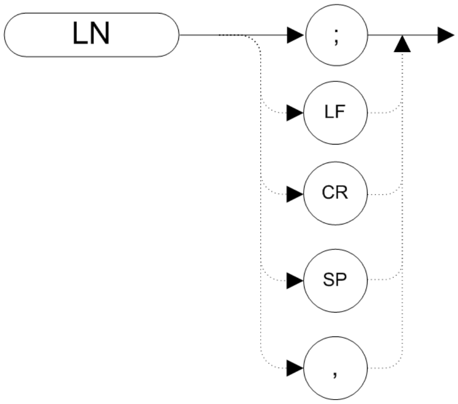
Description

Assigns the upper-limit amplitude value to a limit-line segment.

Format	LIMU <number>DB|DBM
Query Data Type	N/A (Query is not supported by N9061A)
SCPI Equivalent Commands	None

LN (Linear Scale)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

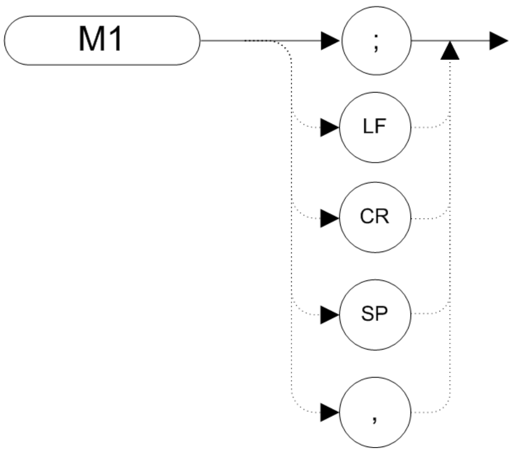
Description

Scales the amplitude (vertical graticule divisions) proportional to the input voltage (that is, linearly), without changing the reference level. The bottom line of the graticule represents 0 V.

Format	LN
Query Data Type	N/A
SCPI Equivalent Commands	:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:SPACing LINear (see "Scale Type" on page 570)
Preset	Off

M1 [one] (Marker Off)

Syntax



Legacy Products

8566A/B, 8568A/B

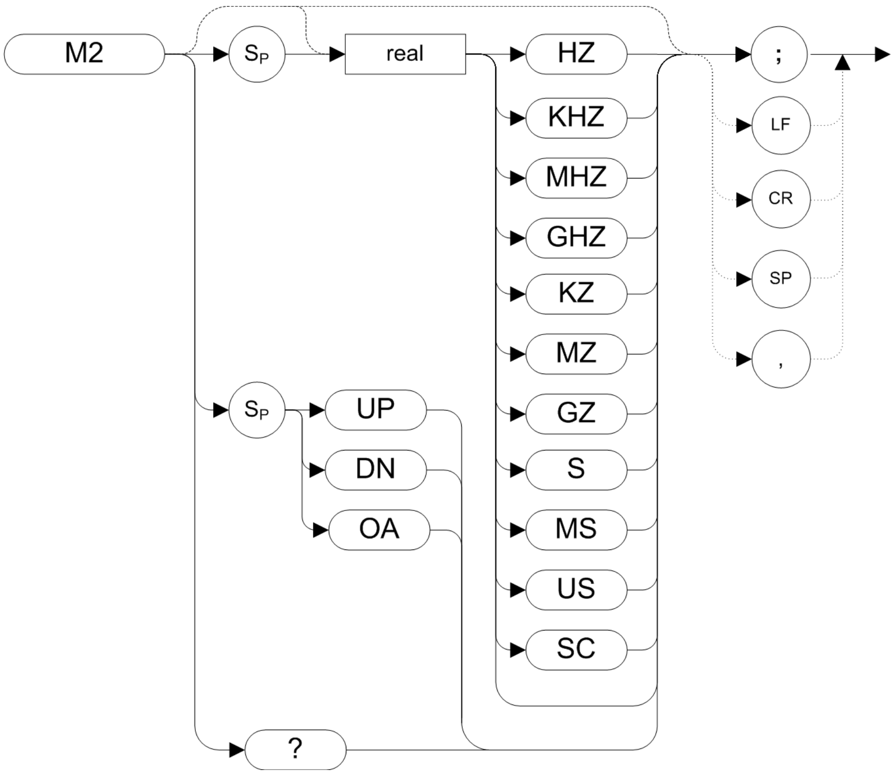
Description

Blanks any markers showing on the display.

Format	M1
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer#:MODE OFF (see "Marker" on page 689)
Notes	Unlike the MKOFF ALL form of "MKOFF (Marker Off)" on page 442, M1 also blanks inactive markers.

M2 [two] (Marker Normal)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

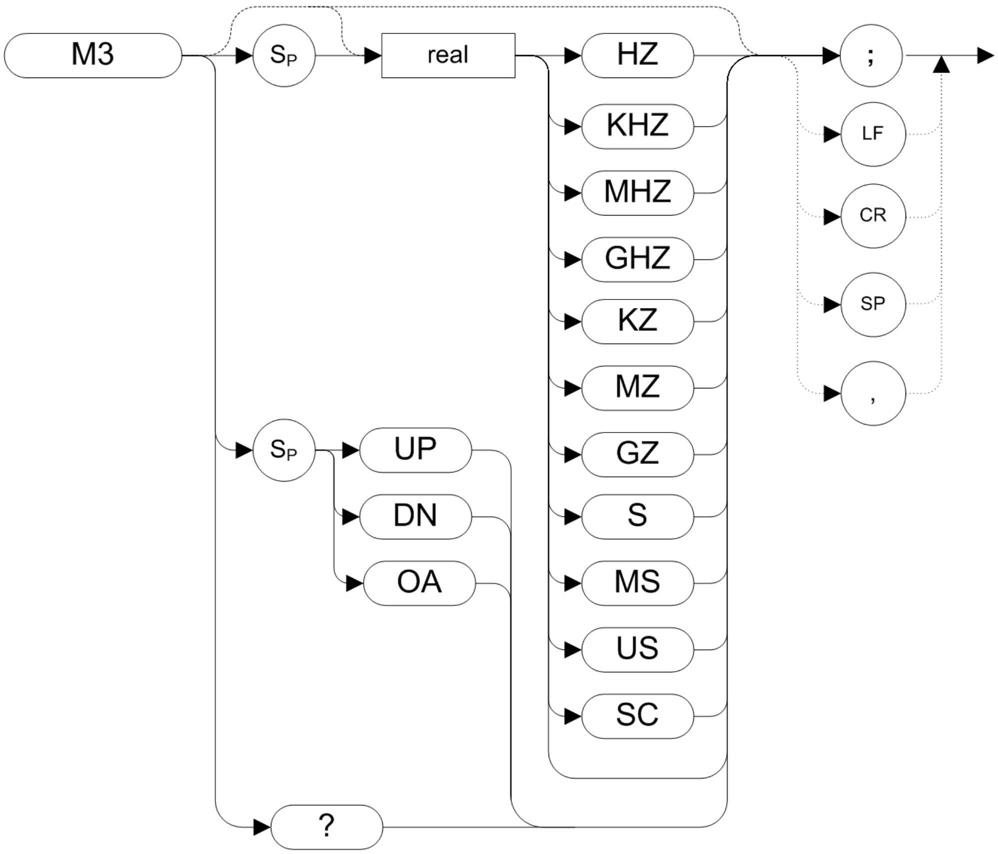
Moves the active marker to the marker frequency. If the active marker type is not currently Normal (for example, if it is Delta), the M2 command changes it to a Normal marker.

Format	M2 <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ|S|MS|US|SC M2 UP|DN UP or DN increments 10% of span M2 OA M2?
Query Data Type	<real>. See "MKF (Marker Frequency)" on page 434.
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:X <freq|time> :CALCulate:MARKer:MODE POSition (See "Marker" on page 689)
Notes	The functions of M2 are identical to "MKN (Marker Normal)" on page 439.

If the active marker has not been declared with "MKACT (Activate Marker)" on page 429, a Normal marker is turned on and this active marker is assumed to be marker number 1.

M3 [three] (Delta Marker)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Computes the frequency and amplitude difference between the active marker and the delta (or difference) marker.

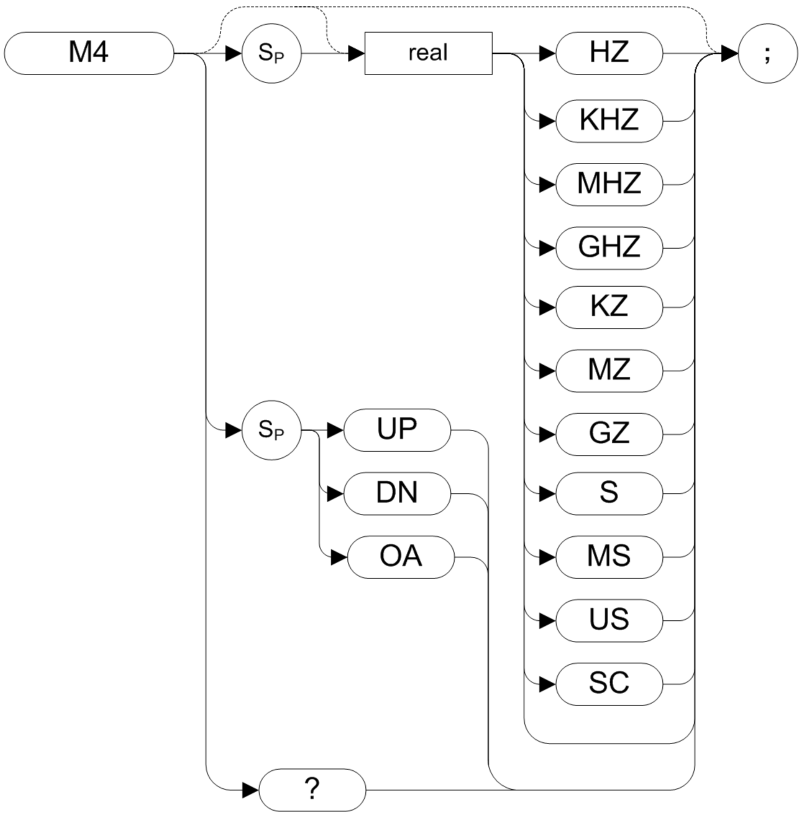
If a delta marker is not displayed on the screen, M3 places one at the specified frequency or on the right hand edge of the display. If an active marker is not displayed on the screen, M3 places an active marker at the center of the screen.

Format	M3 <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ|S|MS|US|SC M3 UP|DN UP or DN increments 10% of span M3 OA M3?

Query Data Type	<real>
SCPI Equivalent Commands	:CALCulate:MARKer2:MODE POSition|DELTa|OFF :CALCulate:MARKer2:REFerence 1 :CALCulate:MARKer2:X <freq|time> (See "Marker" on page 689)
Preset	0
Notes	The functions of M3 are identical to "MKD (Marker Delta)" on page 432. The active marker is the number 1 marker unless otherwise specified by the command "MKACT (Activate Marker)" on page 429.

M4 [four] (Marker Zoom)

Syntax



Legacy Products

8566A/B, 8568A/B

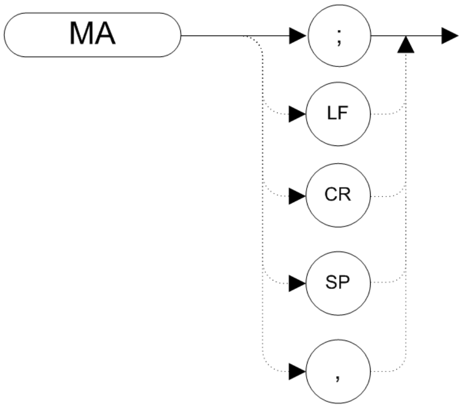
Description

This command increases or decreases the frequency span. With the UP/DN parameters, the change is by one step. With a numeric value, the command moves the marker's horizontal (X) position to the specified position in frequency or time.

Format	M4 <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ|S|MS|US|SC M4 UP|DN UP or DN increases or decreases the frequency span by one step M4 OA The OA option only returns the current value to the controller; it does not set the active function to the active marker. M4?
Query Data Type	<real>
SCPI Equivalent Commands	None

MA (Marker Amplitude Output)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

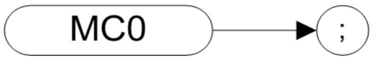
Description

Returns the amplitude level of the active marker if the marker is on the screen. If both the active marker and the delta marker are displayed, the command returns the amplitude difference between the two markers.

Format	MA
Query Data Type	8566A/B, 8568A/B: dependent on the currently set trace data format (see "TDF (Trace Data Format)" on page 530, MDS, O1, O2, O3, or O4). 8560 Series: Amplitude is always returned as an ASCII value (TDF P).
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2|3|4|5|6:Y? (see "Marker" on page 689)
Notes	The functions of MA are identical to "MKA (Marker Amplitude)" on page 428.

MC0 [zero] (Marker Frequency Counter Off)

Syntax



Legacy Products

8568A/B

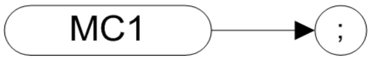
Description

Turns the marker frequency counter off.

<table>
<tr><td>Format</td><td>MC0</td></tr>
<tr><td>Query Data Type</td><td>N/A</td></tr>
<tr><td>SCPI Equivalent Commands</td><td>:CALCulate:MARKer[1]|2|3|4|5|6:FCOunt[:STATe] OFF (see "Counter " on page 736)</td></tr>
<tr><td>Preset</td><td>Off</td></tr>
<tr><td>Notes</td><td>The functions of MC0 are identical to MKFC OFF. See "MKFC (Marker Counter)" on page 435.</td></tr>
</table>

MC1 [one] (Marker Frequency Counter On)

Syntax



Legacy Products

8568A/B

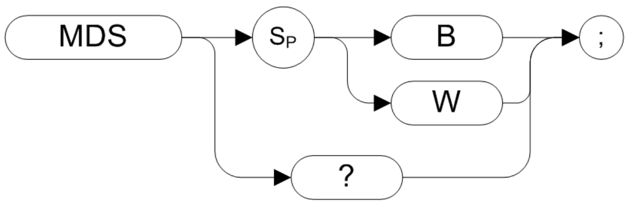
Description

Turns the marker frequency counter on.

Format	MC1
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2|3|4|5|6:FCOunt[:STATe] ON :CALCulate:MARKer[1]|2|3|4|5|6:FCOunt:X? (See "Counter " on page 736)
Preset	Off
Notes	The functions of MC1 are identical to MKFC ON. See "MKFC (Marker Counter)" on page 435.

MDS (Measurement Data Size)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Formats binary data in one of the following formats:

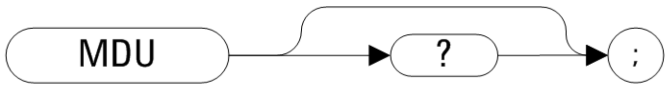
B	Selects a data size of one byte (8 bits).
W	Selects a data size of one word (16 bits).

If no keyword is specified in the command, the default value of W is assumed.

Format	MDS B|[W] MDS?
Query Data Type	B|W
SCPI Equivalent Commands	None
Preset	W

MDU (Measurement Data Units)

Syntax



Legacy Products

8566A/B, 8568A/B

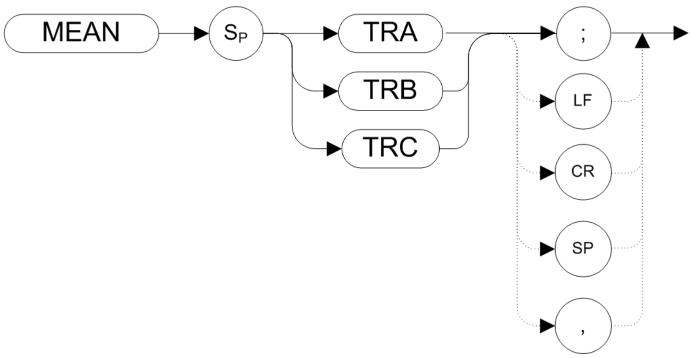
Description

Returns the measurement data units, as a list of four values. N9061A returns the values in display units.

Format	MDU[?]
Query Data Type	The four data values returned are as follows: 1. Lower vertical scale limit 2. Upper vertical scale limit 3. Baseline (dBm) 4. Reference level (dBm)
SCPI Equivalent Commands	None

MEAN (Trace Mean)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

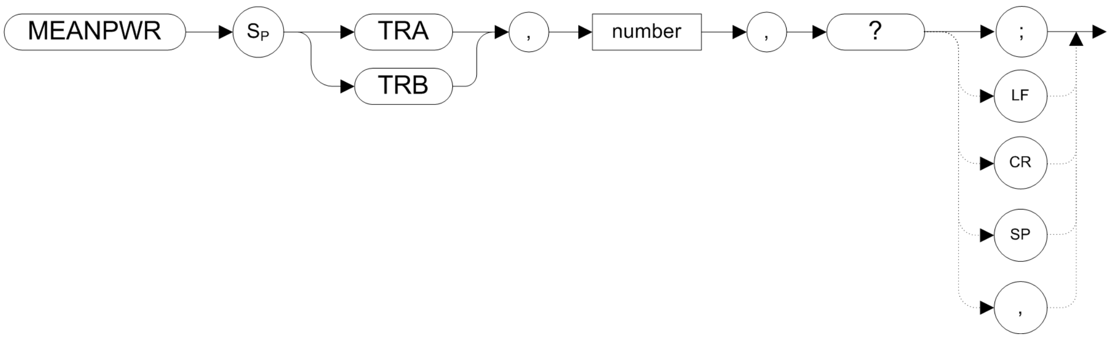
Description

Returns the mean value of the specified trace in display units.

Format	MEAN TRA|TRB TRA corresponds to Trace 1 and TRB corresponds to Trace 2.
Query Data Type	Mean value of the specified trace in display units.
SCPI Equivalent Commands	CALCulate:DATA[1|2|3|4|5|6:COMPress? MEAN TRACe:MATH:MEAN? TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6 (See "Mean Trace Data (Remote Command Only) " on page 1325)

MEANPWR (Mean Power measurement)

Syntax



Legacy Products

8560 series

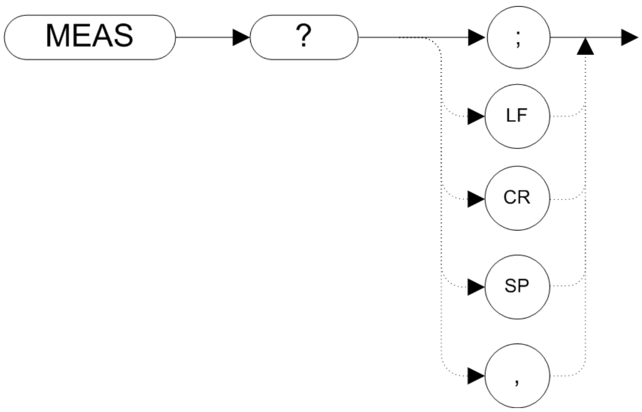
Description

Measures the average power of the carrier during that portion of the time when it is on. The on state is defined as the time when the signal is within a selected number of dB of its peak level. The range of amplitudes that is defined as the on state can be set with the command. The amplitude range is set relative to the peak value of the signal.

Format	MEANPWR TRA|TRB,<number>,? Range: 0.01 dB to 100 dB
Query Data Type	<number> in double.
SCPI Equivalent Commands	None
Notes	MEANPWR is similar to "CARRON (Carrier On Power)" on page 300, except that CARRON defines 'on' as that time when the signal is within 20 dB of its peak level.

MEAS (Meas)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Returns the current sweep status.

- If the instrument is set to sweep and make measurements continuously, the command returns CONTS.
- If it is set to make a single sweep with a single measurement, the command returns SNGLS.

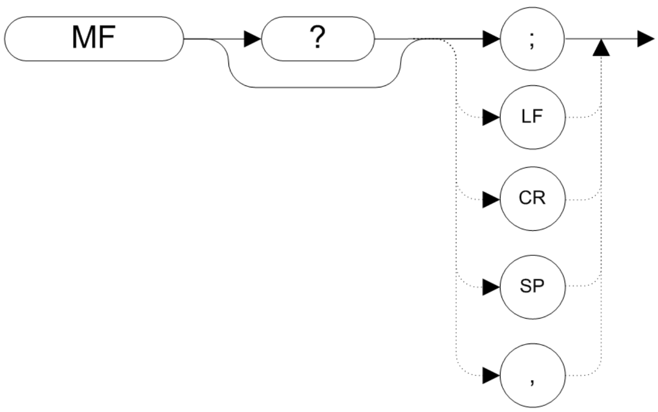
The instrument can be set to single sweep using the command "SNGLS (Single Sweep)" on page 510 and it can be set to continuous sweep using the command "CONTS (Continuous Sweep)" on page 309.

Format	MEAS?
Query Data Type	SNGLS|CONTS
SCPI Equivalent Commands	:INITiate:CONTinuous? (see "Cont (Continuous Measurement/Sweep)" on page 599) Note that the response values for this command differ from those of the legacy command

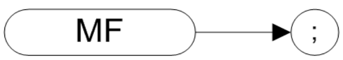
MF (Marker Frequency Output)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

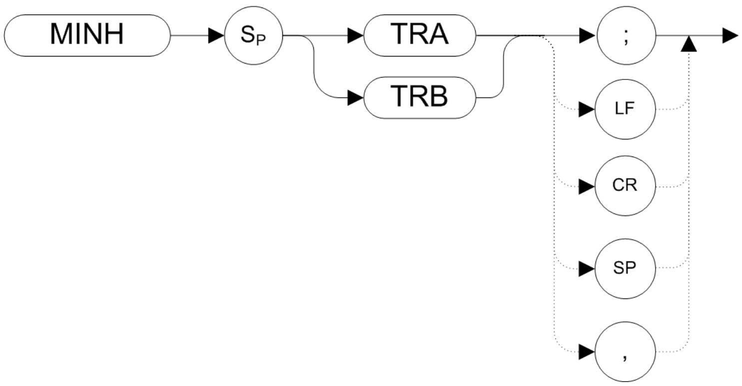
Description

Returns the frequency (or time) of the on-screen active marker. If both an active marker and the delta marker are on the screen, the frequency difference is returned.

Format	8560 series: MF? 8566A/B, 8568A/B: MF
Query Data Type	8566A/B, 8568A/B: Dependent on the current trace data format (see "TDF (Trace Data Format)" on page 530, MDS, O1, O2, O3 and O4). 8560 series: Always returned as an ASCII value (TDF P).
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2|3|4|5|6:X? (see "Marker" on page 689)
Notes	8566 and 8568 only: If the active marker has marker frequency count set to On when using the MF command, the marker frequency count value is returned to the controller.

MINH (Minimum Hold)

Syntax



Legacy Products

8560 series

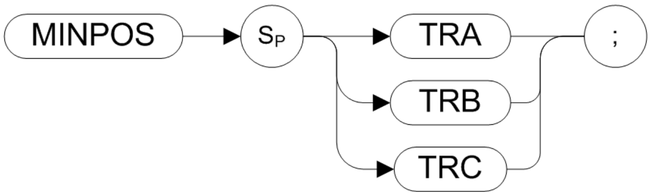
Description

Updates the chosen trace with the minimum signal level detected at each trace-data point from subsequent sweeps.

Format	MINH TRA|TRB
Query Data Type	N/A
SCPI Equivalent Commands	TRACe[1|2|3|4|5|6:TYPE MINHold (see "Trace/Detector" on page 1264)
Preset	After a Preset, all Minhold traces are set to 1000 dBm.

MINPOS (Minimum X Position)

Syntax



Legacy Products

8566A/B, 8568A/B

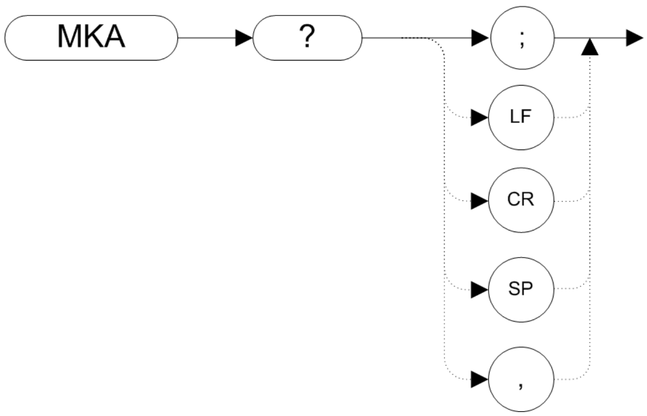
Description

Returns the X co-ordinate value that corresponds to the minimum amplitude of the specified trace.

Format	MINPOS TRA|TRB|TRC
Query Data Type	Value in X-axis display units.
SCPI Equivalent Commands	:CALCulate:MARKer1 2:TRACe 1|2|3|4|5|6 :CALCulate:MARKer1 2:MINimum :CALCulate:MARKer1 2:X? (See "Marker" on page 689)

MKA (Marker Amplitude)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

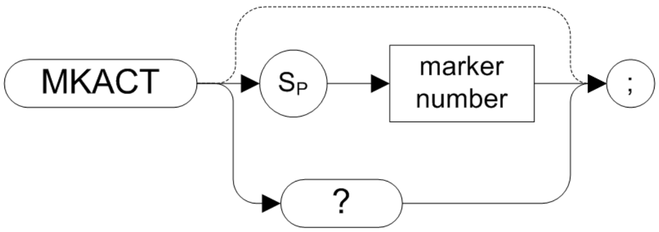
Description

Returns the amplitude level of the active marker if the marker is on the screen. If both the active marker and the delta marker are displayed, the command returns the amplitude difference between the two markers.

Format	MKA?
Query Data Type	8560 Series: The marker amplitude is always returned as an ASCII value (TDF P). 8566 and 8568 Series: Specifies the amplitude of the active marker in dBm when the active marker is the fixed or amplitude type (see "MKTYPE (Marker Type)" on page 455).
SCPI Equivalent Commands	:CALCulate:MARKer1|2:Y? (see "Marker" on page 689)
Notes	The functions of MKA are identical to "MA (Marker Amplitude Output)" on page 417.

MKACT (Activate Marker)

Syntax



Legacy Products

8566A/B, 8568A/B

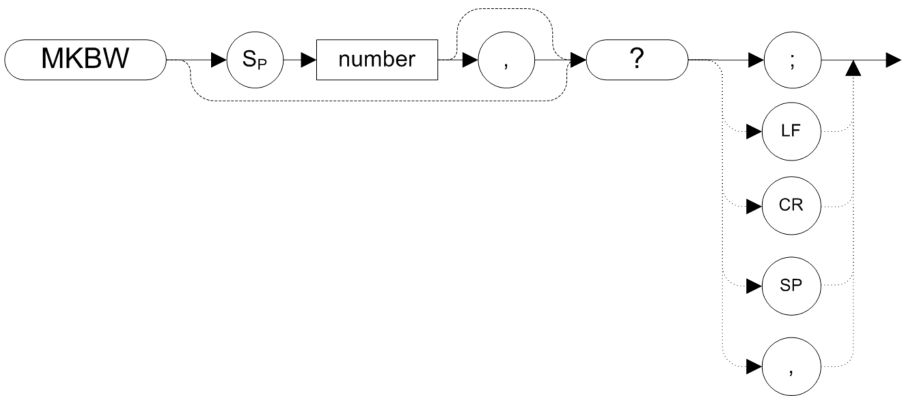
Description

Specifies the active marker. There can be four different markers, but only one marker can be active at any time.

Format	MKACT <integer> Range: 1,2,3,4. Default: 1 MKACT?
Query Data Type	<integer>
SCPI Equivalent Commands	None
Preset	1

MKBW (Marker Bandwidth)

Syntax



Legacy Products

8560 series

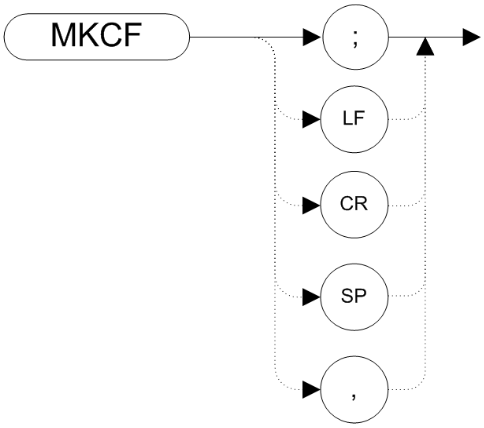
Description

Returns the bandwidth at the specified power level relative to an on-screen marker (if present) or the signal peak (if no on-screen marker is present).

Format	MKBW <number>?
Query Data Type	<number>
SCPI Equivalent Commands	:CALCulate:BANDwidth[:STATe] ON :CALCulate:BANDwidth:NDB <rel_ampl> :CALCulate:BANDwidth:RESult? :CALCulate:BANDwidth[:STATe] OFF (See "N dB Points " on page 830)

MKCF (Marker to Center Frequency)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

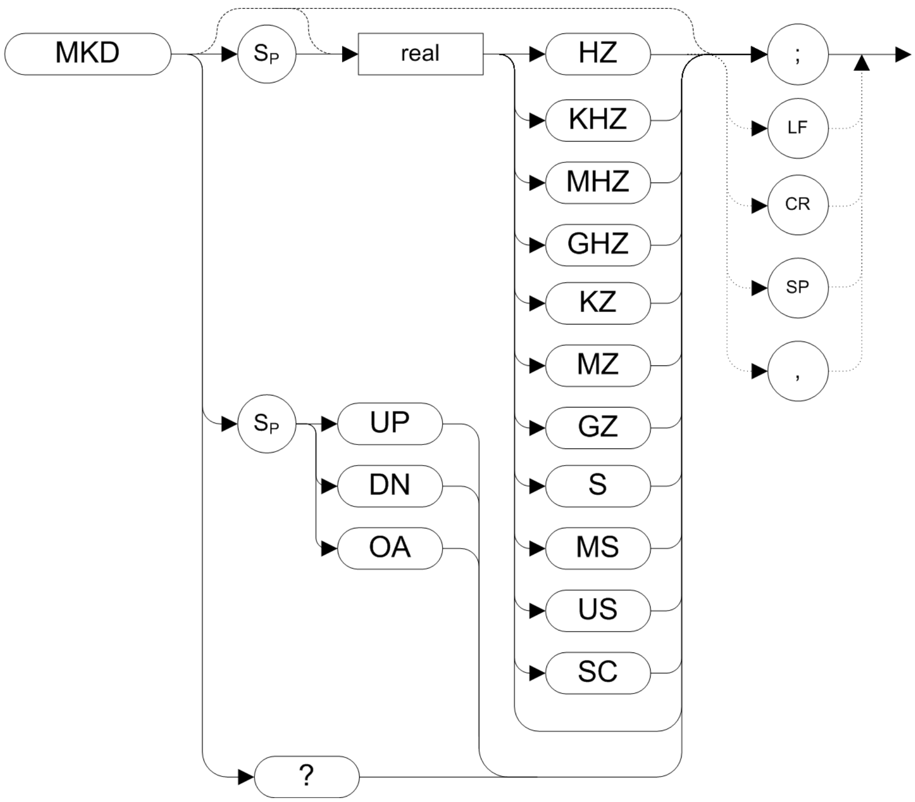
Description

Sets the center frequency equal to the marker frequency and moves the marker to the center of the screen.

Format	MKCF
Query Data Type	N/A
SCPI Equivalent Commands	CALCulate:MARKer[1]|2|3|4|5|6:X:CENTer (see "Marker" on page 689)
Notes	The functions of MKCF are identical to "E2 [two] (Marker to Center Frequency)" on page 325.

MKD (Marker Delta)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Computes the frequency and amplitude difference of the active marker and the delta marker. These values are displayed on the screen.

If a delta marker is not displayed on the screen, the command places one at the specified frequency or on the left or right hand edge of the display.

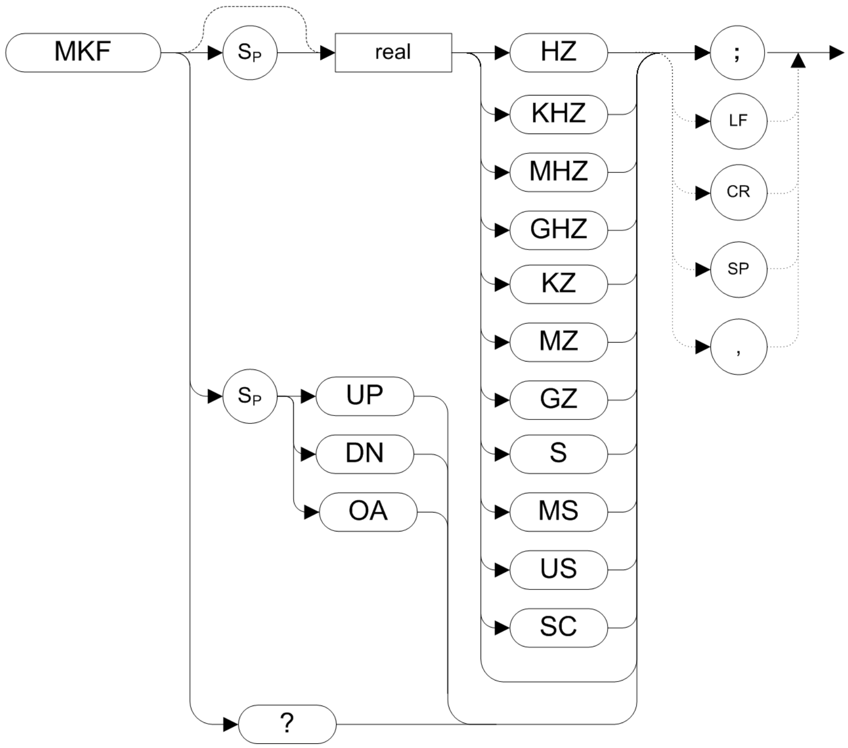
If an active marker is not displayed on the screen, the command places an active marker at the center of the screen.

Format	MKD <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ|S|MS|US|SC MKD UP|DN UP or DN specifies 10% of the current span. MKD OA MKD?

Query Data Type	<real>
SCPI Equivalent Commands	:CALCulate:MARKer2:MODE POSition|DELTa|OFF :CALCulate:MARKer2:REFerence 1 :CALCulate:MARKer2:X (See "Marker" on page 689)
Preset	0
Notes	For 8566A/B and 8568A/B, the functions of MKD are identical to "M3 [three] (Delta Marker)" on page 414.

MKF (Marker Frequency)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

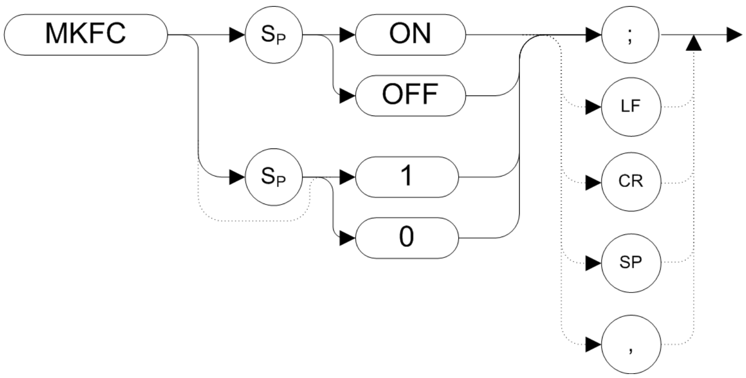
Specifies the frequency value of the active marker.

8566 and 8568 only: If the active marker has marker frequency count set to On when using the MKF? command, the marker frequency count value is returned to the controller.

Format	MKF <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ|S|MS|US|SC MKF UP|DN UP or DN specifies 10% of the current span. MKF OA MKF?
Query Data Type	8560 Series: The data is returned in ASCII format. For all other languages, the format of the returned data is determined by "TDF (Trace Data Format)" on page 530 command and, if TDF B (binary data format) has been selected, by "MDS (Measurement Data Size)" on page 420.
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:X (see "Marker" on page 689)

MKFC (Marker Counter)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

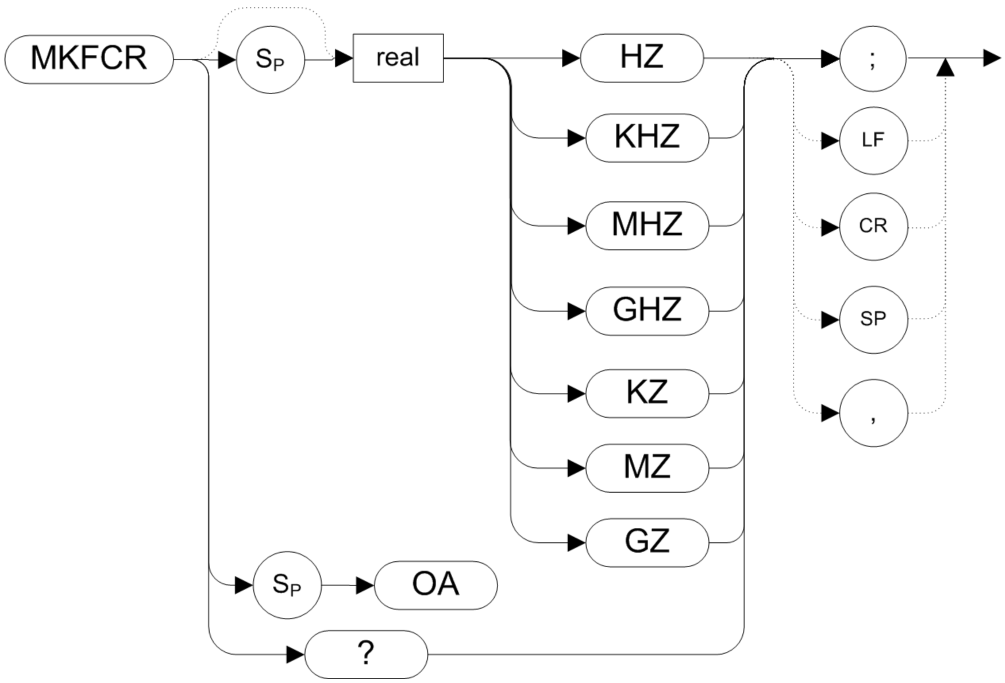
Turns on or off the marker frequency counter. The resolution of the frequency marker counter is determined by "MKFC (Marker Counter)" on page 435.

Format	MKFC ON|OFF|1|0
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2|3|4|5|6:FCOunt ON|OFF :CALCulate:MARKer2:FCOunt:X? (See "Counter " on page 736)
Preset	OFF
Notes	The functions of MKFC are identical to "MC0 [zero] (Marker Frequency Counter Off)" on page 418 and "MC1 [one] (Marker Frequency Counter On)" on page 419.

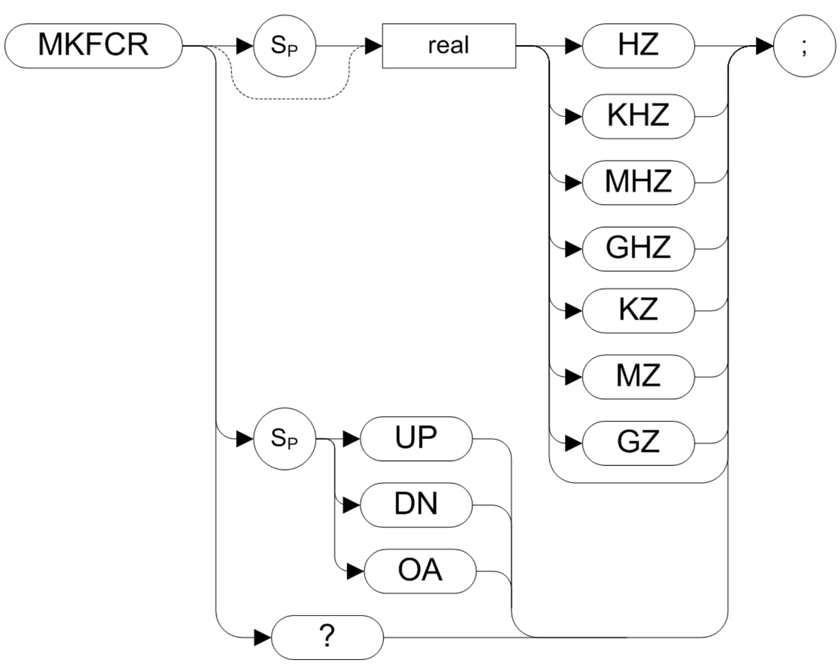
MKFCR (Marker Counter Resolution)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

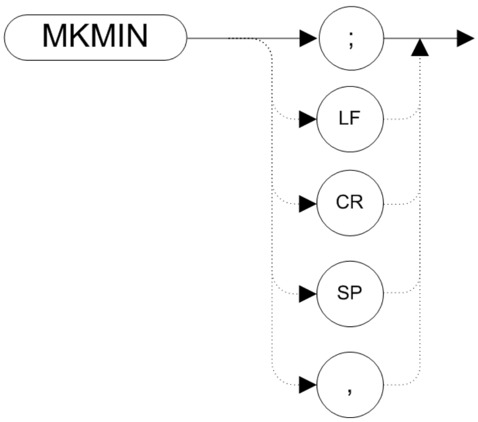
Description

Sets the resolution of the marker frequency counter. The marker counter resolution value is always given either in Hertz or in seconds depending on whether the instrument is operating in the frequency domain or the time domain.

Format	MKFCR <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ MKFCR UP|DN (8566A/B, 8568A/B only) MKFCR OA MKFCR?
Query Data Type	<real> in Hz or S.
SCPI Equivalent Commands	:CALCulate:MARKer[1]:FCOunt:RESolution <freq> (see "Gate Time " on page 739)
Preset	10 kHz
Notes	For 8566A/B, 8568A/B, the functions of MKFCR are identical to "KS= (8566A/B: Automatic Preselector Tracking, 8568A/B: Marker Counter Resolution)" on page 358.

MKMIN (Marker Minimum)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

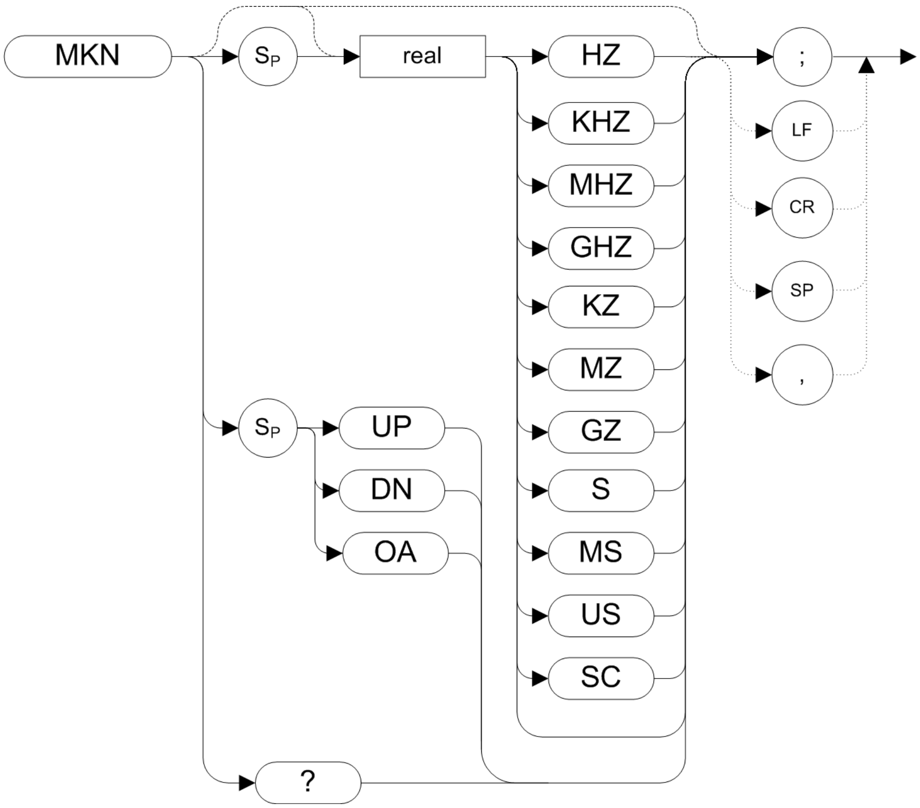
Description

Moves the active marker to the minimum value detected.

Format	MKMIN
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:MINimum (see "Min Search " on page 900)
Notes	For 8566A/B, 8568A/B, the functions of MKMIN are identical to "KSN (Marker Minimum)" on page 384.

MKN (Marker Normal)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Moves the active marker to the specified frequency.

If no marker is currently turned on, a normal marker is turned on.

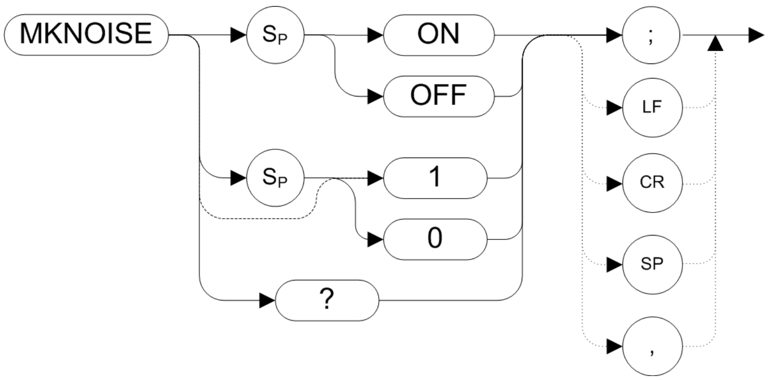
If the active marker type is not currently Normal (for example, it is Delta), the command changes it to a Normal marker.

Format	MKN <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ|S|MS|US|SC MKN UP|DN UP or DN specifies 10% of the current span. MKN OA MKN?
Query Data Type	See "MKF (Marker Frequency)" on page 434.
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:X

	:CALCulate:MARKer:MODE POSition (See "Marker" on page 689)
Notes	The functions of MKN are identical to "M2 [two] (Marker Normal)" on page 412.

MKNOISE (Marker Noise)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

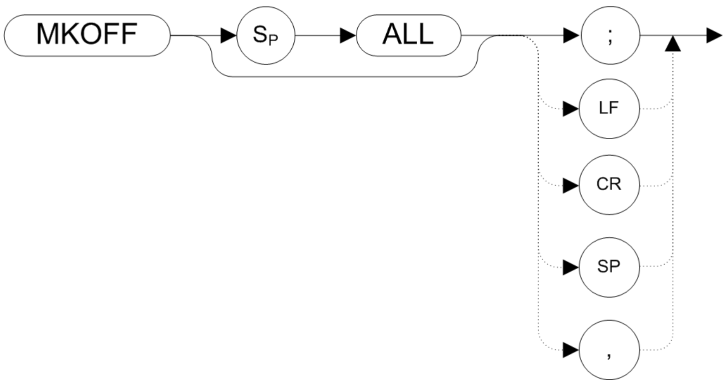
Description

Displays the average RMS noise density at the marker.

Format	MKNOISE ON|OFF|1|0 MKNOISE?
Query Data Type	1|0
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:FUNCtion NOISe :CALCulate:MARKer[1]|2:FUNCtion OFF :CALCulate:MARKer[1]|2:FUNCtion? (Returns OFF|NOIS) (See "Marker Function" on page 742)
Preset	OFF
Notes	For 8566A/B, 8568A/B, the functions of MKNOISE are identical to "KSM (Marker Noise On)" on page 382.

MKOFF (Marker Off)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

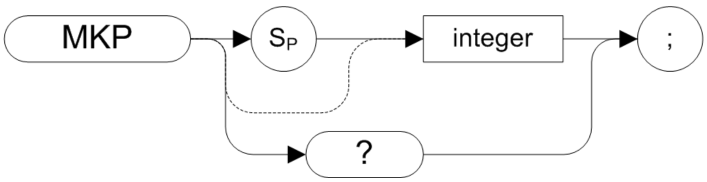
Description

Turns off either the active marker or all the markers. If the ALL parameter is omitted, only the active marker is turned off.

Format	MKOFF [ALL]
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer#:MODE OFF (see "Marker" on page 689)

MKP (Marker Position)

Syntax



Legacy Products

8566A/B, 8568A/B

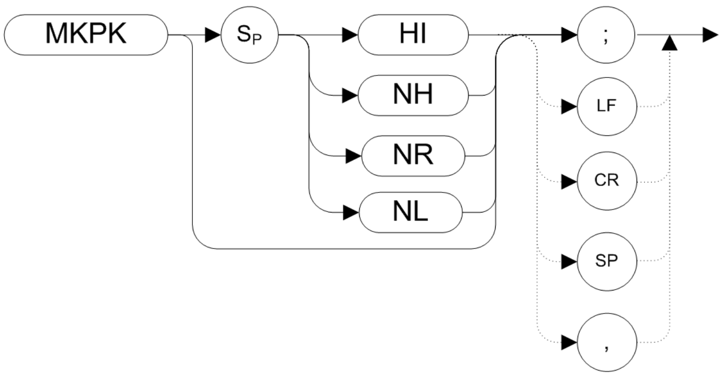
Description

Specifies the marker position horizontally, in display units.

Format	MKP <integer> Range: 1 to 1001 MKP?
Query Data Type	<integer>
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:X (see "Marker" on page 689)

MKPK (Marker Peak)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

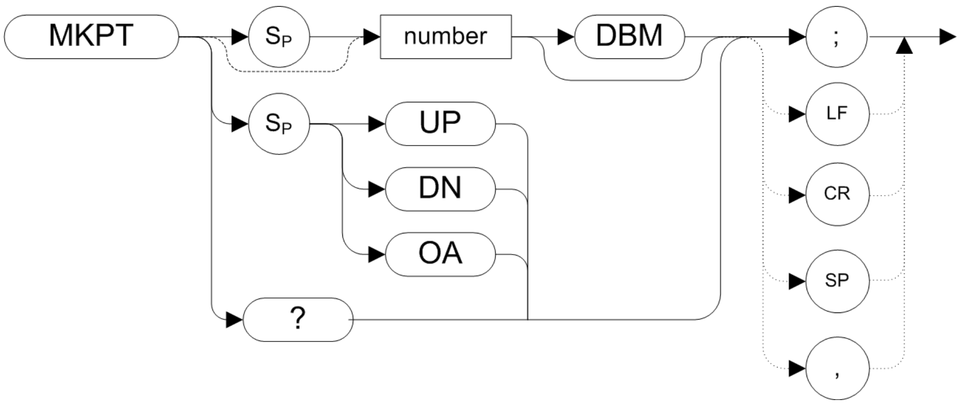
Executing MKPK HI, or simply MKPK (no secondary keyword), positions the active marker at the highest signal detected. If an active marker is on the screen, the MKPK parameters move the marker as follows:

HI (highest)	Moves the active marker to the highest peak.
NH (next highest)	Moves the active marker to the next signal peak of lower amplitude.
NR (next right)	Moves the active marker to the next signal peak to the right of the current marker.
NL (next left)	Moves the active marker to the next signal peak to the left of the current marker.

Format	MKPK [HI]|NH|NR|NL
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:MAXimum :CALCulate:MARKer[1]|2:MAXimum:NEXT :CALCulate:MARKer[1]|2:MAXimum:LEFT|RIGHt (See "Peak Search" on page 887)
Notes	The functions of MKPK (no secondary keyword) and MKPK HI are identical to "E1 [one] (Peak Marker)" on page 324. For 8566A/B, 8568A/B, the functions of MKPK NH are similar to "KSK (Marker to Next Peak)" on page 378, except that KSK does not take in to account the marker peak excursion or marker peak threshold values. For more details on marker peak excursion, see "MKPX (Marker Peak Excursion)" on page 446.

MKPT (Marker Threshold)

Syntax



Legacy Products

8560 series

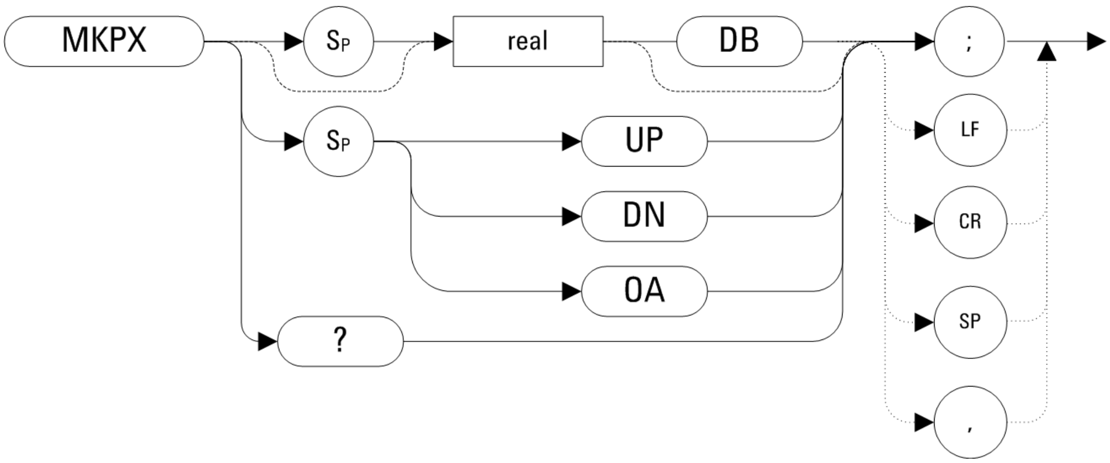
Description

Sets the minimum amplitude level from which a peak on the trace can be detected.

Format	MKPT <number>DBM MKPT UP|DN UP or DN increments by one step size MKPT OA MKPT?
Query Data Type	<number>
SCPI Equivalent Commands	:CALCulate:MARKer:PEAK:THReshold <ampl> (see "Pk Threshold " on page 892)
Preset	–130 dBm

MKPX (Marker Peak Excursion)

Syntax



Preset State: 6 dB

Legacy Products

8560 series, 8566A/B, 8568A/B

Description

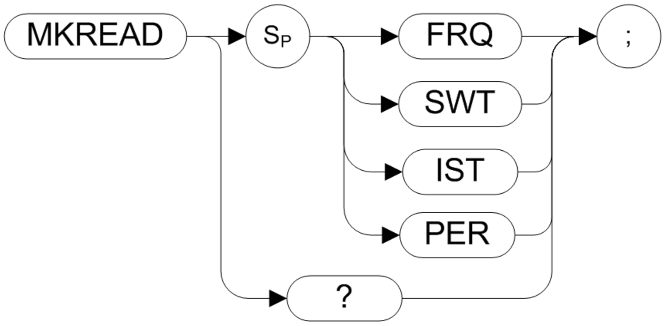
Specifies the minimum signal excursion for the instrument's internal peak identification routine.

The default value is 6 dB. In this case, any signal with an excursion of less than 6 dB on either side of the marker would not be identified. Thus, if an MKPK NH command were to be executed on such a signal, the instrument would not place a marker on this signal peak.

Format	MKPX <real>DB MKPX UP|DN UP or DN increments by one vertical display division MKPX OA MKPX?
Query Data Type	<real>
SCPI Equivalent Commands	:CALCulate:MARKer:PEAK:EXCursion <rel_ampl> (see "Pk Excursion " on page 891)

MKREAD (Marker Readout)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Selects the type of active trace information displayed by the instrument marker readout.

The MKREAD command can select the following types of active trace information:

FRQ	frequency
SWT	sweep time
IST	inverse sweep time
PER	period

The results of the data depend on the MKREAD parameter and the frequency span, and whether the marker delta function is used.

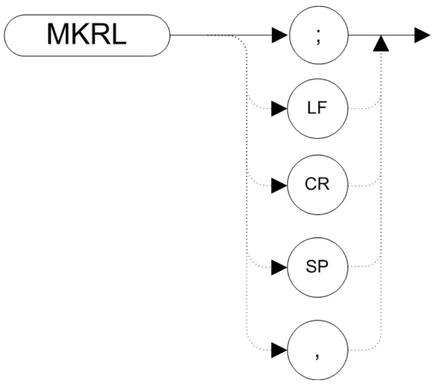
MKREAD Type	Non-Zero Span	Non-Zero Span Delta	Zero Span	Zero Span Delta
FRQ	Reads frequency	Reads delta frequency	N/A	N/A
SWT	Reads time since the start of sweep	Reads delta time between end points	Waveform measurements of detected modulation	Waveform measurements of detected modulation
IST	N/A	N/A	N/A	Computes frequency corresponding to delta of markers. Performs 1/ (T1 – T2)
PER	Period of frequency	(Pulse measurement) delta time	N/A	N/A

Format	MKREAD FRQ|SWT|IST|PER MKREAD?

Query Data Type	FRQ|SWT|IST|PER
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:X:READout FREQuency|TIME|ITIMe|PERiod :CALCulate:MARKer[1]|2:X:READout:AUTO ON (See "X Axis Scale" on page 713)
Preset	FRQ
Notes	The Inverse Sweep Time (IST) readout is only available when using a delta marker in zero span. FFT (Fast Fourier Transform) is not available in N9061A.

MKRL (Marker to Reference Level)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

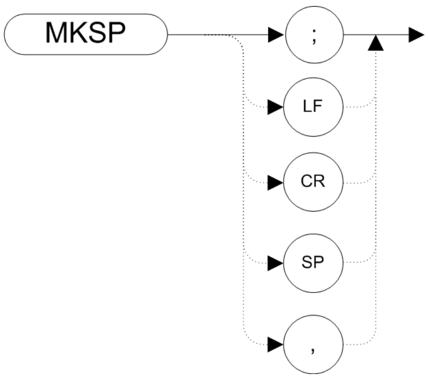
Description

Moves the active marker to the reference level.

Format	MKRL
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2[:SET]:RLEVel (see "Mkr->Ref Lvl" on page 787)
Notes	The functions of MKRL are identical to "E4 [four] (Marker to Reference Level)" on page 327.

MKSP (Marker Span)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

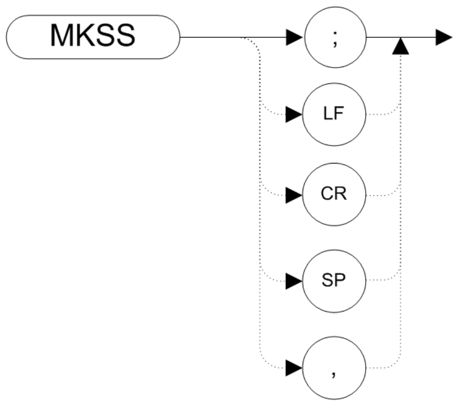
Description

This command operates only when the delta marker is On (see "MKD (Marker Delta)" on page 432 or "M3 [three] (Delta Marker)" on page 414). When the delta marker is On and MKSP is executed, the delta marker and active marker determine the start and stop frequencies. The left marker specifies the start frequency, and the right marker specifies the stop frequency. If marker delta is Off, there is no operation.

Format	MKSP
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer2[:SET]:DELTA:SPAN (see "MkrΔ->Span" on page 789)
Notes	For 8566A/B, 8568A/B, The functions of MKSP are identical to "KSO (Marker Span)" on page 386. If the active marker is not a delta marker, there is no change in its position.

MKSS (Marker to Step Size)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

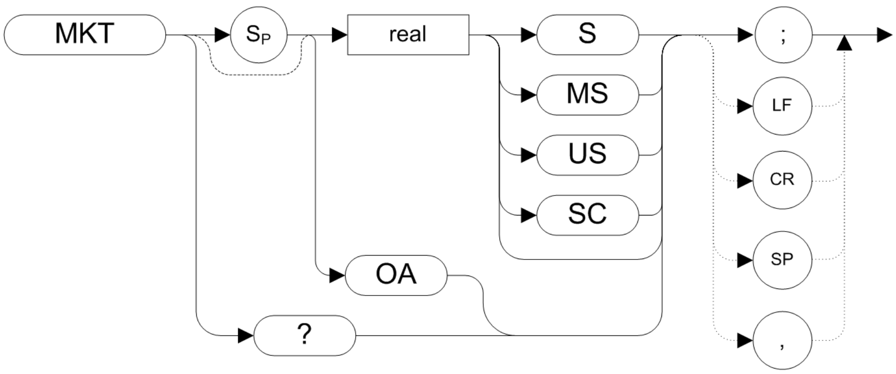
Description

Sets the center-frequency step-size equal to the marker frequency. If the instrument is in the delta mode, the step size is set to the frequency difference between the active and the delta marker.

Format	MKSS
Query Data Type	N/A
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2[:SET]:STEP (see "Mkr->CF Step" on page 785)
Notes	When the marker is a delta marker, the functions of MKSS are identical to "E3 [three] (Delta Marker Step Size)" on page 326.

MKT (Marker Time)

Syntax



Legacy Products

8560 series

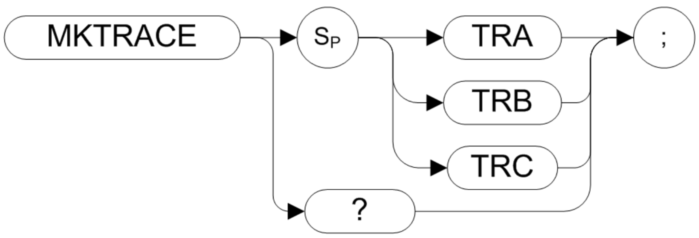
Description

Places a marker at a position that corresponds to a specified point in time during the sweep.

Format	MKT <real>S|MS|US|SC Default unit of time is seconds ('S' or 'SC'). MKT OA MKT?
Query Data Type	<real>
SCPI Equivalent Commands	:CALCulate:MARKer[1]|2:X (see "Marker" on page 689)
Preset	½ Sweep time

MKTRACE (Marker Trace)

Syntax



Legacy Products

8566A/B, 8568A/B

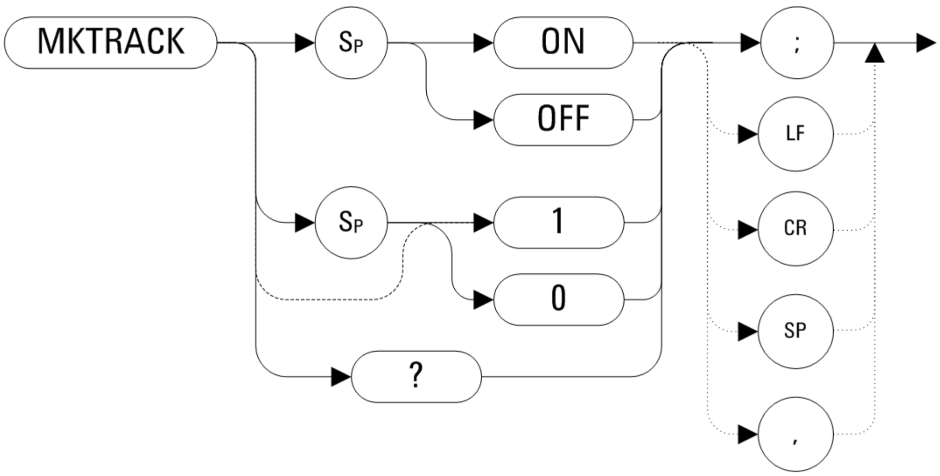
Description

Moves the active marker to the corresponding position in Trace 1, Trace 2, or Trace 3.

Format	MKTRACE TRA|TRB|TRC TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3. MKTRACE?
Query Data Type	TRA|TRB|TRC
SCPI Equivalent Commands	None

MKTRACK (Marker Track)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

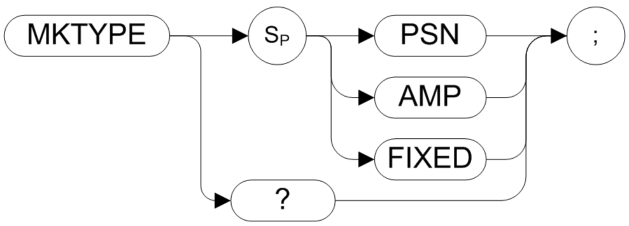
Moves the signal on which the active marker is located to the center of the instrument display and keeps the signal peak at center screen.

To keep a drifting signal at center screen, place the active marker on the desired signal before turning on MKTRACK.

Format	MKTRACK ON|OFF|1|0 MKTRACK?
Query Data Type	8560 series: 0 |1 8566A/B, 8568A/B: ON|OFF
SCPI Equivalent Commands	:CALCulate:MARKer#:TRCKing[:STATe] OFF|ON|0|1 (see "Signal Track (Span Zoom)" on page 1114)
Preset	OFF
Notes	For 8566A/B, 8568A/B, the functions of MKTRACK are identical to "MT0 [zero] (Marker Track Off)" on page 458 and "MT1 [one] (Marker Track On)" on page 459.

MKTYPE (Marker Type)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Specifies the type of marker.

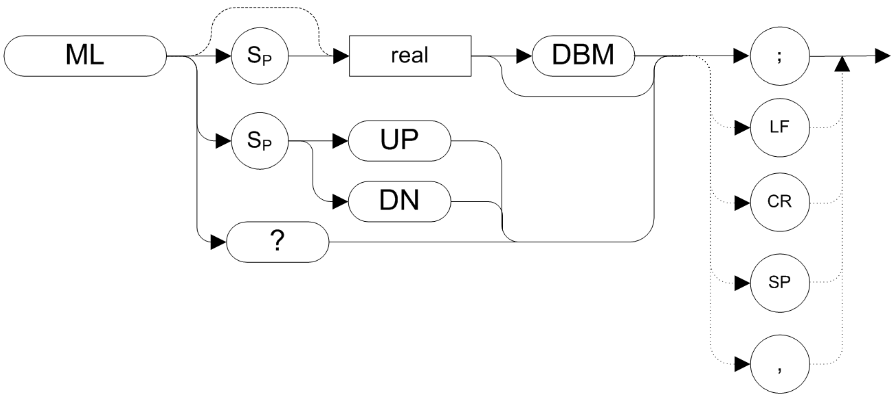
Type	Function	Commands Used to Position Marker
PSN	Allows the marker to be positioned horizontally in display units (default)	"MKP (Marker Position)" on page 443 "MKF (Marker Frequency)" on page 434
AMP	Allows the marker to be positioned according to amplitude	"MKA (Marker Amplitude)" on page 428
FIXED	Allows a marker to be placed at any fixed point on the display	"MKP (Marker Position)" on page 443 "MKF (Marker Frequency)" on page 434 "MKA (Marker Amplitude)" on page 428

Format	MKTYPE PSN|AMP|FIXED MKTYPE?
Query Data Type	PSN|AMP|FIXED
SCPI Equivalent Commands	:CALCulate:MARKer#:MODE POSition :CALCulate:MARKer#:MODE FIXed :CALCulate:MARKer#:X :CALCulate:MARKer#:Y (See "Marker" on page 689)
Preset	PSN
Notes	Marker type can only be set for an active marker. The marker type is reset to PSN when the marker is turned off (using "MKOFF (Marker Off)" on page 442), or when the instrument is preset.

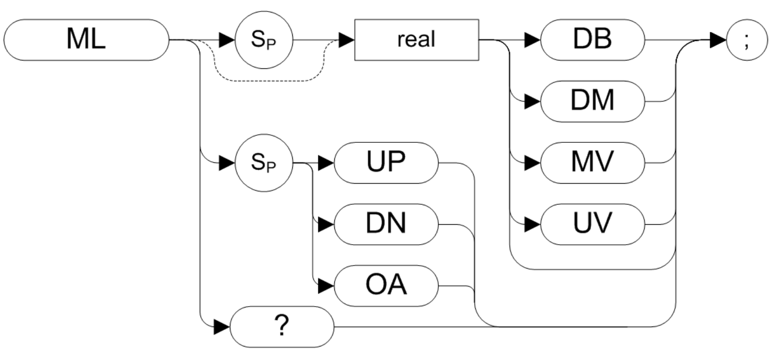
ML (Mixer Level)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level.

The effective mixer level is equal to the reference level minus the input attenuator setting.

If an external amplifier gain value is set, the mixer level is determined using the following equation:

- Mixer Level = Ref. Level - Attenuation + Ext. Amplifier Gain

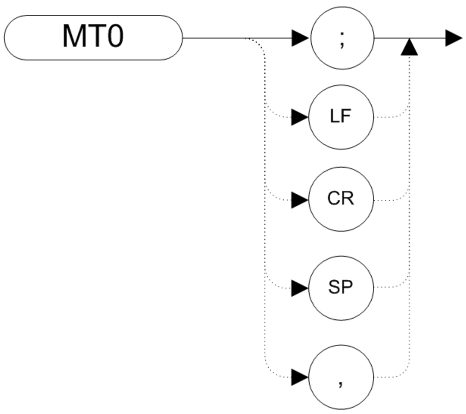
The external amplifier gain is not preset by doing an IP command in case the instrument is measuring a large signal. This is to protect the instrument from damage from a large signal.

Format	ML <real>DB|DM|MV|UV ML UP|DN

	UP or DN increments by 10 dB ML OA ML?
Query Data Type	<real> in dBm
SCPI Equivalent Commands	[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <ampl> dBm [:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer]? (See "Max Mixer Level" on page 570)
Preset	–10 dBm
Notes	For 8566A/B, 8568A/B, the functions of ML are identical to "KS, (Mixer Level)" on page 357.

MT0 [zero] (Marker Track Off)

Syntax



Legacy Products

8566A/B, 8568A/B

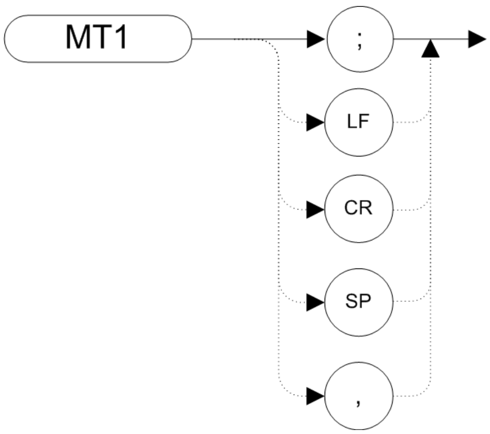
Description

Disables the marker tracking mode.

Format	MT0
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of MT0 are identical to MKTRACK OFF. See "MKTRACK (Marker Track)" on page 454.

MT1 [one] (Marker Track On)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

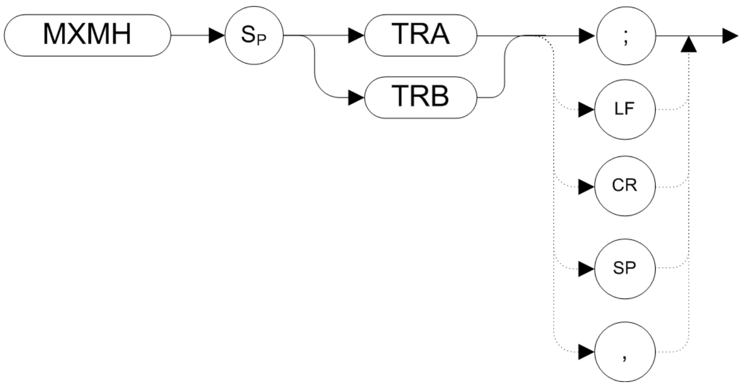
Moves the signal on which the active marker is located to the center of the instrument display and keeps the signal peak at center screen.

To keep a drifting signal at center screen, place the active marker on the desired signal before issuing an MT1 command.

Format	MT1
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of MT1 are identical to MKTRACK ON. See "MKTRACK (Marker Track)" on page 454.

MXMH (Maximum Hold)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

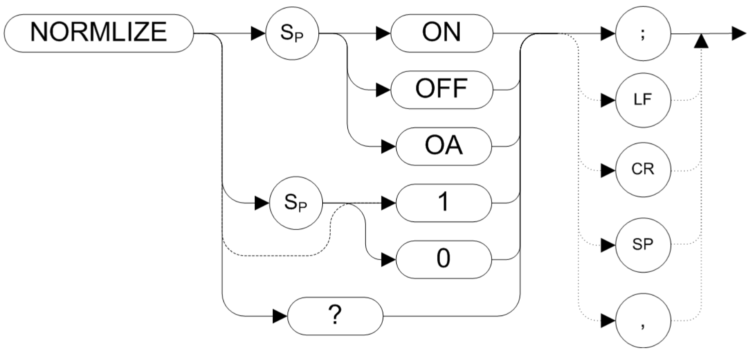
Updates each trace element with the maximum level detected.

MXMH updates the specified trace (either Trace A or Trace B) with a new value from a detector only if the new value is larger than the previous trace data value.

Format	MXMH TRA|TRB TRA corresponds to Trace 1 and TRB corresponds to Trace 2.
Query Data Type	N/A
SCPI Equivalent Commands	:TRACe[1|2|3|4|5|6:TYPE MAXHold [:SENSe]:AVERage:COUNt <integer> (See "Average/Hold Number" on page 794)
Notes	The functions of MXMH are identical to "A2 [two] (Maximum Hold for Trace A)" on page 256 and "B2 [two] (Maximum Hold for Trace B)" on page 288.

NORMLIZE (Normalize Trace Data)

Syntax



Legacy Products

8560 series

Description

Activates or de-activates the normalization routine for stimulus-response measurements. This function subtracts trace B from trace A, offsets the result by the value of the normalized reference position (NRL) and displays the result in trace A.

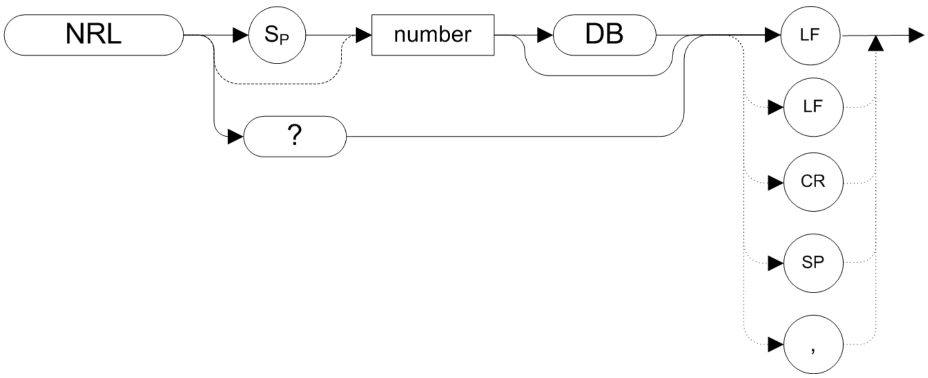
Normalization is automatically turned off by an instrument preset (IP), or at power on.

Normalization is not available when using linear mode and is mutually exclusive of other trace math.

Format	NORMLIZE ON|OFF|1|0 NORMLIZE OA The OA option only returns the current value to the controller; it does **not** set the active function to the normalization state. NORMLIZE?
Query Data Type	1|0
SCPI Equivalent Commands	:TRACe:COPY TRACE1, TRACE3 (if necessary) :TRACe[2]:UPDate OFF (blank Trace2, which corresponds to TRB) :TRACe[2]:DISPlay OFF :CALCulate:NTData[:STATe] OFF|ON|0|1 :CALCulate:NTData[:STATe]? (See "Normalize On/Off" on page 1316)
Preset	OFF
Couplings	NORMLIZE sets Trace B to Blank mode and turns AMBPL or AMB off. All trace math is mutually exclusive, so turning one on turns the other off and *vice versa*. Similarly, when Normalize is on and you change Trace B to Clearwrite or Maxhold (that is, Active), Normalize is turned off.
Errors	Accurate normalization occurs only if the reference trace and the measured trace are on-screen. If any of these traces are off-screen, an error message will be displayed.

NRL (Normalized Reference Level)

Syntax



Legacy Products

8560 series

Description

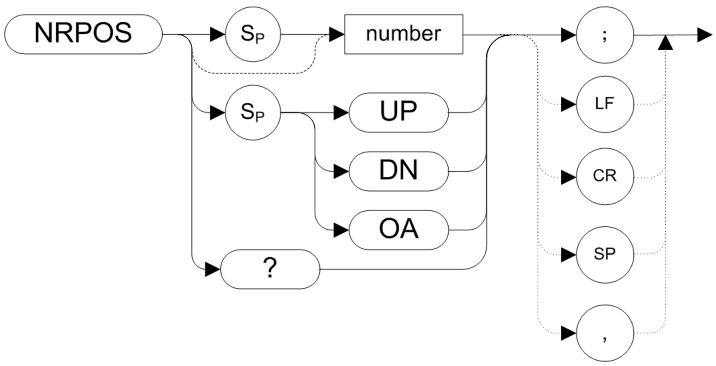
Sets the normalized reference level. Intended for use with the NORMLIZE command. When using NRL, the input attenuator and IF step gains are not affected. This function is a trace-offset function enabling the user to offset the displayed trace without introducing hardware switching errors into the stimulus-response measurement.

The unit of measurement for NRL is dB.

Format	NRL <number>DB NRL?
Query Data Type	Returns the current Normalized Reference Level.
SCPI Equivalent Commands	:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:NRLevel <rel ampl> (see "Norm Ref Lvl" on page 1319)
Preset	0 dB

NRPOS (Normalized Reference Position)

Syntax



Legacy Products

8560 series

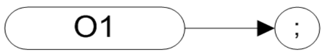
Description

Adjusts the normalized reference-position that corresponds to the position on the graticule where the difference between the measured and calibrated traces reside. The dB value of the normalized reference position is equal to the normalized reference level. The normalized reference position can be adjusted between 0.0 and 10.0, corresponding to the bottom and top graticule lines, respectively.

Format	NRPOS <number> Range: Min = 0; Max = 10 NRPOS UP|DN UP or DN increments by 1.0 NRPOS OA NRPOS?
Query Data Type	Returns the current Normalized Reference Position.
SCPI Equivalent Commands	:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:NRPosition <integer> (see "Norm Ref Posn" on page 1320)
Preset	10

O1 [one] (Format - Display Units)

Syntax



Legacy Products

8566A/B, 8568A/B

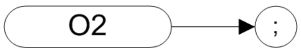
Description

Transmits trace amplitude and position information as decimal values in display units.

Format	O1
Query Data Type	N/A
SCPI Equivalent Commands	None

O2 [two] (Format - Two 8-Bit Bytes)

Syntax



Legacy Products

8566A/B, 8568A/B

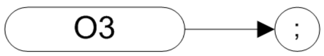
Description

Transmits trace amplitude and position information as two 8-bit binary numbers (one instruction word).

Format	O2
Query Data Type	N/A
SCPI Equivalent Commands	None

O3 [three] (Format - Real Amplitude Units)

Syntax



Legacy Products

8566A/B, 8568A/B

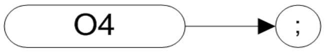
Description

Transmits trace vertical axis information only, in measurement units of Hz, dBm, dB, volts or seconds.

Format	O3
Query Data Type	N/A
SCPI Equivalent Commands	None

O4 [four] (Format - One 8-Bit Byte)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Transmits trace amplitude information only as a binary number.

Format	O4
Query Data Type	N/A
SCPI Equivalent Commands	None
Preset	N/A
Couplings	TDF B ("TDF (Trace Data Format)" on page 530) or "O2 [two] (Format - Two 8-Bit Bytes)" on page 465.

OA or ? (Query Active Function)

Legacy Products

8566A/B, 8568A/B

Description

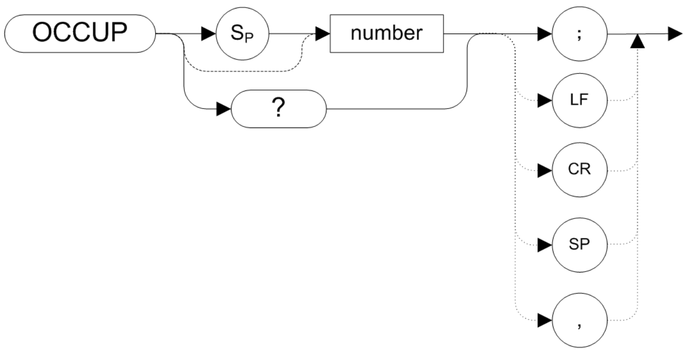
Query active function.

The active functions are ACPBW, ACPSP, AT, CF, CRTHPOS, CRTVPOS, DA, DL, DOTDENS, FA, FB, FMGAIN, GD, GL, LG, MKA, MKD, MKFCR, MKN, MKPAUSE, MKPX, ML, NDB, NRL, RB, RCLS, ROFFSET, RL, RLPOS, SAVES, SAVRCLN, SETDATE, SETTIME, SP, SQLCH, SRCALC, SRCAT, SRCPOFS, SRCPSWP, SRCPWR, SRCTK, SS, ST, TH, TVLINE, VB, VBR, and user-defined active function specified by the ACTDEF command.

Format	OA|? Note that OA sets the active function, whereas ? does not. Thus, for example, SP CF? 100MZ sets the Span, whereas SP CF OA 100 MZ sets the Center Frequency.
Query Data Type	Depends on active function.
SCPI Equivalent Commands	None

OCCUP (Percent Occupied Power Bandwidth)

Syntax



Legacy Products

8560 series

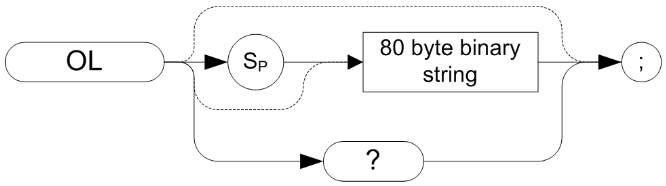
Description

This command is used to query the current value of the percent occupied power. This value is set by "DELMKBW (Occupied Power Bandwidth Within Delta Marker)" on page 316 and "PWRBW (Power Bandwidth)" on page 479. This command can also be used to set the percent occupied power.

Format	OCCUP <number> OCCUP? Range: 0.10 to 100
Query Data Type	<number>
SCPI Equivalent Commands	None
Preset	90

OL (Output Learn String)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Transmits information to the controller that describes the state of the instrument when the OL command is executed. This information is called the “Learn String.”

The Learn String can be sent from the controller memory back to the instrument to restore the instrument to its original state.

The OL command is not completely supported, due to differences between the X-Series and 8566/8568. The following table outlines each byte of the array and the bits supported within that byte.

Byte	Support Information
1	Fixed decimal value 31
2	Fixed decimal value 118
3 to 9	*Supported*
10	*Supported*
11	*Unsupported*: Fixed decimal 0
12 to 17	*Supported*
18	*Supported*: Bits 6, 2, 1 and 0 *Unsupported*: Bits 7, 5, 4, and 3
19	*Supported*: Bits 7, 6, 4, 3, and 0 Bit 5 on X-Series only *Unsupported*: Bits 1 and 2
20	*Supported*: Trigger Mode, Sweep Mode, TRB Clearwrite status Unsupported: Recorder Output
21	*Supported*
22	*Unsupported*: Fixed decimal 0
23 to 25	*Supported*
26	*Supported*: Scale Type, Log Scale Factor, and Display State

Byte	Support Information
	Unsupported: XY Recorder
27	*Supported*
28	*Unsupported*: Fixed decimal 0
29 to 30	*Supported*
31	*Unsupported*: Fixed decimal 0
32 to 37	*Supported*
38	*Unsupported*: Fixed decimal 0
39 to 45	*Supported*
46 to 47	VAVG count limit, value returned is always current count value * 2.
48 to 53	*Supported*
54 to 57	If active marker is a delta marker, active marker absolute Y position only supported for X-Series
58 to 61	If active marker is a delta marker, reference marker absolute Y position only supported for X-Series
62	*Unsupported*: Fixed decimal 0
63	*Supported*
64	*Supported*: Log Amp Units, R3, R2, and R4 *Unsupported*: Stop sweep
65	*Supported*: Lin Amp Units, TRC View Status *Unsupported*: Bits 5 and 4 (always set HI)
66 to 71	*Supported*
72	*Unsupported*: Fixed decimal 0
73	*Supported*: Video Avg *Unsupported*: Power on last, Ext Ref Lvl, Fast HP-IB, Bit 4 (always set HI)
74 to 77	*Unsupported*: Fixed decimal 0
78	*Unsupported*
79	*Unsupported*: Fixed decimal 0
80	Fixed decimal 162

Format	OL <80-byte string> OL?
Query Data Type	See table above.
SCPI Equivalent Commands	None

OT (Output Trace Annotations)

Syntax

OT → ;

Legacy Products

8566A/B, 8568A/B

Description

Sends 32 character-strings to the controller. Each of the 32 character-strings can be up to 64 characters long.

The significance of each string is as follows:

Index	Content
1	"BATTERY"
2	"CORR'D"
3	resolution bandwidth
4	video bandwidth
5	sweep time
6	attenuation
7	reference level
8	scale
9	trace detection
10	center frequency or start frequency
11	span or stop frequency
12	reference level offset
13	display line
14	threshold
15	marker frequency
16	marker amplitude
17	frequency offset
18	video averaging
19	title
20	"PL1 UNLOCK"
21	"PL2 UNLOCK"
22	"Y-I-0 UNLOCK"
23	"HET UNLOCK"
24	"M/N UNLOCK"

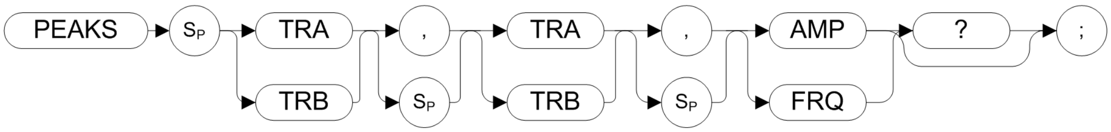
Index	Content
25	"REFUNLOCK"
26	"EXT/OVEN"
27	"MEASUNCAL"
28	frequency diagnostics
29	-
30	"SRQ"
31	center frequency "STEP"
32	active function

Format	OT
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The 'data invalid indicator' status report in string 27 of the returned text is only supported on X-Series instruments.

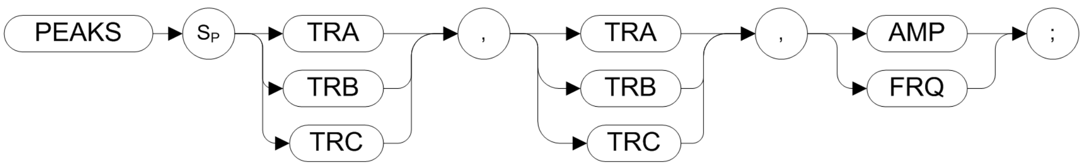
PEAKS (Peaks)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

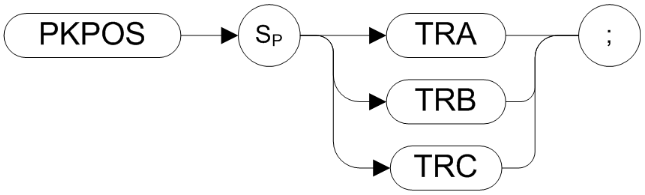
Description

Sorts the signal peaks in the source trace by frequency or amplitude, and sends the results to destination trace.

Format	PEAKS TRA|TRB|TRC,TRA|TRB|TRC,AMP|FRQ[?] The first trace specified is the destination; the second trace specified is the source.
Query Data Type	Number of peaks found.
SCPI Equivalent Commands	:CALCulate:MARKer:PEAK:SORT FREQuency|AMPLitude :CALCulate:DATA[1]|2|3|4:PEAK? :TRACe[:DATA] TRACE[1]|2|3 (See "Peak Sort " on page 895)

PKPOS (Peak Position)

Syntax



Legacy Products

8568

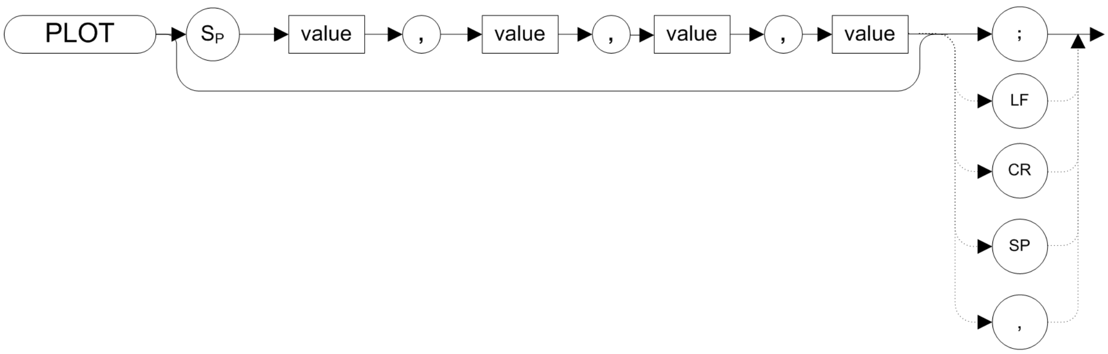
Description

Returns the X co-ordinate value of the maximum peak in the specified trace.

Format	PKPOS TRA|TRB|TRC
Query Data Type	The X co-ordinate value of the maximum peak in the specified trace.
SCPI Equivalent Commands	:CALCulate:MARKer12:MAXimum :CALCulate:MARKer12:X? (See "Marker" on page 689)

PLOT (Plot)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Allows you transfer trace data, graticule and annotation information to a printer using a parallel port.

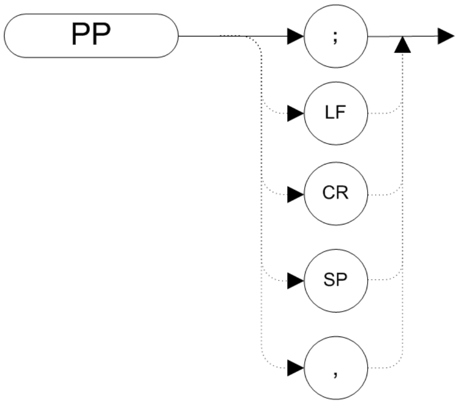
The legacy analyzers transferred data directly to a plotter via the GPIB connection. PLOT now transfers data to a printer, and prints the entire screen.

Although PLOT reads in plotter dimension values, N9061A ignores these.

Format	PLOT <value>,<value>,<value>,<value> N9061A ignores all plotter dimension <value> parameters.
Query Data Type	N/A
SCPI Equivalent Commands	:HCOPY[:IMMediate] (see "Print" on page 603)
Notes	In legacy instruments, PLOT also returns HPGL. The X-series instruments with N9061A installed do not return HPGL.

PP (Preselector Peak)

Syntax



Legacy Products

8560 series, 8566A/B

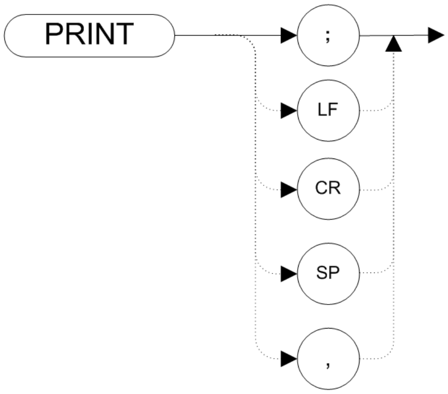
Description

Optimizes preselector tracking to peak the amplitude of a signal at the active marker. If a marker is not on the screen, PP places a marker at the highest signal level, and optimizes preselector tracking at that frequency.

Format	PP
Query Data Type	N/A
SCPI Equivalent Commands	[:SENSe]:POWer[:RF]:PCENter (see "Presel Center" on page 571)
Notes	This command is only supported when the X-series instrument's maximum frequency limit is greater than 3.6 GHz. If the command is sent to an instrument with a maximum frequency limit of 3.6 GHz or less, the command is not executed, and no error is generated.

PRINT (Print)

Syntax



Legacy Products

8560 series

Description

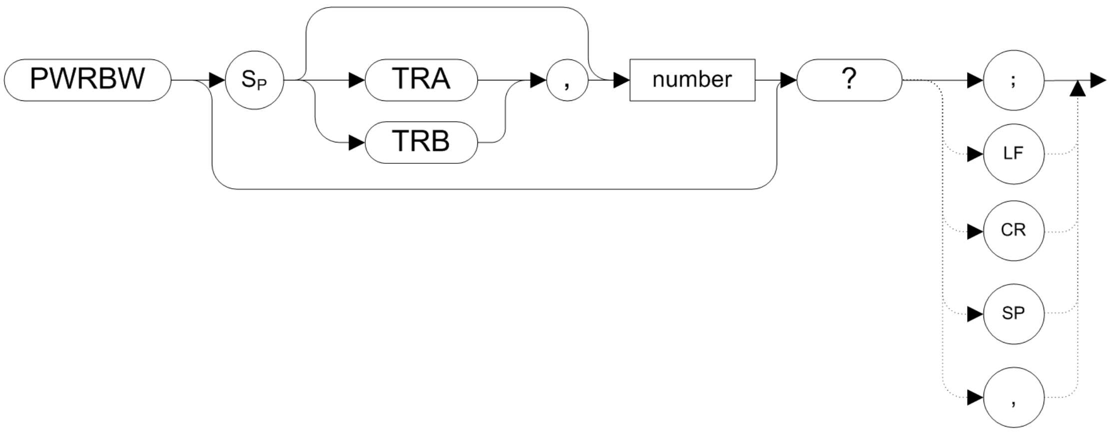
Transfers trace data, graticule and annotation of the screen directly to the instrument's default printer.

Format	PRINT [0|1] N9061A ignores all parameters for this command.
Query Data Type	N/A
SCPI Equivalent Commands	:HCOPY[:IMMediate] (see "Print" on page 603)

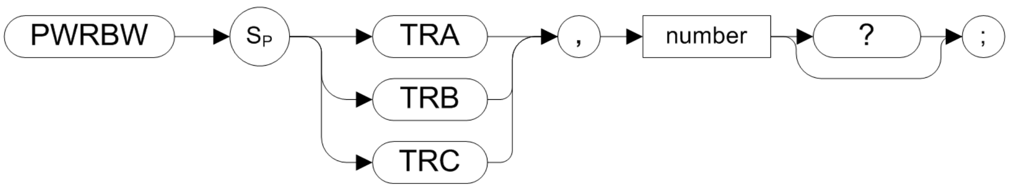
PWRBW (Power Bandwidth)

Syntax

8560 Series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

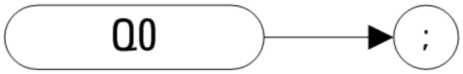
Description

Computes the combined power of all signal responses in the specified trace, and returns the bandwidth of the specified percentage of total power. The number in the command is a percentage value, that is, it has a range of 0 to 100.

Format	8560 series: PWRBW TRA|TRB, <real>,? 8566A/B, 8568A/B: PWRBW TRA|TRB|TRC, <real> Range: 0-100 (percentage)
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	If the percent total power is 100%, the power bandwidth equals the frequency span. On the 8566A/B analyzer, this command stops the trace. That is not the case for N9061A.

Q0 [zero] (Set Detector to EMI Peak Detection)

Syntax



Legacy Products

8568A/B

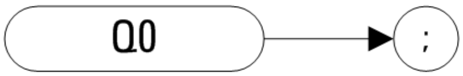
Description

Sets the detector function to EMI Peak detection. This is the same as the Peak detector but uses CISPR related bandwidths.

Format	Q0
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The effect of Q0 is identical to that of the DET EPK command. See "DET (Detection Mode)" on page 317.

Q1 [one] (Set Detector to Quasi Peak Detection)

Syntax



Legacy Products

8568A/B

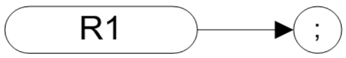
Description

Sets the detector function to Quasi Peak detection. This is a fast-rise, slow-fall detector used to make CISPR compliant EMI measurements.

Format	Q1
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The effect of Q1 is identical to that of the DET QPD command. See "DET (Detection Mode)" on page 317.

R1 [one] (Illegal Command SRQ)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

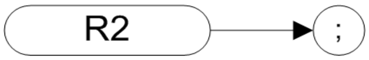
Deactivates all instrument service requests (SRQs) except SRQ140, the illegal-command service request.

The function is identical to RQS 32 (see "RQS (Request Service Conditions)" on page 497).

Format	R1
Query Data Type	N/A
SCPI Equivalent Commands	None

R2 [two] (End-of-Sweep SRQ)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

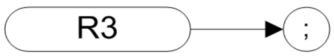
Activates the end-of-sweep and illegal-command service requests.

The function is identical to RQS 36 (see "RQS (Request Service Conditions)" on page 497).

Format	R2
Query Data Type	N/A
SCPI Equivalent Commands	None

R3 [three] (Hardware Broken SRQ)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

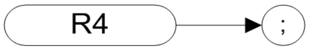
Activates the hardware-broken and illegal-command service requests.

The function is identical to RQS 40 (see "RQS (Request Service Conditions)" on page 497).

Format	R3
Query Data Type	N/A
SCPI Equivalent Commands	None

R4 [four] (Units-Key-Pressed SRQ)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Activates the units-key-pressed and illegal-command SRQs.

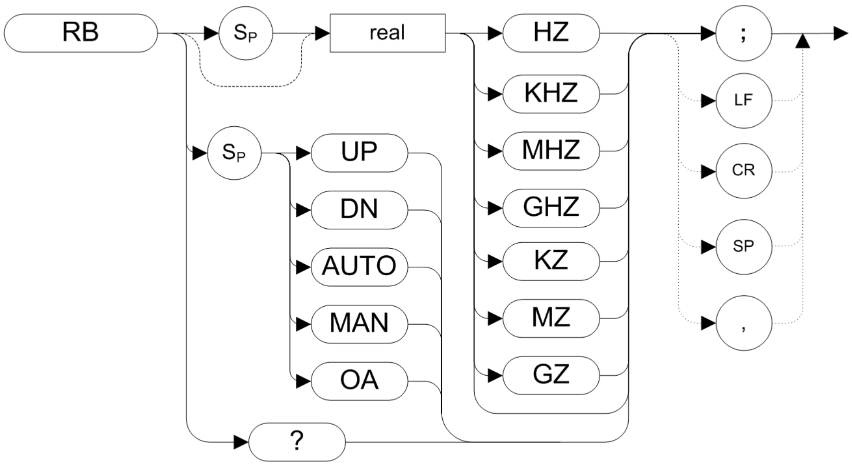
The function is identical to RQS 34 (see "RQS (Request Service Conditions)" on page 497).

Format	R4
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	X-Series instruments cannot replicate the units-key-pressed Service Request since no front panel interaction is supported.

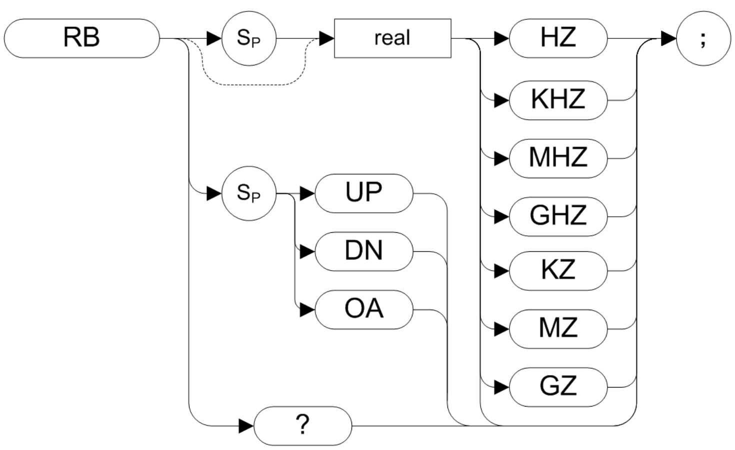
RB (Resolution Bandwidth)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

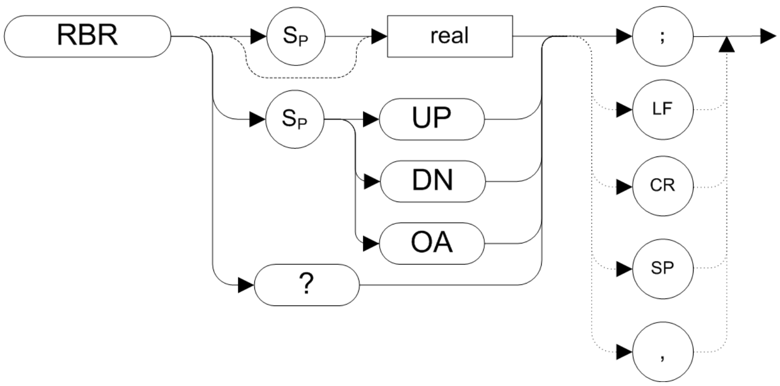
Specifies the resolution bandwidth. Available bandwidths are 1 Hz, 3 Hz, 10 Hz, 30 Hz, 300 Hz, 1 kHz, 3 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, and 3 MHz. The resolution bandwidths, video bandwidths, and sweep time are normally coupled, but executing RB decouples them. Execute "CR (Couple Resolution Bandwidth)" on page 311 to re-establish coupling.

Format	RB <real> HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ RB UP|DN

	UP or DN increments in a 1, 3, 10 sequence RB AUTO|MAN (8560 series only) RB OA RB?
Query Data Type	N/A
SCPI Equivalent Commands	[:SENSe]:BANDwidth[:RESolution] <real> [:SENSe]:BANDwidth[:RESolution]? [:SENSe]:BANDwidth[:RESolution]:AUTO OFF|ON|0|1 [:SENSe]:BANDwidth[:RESolution]:AUTO? (See "Res BW " on page 588)
Preset	8560 series: Coupled mode, 1 MHz 8566A/B, 8568A/B: Coupled mode, 3 MHz
Notes	Default values on X-Series instruments may vary from the legacy analyzers. Refer to the X-Series User's and Programmer's Reference to find out any restrictions that may apply.

RBR (Resolution Bandwidth to Span Ratio)

Syntax



Legacy Products

8560 series

Description

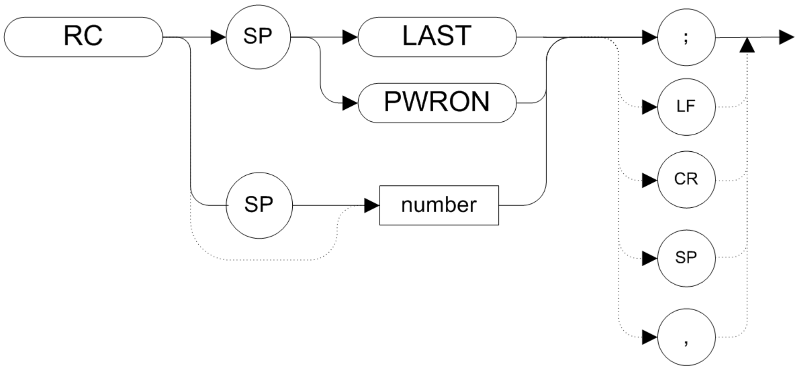
Sets the coupling ratio between the frequency span and the resolution bandwidth. It allows you to set the Span/RBW ratio to 1/<value>, where <value> is set by the user.

Format	RBR <real> RBR UP|DN UP or DN increments in a 1, 2, 5 sequence RBR OA RBR?
Query Data Type	<real> in RBR units
SCPI Equivalent Commands	[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio <integer> (see "Span:3dB RBW " on page 593)

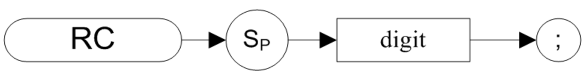
RC (Recall State)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

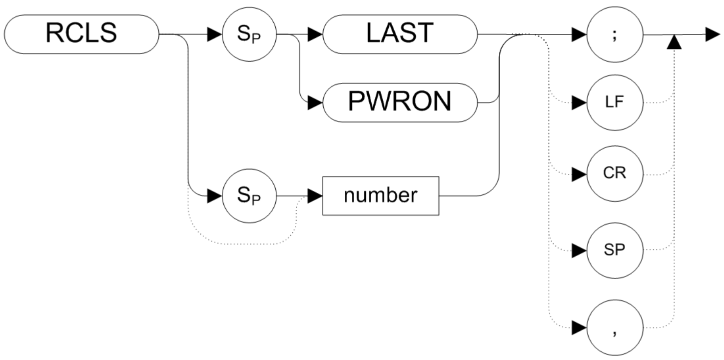
Recalls instrument state data from the specified state register in the instrument's memory.

- Registers 1 through 6 are reserved for the user, and contain instrument states (such as front panel configuration) saved with "SAVES (Save State)" on page 502 or "SV (Save State)" on page 521.
- Option LAST: recalls the instrument state that existed previous to executing the IP command or switching the instrument off. 8566/8 instruments use register 7 for this purpose.
- Option PWRON: sets the instrument state to the same state that occurred when the instrument was switched on. This state was originally saved using the SAVES command.

Format	RC <integer> Range: 1-6 RC LAST|PWRON See Description above.
Query Data Type	N/A
SCPI Equivalent Commands	*RCL <integer> (see "Recall Instrument State " on page 159)
Notes	The functions of RC are identical to "RCLS (Recall State)" on page 490.

RCLS (Recall State)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

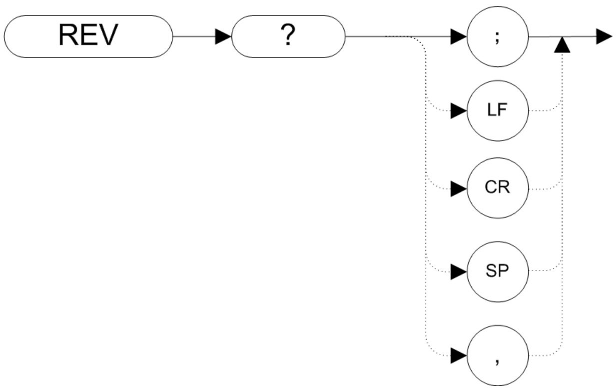
Recalls instrument state data from the specified state register in the instrument's memory.

- Registers 1 through 6 are reserved for the user, and contain instrument states (such as front panel configuration) saved with "SAVES (Save State)" on page 502 or "SV (Save State)" on page 521.
- Option LAST: recalls the instrument state that existed previous to executing the IP command or switching the instrument off. 8566/8 instruments use register 7 for this purpose.
- Option PWRON: sets the instrument state to the same state that occurred when the instrument was switched on. This state was originally saved using SAVES.

Format	RCLS <integer> Range: 1-6 RCLS LAST|PWRON See Description above.
Query Data Type	N/A
SCPI Equivalent Commands	*RCL <integer> (see "Recall Instrument State " on page 159)
Notes	The functions of RCLS are identical to "RC (Recall State)" on page 489.

REV (Revision)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Returns the firmware revision number.

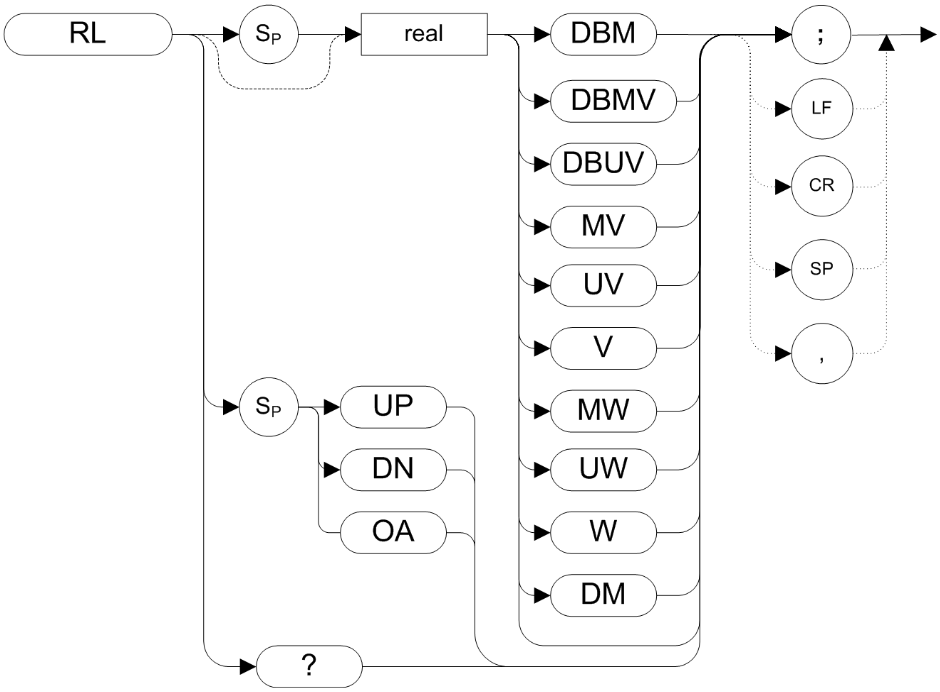
In X-Series instruments, this command returns the build date of the N9061A application that you have installed in your instrument. The date is returned in YYMMDD format (where YY is the number of years since 1950, and MM is the month and DD is the date).

Format	REV?
Query Data Type	Firmware revision number.
SCPI Equivalent Commands	None

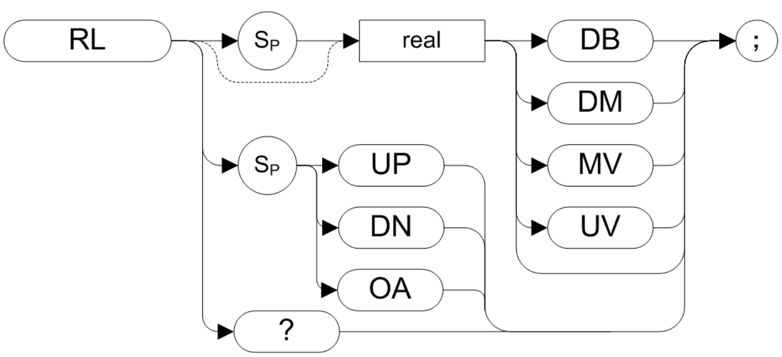
RL (Reference Level)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

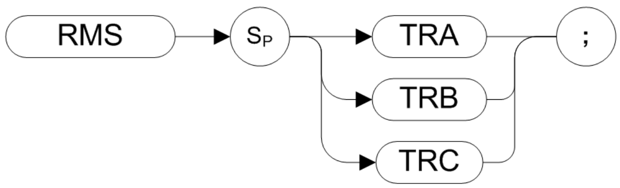
Specifies the amplitude level of the top graticule line on the display. This represents the reference level.

Signal levels above +30 dBm will damage the instrument.

Format	8560 series: RL <real>DBM|DBMV|DBUV|MV|UV|V|MW|UW|W|DM 8566A/B, 8568A/B: RL <real>DB|DM|MV|UV Range (MXA and PXA): –170 dBm to +30 dBm, with 0 dB attenuation Range (EXA): –170 dBm to +23 dBm RL UP|DN UP or DN increments by one vertical division in log mode, and in a 1, 2, 5 sequence in linear mode RL OA RL?
Query Data Type	<real> in dBm [LG] or V [LN]
SCPI Equivalent Commands	:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel <real> (see "Reference Level" on page 559)
Preset	0
Couplings	If the display line is on, changing the reference level does not adjust the position of the display line.
Notes	The Reference Level range for the 8566A/B and 8568A/B is –89.9 dBm to +30 dBm.

RMS (Root Mean Square Value)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

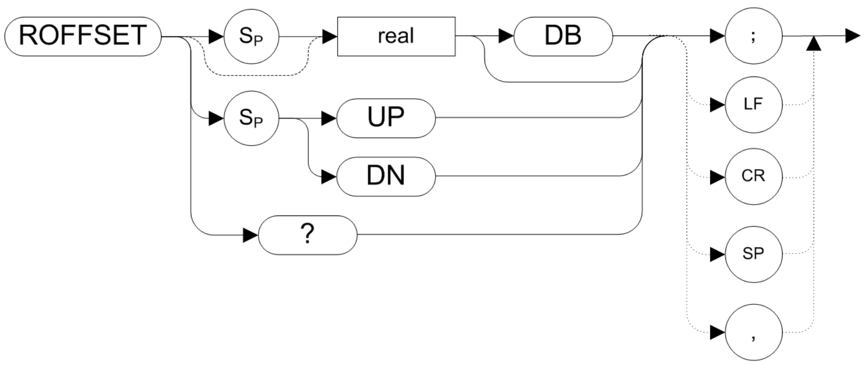
Returns the RMS value of the trace, in display units.

Format	RMS TRA|TRB|TRC
Query Data Type	RMS value of the trace, in display units.
SCPI Equivalent Commands	None

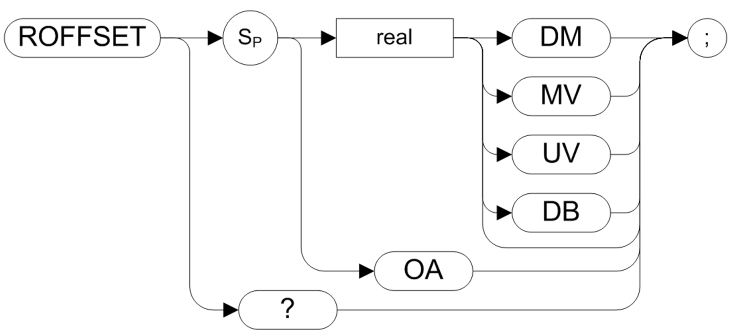
ROFFSET (Reference Level Offset)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Offsets all amplitude readouts without affecting the trace.

Once activated, ROFFSET displays the amplitude offset on the left side of the screen.

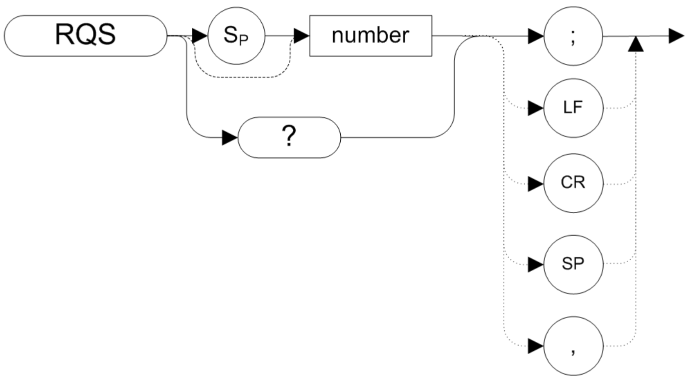
Sending ROFFSET 0 or presetting the instrument eliminates any amplitude offset.

Format	ROFFSET <real>DM|MV|UV|DB ROFFSET UP|DN (8560 series only) UP or DN increments one vertical division ROFFSET OA ROFFSET?
Query Data Type	<real> in dB
SCPI Equivalent Commands	:DISPlay:WINDow[1]:TRAC:eY[:SCALe]:RLEVel:OFFSet <rel_ampl>

	:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel:OFFSet? (See "Reference Level Offset" on page 580)
Preset	0
Notes	For 8566A/B, 8568A/B, the functions of ROFFSET are identical to "KSZ (Reference Level Offset)" on page 394.

RQS (Request Service Conditions)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Sets a bit mask for service requests, each service request has a corresponding bit number and decimal equivalent of that bit number as shown in the table below. Use the decimal equivalents to set the bit mask.

For example, to set a mask for bits 4 and 5, add the decimal equivalents (16 + 32 = 48), then send RQS 48.

Status Byte Definition

Bit#	State	Description
7		
6	RQS	Request Service
5	Error Present	
4	Command Complete	Any command completed.
3		
2	End of Sweep	Any sweep completed.
1	Message	Display message appears.
0	Trigger	Trigger activated.

Format	RQS <bit number> RQS OA RQS?
Query Data Type	The current bit mask.
SCPI Equivalent Commands	*SRE *SRE? (See "Service Request Enable " on page 160) STATus:OPERation:ENABle <integer>

STATus:OPERation:ENABle?

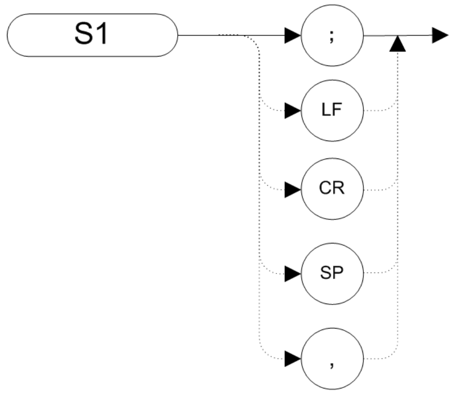
STATus:OPERation:NTRansition <integer>

STATus:OPERation:NTRansition?

(See "Operation Enable" on page 192)

S1[one] (Continuous Sweep)

Syntax



Legacy Products

8566A/B, 8568A/B

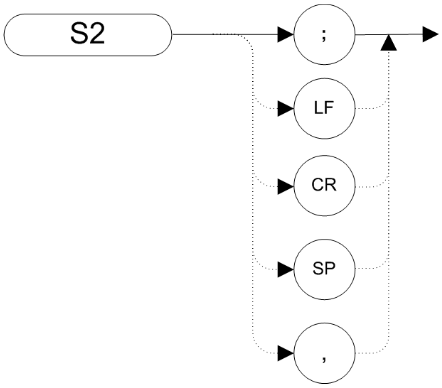
Description

Sets the instrument to continuous sweep mode. In the continuous sweep mode, the instrument takes its next sweep as soon as possible after the current sweep (as long as the trigger conditions are met). A sweep may temporarily be interrupted by data entries made over the remote interface.

Format	S1
Query Data Type	N/A
SCPI Equivalent Commands	:INITiate:CONTinuous 1 (see "Cont (Continuous Measurement/Sweep)" on page 599)
Preset	
Couplings	
Errors	
Notes	The functions of S1 are identical to "CONTS (Continuous Sweep)" on page 309.

S2 [two] (Single Sweep)

Syntax



Legacy Products

8566A/B, 8568A/B

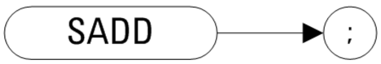
Description

Sets the instrument to single sweep mode. Each subsequent time that this command is sent, one sweep is started if the trigger conditions are met.

Format	S2
Query Data Type	N/A
SCPI Equivalent Commands	:INITiate:CONTinuous 0 (see "Cont (Continuous Measurement/Sweep)" on page 599)
Notes	The functions of S2 are similar to "SNGLS (Single Sweep)" on page 510.

SADD (Add Limit Line Segment)

Syntax



Legacy Products

8560 series

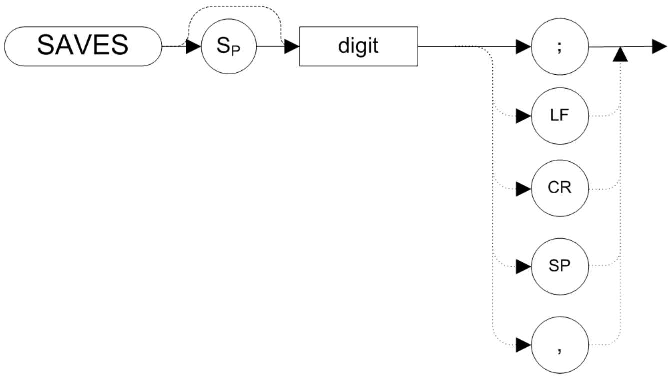
Description

Used to add a limit-line segment to the current limit line.

Format	SADD
Query Data Type	N/A
SCPI Equivalent Commands	None

SAVES (Save State)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

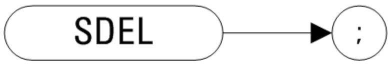
Description

Saves the current state of the instrument in any of the registers one through six.

Format	SAVES <integer> Range: 1-6 SAVES PWRON PWRON sets the instrument to the state it was in when power was turned on.
Query Data Type	N/A
SCPI Equivalent Commands	*SAV <integer> (see "Save Instrument State " on page 160)
Notes	The functions of SAVES are identical to "SV (Save State)" on page 521.

SDEL (Delete Limit Line Segment)

Syntax



Legacy Products

8560 series

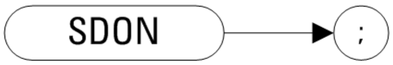
Description

Deletes the limit-line segment specified with the command "SEDI (Edit Limit Line Segment)" on page 505.

Format	SDEL
Query Data Type	N/A
SCPI Equivalent Commands	None

SDON (Terminate SEDI Command)

Syntax



Legacy Products

8560 series

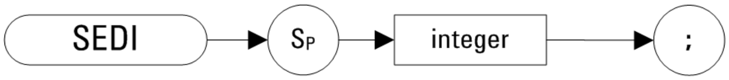
Description

Used to terminate the command "SEDI (Edit Limit Line Segment)" on page 505.

Format	SDON
Query Data Type	N/A
SCPI Equivalent Commands	None

SEDI (Edit Limit Line Segment)

Syntax



Legacy Products

8560 series

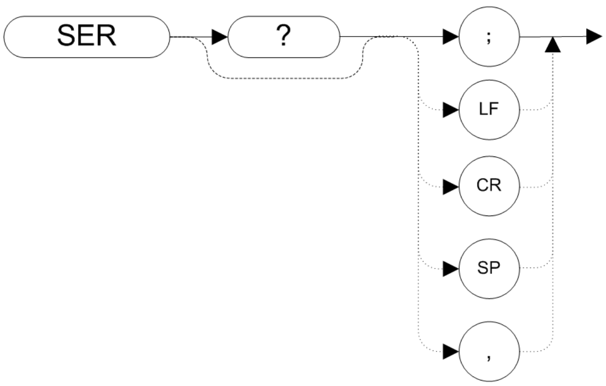
Description

Activates the limit-line segment you identify by its segment number in the limit-line table.

Format	SEDI <integer>
Query Data Type	N/A
SCPI Equivalent Commands	None

SER (Serial Number)

Syntax



Legacy Products

8560 series

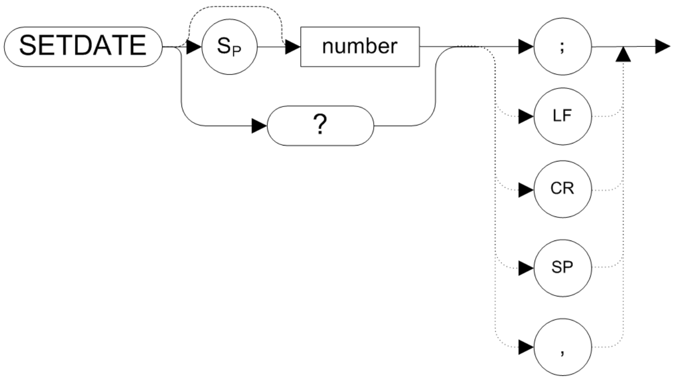
Description

Returns the X-series instrument serial number to the controller.

Format	SER OA SER?
Query Data Type	Serial number.
SCPI Equivalent Commands	*IDN? (see "Identification Query " on page 157)

SETDATE (Set Date)

Syntax



Legacy Products

8560 series

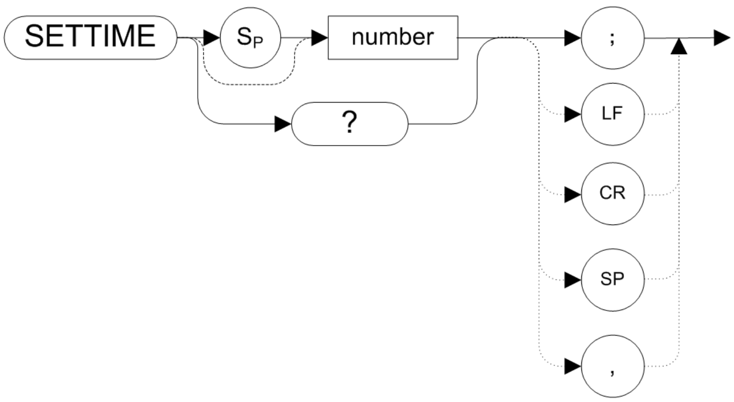
Description

Sets the date of the real-time clock of the instrument. The date takes the form YYMMDD (Year, Month, Day)

Format	SETDATE <number> SETDATE?
Query Data Type	YYMMDD
SCPI Equivalent Commands	:SYSTem:DATE “YYYY,MM,DD”

SETTIME (Set Time)

Syntax



Legacy Products

8560 series

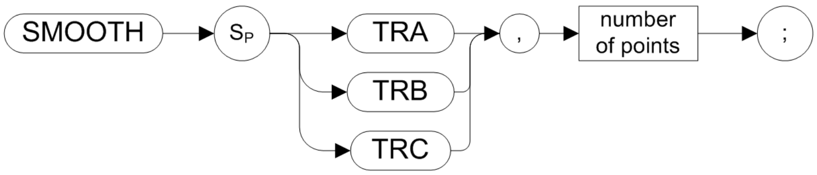
Description

Sets the date of the real-time clock of the instrument. The time takes the form HHMMSS (Hour, Minute, Second).

Format	SETTIME <number> SETTIME?
Query Data Type	HHMMSS
SCPI Equivalent Commands	:SYSTem:TIME "HH,MM,SS"

SMOOTH (Smooth Trace)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Smooths the trace according to the number of points specified for the running average.

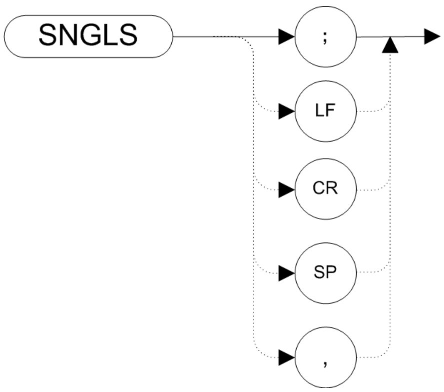
Each point value is replaced with the average of the values (in measurement units) of the given number of points centered on it. Increasing the number of points increases smoothing at the cost of decreasing resolution. If the number of points is an even number, then the number of points is increased by one.

Smoothing decreases at the endpoints.

<table>
<tr><td>Format</td><td>SMOOTH TRA|TRB|TRC,<number>
TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.</td></tr>
<tr><td>Query Data Type</td><td>N/A</td></tr>
<tr><td>SCPI Equivalent Commands</td><td>:TRACe:MATH:SMOoth TRACE(1|2|3|4|5|6) (see "Smooth Trace Data (Remote Command Only) " on page 1323)
:CALCulate:DATA:COMPress? ...</td></tr>
<tr><td>Notes</td><td>Prerequisite Commands: "TS (Take Sweep)" on page 543 when using trace data.
Some differences may be noticed between the smoothed trace in the legacy analyzers and the smoothed trace using the same signal in X-Series instruments.</td></tr>
</table>

SNGLS (Single Sweep)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

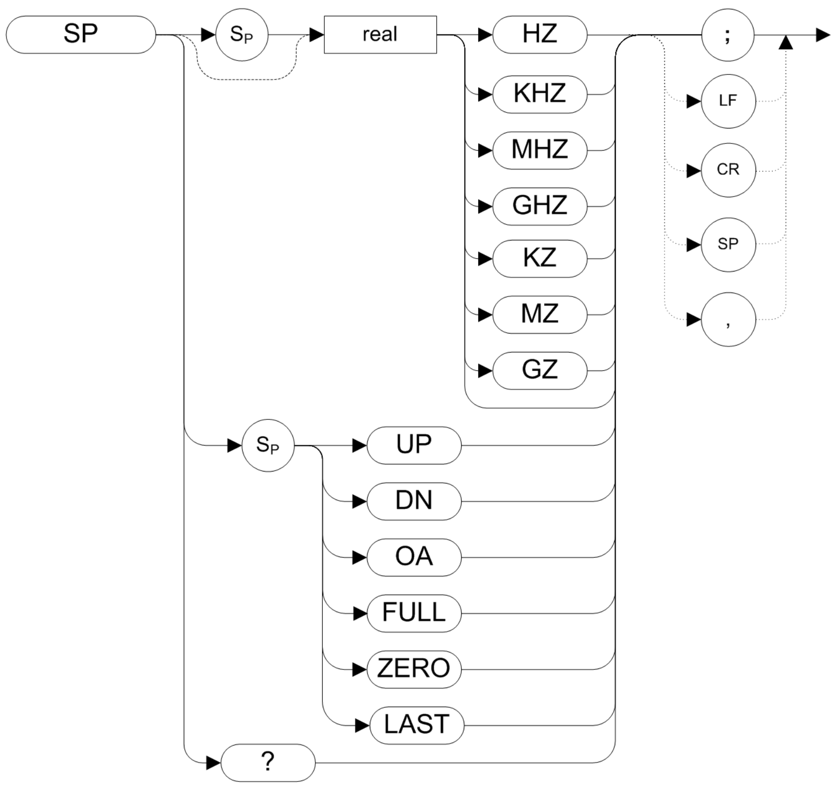
Sets the instrument to single-sweep mode. Each time "TS (Take Sweep)" on page 543 is sent, one sweep taken as long as the trigger conditions are met.

Format	SNGLS
Query Data Type	N/A
SCPI Equivalent Commands	:INITiate:CONTinuous 0 (see "Cont (Continuous Measurement/Sweep)" on page 599)
Notes	The functions of SNGLS are identical to "S2 [two] (Single Sweep)" on page 500.

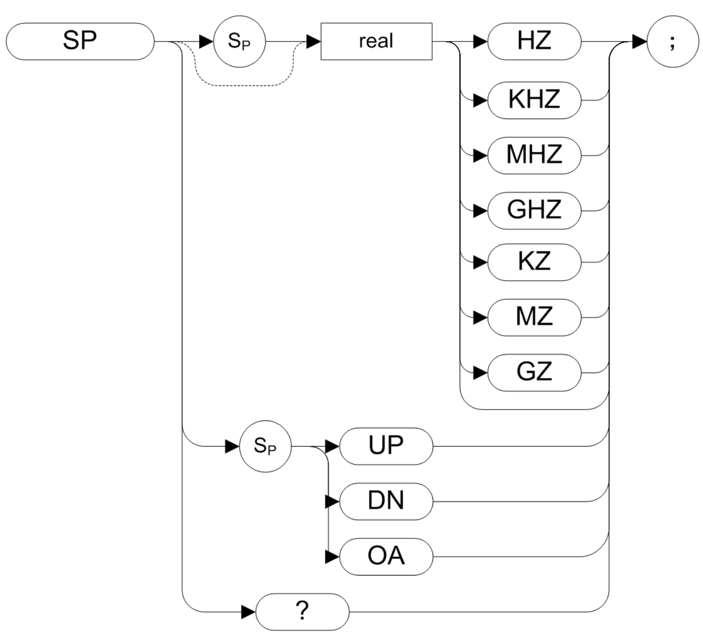
SP (Frequency Span)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

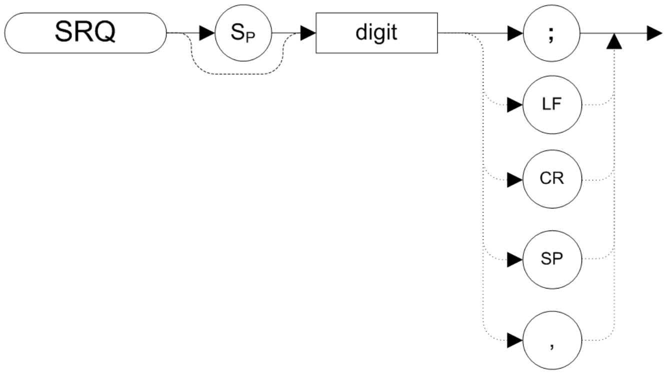
Description

Changes the total displayed frequency range symmetrically about the center frequency.

Format	SP <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ SP UP|DN Step Increment: 1, 2, 5, 10 sequence (up to the stop frequency of the instrument) SP FULL|ZERO|LAST (8560 series only) SP OA SP?
Query Data Type	<real> in Hz
SCPI Equivalent Commands	[:SENSe]:FREQuency:SPAN <freq> [:SENSe]:FREQuency:SPAN? [:SENSe]:FREQuency:SPAN:PREVious (See "Last Span " on page 1114)
Preset	856x: Full Span 8566: 20 GHz
Couplings	If resolution and video bandwidths are coupled to the span width, the bandwidths change with the span width to provide a predetermined level of resolution and noise averaging. Likewise, the sweep time changes to maintain a calibrated display, if coupled. All of these functions are normally coupled, unless "RB (Resolution Bandwidth)" on page 486, "VB (Video Bandwidth)" on page 547, or "ST (Sweep Time)" on page 516 have been executed.

SRQ (Service Request)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

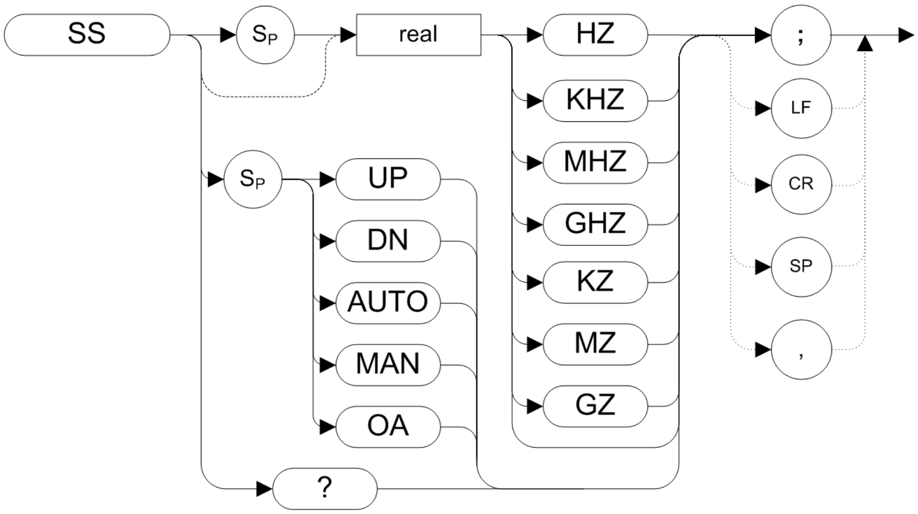
Sends a service request to the controller when the SRQ operand fits the mask supplied with "RQS (Request Service Conditions)" on page 497.

Format	SRQ <digit>
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	N9061A does not support the setting of bit 1 (units-key-pressed) of the status byte. Bit 1 of the status byte is always set to Off.

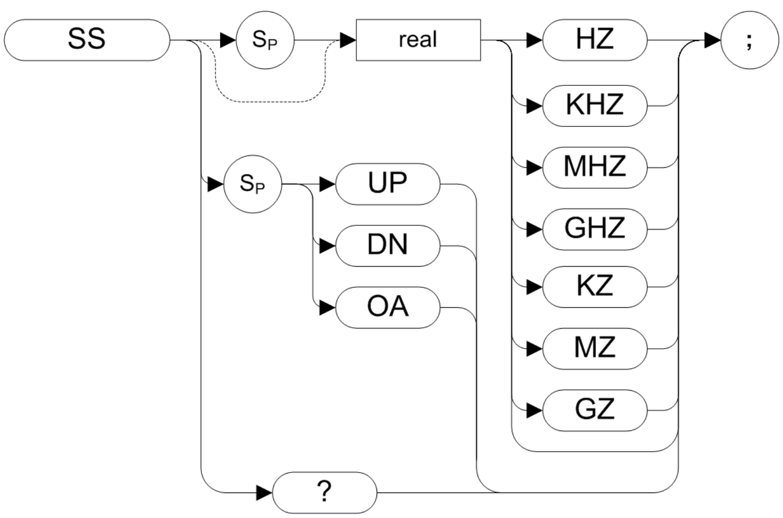
SS (Center Frequency Step Size)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Specifies the center frequency step size.

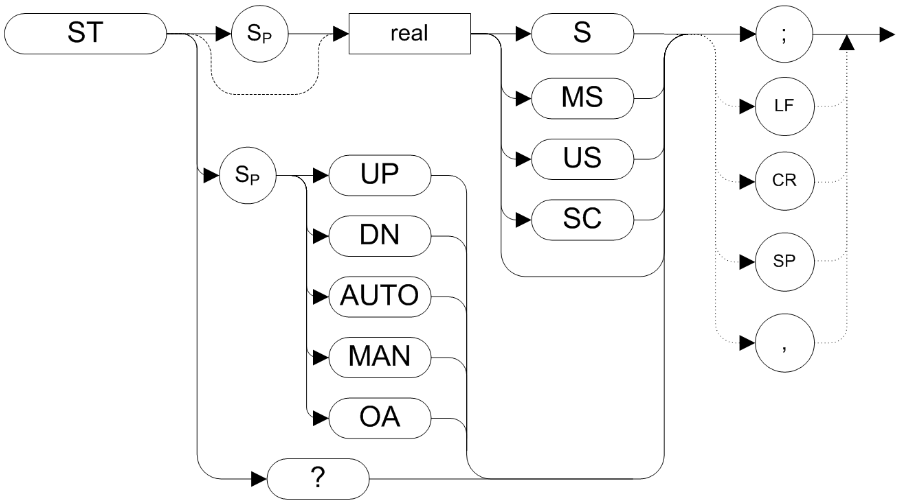
Format	SS <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ Range: 25 to hardware maximum

	SS UP|DN UP or DN increments in a 1, 2, 5, 10 sequence SS AUTO|MAN (8560 series only) SS OA SS?
Query Data Type	<real> in Hz
SCPI Equivalent Commands	[:SENSe]:FREQuency:CENTer:STEP:AUTO ON|OFF [:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq> (See "CF Step" on page 616)
Preset	10 percent of span (1/4 of Res BW if zero-span)

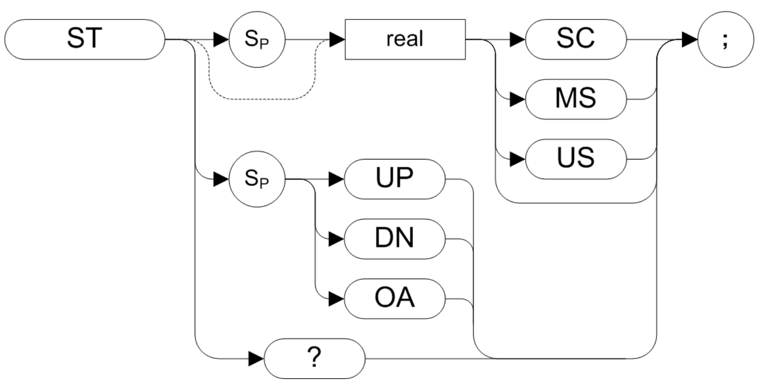
ST (Sweep Time)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

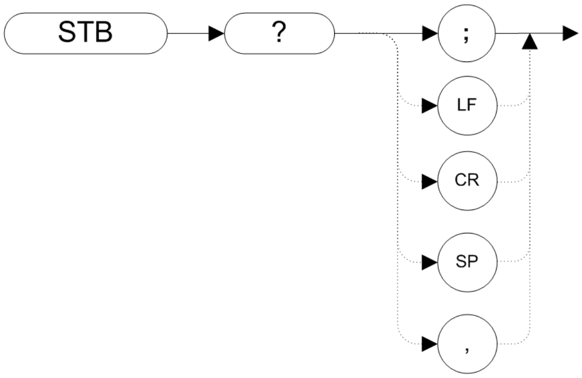
Specifies the time in which the instrument sweeps the displayed frequency or time span.

Format	ST <real>S|MS|US|SC ST UP|DN UP or DN: Increments in a 1,2,5 sequence ST AUTO|MAN (8560 series only) ST OA ST?

	The OA option in the ST command behaves in the same manner as the ST? query, in that it returns the current value to the controller. However, the OA option does **not** set the active function to Sweep Time.
Query Data Type	<real> in seconds
SCPI Equivalent Commands	[:SENSe]:SWEep:TIME <time> [:SENSe]:SWEep:TIME:AUTO ON (See "Sweep Time" on page 1117)
Preset	AUTO

STB (Status Byte Query)

Syntax



Legacy Products

8560 series

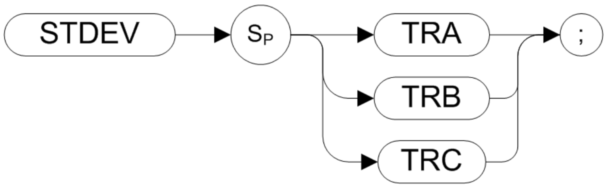
Description

Returns to the controller the decimal equivalent of the bits set in the status byte (see "RQS (Request Service Conditions)" on page 497 and "SRQ (Service Request)" on page 513). STB is equivalent to a serial poll.

Format	STB?
Query Data Type	Status Byte (8 bits)
SCPI Equivalent Commands	*STB? (see "Status Byte Query " on page 161)

STDEV (Standard Deviation of Trace Amplitudes)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

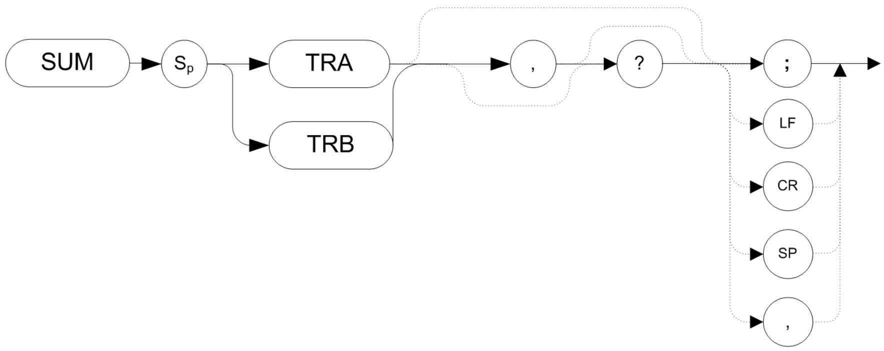
Returns the standard deviation of the trace amplitude in display units.

Format	STDEV TRA|TRB|TRC TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.
Query Data Type	Standard deviation of the trace amplitude in display units.
SCPI Equivalent Commands	:TRACe[:DATA]? TRACE(1|2|3|4|5|6) (see "Send/Query Trace Data (Remote Command Only)" on page 1321)
Notes	Prerequisite Commands: "TS (Take Sweep)" on page 543 when using trace data

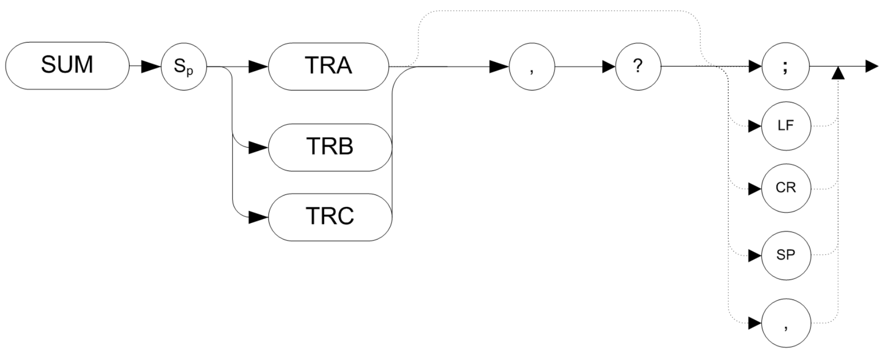
SUM (Sum)

Syntax

8560 Series:



8566A/B, 8568A/B:



Legacy Products

8560 series

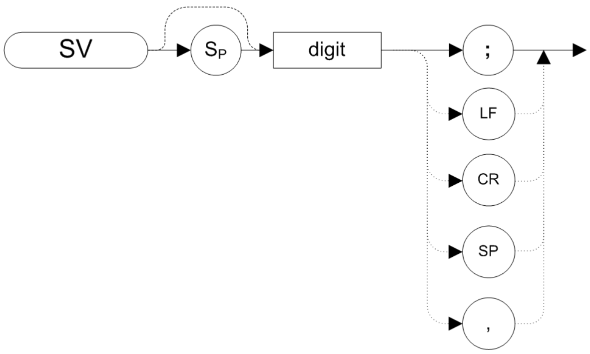
Description

Returns the sum of all the trace values to the controller.

Format	SUM TRA|TRB|TRC(,)(?)
Query Data Type	Sum of all the trace values. The 8560 series returns display units, range (0-610)*601 points, or, if "TDF (Trace Data Format)" on page 530 is set to M, it returns ASCII.
SCPI Equivalent Commands	None

SV (Save State)

Syntax



Legacy Products

8566A/B, 8568A/B

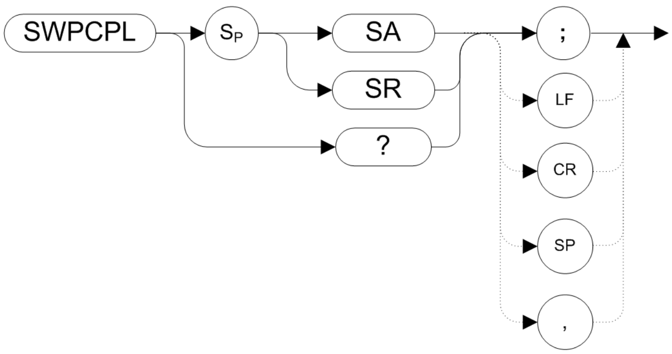
Description

Saves the current state of the instrument in any of the registers one through six.

Format	SV <integer>
Query Data Type	N/A
SCPI Equivalent Commands	*SAV <integer> (see "Save Instrument State " on page 160)
Notes	The functions of SV are identical to "SAVES (Save State)" on page 502.

SWPCPL (Sweep Couple)

Syntax



Legacy Products

8560 series

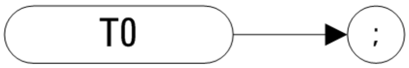
Description

Selects either a stimulus-response (SR) or signal-analyzer (SA) auto-coupled sweep time. In stimulus response mode, auto-coupled sweep times are usually much faster for swept response measurements. Stimulus response auto-coupled sweep times are typically valid in stimulus-response measurements when the system frequency span is less than 20 times the bandwidth of the device under test.

Format	SWPCPL SA|SR SWPCPL?
Query Data Type	SA|SR
SCPI Equivalent Commands	[:SENSe]:SWEep:TIME:AUTO:RULes NORMal|ACCuracy|SRESponse [:SENSe]:SWEep:TIME:AUTO:RULes? (See "Sweep Time Rules" on page 1119)
Preset	SA

T0 [zero] (Turn Off Threshold Level)

Syntax



Legacy Products

8566A/B, 8568A/B

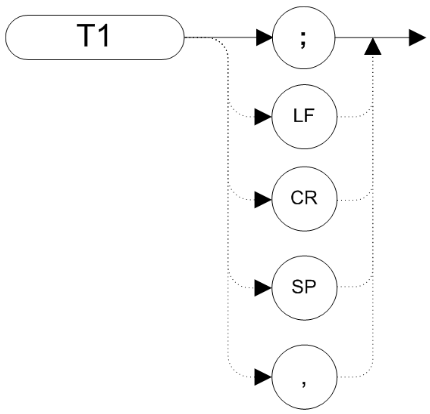
Description

Removes the threshold boundary and its readout from the display.

Format	T0
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of T0 are identical to THE OFF. See "THE (Threshold Enable)" on page 533.

T1 [one] (Free Run Trigger)

Syntax



Legacy Products

8566A/B, 8568A/B

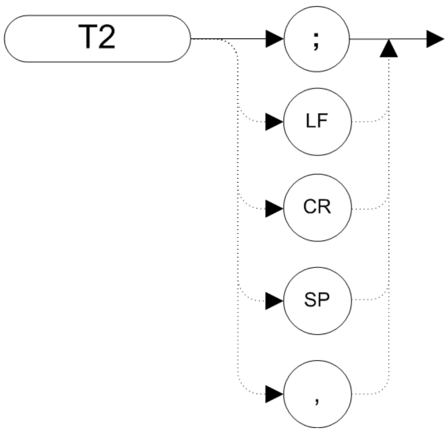
Description

Sets the instrument sweep to free run trigger mode.

Format	T1
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of T1 are identical to TM FREE. See "TM (Trigger Mode)" on page 536.

T2 [two] (Line Trigger)

Syntax



Legacy Products

8566A/B, 8568A/B

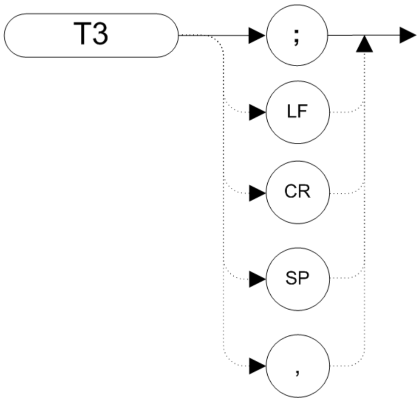
Description

Sets the instrument sweep to line trigger mode.

Format	T2
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of T2 are identical to TM LINE. See "TM (Trigger Mode)" on page 536.

T3 [three] (External Trigger)

Syntax



Legacy Products

8566A/B, 8568A/B

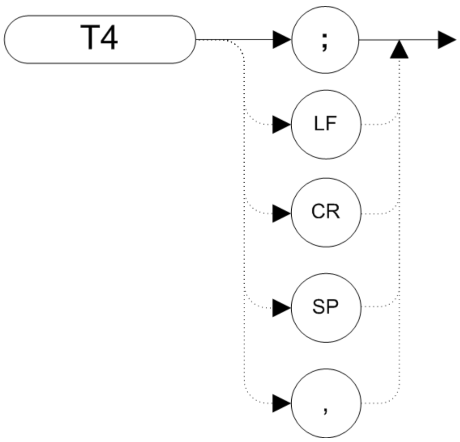
Description

Sets the instrument sweep to external trigger mode.

Format	T3
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of T3 are identical to TM EXT. See "TM (Trigger Mode)" on page 536.

T4 [four] (Video Trigger)

Syntax



Legacy Products

8566A/B, 8568A/B

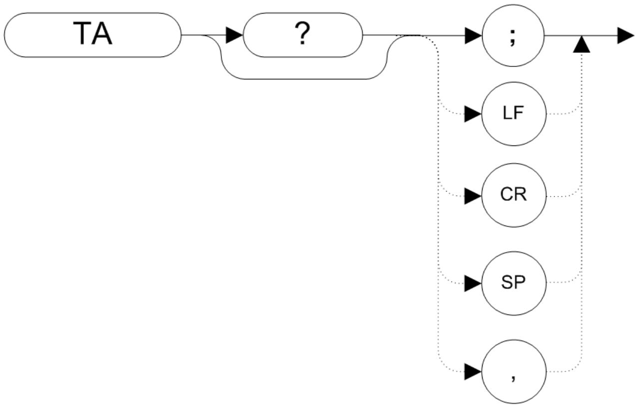
Description

Sets the instrument sweep to video trigger mode.

Format	T4
Query Data Type	N/A
SCPI Equivalent Commands	None
Notes	The functions of T4 are identical to TM VID. See "TM (Trigger Mode)" on page 536.

TA (Trace A)

Syntax



Legacy Products

8566A/B, 8568A/B

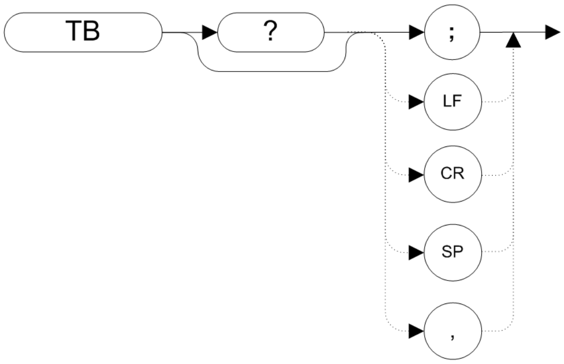
Description

Returns trace A amplitude values from the instrument to the controller.

Format	TA?
Query Data Type	The display unit values are transferred in sequential order (from left to right) as seen on the screen. Display unit values can be transferred to the controller in any one of the four output formats as determined by "O1 [one] (Format - Display Units)" on page 464, "O2 [two] (Format - Two 8-Bit Bytes)" on page 465, "O3 [three] (Format - Real Amplitude Units)" on page 466 and "O4 [four] (Format - One 8-Bit Byte)" on page 467. The format of the returned data is also affected by "TDF (Trace Data Format)" on page 530, and if TDF B (binary data format) has been selected, by "MDS (Measurement Data Size)" on page 420.
SCPI Equivalent Commands	:TRACe[:DATA]? TRACE(1|2|3|4|5|6) :FORMat:[:TRACe][:DATA] (See "Send/Query Trace Data (Remote Command Only)" on page 1321)

TB (Trace B)

Syntax



Legacy Products

8566A/B, 8568A/B

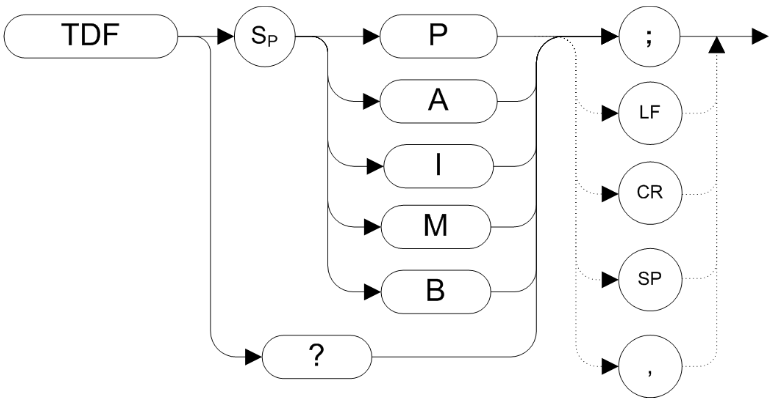
Description

Returns trace B amplitude values from the instrument to the controller.

Format	TB?
Query Data Type	The display unit values are transferred in sequential order (from left to right) as seen on the screen. Display unit values can be transferred to the controller in any one of the four output formats as determined by "O1 [one] (Format - Display Units)" on page 464, "O2 [two] (Format - Two 8-Bit Bytes)" on page 465, "O3 [three] (Format - Real Amplitude Units)" on page 466 and "O4 [four] (Format - One 8-Bit Byte)" on page 467. The format of the returned data is also affected by "TDF (Trace Data Format)" on page 530, and, if TDF B (binary data format) has been selected, by "MDS (Measurement Data Size)" on page 420.
SCPI Equivalent Commands	:TRACe? TRACE(1|2|3|4|5|6) :FORMat[:TRACe][:DATA] (See "Send/Query Trace Data (Remote Command Only)" on page 1321)

TDF (Trace Data Format)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Formats trace information for return to the controller.

The different trace data formats are as follows:

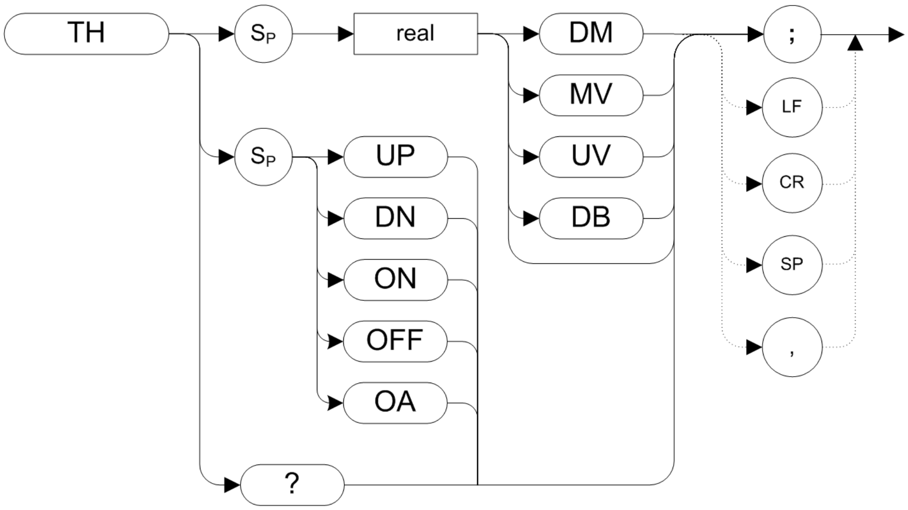
Option	Format
P	Parameter data format. Numbers are in Hz, Volts, Watts, dBm, dBmV, DBuV, DBV.
A	Returns data as an A-block data field. MDS determines whether data comprises one or two 8-bit bytes. (See "MDS (Measurement Data Size)" on page 420.)
I	Returns data as an I-block data field. MDS determines whether data comprises one or two 8-bit bytes. (See "MDS (Measurement Data Size)" on page 420.)
M	ASCII data format.
B	Binary data format. MDS determines whether data comprises one or two 8-bit bytes. (See "MDS (Measurement Data Size)" on page 420.)

Format	TDF P|A|I|M|B TDF?
Query Data Type	P|A|I|M|B
SCPI Equivalent Commands	:FORMat[:TRACe][:DATA] ASCii | INTeger,32 | REAL,32 | REAL,64 (See "Format Data: Numeric Data (Remote Command Only)" on page 174)
Preset	P

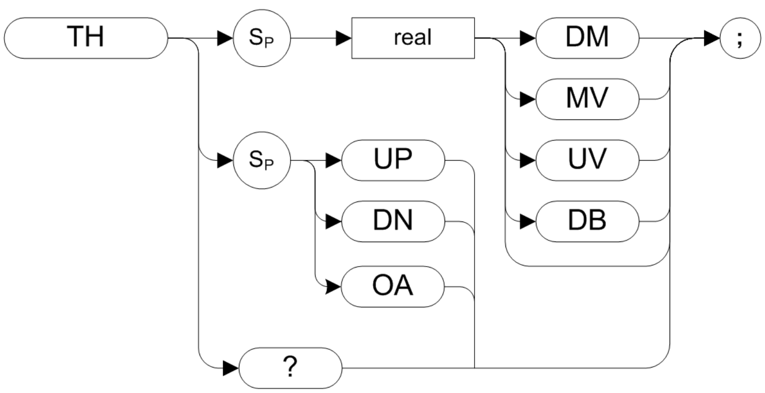
TH (Threshold)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

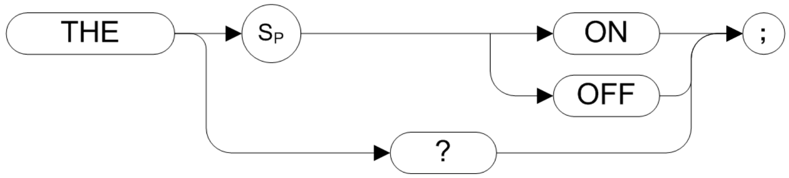
Blanks signal responses below the threshold level, similar to a base line clipper. The threshold level is nine major divisions below the reference level, unless otherwise specified.

Format	TH <real>DM|MV|UV|DB TH UP|DN UP or DN increments by one step size TH ON|OFF (8560 series only)

	TH OA TH?
Query Data Type	<real> in dB
SCPI Equivalent Commands	:CALCulate:MARKer:PEAK:THReshold <ampl> (see "Pk Threshold " on page 892)
Preset	–130 dBm

THE (Threshold Enable)

Syntax



Legacy Products

8566A/B, 8568A/B

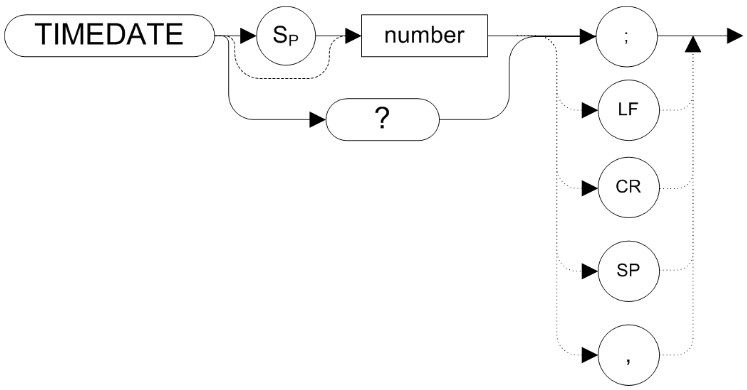
Description

Turns the threshold on or off.

Format	THE ON|OFF THE?
Query Data Type	ON|OFF
SCPI Equivalent Commands	None
Preset	OFF

TIMEDATE (Time Date)

Syntax



Legacy Products

8560 series

Description

Sets and returns the date and time of the real-time clock of the instrument. The number takes the form YYMMDDHHMMSS (Year, Month, Day, Hour, Minute, Second).

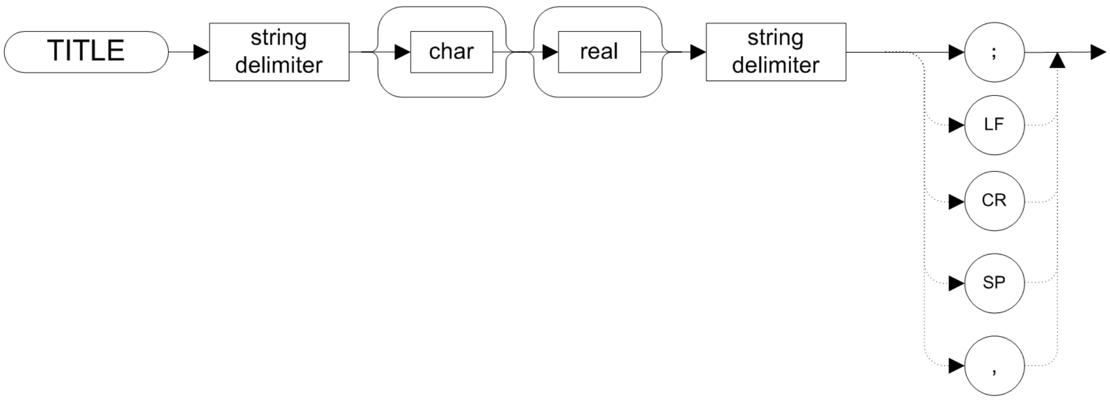
TIMEDATE ON and TIMEDATE OFF commands are supported on some models of the 8560 series. This set of commands displays or hides the time and date in the graticule.

N9061A does **not** support these commands, but accepts them and does not display a CMD ERR error or CMD NOT SUPPORTED error.

Format	TIMEDATE <number> TIMEDATE?
Query Data Type	<number> (YYMMDDHHMMSS)
SCPI Equivalent Commands	:SYSTem:DATE ... :SYSTem:DATE? :SYSTem:TIME ... :SYSTem:TIME?
Notes	This command changes the system clock of the instrument and may invalidate any time-based licenses installed on the instrument.

TITLE (Title)

Syntax



Legacy Products

8560 series

Description

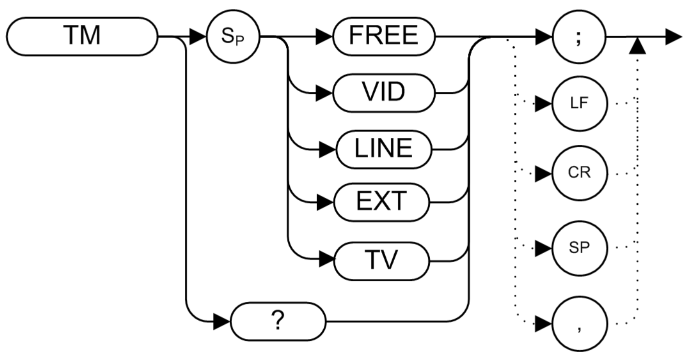
Activates the screen title mode, enabling you to enter your own title for the screen. Valid string delimiters, which must be used to start and terminate the title, are listed below.

See the 8560 Series User's Guide for more details.

Format	TITLE <string delimiter>(<char>)(<real>)<string delimiter> Valid string delimiters: !, ", $, %, &, ', /, :, =, \, ~, @
Query Data Type	N/A
SCPI Equivalent Commands	:DISPlay:ANNotation:TITLe:DATA "text" (see "Change Title " on page 1375)

TM (Trigger Mode)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Selects a trigger mode: free, line, video, or external.

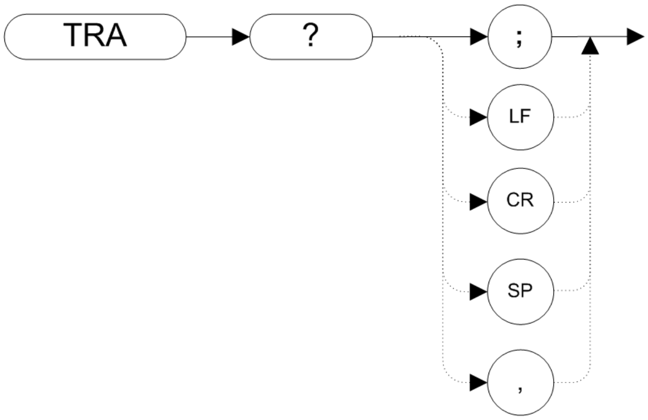
The options are as follows:

Option	Mode Selected
EXT	External mode. Connect an external trigger source to J5 EXT/GATE TRIG INPUT on the rear panel of the instrument. The source must range from 0 to 5 V (TTL). The trigger occurs on the rising, positive edge of the signal (about 1.5 V).
FREE	Free-run mode. Sweep triggers occur as fast as the instrument will allow.
LINE	Line mode. Sweep triggers occur at intervals synchronized to the line frequency.
VID	Video mode. Sweep triggers occur whenever the positively-sloped part of the input signal passes through the video trigger level. This trigger level can be changed (refer to the VTL command), and a dashed line appears on the screen to denote (approximately) the selected level. Video triggering is not available for resolution bandwidths ❍ 100 Hz.
TV	Allows TV triggering if Options 101 and 102, or Option 301 is installed. The functions of TM TV and TV TRIG are similar. TM TV does **not** select the TV line number, set up the amplitude level, change the span, change the bandwidth, or change the sweep time.

Format	TM FREE|VID|LINE|EXT|TV TM?
Query Data Type	FREE|VID|LINE|EXT|TV
SCPI Equivalent Commands	:TRIGger[:SEQuence]:SOURce EXTernal1|EXTernal2|IMMediate|LINE|FRAMe|RFBurst|VIDeo|TV (See "Trigger" on page 1326)
Preset	FREE
Notes	The functions of TM are identical to "T1 [one] (Free Run Trigger)" on page 524, "T2 [two] (Line Trigger)" on page 525, "T3 [three] (External Trigger)" on page 526 and "T4 [four] (Video Trigger)" on page 527.

TRA (Trace Data Input and Output)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

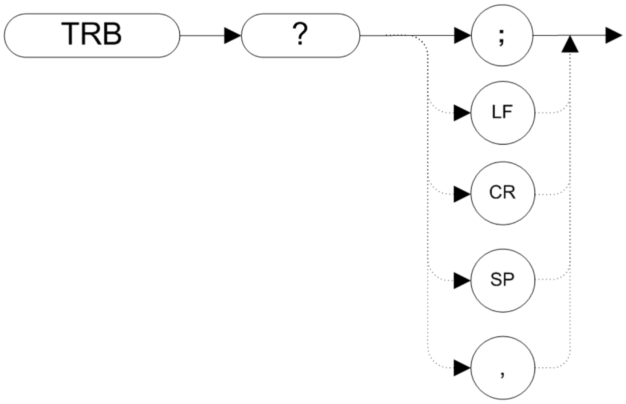
Description

Transfers Trace A amplitude values from the instrument to the controller.

Format	TRA?
Query Data Type	The format depends on the trace data format selected. See "TDF (Trace Data Format)" on page 530 for details on formatting.
SCPI Equivalent Commands	:TRACe? TRACE(1|2|3|4|5|6) (see "Send/Query Trace Data (Remote Command Only)" on page 1321) :FORMat[:TRACe][:DATA] ... :FORMat:BORDer NORMal|SWAPped

TRB (Trace Data Input and Output)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

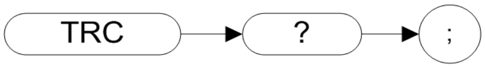
Description

Transfers Trace B amplitude values between the instrument and the controller.

Format	TRB?
Query Data Type	The format depends on the trace data format selected. See "TDF (Trace Data Format)" on page 530 for details on formatting.
SCPI Equivalent Commands	:TRACe? TRACE(1|2|3|4|5|6) (see "Send/Query Trace Data (Remote Command Only)" on page 1321) :FORMat[:TRACe][:DATA] ... :FORMat:BORDer NORMal|SWAPped

TRC (Trace Data Input and Output)

Syntax



Legacy Products

8566A/B, 8568A/B

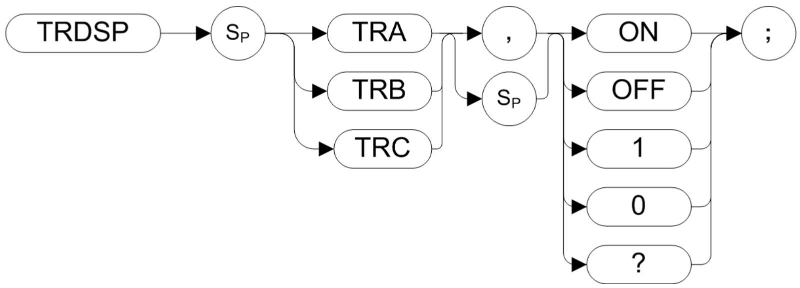
Description

Transfers Trace Amplitude values from the instrument to the controller.

Format	TRC?
Query Data Type	The format depends on the trace data format selected. See "TDF (Trace Data Format)" on page 530 for details on formatting.
SCPI Equivalent Commands	:TRACe? TRACE(1|2|3|4|5|6) (see "Send/Query Trace Data (Remote Command Only)" on page 1321) :FORMat[:TRACe][:DATA] ... :FORMat:BORDer NORMal|SWAPped

TRDSP (Trace Display)

Syntax



Legacy Products

8566A/B, 8568A/B

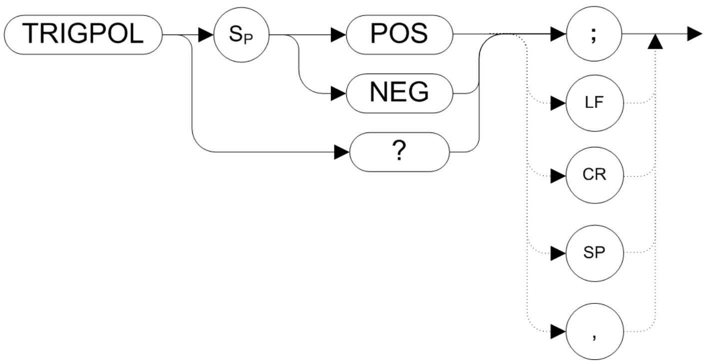
Description

Displays a trace or turns it off.

Format	TRDSP TRA|TRB|TRC ON|OFF|1|0 TRDSP TRA|TRB|TRC ? (Not supported in 8566A/B)
Query Data Type	1|0
SCPI Equivalent Commands	:TRACe#:DISPlay[:STATe] ON|OFF|1|0 (see "View/Blank " on page 1284)
Preset	ON for TRA, OFF for TRB and TRC

TRIGPOL (Trigger Polarity)

Syntax



Legacy Products

8560 series

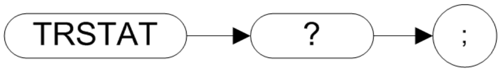
Description

Selects the edge (positive or negative) of the trigger input that causes the trigger event. TRIGPOL is available in all trigger modes.

Format	TRIGPOL POS|NEG TRIGPOL?
Query Data Type	POS|NEG
SCPI Equivalent Commands	:TRIGger[:SEQuence]:SLOPe POSitive|NEGative (see "Trig Slope " on page 1335)
Preset	POS

TRSTAT (Trace State)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Returns trace states to the controller. Valid trace states are Clear-write, View, Blank, Maximum Hold, and Off.

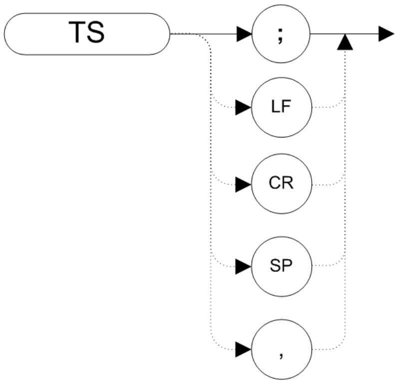
Possible Trace States

Trace State Description	Trace State Data Returned
Clear-write	CLRW
View	VIEW
Blank	BLANK
Maximum Hold	MXMH
Off	No data is returned

Format	TRSTAT?
Query Data Type	CLRW|VIEW|BLANK|MXMH
SCPI Equivalent Commands	:TRACe[1]|2|3:UPDate? :TRACe[1]|2|3:DISPlay? (See "View/Blank " on page 1284)

TS (Take Sweep)

Syntax



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Starts and completes one full sweep before the next command is executed. A TS command is required for each sweep in the single-sweep mode. TS always restarts a sweep even if a sweep is already in progress.

Format	TS
Query Data Type	N/A
SCPI Equivalent Commands	:INITiate[:IMMediate] (see "Restart" on page 984) *OPC? (see "Operation Complete " on page 158)

USERREV

Syntax

USERREV ""|"NNNNNNN"

Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Modifies the response returned by the query "REV (Revision)" on page 491. This command sets the response to be either the supplied parameter value, or else, if this command's parameter is empty or missing, the system-defined value.

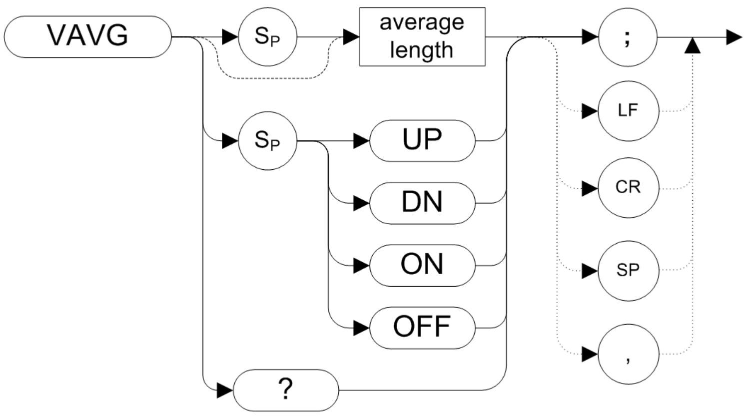
This is an N9061A "extension" command, which is not defined in the command set of any legacy instrument.

Format	USERREV ""|"NNNNNNN" "N" is any digit 0-9
Query Data Type	N/A
SCPI Equivalent Commands	None
Preset	System-defined value
Notes	Usually, you need to set the REV? response only once with this command, and the setting is retained while power is on. However, you will need to set the response again in the following 3 cases: 1. Keysight recovery 2. Instrument software upgrade 3. Restore Mode Defaults

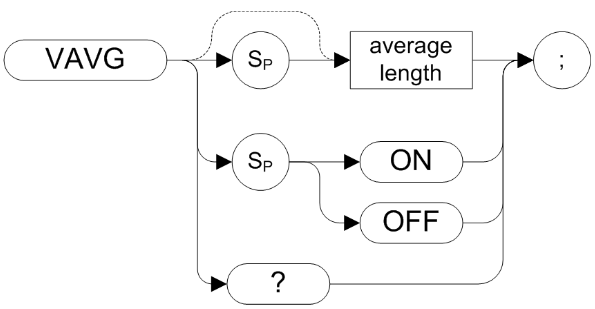
VAVG (Video Average)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Enables the video-averaging function, which averages trace points to smooth the displayed trace. The VAVG? query returns the number of averages for the 8560 series of analyzers.

There are a few differences in the way video averaging works in the N9061A application compared to the legacy analyzers. See the following table for a summary of these differences.

Legacy Analyzers - Video Averaging Behavioral Differences

Condition	Legacy Spectrum Analyzers	N9061A application
All conditions.	*8566 and 8568 only* - Original trace is displayed in Trace C.	Only displays the averaged trace. The averaged trace is displayed in Trace A.
Average Count value set to 0.	Cannot be set to 0.	Video averaging is turned off if the Averaging Count is set to 0.
Change in Average Count	*8566 and 8568 only* - Continues	Resets the counter to zero and starts the measurement

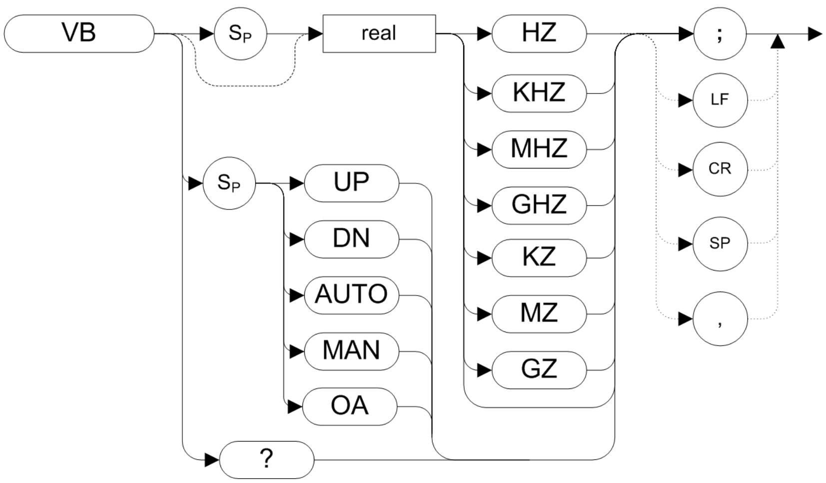
Condition	Legacy Spectrum Analyzers	N9061A application
setting to a higher value.	counting from where the previous value left off.	again.
Change in average counter setting to a lower value.	*8566 and 8568 only* - Updates the screen annotation with the lower averaging value.	If the new count value has not been reached, continues until the new lower count has been reached. If the new, lower count value has already been reached, the instrument will stop and wait until you take a new sweep.
Averaging turned on.	Sweep time remains unchanged.	Sweep time changes due to the selection of the sample detector.
Change in resolution bandwidth, video bandwidth, sweep time, reference level or attenuation.	*8566 and 8568 only* - In single sweep mode, resets counter to zero and starts the averaging again.	Continues the measurement without resetting the counter.
Change in center frequency or span.	In single sweep mode, resets counter to zero and starts the averaging again. *8566 and 8568 only* - Also resets the counter after changes in RBW, VBW, Sweep Time, Ref. Level and Attenuation.	In single sweep mode the X-Series instrument uses all stored averages. Does not reset the counter after changes in RBW, VBW, Sweep Time, Ref. Level and Attenuation.

Format	VAVG <average length> Range: Integer from 1 to 999 VAVG UP|DN (8560 series only) UP or DN: Increments by 1 VAVG ON|OFF VAVG?
Query Data Type	<number>, or 0 if it is OFF
SCPI Equivalent Commands	:TRACe#:TYPE AVERage (for VAVG ON) :TRACe#:TYPE WRITe (for VAVG OFF) [:SENSe]:AVERage:COUNT <integer> (See "Average/Hold Number" on page 794)
Preset	100, OFF
Notes	For 8566A/B, 8568A/B, the functions of VAVG are identical to "KSG (Video Averaging On)" on page 371 or "KSH (Video Averaging Off)" on page 373.

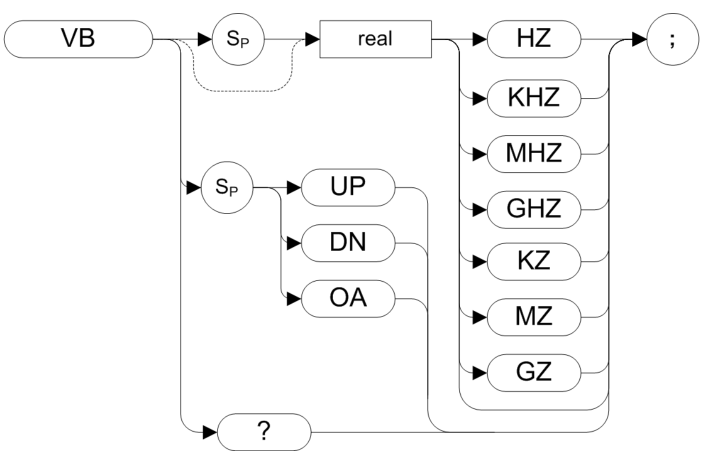
VB (Video Bandwidth)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

Description

Specifies the video bandwidth, which is a post-detection, low-pass filter.

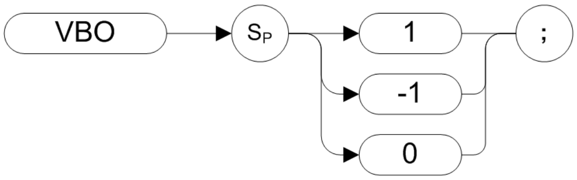
When auto coupled, the video bandwidth is calculated as Resolution Bandwidth x Video Resolution Bandwidth Ratio. See "VBO (Video Bandwidth Coupling Offset)" on page 549 for more details.

Format	VB <real>HZ|KHZ|MHZ|GHZ|KZ|MZ|GZ VB UP|DN

	UP or DN increments in a 1, 3, 10 sequence VB AUTO|MAN (8560 series only) VB OA VB?
Query Data Type	<real>
SCPI Equivalent Commands	[:SENSe]:BANDwidth:VIDeo <freq> [:SENSe]:BANDwidth:VIDeo:AUTO ON (See "Video BW " on page 590)
Preset	Coupled mode, 1 MHz

VBO (Video Bandwidth Coupling Offset)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Specifies the relationship between the video and resolution bandwidths which is maintained when these bandwidths are coupled. The bandwidths are usually coupled unless "RB (Resolution Bandwidth)" on page 486 or "VB (Video Bandwidth)" on page 547 have been executed.

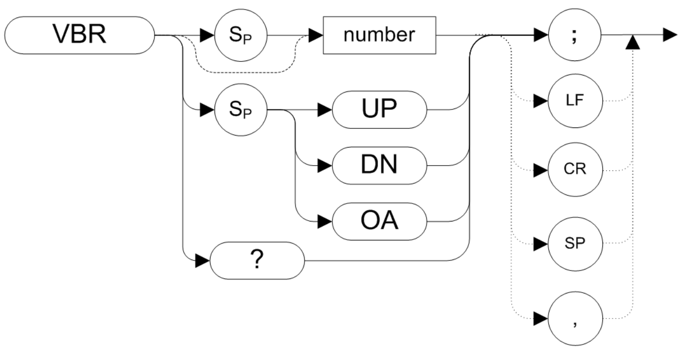
The options specify the behavior as follows:

Option	Behavior
1	The video bandwidth is one step higher than the resolution bandwidth. That is, the video bandwidth:resolution bandwidth ratio is 3.
–1	The video bandwidth is one step lower than the resolution bandwidth. That is, the video bandwidth:resolution bandwidth ratio is 0.3.
0	The ratio remains fixed at 1. That is, the resolution bandwidth and the video bandwidth are always equal.

Format	VBO 1|–1|0
Query Data Type	N/A
SCPI Equivalent Commands	None

VBR (Video Bandwidth to Resolution Bandwidth Ratio)

Syntax



Legacy Products

8560 series

Description

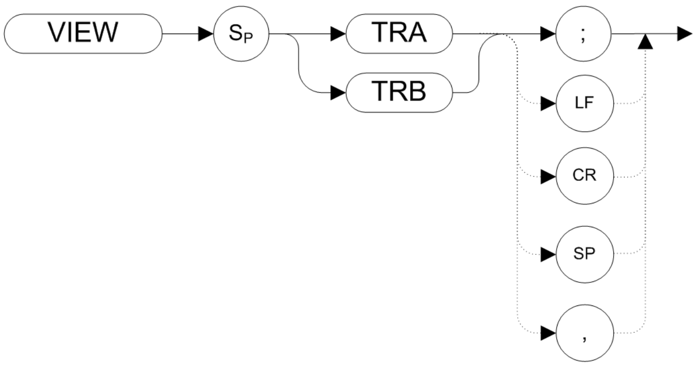
Specifies the relationship between the video and resolution bandwidths that is maintained when these bandwidths are coupled.

Format	VBR <number> <number> Range: 0.003 to 3 VBR UP|DN UP or DN: increment in a 1, 3, 10 sequence VBR OA VBR?
Query Data Type	<number>
SCPI Equivalent Commands	[:SENSe]:BANDwidth:VIDeo:RATio <real> (see "VBW:3dB RBW " on page 591)
Preset	1
Notes	VBR uses the legacy signal analyzer settings for video bandwidth only if Mode Setup > Preferences> Limit RBW/VBW is set to ON.

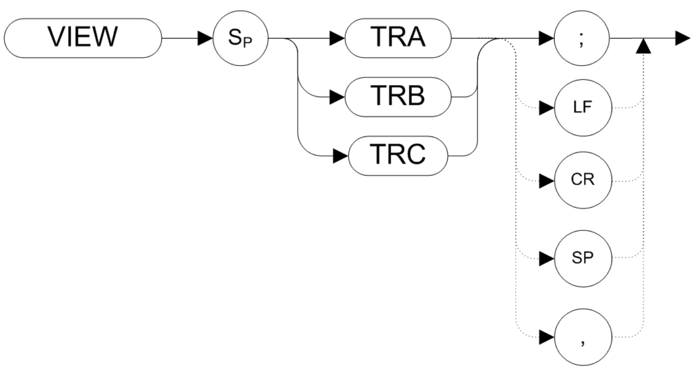
VIEW (View Trace)

Syntax

8560 series:



8566A/B, 8568A/B:



Legacy Products

8560 series, 8566A/B, 8568A/B

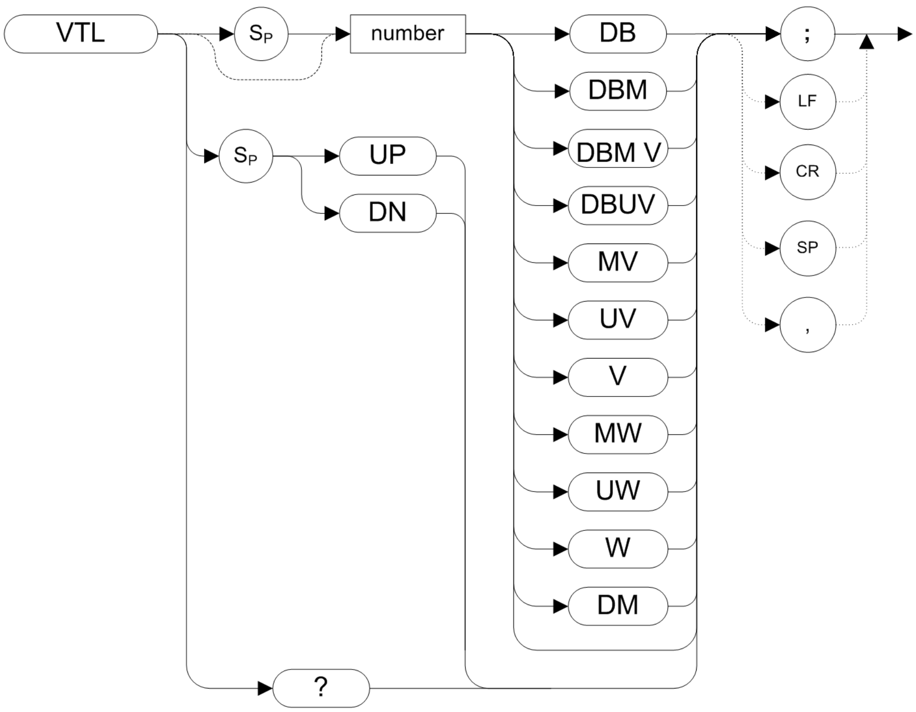
Description

Displays Trace A, Trace B, or Trace C, and stops taking new data into the viewed trace.

Format	VIEW TRA|TRB|TRC TRA corresponds to Trace 1 and TRB corresponds to Trace 2.
Query Data Type	N/A
SCPI Equivalent Commands	:TRACe[1]|2|3|4|5|6:UPDate OFF :TRACe[1|2|3|4|5|6:DISPlay[:STATe] ON (See "View/Blank " on page 1284)
Notes	The functions of VIEW are identical to "A3 [three] (View Mode for Trace A)" on page 257 and "B3 [three] (View Mode for Trace B)" on page 289. For 8566A/B, 8568A/B, VIEW is also identical to "KSj (View Trace C)" on page 377.

VTL (Video Trigger Level)

Syntax



Legacy Products

8560 series

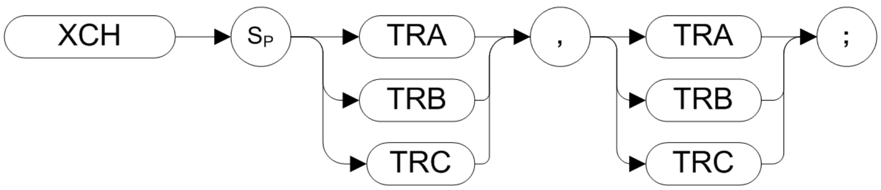
Description

Sets the signal level that triggers a sweep.

Format	VTL <number>DB|DBM|DBMV|DBUV|MV|UV|V|MW|UW|W|DM <number> Range: –220 to 30 VTL UP|DN UP or DN increments by 1 vertical division VTL?
Query Data Type	<real>
SCPI Equivalent Commands	:TRIGger[:SEQuence]:VIDeo:LEVel <ampl> (see "Trigger Level " on page 1334)
Preset	0 dBm
Notes	Setting a value for VTL sets the trigger mode to VIDEO, even if it was not already set to VIDEO. See "TM (Trigger Mode)" on page 536.

XCH (Exchange)

Syntax



Legacy Products

8566A/B, 8568A/B

Description

Exchanges the contents of the source and destination traces. The traces are analyzed and adjusted to fit the number of display points on the screen.

Format	XCH TRA|TRB|TRC,TRA|TRB|TRC
Query Data Type	N/A
SCPI Equivalent Commands	:TRACe#:DISPlay[:STATe]? :TRACe#:UPDate[:STATe]? :TRACe:EXCHange TRACE#, TRACE# :TRACe#:DISPlay[:STATe] :TRACe#:UPDate[:STATe] (See "View/Blank " on page 1284)
Notes	The functions of XCH TRA,TRB are identical to "AXB (Exchange Trace A and Trace B)" on page 286 and "EX (Exchange Trace A and Trace B)" on page 333. The functions of XCH TRB,TRC are identical to "BXC (Exchange Trace B and Trace C)" on page 295 and "KSi (Exchange Trace B and Trace C)" on page 376.

7 RLC Swept SA Measurement Front-Panel & SCPI Reference

The Swept SA measurement uses both swept and FFT analysis, and the frequency and time domains. For more details, see "Swept SA Measurement Description" on page 558 .

NOTE In many of the key and command descriptions that follow, reference is made to the "Spectrum Analyzer Mode" and "Swept SA Measurement". In all cases, the information applicable to this mode and measurement also applies to the RLC Mode and RLC Swept SA Measurement.

Measurement Commands and their Results for Swept SA

The INITiate and CONFigure syntax, as well as the data returned by the queries FETCh, MEASure and READ, are described in this section.

Note that the data returned by FETCh?, MEASure? and READ? uses the data settings specified by the commands FORMat:BORDer (see "Format Data: Byte Order (Remote Command Only)" on page 175) and FORMat:DATA (see "Format Data: Numeric Data (Remote Command Only)" on page 174), and can return real or ASCII data. If the format is set to INT,32, it returns REAL,32 data.

For more measurement related commands, see the SENSe subsystem, and the "Remote Measurement Functions" on page 163.

NOTE The INITiate command works in a slightly different fashion in the Spectrogram view. In the other Views (Normal, Trace Zoom and Zone Span), the following two commands perform exactly the same function:

- :INITiate:RESTart
- :INITiate:IMMediate

However, in the Spectrogram View, the command :INITiate:RESTart works like the Restart key, and clears out the Spectrogram trace history. The command :INITiate:IMMediate does not clear out the Spectrogram trace history but performs all other functions of performing a restart.

The table below lists the measurement commands and their responses for the SANalyzer measurement. Note that the marker values are x, y pairs.

Command	n	Return Value
`INITiate:SANalyzer`	n/a	n/a
`CONFigure?`	n/a	long form name of current measurement, for example, "SANalyzer"
`CONFigure:SANalyzer`	n/a	n/a (selects SAN measurement with Meas Setup settings in preset state – same as Meas Preset)
`CONFigure:SANalyzer:NDEFault`	n/a	n/a (selects SAN measurement without affecting settings)

`FETCh:SANalyzer[n]?`
`MEASure:SANalyzer[n]?`
`READ:SANalyzer[n]?`
	0	Returns the following comma-separated results:
		1. 1 if there is any margin or limit failure, otherwise 0
		2. 0 (future).
		3. 0 (future).
		4. 0 (future).
		5. N dB points result (not a number if off)
		6. Current average count k (the current number of data measurements that have already been combined, in the averaging calculation).
		7. Number of points in the sweep

Command	n	Return Value
		8. 0 (future). 9. 0 (future). 10. 0 (future). 11. Marker 1 value (x,y) 12. Marker 2 value (x,y) 13. Marker 3 value (x,y) 14. Marker 4 value (x,y) 15. Marker 5 value (x,y) 16. Marker 6 value (x,y) 17. Marker 7 value (x,y) 18. Marker 8 value (x,y) 19. Marker 9 value (x,y) 20. Marker 10 value (x,y) 21. Marker 11 value (x,y) 22. Marker 12 value (x,y)
	not specified or n=1	This query returns Trace 1 data as a list of x,y pairs. The y-values are in the current Y Axis Unit of the analyzer. The x-axis values are the values of the trace, in the x-axis scale units of the trace (Hz for frequency domain traces, seconds for time domain traces). When querying trace data, it is best if the analyzer is not sweeping during the query. Therefore, it is good to be in Single Sweep, or Update=Off when querying trace data from the analyzer.
	2	Returns Trace 2 data as a series of x,y pairs
	3	Returns Trace 3 data as a series of x,y pairs
	4	Returns Trace 4 data as a series of x,y pairs
	5	Returns Trace 5 data as a series of x,y pairs
	6	Returns Trace 6 data as a series of x,y pairs
	7 & above	Future use

Swept SA Measurement Description

- Swept Spectrum Analysis (Freq Domain): The analyzer sweeps the LO to generate a heterodyned IF signal that can be detected to analyze the signal content of a range of frequencies. The x-axis of the display is frequency, the Y Axis is amplitude.
- Swept FFT Analysis (Freq Domain): In some cases there is an advantage to not actually sweeping the LO, but instead analyzing the signal by taking a time record and performing FFT analysis. This is what is done in swept FFT analysis, but the data is still presented as though it were a sweeping spectrum analyzer. The x-axis of the display is frequency, the Y Axis is amplitude.
- Zero Span Analysis (Time Domain): In Zero Span analysis, the analyzer stops sweeping the LO, placing it at the center frequency, and then takes time data from the detector while stopped at that frequency. Because the LO is not moving, the frequency span is zero. The time data is presented left to right across the screen just like on an oscilloscope. The x-axis of the display is time, and the Y Axis is amplitude.

All of the tools such as markers, peak tables, limit lines, trace math, N dB points, and marker functions are available in Zero Span measurement analysis, although some work differently in the time and frequency domains.

Key Path	Meas
Initial S/W Revision	Prior to A.02.00

AMPTD Y Scale

The Amplitude front-panel key activates the Amplitude menu and selects Reference Level or Reference Value (depending on the measurement) as the active function.

Some features in the Amplitude menu apply to multiple measurements; others apply only to specific measurements. Keys that only apply to some measurements are blanked or grayed out in measurements that are not supported.

Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

Reference Level

The Reference Level specifies the amplitude represented by the topmost graticule line.

Changing the reference level does not restart a measurement, because it is a display function only; instead it vertically ‘pans’ all displayed traces and markers to the new value. If a change to the reference level changes the attenuation value (e.g. through an auto coupling), then the measurement will be restarted.

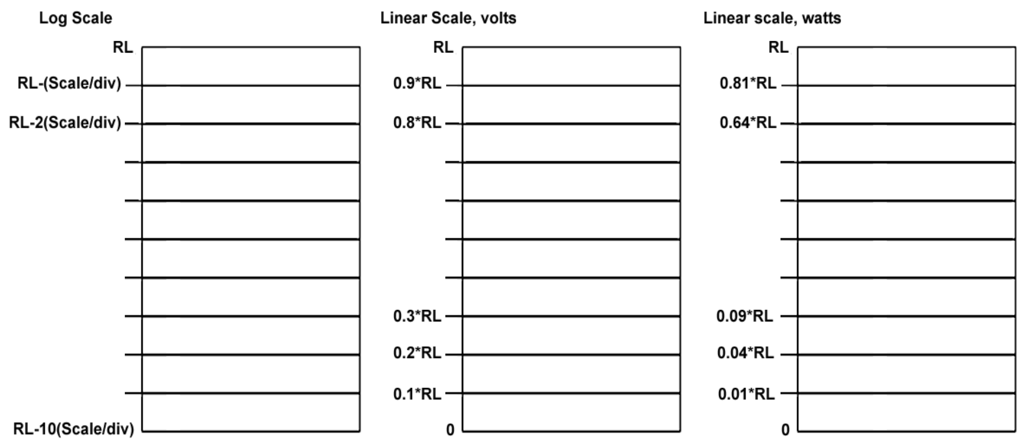
See "Amplitude Representations" on page 560

Key Path	AMPTD Y Scale
Remote Command	`:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel <real>` `:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel?`
Example	DISP:WIND:TRAC:Y:RLEV 20 dBm Sets the reference level to 20 dBm, which displays in the current Y axis unit. For example, if the Y axis unit is dBµV, then 126.99 dBµV will be displayed.
Couplings	If you reduce the attenuation, the analyzer may have to lower the reference level to keep it below its allowed maximum. This allowed maximum level is specified in the “Max” row, below, along with other variables which affect it. When you increase attenuation, the reference level does not change.
Preset	0 dBm
State Saved	Saved in instrument state
Min	RefLevelMin = –170 dBm + RefLevelOffset - ExtGain.
Max	The maximum Ref Level is typically: +30 dBm + RL Offset – External Gain (for MXA and PXA) +23 dBm + RL Offset – External Gain (for EXA and CXA) This maximum value is determined by the maximum power that can be safely applied to the input circuitry. The actual maximum value at any given time may be even less than this, depending on other values including Mech Atten, Int Preamp Gain, Swept IF Gain, FFT IF Gain, Max Mixer Level, and the total attenuation currently available. Note that the maximum reference level is unaffected by the input choice of external mixing.

Default Unit	Depends on the current selected Y axis unit
Backwards Compatibility Notes	1. In PSA, there was a restriction on Ref Level Max which was that it could not exceed 0 dBm when the preamp was on. This restriction does not apply to X-Series. 2. Ref Level – Ref Level is a display function, not a measurement control function, so a change in the setting does not start a new sweep (unless attenuation changes). This behavior differs from that of legacy analyzers
Initial S/W Revision	Prior to A.02.00

Amplitude Representations

The following is an illustration of the reference level and Y Axis scales under various conditions:



Attenuation

This menu controls the attenuator functions and interactions between the attenuation system components.

There are two attenuator configurations in the X-Series. One is a dual attenuator configuration consisting of a mechanical attenuator and an optional electronic attenuator. The other configuration uses a single attenuator with combined mechanical and electronic sections that controls all the attenuation functions. Different models in the X-Series come with different configurations, as described in more detail below:

- "Dual Attenuator Configurations" on page 561
- "Single Attenuator Configuration" on page 561
- "Determining Attenuator Configuration" on page 561

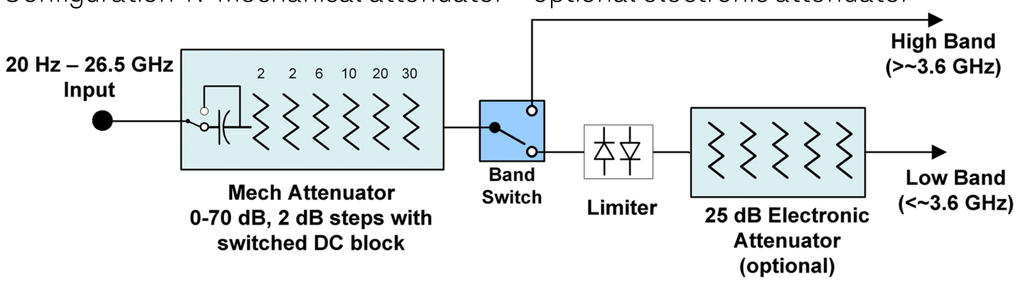
Most Attenuation settings are the same for all measurements; they do not change as you change measurements. Settings like these are called “Meas Global” and are unaffected by Meas Preset.

Key Path	AMPTD Y Scale

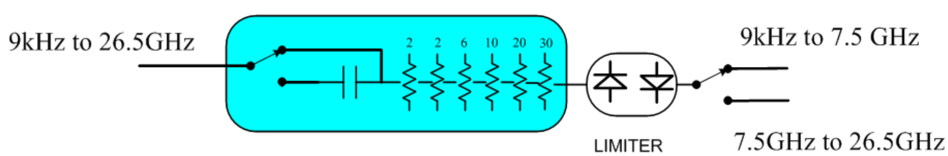
Scope	Meas Global
Dependencies	In measurements that support the I/Q inputs, this key is unavailable when I/Q is the selected input, and is replaced by the Range key in that case.
Readback Line	Contains a summary in [ ] brackets of the current total attenuation. See the descriptions of the "(Mech) Atten " on page 562, "Enable Elec Atten" on page 564, and "Elec Atten" on page 566 keys for more detail on the contributors to the total attenuation. Note that when "Pre-Adjust for Min Clip" on page 567 is on, this value can change at the start of every measurement.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Dual Attenuator Configurations

Configuration 1: Mechanical attenuator + optional electronic attenuator

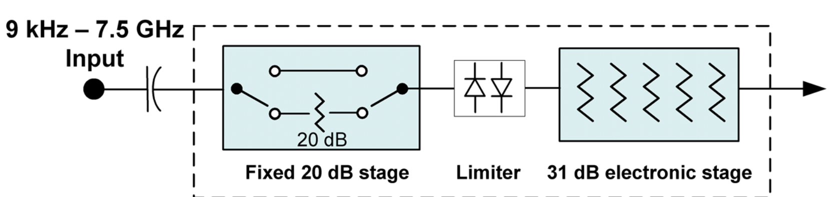


Configuration 2: Mechanical attenuator, no optional electronic attenuator



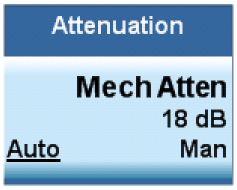
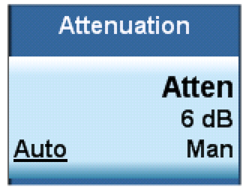
(note that Configuration 2 is not strictly speaking a dual-section attenuator, since there is no electronic section available. However, it behaves exactly like Configuration 1 without the Electronic Attenuator option EA3, therefore for the sake of this document it is grouped into the "Dual Attenuator" configuration)

Single Attenuator Configuration



Determining Attenuator Configuration

You can tell which attenuator configuration you have by pressing the Attenuation key, which (in most modes) opens the Attenuation menu. As shown in the examples below, if the first key in the Attenuation menu says Mech Atten, then you have the dual attenuator configuration. If the first key says Atten, then you have the single attenuator configuration.

Dual Attenuator	Single Attenuator
	

In the single attenuator configuration, you control the attenuation with a single control, as the fixed stage has only two states. In the dual attenuator configuration, both stages have significant range so you are given separate control of the mechanical and electronic attenuator stages.

When you have the dual attenuator configuration, you may still have only a single attenuator, because unless option EA3 (the Electronic Attenuator option) is available, and you purchase it, you will have only the mechanical attenuator.

(Mech) Atten

This key is labeled Mech Atten in dual attenuator models and Atten in single attenuator models. In the dual attenuator configuration, this key only affects the mechanical attenuator.

This key lets you modify the attenuation applied to the RF input signal path. This value is normally auto coupled to the Ref Level, the Internal Preamp Gain, any External Gain that is entered, and the Max Mixer Level, as described in the table below.

See "Attenuator Configurations and Auto/Man" on page 563

Key Path	AMPTD Y Scale, Attenuation

Remote Command	`[:SENSe]:POWer[:RF]:ATTenuation <rel_ampl>`
	`[:SENSe]:POWer[:RF]:ATTenuation?`
	`[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1`
	`[:SENSe]:POWer[:RF]:ATTenuation:AUTO?`

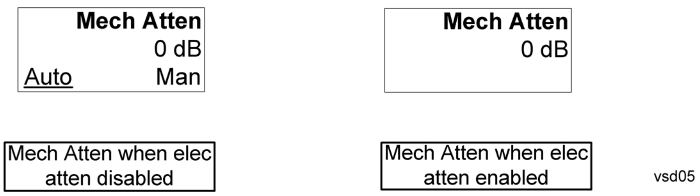
Example	POW:ATT 20 Dual attenuator configuration: sets the mechanical attenuator to 20 dB Single attenuator mode: sets the main attenuation to 20 dB (see below for definition of "main" attenuation). If the attenuator was in Auto, it sets it to Manual.
Dependencies	Some measurements do not support the Auto setting of (Mech) Atten. In these measurements, the Auto/Man selection is not available, and the Auto/Man line on the key disappears. In dual attenuator configurations, when the electronic attenuator is enabled, the mechanical attenuator has no auto setting and the Auto/Man line on the key disappears. The state of Auto/Man is remembered and restored when the electronic attenuator is once again disabled. This is described in more detail in the "Enable Elec Atten" on page 564 key description. See "Attenuator Configurations and Auto/Man" on page 563 for more information on the Auto/Man functionality of Attenuation.

Couplings	When (Mech) Atten is in Auto, it uses the following algorithm to determine a value: Atten = ReferenceLevel + PreAmpGain + ExternalGain – RefLevelOffset - MaxMixerLevel + IF Gain. Limit this value to be between 6 dB and the Max value. No value below 6 dB can ever be chosen by Auto. The resulting value is rounded up to the largest value possible given the attenuation step setting. That is, 50.01 dB would change to 60 dB (for a 10 dB attenuation step). The “IF Gain” term in the equation above is either 0 dB or +10 dB, depending on the settings of FFT IF Gain, Swept IF Gain, max Ref Level and the Auto/Man setting of Mech Atten. In External Mixing and BBIQ,where the Attenuator is not in the signal path, the Attenuator setting changes as described above when (Mech) Atten is in Auto, but no changes are made to the actual attenuator hardware setting until the input is changed back to the RF Input.
Preset	The preset for Mech Attenuation is “Auto.” The Auto value of attenuation is: CXA, EXA, MXA and PXA: 10 dB
State Saved	Saved in instrument state
Min	0 dB The attenuation set by this key cannot be decreased below 6 dB with the knob or step keys. To get to a value below 6 dB it has to be directly entered from the keypad or via SCPI. This protects from adjusting the attenuation to a dangerously small value which can put the instrument at risk of damage to input circuitry. However, if the current mechanical attenuation is below 6 dB it can be increased with the knob and step keys, but not decreased.
Max	CXA N9000A–503/507: 50 dB CXA N9000A–513/526: 70dB EXA: 60 dB MXA and PXA: 70 dB In the single attenuator configuration, the total of ATT and EATT cannot exceed 50 dB, so if the EATT is set to 24 dB first, the main attenuation cannot be greater than 26 dB and will be reduced accordingly; if the main attenuator is set to 40 dB first, EATT cannot be greater than 10 dB.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Attenuator Configurations and Auto/Man

As described in the Attenuation key description, there are two distinct attenuator configurations available in the X-Series, the single attenuator and dual attenuator configurations. In dual attenuator configurations, we have the mechanical attenuation and the electronic attenuation, and the current total attenuation is the sum of the electronic + mechanical attenuation. In single attenuator configurations, we refer to the attenuation set using the (Mech) Atten key (or POW:ATT SCPI) as the “main” attenuation; and the attenuation that is set by the SCPI command POW:EATT as the “soft” attenuation (the POW:EATT command is honored even in the single attenuator configuration, for compatibility purposes). Then the current total attenuation is the sum of the main + soft attenuation. See the Elec Atten key description for more on “soft” attenuation.

In the dual attenuator configuration, when the electronic attenuator is enabled, there is no Auto/Man functionality for the mechanical attenuator, and the third line of the key label (the Auto/Man line) disappears:



Enable Elec Atten

Enables the Electronic Attenuator.

The electronic attenuator offers finer steps than the mechanical attenuator, has no acoustical noise, is faster, and is less subject to wear. These advantages primarily aid in remote operation and are negligible for front panel use. See "Using the Electronic Attenuator: Pros and Cons" on page 566 for a detailed discussion of the pros and cons of using the electronic attenuator.

For the single attenuator configuration, for SCPI backwards compatibility, the “soft” attenuation feature replaces the dual attenuator configuration’s electronic attenuator. All the same couplings and limitations apply. See "Attenuator Configurations and Auto/Man" on page 563

See "More Information" on page 565

Key Path	AMPTD Y Scale, Attenuation
Remote Command	`[:SENSe]:POWer[:RF]:EATTenuation:STATe OFF|ON|0|1` `[:SENSe]:POWer[:RF]:EATTenuation:STATe?`
Example	POW:EATT:STAT ON
Dependencies	This key only appears in Dual Attenuator models with an Electronic Attenuator installed. It does not appear in models with the Single Attenuator configuration, as in the single attenuator configuration there is no “electronic attenuator” there is only a single integrated attenuator (which has both a mechanical and electronic stage). However, in the single attenuator configuration, EATT SCPI commands are accepted for compatibility with other X-series instruments and set a “soft” attenuation as described in "Attenuator Configurations and Auto/Man" on page 563 The electronic attenuator (and the “soft” attenuation function provided in single attenuator configurations) is unavailable above 3.6 GHz. Therefore, if the Stop Frequency of the analyzer is > 3.6 GHz then the Enable Elec Atten key will be OFF and grayed out. If the Internal Preamp is on, meaning it is set to Low Band or Full, the electronic attenuator (and the “soft” attenuation function provided in single attenuator configurations) is unavailable. In this case the Enable Elec Atten key will be OFF and grayed out. If either of the above is true, if the SCPI command is sent, an error indicating that the electronic attenuator is unavailable will be sent. If the electronic/soft Attenuator is enabled, then the Stop Freq of the analyzer is limited to 3.6 GHz and the Internal Preamp is unavailable. The SCPI-only “soft” electronic attenuation for the single-attenuator configuration is not available in

	all measurements; in particular, it is not available in the Swept SA measurement.
Couplings	Enabling and disabling the Electronic Attenuator affects the setting of the Mechanical Attenuator (in dual attenuator configurations). This is described in more detail below this table.
Preset	OFF for Swept SA measurement; ON for all other measurements that support the electronic attenuator
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

More Information

Mechanical Attenuator Transition Rules

When the Electronic Attenuator is enabled, the Mechanical Attenuator transitions to a state that has no Auto function. Below are the rules for transitioning the Mechanical Attenuator. NOTE that the information below ONLY applies to the dual attenuator configurations, and ONLY when the Electronic Attenuator is installed:

When the Electronic Attenuation is enabled from a disabled state:

- The Mechanical Attenuator is initialized to 10 dB (this is its optimal performance setting). You can then set it as desired with SCPI, numeric keypad, step keys, or knob, and it behaves as it normally would in manual mode
- The Auto/Man state of (Mech) Atten is saved
- The Auto/Man line on the (Mech) Atten key disappears and the auto rules are disabled
- The Electronic Attenuator is set to 10 dB less than the previous value of the Mechanical Attenuator, within the limitation that it must stay within the range of 0 to 24 dB of attenuation.

Examples in the dual attenuator configuration:

- Mech Atten at 20 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 10 dB. New total attenuation equals the value before Elec Atten enabled.
- Mech Atten at 0 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 0 dB. New total attenuation does not equal the value before Elec Atten enabled.
- Mech Atten at 40 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 24 dB. New total attenuation does not equal the value before Elec Atten enabled.

When the Electronic Attenuation is disabled from an enabled state:

- The Elec Atten key is grayed out
- The Auto/Man state of (Mech) Atten is restored
- If now in Auto, (Mech) Atten recouples

- If now in Man, (Mech) Atten is set to the value of total attenuation that existed before the Elec Atten was disabled. The resulting value is rounded up to the smallest value possible given the (Mech) Atten Step setting - (That is, 57 dB changes to 58 dB when (Mech) Atten Step is 2 dB.)

Using the Electronic Attenuator: Pros and Cons

The electronic attenuator offers finer steps than the mechanical attenuator, has no acoustical noise, is faster, and is less subject to wear.

The “finer steps” advantage of the electronic attenuator is beneficial in optimizing the alignment of the analyzer dynamic range to the signal power in the front panel as well as remote use. Thus, you can achieve improved relative signal measurement accuracy. Compared to a mechanical attenuator with 2 dB steps, the 1 dB resolution of the electronic attenuator only gives better resolution when the odd-decibel steps are used. Those odd-decibel steps are less accurately calibrated than the even-decibel steps, so one tradeoff for this superior relative accuracy is reduced absolute amplitude accuracy.

Another disadvantage of the electronic attenuator is that the spectrum analyzer loses its “Auto” setting, making operation less convenient.

Also, the relationship between the dynamic range specifications (TOI, SHI, compression and noise) and instrument performance are less well-known with the electrical attenuator. With the mechanical attenuator, TOI, SHI and compression threshold levels increase dB-for-dB with increasing attenuation, and the noise floor does as well. With the electronic attenuator, there is an excess attenuation of about 1 to 3 dB between 0 and 3.6 GHz, making the effective TOI, SHI, and so forth, less well known. Excess attenuation is the actual attenuation relative to stated attenuation. Excess attenuation is accounted for in the analyzer calibration

Elec Atten

Controls the Electronic Attenuator in dual attenuator configurations. This key does not appear in single attenuator configurations, as the control of both the mechanical and electronic stages of the single attenuator is integrated into the single Atten key.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	`[:SENSe]:POWer[:RF]:EATTenuation <rel_ampl>` `[:SENSe]:POWer[:RF]:EATTenuation?`
Notes	Electronic Attenuation’s specification is defined only when Mechanical Attenuation is 6 dB.
Dependencies	This key only appears in Dual Attenuator models with an Electronic Attenuator installed. It does not appear in models with the Single Attenuator configuration, as in the single attenuator configuration there is no “electronic attenuator” there is only a single integrated attenuator (which has both a mechanical and electronic stage). However, in the single attenuator configuration, EATT SCPI commands are accepted for compatibility with other X-series instruments and set a “soft” attenuation as described in "Attenuator Configurations and Auto/Man" on page 563. The “soft” attenuation is treated as an addition to the “main” attenuation value set by the Atten softkey or the POW:ATT SCPI command and affects the total attenuation displayed on the Attenuation key and the Meas Bar. When Enable Elec Atten is off or grayed out, the Elec Atten key is grayed out.
Preset	0 dB

State Saved	Saved in instrument state
Min	0 dB
Max	Dual attenuator configuration: 24 dB Single attenuator configuration: the total of ATT and EATT cannot exceed 50 dB, so if the EATT is set to 24 dB first, the main attenuation cannot be greater than 26 dB and will be reduced accordingly; if the main attenuator is set to 40 dB first, EATT cannot be greater than 10 dB
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Adjust Atten for Min Clip

Sets the combination of mechanical and electronic attenuation based on the current measured signal level so that clipping will be at a minimum.

This is an "immediate action" function, that is, it executes once, when the key is pressed.

This key is grayed out in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	`[:SENSe]:POWer[:RF]:RANGe:OPTimize IMMediate`
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Pre-Adjust for Min Clip

If this function is on, it does the adjustment described under "Adjust Atten for Min Clip" on page 567 each time a measurement restarts. Therefore, in Continuous measurement mode, it only executes before the first measurement.

In dual attenuator models, you can set Elec+Mech Atten, in which case both attenuators participate in the autoranging, or Elec Atten Only, in which case the mechanical attenuator does not participate in the autoranging. This latter case results in less wear on the mechanical attenuator and is usually faster.

This key is grayed out in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	`[:SENSe]:POWer[:RF]:RANGe:OPTimize:ATTenuation OFF | ELECtrical | COMBined` `[:SENSe]:POWer[:RF]:RANGe:OPTimize:ATTenuation?`
Notes	The SCPI parameter ELECtrical sets this function to On in single attenuator models. The SCPI parameter COMBined is mapped to ELECtrical in single attenuator models; if you send COMBined, it sets the function to On and returns ELEC to a query.

Dependencies	This key only appears in Dual Attenuator models with an Electronic Attenuator installed. It does not appear in models with the Single Attenuator configuration, as in the single attenuator configuration there is no "electronic attenuator" there is only a single integrated attenuator (which has both a mechanical and electronic stage). When Enable Elec Atten is off or grayed out, the Pre-Adjust for Min Clip key is grayed out.
Preset	OFF for Swept SA measurement; ON for all other measurements that support Pre-Adjust for Min Clip
State Saved	Saved in instrument state
Range	Dual attenuator models: Off | Elec Atten Only | Mech + Elec Atten Single attenuator models: Off | On
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Remote Command	`[:SENSe]:POWer[:RF]:RANGe:AUTO ON|OFF|1|0` `[:SENSe]:POWer[:RF]:RANGe:AUTO?`
Notes	ON aliases to "Elec Atten Only" (:POW:RANG:OPT:ATT ELEC) OFF aliases to "Off" (:POW:RANG:OPT:ATT OFF) The query :POW:RANG:AUTO? returns true if :POW:RANG:OPT:ATT is not "Off"
Initial S/W Revision	Prior to A.02.00

Off

Turns Pre-Adjust for Min Clip off. This is the default setting.

This key is grayed out in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

Key Path	AMPTD Y Scale, Attenuation, Pre-Adjust for Min Clip
Example	:POW:RANGe:OPT:ATT OFF
Initial S/W Revision	Prior to A.02.00

Elec Atten Only

Selects only the electric attenuator to participate in auto ranging. This offers less wear on the mechanical attenuator and is usually faster.

This key is grayed out in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

Key Path	AMPTD Y Scale, Attenuation, Pre-Adjust for Min Clip
Example	:POW:RANGe:OPT:ATT ELEC
Initial S/W Revision	Prior to A.02.00

Mech + Elec Atten

In dual attenuator models, this selects both attenuators participate in the autoranging.

This key is grayed out in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

Key Path	AMPTD Y Scale, Attenuation, Pre-Adjust for Min Clip
Example	:POW:RANGe:OPT:ATT COMB
Initial S/W Revision	Prior to A.02.00

(Mech) Atten Step

This controls thestep size used when making adjustments to the input attenuation.

This key is labeled Mech Atten Step in dual attenuator models and Atten Step in single attenuator models. In the dual attenuator configuration, this key only affects the step size of the mechanical attenuator.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	`[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement] 10 dB | 2 dB` `[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement]?`
Example	POW:ATT:STEP 2
Notes	Note this feature works like a 1-N choice from the front panel, but it takes a specific value (in dB) when used remotely. The only valid values are 2 and 10.
Dependencies	Blanked in CXA and EXA if option FSA (2 dB steps) is not present. If blanked, attempts to set it via SCPI will yield an error.
Couplings	When the attenuation step size changes, the current mechanical attenuation value is adjusted (if necessary) to be quantized to the new step size. That is, if step is set to 10 dB, mech atten is increased if necessary so it is a multiple of 10 dB
Preset	PXA and MXA: 2 dB EXA and CXA: 10 dB (2 dB with option FSA)
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Max Mixer Level

Controls the limitation on the Ref Level for a given attenuation setting, and therefore also interacts with the Auto rules for selecting the attenuation as a coupling from the reference level.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	`[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <real>` `[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer]?`
Example	POW:MIX:RANG –15 dBm
Preset	–10 dBm
State Saved	Saved in instrument state
Min	–50 dBm
Max	–10 dBm
Default Unit	Depends on the current selected Y axis unit, see Swept SA discussion of Y Axis Unit
Initial S/W Revision	Prior to A.02.00

Scale / Div

Sets the units per vertical graticule division on the display. This function is only available when Scale Type (Log) is selected and the vertical scale is power. When Scale Type (Lin) is selected, Scale/Div is grayed out.

Key Path	AMPTD Y Scale
Remote Command	`:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:PDIVision <rel_ampl>` `:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:PDIVision?`
Example	DISP:WIND:TRAC:Y:PDIV 5 DB
Dependencies	Scale/Div is grayed out in linear Y scale. Sending the equivalent SCPI command does change the Scale/Div, though it has no affect while in Lin.
Preset	10.00 dB / Div
State Saved	Saved in instrument state
Min	0.10 dB
Max	20 dB
Initial S/W Revision	Prior to A.02.00

Scale Type

Chooses a linear or logarithmic vertical scale for the display and for remote data readout.

When Scale Type (Log) is selected, the vertical graticule divisions are scaled in logarithmic units. The top line of the graticule is the Reference Level and uses the scaling per division Scale/Div to assign values to the other locations on the graticule.

When Scale Type (Lin) is selected, the vertical graticule divisions are linearly scaled with the reference level value at the top of the display and zero volts at the bottom. Each vertical division of the graticule represents one-tenth of the Reference Level.

NOTE The Y Axis Unit used for each type of display is set by pressing Y Axis Unit. The analyzer remembers separate Y Axis Unit settings for both Log and Lin.

Key Path	AMPTD Y Scale
Remote Command	`:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:SPACing LINear | LOGarithmic` `:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:SPACing?`
Example	DISP:WIND:TRAC:Y:SPAC LOG DISP:WIND:TRAC:Y:SPAC?
Dependencies	If Normalize is on, Scale Type forced to Log and is grayed out.
Couplings	Changing the Scale Type always sets the Y Axis unit to the last unit specified for the current amplitude scale. In other words, we restore the Y Axis unit setting appropriate per log/lin.
Preset	LOG
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Presel Center

When this key is pressed, the centering of the preselector filter is adjusted to optimize the amplitude accuracy at the frequency of the selected marker. If the selected marker is not on when Presel Center is pressed, the analyzer will turn on the selected marker, perform a peak search, and then perform centering on the marker's center frequency. If the selected marker is already on and between the start and stop frequencies of the analyzer, the analyzer performs the preselector calibration on that marker's frequency. If the selected marker is already on, but outside the frequency range between Start Freq and Stop Freq, the analyzer will first perform a peak search, and then perform centering on the marker's center frequency.

The value displayed on the Presel Adjust key will change to reflect the new preselector tuning (see Presel Adjust.

A number of considerations should be observed to ensure proper operation. See "Proper Preselector Operation" on page 572.

Key Path	AMPTD Y Scale
Remote Command	`[:SENSe]:POWer[:RF]:PCENter`
Example	POW:PCEN
Notes	Note that the rules outlined above under the key description apply for the remote command as well as the key. The result of the command is dependent on marker position, and so forth. Any message shown by the key press is also shown in response to the remote command.
Dependencies	• Grayed out if the microwave preselector is off.) • If the selected marker's frequency is below Band 1, advisory message 0.5001 is generated and no

	action is taken. • Grayed out if entirely in Band 0. • Blank in models that do not include a preselector, such as option 503. If the SCPI is sent in these instruments, it is accepted without error, and the query always returns 0. • Grayed out in the Spectrogram View.
Couplings	The active marker position determines where the centering will be attempted. If the analyzer s in a measurement such as averaging when centering is initiated, the act of centering the preselector will restart averaging but the first average trace will not be taken until the centering is completed.
Status Bits/OPC dependencies	When centering the preselector, *OPC will not return true until the process is complete and a subsequent measurement has completed, nor will results be returned to a READ or MEASure command. The Measuring bit should remain set while this command is operating and should not go false until the subsequent sweep/measurement has completed.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Proper Preselector Operation

A number of considerations should be observed to ensure proper operation:

1. If the selected marker is off, the analyzer will turn on a marker, perform a peak search, and adjust the preselector using the selected marker's frequency. It uses the "highest peak" peak search method unqualified by threshold or excursion, so that there is no chance of a 'no peak found' error. It continues with that peak, even if it is the peak of just noise. Therefore, for this operation to work properly, there should be a signal on screen in a preselected range for the peak search to find.
2. If the selected marker is already on, the analyzer will attempt the centering at that marker's frequency. There is no preselector for signals below about 3.6 GHz, therefore if the marker is on a signal below 3.6 GHz, no centering will be attempted and an advisory message generated
3. In some models, the preselector can be bypassed. If it is bypassed, no centering will be attempted in that range and a message will be generated.

Preselector Adjust

Allows you to manually adjust the preselector filter frequency to optimize its response to the signal of interest. This function is only available when "Presel Center" on page 571 is available.

For general purpose signal analysis, using Presel Center is recommended. Centering the filter minimizes the impact of long-term preselector drift. Presel Adjust can be used instead to manually optimize the preselector. One application of manual optimization would be to peak the preselector response, which both optimizes the signal-to-noise ratio and minimizes amplitude variations due to small (short-term) preselector drifting.

Key Path	AMPTD Y Scale
Scope	Meas Global
Remote Command	`[:SENSe]:POWer[:RF]:PADJust <freq>` `[:SENSe]:POWer[:RF]:PADJust?`
Example	POW:PADJ 100KHz POW:PADJ?
Notes	The value on the key reads out to 0.1 MHz resolution.
Dependencies	• Grayed out if microwave preselector is off.) • Grayed out if entirely in Band 0. • Blank in models that do not include a preselector, such as option 503. If the SCPI is sent in these instruments, it is accepted without error, and the query always returns 0. • Grayed out in the Spectrogram View.
Preset	0 MHz
State Saved	The Presel Adjust value set by Presel Center, or by manually adjusting Presel Adjust, is not saved in instrument state, and does not survive a Preset or power cycle.
Min	–500 MHz
Max	500 MHz
Default Unit	Hz

Backwards Compatibility SCPI	`[:SENSe]:POWer[:RF]:MW:PADJust`
	`[:SENSe]:POWer[:RF]:MMW:PADJust`
	PSA had multiple preselectors, but the X-Series has only one. These commands simply alias to [:SENSe]:POWer[:RF]:PADJust

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Remote Command	`[:SENSe]:POWer[:RF]:PADJust:PRESelector MWAVe | MMWave | EXTernal` `[:SENSe]:POWer[:RF]:PADJust:PRESelector?`
Notes	PSA had multiple preselectors, and you could select which preselector to adjust. Since the X-Series has only one mm/uW preselector, the preselector selection softkey is no longer available. However, to provide backward compatibility, we accept the legacy remote commands. The command form has no effect, the query always returns MWAVe
Initial S/W Revision	Prior to A.02.00

Y Axis Unit

Displays the menu keys that enable you to change the vertical (Y) axis amplitude unit. The analyzer retains the entered Y Axis Unit separately for both Log and Lin amplitude scale types. For example, if Scale Type has been set to Log, and you set Y Axis Unit to dBm, pressing Scale Type (Log) sets the Y Axis Unit to dBm. If Scale Type has been set to Lin and you set Y Axis Unit to V, pressing Scale Type (Lin) sets the Y Axis Unit to V. Pressing Scale Type (Log) again sets the Y axis unit back to dBm.

NOTE The units of current (A, dBmA, dBuA) are calculated based on 50 ohms input impedance.

All four of the EMI units (dBµA/m, dBµV/m, dBG, dBpT) are treated by the instrument exactly as though they were dBuV. The user must load an appropriate correction factor using Amplitude Corrections for accurate and meaningful results.

If a SCPI command is sent to the analyzer that uses one of the EMI units as a terminator, the analyzer treats it as though DBUV had been sent as the terminator.

Key Path	AMPTD Y Scale
Mode	SA
Scope	Meas Global
Remote Command	`:UNIT:POWer DBM | DBMV | DBMA | V | W | A | DBUV | DBUA | DBPW | DBUVM | DBUAM | DBPT | DBG` `:UNIT:POWer?`
Example	UNIT:POW dBmV UNIT:POW?
Notes	The Y axis unit has either logarithmic or linear characteristics. The set of units that is logarithmic consists of dBm, dBmV, dBmA, dBµV, dBµA, dBµV/m, dBµA/m, dBpT, and dBG. The set of units that are linear consists of V, W, and A. The chosen unit will determine how the reference level and all the amplitude-related outputs like trace data, marker data, etc. read out.
Notes	The settings of Y Axis Unit and Scale Type, affect how the data is read over the remote interface. When using the remote interface no unit is returned, so you must know what the Y axis unit is to interpret the results: Example 1, set the following: Scale Type (Log) Y Axis Unit, dBm Scale/Div, 1 dB Ref Level, 10 dBm This sets the top line to 10 dBm with each vertical division representing 1 dB. Thus, if a point on trace 1 is on the fifth graticule line from the top, it represents 5 dBm and will read out remotely as 5. Example 2, set the following: Scale Type (Lin) Y Axis Unit, Volts Ref Level, 100 mV (10 mV/div) This sets the top line to 100 mV and the bottom line to 0 V, so each vertical division represents 10 mV. Thus, if a point on trace 1 is on the fifth graticule line from the top, it represents 50 mV and will read out remotely as 50.
Dependencies	If an amplitude correction with an Antenna Unit other than None is applied and enabled, then that antenna unit is forced and the key with that unit is the only Y Axis Unit available. All other Y Axis Unit keys are grayed out.

	If an amplitude correction with an Antenna Unit other than None is applied and enabled, and you then turn off that correction or set Apply Corrections to No, the Y Axis Unit that existed before the Antenna Unit was applied is restored.
Couplings	The analyzer retains the entered Y Axis Unit separately for both Log and Lin amplitude scale types
Preset	dBm for log scale, V for linear. The true ‘preset’ value is dBm, since at preset the Y Scale type is set to logarithmic.
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00, A.04.00, A.11.00

dBm

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBm.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW DBM
Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	dBm
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

dBmV

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBmV.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW DBMV
Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	dBmV
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

dBmA

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBmA.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW DBMA

Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	dBmA
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

W

Sets the amplitude unit for the selected amplitude scale (log/lin) to watt.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW W
Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	W
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

V

Sets the amplitude unit for the selected amplitude scale (log/lin) to volt.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW V
Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	V
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

A

Sets the amplitude unit for the selected amplitude scale (log/lin) to Ampere.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW A
Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	A
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

dBµV

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBµV.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW DBUV
Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	dBµV
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

dBµA

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBµA.

NOTE The unit dBuA can also appear as an Antenna Unit. This will be used by customers using current probes, because current probes are often supplied with conversion tables that provide the transducer factors. When dBuA is used as an Antenna Unit the normal conversion from power to amps for dBuA (based on the analyzer input impedance) is not done, but instead the conversion is based solely on the Correction that contains the transducer factors. This is what distinguishes dBuA as a normal unit from dBuA as an antenna unit. When querying the Y-Axis unit, you can query the Antenna Unit to distinguish between regular dBuA and the dBuA antenna unit. If :CORR:CSET:ANT? returns NOC (for No Conversion), you are using a normal Y Axis dBuA. If it returns UA you are using an Antenna Unit dBuA.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW DBUA
Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	dBµA
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

dBpW

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBpW.

Key Path	AMPTD Y Scale, Y Axis Unit
Example	UNIT:POW DBPW
Dependencies	Grayed out if an Amplitude Correction with an Antenna Unit is ON.
Readback	dBµA
Initial S/W Revision	A.11.00

Antenna Unit

When a Correction is turned on that uses an Antenna Unit, the Y Axis Unit changes to that Antenna Unit. All of the keys in the Y-Axis Unit menu are then greyed out, except the Antenna Unit key. The unit being used is shown on this key and is shown as selected in the submenu.

Key Path	AMPTD Y Scale, Y Axis Unit
Dependencies	Grayed out if no Amplitude Correction with an Antenna Unit is on.
Readback line	Currently selected unit
Initial S/W Revision	A.11.00

None

This is selected if no Antenna Unit is currently on, however you cannot actually set this value, since it is always grayed out. The key is included simply to provide an indication on the Readback line of the Antenna Unit key when there is no Antenna Unit selected.

Key Path	AMPTD Y Scale, Y Axis Unit, Antenna Unit
Readback	“None”
Initial S/W Revision	A.11.00

dBµV/m

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBµV/m. This is an antenna unit, and this key is grayed out unless a Correction with this Antenna Unit selected is ON. If this is the case, all of the other Antenna Units are grayed out.

Key Path	AMPTD Y Scale, Y Axis Unit, Antenna Unit
Example	UNIT:POW DBUVM
Dependencies	Grayed out if no Amplitude Correction with an Antenna Unit is on.
Readback	dBµV/m
Initial S/W Revision	A.02.00

dBµA/m

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBµA/m. This is an antenna unit, and this key is grayed out unless a Correction with this Antenna Unit selected is ON. If this is the case, all of the other Antenna Units are grayed out.

Key Path	AMPTD Y Scale, Y Axis Unit, Antenna Unit
Example	UNIT:POW DBUAM
Dependencies	Grayed out if no Amplitude Correction with an Antenna Unit is on.

Readback	dBµA/m
Initial S/W Revision	A.02.00

dBpT

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBpT. This is an antenna unit, and this key is grayed out unless a Correction with this Antenna Unit selected is ON. If this is the case, all of the other Antenna Units are grayed out.

Key Path	AMPTD Y Scale, Y Axis Unit, Antenna Unit
Example	UNIT:POW DBPT
Dependencies	Grayed out if no Amplitude Correction with an Antenna Unit is on.
Readback	dBpT
Initial S/W Revision	A.02.00

dBG

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBG. This is an antenna unit, and this key is grayed out unless a Correction with this Antenna Unit selected is ON. If this is the case, all of the other Antenna Units are grayed out.

Key Path	AMPTD Y Scale, Y Axis Unit, Antenna Unit
Example	UNIT:POW DBG
Dependencies	Grayed out if no Amplitude Correction with an Antenna Unit is on.
Readback	dBG
Initial S/W Revision	A.02.00

dBµA

Sets the amplitude unit for the selected amplitude scale (log/lin) to dBµA. This is an antenna unit, and this key is grayed out unless a Correction with this Antenna Unit selected is ON. If this is the case, all of the other Antenna Units are grayed out.

Key Path	AMPTD Y Scale, Y Axis Unit, Antenna Unit
Example	UNIT:POW DBUAM
Dependencies	Grayed out if no Amplitude Correction with an Antenna Unit is on.
Readback	dBµA
Initial S/W Revision	A.11.00

Reference Level Offset

Adds an offset value to the displayed reference level. The reference level is the absolute amplitude represented by the top graticule line on the display.

See "More Information" on page 580

Key Path	AMPTD Y Scale
Mode	SA
Scope	Meas Global
Remote Command	`:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel:OFFSet <rel_ampl>` `:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel:OFFSet?`
Example	DISP:WIND:TRAC:Y:RLEV:OFFS 12.7 Sets the Ref Level Offset to 12.7 dB. The only valid suffix is dB. If no suffix is sent, dB will be assumed.
Preset	0 dBm
State Saved	Saved in instrument state
Min	The range for Ref Lvl Offset is variable. It is limited to values that keep the reference level within the range of –327.6 dB to 327.6 dB.
Max	327.6 dB
Backwards Compatibility Notes	1. In pre-X-Series instruments, Ref Level Offset could not be adjusted by the knob or step keys. That is no longer the case. 2. In ESA and PSA, Ref Level Offset was applied to the data as it was acquired; thus if the Offset changed the new offset was not applied until new trace data was taken. In X-Series, the offset is applied as the data is displayed/queried, so if you change the offset, it will change the data immediately.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

More Information

Offsets are used when gain or loss occurs between a device under test and the analyzer input. Thus, the signal level measured by the analyzer may be thought of as the level at the input of an external amplitude conversion device. Entering an offset does not affect the trace position or attenuation value, just the value of the top line of the display and the values represented by the trace data. Thus, the values of exported trace data, queried trace data, marker amplitudes, trace data used in calculations such as N dB points, trace math, peak threshold, and so forth, are all affected by Ref Level Offset.

NOTE: Changing the offset causes the analyzer to immediately stop the current sweep and prepare to begin a new sweep, but the data will not change until the trace data updates, because the offset is applied to the data as it is taken. If a trace is exported with a nonzero Ref Level Offset, the exported data will contain the trace data with the offset applied.

The maximum reference level available is dependent on the reference level offset. That is, Ref Level - Ref Level Offset must be in the range –170 to +30 dBm. For example, the reference level value range can be initially set to values from –170 dBm to 30 dBm with no reference level offset. If the reference level is first set to –20 dBm, then the reference level offset can be set to values of –150 to +50 dB.

If the reference level offset is first set to –30 dB, then the reference level can be set to values of –200 dBm to 0 dBm. In this case, the reference level is “clamped” at 0 dBm because the maximum limit of +30 dBm is reached with a reference level setting of 0 dBm with an offset of –30 dB. If instead, the reference level offset is first set to 30 dB, then the reference level can be set to values of –140 to +60 dBm.

µW Path Control

The µW Path Control functions include the µW Preselector Bypass (Option MPB) and Low Noise Path (Option LNP) controls in the High Band path circuits.

When the µW Preselector is bypassed, the user has better flatness, but will be subject to spurs from out of band interfering signals. When the Low Noise Path is enabled, the analyzer automatically switches around certain circuitry in the high frequency bands which can contribute to noise, when it is appropriate based on other analyzer settings.

For most applications, the preset state is Standard Path, which gives the best remote-control throughput, minimizes acoustic noise from switching and minimizes the risk of wear out in the hardware switches. For applications that utilize the wideband IF paths, the preset state is the µW Preselector Bypass path, if option MPB is present. This is because, when using a wideband IF such as the 140 MHz IF, the µW Preselector’s bandwidth can be narrower than the available IF bandwidth, causing degraded amplitude flatness and phase linearity, so it is desirable to bypass the preselector in the default case.

Selecting the Low Noise Path Enable option provides a lower noise floor, especially in the 21–26.5 GHz region, though without improving many measures of dynamic range, and without giving the best possible noise floor. The preamp, if purchased and used, gives better noise floor than does the Low Noise Path, however its compression threshold and third-order intercept are much poorer than that of the non-preamp Low Noise Path. There are some applications, typically for signals around –30 dBm, for which the third-order dynamic range of the standard path is good enough, but the noise floor is not low enough even with 0 dB input attenuation. When the third-order dynamic range of the preamp path is too little and the noise floor of the standard path is too high, the Low Noise Path can provide the best dynamic range.

Key Path	AMPTD Y Scale
Mode	SA, BASIC, PNOISE, VSA , LTE, LTETDD
Scope	Meas Global
Remote Command	`[:SENSe]:POWer[:RF]:MW:PATH STD|LNPath|MPBypass|FULL` `[:SENSe]:POWer[:RF]:MW:PATH?`
Example	:POW:MW:PATH LNP Enables the Low Noise path
Notes	If a Presel Center is performed, the analyzer will momentarily switch to the Standard Path, regardless of the setting of µW Path Control The DC Block is always switched in when the low noise path is switched in, to protect succeeding circuitry from DC. Note that this does not mean “when the low noise path is enabled” but when, based on the Low Noise Path rules, the path is actually switched in. This can happen when the selection is Low Noise Path Enable . In the case where the DC Block is switched in the analyzer is now AC coupled. However, if you have selected DC coupling, the UI will still behave as though it were DC coupled, including all annunciation, warnings, status bits, and responses to SCPI queries. This is because, based on other settings, the analyzer could switch out the low noise path at any time and hence go back to being DC coupled.

	Alignment switching ignores the settings in this menu, and restores them when finished.
Dependencies	Unavailable in BBIQ and External Mixing

Preset	• All modes other than IQ Analyzer mode and VXA: STD
	• IQ Analyzer, VXA and WLAN mode:
	  • MPB option present and licensed: MPB
	  • MPB option not present and licensed: STD

State Saved	Save in instrument state
Readback	Value selected in the submenu
Initial S/W Revision	A.04.00
Modified at S/W Revision	A.10.00

Standard Path

This path gives the best remote-control throughput, minimizes acoustic noise from switching and minimizes the risk of wear in the hardware switches, particularly in remote test scenarios where both low band and high band setups will follow in rapid succession.

In this path, the bypass of the low band/high band switch and microwave preamp is never activated, which can cause some noise degradation but preserves the life of the bypass switch.

Key Path	AMPTD Y Scale, µW Path Control
Example	:POW:MW:PATH STD
Readback Text	Standard Path
Initial S/W Revision	A.04.00

µW Preselector Bypass

This key toggles the preselector bypass switch for band 1 and higher. When the microwave presel is on, the signal path is preselected. When the microwave preselector is off, the signal path is not preselected. The preselected path is the normal path for the analyzer.

The preselector is a tunable bandpass filter which prevents signals away from the frequency of interest from combining in the mixer to generate in-band spurious signals (images). The consequences of using a preselector filter are its limited bandwidth, the amplitude and phase ripple in its passband, and any amplitude and phase instability due to center frequency drift.

Option MPB or pre-selector bypass provides an unpreselected input mixer path for certain X-Series signal analyzers with frequency ranges above 3.6 GHz. This signal path allows a wider bandwidth and less amplitude variability, which is an advantage when doing modulation analysis and broadband signal analysis. The disadvantage is that, without the preselector, image signals will be displayed. Another disadvantage of bypassing the preselector is increased LO emission levels at the front panel input port.

Key Path	AMPTD Y Scale, µW Path Control
Example	:POW:MW:PATH MPB
Dependencies	Key is blanked if current mode does not support it. Key is grayed out if mode supports it but current measurement does not support it. Key is blank unless Option MPB is present and licensed. If SCPI command sent when MPB not present, error –241, "Hardware missing; Option not installed" is generated.
Readback Text	µW Preselector Bypass
Initial S/W Revision	A.04.00

Remote Command	`[:SENSe]:POWer[:RF]:MW:PRESelector[:STATe] ON|OFF|0|1` `[:SENSe]:POWer[:RF]:MW:PRESelector[:STATe]?`
Example	:POW:MW:PRES OFF Bypasses the microwave preselector
Notes	The ON parameter sets the STD path (:POW:MW:PATH STD) The OFF parameter sets path MPB (:POW:MW:PATH MPB)
Preset	ON

Internal Preamp

Accesses a menu of keys that control the internal preamps. Turning on the preamp gives a better noise figure, but a poorer TOI to noise floor dynamic range. You can optimize this setting for your particular measurement.

The instrument takes the preamp gain into account as it sweeps. If you sweep outside of the range of the preamp the instrument will also account for that. The displayed result will always reflect the correct gain.

Key Path	AMPTD Y Scale
Scope	Meas Global
Remote Command	`[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1` `[:SENSe]:POWer[:RF]:GAIN[:STATe]?`
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown. The preamp is not available when the electronic/soft attenuator is enabled.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Key Path	AMPTD Y Scale, Internal Preamp

Scope	Meas Global
Remote Command	`[:SENSe]:POWer[:RF]:GAIN:BAND LOW|FULL` `[:SENSe]:POWer[:RF]:GAIN:BAND?`
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown. If a POW:GAIN:BAND FULL command is sent when a low band preamp is available, the preamp band parameter is to LOW instead of FULL, and an "Option not installed" message is generated.
Preset	LOW
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Off

Turns the internal preamp off

Key Path	AMPTD Y Scale, Internal Preamp
Example	:POW:GAIN OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

Low Band

Sets the internal preamp to use only the low band.

The frequency range of the installed (optional) low-band preamp is displayed in square brackets on the Low Band key label.

Key Path	AMPTD Y Scale, Internal Preamp
Example	:POW:GAIN ON :POW:GAIN:BAND LOW
Readback	Low Band
Initial S/W Revision	Prior to A.02.00

Full Range

Sets the internal preamp to use its full range. The low band (0–3.6 GHz or 0–3GHz, depending on the model) is supplied by the low band preamp and the frequencies above low band are supplied by the high band preamp.

The frequency range of the installed (optional) preamp is displayed in square brackets on the Full Range key label. If the high band option is not installed the Full Range key does not appear.

Key Path	AMPTD Y Scale, Internal Preamp
Example	:POW:GAIN ON :POW:GAIN:BAND FULL
Readback	Full Range
Initial S/W Revision	Prior to A.02.00

Auto Couple

The Auto Couple feature provides a quick and convenient way to automatically couple multiple instrument settings. This helps ensure accurate measurements and optimum dynamic range. When the Auto Couple feature is activated, either from the front panel or remotely, all parameters of the current measurement that have an Auto/Manual mode are set to Auto mode and all measurement settings dependent on (or coupled to) the Auto/Man parameters are automatically adjusted for optimal performance.

However, the Auto Couple key actions are confined to the current measurement only. It does not affect other measurements in the mode, and it does not affect markers, marker functions, or trace or display attributes.

For more details, see "More Information" on page 586 below.

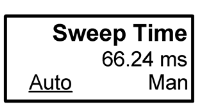
Key Path	Front-panel key
Remote Command	`:COUPle ALL|NONE`
Example	:COUP ALL
Notes	:COUPle ALL puts all Auto/Man parameters in Auto mode (equivalent to pressing the Auto Couple key). :COUPLE NONE puts all Auto/Man parameters in manual mode. It decouples all the coupled instrument parameters and is not recommended for making measurements.
Initial S/W Revision	Prior to A.02.00

More Information

There are two types of functions that have Auto/Manual modes, as described below:

Auto/Man Active Function keys

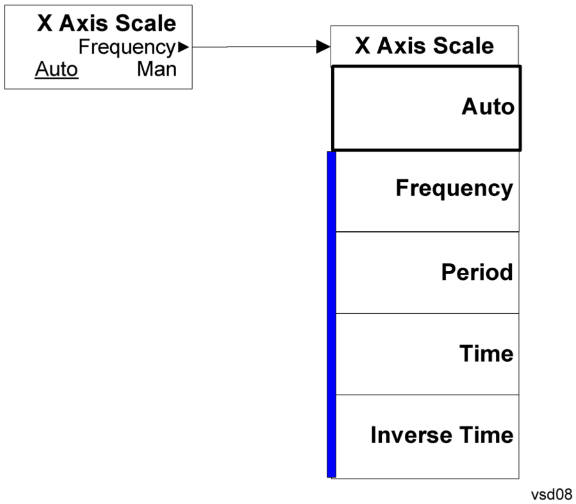
An Auto/Man toggle key controls the binary state associated with an instrument parameter by toggling between Auto (where the parameter is automatically coupled to the other parameters it is dependent upon) and Man (where the parameter is controlled independent of the other parameters), as well as making the parameter the active function. The current mode is indicated on the softkey with either Auto or Man underlined as illustrated below.



vsd07

Auto/Man 1-of-N keys

An Auto/Man 1-of-N key allows you to manually pick from a list of parameter values, or place the function in Auto, in which case the value is automatically selected (and indicated) as shown below. If in Auto, Auto is underlined on the calling key. If in manual operation, manual is indicated on the calling key. But the calling key does not actually toggle the function, it simply opens the menu.


X Axis Scale
Frequency
Auto Man
X Axis Scale
Auto
Frequency
Period
Time
Inverse Time
vsd08

BW

The BW key opens the bandwidth menu, which contains keys to control the Resolution Bandwidth and Video Bandwidth functions of the instrument.

The Resolution BW functions control filter bandwidth and filter type. There are two filter types, Gaussian and Flattop. The Gaussian filters have a response curve that is parabolic on a log scale. The Flattop filter shape is a close approximation of a rectangular filter.

NOTE The AVERAGE functions, which appeared in the BW menu in earlier analyzers, can now be found in the Trace/Detector menu and the Meas Setup menu. In the Trace/Detector menu, you may turn Trace Averaging on or off for the desired traces (rather than globally as in the past); and in the Meas Setup menu you may configure Averaging, by setting the Average Number and the Average Type.

Key Path	Front-panel key
Backwards Compatibility Notes	In previous analyzers, the BW hardkey was labeled “BW/Avg” and included menu keys to control the averaging behavior of the instrument, which was global. In the X-Series, averaging is performed on a trace-by-trace basis, with a corresponding impact on the SCPI functions. A backwards compatibility command ([:SENSe]:AVERage[:STATe]) is provided to preserve the old global behavior. See the section "Trace/Detector" on page 1264 for details. The control for the Average number is now found in the Meas Setup menu. See the section "Meas Setup" on page 794 for details.
Initial S/W Revision	Prior to A.02.00

Res BW

Activates the resolution bandwidth active function, which allows you to manually set the resolution bandwidth (RBW) of the analyzer. Normally, Res BW (Auto) selects automatic coupling of the Res BW to Span using the ratio set by the Span:3 dB RBW key. To decouple the resolution bandwidth, press Res BW until Man is underlined, or simply enter a different value for Res BW.

See "More Information" on page 589

Key Path	BW

Remote Command	`[:SENSe]:BANDwidth|BWIDth[:RESolution] <freq>`
	`[:SENSe]:BANDwidth|BWIDth[:RESolution]?`
	`[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO OFF|ON|0|1`
	`[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO?`

Example	BAND 1 KHZ BAND? BWID:AUTO ON BWID:AUTO?
Notes	For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up)

	available RBW to the value entered. The setting and querying of values depends on the current bandwidth type.
Dependencies	When in Zero Span with no EMI Standard selected, there is no Auto setting for Res BW. The Auto/Man line on the Res BW softkey disappears in this case, and if the SCPI command [:SENSe]:BWID[:RESolution]:AUTO ON is sent, it generates a message. While using the Tracking Generator, you must make sure the Start Frequency is high enough to avoid capturing LO feedthrough in the trace. How high you must make the Start Frequency to avoid this will depend on the RBW you have set. The analyzer displays a condition warning message if the Start Frequency falls below roughly 2.5 times the current RBW. The warning is "Source Uncal;adj Start Freq|RBW|Points". When you see this warning, you should increase the Start Freq, narrow the RBW, or increase the number of Sweep Points.
Couplings	Res BW is normally coupled to Span; if Res BW is set to Auto, as the Span decreases, so will the Res BW. Normally, in Zero Span, this coupling is turned off and Res BW has no Auto setting. When a CISPR or MIL EMI Standard is in use, the Res BW is coupled to Center Frequency and not to Span, and this is true even in Zero Span. Sweep time is coupled to RBW when in a non-zero span. If Sweep Time is set to Auto, then the sweep time is changed as the RBW changes, to maintain amplitude calibration. Video bandwidth (VBW) is normally coupled to RBW. If VBW is set to Auto, then the VBW is changed as the RBW changes, to maintain the ratio set by VBW:3 dB RBW. See the "VBW:3dB RBW " on page 591"VBW:3dB RBW " on page 591 key description.
Preset	3 MHz ON
State Saved	Saved in instrument state
Min	1 Hz
Max	8 MHz is the max equivalent –3 dB RBW, which means that the named RBW (the one shown on the key etc) can actually exceed 8 MHz if using a filter other than –3 dB Gaussian
Default Unit	Hz
Backwards Compatibility Notes	For backwards compatibility this command obeys both the BANDwidth and BWIDth forms. For ESA, the maximum Res BW was 5 MHz; on X-Series it is 8 MHz.
Initial S/W Revision	Prior to A.02.00

More Information

When the Res BW is manually selected, it may be returned to the coupled state by pressing the Res BW key until Auto is underlined. This may also be done by pressing Auto Couple or by performing a Preset.

When Res BW is set to Auto, the bandwidth selected depends on the Filter Type (see "Filter Type" below).

Only certain discrete resolution bandwidths are available. The available bandwidths are dependent on the Filter Type or the EMC Standard. If an unavailable bandwidth is entered with the numeric keypad, the closest available bandwidth is selected.

The zero-span case deserves some mention, because RBW is coupled to Span when in a swept (non-zero) span and in zero span there is normally no meaningful RBW coupling in Zero Span. However, when a MIL or

CISPR EMC Standard is selected, there IS a meaningful coupling for RBW in Zero Span – in fact, it is coupled to Center Frequency, in order to make measurements according to the EMI specifications.

The annotation under RBW in the bottom left of the screen shows the type of filter or bandwidth that is being used. The following examples illustrate this:

–3 dB (Normal) filter BW: Res BW 300 Hz

–6 dB filter BW: Res BW (–6 dB) 422 Hz

Noise filter BW: Res BW (Noise) 317 Hz

Impulse filter BW: Res BW (Impulse) 444 Hz

CISPR filter BW :Res BW (CISPR) 200 Hz

MIL filter BW:Res BW (MIL) 1 kHz

Flattop filter type:Res BW (Flattop) 300 Hz

Video BW

Lets you change the analyzer post-detection filter (VBW or “video bandwidth”) from 1 Hz to 8 MHz in approximately 10% steps. In addition, a wide-open video filter bandwidth may be chosen by selecting 50 MHz. The VBW is annotated at the bottom of the display, in the center.

NOTE An * is displayed next to the VBW annotation when certain detector types (Average, EMI Average, Quasi Peak, and RMS Average) are in use. This is because the VBW filter is out of the circuit for these detectors and does not affect any traces which use them. If there is any active trace using one of these detectors the * is displayed. See "Annotation Examples" on page 591.

Normally, Video BW (Auto) selects automatic coupling of the Video BW filter to the resolution bandwidth filter using the ratio set by the VBW:3 dB RBW key. To decouple the video bandwidth, press Video BW until Man is underlined, or simply enter a new value.

When the Video BW is manually selected, it may be returned to the coupled state by pressing the Video BW key until Auto is underlined. This may also be done by pressing Auto Couple or by performing a Preset.

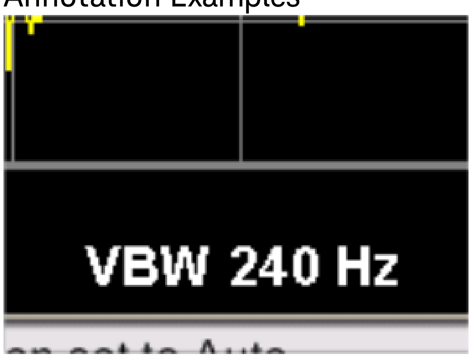
Key Path	BW

Remote Command	`[:SENSe]:BANDwidth|BWIDth:VIDeo <freq>`
	`[:SENSe]:BANDwidth|BWIDth:VIDeo?`
	`[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO OFF|ON|0|1`
	`[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO?`

Example	BAND:VID 1 KHZ

	BAND:VID? BWID:VID:AUTO ON BWID:VID:AUTO?
Notes	For numeric entries, the analyzer chooses the nearest (arithmetically, on a linear scale, rounding up) available VBW to the value entered. The 50 MHz VBW is defined to mean “wide open”. The values shown in this table reflect the conditions after a Mode Preset.
Dependencies	Sometimes the displayed Video BW is not actually used to process the trace data: • When the Average Detector is selected and Sweep Type is set to Swept, the video bandwidth filter cannot be used, because it uses the same hardware as the Average Detector. • When the Quasi-Peak, EMI Average or RMS Average detector is selected the VBW is implemented by the digital IF as part of the detector When this is the case, the VBW still acts to change the Sweep Time, if Sweep Time is in Auto, and still affects the data on other traces for which this is not the case.
Preset	3 MHz ON
State Saved	Saved in instrument state
Min	1 Hz
Max	50 MHz
Default Unit	Hz
Backwards Compatibility Notes	For backwards compatibility this command obeys both the BANDwidth and BWIDth forms.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

Annotation Examples



All active traces using VBW   One or more active traces not using VBW

VBW:3dB RBW

Selects the ratio between the video bandwidth and the equivalent 3 dB resolution bandwidth to be used for setting VBW when VBW is in Auto.

VBW:3dB RBW (Auto) selects automatic coupling of the VBW:3 dB RBW ratio to Detector using the rules described below in "Auto Rules" on page 592. To decouple the ratio, press VBW:3 dB RBW until Man is underlined, or simply enter a new value.

When the VBW:3dB RBW is manually selected, it may be returned to the coupled state by pressing the VBW:3 dB RBW key until Auto is underlined. This may also be done by pressing Auto Couple or by performing a Preset.

Key Path	BW

Remote Command	`[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio <real>`
	`[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio?`
	`[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO OFF|ON|0|1`
	`[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO?`

Example	BAND:VID:RAT 2 BAND:VID:RAT? BAND:VID:RAT:AUTO 0 BAND:VID:RAT:AUTO?
Notes	The values shown in this table reflect the conditions after a Mode Preset.
Couplings	See "Coupling Auto Rules"
Preset	1 ON
State Saved	Saved in instrument state
Min	0.00001
Max	3000000
Backwards Compatibility Notes	For backwards compatibility this command obeys both the BANDwidth and BWIDth forms.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

Auto Rules

The Auto Rules for the VBW:3dB RBW function follow.

First, if Source Mode is set to "Tracking": Use 1.0

Otherwise, we go through the following list of detector numbers and find the lowest numbered detector being used on any active traces (traces for which Update is On):

1. Peak
2. Normal
3. Average
4. Sample

5. Negative Peak

6. EMI Average

7. Quasi Peak

8. RMS Average

Use that detector to pick the ratio based on the following criteria:

1. If the detector is Peak and the EMC Standard is set to either CISPR or MIL, use 10.0 (we use wide VBWs to capture peak levels accurately).

2. Otherwise, if the detector is Negative Peak, use 1.0 (in the Negative Peak case, there are no known significant use models so we use a medium ratio).

3. Otherwise, if the detector is Normal, use 1.0.

4. Otherwise, if the detector is Average, and the span in nonzero, use 0.1. The use of a small ratio in Average detection is desirable because of its effect on the sweep time equations. The VBW filter is not actually in-circuit when the average detector is on. If the detector is Average, and the span is zero, use 10.0, which gives optimal behavior for Interval Markers in zero span.

5. Otherwise, if the detector is EMI Average, Quasi Peak or RMS Average, use 10.0. In fact this is a "don't care" since no VBW is used for these detectors, as noted under "Dependencies" for the VBW key

6. Otherwise, the detector is simply Peak or Sample. These two detectors can use the same rules. In these cases, if any active trace is in max hold or min hold, use 10.0, because Max and Min Hold operations will usually be intended to capture peaks and pits without smoothing from the VBW filter; otherwise, use 1.0 as a compromise, because you have not set the analyzer in a way that implies that you are measuring noise, pulsed-RF or CW signals, and for backward compatibility with earlier analyzers.

Note that because the above couplings depend on which traces are active, they are re-examined whenever any trace goes active or inactive, except when this leaves no traces active. Transitioning to the state where no traces are active should not affect the couplings; in that way, the annotation will always reflect the state of the last trace which was active.

Span:3dB RBW

Selects the ratio between span and resolution bandwidth.

Normally, Span:3dB RBW (Auto) selects a Span:3 dB RBW ratio of 106:1. If you manually enter the ratio, Man will become underlined, which enables you to manually select ratios more suitable for certain measurements.

When the Span:3dB RBW is manually selected, it may be returned to the coupled state by pressing the Span:3dB RBW key until Auto is underlined. This may also be done by pressing Auto Couple or by performing a Preset.

Key Path	BW

Remote Command	`[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio <integer>`
	`[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio?`
	`[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO OFF | ON | 0 | 1`

	[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO?
Example	FREQ:SPAN:BAND:RAT 200 sets a ratio of 200:1, and turns off the auto coupling. FREQ:SPAN:BAND:RAT:AUTO ON FREQ:SPAN:BAND:RAT?
Notes	The values shown in this table reflect the conditions after a Mode Preset.
Dependencies	Grayed out when the EMC Standard is set to CISPR or MIL, since RBW is coupled to Center Frequency rather than Span in this case. If the grayed out key is pressed, an advisory message is generated. If the equivalent SCPI command is sent, the command is acted upon, but it doesn't affect the current measurement.
Preset	106 ON
State Saved	Saved in instrument state
Min	2
Max	10000
Initial S/W Revision	Prior to A.02.00

RBW Control

Selects the type/shape for the resolution bandwidth filters. Historically, the Res BW filters in Agilent spectrum analyzers were Gaussian filters, specified using the –3 dB bandwidth of the filter. That is, a 10 MHz Res BW filter was a Gaussian shape with its –3 dB points 10 MHz apart. In the X-Series you can, using the Filter BW key, specify bandwidths other than the –3 dB bandwidth (–6 dB, Noise, Impulse) for the width of the Gaussian filters. Furthermore, the Filter BW menu lets you choose between a Gaussian and Flat Top filter shape, for varying measurement conditions.

Key Path	BW
Dependencies	The RBW Control key is grayed out if the EMC Standard is set to CISPR or MIL. In this case the Filter Type is always Gaussian; the Filter BW is chosen as appropriate for the filter and the standard.
Readback line	[<filter type>] or, if Filter Type is Gaussian, [Gaussian,<filter BW>]
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

Filter Type

Besides the familiar Gaussian filter shape, there are certain special filter types, such as Flat Top, that are desirable under certain conditions. The Filter Type menu gives you control over these types.

See "More Information" on page 595

Key Path	BW, RBW Control
Remote Command	[:SENSe]:BANDwidth|BWIDth:SHAPe GAUSsian|FLATtop

	`[:SENSe]:BANDwidth|BWIDth:SHAPe?`
Example	BAND:SHAP GAUS
Notes	GAUSsian= Gaussian FLATtop = Flattop
Dependencies	When EMC Standard is set to CISPR or MIL, the Filter Type is always Gaussian. Any attempt to set it to Flattop will give an error.
Preset	Auto Couple chooses the preset value
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

More Information

Gaussian filters

When the Gaussian filter type is chosen, a set of 160 RBW filters are available whose shape is approximately Gaussian. The actual bandwidths used to realize the X-Series' Gaussian filters are chosen to come as close as possible to a 24 step per decade series, within the limitations of the digital IF.

For Gaussian filters, the annotation at the bottom of the screen shows the filter bandwidth type (unless it is Normal). This will be shown parenthetically between the words "Res BW" and the value, for example

Res BW 10.0 Hz (Normal bandwidth)

Res BW (Impulse) 14.8 Hz (Impulse bandwidth)

Flattop filters

When the Flattop filter type is chosen, a new set of 134 RBW hardware settings are available. These settings realize filters that are approximately rectangular in shape. When this shape is chosen the filter bandwidth options are irrelevant and therefore unavailable.

The annotation at the bottom of the screen will show that the Flattop shape is being used, for example:

Res BW (Flattop) 10 Hz

Gaussian

Selects the Gaussian filter type. There are 160 of these RBWs. They are arranged in a 24-per-decade sequence from 1 Hz through 3 MHz, plus the 4, 5, 6 and 8 MHz settings.

Key Path	BW, RBW Control, Filter Type
Example	BAND:SHAP GAUS
Notes	Parameter is GAUSsian. See remote command in section "Filter Type " on page 594.
Readback	Gaussian
Initial S/W Revision	Prior to A.02.00

Flattop

Selects the flat top filter type

Key Path	BW, RBW Control, Filter Type
Example	BAND:SHAP FLAT
Readback	Flattop
Initial S/W Revision	Prior to A.02.00

Filter BW

When using the Gaussian filters for certain types of applications it can be useful to be able to specify the filter width using points other than the –3 dB points. The Filter BW function allows you to pick the filter based on its –3 dB (Normal) bandwidth, its –6 dB bandwidth, its Noise bandwidth, or its Impulse bandwidth.Note that in all four cases the –3 dB bandwidth is the same. The filter does not change, but the way you specify it changes.

See "More Information" on page 596

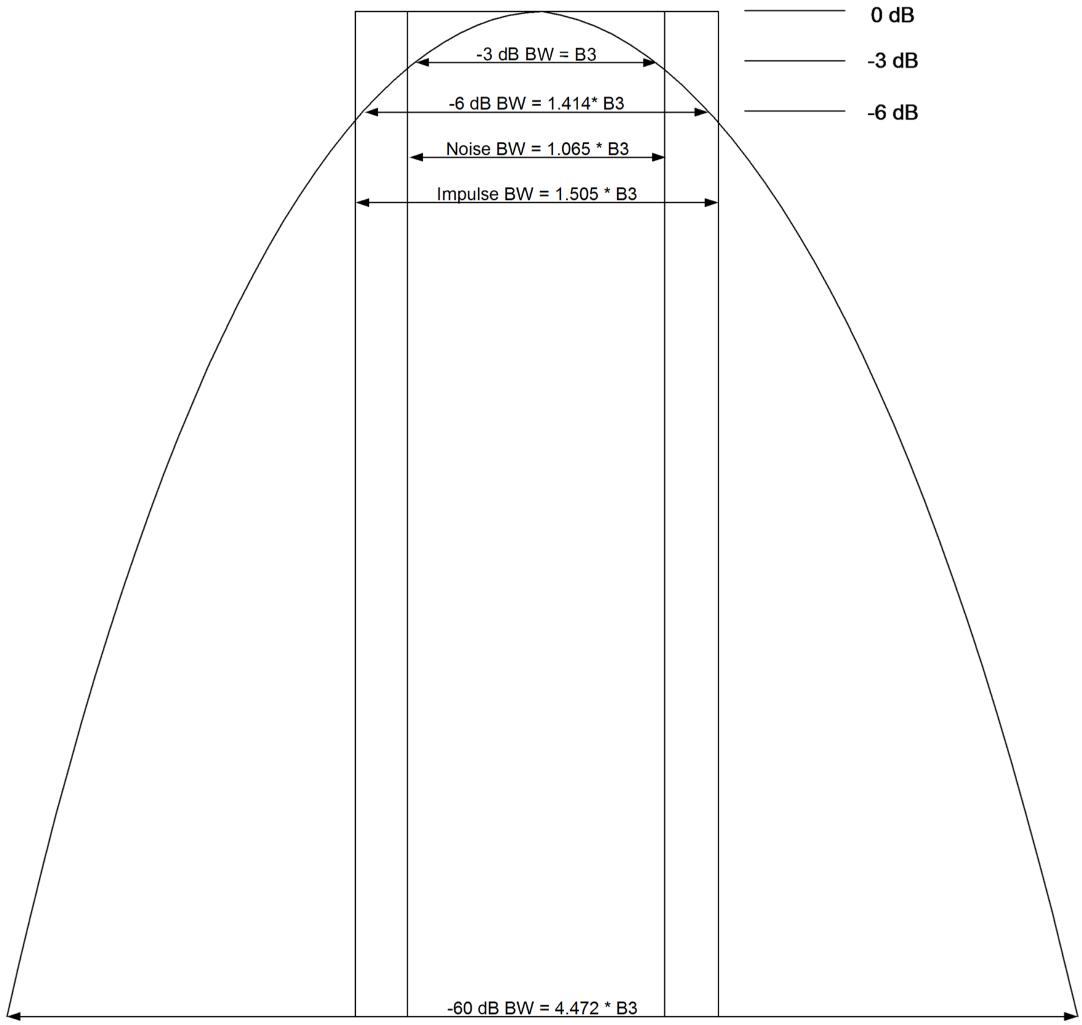
Key Path	BW, RBW Control
Remote Command	`[:SENSe]:BANDwidth|BWIDth:TYPE DB3|DB6|IMPulse|NOISe` `[:SENSe]:BANDwidth|BWIDth:TYPE?`
Example	BAND:TYPE NOIS
Notes	DB3 = –3 dB (Normal) DB6 = –6 dB IMPulse = Impulse NOISe = Noise
Dependencies	Grayed out if the Flattop filter type is selected. When EMC Standard is set to CISPR or MIL, the Filter BW key is greyed out and the readback annotation on the key is blanked. This is because the Filter BW is chosen as appropriate for the filter and the standard and not selected by this key.Any attempt to set it otherwise will give an error.
Preset	Auto Couple chooses the preset value
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

More Information

The analyzer provides four ways of specifying the bandwidth of a Gaussian filter:

1. The –3 dB bandwidth of the filter
2. The –6 dB bandwidth of the filter
3. The equivalent Noise bandwidth of the filter, which is defined as the bandwidth of a rectangular filter with the same peak gain which would pass the same power for noise signals.
4. The equivalent Impulse bandwidth of the filter, which is defined as the bandwidth of a rectangular filter with the same peak gain which would pass the same power for impulsive (narrow pulsed) signals.

The figure below shows the relationships of the various filter bandwidths for filters with the X-Series' shape factor (shape factor is defined as the ratio of the –60 dB bandwidth to the – 3 dB bandwidth):



The Filter Type menu lets you choose the filter bandwidth (–3 dB, –6 dB, Noise or Impulse) that will be used when specifying the width of the filter. Note that for a given Gaussian filter, changing the filter bandwidth specification does not affect the filter width at all but only the means of specifying it. For example, the filter whose –3 dB bandwidth is 1.0 kHz is the same as the filter whose –6 dB bandwidth is 1.41 kHz, whose Noise bandwidth is 1.06 kHz, and whose Impulse bandwidth is 1.48 kHz. As you cycle through these various filter bandwidths the filter does not change, but the way the filter is annotated and the value which appears in the active function area and on the softkey does.

–3 dB (Normal)

Selects the normal Gaussian-shaped bandwidths that are defined by their –3 dB bandwidths.

Key Path	BW, RBW Control, Filter BW
Example	BAND:TYPE DB3
Readback	–3 dB
Initial S/W Revision	Prior to A.02.00

–6 dB

Selects the filter bandwidths where the bandwidth is defined at the –6 dB points. This uses the normal RBW filters, but the value displayed on the key, active function line and screen annotation changes to reflect the –6 dB bandwidth instead of the –3 dB bandwidth.

Key Path	BW, RBW Control, Filter BW
Example	BAND:TYPE DB6
Readback	–6 dB
Initial S/W Revision	Prior to A.02.00

Noise

Selects the noise filter bandwidths. This uses the normal RBW filters, but the value displayed on the key, active function line and screen annotation changes to reflect the equivalent noise bandwidth, instead of the –3 dB bandwidth.

Key Path	BW, RBW Control, Filter BW
Example	BAND:TYPE NOIS
Readback	Noise
Initial S/W Revision	Prior to A.02.00

Impulse

Selects the impulse bandwidths. This uses the normal RBW filters, but the value displayed on the key, active function line and screen annotation changes to reflect the equivalent impulse bandwidth instead of the –3 dB bandwidth.

Key Path	BW, RBW Control, Filter BW
Example	BAND:TYPE IMP
Readback	Impulse
Initial S/W Revision	Prior to A.02.00

Cont (Continuous Measurement/Sweep)

Sets the analyzer for Continuous measurement operation. The single/continuous state is Meas Global so the setting will affect all measurements. If you are Paused, pressing Cont does a Resume.

Key Path	Front-panel key
Remote Command	`:INITiate:CONTinuous OFF|ON|0|1` `:INITiate:CONTinuous?`
Example	:INIT:CONT 0 puts analyzer in Single measurement operation. :INIT:CONT 1 puts analyzer in Continuous measurement operation
Preset	ON (Note that SYST:PRESet sets INIT:CONT to ON but *RST sets INIT:CONT to OFF)
State Saved	Saved in instrument state
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, there is no Cont hardkey, instead there is a Sweep Single/Cont key. In these analyzers, switching the Sweep Single/Cont key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart Max Hold and Min Hold. The X-Series has Single and Cont keys in place of the SweepSingleCont key. In the X-Series, if in single measurement, the Cont key (and INIT:CONT ON) switches to continuous measurement, but never restarts a measurement and never resets a sweep.
Initial S/W Revision	Prior to A.02.00

In Swept SA Measurement (Spectrum Analysis Mode):

- The analyzer takes repetitive sweeps, averages, measurements, etc., when in Continuous mode. When the average count reaches the Average/Hold Number the count stops incrementing, but the analyzer keeps sweeping. See the Trace/Detector section for the averaging formula used both before and after the Average/Hold Number is reached. The trigger condition must be met prior to each sweep. The type of trace processing for multiple sweeps, is set under the Trace/Detector key, with choices of Trace Average, Max Hold, or Min Hold.

In Other Measurements/Modes:

- With Avg/Hold Num (in the Meas Setup menu) set to Off or set to On with a value of 1, a sweep is taken after the trigger condition is met; and the analyzer continues to take new sweeps after the current sweep has completed and the trigger condition is again met. However, with Avg/Hold Num set to On with a value >1, multiple sweeps (data acquisitions) are taken for the measurement. The trigger condition must be met prior to each sweep. The sweep is not stopped when the average count k equals the number N set for Avg/Hold Num is reached, but the number k stops incrementing. A measurement average usually applies to all traces, marker results, and numeric results. But sometimes it only applies to the numeric results.

If the analyzer is in Single measurement, pressing the Cont key does not change k and does not cause the sweep to be reset; the only action is to put the analyzer into Continuous measurement operation.

If it is already in continuous sweep:

- the INIT:CONT 1 command has no effect
- the INIT:CONT 0 command places the analyzer in Single Sweep, but has no effect on the current sequence until k = N, at which point the current sequence stops and the instrument goes into the idle state.

File

Opens a menu that enables you to access various standard and custom Windows functions. Press any other front-panel key to exit.

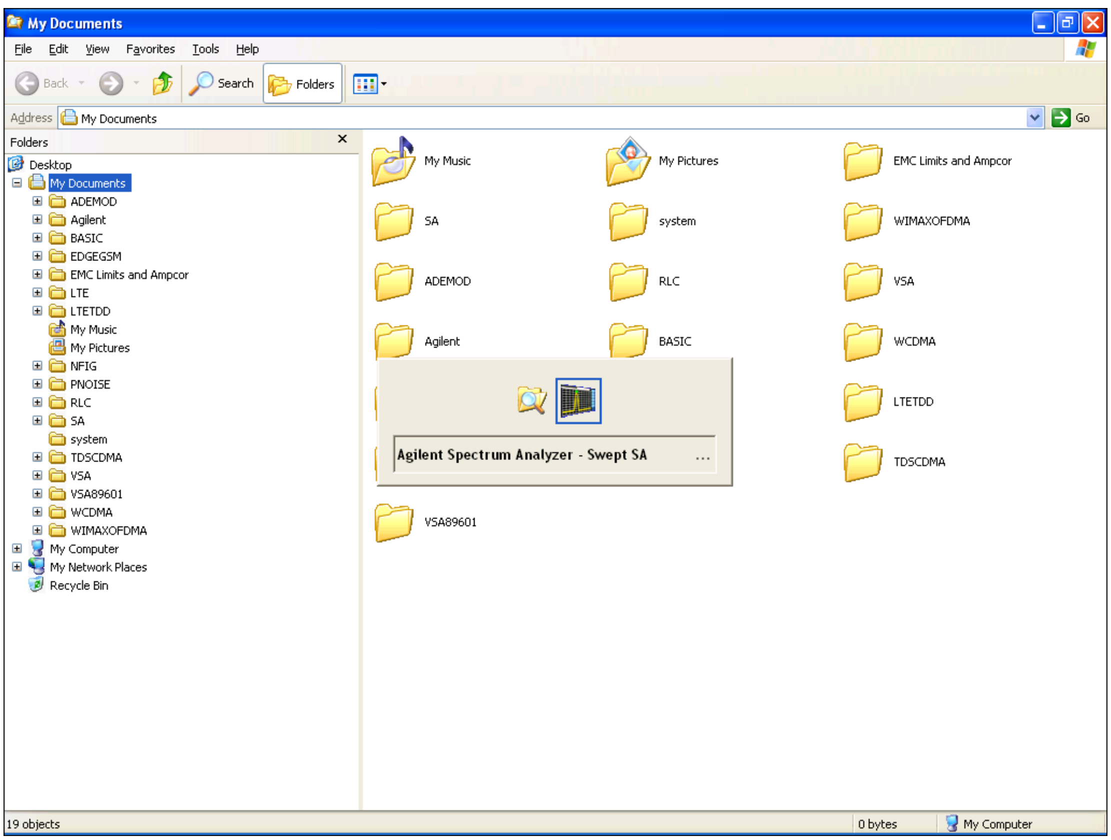
Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

File Explorer

Opens the standard Windows File Explorer. The File Explorer opensin the My Documents directory for the current user.

The File Explorer is a separate Windows application, so to return to the analyzer once you are in the File Explorer, you may either:

Exit the File Explorer by clicking on the red X in the upper right hand corner, with a mouse



Or use Alt-Tab: press and hold the Alt 

key and press and release the Tab key until the Analyzer logo is showing in the window in the center of the screen, as shown above, then release the Alt key.

Key Path	File

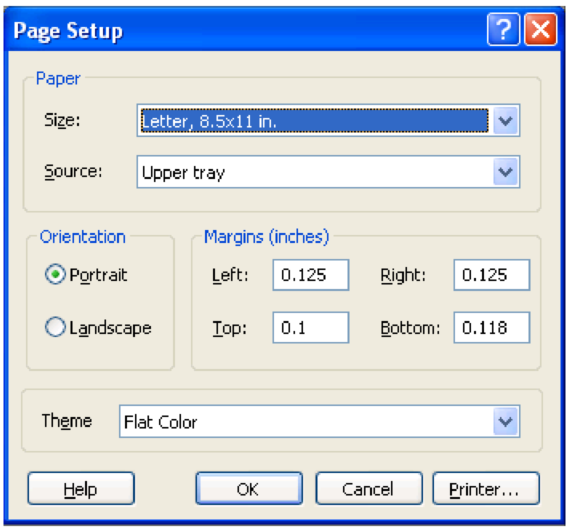
Initial S/W Revision	Prior to A.02.00

Page Setup

The Page Setup key brings up a Windows Page Setup dialog that allows you to control aspects of the pages sent to the printer when the PRINT hardkey is pressed.

Key Path	File
Initial S/W Revision	Prior to A.02.00

Paper size, the printer paper source, the page orientation and the margins are all settable. Just like any standard Windows dialog, you may navigate the dialog using the front-panel keys, or a mouse. There are no SCPI commands for controlling these parameters.



Also contained in this dialog is a drop-down control that lets you select the Theme to use when printing. For more on Themes, see information under View/Display, Display, System Display Settings, Theme. The Theme control has a corresponding SCPI command.

Parameter Name	Print Themes
Parameter Type	Enum
Mode	All
Remote Command	`:SYSTem:PRINt:THEMe TDColor|TDMonochrome|FCOLor|FMONochrome` `:SYSTem:PRINt:THEMe?`
Example	:SYST:PRIN:THEM FCOL
Setup	:SYSTem:DEFault MISC
Preset	FCOL; not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.

State Saved	No
Initial S/W Revision	Prior to A.02.00

Print

This front-panel key is equivalent to performing a File, Print, OK. It immediately performs the currently configured Print to the Default printer.

The :HCOPy command is equivalent to pressing the PRINT key. The HCOPy:ABORt command can be used to abort a print which is already in progress. Sending HCOPy:ABORt will cause the analyzer to stop sending data to the printer, although the printer may continue or even complete the print, depending on how much data was sent to the printer before the user sent the ABORt command.

Key Path	Front-panel key
Remote Command	`:HCOPy[:IMMediate]`
Initial S/W Revision	Prior to A.02.00

Key Path	SCPI command only
Remote Command	`:HCOPy:ABORt`
Initial S/W Revision	Prior to A.02.00

Restore Down

This key allows you to Restore Down the Instrument Application and reverses the action taken by Maximize. This key is only visible when the application has been maximized, and after the Restore Down action has been completed this key is replaced by the Maximize key.

Key Path	File
Mode	All
Notes	No equivalent remote command for this key.
State Saved	No
Initial S/W Revision	A.05.01

Minimize

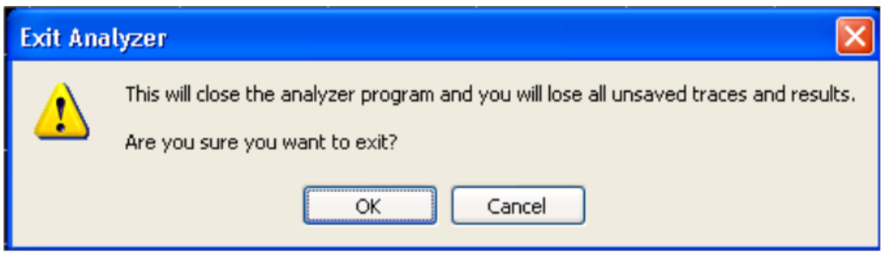
The Minimize key causes the analyzer display to disappear down into the task bar, allowing you to see the Windows Desktop. You can use Alt-Tab (press and hold the Alt 

key and press and release the Tab key) to restore the analyzer display.

Key Path	File
Mode	All
Notes	No equivalent remote command for this key.
State Saved	No
Initial S/W Revision	A.05.01

Exit

This key, when pressed, will exit the Instrument Application. A dialog box is used to confirm that you intended to exit the application:



Key Path	File
Mode	All
Notes	The Instrument Application willclose. No further SCPI commands can be sent. Use with caution!
Initial S/W Revision	Prior to A.02.00

FREQ Channel

Accesses a menu of keys that allow you to control the Frequency and Channel parameters of the instrument.

Some features in the Frequency menu are the same for all measurements – they do not change as you change measurements. Settings like these are called "Meas Global" and are unaffected by Meas Preset. For example, the Center Freq setting is the same for all measurements - it does not change as you change measurements.

Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

Zone Center

Zone Center appears as the top key in the Frequency menu in the Trace Zoom View of the Spectrum Analyzer & RLC Modes.

Zone Center allows you to change the frequency of the zone without changing the zone span. As the zone center is changed, the center frequency of the lower window is changed. Note that the lower window is not updated to reflect the change unless it is selected as the active window.

The center frequency for the lower window is not limited by the selected start and stop frequencies in the upper window. However, if the frequency span of the lower window is at all outside of the span for the upper window, an orange arrow pointing left or right will be displayed at the left or right edge of the top window.

Key Path	FREQ Channel
Remote Command	`[:SENSe]:FREQuency:ZSPan:CENTer <frequency>` `[:SENSe]:FREQuency:ZSPan:CENTer?`
Example	:FREQ:ZSP:CENT 20 MHz
Notes	Min and Max values depend on the Hardware Options (5xx)
Dependencies	Only appears when the Zone Span View of the Swept SA measurement is selected. If the SCPI command is sent in other Views, an error is generated.
Couplings	Center Frequency of lower window changes so that it is always the same as Zone Center, and vice-versa Affected by Freq Offset exactly the same as is Center Frequency.
Preset	On entry to Zone Span, the Zone Center frequency is the same as the analyzer Center Frequency. So if you do a Mode Preset and then immediately go into Zone Span, Zone Center matches the Preset values listed in the table under the Center Freq key description.
State Saved	Saved in instrument state
Min	Hardware dependent; Zone Span dependent. Zone Center cannot go so low as to force Zone Left to be <0.
Max	The maximum Zone Center frequency is the same as the maximum analyzer Center Frequency, which is basically the instrument maximum frequency minus 5 Hz. See the table under the key description

	for "Center Freq" on page 607.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

Zoom Center

Zoom Center appears as the top key in the Frequency menu in the Trace Zoom View of the Spectrum Analyzer Mode.

Zoom Center allows you to change the frequency of the zoom region, and hence of the lower window, without changing the Zoom Span.

The Zoom Center value is displayed in the lower left corner of the zoom window (below the graticule) when the frequency entry mode is Center/Span (pressing Center Freq or Span sets the frequency entry mode to Center/Span). When the frequency entry mode is Start/Stop, Zoom Start is displayed in this lower left annotation position (pressing Start Freq or Stop Freq sets the frequency entry mode to Start/Stop).

Key Path	FREQ Channel
Remote Command	`[:SENSe]:FREQuency:TZOom:CENTer <frequency>` `[:SENSe]:FREQuency:TZOom CENTer?`
Example	FREQ:TZO:CENT 20 MHz
Dependencies	Only appears in the Trace Zoom View of the Swept SA measurement. If the SCPI command is sent in other Views, an error is reported.
Couplings	The center frequency for the lower window is limited by the start and stop frequencies in the upper window. You cannot move the zoom region out of the upper window, nor does changing the Zoom Center frequency ever change the Zoom Span. When Zoom Center increases or decreases to a value that causes the zoom region to touch an edge of the top window, the Zoom Center is clipped at that value. If the analyzer Start and/or Stop frequencies change such that the Zoom Region is no longer between them, the Zoom Region is moved to the far left or right of the top window as appropriate. Affected by Freq Offset exactly the same as is Center Frequency.
Preset	13.255 GHz
State Saved	Saved in instrument state
Min	Start Frequency of top window
Max	The maximum Zoom Center frequency is the same as the maximum analyzer Center Frequency, which is basically the instrument maximum frequency – 5 Hz. See the table under the Center Freq key description.
Default Unit	Hz
Initial S/W Revision	A.07.01
Preset	On entry to Trace Zoom, the Zoom Center frequency is the same as the analyzer Center Frequency. So if you do a Mode Preset and then immediately go into Trace Zoom, Zoom Center matches the Preset values listed in the table under the Center Freq key description.

Auto Tune

Auto Tune appears as the top key in the Frequency menu in the Normal and Spectrogram views of the Spectrum Analyzer Mode.

Auto Tune is an immediate action key. When it is pressed, it causes the analyzer to change Center Frequency to the strongest signal in the tunable span of the analyzer, excluding the LO. It is designed to quickly get you to the most likely signal(s) of interest, with no signal analysis knowledge required. As such, there are no configurable parameters for this feature. There are only pre-selected values that work in most real world situations.

Auto Tune performs a Preset as part of its function, so it always returns you to the Normal View and a preset state, although it does leave the AC/DC coupling and Single/Cont state unaffected.

NOTE	You may see a slight pause before the signal of interest is presented at midscreen.

Key Path	FREQ Channel
Remote Command	`[:SENSe]:FREQuency:TUNE:IMMediate`
Dependencies	Auto Tune is not available (grayed out) when Source Mode=Tracking.
Initial S/W Revision	Prior to A.02.00

Center Freq

Sets the frequency that corresponds to the horizontal center of the graticule (when frequency Scale Type is set to linear). While adjusting the Center Frequency the Span is held constant, which means that both Start Frequency and Stop Frequency will change.

Pressing Center Freq also sets the frequency entry mode to Center/Span. In Center/Span mode, the center frequency and span values are displayed below the graticule, and the default active function in the Frequency menu is Center Freq.

The center frequency setting is the same for all measurements within a mode, that is, it is Meas Global. Some modes are also able to share a Mode Global center frequency value. If this is the case, the Mode will have a Global Settings key in its Mode Setup menu.

The Center Freq function sets (and queries) the Center Frequency for the currently selected input. If your analyzer has multiple inputs, and you select another input, the Center Freq changes to the value for that input. SCPI commands are available to directly set the Center Freq for a specific input.

Center Freq is remembered as you go from input to input. Thus you can set a Center Freq of 10 GHz with the RF Input selected, change to BBIQ and set a Center Freq of 20 MHz, then switch to External Mixing and set a Center Freq of 60 GHz, and when you go back to the RF Input the Center Freq will go back to 10 GHz; back to BBIQ and it is 20 MHz; back to External Mixing and it is 60 GHz.

See "RF Center Freq" on page 610

See Ext Mix Center Freq

See "I/Q Center Freq" on page 612

See "Center Frequency Presets" on page 609

Key Path	FREQ Channel
Scope	Meas Global
Remote Command	`[:SENSe]:FREQuency:CENTer <freq>` `[:SENSe]:FREQuency:CENTer?`
Example	FREQ:CENT 50 MHz FREQ:CENT UP changes the center frequency to 150 MHz if you use FREQ:CENT:STEP 100 MHz to set the center frequency step size to 100 MHz FREQ:CENT?
Notes	This command sets either the RF or I/Q Center Frequency depending on the selected input. For RF input it is equivalent to FREQ:RF:CENT For I/Q input it is equivalent to FREQ:IQ:CENT Preset and Max values are dependent on Hardware Options (5xx) If no terminator (e.g. MHz) is sent the terminator Hz is used. If a terminator with unit other than Frequency is used, an invalid suffix error message is generated.
Dependencies	The Center Frequency can be limited by Start or Stop Freq limits, if the Span is so large that Start or Stop reach their limit.
Couplings	When operating in “swept span”, any value of the Center Frequency or Span that is within the frequency range of the analyzer is allowed when the value is being set through the front panel numeric key pad or the SCPI command. The other parameter is forced to a different value if needed, to keep the Start and the Stop Frequencies within the analyzer’s frequency range
Preset	Depends on instrument maximum frequency, mode, measurement, and selected input. See "Center Frequency Presets" on page 609 and "RF Center Freq" on page 610 and Ext Mix Center Freq and "I/Q Center Freq" on page 612.
State Saved	Saved in instrument state
Min	Depends on instrument maximum frequency, mode, measurement, and selected input.. See "Center Frequency Presets" on page 609 and "RF Center Freq" on page 610 and "I/Q Center Freq" on page 612.
Max	Depends on instrument maximum frequency, mode, measurement, and selected input.. See "Center Frequency Presets" on page 609 and "RF Center Freq" on page 610 and "I/Q Center Freq" on page 612.
Default Unit	Hz
Status Bits/OPC Dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

Center Frequency Presets

The following table provides the Center Frequency Presets for the Spectrum Analyzer mode, and the Max Freq, for the various frequency options:

Freq Option	CF after Mode Preset	Stop Freq after Mode Preset	Max Freq (can't tune above)
503 (all but N9000A)	1.805 GHz	3.6 GHz	3.7 GHz
503 (N9000A)	1.505 GHz	3.0 GHz	3.08 GHz
507 (all but N9000A)	3.505 GHz	7.0 GHz	7.1 GHz
507 (N9000A)	3.755 GHz	7.5 GHz	7.58 GHz
508 (all but N9038A)	1.805 GHz	3.6 GHz	8.5 GHz
508 (N9038A)	4.205 GHz	8.4 GHz	8.5 GHz
513	6.805 GHz	13.6 GHz	13.8 GHz
526 (all but N9000A and N9038A)	13.255 GHz	26.5 GHz	27.0 GHz
526 (N9000A)	13.255 GHz	26.5 GHz	26.55 GHz
526 (N9038A)	1.805 GHz	3.6 GHz	27.0 GHz
532	16.005 GHz	32.0 GHz	32.5 GHz
543	21.505 GHz	43.0 GHz	TBD
544	22.005 GHz	44.0 GHz	44.5 GHz
550	25.005 GHz	50.0 GHz	51 GHz

Input 2:

Model	CF after Mode Preset	Stop Freq after Mode Preset	Max Freq (can't tune above)
N9000A opt C75	0.7505GHz	1.5 GHz	1.58 GHz
N9038A	505 MHz	1 GHz	1.000025 GHz

Tracking Generator Frequency Limits (N9000A only):

Tracking Generator Option	Min Freq (clips to this freq when turn TG on and can't tune below while TG on)	If above this Freq, Stop Freq clipped to this Freq when TG turned on	**Max Freq (can't tune above) while TG on**
T03	9 kHz	3.0 GHz	3.08 GHz
T06	9 kHz	6.0 GHz	6.05 GHz

The following table shows the Center Frequency Presets for modes other than Spectrum Analyzer:

Mode	CF Preset for RF
WCDMA	1 GHz
WIMAXOFDMA,	1 GHz
BASIC	1 GHz
ADEMOD	1 GHz
VSA	1 GHz
TDSCDMA	1 GHz
PNOISE	1 GHz
LTE	1 GHz
LTETDD	1 GHz
MSR	1 GHz
GSM	935.2 MHz
NFIGURE	1.505 GHz

RF Center Freq

SCPI command for specifying the RF Center Frequency. This command will set the Center Frequency to be used when the RF input is selected, even if the RF input is not the input that is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

Scope	Meas Global
Remote Command	`[:SENSe]:FREQuency:RF:CENTer <freq>` `[:SENSe]:FREQuency:RF:CENTer?`
Example	FREQ:RF:CENT 30 MHz
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Dependencies	If the electronic/soft attenuator is enabled, any attempt to set Center Frequency such that the Stop Frequency would be >3.6 GHz fails and results in an advisory message. If the equivalent SCPI

	command is sent, this same message is generated as part of a "–221, Settings conflict" warning. If Source Mode is set to Tracking, and the Max or Min Center Freq is therefore limited by the limits of the source, a warning message is generated, "Data out of range;clipped to source max/min" if these limits are exceeded. Note that for an external source, these limits can be affected by the settings of Source Numerator, Source Denominator and Power Sweep.
Preset	See table above
State Saved	Saved in instrument state.
Min	–79.999995 MHz, unless Source Mode is set to Tracking, in which case it is limited by the minimum frequency of the Source
Max	See table above. Basically instrument maximum frequency – 5 Hz. Note that, if the Source Mode is set to Tracking, the effective instrument maximum frequency may be limited by the source maximum frequency. If the knob or step keys are being used, also depends on the value of the other three interdependent parameters Span, Start Frequency and Stop Frequency
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Ext Mix Center Freq

SCPI command for specifying the External Mixer Center Frequency. This command will set the Center Frequency to be used when the External Mixer is selected, even if the External Mixer input is not the input which is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

Scope	Meas Global
Remote Command	`[:SENSe]:FREQuency:EMIXer:CENTer <freq>` `[:SENSe]:FREQuency:EMIXer:CENTer?`
Example	:FREQ:EMIX:CENT 60 GHz :FREQ:EMIX:CENT?
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Couplings	When returning to External Mixing after having been switched to one of the other inputs (e.g., RF), you will come back into the settings that you had when you left External Mixing. So you will come back to the band you were in with the Center Frequency that you had. However, Span is not an input-dependent parameter, therefore you will bring the span over from the other input. Therefore, the analyzer comes back with the span from the previous input, limited as necessary by the current mixer setup.
Preset	When a Mode Preset is performed while in External Mixing, the Start frequency of the current Mode is set to the nominal Min Freq of the lowest harmonic range in the Harmonic Table for the current mixer setup. Similarly, the Stop frequency of the current Mode is set to the nominal Max Freq of the highest harmonic range in the Harmonic Table. The Center Freq thus presets to the point arithmetically equidistant from these two frequencies.

	If the current measurement has a limited Span available to it, and cannot achieve the Span shown in the table (Span=Stop Freq – Start Freq), the analyzer uses the maximum Span the measurement allows, and still sets the Center Freq to the midpoint of the Start and Stop Freq values in the Harmonic Table. When Restore Input/Output Defaults is performed, the mixer presets to the 11970A, whose Start and Stop frequencies are 26.5 and 40 GHz respectively. The center of these two frequencies is 33.25 GHz. Therefore, after a Restore Input/Output Defaults, if you go into External Mixing and do a Mode Preset while in the Spectrum Analyzer Mode, the resulting Center Freq is 33.25 GHz.
State Saved	Saved in instrument state.
Min	The minimum frequency in the currently selected mixer band + 5 Hz
Max	The maximum frequency in the currently selected mixer band – 5 Hz If the knob or step keys are being used, also depends on the value of the other three interdependent parameters Span, Start Frequency and Stop Frequency
Initial S/W Revision	A.08.01

I/Q Center Freq

SCPI command for specifying the I/Q Center Frequency. This command will set the Center Frequency to be used when the I/Q input is selected, even if the I/Q input is not the input which is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

Scope	Meas Global
Remote Command	`[:SENSe]:FREQuency:IQ:CENTer <freq>` `[:SENSe]:FREQuency:IQ:CENTer?`
Example	FREQ:IQ:CENT: 30 MHz
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Preset	0 Hz
State Saved	Saved in instrument state.
Min	–40.049995 MHz
Max	40.049995 MHz
Initial S/W Revision	Prior to A.02.00

Start Freq

Sets the frequency at the left side of the graticule. While adjusting the start frequency, the stop frequency is held constant, which means that both the center frequency and span will change.

Start Freq also sets the frequency entry mode to Start or Stop. In Start or Stop mode, the start frequency and stop frequency values are displayed below the graticule, and the default active function in the Frequency menu is Start Freq.

Key Path	FREQ Channel
Remote Command	`[:SENSe]:FREQuency:STARt <freq>` `[:SENSe]:FREQuency:STARt?`
Example	FREQ:STAR 200 MHz FREQ:STAR?
Notes	Max values depends on Hardware Options (5xx)
Dependencies	By direct entry: You cannot set Start frequency > Stop frequency. You cannot set Start frequency = Stop frequency. You cannot select zero span by setting Start = Stop. You cannot set Start Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, Stop Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop. With the knob or step keys: Cannot increment Start Freq to a value greater than Stop Freq – 10 Hz. If already in zero span, cannot increment at all, and the first decrement will be forced to at least 10 Hz. The Start Frequency can be limited by Span limits, if the Stop Frequency is below its preset value. If the electronic/soft attenuator is enabled, any attempt to set the Start Frequency such that the Stop Frequency would be >3.6 GHz fails and results in an advisory message. If the equivalent SCPI command is sent, this same message is generated as part of a "–221, Settings conflict" warning. If Source Mode is set to Tracking, and the Max or Min Start Freq is therefore limited by the limits of the source, a warning message is generated, "Data out of range;clipped to source max/min" if these limits are exceeded. Note that for an external source, these limits can be affected by the settings of Source Numerator, Source Denominator and Power Sweep.
Couplings	In the Spectrum Analyzer, the four parameters Center Freq, Start Freq, Stop Freq and Span are interdependent, as changing one necessarily affects one or more of the others. The couplings between Center Freq and Span are detailed under the key descriptions for those keys. These couplings also affect Start Freq and Stop Freq. You cannot set Start frequency = Stop frequency. You cannot select zero span by setting Start = Stop. The instrument will alter the value of the last setting to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	Start Freq does not preset. On Mode Preset, Span & CF preset, and Start Freq is derived. On a Meas Preset only Span presets, CF does not, so Start Freq will vary depending on CF. When a Mode Preset is performed while in External Mixing, the Start frequency of the current Mode is set to the nominal Min Freq of the lowest harmonic range in the Harmonic Table for the current mixer setup. If the current measurement has a limited Span available to it, and cannot achieve the Span shown in the table (Span=Stop Freq – Start Freq), the analyzer uses the maximum Span the measurement allows, and sets the Center Freq to the midpoint of the Start and Stop Freq values in the Harmonic Table. Thus, in this case, the Start Freq will preset to a frequency below the preset Center Freq by ½ of the maximum Span. When Restore Input/Output Defaults is performed, the mixer presets to the 11970A, whose Start frequency is 26.5 GHz.

	Therefore, after a Restore Input/Output Defaults, if you go into External Mixing and do a Mode Preset while in the Spectrum Analyzer Mode, the resulting Start Freq is 26.5 GHz.
State Saved	Saved in instrument state
Min	–80 MHz, unless Source Mode is set to Tracking, in which case it is limited by the minimum frequency of the Source If the knob or step keys are being used, depends on the value of the other three interdependent parameters While in External Mixing, the minimum Start Freq you can set is determined by the external mixing parameters. It will be close to the minimum LO frequency (3.8 GHz if undoubled, 8.6 GHz if doubled) times the harmonic number, for the lowest harmonic range in the Harmonic Table for the current mixer setup. It can be queried with the SCPI command :FREQ:STARt? MIN.
Max	Depends on the instrument maximum frequency – 10 Hz. Note that, if the Source Mode is set to Tracking, the effective instrument maximum frequency may be limited by the source maximum frequency. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters. While in External Mixing, the maximum Start Freq you can set is determined by the external mixing parameters. It will be close to the maximum LO frequency (7 GHz if undoubled, 14 GHz if doubled) times the harmonic number, for the highest harmonic range in the Harmonic Table for the current mixer setup. It can be queried with the SCPI command :FREQ:STARt? MAX.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Stop Freq

Sets the frequency at the right side of the graticule. While adjusting the stop Frequency, the start frequency is held constant, which means that both the center frequency and span will change.

Stop Freq also sets the frequency entry mode to Start or Stop. In Start or Stop mode, the start frequency and stop frequency values are displayed below the graticule, and the default active function in the Frequency menu is Start Freq.

Key Path	FREQ Channel
Remote Command	`[:SENSe]:FREQuency:STOP <freq>` `[:SENSe]:FREQuency:STOP?`
Example	FREQ:STOP 220 MHz FREQ:STOP?
Notes	Preset and Max values are dependent on Hardware Options (5xx)
Dependencies	By direct entry: You cannot set the Stop frequency < Start frequency. You cannot set Start frequency = Stop

	frequency. You cannot select zero span by setting Start = Stop. You cannot set Stop Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, Start Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop. With the knob or step keys: Cannot decrement Stop Freq to a value less than Start Freq + 10 Hz. If already in zero span, cannot decrement at all, and the first increment will be forced to at least 10 Hz. The Stop Frequency can be limited by Span limits, if the Start Frequency is above its preset value. If the electronic/soft attenuator is enabled, any attempt to set the Stop Frequency >3.6 GHz fails and results in an advisory message. If the equivalent SCPI command is sent, this same message is generated as part of a "–221, Settings conflict" warning. If Source Mode is set to Tracking, and the Max or Min Stop Freq is therefore limited by the limits of the source, a warning message is generated, "Data out of range;clipped to source max/min" if these limits are exceeded. Note that for an external source, these limits can be affected by the settings of Source Numerator, Source Denominator and Power Sweep.
Couplings	In the Spectrum Analyzer, the four parameters Center Freq, Start Freq, Stop Freq and Span are interdependent, as changing one necessarily affects one or more of the others. The couplings between Center Freq and Span are detailed under the key descriptions for those keys. These couplings also affect Start Freq and Stop Freq. You cannot set Start frequency = Stop frequency. You cannot select zero span by setting Start = Stop. The instrument will alter the value of the last setting to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	On Mode Preset, Span & CF preset, and Stop Freq is derived. See "Center Frequency Presets" on page 609 for a table which shows the Stop Freq after Preset for various model and option numbers). On a Meas Preset only Span presets, CF does not, so Stop Freq will vary depending on CF. When a Mode Preset is performed while in External Mixing, the Stop frequency of the current Mode is set to the nominal Max Freq of the highest harmonic range in the Harmonic Table for the current mixer setup. If the current measurement has a limited Span available to it, and cannot achieve the Span shown in the table (Span=Stop Freq – Start Freq), the analyzer uses the maximum Span the measurement allows, and sets the Center Freq to the midpoint of the Start and Stop Freq values in the Harmonic Table. Thus, in this case, the Stop Freq will preset to a frequency above the preset Center Freq by ½ of the maximum Span. When Restore Input/Output Defaults is performed, the mixer presets to the 11970A, whose Stop frequency is 40 GHz. Therefore, after a Restore Input/Output Defaults, if you go into External Mixing and do a Mode Preset while in the Spectrum Analyzer Mode, the resulting Stop Freq is 40 GHz.
State Saved	Saved in instrument state
Min	–79.999999999 MHz, unless Source Mode is set to Tracking, in which case it is limited by the minimum frequency of the Source If the knob or step keys are being used, depends on the value of the other three interdependent parameters While in External Mixing, the minimum Stop Freq you can set is determined by the external mixing parameters. It will be close to the minimum LO frequency (3.8 GHz if undoubled, 8.6 GHz if doubled) times the harmonic number, for the lowest harmonic range in the Harmonic Table for the current mixer setup. It can be queried with the SCPI command :FREQ:STOP? MIN.

Max	Depends on instrument maximum frequency. Note that, if the Source Mode is set to Tracking, the effective instrument maximum frequency may be limited by the source maximum frequency. If the knob or step keys are being used, depends on the value of the other three interdependent parameters. While in External Mixing, the maximum Stop Freq you can set is determined by the external mixing parameters. It will be close to the maximum LO frequency (7 GHz if undoubled, 14 GHz if doubled) times the harmonic number, for the highest harmonic range in the Harmonic Table for the current mixer setup. It can be queried with the SCPI command :FREQ:STOP? MAX.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

CF Step

Changes the step size for the center frequency and start and stop frequency functions. Once a step size has been selected and the center frequency function is active, the step keys (and the UP|DOWN parameters for Center Frequency from remote commands) change the center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the analyzer.

Note that the start and stop frequencies also step by the CF Step value.

Key Path	FREQ Channel

Remote Command	`[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>`
	`[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?`
	`[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1`
	`[:SENSe]:FREQuency:CENTer:STEP:AUTO?`

Example	FREQ:CENT:STEP:AUTO ON FREQ:CENT:STEP 500 MHz FREQ:CENT UP increases the current center frequency value by 500 MHz FREQ:CENT:STEP? FREQ:CENT:STEP:AUTO?
Notes	 Preset and Max values are depending on Hardware Options (503, 507, 508, 513, 526)
Notes	Preset and Max values are dependent on Hardware Options (5xx)
Dependencies	Freq Offset is not available in External Mixing. In this case the Freq Offset key is grayed out and shows a value of zero. It will once again be available, and show the previously set value, when you return to the RF Input.

Dependencies	Span, RBW, Center frequency If the electronic/soft attenuator is enabled, any attempt to change the value of the center frequency >3.6 GHz by pressing the Up-arrow key, fails and results in an advisory message. If the equivalent SCPI command is sent, this same message is generated as part of a "–221, Settings conflict" warning.
Couplings	When auto-coupled in a non-zero span, the center frequency step size is set to 10% of the span. When auto-coupled in zero span, the center frequency step size is set to the equivalent –3 dB RBW value.
Preset	Auto ADEMOD: 1 MHz ON
State Saved	Saved in instrument state
Min	– (the maximum frequency of the instrument). That is, 27 GHz max freq instrument has a CF step range of +/– 27 GHz. Note that this is the maximum frequency given the current settings of the instrument, so in External Mixing, for example, it is the maximum frequency of the current mixer band.
Max	The maximum frequency of the instrument. That is, 27 GHz max freq instrument has a CF step range of +/– 27 GHz. Note that this is the maximum frequency given the current settings of the instrument, so in External Mixing, for example, it is the maximum frequency of the current mixer band.
Default Unit	Hz
Status Bits/OPC dependencies	non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Freq Offset

Enables you to set a frequency offset value to account for frequency conversions outside of the analyzer. This value is added to the display readout of the marker frequency, center frequency, start frequency, stop frequency, and all other absolute frequency settings in the analyzer including frequency count. When a frequency offset is entered, the value appears below the center of the graticule. To eliminate an offset, perform a Mode Preset or set the frequency offset to 0 Hz.

See "More Information" on page 618.

Key Path	FREQ Channel
Scope	Meas Global
Remote Command	`[:SENSe]:FREQuency:OFFSet <freq>` `[:SENSe]:FREQuency:OFFSet?`
Example	FREQ:OFFS 10 MHz
Notes	Preset and Max values are dependent on Hardware Options (503, 507, 508, 513, 526)

Dependencies	Freq Offset is not available in External Mixing. In this case the Freq Offset key is grayed out and shows a value of zero. However, the value of CF Offset that was set for the RF Input is retained and restored when the user switches back to the RF Input.
Preset	See the table in See "Center Frequency Presets" on page 609
State Saved	Saved in instrument state
Min	–500 GHz
Max	500 GHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Backwards Compatibility SCPI	`DISPlay:WINDow[1]:TRACe:X[:SCALe]:OFFSet` The DISPlay version of the command is in the instrument for compatibility across platforms and is not recommended for new development.
Backwards Compatibility Notes	1. In pre-X-Series instruments, Frequency Offset could not be adjusted by the knob or step keys. That is no longer the case. 2. Some previous spectrum analyzers did not adjust frequency counter results for the Frequency Offset. The X-Series does adjust the frequency counter for the offset.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00, A.08.50

More Information

This command does not affect any bandwidths or the settings of relative frequency parameters such as delta markers or span. It does not affect the current hardware settings of the analyzer, but only the displayed frequency values. Entering an offset does not affect the trace position or display, just the value of the start and stop frequency and the values represented by the trace data. The frequency values of exported trace data, queried trace data, markers, trace data used in calculations such as N dB points, trace math, etc., are all affected by Freq Offset. Changing the offset, even on a trace that is not updating will immediately change all of the above, without taking new data.

NOTE: If a trace is exported with a nonzero Freq Offset, the exported data will contain the trace data with the offset applied. Therefore, if that trace were to be imported back into the analyzer, you would want Freq Offset to be 0, or the offset would be applied again to data which is already offset. No such care need be taken when saving a State+Trace file because the data and state are saved together.

Input/Output

The Input/Output features are common across multiple Modes and Measurements. These common features are described in this section. See the Measurement description for information on features that are unique.

The Input/Output key accesses the keys that control the Input/Output parameters of the instrument. In general, these are functions associated with external connections to the analyzer, either to the inputs or the outputs. Since these connections tend to be fairly stable within a given setup, in general, the input/output settings do not change when you Preset the analyzer.

Other functions related to the input/output connections, but which tend to change on a measurement by measurement basis, can be found under the Trigger and AMPTD Y Scale keys. In addition, some of the digital I/O bus configurations can be found under the System key.

NOTE	The functions in the Input/Output menu are "global" (common) to all Modes (applications). But individual Input/Output functions only appear in a Mode if they apply to that Mode. Functions that apply to a Mode but not to all measurements in the Mode may be grayed-out in some measurements.

"Input/Output variables - Preset behavior" on page 621

The Input Port selection is the first menu under the Input/Output key:

Key Path	Front-panel key
Remote Command	`[:SENSe]:FEED RF|AIQ|EMIXer` `[:SENSe]:FEED?`
Example	:FEED RF :FEED?
Couplings	The [:SENSe]:FEED RF command turns the calibrator OFF
Preset	This setting is unaffected by a Preset or power cycle. It survives a Mode Preset and mode changes. It is set to RF on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`[:SENSe]:FEED AREFerence` In the PSA the calibrator was one of the inputs and selected using the AREF parameter to the same :FEED command that switched the inputs. In the X-Series it is controlled in a separate menu and overrides the input selection. For code compatibility the [:SENSe]:FEED AREFerence command is provided, and is aliased to [SENSe]:FEED:AREF REF50, which causes the input to be switched to the 50 MHz calibrator. The [:SENSe]:FEED RF command switches the input back to the RF port and turns the calibrator OFF, thus providing full compatibility with the PSA calibrator function. Note that after sending this, the query [:SENSe]:FEED? does **not** return “AREF” but instead the currently selected input.

Backwards Compatibility SCPI	`[:SENSe]:FEED IQ|IONLy|QONLy`
	`[:SENSe]:FEED?`
	The parameters IQ | IONLy | QONLy are supported for backwards compatibility with the E44406A.
	• [:SENSe]:FEED IQ aliases to [:SENSe]:FEED: IQ:TYPE IQ

	• [:SENSe]:FEED IONLy aliases to [:SENSe]:FEED:IQ:TYPE IONLy • [:SENSe]:FEED QONLy aliases to [:SENSe]:FEED:IQ:TYPE QONLy The query [:SENSe]:FEED? always returns AIQ, whichever of the legacy parameters IQ | IONLy | QONLy have been specified.
Backwards Compatibility Notes	Most of the settings in the X-Series Input/Output system, including External Gain, Amplitude Corrections settings and data, etc., are shared by all modes and are not changed by a mode switch. Furthermore, most variables in the Input/Output system key are not affected by Mode Preset. Both of these behaviors represent a departure from legacy behavior. In the X-Series, Input/Output settings are reset by using the "Restore Input/Output Defaults" function. They can also be reset to their default values through the System->Restore System Defaults-> In/Out Config key or through the System ->Restore System Defaults -> All key (and corresponding SCPI). While this matches most use cases better, it does create some code compatibility issues. For example, Amplitude Corrections are no longer turned off by a Mode Preset, but instead by using the "Restore Input/Output Defaults" key/SCPI. Although Input/Output settings are not part of each Mode's State, they are saved in the Save State files, so that all of the instrument settings can be recalled with Recall State, as in legacy instruments.
Initial S/W Revision	Prior to A.02.00

Remote Command	`:INPut:MIXer EXTernal|INTernal` `:INPut:MIXer?`
Example	INP:MIX INT INP:MIX?
Notes	In legacy analyzers you choose between the Internal mixer or an External Mixer. In the X-Series, the External Mixer is one of the choices for the Input and is selected using the FEED command (:SENSe:FEED EXTMixer). For compatibility, the INPut:MIXer EXTernal|INTernal legacy command is mapped as follows: 1. When INPut:MIXer EXTernal is received, SENSe:FEED EMIXer is executed. 2. When INPut:MIXer INTernal is received, SENSe:FEED RF is executed. 3. When INPut:MIXer? is received, the response will be INT if any input other than the external mixer is selected and EXT if the external mixer is selected
Preset	INT
Backwards Compatibility Notes	PSA supports the following SCPI Command : :INPut:MIXer:TYPE PRESelected|UNPReselect :INPut:MIXer:TYPE? PXA does not support the :INPut:MIXer:TYPE command.
Initial S/W Revision	A.08.01

Input/Output variables - Preset behavior

Virtually all the input/output settings are **not** a part of mode preset. They can be set to their default value by one of the three ways:

- by using the Restore Input/Output Defaults key on the first page of the input/output menu,
- by using the System->Restore System Defaults->Input/Output Settings or,
- by using the System -> Restore System Defaults->All. Also, they survive a Preset and a Power cycle.

A very few of the Input/Output settings do respond to a Mode Preset; for example, if the Calibrator is on it turns off on a Preset, and if DC coupling is in effect it switches to AC on a Preset. These exceptions are made in the interest of reliability and usability, which overrides the need for absolute consistency. Exceptions are noted in the SCPI table for the excepted functions.

RF Input

Selects the front-panel RF input port to be the analyzer signal input. If RF is already selected, pressing this key accesses the RF input setup functions.

Key Path	Input/Output
Example	[:SENSe]:FEED RF
Readback	The RF input port, RF coupling, and current input impedance settings appear on this key as: "XX, YY, ZZ" where XX is RF, RF2, RFIO1, RFIO2, depending on what input is selected (only appears on analyzers with multiple RF inputs) YY is AC or DC ZZ is 50Ω or 75Ω
Initial S/W Revision	Prior to A.02.00

Input Z Correction

Sets the input impedance for unit conversions. This affects the results when the y-axis unit is voltage or current units (dBmV, dBμV, dBμA, V, A), but not when it is power units (dBm, W). The impedance you select is for computational purposes only, since the actual impedance is set by internal hardware to 50 ohms. Setting the computational input impedance to 75 ohms is useful when using a 75 ohm to 50 ohm adapter to measure a 75 ohm device on an analyzer with a 50 ohm input impedance.

There are a variety ways to make 50 to 75 ohm transitions, such as impedance transformers or minimum loss pads. The choice of the solution that is best for your measurement situation requires balancing the amount of loss that you can tolerate with the amount of measurement frequency range that you need. If you are using one of these pads/adaptors with the Input Z Corr function, you might also want to use the Ext Gain key. This function is used to set a correction value to compensate for the gain (loss) through your pad. This correction factor is applied to the displayed measurement values.

Key Path	Input/Output, RF Input
Remote Command	`[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude] 50|75` `[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]?`
Example	CORR:IMP 75 sets the input impedance correction to 75 ohms. CORR:IMP?
Couplings	In the N9000A option C75, when RF Input 2 is selected, the Input Z Correction will automatically change to 75 ohms. The user may then change it to whatever is desired. When the main RF Input is selected, the Input Z Correction will automatically change to 50 ohms. The user may then change it to whatever is desired.
Preset	This is unaffected by a Preset but is set to 50 ohms on a "Restore Input/Output Defaults" or "Restore System Defaults->All" Some instruments/options may have 75 ohms available.
State Saved	Saved in instrument state
Readback	50 Ω or 75 Ω. Current setting reads back to the RF key.
Initial S/W Revision	Prior to A.02.00

RF Coupling

Specifies alternating current (AC) or direct current (DC) coupling at the analyzer RF input port. Selecting AC coupling switches in a blocking capacitor that blocks any DC voltage present at the analyzer input. This decreases the input frequency range of the analyzer, but prevents damage to the input circuitry of the analyzer if there is a DC voltage present at the RF input.

In AC coupling mode, you can view signals below the corner frequency of the DC block, but below a certain frequency the amplitude accuracy is not specified. The frequency below which specifications do not apply is:

X-Series Model	Lowest Freq for meeting specs when AC coupled	Lowest Freq for meeting specs when DC coupled
N9000A–503/507	100 kHz	n/a
N9000A-C75 Input 2	1 MHz	n/a
N9000A–513/526	10 MHz	9 kHz
N9010A	10 MHz	9 kHz
N9020A	10 MHz	20 Hz
N9030A	10 MHz	3 Hz

Some amplitude specifications apply only when coupling is set to DC. Refer to the appropriate amplitude specifications and characteristics for your analyzer.

When operating in DC coupled mode, ensure protection of the analyzer input circuitry by limiting the DC part of the input level to within 200 mV of 0 Vdc. In AC or DC coupling, limit the input RF power to +30 dBm (1 Watt).

Key Path	Input/Output, RF Input
Remote Command	`:INPut:COUPling AC|DC|RLC` `:INPut:COUPling?`
Example	INP:COUP DC
Dependencies	This key does not appear in models that are always AC coupled. When the SCPI command to set DC coupling is sent to these models, it results in the error “Illegal parameter value; This model is always AC coupled” In these models, the SCPI query INP:COUP? always returns AC. This key does not appear in models that are always DC coupled.When the SCPI command to set AC coupling is sent to these models, it results in the error “Illegal parameter value; This instrument is always DC coupled” In these models, the SCPI query INP:COUP? always returns DC.
Preset	AC on models that support AC coupling On models that are always DC coupled, such as millimeter wave models (frequency ranges 30 GHz and above), the preset is DC.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

I/Q

This feature is not available unless the "Baseband I/Q (Option BBA)" on page 623 is installed.

Selects the front-panel I/Q input ports to be the analyzer signal input. If I/Q is already selected, pressing this key accesses the I/Q setup menu.

Key Path	Input/Output
Mode	BASIC, CDMA2K, EDGEGSM, TDSCMDA, VSA89601, WIMAXOFDMA
Example	FEED AIQ
Notes	Not all measurements support the use of the I/Q signal input. When I/Q is selected in a measurement that does not support it, the “No Result; Meas invalid with I/Q inputs” error condition message appears. This is error 135
Initial S/W Revision	Prior to A.02.00

Baseband I/Q (Option BBA)

The Baseband I/Q functionality is a hardware option. It is option BBA. If the option is not installed, none of the I/Q functionality is enabled.

The Baseband I/Q has four input ports and one output port. The input ports are I, I-bar, Q, and Q-bar. The I and I-bar together compose the I channel and the Q and Q-bar together compose the Q channel. Each channel has two modes of operation, Single-Ended (also called "unbalanced") and Differential Input (also called "balanced"). When in Single-Ended operation, only the main port (I or Q) is used and the complementary port (I-bar or Q-bar) is ignored. When in Differential Input mode, both main and complementary ports are used.

The input settings (range, attenuation, skew, impedance, external gain) apply to the channels, not the individual ports.

The system supports a variety of 1 MΩ input passive probes as well as the Keysight 113x Series active differential probes using the Infinimax probe interface.

The Keysight 113x Series active probes can be used for both single ended and differential measurements. In either case a single connection is made for each channel (on either the I or Q input). The input is automatically configured to 50 Ω single ended and the probe power is supplied through the Infinimax interface. The probe can be configured for a variety of input coupling and low frequency rejection modes. In addition, a wide range of offset voltages and probe attenuation accessories are supported at the probe interface. The active probe has the advantage that it does not significantly load the circuit under test, even with unity gain probing.

With passive 1 MΩ probes, the probe will introduce a capacitive load on the circuit, unless higher attenuation is used at the probe interface. Higher attenuation reduces the signal level and degrades the signal-to-noise-ratio of the measurement. Passive probes are available with a variety of attenuation values for a moderate cost. Most Keysight passive probes can be automatically identified by the system, setting the input impedance setting required as well as the nominal attenuation. For single ended measurements a single probe is used for each channel. Other passive probes can be used, with the attenuation and impedance settings configured manually.

For full differential measurements, the system supports probes on each of the four inputs. The attenuation of the probes should be the same for good common mode rejection and channel match.

Both active and passive probes in single ended and differential configurations can be calibrated. This calibration uses the Cal Out BNC connection and a probe connection accessory. The calibration achieves excellent absolute gain flatness in a probed measurement. It matches both the gain and frequency response of the I and Q channels as well as any delay skew, resulting in high accuracy in derived measurements such as Error Vector Magnitude (EVM).

When a probe is connected a status message will be displayed. The message will indicate if calibration data is available or not. Calibration data is saved for each type of probe (including "none") for each port and will be reapplied whenever that type of probe is re-connected to the same port. For probes with EEPROM identification, the calibration data will be stored based on the unique probe identifier and will reapply data for that particular probe if it is available. The data will not follow a probe from one port to another. For probes without EEPROM identification, the instrument cannot distinguish between different probes of the same type and it will use the data from the last calibration for that probe type on that port.

When in differential mode, both the main and complementary probes are expected to be of the same type.

In some situations, the I and Q channels should be configured identically. In other situations it is convenient to control them independently. Some menus have a "Q Same as I" setting that will cause the Q channel configuration to mirror the I channel configuration, avoiding the overhead of double data entry when the channels should be the same.

The output port is for calibrating the I/Q input ports, although it can also be manually controlled.

There are two types of calibrations available: cable calibration and probe calibration. The cable calibration will guide the user through connecting each input port in turn. All ports must be calibrated together. The probe calibration is done for a specific channel (I or Q). If in Single-Ended mode, only the main port is calibrated. When in Differential Input mode, the user is guided through calibrating both main and complementary ports.

The front panel I/Q port LEDs indicate the current state of that port. On (green) indicates it is active, and off (dark) indicates it is not in use. For example, the Cal Out port LED is on if and only if there is signal coming out of that port.

The input is a context and some parameters have separate values for each context. The SCPI for these parameters has an optional "[:RF|IQ]" node. If the specific context is omitted, the command acts on the current input context's value. Here are the parameters that are input context sensitive:

- Center Frequency
- Trigger Source

It is important to distinguish between the I and Q input ports and the displayed I and Q data values. The I and Q input ports feed into a digital receiver that does digital tuning and filtering. The I and Q data seen by the user (either on the display or through SCPI) corresponds to the real ("I") and the imaginary ("Q") output from the digital receiver. When the input path is I+jQ or I Only and the center frequency is 0 Hz the I input ends up in as the real output from the receiver and appears as "I" data. Likewise, when the input path is I+jQ and the center frequency is 0 Hz, the Q input ends up as the imaginary output from the receiver and appears as "Q" data. However, when the input path is Q Only, the Q input is sent to the receiver as Q+j0, so the receiver output has the Q input coming out on the real output, and so in Q Only, the signal from the Q input port appears as the "I" data. Another situation where the I and Q data do not necessarily correspond directly to the I and Q inputs is when the center frequency is non-zero. The digital processing involved in the tuning is a complex operation. This will result in I Only data appearing as both "I" and "Q" data, the same as that signal would appear if seen through the RF input port.

Baseband I/Q Remote Language Compatibility

For the Keysight E4406A VSA Series Transmitter Tester, Option B7C provided baseband I/Q inputs. Code compatibility has been provided to allow many of the commands for option B7C to function properly with the X-Series. The X-Series has hardware differences and additional capabilities (e.g., E4406A does not have independent settings of I & Q nor does it provide for probe calibrations) which make 100% compatibility impossible.

The following commands are supported:

- :CALibration:IQ:FLATness
- :INPut:IMPedance:IQ U50|B50|U1M|B1M
- :INPut:IMPedance:REFerence <integer>

The [:SENSe]:FEED RF|IQ|IONLy|QONLy|AREFerence|IFALign command supports all parameters except IFALign. The FEED? query returns only RF|AIQ|AREF.

The following commands are **not** supported:

- :CALibration:GIQ
- :CALibration:IQ:CMR
- :INPut:IQ:ALIGn OFF|ON|0|1

The Rohde & Schwarz FSQ-B71 also provides baseband I/Q inputs. A certain amount of code compatibility is provided in the X-Series, however hardware differences make this a somewhat limited set.

Supported:

- The "<1|2>" is supported as "[1]".
- INPut<1|2>:IQ:BALanced[:STATe] ON | OFF
- INPut<1|2>:IQ:TYPE I | Q | IQ
- INPut<1|2>:IQ:IMPedance LOW | HIGH

Not Supported:

- INPut<1|2>:SELect AIQ | RF
- TRACe<1|2>:IQ:DATA:FORMat COMPatible | IQBLock | IQPair>
- TRACe<1|2>:IQ:DATA:MEMory? <offset samples>,<# of samples>
- TRACe<1|2>:IQ:DATA?
- TRACe<1|2>:IQ:SET <filter type>,<rbw>,<sample rate>,<trigger source>,<trigger slope>, <pretrigger samples>, <# of samples>
- TRACe<1|2>:IQ:SRATe 10.0kHz to 81.6MHz
- TRACe<1|2>:IQ[:STATe] ON|OFF

The Rohde & Schwarz FMU has the following SCPI, which is not supported (these commands start/abort the probe calibration procedure, which is manually interactive from the front panel):

- CALibration:ABORt
- CALibration:PROBe[:STARt]

I/Q Path

Selects which I/Q input channels are active. The LED next to each I/Q input port will be on when that port is active.

The analysis bandwidth for each channel is the same as that of the instrument. For example, the base N9020A has a bandwidth of 10 MHz. With I/Q input the I and Q channels would each have an analysis bandwidth of 10 MHz, giving 20 MHz of bandwidth when the I/Q Path is I+jQ. With option B25, the available bandwidth becomes 25 MHz, giving 25 MHz each to I and Q and 50 MHz to I+jQ.

I/Q voltage to power conversion processing is dependent on the I/Q Path selected.

- With I+jQ input we know that the input signal may not be symmetrical about 0 Hz, because it has a complex component. Therefore, above 0 Hz only the positive frequency information is displayed, and below 0 Hz only the negative frequency information is displayed.
- With all other Input Path selections, the input signal has no complex component and therefore is always symmetrical about 0 Hz. In this case, by convention, the power conversion shows the combined voltage for both the positive and negative frequencies. The information displayed below 0 Hz is the mirror of the information displayed above 0 Hz. This results in a power reading 6.02 dB higher (for both) than would be seen with only the positive frequency voltage. Note also that, in this case the real signal may have complex modulation embedded in it, but that must be recovered by further signal processing.

Key Path	Input/Output, I/Q
Remote Command	`[:SENSe]:FEED:IQ:TYPE IQ|IONLy|QONLy|INDependent` `[:SENSe]:FEED:IQ:TYPE?`
Example	Set the input to be both the I and Q channels, combined as I + j * Q. FEED:IQ:TYPE IQ
Notes	The Independent I and Q selection is only available in GPVSA
Preset	IQ
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	I+jQ | I Only | Q Only | Independent I and Q
Readback Text	I+jQ | I Only | Q Only | Ind I/Q
Initial S/W Revision	Prior to A.02.00

Remote Command	`:INPut[1]:IQ:TYPE IQ|I|Q` `:INPut[1]:IQ:TYPE?`
Notes	For R&S FSQ-B71 compatibility
Preset	IQ
Initial S/W Revision	Prior to A.02.00

I+jQ

Sets the signal input to be both the I and Q channels. The I and Q channel data will be combined as I + j * Q.

Key Path	Input/Output, I/Q, I/Q Path
Example	Set the input to be both the I and Q channels, combined as I + j * Q. FEED:IQ:TYPE IQ
Initial S/W Revision	Prior to A.02.00

I Only

Sets the signal input to be only the I channel. The Q channel will be ignored. The data collected is still complex. When the center frequency is 0 the imaginary part will always be zero, but for any other center frequency both the real and imaginary parts will be significant.

Key Path	Input/Output, I/Q, I/Q Path
Example	Set the input to be only the I channel. FEED:IQ:TYPE IONL
Initial S/W Revision	Prior to A.02.00

Q Only

Sets the signal input to be only the Q channel. The I channel will be ignored. The Q channel will be sent to the digital receiver block as Q+j0. The receiver's output is still complex. When the center frequency is 0 the imaginary part will always be zero, but for any other center frequency both the real and imaginary parts will be significant. Note that since the receiver's real output is displayed as the "I" data, when the center frequency is 0, the Q Only input appears as the "I" data.

Key Path	Input/Output, I/Q, I/Q Path
Example	Set the input to be only the Q channel. FEED:IQ:TYPE QONL
Initial S/W Revision	Prior to A.02.00

I Setup

Access the channel setup parameters for the I channel.

Key Path	Input/Output, I/Q
Initial S/W Revision	Prior to A.02.00

I Differential Input

Selects differential input on or off for the I channel. For differential input (also called balanced input), the analyzer uses both main and complementary ports. When differential input is off (also called single-ended or unbalanced input), the analyzer uses only the main port.

Key Path	Input/Output, I/Q, I Setup
Remote Command	`:INPut:IQ[:I]:DIFFerential OFF|ON|0|1` `:INPut:IQ[:I]:DIFFerential?`
Example	Put the I channel in Differential Input mode INP:IQ:DIFF ON

Notes	When I Differential Input = On, the analyzer will check for attenuation mismatches between the I and I-bar ports. If the difference in attenuation values exceeds 0.5 dB a Settings Alert error condition, error 159 will be set. When I Differential Input = On, and IQ Path is I+jQ, the Q Differential input must also be On. Similarly, when I Differential Input = Off, and IQ Path is I+jQ, the Q Differential input must also be Off. If the states of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Differential.
Couplings	Some active probes include built-in differential capability. When one of these probes is sensed, this key is disabled. Since the differential capability is handled in the probe, the Analyzer will use only the main port and the key will show that the Analyzer's Differential Input mode is Off (indicating that the complementary port is not in use). When Q Same as I is On, the value set for I will also be copied to Q.
Preset	Off
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	Off | On
Initial S/W Revision	Prior to A.02.00

Remote Command	`:INPut[1]:IQ:BALanced[:STATe] OFF|ON|0|1` `:INPut[1]:IQ:BALanced[:STATe]?`
Notes	For R&S FSQ-B71 compatibility, with no independent settings for the I and Q channels. Therefore, it is tied only to the I channel and does not provide an equivalent for the Q channel. For proper operation of the backwards compatibility command Q Same as I should be set to On.
Preset	OFF
Initial S/W Revision	Prior to A.02.00

I Input Z

Selects the input impedance for the I channel. The impedance applies to both the I and I-bar ports.

The input impedance controls the hardware signal path impedance match. It is not used for converting voltage to power. The voltage to power conversion always uses the Reference Z parameter. The Reference Z parameter applies to both I and Q channels.

Key Path	Input/Output, I/Q, I Setup
Remote Command	`:INPut[1]:IQ[:I]:IMPedance LOW|HIGH` `:INPut[1]:IQ[:I]:IMPedance?`
Example	Set the I channel input impedance to 1 MΩ INP:IQ:IMP HIGH
Notes	LOW = 50 Ω, HIGH = 1 MΩ

	When IQ Path is I+jQ, the I Input Z setting must be the same as the Q Input Z setting. If the settings of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Input Z.
Couplings	Input impedance is a built-in characteristic of a probe. Therefore, whenever a probe is sensed, this key is disabled and the value is set to match the probe. When no probe is sensed on Q and Q Same as I is On, the value set for I will also be copied to Q.
Preset	LOW
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	50 Ω | 1 MΩ
Initial S/W Revision	Prior to A.02.00

I Skew

Sets the skew factor for the I channel. The skew will shift the channel's data in time. Use this to compensate for differences in the electrical lengths of the input paths due to cabling.

Key Path	Input/Output, I/Q, I Setup
Remote Command	`[:SENSe]:CORRection:IQ[:I]:SKEW <seconds>` `[:SENSe]:CORRection:IQ[:I]:SKEW?`
Example	Delay the data for the I channel by 10 ns. CORR:IQ:SKEW 10 ns
Preset	0
State Saved	Yes This is unaffected by Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	0 s to 100 ns
Min	0 s
Max	+100 ns
Initial S/W Revision	Prior to A.02.00

I Probe

Access the probe setup parameters for the I channel. See "I/Q Probe Setup" on page 640.

Key Path	Input/Output, I/Q, I Setup
State Saved	No
Readback Text	[<I port probe id>] This is reporting the type of probe sensed on the I port. There is no parameter for overriding what is

	sensed.
Initial S/W Revision	Prior to A.02.00

Attenuation

The attenuation is part of the calibration data stored with the probe type and is initially the value that was returned by the last calibration. You can modify this value and any changes will be stored with the calibration data and will survive power cycles and presets. When a probe calibration is performed the attenuation value will be overwritten by the calibration.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	`[:SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio <real>` `[:SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio?`
Example	Set the attenuation for the current I probe to 100.00:1. CORR:IQ:I:ATT:RAT 100
Notes	Each probe type has its own attenuation setting. As probes are changed the attenuation value will reflect the new probe's setting. Changing the attenuation affects only the current probe type's setting and leaves all others unchanged. When the IQ Path is I+jQ, the Q probe attenuation setting must match the I Probe attenuation setting within 1 dB. If this is not the case, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Attenuation.
Preset	Each probe type has its own default. The default for the "Unknown" probe type is 1:1.
State Saved	Saved with probe calibration data. It survives a power cycle and is not affected by a Preset or Restore.
Range	0.001 to 10000
Min	0.001
Max	10000
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:CORRection:IQ:I|Q:ATTenuation <rel_ampl>` `[:SENSe]:CORRection:IQ:I|Q:ATTenuation?`
Example	Set the attenuation for the current I probe type to 100.00:1. CORR:IQ:I:ATT 20 dB
Range	–60 dB to +80 dB
Min	–60 dB
Max	+80 dB
Initial S/W Revision	Prior to A.02.00

Calibrate

Invokes the guided probe calibration. The guided probe calibration is context sensitive and depends on the channel (I or Q) and the Differential Input state. The calibration is only performed on the selected channel. When Differential Input is on, both the probe attached to the main port and the probe attached to the complementary port are calibrated. When Differential Input is off, only the probe attached to the main port is calibrated. See "I/Q Guided Calibration" on page 688.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe, Coupling
Readback Text	The last calibration date, or if no calibration exists, "(empty)". Last: <cal date> <cal time> Example: Last: 8/22/2007 1:02:49 PM
Initial S/W Revision	Prior to A.02.00

Clear Calibration

Clears the calibration data for the current port and probe. It does not clear the data for other probe types or other ports. If the sensed probe has EEPROM identification, only the data for that specific probe is cleared. After this command has completed, the probe calibration state will be the same as if no probe calibration had ever been performed for the specified channel and probe. The probe attenuation will be the default value for that probe type and the Cable Calibration frequency response corrections will be used. This command is dependent on the Differential Input state. When Differential Input is on, both the data for the probe attached to the main port and the data for the probe attached to the complementary port are cleared. When Differential Input is off, only data for the probe attached to the main port is cleared.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	`:CALibration:IQ:PROBe:I|Q:CLEar`
Example	Clear the calibration data for the I channel and the current probe (with EEPROM identification) or probe type (without EEPROM identification). :CAL:IQ:PROBe:I:CLE
Initial S/W Revision	Prior to A.02.00

Combined Differential/Input Z (Remote Command Only)

This is Remote Command only (no front panel) and is for backwards compatibility only. It combines the Differential Input and Input Z selections into a single SCPI command.

Remote Command	`:INPut:IMPedance:IQ U50|B50|U1M|B1M` `:INPut:IMPedance:IQ?`
Example	:INPut:IMPedance:IQ U50 This is equivalent to the following two SCPI commands:

	:INP:IQ:DIFF OFF :INP:IQ:IMP 50
Notes	Provided for E4406A code compatibility. The enum values translate as follows: U50: Differential Input = Off, Input Z = 50Ω B50: Differential Input = On, Input Z = 50Ω U1M: Differential Input = Off, Input Z = 1 MΩ B1M: Differential Input = On, Input Z = 1 MΩ This command is for backwards compatibility. It combines the Input Z (50Ω or 1 MΩ) parameter with the Differential Input (Off = "Unbalanced", On = "Balanced") parameter into a single enumeration. This backwards compatibility SCPI command was for an instrument without independent settings for the I and Q channels. Therefore, it is tied only to the I channel and does not provide an equivalent for the Q channel. For proper operation of the backwards compatibility command Q Same as I should be set to On. Also, note the subtle difference between this SCPI command and the backwards compatibility command for Input Z. The Input Z SCPI has "IQ" before "IMP" while this command has that order reversed.
Couplings	This command does not have an independent parameter, but instead is tied to the Differential Input and Input Z parameters. The coupling for those parameters apply to this command too.
Preset	U50
Initial S/W Revision	Prior to A.02.00

Q Setup

Access the channel setup parameters for the Q channel.

Key Path	Input/Output, I/Q
Readback Text	When Q Same as I is On the readback is "Q Same as I".
Initial S/W Revision	Prior to A.02.00

Q Same as I

Many, but not all, usages require the I and Q channels have an identical setup. To simplify channel setup, the Q Same as I will cause the Q channel parameters to be mirrored from the I channel. That way you only need to set up one channel (the I channel). The I channel values are copied to the Q channel, so at the time Q Same as I is turned off the I and Q channel setups will be identical. This does not apply to Probe settings or to parameters that are determined by the probe.

Key Path	Input/Output, I/Q, Q Setup
Remote Command	`:INPut:IQ:MIRRored OFF|ON|0|1` `:INPut:IQ:MIRRored?`

Example	Turn off the mirroring of parameters from I to Q. INP:IQ:MIRR OFF
Couplings	Only displayed for the Q channel. When Yes, the I channel values for some parameters are mirrored (copied) to the Q channel. However, when a parameter is determined by the type of probe and a probe is sensed, the probe setting is always used and the I channel setting is ignored. The following parameters are mirrored: Differential Input (when not determined by probe) Input Z (when not determined by probe)
Preset	This is unaffected by a Preset but is set to the default value (Q Same as I set to "On") on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state.
Range	On | Off
Readback Text	"Q Same as I" when On, otherwise none.
Initial S/W Revision	Prior to A.02.00

Q Differential Input

Selects differential input on or off for the Q channel. For differential input (also called balanced input), the analyzer uses both the Q and Q-bar ports. When differential input is off (also called single-ended or unbalanced input), the analyzer uses only the Q port.

Key Path	Input/Output, I/Q, Q Setup
Remote Command	`:INPut:IQ:Q:DIFFerential OFF|ON|0|1` `:INPut:IQ:Q:DIFFerential?`
Example	Put the Q channel in Differential Input mode INP:IQ:Q:DIFF ON
Notes	When Differential Input = On, the analyzer will check for attenuation mismatches between the Q and Q-bar ports. If the difference in attenuation values exceeds 0.5 dB a Settings Alert error condition, error 159 will be set. When Q Differential Input = On, and IQ Path is I+jQ, the I Differential input must also be On. Similarly, when Q Differential Input = Off, and IQ Path is I+jQ, the I Differential input must also be Off. If the states of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Differential.
Couplings	Some active probes include built-in differential capability. When one of these probes is sensed, this key is disabled. Since the differential capability is handled in the probe, the Analyzer will use only the main port and the key will show that the Analyzer's Differential Input mode is Off (indicating that the complementary port not in use). When a differential probe is not sensed and Q Same as I is On, the value set for I will be copied to Q. This key is disabled when Q Same as I is On.
Preset	Off
State Saved	On This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"

Range	Off | On
Initial S/W Revision	Prior to A.02.00

Q Input Z

Selects the input impedance for the Q channel. The impedance applies to both the Q and Q-bar ports.

The input impedance controls the hardware signal path impedance match. It is not used for converting voltage to power. The voltage to power conversion always uses the Reference Z parameter. The Reference Z parameter applies to both I and Q channels.

Key Path	Input/Output, I/Q, Q Setup
Remote Command	`:INPut[1]:IQ:Q:IMPedance LOW|HIGH` `:INPut[1]:IQ:Q:IMPedance?`
Example	Set the Q channel input impedance to 1 MΩ INP:IQ:Q:IMP HIGH
Notes	LOW = 50 Ω, HIGH = 1 MΩ When IQ Path is I+jQ, the I Input Z setting must be the same as the Q Input Z setting. If the settings of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Input Z.
Couplings	Input impedance is a built-in characteristic of a probe. Therefore, whenever a probe is sensed, this key is disabled and the value is set to match the probe. When no probe is sensed and Q Same as I is On, the value set for I will also be copied to Q. This key is disabled when Q Same as I is On.
Preset	LOW
State Saved	On This is unaffected by Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	50 Ω | 1 MΩ
Initial S/W Revision	Prior to A.02.00

Q Skew

Sets the skew factor for the Q channel. The skew will shift the channel's data in time. Use this to compensate for differences in the electrical lengths of the input paths due to cabling and probes.

Key Path	Input/Output, I/Q, Q Setup
Remote Command	`[:SENSe]:CORRection:IQ:Q:SKEW <seconds>` `[:SENSe]:CORRection:IQ:Q:SKEW?`
Example	Delay the data for the Q channel by 10 ns. CORR:IQ:Q:SKEW 10 ns

Preset	0
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	0 s to 100 ns
Min	0 s
Max	+100 ns
Initial S/W Revision	Prior to A.02.00

Q Probe

Accesses the probe setup parameters for the Q channel. See "I/Q Probe Setup" on page 640.

Key Path	Input/Output, I/Q, Q Setup
State Saved	No
Readback Text	[<Q port probe id>] This is reporting the type of probe sensed on the Q port. There is no parameter for overriding what is sensed.
Initial S/W Revision	Prior to A.02.00

Attenuation

The attenuation is part of the calibration data stored with the probe type and is initially the value that was returned by the last calibration. You can modify this value and any changes will be stored with the calibration data and will survive power cycles and presets. When a probe calibration is performed the attenuation value will be overwritten by the calibration.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	`[:SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio <real>` `[:SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio?`
Example	Set the attenuation for the current I probe to 100.00:1. CORR:IQ:I:ATT:RAT 100
Notes	Each probe type has its own attenuation setting. As probes are changed the attenuation value will reflect the new probe's setting. Changing the attenuation affects only the current probe type's setting and leaves all others unchanged. When the IQ Path is I+jQ, the Q probe attenuation setting must match the I Probe attenuation setting within 1 dB. If this is not the case, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Attenuation.
Preset	Each probe type has its own default. The default for the "Unknown" probe type is 1:1.
State Saved	Saved with probe calibration data. It survives a power cycle and is not affected by a Preset or Restore.

Range	0.001 to 10000
Min	0.001
Max	10000
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:CORRection:IQ:I|Q:ATTenuation <rel_ampl>` `[:SENSe]:CORRection:IQ:I|Q:ATTenuation?`
Example	Set the attenuation for the current I probe type to 100.00:1. CORR:IQ:I:ATT 20 dB
Range	–60 dB to +80 dB
Min	–60 dB
Max	+80 dB
Initial S/W Revision	Prior to A.02.00

Calibrate

Invokes the guided probe calibration. The guided probe calibration is context sensitive and depends on the channel (I or Q) and the Differential Input state. The calibration is only performed on the selected channel. When Differential Input is on, both the probe attached to the main port and the probe attached to the complementary port are calibrated. When Differential Input is off, only the probe attached to the main port is calibrated. See "I/Q Guided Calibration" on page 688.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe, Coupling
Readback Text	The last calibration date, or if no calibration exists, "(empty)". Last: <cal date> <cal time> Example: Last: 8/22/2007 1:02:49 PM
Initial S/W Revision	Prior to A.02.00

Next

Perform the Q port calibration.

Key Path	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
Remote Command	`:CALibration:IQ:PROBe:Q`
Example	CAL:IQ:PROB:Q
Notes	The Q port must be connected to the Cal Out port before issuing the SCPI command.

	The calibration data is saved as soon as the port is calibrated and will survive power cycles. It is not reset by any preset or restore data commands.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Clear Calibration

Clears the calibration data for the current port and probe. It does not clear the data for other probe types or other ports. If the sensed probe has EEPROM identification, only the data for that specific probe is cleared. After this command has completed, the probe calibration state will be the same as if no probe calibration had ever been performed for the specified channel and probe. The probe attenuation will be the default value for that probe type and the Cable Calibration frequency response corrections will be used. This command is dependent on the Differential Input state. When Differential Input is on, both the data for the probe attached to the main port and the data for the probe attached to the complementary port are cleared. When Differential Input is off, only data for the probe attached to the main port is cleared.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	`:CALibration:IQ:PROBe:I|Q:CLEar`
Example	Clear the calibration data for the I channel and the current probe (with EEPROM identification) or probe type (without EEPROM identification). :CAL:IQ:PROBe:I:CLE
Initial S/W Revision	Prior to A.02.00

Reference Z

Sets the value of the impedance to be used in converting voltage to power for the I and Q channels. This does not change the hardware's path impedance (see "I Input Z" on page 629).

Key Path	Input/Output, I/Q
Remote Command	`:INPut:IMPedance:REFerence <integer>` `:INPut:IMPedance:REFerence?`
Example	Set the I/Q reference impedance to 50 Ω INP:IMP:REF 50
Preset	50 Ω
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	1 Ω to 1 MΩ
Min	1 Ω
Max	1 MΩ
Initial S/W Revision	Prior to A.02.00

I/Q Cable Calibrate...

The I/Q cable calibration creates correction data for each of the front panel I/Q ports. This calibration data is used whenever no probe specific calibration data is available. It is important that all ports are calibrated using the same short BNC cable so that the data is comparable from port to port.

The guided calibration (front panel only) will show connection diagrams and guide you through the isolation calibration and calibrating each port. The calibration data for each port is stored separately, so as soon as a port is calibrated that data is saved and will be used. If you press "Exit" to exit the calibration process, the data for the ports already completed will still be used. It is recommended that a calibration be completed once started, or if exited, that it be properly done before the next use of the I/Q ports. The "Next" button will perform the calibration for the current port and then proceed to the next step in the calibration procedure. The "Back" button will return to the prior port in the procedure. Both keys and dialog buttons are supplied for ease of use. The dialog buttons are for mouse use and the softkeys for front panel use.

The calibration can also be done via SCPI, but no connection diagrams will be shown. You will have to make the correct connections before issuing each port calibration command. Again, it is recommended that all ports be calibrated at the same time.

The instrument state remains as it was prior to entering the calibration procedure except while a port is actually being calibrated. Once a port is calibrated it returns to the prior state. A port calibration is in process only from the time the "Next" button is pressed until the next screen is shown. For SCPI, this corresponds to the time from issuing the CAL:IQ:FLAT:I|IB|Q|QB command until the operation is complete.

For example, if the prior instrument state is Cal Out = Off, Input = I+jQ, and Differential = Off, then up until the time the "Next" button is pressed the I Input and Q Input LEDs are on and the Cal Out, I-bar Input and Q-bar Input LEDs are off. Once the "Next" button is pressed for the I port calibration, only the Cal Out and I Input LEDs will be on and the others will be off. When the screen progresses to the next step ("Next" button again enabled), the prior state is restored and only the I Input and Q Input LEDs are on (Cal Out is off again).

The last calibration date and time for each port will be displayed. Any calibrations that are more than a day older than the most recent calibration will be displayed with the color amber.

Key Path	Input/Output, I/Q
Initial S/W Revision	Prior to A.02.00

Next

Perform the I/Q Isolation calibration.

Key Path	Input/Output, I/Q, I/Q Cable Calibration
Remote Command	`:CALibration:IQ:ISOLation`
Example	CAL:IQ:ISOL
Notes	All front panel I/Q ports must not be connected to anything.
Notes	All cables and probes should be disconnected from the I/Q ports before issuing the SCPI command.
State Saved	No.
Initial S/W Revision	Prior to A.02.00

Exit

Exits the calibration procedure. All ports calibrated before pressing Exit will use the newly acquired calibration data.

Key Path	Input/Output, I/Q, I/Q Cable Calibration
Notes	Using the Exit button does not restore the calibration data to the state prior to entering the guided calibration. Once a port is calibrated the data is stored immediately and the only way to change it is to redo the calibration step. When the calibration may be left in an inconsistent state, a confirmation dialog is displayed (see "Exit Confirmation" on page 640).
Initial S/W Revision	Prior to A.02.00

Exit Confirmation

When Exit is pressed during one of the calibration routines, the calibration may be in an inconsistent state, with some of the ports having newly measured calibration data and others with old data. If this is the case, a dialog box appears, to confirm that you really want to exit.

- A "Yes" answer exits the calibration procedure, leaving potentially inconsistent calibration data in place.
- A "No" answer returns you to the calibration procedure.

I/Q Probe Setup

The set of I/Q probe setup parameters will change based on the type of probe that is sensed. All probe types have the Attenuation parameter, and all probe types can be calibrated. The remaining parameters are only available for some probe types and will not be shown when not available. The probe type is determined by and reported for only for the I and Q ports, never the I-bar or Q-bar ports. The menu title will be "<ch>: <probe id>", where "<ch>" is either "I" or "Q" and "<probe id>" is the type of probe. For example, for the I Probe setup with a Keysight 1130A probe connected to the I port, the title will be "I: 1130A".

Probe calibration data is stored for each probe type for each channel. When no probe is sensed, the probe type "Unknown" is used, and this is also treated like a probe type with its own calibration data. When a probe is changed, the calibration data for that probe type for that port is restored. An advisory message will be displayed showing the new probe type and the calibration status. The calibration data is stored permanently (survives a power cycle) and is not affected by a Preset or any of the Restore commands. When the probe has EEPROM identification (most newer Keysight probes have this), the calibration data is stored by probe serial number and port, so if you have two probes of the same type, the correct calibration data will be used for each. For probes that do not have EEPROM identification, the calibration data is stored by probe type and port and the instrument cannot distinguish between different probes of the same type. In all cases (with or without EEPROM identification), the calibration data is port specific, so it will not follow a specific probe from port to port if the probe is moved.

The "Unknown" probe type is used whenever no probe is sensed. When no calibration data exists for "Unknown" the latest cable calibration data is used (see Section "I/Q Guided Calibration" on page 688).

Attenuation

The attenuation is part of the calibration data stored with the probe type and is initially the value that was returned by the last calibration. You can modify this value and any changes will be stored with the calibration data and will survive power cycles and presets. When a probe calibration is performed the attenuation value will be overwritten by the calibration.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	`[:SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio <real>` `[:SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio?`
Example	Set the attenuation for the current I probe to 100.00:1. CORR:IQ:I:ATT:RAT 100
Notes	Each probe type has its own attenuation setting. As probes are changed the attenuation value will reflect the new probe's setting. Changing the attenuation affects only the current probe type's setting and leaves all others unchanged. When the IQ Path is I+jQ, the Q probe attenuation setting must match the I Probe attenuation setting within 1 dB. If this is not the case, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Attenuation.
Preset	Each probe type has its own default. The default for the "Unknown" probe type is 1:1.
State Saved	Saved with probe calibration data. It survives a power cycle and is not affected by a Preset or Restore.
Range	0.001 to 10000
Min	0.001
Max	10000
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:CORRection:IQ:I|Q:ATTenuation <rel_ampl>` `[:SENSe]:CORRection:IQ:I|Q:ATTenuation?`
Example	Set the attenuation for the current I probe type to 100.00:1. CORR:IQ:I:ATT 20 dB
Range	–60 dB to +80 dB
Min	–60 dB
Max	+80 dB
Initial S/W Revision	Prior to A.02.00

Offset

Some active probes have DC offset capability. When one of these probes is connected this control will be visible. The signal is adjusted for the DC offset before entering the analyzer's port. This allows for removal of a DC offset before reaching the analyzer's input port voltage limits. For example, a signal that varies 1 V peak-to-peak with a DC offset equal to the analyzer's max input voltage would exceed the input limits of the analyzer for half its cycle. Removing the DC offset allows the analyzer to correctly process the entire signal.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	`:INPut:OFFSet:I|Q <voltage>` `:INPut:OFFSet:I|Q?`
Example	Remove a DC offset of –0.5 V from the I channel input. INP:OFFS:I –0.5
Notes	Only some probe types support Offset. For those that do, each probe type has its own Offset setting. As probes are changed the Offset value will reflect the new probe's setting. Changing the Offset affects only the current probe type's setting and leaves all others unchanged.
Preset	0 V
State Saved	Saved with probe calibration data. It survives power cycle and is not affected by Preset or Restore.
Range	–18 V to +18 V
Min	–18 V
Max	+18 V
Initial S/W Revision	Prior to A.02.00

Coupling

Some probe types allow coupling to reject low frequencies. This will filter out the DC component of a signal that is composed of a DC bias plus some AC signal. This control is visible only for probe types that have this capability.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	`:INPut:COUPling:I|Q DC|LFR1|LFR2` `:INPut:COUPling:I|Q?`
Example	Set the probe to low frequency rejection below 1.7 Hz. INP:COUP:I LFR1
Notes	Only some probe types support Coupling. For those that do, each probe type has its own Coupling setting. As probes are changed the Coupling value will reflect the new probe's setting. Changing the Coupling affects only the current probe type's setting and leaves all others unchanged.
Preset	DC
State Saved	Saved with probe calibration data. It survives a power cycle and is not affected by a Preset or Restore.
Range	DC | AC 1.7 Hz LFR1 | AC 0.14 Hz LFR2
Readback Text	DC | LFR1 | LFR2
Initial S/W Revision	Prior to A.02.00

DC

Turns off low frequency rejection, allowing signals down to DC.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe, Coupling
Example	Turn off low frequency rejection on the I channel INP:COUP:I DC
Initial S/W Revision	Prior to A.02.00

LFR1

Turns on low frequency rejection, rejecting signal component lower than 1.7 Hz.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe, Coupling
Example	Turn on low frequency rejection on the I channel for frequencies lower than 1.7 Hz INP:COUP:I LFR1
Initial S/W Revision	Prior to A.02.00

LFR2

Turns on low frequency rejection, rejecting signal component lower than 0.14 Hz.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe, Coupling
Example	Turn on low frequency rejection on the I channel for frequencies lower than 0.14 Hz INP:COUP:I LFR2
Initial S/W Revision	Prior to A.02.00

Calibrate

Invokes the guided probe calibration. The guided probe calibration is context sensitive and depends on the channel (I or Q) and the Differential Input state. The calibration is only performed on the selected channel. When Differential Input is on, both the probe attached to the main port and the probe attached to the complementary port are calibrated. When Differential Input is off, only the probe attached to the main port is calibrated. See "I/Q Guided Calibration" on page 688.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe, Coupling
Readback Text	The last calibration date, or if no calibration exists, "(empty)". Last: <cal date> <cal time> Example: Last: 8/22/2007 1:02:49 PM
Initial S/W Revision	Prior to A.02.00

Clear Calibration

Clears the calibration data for the current port and probe. It does not clear the data for other probe types or other ports. If the sensed probe has EEPROM identification, only the data for that specific probe is cleared. After this command has completed, the probe calibration state will be the same as if no probe calibration had ever been performed for the specified channel and probe. The probe attenuation will be the default value for that probe type and the Cable Calibration frequency response corrections will be used. This command is dependent on the Differential Input state. When Differential Input is on, both the data for the probe attached to the main port and the data for the probe attached to the complementary port are cleared. When Differential Input is off, only data for the probe attached to the main port is cleared.

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	`:CALibration:IQ:PROBe:I|Q:CLEar`
Example	Clear the calibration data for the I channel and the current probe (with EEPROM identification) or probe type (without EEPROM identification). :CAL:IQ:PROBe:I:CLE
Initial S/W Revision	Prior to A.02.00

I/Q Cable Calibration Time (Remote Command Only)

Returns the last date and time that the I/Q Cable Calibration was performed for a specific port. This is a remote query command only.

Remote Command	`:CALibration:IQ:FLATness:I|IBAR|Q|QBAR:TIME?`
Example	:CAL:IQ:FLAT:I:TIME?
Notes	This returns 6 integer values: year, month, day, hour, minute, second. When no calibration has been performed, all values will be 0.
Initial S/W Revision	A.02.00

I/Q Probe Calibration Time (Remote Command Only)

Return the last date and time that the I/Q Probe Calibration was performed for a specific port. This is a remote query command only.

Remote Command	`:CALibration:IQ:PROBe:I|IBAR|Q|QBAR:TIME?`
Example	:CAL:IQ:PROB:I:TIME?
Notes	This returns 6 integer values: year, month, day, hour, minute, second. When no calibration has been performed, all values are 0. The value is specific to both the port and probe, so the value will change as probes are connected or disconnected.
Initial S/W Revision	A.02.00

RF Calibrator

Lets you choose a calibrator signal to look at or turns the calibrator "off".

Key Path	Input/Output
Remote Command	`[:SENSe]:FEED:AREFerence REF50|REF4800|OFF` `[:SENSe]:FEED:AREFerence?`
Example	FEED:AREF REF50 selects the 50 MHz amplitude reference as the signal input. FEED:AREF REF4800 selects the 4.8 GHz amplitude reference as the signal input FEED:AREF OFF turns the calibrator "off" (switches back to the selected input – RF or I/Q)
Dependencies	Selecting an input (RF or I/Q) turns the Calibrator OFF. This is true whether the input is selected by the keys or with the [:SENSe]:FEED command. The 4.8 GHz internal reference is only available in some models and frequency range options. If the 4.8 GHz reference is not present, the 4.8 GHz softkey will be blanked, and if the REF4800 parameter is sent, the analyzer will generate an error.
Couplings	When one of the calibrator signals is selected, the analyzer routes that signal (an internal amplitude reference) to the analyzer, and changes the main input selection to RF so the calibrator signal can be seen. When you turn the calibrator off it does not switch back to the previously selected input.
Preset	OFF
State Saved	Saved in instrument state
Readback	Off, 50 MHz, 4.8 GHz
Initial S/W Revision	Prior to A.02.00

Remote Command	`:CALibration:SOURce:STATe OFF|ON|0|1` `:CALibration:SOURce:STATe?`
Notes	For ESA backwards compatibility. In the ESA the calibrator was a separate output which you connected to the input and switched on with this command. In the X-Series, the ON parameter is aliased to the [SENSe]:FEED:AREF REF50 command and the OFF parameter is aliased to [SENSe]:FEED:AREF OFF. When CALibration:SOURce:STATe? is received, 1 will be returned if any of the references is selected and 0 if the Calibrator is "Off"
Preset	OFF
Initial S/W Revision	Prior to A.02.00

50 MHz

Selects the 50 MHz internal reference as the input signal.

Key Path	Input/Output, RF Calibrator
Example	:FEED:AREF REF50
Readback	50 MHz
Initial S/W Revision	Prior to A.02.00

4.8 GHz

Selects the 4.8 GHz internal reference as the input signal.

Key Path	Input/Output, RF Calibrator
Example	:FEED:AREF REF4800
Dependencies	The 4.8 GHz internal reference is only available in some models and frequency range options. If the 4.8 GHz reference is not present, the 4.8 GHz softkey will be blanked, and if the REF4800 parameter is sent, the analyzer will generate an error.
Readback	4.8 GHz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Off

Switches the input back to the selected input (RF or I/Q)

Key Path	Input/Output, RF Calibrator
Example	:FEED:AREF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

External Gain

Compensates for gain or loss in the measurement system outside the spectrum analyzer. The External Gain is subtracted from the amplitude readout (or the loss is added to the amplitude readout). So, the displayed signal level represents the signal level at the output of the device-under-test, which can be the input of an external device that provides gain or loss.

Entering an External Gain value does not affect the Reference Level, therefore the trace position on screen changes, as do all of the values represented by the trace data. Thus, the values of exported trace data, queried trace data, marker amplitudes, trace data used in calculations such as N dB points, trace math, peak threshold, etc., are all affected by External Gain. Changing the External Gain, even on a trace that is not updating, will immediately change all of the above, without new data needing to be taken.

NOTE

Changing the External Gain causes the analyzer to immediately stop the current sweep and prepare to begin a new sweep. The data will not change until the trace data updates because the offset is applied to the data as it is taken. If a trace is exported with a nonzero External Gain, the exported data will contain the trace data with the offset applied.

In the Spectrum Analyzer mode, a Preamp is the common external device providing gain or loss. In a measurement application mode like GSM or W-CDMA, the gain or loss could be from a BTS (Base Transceiver Station) or an MS (Mobile Station). So in the Spectrum Analyzer mode MS and BTS would be grayed out and the only choice would be Ext Preamp. Similarly in some of the digital communications applications, Ext Preamp will be grayed out and you would have a choice of MS or BTS.

Key Path	Input/Output
Couplings	The Ext Preamp, MS, and BS keys may be grayed out depending on which measurement is currently selected. If any of the grayed out keys are pressed, or the equivalent SCPI command is sent, an advisory message is generated.
Readback	1-of-N selection | [variable]
Initial S/W Revision	Prior to A.02.00

Ext Preamp

This function is similar to the reference level offset function. Both affect the displayed signal level. Ref Lvl Offset is a mathematical offset only, no analyzer configuration is affected. Ext Preamp gain is used when determining the auto-coupled value of the Attenuator. The External Gain value and the Maximum Mixer Level settings are both part of the automatic setting equation for the RF attenuation setting. (10 dB of Attenuation is added for every 10 dB of External Gain.)

Note that the Ref Lvl Offset and Maximum Mixer Level are described in the Amplitude section. They are reset by the instrument Preset. The External Preamp Gain is reset by the "Restore Input/Output Defaults" or "Restore System Defaults->All functions. . The External Gain is subtracted from the amplitude readout so that the displayed signal level represents the signal level at the output of the device-under-test, which is the input of the external device that is providing gain or loss.

Key Path	Input/Output, External Gain
Remote Command	`[:SENSe]:CORRection:SA[:RF]:GAIN <rel_ampl>` `[:SENSe]:CORRection:SA[:RF]:GAIN?`
Example	CORR:SA:GAIN 10 sets the Ext Gain value to 10 dB CORR:SA:GAIN –10 sets the Ext Gain value to –10 dB (that is, an attenuation of 10 dB)
Notes	Does not auto return.
Dependencies	The reference level limits are determined in part by the External Gain/Atten, Max Mixer Level, and RF Atten. This key is grayed out in Modes that do not support External Gain
Preset	This is unaffected by Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Min	–120 dB
Max	120 dB
Readback	Preamp Gain, <Ext Gain value> dB
Backwards Compatibility SCPI	`[:SENSe]:CORRection:OFFSet[:MAGNitude]` The legacy "Ext Preamp Gain" key is now called "Ext Gain" and the sub-menu has choices of Ext Preamp | MS | BTS for backwards compatibility.
Initial S/W Revision	Prior to A.02.00

MS

Sets an external gain/attenuation value for MS (Mobile Station) tests.

Key Path	Input/Output, External Gain
Remote Command	`[:SENSe]:CORRection:MS[:RF]:GAIN <rel_ampl>` `[:SENSe]:CORRection:MS[:RF]:GAIN?`
Example	CORR:MS:GAIN 10 sets the Ext Gain value to 10 dB CORR:MS:GAIN –10 sets the Ext Gain value to –10 dB (that is, a loss of 10 dB.)
Notes	Does not auto return.
Dependencies	The reference level limits are determined in part by the External Gain, Max Mixer Level, RF Atten This key is grayed out in modes that do not support MS.
Preset	This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state.
Min	–100 dB
Max	100 dB
Readback	MS, <Ext Gain value> dB
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:CORRection:MS[:RF]:LOSS <rel_ampl>` `[:SENSe]:CORRection:MS[:RF]:LOSS?`
Example	CORR:MS:LOSS 10 sets the Ext Gain value to –10 dB, and subsequently querying :LOSS will give 10 dB CORR:MS:LOSS –10 sets the Ext Gain value to 10 dB, and subsequently querying :LOSS will give –10 dB
Notes	A positive value of <rel_ampl> in the above command means a loss and a negative value indicates a gain. Anytime :LOSS is set it sets :GAIN to the negative value of the parameter sent. Anytime :LOSS is queried it gives the negative of :GAIN
Preset	This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Min	100 dB
Max	–100 dB
Initial S/W Revision	Prior to A.02.00

BTS

Sets an external attenuation value for BTS (Base Transceiver Station) tests.

Key Path	Input/Output, External Gain
Remote Command	`[:SENSe]:CORRection:BTS[:RF]:GAIN <rel_ampl>` `[:SENSe]:CORRection:BTS[:RF]:GAIN?`
Example	CORR:BTS:GAIN 10 sets the Ext Gain value to 10 dB CORR:BTS:GAIN –10 sets the Ext Gain value to –10 dB (that is, a loss of 10 dB.)
Notes	Does not auto return.
Dependencies	The reference level limits are determined in part by the External Gain, Max Mixer Level, RF Atten This key is grayed out in modes that do not support BTS.
Preset	This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state.
Min	–100 dB
Max	100 dB
Readback	BTS, <Ext Gain value> dB
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:CORRection:BTS[:RF]:LOSS <rel_ampl>` `[:SENSe]:CORRection:BTS[:RF]:LOSS?`
Example	CORR:BTS:LOSS 10 sets the Ext Gain value to –10 dB, and subsequently querying :LOSS will give 10 dB CORR:BTS:LOSS –10 sets the Ext Gain value to 10 dB, and subsequently querying :LOSS will give –10 dB
Notes	A positive value of <rel_ampl> in the above command means a loss and a negative value indicates a gain. Anytime :LOSS is set it sets :GAIN to the negative value of the parameter sent. Anytime :LOSS is queried it gives the negative of :GAIN
Preset	This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Min	100 dB
Max	–100 dB
Initial S/W Revision	Prior to A.02.00

I Ext Gain

This function affects only the I channel input, except when the Input Path is I+jQ. In I+jQ this setting is applied to both I and Q channel inputs. It is not available unless the Baseband I/Q option (BBA) is installed.

Key Path	Input/Output, External Gain
Remote Command	`[:SENSe]:CORRection:IQ:I:GAIN <rel_ampl>` `[:SENSe]:CORRection:IQ:I:GAIN?`
Example	Set the I Ext Gain to 10 dB CORR:IQ:I:GAIN 10 Set the I Ext Gain to –10 dB (that is, a loss of 10 dB.) CORR:IQ:I:GAIN –10
Notes	Not available unless option BBA is installed
Preset	0 dB This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state.
Min	–100 dB
Max	100 dB
Readback Text	I Gain, <I Ext Gain> dB
Initial S/W Revision	Prior to A.02.00

Q Ext Gain

This function affects only the Q channel input and only when the Input Path is not I+jQ. It is not available unless the Baseband I/Q option (BBA) is installed.

Key Path	Input/Output, External Gain
Remote Command	`[:SENSe]:CORRection:IQ:Q:GAIN <rel_ampl>` `[:SENSe]:CORRection:IQ:Q:GAIN?`
Example	Set the Q Ext Gain to 10 dB CORR:IQ:Q:GAIN 10 Set the Q Ext Gain to –10 dB (that is, a loss of 10 dB.) CORR:IQ:Q:GAIN –10
Notes	Not available unless option BBA is installed.
Preset	0 dB This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state.
Min	–100 dB
Max	100 dB

Readback Text	Q Gain, <I Ext Gain> dB
Initial S/W Revision	Prior to A.02.00

Restore Input/Output Defaults

This selection causes the group of settings and data associated with the Input/Output key to be a reset to their default values. In addition, when a Source is installed, licensed and selected, Restore Input/Output defaults will initiate a Source Preset.

This level of Restore System Defaults does not affect any other system settings or mode settings and does not cause a mode switch. All the features described in this section are reset using this key, including Input Corrections and Data (described in the Corrections section).

Key Path	Input/Output
Example	:SYST:DEF INP presets all the Input/Output variables to their factory default values.
Notes	Refer to the Utility Functions for information about Restore System Defaults and the complete description of the :SYSTem:DEFault INPut: command.
Initial S/W Revision	Prior to A.02.00

Corrections

This key accesses the Amplitude Corrections menu.

Amplitude Corrections arrays can be entered, sent over SCPI, or loaded from a file. They allow you to correct the response of the analyzer for various use cases. The X-series supports four separate Corrections arrays, each of which can contain up to 2000 points. They can be turned on and off individually and any or all can be on at the same time.

Trace data is in absolute units and corrections data is in relative units, but we want to be able to display trace data at the same time as corrections data. Therefore we establish a reference line to be used while building or editing a Corrections table. The reference line is halfway up the display and represents 0 dB of correction. It is labeled “0 dB CORREC”. It is drawn in blue.

Corrections data is always in dB. Whatever dB value appears in the correction table represents the correction to be applied to that trace at that frequency. So if a table entry shows 30 dB that means we ADD 30 dB to each trace to correct it before displaying it.

In zero span, where the frequency is always the center frequency of the analyzer, we apply the (interpolated) correction for the center frequency to all points in the trace. In the event where there are two correction amplitudes at the center frequency, we apply the first one in the table.

Note that the corrections are applied as the data is taken; therefore, a trace in View (Update Off) will not be affected by changes made to the corrections table after the trace is put in View.

Key Path	Input/Output, Corrections
Mode	SA, DVB-T/H, DTMB, SEQAN, TDSCDMA
Dependencies	This key will only appear if you have the proper option installed in your instrument. Amplitude correction may not be available in all modes; if a mode does not support amplitude correction, the Corrections key should be blanked while in that mode. If an application supports corrections but the current measurement does not, then the key should be grayed out in that measurement
Preset	Corrections arrays are reset (deleted) by Restore Input/Output Defaults. They survive shutdown and restarting of the analyzer application, which means they will survive a power cycle.
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.

Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Correction On/Off

Turning the Selected Correction on allows the values in it to be applied to the data. This also automatically turns on "Apply Corrections" (sets it to ON), otherwise the correction would not take effect.

A new sweep is initiated if an amplitude correction is switched on or off. Note that changing, sending or loading corrections data does NOT directly initiate a sweep, however in general these operations will turn corrections on, which DOES initiate a sweep.

Key Path	Input/Output, Corrections
Remote Command	`[:SENSe]:CORRection:CSET[1]|2|...6[:STATe] ON|OFF|1|0` `[:SENSe]:CORRection:CSET[1]|2|...6[:STATe]?`
Example	SENS:CORR:CSET1 ON
Dependencies	Turning this on automatically turns on "Apply Corrections" Only the first correction array (Correction 1) supports antenna units. When this array is turned on, and it contains an Antenna Unit other than “None”, the Y Axis Unit of the analyzer is forced to that Antenna Unit. All other Y Axis Unit choices are grayed out. Note that this means that a correction file with an Antenna Unit can only be loaded into the Corrections 1 register. Consequently only for Correction 1 does the dropdown in the Recall dialog include.ant, and if an attempt is made to load a correction file into any other Correction register which DOES contain an antenna unit, a Mass Storage error is generated. This command will generate an “Option not available” error unless you have the proper option installed in your instrument.
Preset	Not affected by a Preset. Set to OFF by Restore Input/Output Defaults
State Saved	Saved in instrument state.
Backwards Compatibility	Unlike legacy analyzers, Preset does not turn Corrections off (Restore Input/Output Defaults does).

Notes	
Initial S/W Revision	A.02.00

Properties

Accesses a menu that lets you set the properties of the selected correction.

Key Path	Input/Output, Corrections
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults

Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1|Correction 2|Correction 3|Correction 4|Correction 5|Correction 6
Initial S/W Revision	A.02.00

Antenna Unit

For devices (like antennas) that make measurements of field strength or flux density, the correction array should contain within its values the appropriate conversion factors such that, when the data on the analyzer is presented in dBµV, the display is calibrated in the appropriate units. The "Antenna Unit" used for the conversion is contained within the corrections array database. It may be specifiedor loaded in from an external file or SCPI.

When an array with an Antenna Unit other than "None" is turned on, the Y Axis Unit of the analyzer is forced to that unit. When this array is turned on, and it contains an Antenna Unit other than “None”, the Y Axis Unit of the analyzer is forced to that Antenna Unit., and all other Y Axis Unit choices are grayed out.

Antenna Unit does not appear in all Modes that support Corrections. Only the modes listed in the Mode row of the table below support Antenna Units.

Key Path	Input/Output, Corrections, Properties
Mode	SA
Remote Command	`[:SENSe]:CORRection:CSET[1]:ANTenna[:UNIT] GAUSs | PTESla | UVM | UAM | UA | NOConversion` `[:SENSe]:CORRection:CSET[1]:ANTenna[:UNIT]?`
Example	CORR:CSET:ANT GAUS
Dependencies	Only the first correction array (Correction 1) supports antenna units. Note that this means that a correction file with an Antenna Unit can only be loaded into the Corrections 1 register. Consequently only for Correction 1 does the dropdown in the Recall dialog include.ant, and if an attempt is made to load a correction file into any other Correction register which DOES contain an antenna unit, a Mass Storage error is generated.

Preset	Unaffected by Preset. Set to NOC by Restore Input/Output Defaults
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

None

Selects no antenna unit for this Correction set. Thus no Y Axis unit will be forced.

Key Path	Input/Output, Corrections, Properties, Antenna Unit
Example	:CORR:CSET:ANT NOC
Readback	"None"
Initial S/W Revision	A.02.00

dBµV/m

Sets the antenna unit to dBµV/m. If this correction is turned on, and Apply Corrections is on, the Y Axis Unit will then be forced to dBµV/m and all other Y Axis Unit selections will be grayed out.

Key Path	Input/Output, Corrections, Properties, Antenna Unit
Example	:CORR:CSET:ANT UVM
Readback	"dBµV/m"
Initial S/W Revision	A.02.00

dBµA/m

Sets the antenna unit to dBµA/m. If this correction is turned on, and Apply Corrections is on, the Y Axis Unit will then be forced to dBµA/m and all other Y Axis Unit selections will be grayed out.

Key Path	Input/Output, Corrections, Properties, Antenna Unit
Example	:CORR:CSET:ANT UVA
Readback	" dBµA/m"
Initial S/W Revision	A.02.00

dBpT

Sets the antenna unit to dBpT. If this correction is turned on, and Apply Corrections is on, the Y Axis Unit will then be forced to dBpT and all other Y Axis Unit selections will be grayed out.

Key Path	Input/Output, Corrections, Properties, Antenna Unit
Example	:CORR:CSET:ANT PTES

Readback	"dBpT"
Initial S/W Revision	A.02.00

dBG

Sets the antenna unit to dBG. If this correction is turned on, and Apply Corrections is on, the Y Axis Unit will then be forced to dBG and all other Y Axis Unit selections will be grayed out.

Key Path	Input/Output, Corrections, Properties, Antenna Unit
Example	:CORR:CSET:ANT GAUS
Readback	" dBG"
Initial S/W Revision	A.02.00

dBμA

Sets the antenna unit to dBμA. If this correction is turned on, and Apply Corrections is on, the Y Axis Unit will then be forced to dBμA and all other Y Axis Unit selections will be grayed out.

Key Path	Input/Output, Corrections, Properties, Antenna Unit
Example	:CORR:CSET:ANT UA
Readback	" dBμA"
Initial S/W Revision	A.11.00

Frequency Interpolation

This setting controls how the correction values per-bucket are calculated. We interpolate between frequencies in either the logarithmic or linear scale.

This setting is handled and stored individually per correction set.

See "Interpolation" on page 660

Key Path	Input/Output, Corrections, Properties
Remote Command	`[:SENSe]:CORRection:CSET[1]|2|...6:X:SPACing LINear | LOGarithmic` `[:SENSe]:CORRection:CSET[1]|2|...6:X:SPACing?`
Example	CORR:CSET:X:SPAC LIN
Preset	Unaffected by a Preset. Set to Linear by Restore Input/Output Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

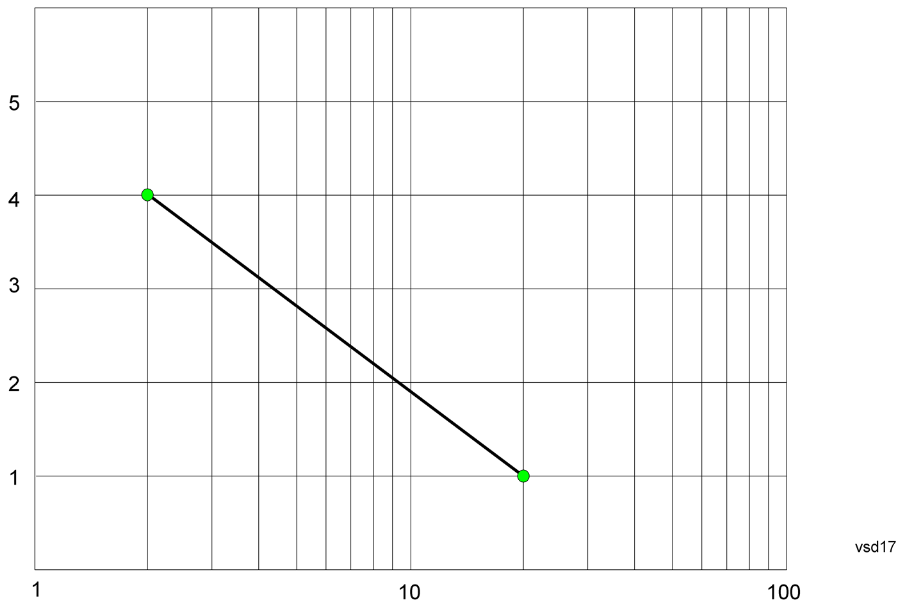
Interpolation

For each bucket processed by the application, all of the correction factors at the frequency of interest (center frequency of each bucket) are summed and added to the amplitude. All trace operations and post processing treat this post-summation value as the true signal to use.

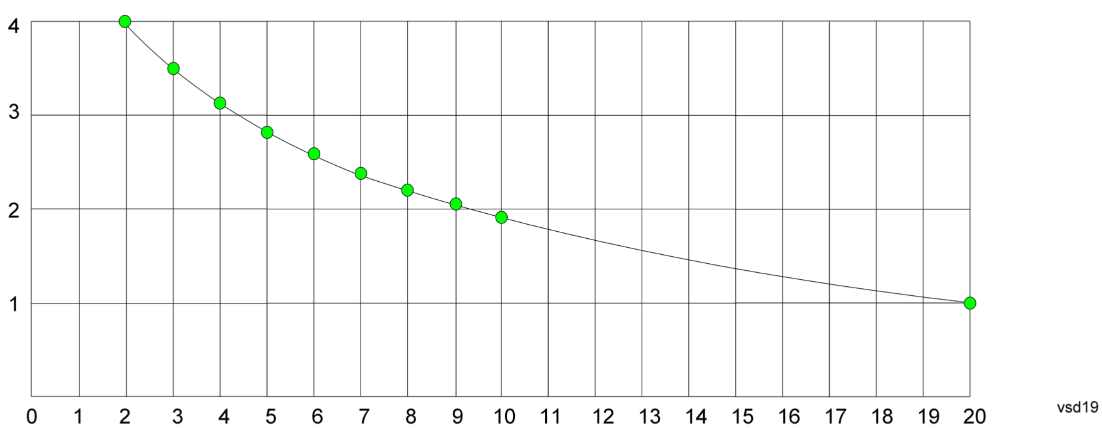
To effect this correction, the goal, for any particular start and stop frequency, is to build a correction trace, whose number of points matches the current Sweep Points setting of the instrument, which will be used to apply corrections on a bucket by bucket basis to the data traces.

For amplitudes that lie between two user specified frequency points, we interpolate to determine the amplitude value. You may select either linear or logarithmic interpolation between the frequencies.

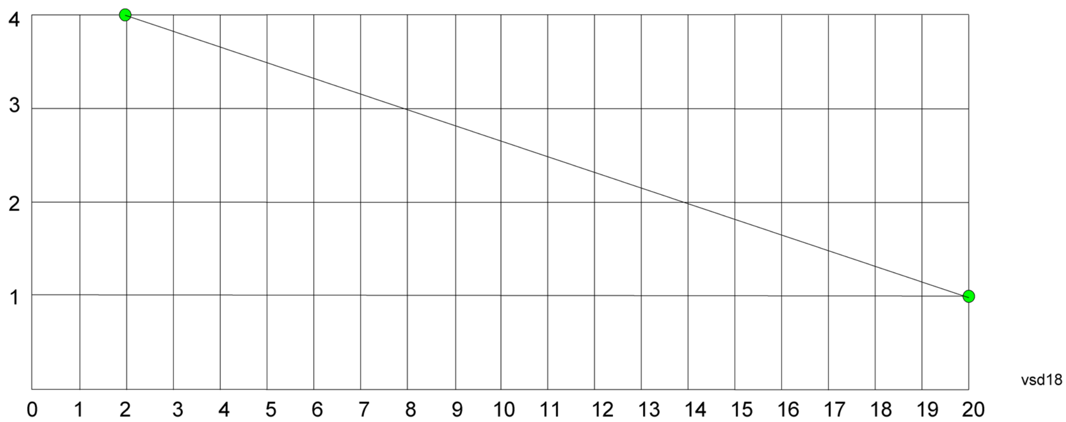
If we interpolate on a log scale, we assume that the line between the two points is a straight line on the log scale. For example, let's say the two points are (2,4) and (20,1). A straight line between them on a log scale looks like:



On a linear scale (like that of the spectrum analyzer), this translates to:



If we interpolate on a linear scale, we assume that the two points are connected by a straight line on the linear scale, as below:



The correction to be used for each bucket is taken from the interpolated correction curve at the center of the bucket.

Description

Sets an ASCII description field which will be stored in an exported file. Can be displayed in the active function area by selecting as the active function, if desired to appear in a screen capture.

Key Path	Input/Output, Corrections, Properties
Remote Command	`[:SENSe]:CORRection:CSET[1]|2|...6:DESCription "text"` `[:SENSe]:CORRection:CSET[1]|2|...6:DESCription?`
Example	:CORR:CSET1:DESC "11941A Antenna correction"
Notes	45 chars max; may not fit on display if max chars used
Preset	Unaffected by a Preset. Set to empty by Restore Input/Output Defaults
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Comment

Sets an ASCII comment field which will be stored in an exported file. Can be displayed in the active function area by selecting as the active function, if desired to appear in a screen capture.

Key Path	Input/Output, Corrections, Properties
Remote Command	`[:SENSe]:CORRection:CSET[1]|2|...6:COMMent "text"` `[:SENSe]:CORRection:CSET[1]|2|...6:COMMent?`
Example	:CORR:CSET1:COMM "this is a comment"
Notes	60 chars max; may not fit on display if max chars used
Preset	Unaffected by Preset. Set to empty by Restore Input/Output Defaults

State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

Edit

Invokes the integrated editing facility for this correction set.

When entering the menu, the editor window turns on, the selected correction is turned On, Apply Corrections is set to On, the amplitude scale is set to Log, and the Amplitude Correction ("Ampcor") trace is displayed. The actual, interpolated correction trace is shown in green for the selected correction. Note that since the actual interpolated correction is shown, the correction trace may have some curvature to it. This trace represents only the correction currently being edited, rather than the total, accumulated amplitude correction for all amplitude corrections which are currently on, although the total, accumulated correction for all corrections which are turned on is still applied to the data traces.

Because corrections data is always in dB, but the Y-axis of the analyzer is in absolute units, it is necessary to establish a reference line for display of the Corrections data. The reference line is halfway up the display and represents 0 dB of correction. It is labeled "0 dB CORREC". It is drawn in blue.

Corrections data is always in dB. Whatever dB value appears in the correction table represents the correction to be applied to that trace at that frequency. So if a table entry shows 30 dB that means we ADD 30 dB to each trace to correct it before displaying it. By definition all points are connected. If a gap is desired for corrections data, enter 0 dB.

Note that a well-designed Corrections array should start at 0 dB and end at 0 dB. This is because whatever the high end point is will be extended to the top frequency of the instrument, and whatever the low end point is will be extended down to 0 Hz. So for a Corrections array to have no effect outside its range, you should start and end the array at 0 dB.

NOTE The table editor will only operate properly if the analyzer is sweeping, because its updates are tied to the sweep system. Thus, you should not try to use the editor in single sweep, and it will be sluggish during compute-intensive operations like narrow-span FFT sweeps.

When exiting the edit menu (by using the Return key or by pressing an instrument front-panel key), the editor window turns off and the Ampcor trace is no longer displayed; however, Apply Corrections remains On, any correction that was on while in the editor remains on, and the amplitude scale returns to its previous setting.

Corrections arrays are not affected by a Preset, because they are in the Input/Output system. They also survive shutdown and restarting of the analyzer application, which means they will survive a power cycle.

Key Path	Input/Output, Corrections
Initial S/W Revision	A.02.00

Delete Correction

Deletes the correction values for this set. When this key is pressed a prompt is placed on the screen that says “Please press Enter or OK key to delete correction. Press ESC or Cancel to close this dialog.” The deletion is only performed if you press OK or Enter.

Key Path	Input/Output, Corrections
Remote Command	`[:SENSe]:CORRection:CSET[1]|2|...6:DELete`
Example	CORR:CSET:DEL CORR:CSET1:DEL CORR:CSET4:DEL
Notes	Pressing this key when no corrections are present is accepted without error.
Initial S/W Revision	A.02.00

Apply Corrections

Applies amplitude corrections, which are marked as ON to the measured data. If this is set to OFF, then no amplitude correction sets will be used, regardless of their individual on/off settings. If set to ON, the corrections that are marked as ON (see "Correction On/Off" on page 654) are used.

Key Path	Input/Output, Corrections
Remote Command	`[:SENSe]:CORRection:CSET:ALL[:STATe] ON|OFF|1|0` `[:SENSe]:CORRection:CSET:ALL[:STATe]?`
Example	SENS:CORR:CSET:ALL OFF This command makes sure that no amplitude corrections are applied, regardless of their individual on/off settings.
Preset	Not affected by Preset. Set to OFF by Restore Input/Output Defaults
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Delete All Corrections

Erases all correction values for all 4 Amplitude Correction sets.

When this key is pressed a prompt is placed on the screen that says “Please press Enter or OK key to delete all corrections. Press ESC or Cancel to close this dialog.” The deletion is only performed if you press OK or Enter.

Key Path	Input/Output, Corrections
Remote Command	`[:SENSe]:CORRection:CSET:ALL:DELete`
Example	CORR:CSET:ALL:DEL
Initial S/W Revision	A.02.00

Merge Correction Data (Remote Command Only)

The command takes an ASCII series of alternating frequency and amplitude points, each value separated by commas. The difference between this command and Set Data is that this merges new correction points into an existing set.

Any new point with the same frequency as an existing correction point will replace the existing point's amplitude with that of the new point.

An Ampcor array can contain a maximum of 2000 points.

Remote Command	`[:SENSe]:CORRection:CSET[1]|2|...6:DATA:MERGe <freq>, <ampl>, ...`
Example	CORR:CSET1:DATA:MERGE 15000000, –5.0, 25000000, 5.0 This adds two correction points at (15 MHz, –5.0 dB) and (25 MHz, 5.0 dB) to whatever values already exist in correction set 1.
Preset	Empty after Restore Input/Output Defaults. Survives shutdown/restart of analyzer application (including power cycle)
Min	Freq: 0 Hz Amptd: –1000 dBm
Max	Freq: 1 THz Amptd: +1000 dBm
Initial S/W Revision	A.02.00

Set (Replace) Data (Remote Command Only)

The command takes an ASCII series of alternating frequency and amplitude points, each value separated by commas.

The values sent in the command will totally replace all existing correction points in the specified set.

An Ampcor array can contain a maximum of 2000 points.

Remote Command	`[:SENSe]:CORRection:CSET[1]|2|...6:DATA <freq>, <ampl>, . . .` `[:SENSe]:CORRection:CSET[1]|2|...6:DATA?`
Example	CORR:CSET1:DATA 10000000, –1.0, 20000000, 1.0 This defines two correction points at (10 MHz, –1.0 dB) and (20 MHz, 1.0 dB) for correction set 1.
Preset	Empty after Restore Input/Output Defaults. Survives a shutdown or restart of analyzer application (including a power cycle).
State Saved	Saved in instrument state.
Min	Freq: 0 Hz Amptd: –1000 dBm
Max	Freq: 1 THz Amptd: +1000 dBm
Initial S/W Revision	A.02.00

Freq Ref In

Specifies the frequency reference as being the internal reference, external reference or sensing the presence of an external reference.

When the frequency reference is set to internal, the internal 10 MHz reference is used even if an external reference is connected.

When the frequency reference is set to external, the instrument will use the external reference. However, if there is no external signal present, or it is not within the proper amplitude range, a condition error message is generated. When the external signal becomes valid, the error is cleared.

If Sense is selected, the instrument checks whether a signal is present at the external reference connector and will automatically switch to the external reference when a signal is detected. When no signal is present, it automatically switches to the internal reference. No message is generated as the reference switches between external and internal. The monitoring of the external reference occurs approximately on 1 millisecond intervals, and never occurs in the middle of a measurement acquisition, only at the end of the measurement (end of the request).

If for any reason the instrument’s frequency reference is not able to obtain lock, Status bit 2 in the Questionable Frequency register will be true and a condition error message is generated. When lock is regained, Status bit 2 in the Questionable Frequency register will be cleared and the condition error will be cleared.

If an external frequency reference is being used, you must enter the frequency of the external reference if it is not exactly 10 MHz. The External Ref Freq key is provided for this purpose.

Key Path	Input/Output
Remote Command	`[:SENSe]:ROSCillator:SOURce:TYPE INTernal|EXTernal|SENSe` `[:SENSe]:ROSCillator:SOURce:TYPE?`
Preset	This is unaffected by a Preset but is set to SENSe on a "Restore Input/Output Defaults" or "Restore System Defaults->All".
State Saved	Saved in instrument state.
Status Bits/OPC dependencies	STATus:QUEStionable:FREQuency bit 2 set if unlocked.
Backwards Compatibility Notes	Freq Ref In was not saved in state in the legacy instruments. It is a part of state in the X-Series.
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:ROSCillator:SOURce?`
Notes	The query [SENSe]:ROSCillator:SOURce? returns the current switch setting. This means: 1. If it was set to SENSe but there is no external reference so the instrument is actually using the internal reference, then this query returns INTernal and not SENSe. 2. If it was set to SENSe and there is an external reference present, the query returns EXTernal and not SENSe. 3. If it was set to EXTernal, then the query returns "EXTernal" 4. If it was set to INTernal, then the query returns “INTernal”

Preset	SENSe
Backwards Compatibility Notes	The query [:SENSe]:ROSCillator:SOURce? was a query-only command in ESA which always returned whichever reference the instrument was using. The instrument automatically switched to the ext ref if it was present. In PSA (which had no sensing) the command [:SENSe]:ROSCillator:SOURce set the reference (INT or EXT), so again its query returned the actual routing. Thus the query form of this command is 100% backwards compatible with both instruments.
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:ROSCillator:SOURce INTernal|EXTernal`
Notes	For PSA compatibility the command form is provided and is directly mapped to [:SENSe]:ROSCillator:SOURce:TYPE
Initial S/W Revision	Prior to A.02.00

Sense

The external reference is used if a valid signal is sensed at the Ext Ref input. Otherwise the internal reference is used.

Key Path	Input/Output, Freq Ref In
Example	:ROSC:SOUR:TYPE SENS
Readback	Sense
Initial S/W Revision	Prior to A.02.00

Internal

The internal reference is used.

Key Path	Input/Output, Freq Ref In
Example	:ROSC:SOUR:TYPE INT
Readback	Internal
Initial S/W Revision	Prior to A.02.00

External

The external reference is used.

Key Path	Input/Output, Freq Ref In

Example	:ROSC:SOUR:TYPE EXT
Readback	External
Initial S/W Revision	Prior to A.02.00

Ext Ref Freq

This key tells the analyzer the frequency of the external reference. When the external reference is in use (either because the reference has been switched to External or because the Reference has been switched to Sense and there is a valid external reference present) this information is used by the analyzer to determine the internal settings needed to lock to that particular external reference signal.

For the instrument to stay locked, the value entered must be within 5 ppm of the actual external reference frequency. So it is important to get it close, or you risk an unlock condition.

Note that this value only affects the instrument’s ability to lock. It does not affect any calculations or measurement results. See "Freq Offset" in the Frequency section for information on how to offset frequency values.

Key Path	Input/Output, Freq Ref In
Remote Command	`[:SENSe]:ROSCillator:EXTernal:FREQuency <freq>` `[:SENSe]:ROSCillator:EXTernal:FREQuency?`
Example	ROSC:EXT:FREQ 20 MHz sets the external reference frequency to 20 MHz, but does not select the external reference. ROSC:SOUR:TYPE EXT selects the external reference.
Notes	Still available with Internal selected, to allow setup for when External is in use.
Preset	This is unaffected by a Preset but is set to 10 MHz on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Min	CXA: 10 MHz EXA: 10 MHz or 13 MHz, depending on whether N9010A-R13 is licensed MXA: 1 MHz PXA: 1 MHz
Max	CXA: 10 MHz EXA: 10 MHz MXA: 50 MHz PXA: 50 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00

External Reference Lock BW

This control lets you adjust the External Reference phase lock bandwidth. This control is available in some models of the X-Series.

The PXA variable reference loop bandwidth allows an external reference to be used and have the analyzer close-in phase noise improved to match that of the reference. This could result in an improvement of tens of decibels. The choice of “Wide” or “Narrow” affects the phase noise at low offset frequencies, especially 4 to 400 Hz offset. When using an external reference with superior phase noise, we recommend setting the external reference phase-locked-loop bandwidth to wide (60 Hz), to take advantage of that superior performance. When using an external reference with inferior phase noise performance, we recommend setting that bandwidth to narrow (15 Hz). In these relationships, inferior and superior phase noise are with respect to –134 dBc/Hz at 30 Hz offset from a 10 MHz reference. Because most reference sources have phase noise behavior that falls off at a rate of 30 dB/decade, this is usually equivalent to –120 dBc/Hz at 10 Hz offset.

Key Path	Input/Output, Freq Ref In
Scope	Mode Global
Remote Command	`[:SENSe]:ROSCillator:BANDwidth WIDE|NARRow` `[:SENSe]:ROSCillator:BANDwidth?`
Example	ROSC:BAND WIDE
Dependencies	This key only appears in analyzers equipped with the required hardware.
Preset	This is unaffected by a Preset but is set to Narrow on a "Restore Input/Output Defaults" or "Restore System Defaults -> All"
State Saved	Saved in Input/Output state.
Initial S/W Revision	A.04.00

External Ref Coupling

Only appears with option ERC installed and licensed.

This function lets you couple the sweep system of the analyzer to the state of the External Reference. If Normal is selected, data acquisition proceeds regardless of the state of the External Reference. When you select Ext Ref Out Of Range Stops Acquisition, the data acquisition (sweep or measurement) stops when either the "521, External ref out of range" or the "503, Frequency Reference unlocked” error message is asserted. Note that this will only take place if the Freq Ref In selection is External.

With the acquisition stopped, the data display will stop updating (even if this occurs in the middle of a sweep or measurement) and no data will be returned to a READ? or MEASure? query; that is, these queries will not complete because the analyzer will not respond to them. Furthermore, no response will be generated to a *WAI? or *OPC? query.

Proper SCPI sequences are shown below, which will always fail to return if the acquisition stops during the requested sweep or measurement. Note that, for predictable operation of this function, it is best to operate the analyzer in single measurement mode (INIT:CONT OFF), because if operating in continuous mode, the analyzer may respond to the above queries even after the acquisition stops, with data left over from the previous acquisition.

:INIT:CONT OFF

:INIT:IMM;*OPC?

--

:INIT:CONT OFF

:INIT:IMM;*WAI?

--

:INIT:CONT OFF

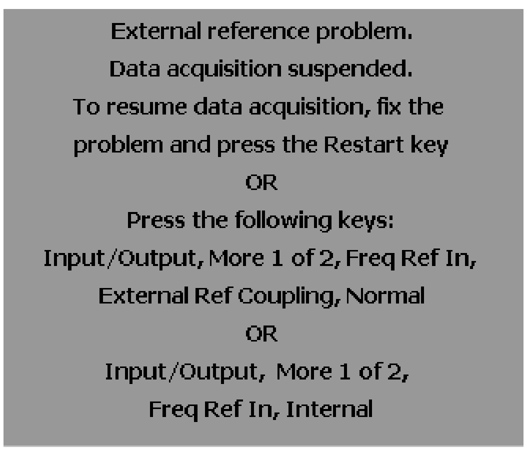
:READ?

--

:INIT:CONT OFF

:MEASure?

When the acquisition ceases, in addition to the error condition(s) described above, a popup error message will be generated informing you that the acquisition has ceased due to an invalid external reference. This message will stay on the screen while the acquisition is suspended.



If you press the Restart key this message will be taken off the screen and a new acquisition will be attempted. If the External Reference problem persists the message will re-appear. You can also remove the message by changing back to the Normal setting of Sweep/Ext Ref Coupling, or by pressing Freq Ref In, Internal, or Freq Ref In, Sense, or Restore Input/Output Defaults.

The setting of External Ref Coupling is persistent across power-cycling and is not reset with a Preset. It is reset to the default state (Normal) when Restore Input/Output Defaults is invoked, which will also restart normal data acquisition.

The detection of invalid external reference is under interrupt processing. If the external reference becomes invalid then returns to valid in too short a time, no error condition will be detected or reported and therefore the acquisition will not be stopped.

Key Path	Input/Output, Freq Ref In
Mode	All
Remote Command	`[:SENSe]:ROSCillator:COUPling NORMal|NACQuisition` `[:SENSe]:ROSCillator:COUPling?`
Preset	This setting is persistent: it survives power-cycling or a Preset and is reset with Restore Input/Output defaults.
State Saved	Not saved in instrument state
Readback	Normal|Stop Acq
Initial S/W Revision	A.02.00

External Ref Coupling

Only appears with option ERC installed and licensed.

This function lets you couple the sweep system of the analyzer to the state of the External Reference. If Normal is selected, data acquisition proceeds regardless of the state of the External Reference. When you select Ext Ref Out Of Range Stops Acquisition, the data acquisition (sweep or measurement) stops when either the "521, External ref out of range" or the "503, Frequency Reference unlocked" error message is asserted. Note that this will only take place if the Freq Ref In selection is External.

With the acquisition stopped, the data display will stop updating (even if this occurs in the middle of a sweep or measurement) and no data will be returned to a READ? or MEASure? query; that is, these queries will not complete because the analyzer will not respond to them. Furthermore, no response will be generated to a *WAI? or *OPC? query.

Proper SCPI sequences are shown below, which will always fail to return if the acquisition stops during the requested sweep or measurement. Note that, for predictable operation of this function, it is best to operate the analyzer in single measurement mode (INIT:CONT OFF), because if operating in continuous mode, the analyzer may respond to the above queries even after the acquisition stops, with data left over from the previous acquisition.

:INIT:CONT OFF

:INIT:IMM;*OPC?

--

:INIT:CONT OFF

:INIT:IMM;*WAI?

--

:INIT:CONT OFF

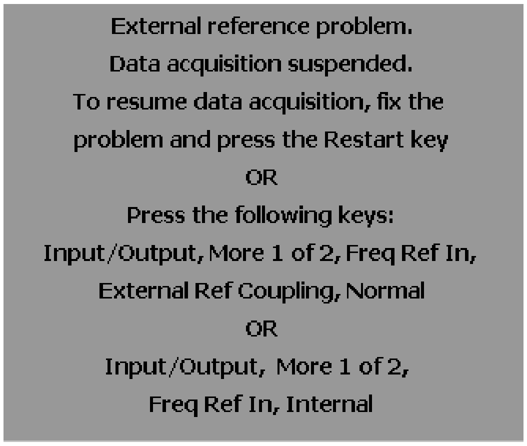
:READ?

--

:INIT:CONT OFF

:MEASure?

When the acquisition ceases, in addition to the error condition(s) described above, a popup error message will be generated informing you that the acquisition has ceased due to an invalid external reference. This message will stay on the screen while the acquisition is suspended.



If you press the Restart key this message will be taken off the screen and a new acquisition will be attempted. If the External Reference problem persists the message will re-appear. You can also remove the message by changing back to the Normal setting of Sweep/Ext Ref Coupling, or by pressing Freq Ref In, Internal, or Freq Ref In, Sense, or Restore Input/Output Defaults.

The setting of External Ref Coupling is persistent across power-cycling and is not reset with a Preset. It is reset to the default state (Normal) when Restore Input/Output Defaults is invoked, which will also restart normal data acquisition.

The detection of invalid external reference is under interrupt processing. If the external reference becomes invalid then returns to valid in too short a time, no error condition will be detected or reported and therefore the acquisition will not be stopped.

Key Path	Input/Output, Freq Ref In
Mode	All
Remote Command	`[:SENSe]:ROSCillator:COUPling NORMal|NACQuisition` `[:SENSe]:ROSCillator:COUPling?`
Preset	This setting is persistent: it survives power-cycling or a Preset and is reset with Restore Input/Output defaults.
State Saved	Not saved in instrument state
Readback	Normal|Stop Acq
Initial S/W Revision	A.02.00

External Ref Coupling

Only appears with option ERC installed and licensed.

This function lets you couple the sweep system of the analyzer to the state of the External Reference. If Normal is selected, data acquisition proceeds regardless of the state of the External Reference. When you select Ext Ref Out Of Range Stops Acquisition, the data acquisition (sweep or measurement) stops when either the "521, External ref out of range" or the "503, Frequency Reference unlocked" error message is asserted. Note that this will only take place if the Freq Ref In selection is External.

With the acquisition stopped, the data display will stop updating (even if this occurs in the middle of a sweep or measurement) and no data will be returned to a READ? or MEASure? query; that is, these queries will not complete because the analyzer will not respond to them. Furthermore, no response will be generated to a *WAI? or *OPC? query.

Proper SCPI sequences are shown below, which will always fail to return if the acquisition stops during the requested sweep or measurement. Note that, for predictable operation of this function, it is best to operate the analyzer in single measurement mode (INIT:CONT OFF), because if operating in continuous mode, the analyzer may respond to the above queries even after the acquisition stops, with data left over from the previous acquisition.

:INIT:CONT OFF

:INIT:IMM;*OPC?

--

:INIT:CONT OFF

:INIT:IMM;*WAI?

--

:INIT:CONT OFF

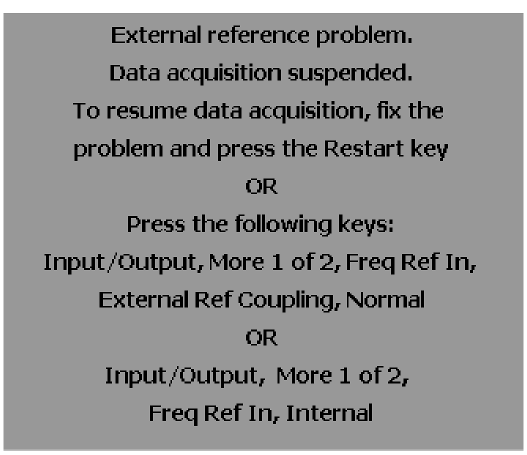
:READ?

--

:INIT:CONT OFF

:MEASure?

When the acquisition ceases, in addition to the error condition(s) described above, a popup error message will be generated informing you that the acquisition has ceased due to an invalid external reference. This message will stay on the screen while the acquisition is suspended.



If you press the Restart key this message will be taken off the screen and a new acquisition will be attempted. If the External Reference problem persists the message will re-appear. You can also remove the message by changing back to the Normal setting of Sweep/Ext Ref Coupling, or by pressing Freq Ref In, Internal, or Freq Ref In, Sense, or Restore Input/Output Defaults.

The setting of External Ref Coupling is persistent across power-cycling and is not reset with a Preset. It is reset to the default state (Normal) when Restore Input/Output Defaults is invoked, which will also restart normal data acquisition.

The detection of invalid external reference is under interrupt processing. If the external reference becomes invalid then returns to valid in too short a time, no error condition will be detected or reported and therefore the acquisition will not be stopped.

Key Path	Input/Output, Freq Ref In
Mode	All
Remote Command	`[:SENSe]:ROSCillator:COUPling NORMal|NACQuisition` `[:SENSe]:ROSCillator:COUPling?`
Preset	This setting is persistent: it survives power-cycling or a Preset and is reset with Restore Input/Output defaults.
State Saved	Not saved in instrument state
Readback	Normal|Stop Acq
Initial S/W Revision	A.02.00

Output Config

Accesses keys that configure various output settings, like the frequency reference output, trigger output and analog output.

Key Path	Input/Output
Backwards Compatibility Notes	In ESA there was not a user interface to enable the Video Output (Analog Output), Trigger Output, or Gate Output. In the X-Series each of these physical connectors requires configuration, thus the user interface has been added for X-Series, along with the potential for an output you think is always on to be switched off.
Initial S/W Revision	Prior to A.02.00

Trig Out (1 and 2)

Select the type of output signal that will be output from the rear-panel Trig 1 Out or Trig 2 Out connectors.

Key Path	Input/Output, Output Config
Remote Command	`:TRIGger|TRIGger1|TRIGger2[:SEQuence]:OUTPut HSWP | MEASuring | MAIN | GATE | GTRigger | OEVen | SPOint | SSWeep | SSETtled | S1Marker | S2Marker | S3Marker | S4Marker | OFF` `:TRIGger|TRIGger1|TRIGger2[:SEQuence]:OUTPut?`

Example	TRIG:OUTP HSWP TRIG2:OUTP GATE
Dependencies	The second Trigger output (Trig 2 Out) does not appear in all models; in models that do not support it, the Trig 2 Out key is blanked, and sending the SCPI command for this output generates an error, "Hardware missing; Not available for this model number" In models that do not support the Trigger 2 output, this error is returned if trying to set Trig 2 Out and a query of Trig 2 Out returns OFF.
Preset	Trigger 1: Sweeping (HSWP) Trigger 2: Gate This is unaffected by a Preset but is preset to the above values on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Polarity

Sets the output to the Trig 1 Out or Trig 2 Out connector to trigger on either the positive or negative polarity.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Remote Command	`:TRIGger|TRIGger1|TRIGger2[:SEQuence]:OUTPut:POLarity POSitive	NEGative` `:TRIGger|TRIGger1|TRIGger2[:SEQuence]:OUTPut:POLarity?`
Example	TRIG1:OUTP:POL POS
Preset	This is unaffected by a Preset but is set to POSitive on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Off

Selects no signal to be output to the Trig 1 Out or Trig 2 Out connector.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

Sweeping (HSWP)

Selects the Sweeping Trigger signal to be output to the Trig 1 Out or Trig 2 Out connector when a measurement is made. This signal has historically been known as "HSWP" (High = Sweeping), and is 5 V TTL level with 50 ohm output impedance.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP HSWP
Readback	Sweeping
Initial S/W Revision	Prior to A.02.00

Measuring

Selects the Measuring trigger signal to be output to the Trig 1 Out or Trig 2 Out connector. This signal is true while the Measuring status bit is true.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP MEAS
Readback	Measuring
Initial S/W Revision	Prior to A.02.00

Main Trigger

Selects the current instrument trigger signal to be output to the Trig 1 Out or Trig 2 Out connector.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP MAIN
Readback	Main Trigger
Initial S/W Revision	Prior to A.02.00

Gate Trigger

Selects the gate trigger signal to be output to the Trig 1 Out or Trig 2 Out connector. This is the source of the gate timing, not the actual gate signal.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP GTR
Readback	Gate Trigger
Initial S/W Revision	Prior to A.02.00

Gate

Selects the gate signal to be output to the Trig 1 Out or Trig 2 Out connector. The gate signal has been delayed and its length determined by delay and length settings. When the polarity is positive, a high on the Trig 1 Out or Trig 2 Out represents the time the gate is configured to pass the signal.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP GATE
Readback	Gate
Initial S/W Revision	Prior to A.02.00

Odd/Even Trace Point

Selects either the odd or even trace points as the signal to be output to the Trig 1 Out or Trig 2 Out connector when performing swept spectrum analysis. When the polarity is positive, this output goes high during the time the analyzer is sweeping past the first point (Point 0) and every other following trace point. The opposite is true if the polarity is negative.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP OEV
Readback	Odd/Even
Initial S/W Revision	Prior to A.02.00

Trig Out (1 and 2)

Select the type of output signal that will be output from the rear-panel Trig 1 Out or Trig 2 Out connectors.

Key Path	Input/Output, Output Config
Remote Command	`:TRIGger|TRIGger1|TRIGger2[:SEQuence]:OUTPut HSWP	MEASuring	MAIN	GATE	GTRigger	OEVen	SPOint	SSWeep	SSETtled	S1Marker	S2Marker	S3Marker	S4Marker	OFF` `:TRIGger|TRIGger1|TRIGger2[:SEQuence]:OUTPut?`
Example	TRIG:OUTP HSWP TRIG2:OUTP GATE
Dependencies	The second Trigger output (Trig 2 Out) does not appear in all models; in models that do not support it, the Trig 2 Out key is blanked, and sending the SCPI command for this output generates an error, “Hardware missing; Not available for this model number” In models that do not support the Trigger 2 output, this error is returned if trying to set Trig 2 Out and a query of Trig 2 Out returns OFF.
Preset	Trigger 1: Sweeping (HSWP) Trigger 2: Gate This is unaffected by a Preset but is preset to the above values on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Polarity

Sets the output to the Trig 1 Out or Trig 2 Out connector to trigger on either the positive or negative polarity.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Remote Command	`:TRIGger|TRIGger1|TRIGger2[:SEQuence]:OUTPut:POLarity POSitive | NEGative` `:TRIGger|TRIGger1|TRIGger2[:SEQuence]:OUTPut:POLarity?`
Example	TRIG1:OUTP:POL POS
Preset	This is unaffected by a Preset but is set to POSitive on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Off

Selects no signal to be output to the Trig 1 Out or Trig 2 Out connector.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

Sweeping (HSWP)

Selects the Sweeping Trigger signal to be output to the Trig 1 Out or Trig 2 Out connector when a measurement is made. This signal has historically been known as "HSWP" (High = Sweeping), and is 5 V TTL level with 50 ohm output impedance.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP HSWP
Readback	Sweeping
Initial S/W Revision	Prior to A.02.00

Measuring

Selects the Measuring trigger signal to be output to the Trig 1 Out or Trig 2 Out connector. This signal is true while the Measuring status bit is true.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP MEAS
Readback	Measuring
Initial S/W Revision	Prior to A.02.00

Main Trigger

Selects the current instrument trigger signal to be output to the Trig 1 Out or Trig 2 Out connector.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP MAIN
Readback	Main Trigger
Initial S/W Revision	Prior to A.02.00

Gate Trigger

Selects the gate trigger signal to be output to the Trig 1 Out or Trig 2 Out connector. This is the source of the gate timing, not the actual gate signal.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP GTR
Readback	Gate Trigger
Initial S/W Revision	Prior to A.02.00

Gate

Selects the gate signal to be output to the Trig 1 Out or Trig 2 Out connector. The gate signal has been delayed and its length determined by delay and length settings. When the polarity is positive, a high on the Trig 1 Out or Trig 2 Out represents the time the gate is configured to pass the signal.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP GATE
Readback	Gate
Initial S/W Revision	Prior to A.02.00

Odd/Even Trace Point

Selects either the odd or even trace points as the signal to be output to the Trig 1 Out or Trig 2 Out connector when performing swept spectrum analysis. When the polarity is positive, this output goes high during the time the analyzer is sweeping past the first point (Point 0) and every other following trace point. The opposite is true if the polarity is negative.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP OEV
Readback	Odd/Even
Initial S/W Revision	Prior to A.02.00

Analog Out

This menu lets you control which signal is fed to the "Analog Out" connector on the analyzer rear panel.

See "More Information" on page 679

Key Path	Input/Output, Output Config
Remote Command	`:OUTPut:ANALog OFF|SVIDeo|LOGVideo|LINVideo|DAUDio` `:OUTPut:ANALog?`
Example	OUTP:ANAL SVIDeo ! causes the analog output type to be Screen Video
Preset	OFF
Preset	This is unaffected by Preset but is set to DAUDio on a "Restore Input/Output Defaults" or "Restore System Defaults->All
State Saved	Saved in Input/Output State
Readback line	1-of-N selection [variable]
Backwards Compatibility Notes	Prior to A.04.00, OFF was the default functionality except when in the Analog Demod application or with Tune and Listen, in which case it was DAUDio, and there was no selection menu. So for backwards compatibility with earlier X-Series firmware versions, Auto (:OUTP:ANAL:AUTO ON) will duplicate the prior behavior. The DNWB and SANalyzer parameters, which were legal in PSA but perform no function in the X-Series, are accepted without error.
Initial S/W Revision	A.04.00

More Information

The table below gives the range for each output.

Analog Out	Nominal Range exc. (10% overrange)	Scale Factor	Notes
Off	0 V		
Screen Video	0 – 1 V open circuit	10%/division	8566 compatible
Log Video	0 – 1 V terminated	1/(192.66 dB/V)	dB referenced to mixer level, 1V out for –10 dBm at the mixer.

Linear Video	0 – 1 V terminated	100%/V	Linear referenced to Ref Level, 1 V out for RF envelope at the Ref Level.
Demod Audio	(varies with analyzer setting)		

Auto

Selects the Auto state for the Analog Output menu. In this state, the Analog Output will automatically be set to the most sensible setting for the current mode or measurement.

If you make a selection manually from the Analog Out menu, this selection will remain in force until you change it (or re-select Auto), even if you go to a mode or measurement for which the selected output does not apply.

Key Path	Input/Output, Output Config, Analog Out
Remote Command	`OUTPut:ANALog:AUTO OFF|ON|0|1` `OUTPut:ANALog:AUTO?`
Example	OUTP:ANAL:AUTO ON
Preset	ON
State Saved	Saved in Input/Output State
Initial S/W Revision	A.04.00

Off

Turns off the analog output.

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL OFF ! causes the analog output to be off
Readback Text	Off
Initial S/W Revision	A.04.00

Screen Video

Selects the analog output to be the screen video signal. In this mode, the pre-detector data is output to the Analog Out connector. The output looks very much like the trace displayed on the analyzer's screen, and depends on the Log/Lin display Scale, Reference Level, and dB per division, but is not influenced by the selected detector or any digital flatness corrections or trace post-processing (like Trace Averaging).

Note that this mode is similar to the Analog Output of the HP 8566 family and the Video Out (opt 124) capability of the Keysight PSA analyzer (E444x), although there are differences in the behavior.

Key Path	Input/Output, Output Config, Analog Out

Example	OUTP:ANAL SVID
Dependencies	Because the Screen Video output uses one of the two IF processing channels, only one detector is available while Screen Video is selected. All active traces will change to use the same detector as the selected trace when Screen Video is activated. Screen Video output is not available while any EMI Detector is selected (Quasi Peak, RMS Average or EMI Average), because these detectors use both IF processing channels. Consequently, if the user chooses an EMI Detector, there will be no Screen Video output. The output holds at its last value during an alignment and during a marker count. After a sweep: • If a new sweep is to follow (as in Continuous sweep mode), the output holds at its last value during the retrace before the next sweep starts. If the analyzer is in zero-span, there is no retrace, as the analyzer remains tuned to the Center Frequency and does not sweep. Therefore, in zero-span, the output simply remains live between display updates. • If no new sweep is to follow (as in Single sweep mode), the output remains live, and continues to show the pre-detector data This function depends on optional capability; the key will be blanked and the command will generate an “Option not available” error unless you have Option YAV or YAS licensed in your instrument.
Couplings	Screen Video output changes while in FFT Sweeps, so for measurements that use exclusively FFT Sweeps, or if the user manually chooses FFT Sweeps, the Screen Video output will look different than it does in swept mode.
Readback Text	Screen Video
Backwards Compatibility Notes	See "Backwards Compatibility:" on page 681, below.
Initial S/W Revision	A.04.00

Backwards Compatibility:

The Screen Video function is intended to be very similar to the 8566 Video Output and the PSA Option 124. However, unlike the PSA, it is not always on; it must be switched on by the Screen Video key. Also, unlike the PSA, there are certain dependencies (detailed above) – for example, the Quasi Peak Detector is unavailable when Screen Video is on.

Furthermore, the PSA Option 124 hardware was unipolar and its large range was padded to be exactly right for use as a Screen Video output. In the X-Series, the hardware is bipolar and has a wider range to accommodate the other output choices. Therefore, the outputs won’t match up exactly and users may have to modify their setup when applying the X-Series in a PSA application.

Log Video (RF Envelope, Ref=Mixer Level)

Selects the analog output to be the log of the video signal. In this mode, the pre-detector data is output to the Analog Out connector with a Log scaling. The output is referenced to the current level at the mixer, does not depend on display settings like Reference Level or dB per division, and it is not influenced by the selected detector or any digital flatness corrections or trace post-processing (like Trace Averaging), but does change with input attenuation.

The output is designed so that full scale (1 V) corresponds to –10 dBm at the mixer. The full range (0–1 V) covers 192.66 dB ; thus, 0 V corresponds to –202.66 dBm at the mixer.

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL LOGV
Dependencies	Because the Log Video output uses one of the two IF processing channels, only one detector is available while Screen Video is selected. All active traces will change to use the same detector as the selected trace when Log Video is activated. Log Video output is not available while any EMI Detector is selected (Quasi Peak, RMS Average or EMI Average), because these detectors use both IF processing channels. Consequently, if the user chooses an EMI Detector, there will be no Log Video output. The output holds at its last value during an alignment, during a marker count, and during retrace (after a sweep and before the next sweep starts). This function depends on optional capability. The key will be blanked and the command will generate an “Option not available” error unless you have Option YAV licensed in your instrument.
Couplings	Log Video output changes while in FFT Sweeps, so for measurements that use exclusively FFT Sweeps, or if the user manually chooses FFT Sweeps, the Log Video output will look different than it does in swept mode.
Readback Text	Log Video
Initial S/W Revision	A.04.00

Linear Video (RF Envelope, Ref=Ref Level)

Selects the analog output to be the envelope signal on a linear (voltage) scale. In this mode, the pre-detector data is output to the Analog Out connector with a Linear scaling. The output is based on the current Reference Level, and is not influenced by the selected detector or any digital flatness corrections or trace post-processing (like Trace Averaging).

The scaling is set so that 1 V output occurs with an instantaneous video level equal to the reference level, and 0 V occurs at the bottom of the graticule. This scaling gives you the ability to control the gain without having another setup control for the key. But it requires you to control the look of the display (the reference level) in order to control the analog output.

This mode is ideal for looking at Amplitude Modulated signals, as the linear envelope effectively demodulates the signal.

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL LINV
Dependencies	Because the Linear Video output uses one of the two IF processing channels, only one detector is available while Linear Video is selected. All active traces will change to use the same detector as the selected trace when Log Video is activated. Linear Video output is not available while any EMI Detector is selected (Quasi Peak, RMS Average or EMI Average), because these detectors use both IF processing channels. Consequently, if the user chooses an EMI Detector, there will be no Linear Video output. The output holds at its last value during an alignment and during a marker count and during retrace (after a sweep and before the next sweep starts).

	This function depends on optional capability; the key will be blanked and the command will generate an "Option not available" error unless you have Option YAV licensed in your instrument.
Couplings	Linear Video output changes while in FFT Sweeps, so for measurements that use exclusively FFT Sweeps, or if the user manually chooses FFT Sweeps, the Linear Video output will look different than it does in swept mode.
Readback Text	Linear Video
Initial S/W Revision	A.04.00

Demod Audio

Selects the analog output to be the demodulation of the video signal.

When Demod Audio is selected, the demodulated audio signal appears at this output whenever the Analog Demod application is demodulating a signal or when Analog Demod Tune and Listen is operating in the Swept SA measurement.

When Analog Out is in the Auto state, this output is auto-selected when in the Analog Demod mode or when Analog Demod Tune and Listen is operating in the Swept SA measurement.

If any other Analog Output is manually selected when in the Analog Demod mode or when Analog Demod Tune and Listen is operating in the Swept SA measurement, a condition warning message appears.

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL DAUD
Dependencies	This key only appears if the Analog Demod application (N9063A), the N6141A or W6141A application, or Option EMC is installed and licensed, otherwise the key will be blanked and the command will generate an "Option not available" error. The output holds at its last value during an alignment and during a marker count. It is not held between sweeps, in order for Tune and Listen to work properly. When Demod Audio is the selected Analog Output: • all active traces are forced to use the same detector. • CISPR detectors (QPD, EMI Avg, RMS Avg) are unavailable
Readback Text	Demod Audio
Initial S/W Revision	Prior to A.02.00 (this was the default functionality, and there was no selection)
Modified at S/W Revision	A.04.00

Digital Bus

This menu allows you to configure the LVDS connector located on the rear panel of the instrument. It is a unidirectional link of real time data at a 90 MSa/s rate. The ADC is sampling a 22.5 MHz IF.

The data that appears on this port is raw, uncorrected ADC samples, unless you have option RTL. With option RTL, you get fully corrected I/Q data.

This connector will only be active when the Narrowband IF Path is currently in use.

Key Path	Input/Output, Output Config
Initial S/W Revision	A.04.00

Bus Out On/Off

When Bus Out is on, all acquisitions are streamed to the output port including acquisitions for internal purposes such as Alignment. The internal processing and routing of acquisitions continues as usual and is unaffected by the state of Bus Out.

When Bus Out is off, no signal appears on the LVDS port.

Key Path	Input/Output, Output Config, Digital Bus
Scope	Mode Global
Remote Command	`:OUTPut:DBUS[1][:STATe] ON|OFF|1|0` `:OUTPut:DBUS[1][:STATe]?`
Example	OUTP:DBUS ON
Preset	This is unaffected by a Preset but is set to Off on a "Restore Input/Output Defaults" or "Restore System Defaults -> All"
State Saved	Saved in Input/Output State
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

I/Q Cal Out

The Baseband I/Q "Cal Out" port can be turned on with either a 1 kHz or a 250 kHz square wave. This can be turned on independent of the input selection. A Preset will reset this to Off.

Key Path	Input/Output, Output Config
Remote Command	`:OUTPut:IQ:OUTPut IQ1|IQ250|OFF` `:OUTPut:IQ:OUTPut?`
Example	OUTP:IQ:OUTP IQ1
Couplings	An I/Q Cable Calibration or an I/Q Probe Calibration will change the state of the Cal Out port as needed by the calibration routine. When the calibration is finished the I/Q Cal Out is restored to the pre-calibration state.
Preset	Off
State Saved	Saved in instrument state.
Range	1 kHz Square Wave|250 kHz Square Wave|Off
Readback Text	1 kHz|250 kHz|Off
Initial S/W Revision	Prior to A.02.00
Saved State	Saved in instrument state

1 kHz Square Wave

Turns on the 1 kHz square wave signal at the Cal Out port. This choice is only available with option BBA.

Key Path	Input/Output, Output Config, I/Q Cal Out
Readback	I/Q 1kHz
Initial S/W Revision	Prior to A.02.00

250 kHz Square Wave

Turns on the 250 kHz square wave signal at the Cal Out port. This choice is only available with option BBA.

Key Path	Input/Output, Output Config, I/Q Cal Out
Readback	I/Q 250kHz
Initial S/W Revision	Prior to A.02.00

Off

Turns off the signal at the Cal Out port. This choice is only available with option BBA.

Key Path	Input/Output, Output Config, I/Q Cal Out
Readback	Off
Initial S/W Revision	Prior to A.02.00

Aux IF Out

This menu controls the signals that appear on the SMA output on the rear panel labeled “AUX IF OUT

The Aux IF Out functionality is only valid for RF and External Mixer inputs. When using the External Mixing path, the Aux IF Out levels (for all three Options CR3, CRP, and ALV) will be uncalibrated because the factory default Aux IF level was set to accommodate the expected IF levels for the RF path.

Key Path	Input/Output, Output Config
Remote Command	`:OUTPut:AUX SIF|AIF|LOGVideo|OFF` `:OUTPut:AUX?`
Dependencies	The softkey does not appear in models that do not support the Aux IF Out.
Preset	This is unaffected by a Preset but is set to OFF on a "Restore Input/Output Defaults" or "Restore System Defaults->All”
State Saved	Saved in Input/Output state

Readback line	1-of-N selection [variable]
Backwards Compatibility Notes	In the PSA, the IF output has functionality equivalent to the "Second IF" function in the X-Series' Aux IF Out menu. In the X-Series, it is necessary to switch the Aux IF Out to "Second IF" to get this functionality, whereas in PSA it is always on, since there are no other choices. Hence a command to switch this function to "Second IF" will have to be added by customers migrating from PSA who use the IF Output in PSA.
Initial S/W Revision	A.04.00

Off

In this mode nothing comes out of the "AUX IF OUT" connector on the rear panel. The connector appears as an open-circuit (that is, it is not terminated in any way).

Key Path	Input/Output, Output Config, Aux IF Out
Example	OUTP:AUX OFF causes the aux output type to be off
Readback Text	Off
Initial S/W Revision	A.04.00

Second IF

In this mode the 2nd IF output is routed to the rear panel connector. The annotation on the key shows the current 2nd IF frequency in use in the analyzer.

The frequency of the 2nd IF depends on the current IF signal path as shown in the table below:

IF Path Selected	Frequency of "Second IF" Output
10 MHz	322.5 MHz
25 MHz	322.5 MHz
40 MHz	250 MHz
140 MHz	300 MHz

The signal quality, such as signal to noise ratio and phase noise, are excellent in this mode.

Key Path	Input/Output, Output Config, Aux IF Out
Example	OUTP:AUX SIF causes the aux output type to be Second IF
Dependencies	Does not appear unless Option CR3 is installed.
Readback Text	Second IF
Initial S/W Revision	A.04.00

Arbitrary IF

In this mode the 2nd IF output is mixed with a local oscillator and mixer to produce an arbitrary IF output between 10 MHz and 75 MHz with 500 kHz resolution. The phase noise in this mode will not be as good as in Second IF mode.

The IF output frequency is adjustable, through an active function which appears on the Arbitrary IF selection key, from 10 MHz to 75 MHz with 500 kHz resolution.

The bandwidth of this IF output varies with band and center frequency, but is about 40 MHz at the –3 dB width. When the output is centered at lower frequencies in its range, signal frequencies at the bottom of the bandwidth will “fold”. For example, with a 40 MHz bandwidth (20 MHz half-bandwidth), and a 15 MHz IF center, a signal –20 MHz relative to the spectrum analyzer center frequency will have a relative response of about –3 dB with a frequency 20 MHz below the 15 MHz IF center. This –5 MHz frequency will fold to become a +5 MHz signal at the IF output. Therefore, lower IF output frequencies are only useful with known band-limited signals.

Key Path	Input/Output, Output Config, Aux IF Out
Example	OUTP:AUX AIF causes the aux output type to be the Arbitrary IF
Dependencies	Does not appear unless Option CRP is installed.
Readback Text	Arbitrary IF
Initial S/W Revision	A.04.00

Key Path	Input/Output, Output Config, Aux IF Out
Scope	Mode Global
Remote Command	`:OUTPut:AUX:AIF <value>` `:OUTPut:AUX:AIF?`
Example	:OUTP:AUX:AIF 50 MHZ
Preset	This is unaffected by a Preset but is set to 70 MHz on a "Restore Input/Output Defaults" or "Restore System Defaults->All”
State Saved	Saved in Input/Output State
Min	10 MHz
Max	75 MHz
Default Unit	Hz
Initial S/W Revision	A.04.00

Fast Log Video

In this mode the 2nd IF output is passed through a log amp and the log envelope of the IF signal is sent to the rear panel. The open circuit output level varies by about 25 mV per dB, with a top-of-screen signal producing about 1.6 Volts. The output impedance is nominally 50 ohms.

This mode is intended to meet the same needs as Option E4440A-H7L Fast Rise Time Video Output on the Keysight E4440A PSA Series, allowing you to characterize pulses with fast rise times using standard measurement suites on modern digital scopes.

Key Path	Input/Output, Output Config, Aux IF Out
Example	OUTP:AUX LOGVideo causes the aux output type to be Fast Log Video
Dependencies	Does not appear unless Option ALV is installed. The output is off during an alignment but not during a marker count, and is not blanked during retrace (after a sweep and before the next sweep starts).
Readback Text	Fast Log Video
Initial S/W Revision	A.04.00

I/Q Guided Calibration

Calibrating the Baseband I/Q ports requires several steps and manual connections. The Guided Calibration interactively guides you through the required steps, displaying diagrams to help with the connections. The steps vary depending on the setup.

In the Guided Calibration windows, the date and time of the last calibration are displayed. If any of the items listed are displayed in yellow, this indicates that the calibration for that item is inconsistent with the latest calibration, and you should complete the entire calibration process before you exit the calibration.

I/Q Isolation Calibration

The I/Q Isolation Calibration must be run before calibrating any port with either the I/Q Cable Calibration or I/Q Probe Calibration. This calibration is performed with nothing connected to any of the front panel I/Q ports. This is the first step in both the I/Q Cable Calibration and the I/Q Probe Calibration.

I/Q Isolation Calibration Time (Remote Command Only)

Returns the last date and time that the I/Q Isolation Calibration was performed. This is a remote query command only.

Remote Command	`:CALibration:IQ:ISOLation:TIME?`
Example	:CAL:IQ:ISOL:TIME?
Notes	This returns 6 integer values: year, month, day, hour, minute, second. When no calibration has been performed, all values will be 0.
Initial S/W Revision	A.02.00

Marker

The Marker key accesses the Marker menu. A marker can be placed on a trace to allow the value of the trace at the marker point to be determined precisely. The functions in this menu include a 1-of-N selection of the control mode Normal, Delta, Fixed, or Off for the selected marker.

The fundamental marker operation involves setting a Marker’s X-Axis value and then reading the marker’s Y-Axis value. From the front panel you do this using the Marker menu and the green marker readout in the upper right corner of the display. Programmatically, to set the Marker’s X-Axis value use :CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X <freq|time> . To query the Marker’s Y-Axis value, use :CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:Y? . See "Setting/Querying the Marker X Axis Value" on page 690 and "Setting/Querying the Marker Y Axis Value" on page 692 for information on these functions.

When Marker is pressed, if the selected marker is Off, pressing Marker sets it to Normal and places it at the center of the screen on the trace determined by the Marker Trace rules. If the selected marker is already On it will remain at the frequency/time and amplitude to which it is already set, even if this means it will be offscreen.

NOTE	Markers can be on and not be visible because they are offscreen. This may occur if you set a marker to a frequency outside of the current settings of the Start and Stop frequencies, or in Spectrogram View, you place a marker on a Display Trace other than 0. To move the marker on to the display, press Peak Search.

Markers may also be used in pairs to read the difference (or delta) between two data points. They can be used in Marker Functions to do advanced data processing, or to specify operating points in functions like Signal Track and N dB Points.

The command in the table below selects the marker and sets the marker control mode as described under Normal, Delta, Fixed and Off, below. All interactions and dependencies detailed under the key description are enforced when the remote command is sent.

See "Marker Control Mode" on page 690.

See "Setting/Querying the Marker X Axis Value" on page 690.

See "Setting the Marker X Position in Trace Points" on page 691.

See "Setting/Querying the Marker Y Axis Value" on page 692.

See "Marker Backwards Compatibility" on page 693

Key Path	Front-panel key
Remote Command	`:CALCulate:MARKer[1]|2|...12:MODE POSition|DELTa|FIXed|OFF` `:CALCulate:MARKer[1]|2|...12:MODE?`
Preset	OFF (all markers)
State Saved	The marker control mode is saved in instrument state
Backwards Compatibility SCPI	`:CALCulate:MARKer[1]|2|...12:MODE SPAN|BAND` To support band function backwards compatibility, both of these legacy parameters are accepted and aliased to POSition. They are never returned to a query. See "Band Function Backwards Compatibility" on page 743 for more information.
Initial S/W Revision	Prior to A.02.00

Marker Control Mode

There are four control modes for markers:

- Normal (POSition) – A marker that can be moved to any point on the X Axis by specifying its X Axis value, and who's absolute Y Axis value is then the value of the trace point at that X Axis value.
- Delta (DELTa) – A marker that can be moved to any point on the X Axis by specifying its X Axis offset from a reference marker, and whose absolute Y Axis value is then the value of the trace point at that X Axis value.
- Fixed (FIXed) – A marker whose X Axis and Y Axis values may be directly or indirectly specified by you, but whose Y Axis value remains fixed, once specified, and does not follow the trace. Fixed markers are useful as reference markers for Delta markers, as operands in a Peak Search operation, and as arbitrary reference points settable by you. These markers are represented on the display by an “X” rather than a diamond.
- Off (OFF) – A marker that is not in use.

In the Swept SA measurement, the Preset control mode is Off for all markers.

Setting/Querying the Marker X Axis Value

The command below sets the marker X Axis value in the current marker X Axis Scale unit. In each case the marker that is addressed becomes the selected marker. It has no effect (other than to cause the marker to become selected) if the control mode is Off, but it is the SCPI equivalent of entering an X value if the control mode is Normal,Delta, or Fixed.

Remote Command	:CALCulate:MARKer[1]|2|...12:X <freq|time> :CALCulate:MARKer[1]|2|...12:X?
Notes	If no suffix is sent it will use the fundamental units for the current marker X Axis Scale. If a suffix is sent that does not match the current marker X Axis Scale unit, an invalid suffix message will be generated. If the specified marker is Fixed and a Marker Function is on, a message is generated. If the key is pressed, an advisory message is generated. If the equivalent SCPI command is sent, this same message is generated as part of a “–221, Settings conflict” warning. The query returns the marker’s absolute X Axis value if the control mode is Normal or Fixed. It returns the offset from the marker’s reference marker if the control mode is Delta. The query is returned in the fundamental units for the current marker X Axis scale: Hz for Frequency and Inverse Time, seconds for Period and Time. If the marker is Off the response is not a number.
Preset	After a preset, if X is queried with no value sent first, the center of screen value will be returned. This will depend on the frequency range of the instrument. 13.255 GHz is correct for 26 GHz instruments only (Option 526).
Min	– ∞ (minus infinity)
Max	+ ∞ (plus infinity). Unlike legacy analyzers, where the markers were forced to be on screen, X-Series

	marker values are not limited and do not clip
Default Unit	determined by X Axis Scale
Backwards Compatibility SCPI	`:CALCulate:MARKer[1]|2|...4:X:CENTer` This alias is provided for compatibility with the Band Power function in PSA and ESA. See details in the "Marker Function" section under "Band Function Backwards Compatibility" on page 743
Backwards Compatibility Notes	In earlier Agilent analyzers, markers were position markers, which means that Normal and Delta markers stayed at the same screen position when X Axis parameters were changed. In the X-Series, markers are value markers, which means that when the analyzer's X Axis settings are changed, the marker's X Axis value in fundamental X Axis units remains unchanged. See "Marker Backwards Compatibility" on page 693 for a full discussion of this change.
Initial S/W Revision	Prior to A.02.00

Setting the Marker X Position in Trace Points

The command below sets the marker X position in trace points. It has no effect if the marker control mode is Off. But it is the SCPI equivalent of entering a value if the control mode is Normal or Delta or Fixed – except the setting is in trace points rather than X Axis Scale units.

NOTE The entered value in Trace Points is immediately translated into the current X Axis Scale units for setting the value of the marker. The marker's value in X Axis Scale Units, NOT trace points, will be preserved if a change is made to the X Axis scale settings. Thus, if you use this command to place a marker on bucket 500, which happens at that time to correspond to 13 GHz, and then you change the Start Frequency so that bucket 500 is no longer 13 GHz, the marker will stay at 13 GHz, NOT at bucket 500! This is important to realize as it differs from the behavior of past Agilent analyzers.

Remote Command	`:CALCulate:MARKer[1]|2|...12:X:POSition <real>` `:CALCulate:MARKer[1]|2|...12:X:POSition?`
Notes	If the specified marker is Fixed and a Marker Function is on, a message is generated. If the key is pressed, an advisory message is generated. If the equivalent SCPI command is sent, this same message is generated as part of a "–221, Settings conflict" warning. The query returns the marker's absolute X Axis value in trace points if the control mode is Normal or Fixed. It returns the offset from the marker's reference marker in trace points if the control mode is Delta. The value is returned as a real number, not an integer, corresponding to the translation from X Axis Scale units to trace points
Preset	After a preset, if X is queried with no value sent first, the center of screen value will be returned. So if per default, the number of Trace points is 1001, the center value will be 500.
Min	0
Max	Number of trace points – 1
Default Unit	unitless
Backwards Compatibility SCPI	`:CALCulate:MARKer[1]|2|...4:X:POSition:CENTer` This alias is provided for compatibility with the Band Power function in PSA and ESA. See details in

	the “Marker Function” section under "Band Function Backwards Compatibility" on page 743
Initial S/W Revision	Prior to A.02.00

Setting/Querying the Marker Y Axis Value

The fundamental item of marker data accessed by users is the marker’s Y-Axis value. The query below is used to select the marker and read the marker’s Y-Axis value.

In the command form, it selects the marker and sets the marker Y Axis value; the default unit is the current Y Axis unit. The command form has no effect (other than selecting the marker) unless the marker control mode is Fixed.

Remote Command	`:CALCulate:MARKer[1]|2|...12:Y <real>` `:CALCulate:MARKer[1]|2|...12:Y?`
Example	CALC:MARK2:MODE POS turns on marker 2 as a normal marker. CALC:MARK2:X 20 GHZ moves marker 2 to 20 GHz if X Axis Scale is Frequency. If X Axis Scale is Time, an Invalid Suffix error is generated.
Notes	The command :CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:Y? returns the marker Y-axis result, if the control mode is Normal, Fixed or Delta. If the marker is Off the response is 9.91e37 (“Not A Number”). If no suffix is sent it will use the current Y Axis unit. If a suffix is sent that does not have units of absolute amplitude, an invalid suffix error is generated. If a marker function is on for the specified marker, a Settings Conflict message is generated.
Preset	Trace value at center of screen. There is no way to predict what this will be after a preset.
Min	– ∞ (minus infinity)
Max	+ ∞ (plus infinity)
Backwards Compatibility Notes	As a result of the change from position markers to value markers (see below), markers can be at a frequency which is offscreen, whereas in the past, they were clipped to the screen edges and hence were never offscreen. In the past, since markers could never be offscreen they always returned a valid result. In the X-Series, markers which are offscreen return not a number as a result; hence the potential now exists for not a number to be returned for a marker Y-Axis query. Also, in some previous analyzers linear ratios read out on the display in %. In the X-Series they display as dimensionless quantities. Eg, a quantity which used to display as 52% now displays as .52. The SCPI behavior is unaffected as it has always read out the ratio rather than the percentage.
Initial S/W Revision	Prior to A.02.00

Querying the Marker Z Axis Value

The command below queries the marker Z Axis value in the Spectrogram View only. The Z Axis value of a marker represents the time value of the marker (see “Representation of Time” under the Spectrogram View description). In each case the marker that is addressed becomes the selected marker.

Remote Command	`:CALCulate:MARKer[1]|2|...12:Z?`

Notes	The query returns the marker's absolute Z Axis value if the control mode is Normal or Fixed. It returns the offset from the marker's reference marker if the control mode is Delta. For Spectrogram, the Z Axis value represents the amount of time transpired since the start of the recording of traces.
Preset	9.91E+37
Min	-Infinity
Max	+Infinity

Setting or Querying the Marker Z Position

The command below sets the Marker Z position in the Spectrogram View only. Setting the Z Position sets which of the 300 traces in the Spectrogram the selected marker will appear on. In each case the marker that is addressed becomes the selected marker. It has no effect (other than to cause the marker to become selected) if the control mode is Off, but it is the SCPI equivalent of making a Marker Z entry if the control mode is Normal,Delta, or Fixed.

Remote Command	`:CALCulate:MARKer[1]|2|...12:Z:POSition <integer>` `:CALCulate:MARKer[1]|2|...12:Z:POSition?`
Notes	The command sets or queries the Z Axis position. In the Spectrogram View, this value correlates to be one of the 300 stored traces. Each Z Axis position represents a different stored trace.
Preset	0
Min	0
Max	Number of traces stored is limited to 300.
Default Unit	unitless

Marker Backwards Compatibility

In earlier Agilent analyzers, markers were position markers, which means that Normal and Delta markers stayed at the same screen position when X Axis parameters were changed. So a marker at center screen stayed at center screen even if Center Frequency was changed (which means that the marker's frequency changed). In the X-Series, markers are value markers, which means that when the analyzer's X Axis settings are changed, the marker's X Axis value in fundamental X Axis units remains unchanged. For example, if you put a marker at a particular frequency, it will stay at that frequency regardless of whether or not you change the Center Frequency of the analyzer, even if that means that the marker ends up offscreen.

While this change resulted in an overall higher level of usability of the marker system, there are some use cases where the user depends on the marker staying at the center of the screen. The most common one is where the user turns on a marker at center screen and uses it to measure the trace amplitude at the center frequency or at a series of center frequencies, without the need to ever move the marker. In the X-Series, to mimic the legacy behavior for this use case, the user must turn the marker off and then back on after changing the center frequency of the analyzer. This causes the marker to reappear in the center of the screen.

Also as a result of the change from position markers to value markers, markers can be at a frequency which is offscreen, whereas in the past, they were clipped to the screen edges and hence were never offscreen. Users who depended on this clipping behavior to force markers to the edges of the screen will have to rewrite their code. Furthermore, since markers could never be offscreen they always returned a valid result. In the X-Series, markers which are offscreen return not a number as a result; hence the potential now exists for not a number to be returned for a marker query.

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.

Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Normal

Sets the control mode for the selected marker to Normal and turns on the active function for setting its value. If the selected marker was Off, it is placed at the center of the screen on the trace specified by the marker's Trace attribute.

A Normal mode (POSition type) marker can be moved to any point on the X Axis by specifying its X Axis value. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker
Example	:CALC:MARK:MODE POS sets Marker 1 to Normal.
Notes	See the description under the " Marker" key.
Couplings	The marker addressed by this command becomes the selected marker on the front panel.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00
Backwards Compatibity SCPI	`:CALCulate:MARKer[1]|2|...12:STATe ON|1` Setting a marker which is OFF to ON or 1 selects the marker, puts it in Normal mode and places it at the center of the screen. Setting a marker which is not OFF to ON has no effect (does not change its control mode). Example: CALC:MARK2:STAT ON sets Marker 2 to Normal if it was off; otherwise it does nothing. The response to the query will be ON unless the marker is OFF.

Remote Command	`:CALCulate:MARKer[1]|2|...12:STATe OFF|ON|0|1` `:CALCulate:MARKer[1]|2|...12:STATe?`
Preset	OFF
Initial S/W Revision	Prior to A.02.00

Delta

Sets the control mode for the selected marker to Delta and turns on the active function for setting its delta value. If the selected marker was Off, it is placed at the center of the screen on the trace specified by the marker's Trace attribute.

In Delta mode the marker result shows the relative result between the selected (Delta) marker and its reference marker. A delta marker can be moved to any point on the X Axis by specifying its X Axis offset from a reference marker. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker

Example	:CALC:MARK:MODE DELT sets marker 1 to Delta.
Notes	See the description under the “ Marker” key.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state
Backwards Compatibility Notes	Previously, pressing Delta (or sending the CALC:MARK:MODE:DELTa command) always moved the reference marker to the delta marker. Now it only does so if the marker was already a delta marker.
Initial S/W Revision	Prior to A.02.00

Fixed

Sets the control mode for the selected marker to Fixed. A fixed marker is fixed in the sense that it stays where you place it. It can be directly moved in both X and Y. It can be moved with a Peak Search. It can also be indirectly moved by re-zeroing the delta if it is a relative marker. If it is moved, it again becomes fixed at the X Axis point it moved to and it has a Y-axis result that it took on when it moved there. If a Normal or Delta marker is changed to Fixed it becomes fixed at the X Axis point it was at, and with the Y-axis result it had when it was set to Fixed.

In Fixed mode the marker result shows:

- If no Marker Function is on, the absolute X Axis and Y axis value of the marker
- If a Marker Function is on, the X Axis value and the Y-axis function result the marker had when it became fixed.

See "Fixed Marker X Axis Value" on page 699.

See "Fixed Marker Y Axis Value" on page 700.

See Fixed Marker Z Axis Value

Fixed Marker X Axis Value

Key Path	Marker, Fixed
Example	:CALC:MARK:MODE FIX sets Marker 1 to Fixed.
Notes	See the description under the “ Marker” key, above.
Dependencies	• You cannot directly set the X or Y value of a Fixed marker which has a marker function turned on. If an attempt is made to actually adjust it while a Marker Function is on, a warning message is generated. • You cannot directly set the Y value of a Fixed marker while Normalize is turned on. If an attempt is made to do so while Normalize is on, a warning message is generated.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X and Y Axis values are saved in instrument state
Backwards Compatibility Notes	In legacy analyzers, only a Reference marker could be Fixed, and it was always Fixed. Additionally it could not be noved. In the X-Series, any marker can be set to Fixed and can be moved to any X or Y value.
Initial S/W Revision	Prior to A.02.00

Fixed Marker Y Axis Value

Key Path	Marker, Fixed
Example	:CALC:MARK:MODE FIX sets Marker 1 to Fixed.
Notes	See the description under the Marker key.
Dependencies	You cannot directly set the X or Y value of a Fixed marker which has a marker function turned on. If an attempt is made to actually adjust it while a Marker Function is on, a warning message is generated.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X and Y Axis values are saved in instrument state
Default Unit	depends on the current selected Y axis unit
Initial S/W Revision	Prior to A.02.00

Fixed Marker Z Axis Value

The Marker Z position determines which of the 301 traces (0–300) the selected marker is on. It cannot be set above the maximum trace in the Spectrogram window and, unlike the Marker X position, will not move off screen in the Spectrogram Window if the storage size is smaller than the number of traces that can be viewed.

If Spectrogram is on, the marker result block has a third line displaying the time value of Marker Z. If the marker is a delta marker, the delta time value is displayed. Although the Z Marker position can be moved to trace 0, this is not recommended, as the current trace value is constantly being updated by new acquisitions and therefore the Z time value for trace 0 is not completely registered until the trace is completed.

Marker Z position is only available in the Spectrogram View

Key Path	Marker, Fixed
Example	:CALC:MARK2:MODE FIX sets Marker 2 to Fixed. :CALC:MARK2:Z:POS 150 puts Marker 2 on Trace 150
Dependencies	Only appears in the Spectrogram view, otherwise blanked
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X, Y and Z Axis values are saved in instrument state
Initial S/W Revision	A.07.01

Fixed

Sets the control mode for the selected marker to Fixed. A fixed marker is fixed in the sense that it stays where you place it. It can be directly moved in both X and Y. It can be moved with a Peak Search. It can also be indirectly moved by re-zeroing the delta if it is a relative marker. If it is moved, it again becomes fixed at the X Axis point it moved to and it has a Y-axis result that it took on when it moved there. If a Normal or

Delta marker is changed to Fixed it becomes fixed at the X Axis point it was at, and with the Y-axis result it had when it was set to Fixed.

In Fixed mode the marker result shows:

- If no Marker Function is on, the absolute X Axis and Y axis value of the marker
- If a Marker Function is on, the X Axis value and the Y-axis function result the marker had when it became fixed.

See "Fixed Marker X Axis Value" on page 701.

See "Fixed Marker Y Axis Value" on page 701.

See Fixed Marker Z Axis Value

Fixed Marker X Axis Value

Key Path	Marker, Fixed
Example	:CALC:MARK:MODE FIX sets Marker 1 to Fixed.
Notes	See the description under the " Marker" key, above.
Dependencies	• You cannot directly set the X or Y value of a Fixed marker which has a marker function turned on. If an attempt is made to actually adjust it while a Marker Function is on, a warning message is generated. • You cannot directly set the Y value of a Fixed marker while Normalize is turned on. If an attempt is made to do so while Normalize is on, a warning message is generated.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X and Y Axis values are saved in instrument state
Backwards Compatibility Notes	In legacy analyzers, only a Reference marker could be Fixed, and it was always Fixed. Additionally it could not be noved. In the X-Series, any marker can be set to Fixed and can be moved to any X or Y value.
Initial S/W Revision	Prior to A.02.00

Fixed Marker Y Axis Value

Key Path	Marker, Fixed
Example	:CALC:MARK:MODE FIX sets Marker 1 to Fixed.
Notes	See the description under the Marker key.
Dependencies	You cannot directly set the X or Y value of a Fixed marker which has a marker function turned on. If an attempt is made to actually adjust it while a Marker Function is on, a warning message is generated.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X and Y Axis values are saved in instrument state
Default Unit	depends on the current selected Y axis unit
Initial S/W Revision	Prior to A.02.00

Fixed Marker Z Axis Value

The Marker Z position determines which of the 301 traces (0–300) the selected marker is on. It cannot be set above the maximum trace in the Spectrogram window and, unlike the Marker X position, will not move off screen in the Spectrogram Window if the storage size is smaller than the number of traces that can be viewed.

If Spectrogram is on, the marker result block has a third line displaying the time value of Marker Z. If the marker is a delta marker, the delta time value is displayed. Although the Z Marker position can be moved to trace 0, this is not recommended, as the current trace value is constantly being updated by new acquisitions and therefore the Z time value for trace 0 is not completely registered until the trace is completed.

Marker Z position is only available in the Spectrogram View

Key Path	Marker, Fixed
Example	:CALC:MARK2:MODE FIX sets Marker 2 to Fixed. :CALC:MARK2:Z:POS 150 puts Marker 2 on Trace 150
Dependencies	Only appears in the Spectrogram view, otherwise blanked
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X, Y and Z Axis values are saved in instrument state
Initial S/W Revision	A.07.01

Fixed

Sets the control mode for the selected marker to Fixed. A fixed marker is fixed in the sense that it stays where you place it. It can be directly moved in both X and Y. It can be moved with a Peak Search. It can also be indirectly moved by re-zeroing the delta if it is a relative marker. If it is moved, it again becomes fixed at the X Axis point it moved to and it has a Y-axis result that it took on when it moved there. If a Normal or Delta marker is changed to Fixed it becomes fixed at the X Axis point it was at, and with the Y-axis result it had when it was set to Fixed.

In Fixed mode the marker result shows:

- If no Marker Function is on, the absolute X Axis and Y axis value of the marker
- If a Marker Function is on, the X Axis value and the Y-axis function result the marker had when it became fixed.

See "Fixed Marker X Axis Value" on page 702.

See "Fixed Marker Y Axis Value" on page 703.

See Fixed Marker Z Axis Value

Fixed Marker X Axis Value

Key Path	Marker, Fixed

Example	:CALC:MARK:MODE FIX sets Marker 1 to Fixed.
Notes	See the description under the " Marker" key, above.
Dependencies	• You cannot directly set the X or Y value of a Fixed marker which has a marker function turned on. If an attempt is made to actually adjust it while a Marker Function is on, a warning message is generated. • You cannot directly set the Y value of a Fixed marker while Normalize is turned on. If an attempt is made to do so while Normalize is on, a warning message is generated.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X and Y Axis values are saved in instrument state
Backwards Compatibility Notes	In legacy analyzers, only a Reference marker could be Fixed, and it was always Fixed. Additionally it could not be noved. In the X-Series, any marker can be set to Fixed and can be moved to any X or Y value.
Initial S/W Revision	Prior to A.02.00

Fixed Marker Y Axis Value

Key Path	Marker, Fixed
Example	:CALC:MARK:MODE FIX sets Marker 1 to Fixed.
Notes	See the description under the Marker key.
Dependencies	You cannot directly set the X or Y value of a Fixed marker which has a marker function turned on. If an attempt is made to actually adjust it while a Marker Function is on, a warning message is generated.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X and Y Axis values are saved in instrument state
Default Unit	depends on the current selected Y axis unit
Initial S/W Revision	Prior to A.02.00

Fixed Marker Z Axis Value

The Marker Z position determines which of the 301 traces (0–300) the selected marker is on. It cannot be set above the maximum trace in the Spectrogram window and, unlike the Marker X position, will not move off screen in the Spectrogram Window if the storage size is smaller than the number of traces that can be viewed.

If Spectrogram is on, the marker result block has a third line displaying the time value of Marker Z. If the marker is a delta marker, the delta time value is displayed. Although the Z Marker position can be moved to trace 0, this is not recommended, as the current trace value is constantly being updated by new acquisitions and therefore the Z time value for trace 0 is not completely registered until the trace is completed.

Marker Z position is only available in the Spectrogram View

Key Path	Marker, Fixed
Example	:CALC:MARK2:MODE FIX sets Marker 2 to Fixed. :CALC:MARK2:Z:POS 150 puts Marker 2 on Trace 150
Dependencies	Only appears in the Spectrogram view, otherwise blanked
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X, Y and Z Axis values are saved in instrument state
Initial S/W Revision	A.07.01

Off

Turns off the selected marker.

In addition, Off removes the marker annunciation from the display, turns off any active function and any marker function, and resets the following properties to their default value:

- X Axis scale: Auto
- Band/Interval Span: 0
- Auto Trace: On

Off does not affect which marker is selected.

Key Path	Marker
Example	:CALC:MARK:MODE OFF sets Marker 1 to Off.
Notes	See the description under the “ Marker” key.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) is saved in instrument state
Initial S/W Revision	Prior to A.02.00
Backwards Compatibity SCPI	`:CALCulate:MARKer[1]|2|...12:STATe OFF|0` The response to the query will be OFF unless the marker is ON.

Properties

Opens a menu used to set certain properties of the selected marker.

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

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Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1

State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

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Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker

Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Relative To

Selects the marker that the selected marker will be relative to (its reference marker).

Every marker has another marker to which it is relative. This marker is referred to as the “reference marker” for that marker. This attribute is set by the Marker, Properties, Relative To key. The marker must be a Delta marker to make this attribute relevant. If it is a Delta marker, the reference marker determines how the marker is controlled and how its value is displayed. A marker cannot be relative to itself.

Key Path	Marker, Properties
Remote Command	:CALCulate:MARKer[1]|2|...12:REFerence <integer>

	`:CALCulate:MARKer[1]|2|...12:REFerence?`
Example	CALC:MARK1:REF 2 sets the marker 1 reference marker to 2 and turns marker 1 on as a delta marker.
Notes	A marker cannot be relative to itself so that choice is grayed out. If the grayed out key is pressed, an advisory message is generated.
Notes	This command causes the marker specified with the subopcode to become selected. Range (for SCPI command): 1 to 12. If the range is exceeded the value is clipped.
Couplings	The act of specifying the selected marker's reference marker makes the selected marker a Delta marker. If the reference marker is off it is turned on in Fixed mode at the delta marker location.
Preset	The preset default "Relative To" marker (reference marker) is the next higher numbered marker (current marker +1). For example, if marker 2 is selected, then it's default reference marker is marker 3. The exception is marker 12, which has a default reference of marker 1. Set to the defaults by using Restore Mode Defaults. This is not reset by Marker Off, All Markers Off, or Preset.
State Saved	Saved in instrument state. Not affected by Marker Off and hence not affected by Preset or power cycle.
Min	1
Max	12
Status Bits/OPC dependencies	none Default (selected when Restore Mode Defaults is pressed): next higher numbered marker or 1 if marker 12.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker

Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1

State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

X Axis Scale

Accesses a menu that enables you to affect how the X Axis information for the selected marker is displayed in the marker area (top-right of display) and the active function area of the display, and how the marker is controlled. The available settings for the X Axis Scale are Frequency, Period, Time, and Inverse Time.

See "More Information" on page 713.

Key Path	Marker, Properties
Remote Command	`:CALCulate:MARKer[1]|2|...12:X:READout FREQuency	TIME	ITIMe	PERiod` `:CALCulate:MARKer[1]|2|...12:X:READout?` `:CALCulate:MARKer[1]|2|...12:X:READout:AUTO ON|OFF|1|0` `:CALCulate:MARKer[1]|2|...12:X:READout:AUTO?`
Example	CALC:MARK3:X:READ TIME sets the marker 3 X Axis Scale to Time.
Notes	This command causes the specified marker to become selected.
Preset	AUTO Marker Preset (selected when a marker is turned Off): Auto (see below). In most measurements the Auto settings results in Frequency being the preset readout.
State Saved	Saved in instrument state
Backwards Compatibility Notes	The X Axis Scale of a marker (Readout in legacy analyzers) now has only one value, not one value for frequency domain and another value for time domain. The value changes (if in Auto) when the domain of the trace it is on changes. This means that the default behaviors are identical, but if the user changes the readout manually in swept and expects the default to remain in zero span, there may be some backwards compatibility problems. As an example, in the old instruments, if the user set Readout to Period in a swept span, and the instrument was set to zero span, the readout changed to Time, the default for Zero Span. Now, it will stay in Period even in Zero Span until the user changes it or sets it back to Auto. Additionally, all choices for X Axis Scale are now always allowed. In legacy analyzers the choices of X Axis Scale were restricted based on the domain the instrument was currently in. Since the new behavior is less restrictive this should not show up as a backwards compatibility issue.
Initial S/W Revision	Prior to A.02.00

More Information

The X Axis Scale of a marker is the scale of its X Axis value. This affects the units displayed in the Marker Result block and used to specify the marker's X Axis location. The X Axis Scale is specified using the Marker, Properties, X Axis Scale key.

All markers in swept spans have both a time and frequency value. Which of these is used for the result display, and for positioning the marker, depends on the X Axis Scale setting. The X Axis Scale setting can be Frequency or Time, as well as the reciprocal of either (Period or Inverse Time). There is also an Auto setting - when in Auto, a marker's X Axis Scale changes whenever the domain of the trace, upon which it set, changes. All choices for X Axis Scale are allowed. Note that this behavior differs from the behavior in previous instruments: previously the instrument remembered a different X Axis Scale (formerly called Readout) for each domain, and the choices of X Axis Scale were restricted. These restrictions were based on the current domain of the instrument.

Auto

When in Auto, the X-Axis Scale is Frequency if the Marker Trace is a frequency domain trace, Time if the Marker Trace is a time domain trace. When in Auto, if the marker changes traces, or the domain of the trace the marker is on changes, the auto result is re-evaluated. If the X Axis Scale is chosen manually, that Scale is used regardless of the domain of the trace.

Key Path	Marker, Properties, X Axis Scale
Example	CALC:MARK2:X:READ:AUTO ON sets the marker 2 X-axis scaling to automatically select the most appropriate units.
Initial S/W Revision	Prior to A.02.00

Frequency

Sets the marker X Axis scale to Frequency, displaying the absolute frequency of a normal marker or the frequency of the delta marker relative to the reference marker. Frequency is the auto setting for frequency domain traces.

If Frequency is selected for a time domain trace, all of the points in the trace will show the same value. Attempting to use the knob or step keys to adjust the X Axis value of the marker or entering an X Axis value from the numeric keypad or remotely will have no effect but will generate no error.

Key Path	Marker, Properties, X Axis Scale
Example	CALC:MARK2:X:READ FREQ sets the marker 2 X Axis scale to Frequency.
Notes	1-of-N readback is Frequency
State Saved	The X Axis Scale setting is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Period

Sets the marker X Axis scale to Period, displaying the reciprocal of the frequency of the marker, or the reciprocal of the frequency separation of the two markers in a delta-marker mode. The units are those of time (sec, msec, etc). If the markers are at the same frequency in a delta marker mode, the result will be the reciprocal of 0, which is infinitely large. The display will show "---" and a SCPI query will return infinity.

If Period is selected for a time domain trace, all of the points in the trace will show the same value. Attempting to use the knob or step keys to adjust the X Axis value of the marker or entering an X Axis value from the numeric keypad or remotely will have no effect but will generate no error.

Key Path	Marker, Properties, X Axis Scale
Example	CALC:MARK2:X:READ PER sets the marker 2 X Axis scale to Period.
Notes	1-of-N readback is Period
State Saved	The X Axis Scale setting is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Time

Sets the marker X Axis scale to Time, displaying the time interval between a normal marker and the start of a sweep or the time of the delta marker relative to the reference marker. Time is the auto setting for time domain traces. In a delta-marker mode it is the (sweep) time interval between the two markers.

Key Path	Marker, Properties, X Axis Scale
Example	CALC:MARK2:X:READ TIME sets the marker 2 X Axis Scale to Time..
Notes	1-of-N readback is Time
Couplings	Frequency domain traces taken in FFT mode have no valid time data. Therefore when Time is selected for markers on such traces, the X Axis value is taken as the appropriate percentage of the displayed sweep time, which is a calculated estimate.
State Saved	The X Axis Scale setting is saved in instrument state
Initial S/W Revision	Prior to A.02.00

Inverse Time

Sets the marker X Axis scale to Inverse Time, displaying the reciprocal time. It is useful in a delta mode to show the reciprocal of (sweep) time between two markers. This function is only meaningful when on a time domain trace and in the Delta control mode. If the markers are at the same X Axis value, the time between them is 0, so the reciprocal of sweep time is infinitely large. The display will show “---” and a SCPI query will return infinity.

Key Path	Marker, Properties, X Axis Scale
Example	:CALC:MARK2:X:READ ITIM sets the marker 2 X Axis scale to Inverse Time.
Notes	1-of-N readback is Inverse Time
Couplings	Frequency domain traces taken in FFT mode have no valid time data. Therefore when Inverse Time is selected for markers on such traces, the X Axis value is undefined, shows as “---” and returns not a number to a query.
State Saved	The X Axis Scale setting is saved in instrument state
Initial S/W Revision	Prior to A.02.00

Marker Trace

Selects the trace that you want your marker to be placed on. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an associated trace, even Fixed markers; it is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

See "Auto Init On" on page 716.

See "Auto Init Rules Flowchart" on page 717.

See "Auto Init OFF" on page 717.

Key Path	Marker, Properties
Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe 1|2|3|4|5|6` `:CALCulate:MARKer[1]|2|...12:TRACe?`
Example	CALC:MARK1:TRAC 2 places marker 1 on trace 2.
Notes	A marker may be placed on a blanked and/or inactive trace, even though the trace is not visible and/or updating. An application may register a trace name to be displayed on the key instead of a trace number.
Couplings	The state of Marker Trace is not affected by the Auto Couple key. If a Marker Trace is chosen manually, Auto Init goes to Off for that marker. Sending the remote command causes the addressed marker to become selected.
Preset	Presets on Preset or All Markers Off
State Saved	The Marker Trace and state of Auto Init for each marker is saved in instrument state.
Min	1
Max	6
Readback line	[TraceN, Auto Init] or [TraceN, Manual] where N is the trace number to which the marker is currently assigned.
Initial S/W Revision	Prior to A.02.00

Auto Init On

When Auto Init is true, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta or Fixed) from an Off state. (The trace attribute is also determined for all markers that are on, whenever Auto Init is turned on).

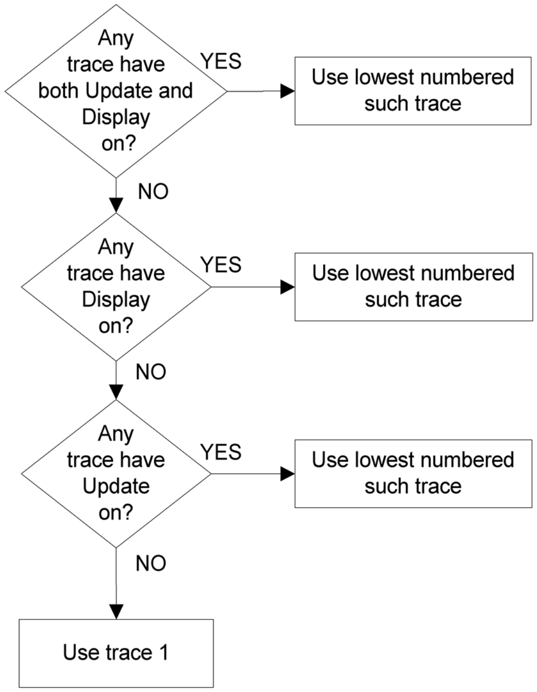
When the marker moves between traces the marker's X position in trace points is retained as it moves. For moving between active traces this generally means the x-axis value of the marker will not change. But for moving to or from an inactive trace, the x-axis value will take on that of the new trace at the bucket the marker was on the old trace (and is still on, on the new trace, since the bucket doesn't change).

Note this is true even if the marker is off screen. Thus, a marker that is at the center of the screen on the old trace stays at the center of the screen on the new trace. A marker that is off screen one whole screen to the left on the old trace remains off screen one whole screen to the left on the new trace – even if this means it will be at negative time!

Marker Trace is set to 1, and Auto Init is set to On, on a Preset or All Markers Off.

Auto Init Rules Flowchart

The following flowchart depicts the Auto Init rules:



This flowchart makes it clear that putting all lower-numbered traces in View is the simplest way to specify which trace you want the markers to go to when they turn on. For example, if you want all Markers to go to trace 2 when they turn on, put trace 1 in View.

Auto Init OFF

This command associates the marker with the specified trace and turns Marker Trace, Auto Init OFF for that marker. If the marker is not Off it moves the marker from the trace it was on to the new trace. If the marker is Off it stays off but is now associated with the specified trace.

The query returns the number of the trace on which the marker is currently placed, even if that marker is in Auto mode.

Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe:AUTO OFF|ON|0|1` `:CALCulate:MARKer[1]|2|...12:TRACe:AUTO?`
Notes	Turning Marker Trace Auto Init off has no effect on the trace on which the marker is currently placed. The response to the query will be 0 if OFF, 1 if ON.
Couplings	The state of Auto Init is not affected by the Auto Couple key. Auto Init is set to True on a Preset or All Markers Off. If Auto Init is set to On for a marker and that marker is on, that marker's Marker Trace is immediately set according to the above flowchart. Sending the remote command causes the addressed marker to become selected.

Preset	ON
Backwards Compatibility Notes	The Marker Trace Auto function in legacy analyzers has been replaced by Marker Trace Auto Init, but the same SCPI command is used for the new function. This should work fine for most legacy users. See the sections on "Auto Init On" on page 716, "Auto Init OFF" on page 717 and the "Auto Init Rules Flowchart" on page 717 for details. The new auto functionality causes markers to automatically go to the appropriate trace when the marker is first turned on. Users who counted on markers changing traces when a trace was put in or out of View will have to modify their code.
Initial S/W Revision	Prior to A.02.00

Marker Trace

Selects the trace that you want your marker to be placed on. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an associated trace, even Fixed markers; it is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

See "Auto Init On" on page 719.

See "Auto Init Rules Flowchart" on page 719.

See "Auto Init OFF" on page 719.

Key Path	Marker, Properties
Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe 1|2|3|4|5|6` `:CALCulate:MARKer[1]|2|...12:TRACe?`
Example	CALC:MARK1:TRAC 2 places marker 1 on trace 2.
Notes	A marker may be placed on a blanked and/or inactive trace, even though the trace is not visible and/or updating. An application may register a trace name to be displayed on the key instead of a trace number.
Couplings	The state of Marker Trace is not affected by the Auto Couple key. If a Marker Trace is chosen manually, Auto Init goes to Off for that marker. Sending the remote command causes the addressed marker to become selected.
Preset	Presets on Preset or All Markers Off
State Saved	The Marker Trace and state of Auto Init for each marker is saved in instrument state.
Min	1
Max	6
Readback line	[TraceN, Auto Init] or [TraceN, Manual] where N is the trace number to which the marker is currently assigned.
Initial S/W Revision	Prior to A.02.00

Auto Init On

When Auto Init is true, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta or Fixed) from an Off state. (The trace attribute is also determined for all markers that are on, whenever Auto Init is turned on).

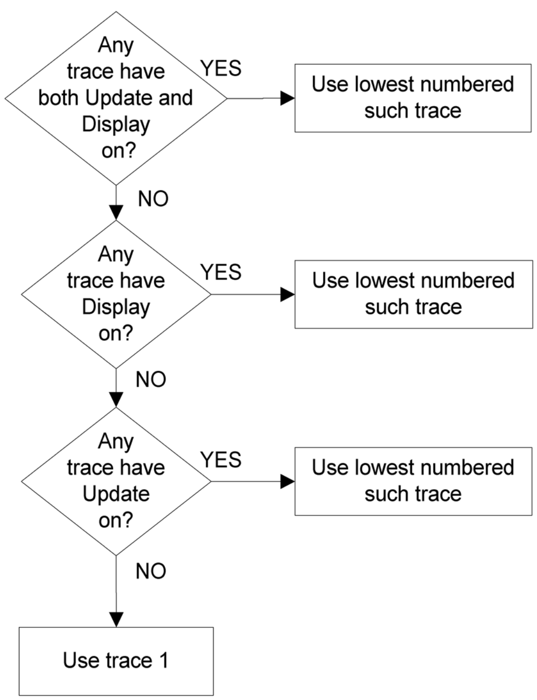
When the marker moves between traces the marker's X position in trace points is retained as it moves. For moving between active traces this generally means the x-axis value of the marker will not change. But for moving to or from an inactive trace, the x-axis value will take on that of the new trace at the bucket the marker was on the old trace (and is still on, on the new trace, since the bucket doesn't change).

Note this is true even if the marker is off screen. Thus, a marker that is at the center of the screen on the old trace stays at the center of the screen on the new trace. A marker that is off screen one whole screen to the left on the old trace remains off screen one whole screen to the left on the new trace – even if this means it will be at negative time!

Marker Trace is set to 1, and Auto Init is set to On, on a Preset or All Markers Off.

Auto Init Rules Flowchart

The following flowchart depicts the Auto Init rules:



This flowchart makes it clear that putting all lower-numbered traces in View is the simplest way to specify which trace you want the markers to go to when they turn on. For example, if you want all Markers to go to trace 2 when they turn on, put trace 1 in View.

Auto Init OFF

This command associates the marker with the specified trace and turns Marker Trace, Auto Init OFF for that marker. If the marker is not Off it moves the marker from the trace it was on to the new trace. If the marker is Off it stays off but is now associated with the specified trace.

The query returns the number of the trace on which the marker is currently placed, even if that marker is in Auto mode.

Remote Command	:CALCulate:MARKer[1]|2|...12:TRACe:AUTO OFF|ON|0|1 :CALCulate:MARKer[1]|2|...12:TRACe:AUTO?
Notes	Turning Marker Trace Auto Init off has no effect on the trace on which the marker is currently placed. The response to the query will be 0 if OFF, 1 if ON.
Couplings	The state of Auto Init is not affected by the Auto Couple key. Auto Init is set to True on a Preset or All Markers Off. If Auto Init is set to On for a marker and that marker is on, that marker’s Marker Trace is immediately set according to the above flowchart. Sending the remote command causes the addressed marker to become selected.
Preset	ON
Backwards Compatibility Notes	The Marker Trace Auto function in legacy analyzers has been replaced by Marker Trace Auto Init, but the same SCPI command is used for the new function. This should work fine for most legacy users. See the sections on "Auto Init On" on page 719, "Auto Init OFF" on page 719 and the "Auto Init Rules Flowchart" on page 719 for details. The new auto functionality causes markers to automatically go to the appropriate trace when the marker is first turned on. Users who counted on markers changing traces when a trace was put in or out of View will have to modify their code.
Initial S/W Revision	Prior to A.02.00

Marker Trace

Selects the trace that you want your marker to be placed on. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an associated trace, even Fixed markers; it is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

See "Auto Init On" on page 721.

See "Auto Init Rules Flowchart" on page 721.

See "Auto Init OFF" on page 722.

Key Path	Marker, Properties
Remote Command	:CALCulate:MARKer[1]|2|...12:TRACe 1|2|3|4|5|6 :CALCulate:MARKer[1]|2|...12:TRACe?
Example	CALC:MARK1:TRAC 2 places marker 1 on trace 2.
Notes	A marker may be placed on a blanked and/or inactive trace, even though the trace is not visible and/or updating. An application may register a trace name to be displayed on the key instead of a trace number.
Couplings	The state of Marker Trace is not affected by the Auto Couple key. If a Marker Trace is chosen manually, Auto Init goes to Off for that marker.

	Sending the remote command causes the addressed marker to become selected.
Preset	Presets on Preset or All Markers Off
State Saved	The Marker Trace and state of Auto Init for each marker is saved in instrument state.
Min	1
Max	6
Readback line	[TraceN, Auto Init] or [TraceN, Manual] where N is the trace number to which the marker is currently assigned.
Initial S/W Revision	Prior to A.02.00

Auto Init On

When Auto Init is true, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta or Fixed) from an Off state. (The trace attribute is also determined for all markers that are on, whenever Auto Init is turned on).

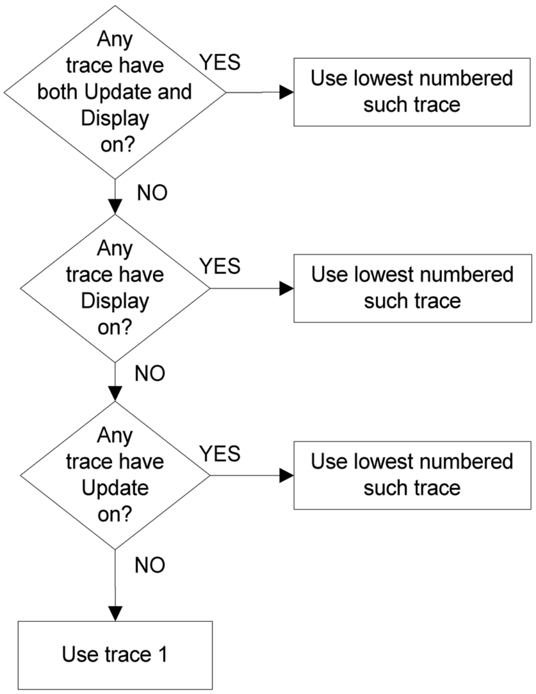
When the marker moves between traces the marker's X position in trace points is retained as it moves. For moving between active traces this generally means the x-axis value of the marker will not change. But for moving to or from an inactive trace, the x-axis value will take on that of the new trace at the bucket the marker was on the old trace (and is still on, on the new trace, since the bucket doesn't change).

Note this is true even if the marker is off screen. Thus, a marker that is at the center of the screen on the old trace stays at the center of the screen on the new trace. A marker that is off screen one whole screen to the left on the old trace remains off screen one whole screen to the left on the new trace – even if this means it will be at negative time!

Marker Trace is set to 1, and Auto Init is set to On, on a Preset or All Markers Off.

Auto Init Rules Flowchart

The following flowchart depicts the Auto Init rules:



This flowchart makes it clear that putting all lower-numbered traces in View is the simplest way to specify which trace you want the markers to go to when they turn on. For example, if you want all Markers to go to trace 2 when they turn on, put trace 1 in View.

Auto Init OFF

This command associates the marker with the specified trace and turns Marker Trace, Auto Init OFF for that marker. If the marker is not Off it moves the marker from the trace it was on to the new trace. If the marker is Off it stays off but is now associated with the specified trace.

The query returns the number of the trace on which the marker is currently placed, even if that marker is in Auto mode.

Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe:AUTO OFF|ON|0|1` `:CALCulate:MARKer[1]|2|...12:TRACe:AUTO?`
Notes	Turning Marker Trace Auto Init off has no effect on the trace on which the marker is currently placed. The response to the query will be 0 if OFF, 1 if ON.
Couplings	The state of Auto Init is not affected by the Auto Couple key. Auto Init is set to True on a Preset or All Markers Off. If Auto Init is set to On for a marker and that marker is on, that marker’s Marker Trace is immediately set according to the above flowchart. Sending the remote command causes the addressed marker to become selected.
Preset	ON
Backwards Compatibility Notes	The Marker Trace Auto function in legacy analyzers has been replaced by Marker Trace Auto Init, but the same SCPI command is used for the new function. This should work fine for most legacy users.

	See the sections on "Auto Init On" on page 721, "Auto Init OFF" on page 722 and the "Auto Init Rules Flowchart" on page 721 for details. The new auto functionality causes markers to automatically go to the appropriate trace when the marker is first turned on. Users who counted on markers changing traces when a trace was put in or out of View will have to modify their code.
Initial S/W Revision	Prior to A.02.00

Marker Trace

Selects the trace that you want your marker to be placed on. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an associated trace, even Fixed markers; it is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

See "Auto Init On" on page 723.

See "Auto Init Rules Flowchart" on page 724.

See "Auto Init OFF" on page 724.

Key Path	Marker, Properties
Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe 1|2|3|4|5|6` `:CALCulate:MARKer[1]|2|...12:TRACe?`
Example	CALC:MARK1:TRAC 2 places marker 1 on trace 2.
Notes	A marker may be placed on a blanked and/or inactive trace, even though the trace is not visible and/or updating. An application may register a trace name to be displayed on the key instead of a trace number.
Couplings	The state of Marker Trace is not affected by the Auto Couple key. If a Marker Trace is chosen manually, Auto Init goes to Off for that marker. Sending the remote command causes the addressed marker to become selected.
Preset	Presets on Preset or All Markers Off
State Saved	The Marker Trace and state of Auto Init for each marker is saved in instrument state.
Min	1
Max	6
Readback line	[TraceN, Auto Init] or [TraceN, Manual] where N is the trace number to which the marker is currently assigned.
Initial S/W Revision	Prior to A.02.00

Auto Init On

When Auto Init is true, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta or Fixed) from an Off state. (The trace attribute is also determined for all markers that are on, whenever Auto Init is turned on).

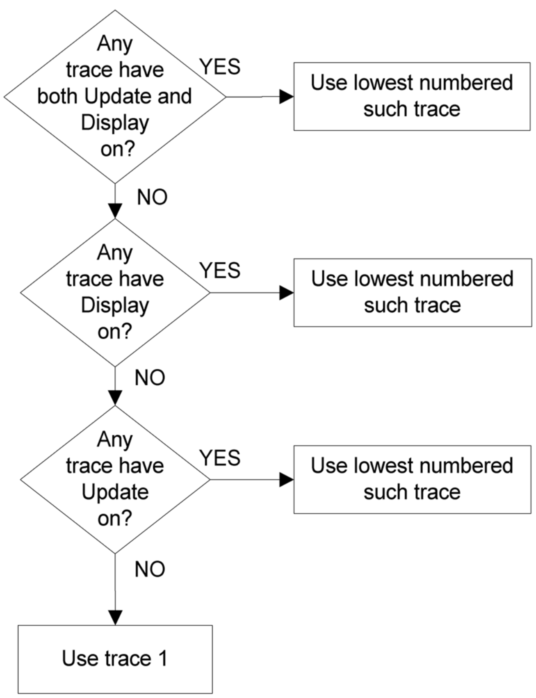
When the marker moves between traces the marker's X position in trace points is retained as it moves. For moving between active traces this generally means the x-axis value of the marker will not change. But for moving to or from an inactive trace, the x-axis value will take on that of the new trace at the bucket the marker was on the old trace (and is still on, on the new trace, since the bucket doesn't change).

Note this is true even if the marker is off screen. Thus, a marker that is at the center of the screen on the old trace stays at the center of the screen on the new trace. A marker that is off screen one whole screen to the left on the old trace remains off screen one whole screen to the left on the new trace – even if this means it will be at negative time!

Marker Trace is set to 1, and Auto Init is set to On, on a Preset or All Markers Off.

Auto Init Rules Flowchart

The following flowchart depicts the Auto Init rules:



This flowchart makes it clear that putting all lower-numbered traces in View is the simplest way to specify which trace you want the markers to go to when they turn on. For example, if you want all Markers to go to trace 2 when they turn on, put trace 1 in View.

Auto Init OFF

This command associates the marker with the specified trace and turns Marker Trace, Auto Init OFF for that marker. If the marker is not Off it moves the marker from the trace it was on to the new trace. If the marker is Off it stays off but is now associated with the specified trace.

The query returns the number of the trace on which the marker is currently placed, even if that marker is in Auto mode.

Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe:AUTO OFF|ON|0|1` `:CALCulate:MARKer[1]|2|...12:TRACe:AUTO?`
Notes	Turning Marker Trace Auto Init off has no effect on the trace on which the marker is currently placed. The response to the query will be 0 if OFF, 1 if ON.
Couplings	The state of Auto Init is not affected by the Auto Couple key. Auto Init is set to True on a Preset or All Markers Off. If Auto Init is set to On for a marker and that marker is on, that marker's Marker Trace is immediately set according to the above flowchart. Sending the remote command causes the addressed marker to become selected.
Preset	ON
Backwards Compatibility Notes	The Marker Trace Auto function in legacy analyzers has been replaced by Marker Trace Auto Init, but the same SCPI command is used for the new function. This should work fine for most legacy users. See the sections on "Auto Init On" on page 723, "Auto Init OFF" on page 724 and the "Auto Init Rules Flowchart" on page 724 for details. The new auto functionality causes markers to automatically go to the appropriate trace when the marker is first turned on. Users who counted on markers changing traces when a trace was put in or out of View will have to modify their code.
Initial S/W Revision	Prior to A.02.00

Marker Trace

Selects the trace that you want your marker to be placed on. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an associated trace, even Fixed markers; it is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

See "Auto Init On" on page 726.

See "Auto Init Rules Flowchart" on page 726.

See "Auto Init OFF" on page 727.

Key Path	Marker, Properties
Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe 1|2|3|4|5|6` `:CALCulate:MARKer[1]|2|...12:TRACe?`
Example	CALC:MARK1:TRAC 2 places marker 1 on trace 2.
Notes	A marker may be placed on a blanked and/or inactive trace, even though the trace is not visible and/or updating. An application may register a trace name to be displayed on the key instead of a trace number.
Couplings	The state of Marker Trace is not affected by the Auto Couple key. If a Marker Trace is chosen manually, Auto Init goes to Off for that marker. Sending the remote command causes the addressed marker to become selected.
Preset	Presets on Preset or All Markers Off

State Saved	The Marker Trace and state of Auto Init for each marker is saved in instrument state.
Min	1
Max	6
Readback line	[TraceN, Auto Init] or [TraceN, Manual] where N is the trace number to which the marker is currently assigned.
Initial S/W Revision	Prior to A.02.00

Auto Init On

When Auto Init is true, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta or Fixed) from an Off state. (The trace attribute is also determined for all markers that are on, whenever Auto Init is turned on).

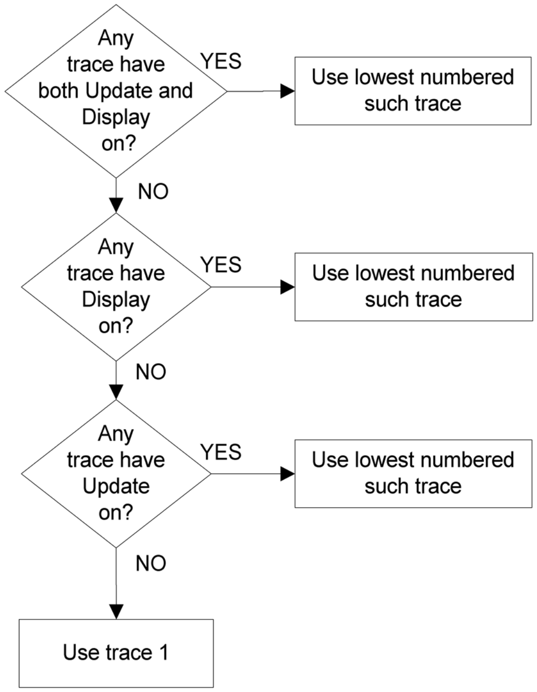
When the marker moves between traces the marker's X position in trace points is retained as it moves. For moving between active traces this generally means the x-axis value of the marker will not change. But for moving to or from an inactive trace, the x-axis value will take on that of the new trace at the bucket the marker was on the old trace (and is still on, on the new trace, since the bucket doesn't change).

Note this is true even if the marker is off screen. Thus, a marker that is at the center of the screen on the old trace stays at the center of the screen on the new trace. A marker that is off screen one whole screen to the left on the old trace remains off screen one whole screen to the left on the new trace – even if this means it will be at negative time!

Marker Trace is set to 1, and Auto Init is set to On, on a Preset or All Markers Off.

Auto Init Rules Flowchart

The following flowchart depicts the Auto Init rules:



This flowchart makes it clear that putting all lower-numbered traces in View is the simplest way to specify which trace you want the markers to go to when they turn on. For example, if you want all Markers to go to trace 2 when they turn on, put trace 1 in View.

Auto Init OFF

This command associates the marker with the specified trace and turns Marker Trace, Auto Init OFF for that marker. If the marker is not Off it moves the marker from the trace it was on to the new trace. If the marker is Off it stays off but is now associated with the specified trace.

The query returns the number of the trace on which the marker is currently placed, even if that marker is in Auto mode.

Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe:AUTO OFF|ON|0|1` `:CALCulate:MARKer[1]|2|...12:TRACe:AUTO?`
Notes	Turning Marker Trace Auto Init off has no effect on the trace on which the marker is currently placed. The response to the query will be 0 if OFF, 1 if ON.
Couplings	The state of Auto Init is not affected by the Auto Couple key. Auto Init is set to True on a Preset or All Markers Off. If Auto Init is set to On for a marker and that marker is on, that marker's Marker Trace is immediately set according to the above flowchart. Sending the remote command causes the addressed marker to become selected.
Preset	ON
Backwards Compatibility Notes	The Marker Trace Auto function in legacy analyzers has been replaced by Marker Trace Auto Init, but the same SCPI command is used for the new function. This should work fine for most legacy users.

	See the sections on "Auto Init On" on page 726, "Auto Init OFF" on page 727 and the "Auto Init Rules Flowchart" on page 726 for details. The new auto functionality causes markers to automatically go to the appropriate trace when the marker is first turned on. Users who counted on markers changing traces when a trace was put in or out of View will have to modify their code.
Initial S/W Revision	Prior to A.02.00

Marker Trace

Selects the trace that you want your marker to be placed on. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an associated trace, even Fixed markers; it is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

See "Auto Init On" on page 728.

See "Auto Init Rules Flowchart" on page 729.

See "Auto Init OFF" on page 729.

Key Path	Marker, Properties
Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe 1|2|3|4|5|6` `:CALCulate:MARKer[1]|2|...12:TRACe?`
Example	CALC:MARK1:TRAC 2 places marker 1 on trace 2.
Notes	A marker may be placed on a blanked and/or inactive trace, even though the trace is not visible and/or updating. An application may register a trace name to be displayed on the key instead of a trace number.
Couplings	The state of Marker Trace is not affected by the Auto Couple key. If a Marker Trace is chosen manually, Auto Init goes to Off for that marker. Sending the remote command causes the addressed marker to become selected.
Preset	Presets on Preset or All Markers Off
State Saved	The Marker Trace and state of Auto Init for each marker is saved in instrument state.
Min	1
Max	6
Readback line	[TraceN, Auto Init] or [TraceN, Manual] where N is the trace number to which the marker is currently assigned.
Initial S/W Revision	Prior to A.02.00

Auto Init On

When Auto Init is true, the marker’s trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta or Fixed) from an Off state. (The trace attribute is also determined for all markers that are on, whenever Auto Init is turned on).

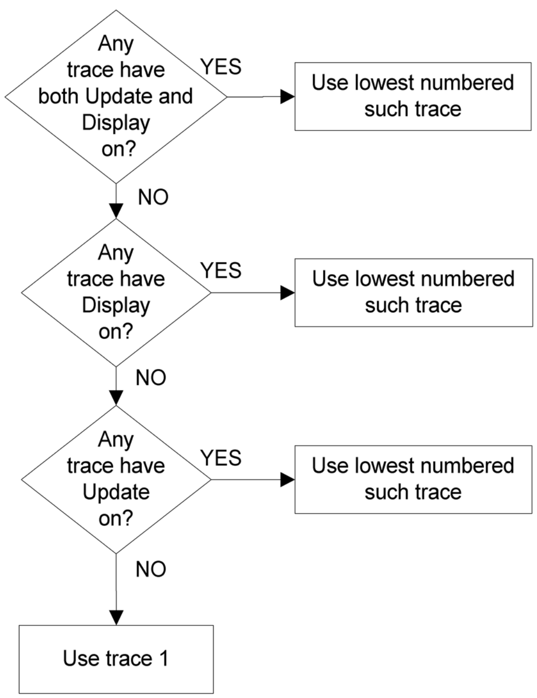
When the marker moves between traces the marker's X position in trace points is retained as it moves. For moving between active traces this generally means the x-axis value of the marker will not change. But for moving to or from an inactive trace, the x-axis value will take on that of the new trace at the bucket the marker was on the old trace (and is still on, on the new trace, since the bucket doesn't change).

Note this is true even if the marker is off screen. Thus, a marker that is at the center of the screen on the old trace stays at the center of the screen on the new trace. A marker that is off screen one whole screen to the left on the old trace remains off screen one whole screen to the left on the new trace – even if this means it will be at negative time!

Marker Trace is set to 1, and Auto Init is set to On, on a Preset or All Markers Off.

Auto Init Rules Flowchart

The following flowchart depicts the Auto Init rules:



This flowchart makes it clear that putting all lower-numbered traces in View is the simplest way to specify which trace you want the markers to go to when they turn on. For example, if you want all Markers to go to trace 2 when they turn on, put trace 1 in View.

Auto Init OFF

This command associates the marker with the specified trace and turns Marker Trace, Auto Init OFF for that marker. If the marker is not Off it moves the marker from the trace it was on to the new trace. If the marker is Off it stays off but is now associated with the specified trace.

The query returns the number of the trace on which the marker is currently placed, even if that marker is in Auto mode.

Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe:AUTO OFF|ON|0|1` `:CALCulate:MARKer[1]|2|...12:TRACe:AUTO?`
Notes	Turning Marker Trace Auto Init off has no effect on the trace on which the marker is currently placed. The response to the query will be 0 if OFF, 1 if ON.
Couplings	The state of Auto Init is not affected by the Auto Couple key. Auto Init is set to True on a Preset or All Markers Off. If Auto Init is set to On for a marker and that marker is on, that marker's Marker Trace is immediately set according to the above flowchart. Sending the remote command causes the addressed marker to become selected.
Preset	ON
Backwards Compatibility Notes	The Marker Trace Auto function in legacy analyzers has been replaced by Marker Trace Auto Init, but the same SCPI command is used for the new function. This should work fine for most legacy users. See the sections on "Auto Init On" on page 728, "Auto Init OFF" on page 729 and the "Auto Init Rules Flowchart" on page 729 for details. The new auto functionality causes markers to automatically go to the appropriate trace when the marker is first turned on. Users who counted on markers changing traces when a trace was put in or out of View will have to modify their code.
Initial S/W Revision	Prior to A.02.00

Marker Trace

Selects the trace that you want your marker to be placed on. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an associated trace, even Fixed markers; it is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

See "Auto Init On" on page 731.

See "Auto Init Rules Flowchart" on page 731.

See "Auto Init OFF" on page 732.

Key Path	Marker, Properties
Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe 1|2|3|4|5|6` `:CALCulate:MARKer[1]|2|...12:TRACe?`
Example	CALC:MARK1:TRAC 2 places marker 1 on trace 2.
Notes	A marker may be placed on a blanked and/or inactive trace, even though the trace is not visible and/or updating. An application may register a trace name to be displayed on the key instead of a trace number.
Couplings	The state of Marker Trace is not affected by the Auto Couple key. If a Marker Trace is chosen manually, Auto Init goes to Off for that marker. Sending the remote command causes the addressed marker to become selected.
Preset	Presets on Preset or All Markers Off

State Saved	The Marker Trace and state of Auto Init for each marker is saved in instrument state.
Min	1
Max	6
Readback line	[TraceN, Auto Init] or [TraceN, Manual] where N is the trace number to which the marker is currently assigned.
Initial S/W Revision	Prior to A.02.00

Auto Init On

When Auto Init is true, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta or Fixed) from an Off state. (The trace attribute is also determined for all markers that are on, whenever Auto Init is turned on).

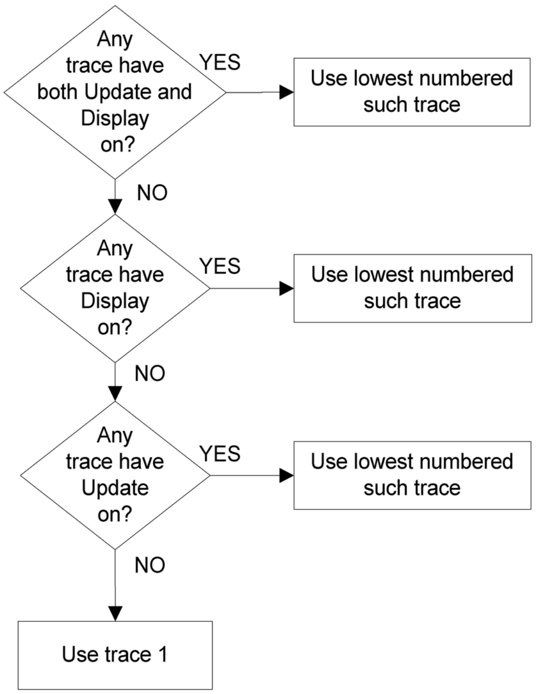
When the marker moves between traces the marker's X position in trace points is retained as it moves. For moving between active traces this generally means the x-axis value of the marker will not change. But for moving to or from an inactive trace, the x-axis value will take on that of the new trace at the bucket the marker was on the old trace (and is still on, on the new trace, since the bucket doesn't change).

Note this is true even if the marker is off screen. Thus, a marker that is at the center of the screen on the old trace stays at the center of the screen on the new trace. A marker that is off screen one whole screen to the left on the old trace remains off screen one whole screen to the left on the new trace – even if this means it will be at negative time!

Marker Trace is set to 1, and Auto Init is set to On, on a Preset or All Markers Off.

Auto Init Rules Flowchart

The following flowchart depicts the Auto Init rules:



This flowchart makes it clear that putting all lower-numbered traces in View is the simplest way to specify which trace you want the markers to go to when they turn on. For example, if you want all Markers to go to trace 2 when they turn on, put trace 1 in View.

Auto Init OFF

This command associates the marker with the specified trace and turns Marker Trace, Auto Init OFF for that marker. If the marker is not Off it moves the marker from the trace it was on to the new trace. If the marker is Off it stays off but is now associated with the specified trace.

The query returns the number of the trace on which the marker is currently placed, even if that marker is in Auto mode.

Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe:AUTO OFF|ON|0|1` `:CALCulate:MARKer[1]|2|...12:TRACe:AUTO?`
Notes	Turning Marker Trace Auto Init off has no effect on the trace on which the marker is currently placed. The response to the query will be 0 if OFF, 1 if ON.
Couplings	The state of Auto Init is not affected by the Auto Couple key. Auto Init is set to True on a Preset or All Markers Off. If Auto Init is set to On for a marker and that marker is on, that marker's Marker Trace is immediately set according to the above flowchart. Sending the remote command causes the addressed marker to become selected.
Preset	ON
Backwards Compatibility Notes	The Marker Trace Auto function in legacy analyzers has been replaced by Marker Trace Auto Init, but the same SCPI command is used for the new function. This should work fine for most legacy users.

	See the sections on "Auto Init On" on page 731, "Auto Init OFF" on page 732 and the "Auto Init Rules Flowchart" on page 731 for details. The new auto functionality causes markers to automatically go to the appropriate trace when the marker is first turned on. Users who counted on markers changing traces when a trace was put in or out of View will have to modify their code.
Initial S/W Revision	Prior to A.02.00

Marker Trace

Selects the trace that you want your marker to be placed on. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an associated trace, even Fixed markers; it is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

See "Auto Init On" on page 733.

See "Auto Init Rules Flowchart" on page 734.

See "Auto Init OFF" on page 734.

Key Path	Marker, Properties
Remote Command	`:CALCulate:MARKer[1]|2|...12:TRACe 1|2|3|4|5|6` `:CALCulate:MARKer[1]|2|...12:TRACe?`
Example	CALC:MARK1:TRAC 2 places marker 1 on trace 2.
Notes	A marker may be placed on a blanked and/or inactive trace, even though the trace is not visible and/or updating. An application may register a trace name to be displayed on the key instead of a trace number.
Couplings	The state of Marker Trace is not affected by the Auto Couple key. If a Marker Trace is chosen manually, Auto Init goes to Off for that marker. Sending the remote command causes the addressed marker to become selected.
Preset	Presets on Preset or All Markers Off
State Saved	The Marker Trace and state of Auto Init for each marker is saved in instrument state.
Min	1
Max	6
Readback line	[TraceN, Auto Init] or [TraceN, Manual] where N is the trace number to which the marker is currently assigned.
Initial S/W Revision	Prior to A.02.00

Auto Init On

When Auto Init is true, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta or Fixed) from an Off state. (The trace attribute is also determined for all markers that are on, whenever Auto Init is turned on).

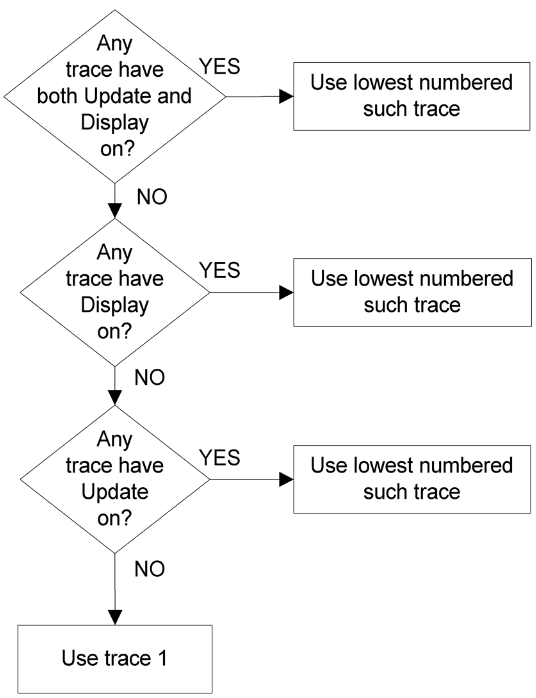
When the marker moves between traces the marker's X position in trace points is retained as it moves. For moving between active traces this generally means the x-axis value of the marker will not change. But for moving to or from an inactive trace, the x-axis value will take on that of the new trace at the bucket the marker was on the old trace (and is still on, on the new trace, since the bucket doesn't change).

Note this is true even if the marker is off screen. Thus, a marker that is at the center of the screen on the old trace stays at the center of the screen on the new trace. A marker that is off screen one whole screen to the left on the old trace remains off screen one whole screen to the left on the new trace – even if this means it will be at negative time!

Marker Trace is set to 1, and Auto Init is set to On, on a Preset or All Markers Off.

Auto Init Rules Flowchart

The following flowchart depicts the Auto Init rules:



This flowchart makes it clear that putting all lower-numbered traces in View is the simplest way to specify which trace you want the markers to go to when they turn on. For example, if you want all Markers to go to trace 2 when they turn on, put trace 1 in View.

Auto Init OFF

This command associates the marker with the specified trace and turns Marker Trace, Auto Init OFF for that marker. If the marker is not Off it moves the marker from the trace it was on to the new trace. If the marker is Off it stays off but is now associated with the specified trace.

The query returns the number of the trace on which the marker is currently placed, even if that marker is in Auto mode.

Remote Command	:CALCulate:MARKer[1]|2|...12:TRACe:AUTO OFF|ON|0|1 :CALCulate:MARKer[1]|2|...12:TRACe:AUTO?
Notes	Turning Marker Trace Auto Init off has no effect on the trace on which the marker is currently placed. The response to the query will be 0 if OFF, 1 if ON.
Couplings	The state of Auto Init is not affected by the Auto Couple key. Auto Init is set to True on a Preset or All Markers Off. If Auto Init is set to On for a marker and that marker is on, that marker's Marker Trace is immediately set according to the above flowchart. Sending the remote command causes the addressed marker to become selected.
Preset	ON
Backwards Compatibility Notes	The Marker Trace Auto function in legacy analyzers has been replaced by Marker Trace Auto Init, but the same SCPI command is used for the new function. This should work fine for most legacy users. See the sections on "Auto Init On" on page 733, "Auto Init OFF" on page 734 and the "Auto Init Rules Flowchart" on page 734 for details. The new auto functionality causes markers to automatically go to the appropriate trace when the marker is first turned on. Users who counted on markers changing traces when a trace was put in or out of View will have to modify their code.
Initial S/W Revision	Prior to A.02.00

Lines

When on, displays a vertical line of graticule height and a horizontal line of graticule width, intersecting at the indicator point of the marker (that is, the center of the X or the bottom tip of the diamond. The lines are blue in color.

If the marker is off screen the lines should be extended from the marker so that they go thru the screen area if possible. This is really useful for off screen Fixed markers as it lets you see their amplitude even though they are off the X Axis.

Key Path	Marker, Properties
Remote Command	:CALCulate:MARKer[1]|2|...12:LINes[:STATe] OFF|ON|0|1 :CALCulate:MARKer[1]|2|...12:LINes[:STATe]?
Example	:CALC:MARK2:LIN:ON turns Lines on for marker 2.
Couplings	Sending the remote command causes the addressed marker to become selected.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Marker Table

When set to On, the display is split into a measurement window and a marker data display window. For each marker which is on, information is displayed in the data display window, which includes the marker number, control mode, trace number, X axis scale, X axis value, and the Y-axis result. Additional information is shown for markers which have marker functions turned on.

Turning the Marker Table on turns the Peak Table off and vice versa.

Key Path	Marker
Remote Command	`:CALCulate:MARKer:TABLe[:STATe] OFF|ON|0|1` `:CALCulate:MARKer:TABLe[:STATe]?`
Example	CALC:MARK:TABL ON turns on the marker table.
Preset	OFF
State Saved	The on/off state of the Marker Table is saved in instrument state
Initial S/W Revision	Prior to A.02.00

Marker Count

Accesses the marker count menu.

Key Path	Marker
Readback line	[On] if count on for the selected marker, [Off] if it is off.
Initial S/W Revision	Prior to A.02.00

Counter

Turns the marker frequency counter on and off. The selected marker is counted, and if the selected marker is a delta marker and its reference marker is not fixed, the reference marker is counted as well.

See "Understanding the Marker Counter" on page 737.

See "Query Count Value" on page 737.

Key Path	Marker, Marker Count
Remote Command	`:CALCulate:MARKer[1]|2|...12:FCOunt[:STATe] OFF|ON|0|1` `:CALCulate:MARKer[1]|2|...12:FCOunt[:STATe]?`
Example	CALC:MARK2:FCO ON selects marker 2, turns it on, and turns on the counter CALC:MARK2:FCO:X? returns the counted frequency.
Notes	Fixed markers are not counted, but a Fixed marker will have a count stored in it if it is selected or is the reference marker for the selected marker. The count already in the marker is stored when the marker becomes fixed and if there is none or the marker moves (for example, Pk Search) it is counted and stored after the next sweep. If a Fixed marker has a count stored in it, that count will be displayed when the marker is selected, and used as the reference count when that marker is a reference marker. If a Fixed marker has a count stored in it, that count will be deleted if the marker X is adjusted.

	If a Fixed marker has a count stored in it, and a Search function is performed using the Fixed marker, while the counter is on, the count stored in the marker will be updated. If a Fixed marker has a count stored in it, and is a reference marker, and the reference is moved to a valid trace point by re-zeroing the delta (by pressing Delta again or sending the DELTa SCPI command), while the counter is on, the count stored in the marker will be updated.
Notes	This command causes the specified marker to become selected.
Dependencies	Marker Count is unavailable (grayed out and Off) if the Gate function is on.
Couplings	If the selected marker is Off when the counter is turned on, the selected marker is set to Normal and placed at center of screen on the trace determined by the Marker Trace rules. If a marker that is OFF is selected while the counter is on, the counter remains on, but since the marker is off, the count is undefined. In this case the analyzer will return not a number to a SCPI count query. The counter is turned OFF when the selected marker is turned OFF.
Preset	OFF
State Saved	The state of the counter (on/off) is saved in instrument state. In the case of Fixed markers, the count stored in the marker is saved in instrument state.
Backwards Compatibility Notes	In some legacy analyzers (e.g., the 8560 series) the FreqOffset value was applied to the Marker Count. In others (e.g., ESA and PSA) it was not. The X-Series follows the ESA/PSA model and does not apply Freq Offset to the Marker Count. In ESA and PSA the reference marker for Delta markers was always counted. In the X-Series the marker is counted for Normal and Delta markers; but for the reference marker, if it is a Fixed marker, we use the count stored in the Fixed marker. This enhanced capability may require a change to some users' code and/or test procedures.
Initial S/W Revision	Prior to A.02.00

Query Count Value

Queries the frequency count. The query returns the absolute count unless the specified marker is in Delta mode, then it returns the relative count. If the marker is off, or the marker is on but the counter is off, the analyzer will return not a number to a SCPI count query. A marker with no stored count, or a non-Fixed marker on a stored trace, will also return not a number to a SCPI count query. Note this result may simply mean that the first sweep after the counter turned on has not yet completed.

Remote Command	`:CALCulate:MARKer[1]|2|...12:FCOunt:X?`
Notes	This query does NOT cause the specified marker to become selected.
Initial S/W Revision	Prior to A.02.00

Understanding the Marker Counter

See "Counting Off-screen Markers" on page 738.

See "Delta Marker" on page 738.

See "Fixed Markers" on page 738.

See "More Information on "Counter"" on page 738.

Using the internal counter we can count the frequency of a marker, but we cannot count while we are actually sweeping. So, once we are done with a sweep, we move to the selected marker frequency and count that frequency. Then, if the marker is a Delta marker, the count is also taken for its reference marker. The count is actually performed by moving the LO to the frequency (or frequencies in the case of a delta marker) we wish to count. The count is executed on a marker by marker basis and no further count is taken until after the next sweep (even if the marker moves before another sweep has completed).

The Marker Count is taken by tuning the instrument to the frequency of the marker and counting the IF, with the instrument not sweeping. The count is adjusted for display by adding or subtracting it (as appropriate) from the LO frequency, so that you see a count that represents the signal frequency. This is true even if External Mixing is on. Since all this happens between sweeps, you never see the instrument retuning to do the counts.

If you wish to see the entered frequency of a counted marker it will appear in the active function area when that marker is selected (for Fixed markers, you have to press the Marker, Fixed key to select Fixed markers and then press it a second time to view or adjust the x or y marker values).

Counting Off-screen Markers

If the selected marker is off the X-axis the instrument can still be tuned to the marker (unless it is outside the current range of the instrument), so the count can still be displayed. This means you can see a count for an off-screen marker even though there may be no valid Y-value for the marker. If the marker frequency is outside the range of the instrument, the display will show three dashes in the count block (---), and not a number is returned to a SCPI count query.

Delta Marker

When a Delta Marker is selected while Marker Count is on:

5. If the reference marker is not a fixed marker, the display shows the difference between the count of the selected marker and the count of the reference marker
6. If the reference marker is a fixed marker and there is a count stored in the marker (because Marker Count was on when the marker became a fixed marker), the display shows the difference between the count at the marker and the count stored in the reference marker.

Marker Count works in zero span as well as in Swept SA. The instrument tunes to the frequency of the selected marker, which, for active zero span traces, is simply the center frequency of the analyzer.

Fixed Markers

Fixed markers have a count stored in them that is generally kept fixed and not updated. If a fixed marker is selected, or used as a reference, the signal at the marker frequency is not counted; rather the stored count is seen or used as the reference. The count is stored, if Count is on, when the marker becomes fixed or when, while fixed, the marker is moved by re-zeroing the reference (if it is the reference marker) or via a peak search (since both of these, by definition, use valid trace data). The count stored in a Fixed marker is lost if the counter is turned off, if the marker is moved to an inactive trace, or if the marker is moved by adjusting its x-value.

More Information on "Counter"

When the counter is on, the count (or the delta count) for the selected marker is displayed.

The invalid data indicator (*) will turn on until the completion of the first count.

Marker Count frequency readings are corrected using the Freq Offset function (in some previous analyzers, they were not). Note however that Marker Delta readings are not corrected, as any offset would be applied to both.

In zero span on active traces the counter continues to function, counting any signal near the center frequency of the analyzer.

NOTE	No signal farther from the marker frequency than the Res BW will be seen by the counter.

The above command turns on or off the frequency counter. If the specified marker number in the command is not the selected marker, it becomes the selected marker. If the specified marker number is not on, FCOunt ON sets it to Normal and places it at center of screen on the trace determined by the Marker Trace rules. Once the marker count is on, it is on for any selected marker, not just for the one used in the command. A 1 is returned to the state query only if marker count is on and the specified number is the selected marker. The invalid data indicator (*) will turn on until the completion of the first count but this does not keep a value from being returned.

Gate Time

Controls the length of time during which the frequency counter measures the signal frequency. Longer gate times allow for greater averaging of signals whose frequency is “noisy”, though the measurement takes longer. If the gate time is an integer multiple of the length of a power-line cycle (20 ms for 50 Hz power, 16.67 ms for 60 Hz power), the counter rejects incidental modulation at the power line rate. The shortest gate time that rejects both 50 and 60 Hz modulation is 100 ms, which is the value chosen in Auto, or on Preset or when Auto Couple is pressed.

The start time of the Gate Time of the counter must be controlled by the same trigger parameters as controls the sweep. Thus, if the Trigger is not in Free Run, the counter gate must not start until after the trigger is received and delayed.

Key Path	Marker Function, Marker Count

Remote Command	`:CALCulate:MARKer[1]|2|...12:FCOunt:GATetime <time>`
	`:CALCulate:MARKer[1]|2|...12:FCOunt:GATetime?`
	`:CALCulate:MARKer[1]|2|...12:FCOunt:GATetime:AUTO OFF|ON|0|1`
	`:CALCulate:MARKer[1]|2|...12:FCOunt:GATetime:AUTO?`

Example	:CALC:MARK2:FCO:GAT 1e-2 sets the gate time for Marker 2 to 10^(–2) s = 10 ms.
Notes	When Auto Couple is pressed, Gate Time is set to 100 ms.
Notes	This command causes the specified marker to become selected.
Preset	100 ms ON
State Saved	Saved in instrument state.
Min	1 us
Max	500 ms
Initial S/W Revision	Prior to A.02.00

Remote Command	`:CALCulate:MARKer[1]|2|...4:FCOunt:RESolution <freq>`
	`:CALCulate:MARKer[1]|2|...4:FCOunt:RESolution?`
	`:CALCulate:MARKer[1]|2|...4:FCOunt:RESolution:AUTO ON | OFF | 1 | 0`
	`:CALCulate:MARKer[1]|2|...4:FCOunt:RESolution:AUTO?`

Notes	This command is provided for ESA compatibility, which allowed the user to control the gate resolution, rather than the gate time. :CALCulate:MARKer[1]|2|3|4:FCOunt:RESolution <freq> Sets the gate time to 1/freq :CALCulate:MARKer[1]|2|3|4:FCOunt:RESolution? Returns 1/gate_time :CALCulate:MARKer[1]|2|3|4:FCOunt:RESolution:AUTO OFF|ON|0|1 is accepted and ignored :CALCulate:MARKer[1]|2|3|4:FCOunt:RESolution:AUTO? Always returns 1 All of these commands cause the marker to become selected.
Preset	1 Hz ON
Initial S/W Revision	Prior to A.02.00

Couple Markers

When this function is On, moving any marker causes an equal X Axis movement of every other marker which is not Fixed or Off. By “equal X Axis movement” we mean that we preserve the difference between each marker’s X Axis value (in the fundamental x-axis units of the trace that marker is on) and the X Axis value of the marker being moved (in the same fundamental x-axis units).

Note that Fixed markers do not couple. They stay where they were while all the other markers move. Of course, if a Fixed marker is being moved, all the non-fixed markers do move with it.

This may result in markers going off screen.

Key Path	Marker
Remote Command	`:CALCulate:MARKer:COUPle[:STATe] OFF|ON|0|1` `:CALCulate:MARKer:COUPle[:STATe]?`
Example	:CALC:MARK:COUP ON sets Couple Markers on.
Preset	Off, presets on Mode Preset and All Markers Off
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

All Markers Off

Turns off all markers. See Marker, "Off " on page 704.

Key Path	Marker
Remote Command	`:CALCulate:MARKer:AOFF`

Example	CALC:MARK:AOFF turns off all markers.
Couplings	Sets the selected marker to 1.
Preset	n/a.
Initial S/W Revision	Prior to A.02.00

Marker Function

The Marker Function key opens up a menu of softkeys that allow you to control the Marker Functions of the instrument. Marker Functions perform post-processing operations on marker data. Band Functions are Marker Functions that allow you to define a band of frequencies around the marker. The band defines the region of data used for the numerical calculations. These marker functions also allow you to perform mathematical calculations on trace and marker data and report the results of these calculations in place of the normal marker result.

NOTE	Unlike regular markers, marker function markers are not placed directly on the trace. They are placed at a location which is relative to the result of the function calculation.

- See "More Information" on page 742.
- See "Fixed marker functions" on page 743.
- See "Interval Markers" on page 743.

Key Path	Front-panel key
Remote Command	`:CALCulate:MARKer[1]|2|...12:FUNCtion NOISe	BPOWer	BDENsity	OFF` `:CALCulate:MARKer[1]|2|...12:FUNCtion?`
Notes	Sending this command selects the sub-opcoded marker The marker function result is queried in the same way as the Marker Result, as outlined in the Marker section, with the CALC:MARK:Y? command.
Dependencies	Fixed markers: It is not possible to change the Band Function for a Fixed marker; so all of the Band Function keys are grayed out for a Fixed marker. If a marker function was already on when the marker became Fixed, then the selected Band Function is shown but cannot be changed. Therefore, you cannot directly set the X or Y value of a Fixed marker that has a marker function turned on. To turn off the function, turn off the marker.
Preset	OFF
State Saved	The band function for each marker is saved in instrument state
Backwards Compatibility Notes	The introduction of adjustable-width Band Functions in the X-Series fundamentally changes the way Band Power markers are controlled. See the section entitled "Band Function Backwards Compatibility" on page 743 below for a complete discussion of programming Band Functions in a backwards compatible fashion.
Initial S/W Revision	Prior to A.02.00

More Information

The units to be used for displaying Marker Function results in Delta mode vary depending on what is the reference marker and what it is referenced to.

Marker Functions are different from Measurements, which automatically perform complex sequences of setup, data acquisition, and display operations in order to measure specified signal characteristics. Marker Functions are specified for each individual marker and may be turned on individually for each marker.

The Marker Fctn menu controls which marker functions are turned on and allows you to adjust setup parameters for each function. The Marker Functions are Marker Noise, Band/Interval Power, and Band/Interval Density, only one of which can be on for a given marker.

If the selected marker is off, pressing Marker Fctn sets it to Normal and places it at the center of the display on the trace determined by the Marker Trace rules. However, if the selected marker was Off, Marker Function Off had to be the selected function, and it remains so even after the marker is thus turned on, although you may then change it.

Fixed marker functions

In the case of a fixed marker, it is not possible to turn on or change a band function. This is because a Fixed marker holds the value it had when it became fixed; the trace it was on may keep on changing, so the function value, which depends on trace data, could not be calculated on an ongoing basis.

It is possible to have a Marker Function on for a Fixed marker, in the case where a function was already on when the marker became Fixed. In this case the function value will be retained in the marker. It is also possible to have a Marker Function on for a Fixed marker in the case when the marker was off and was turned on as Fixed because Delta was pressed to create a reference marker - in which case the marker function, marker function width, Y Axis value and marker function result that the Delta marker had when Delta was pressed are copied into the Fixed marker. If Delta is pressed again, causing the fixed reference marker to move to the delta marker's position, the marker function, marker function width, Y Axis value and marker function result that the Delta marker had when Delta was pressed are again copied into the fixed reference marker.

If a Marker Function is on for a Fixed marker, the marker's reported value is derived by the function. Therefore you cannot directly set the X or Y value of a Fixed marker which has a marker function turned on. Indirect setting as detailed above or when a Peak Search is performed is allowed, as the Fixed marker is always placed on a trace and can derive its function value from the trace at the moment when it is placed.

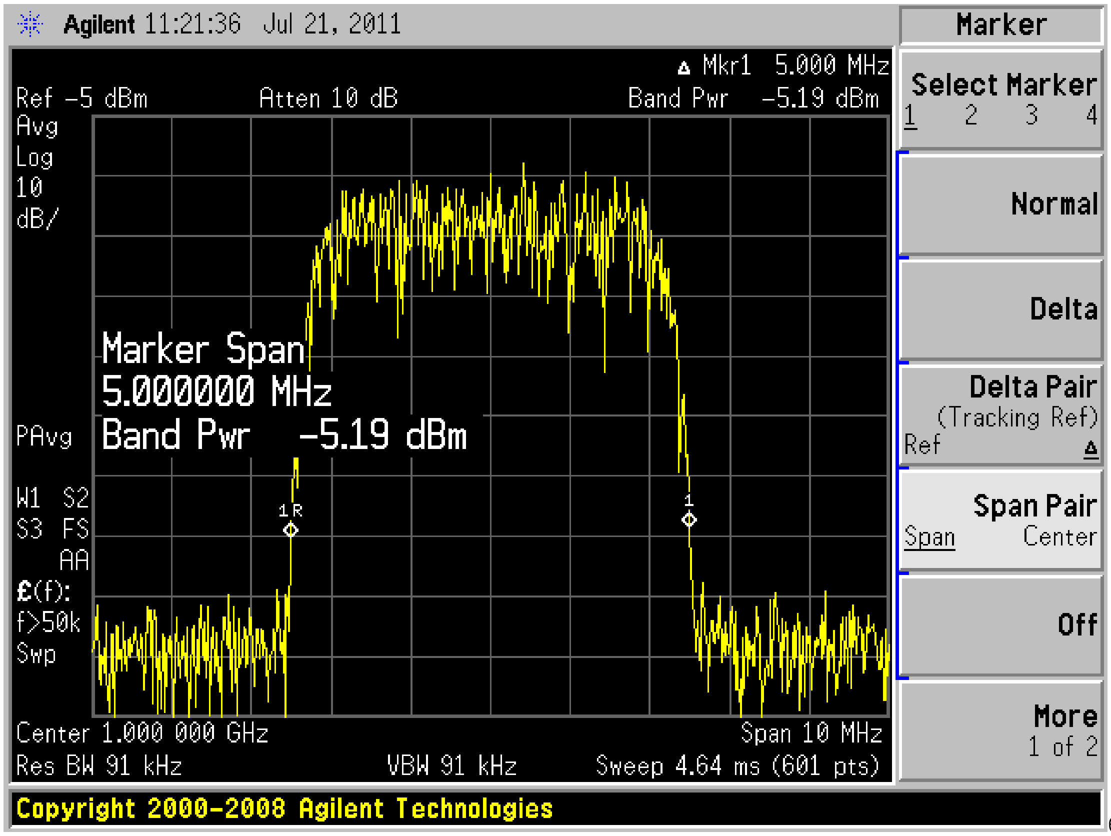
Interval Markers

What is an interval marker? The band power marker computes the total power within a span in a nonzero span. The results computation must include the RBW. The interval power marker measures the average power across some time interval in zero span.

Interval Density is defined to be Interval Power divided by Bn. Bn is the noise bandwidth of the RBW filter, as noted and used within the Band Power computation.

Band Function Backwards Compatibility

To define the Band Power function, the ESA and PSA analyzers used Delta Marker functionality with two markers, for example, Marker 1 and its Reference Marker, as shown below:



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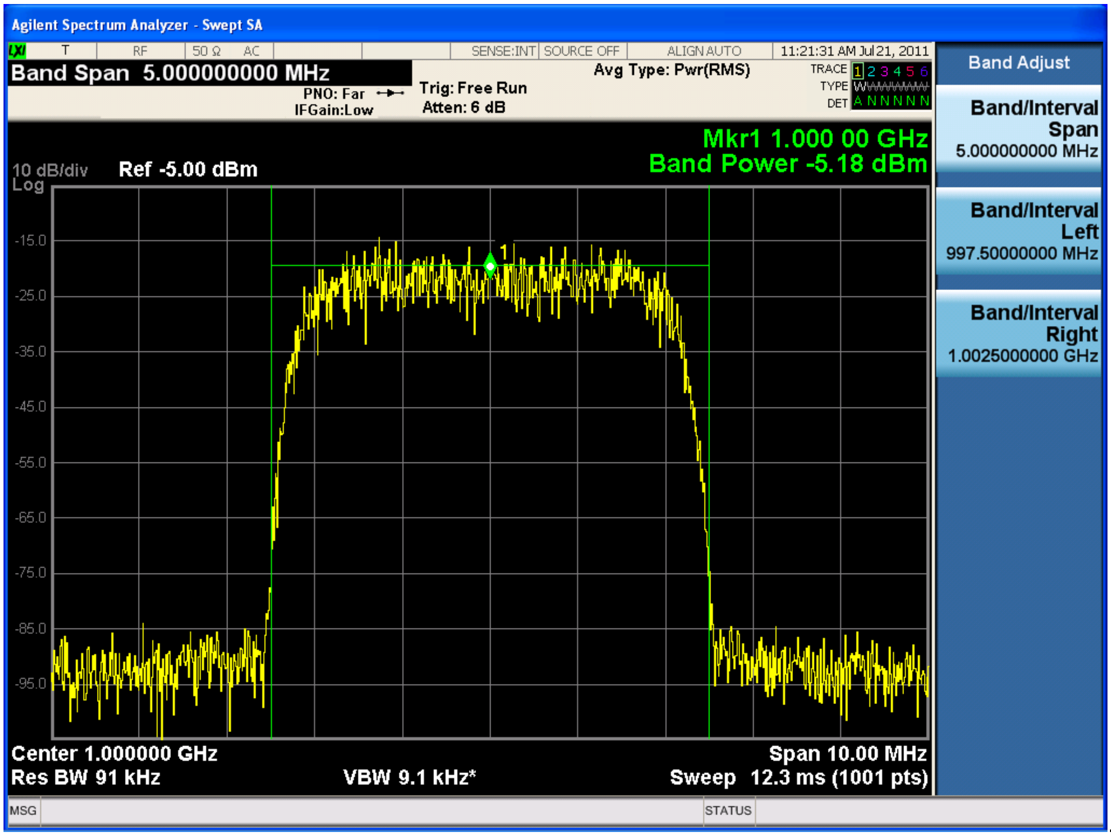
The marker modes known as Span Pair and Delta Pair (Band Pair in ESA) were used to set two markers for the primary purpose of defining the band of a Band Power function. The two markers were set by adjusting their span and centerpoint (Span Pair mode) or by adjusting their locations independently to directly define the Start and Stop edges of the band (Band Pair/Delta Pair modes).

In the X-Series, the introduction of adjustable-width Band Functions fundamentally changes the way Band Power markers are controlled, by using a single marker to completely define the function, as shown below:



In the X-Series the marker itself has a width attribute, which you set using the Band Span function. The marker shows “wings” that define the edges of the band in which the Band Power is being measured. You only need one marker, not a pair of markers, to completely define a Band Power function (making it possible to do Delta Band Power, which PSA and ESA could not do).

Additional control functions of Band Left and Band Right are provided for the case when you need to precisely set the band edges. Note that the marker itself always remains centered in the band.

To map the old Span Pair and Band Pair/Delta Pair functions to the X-Series for code compatibility, aliases and compatibility commands were added. Since Span Pair and Band Pair/Delta Pair were primarily used for making band power measurements, the aliases are provided for setting the parameters of a Band Function. If the user was using the old commands for anything other than Band Power these aliases will likely not yield compatible results.

For example, some users took advantage of the fact that the Band Pair commands let you arbitrarily set the frequency (time) of a delta marker and its non-fixed reference marker. In these cases, which had nothing to do with band Power, the new commands will not be compatible. For these use cases the user must use two markers and position each using the CALC:MARK:X commands, since “marker pairs” do not exist anymore.

Note that all of the alias commands described below cause the specified marker to become selected.

1. Marker Mode compatibility

To setup Band Power measurements in the ESA and PSA, you had to send the :CALCulate:MARKer[1]|2|3|4:MODE POSition|DELTa|BAND|SPAN|OFF
command with either the BAND or SPAN parameter, in order to turn on the marker control modes that let

you use a pair of delta markers as Band Power markers. In the X-Series this is no longer necessary, as there are no special marker modes for Band power. So when this command is sent with either a BAND or SPAN parameter it is aliased to simply turn on Normal markers. Thus:

Old command	Aliased to
:CALCulate:MARKer[1]|2|3|4:MODE:BAND	:CALCulate:MARKer[1]|2|3|4:MODE:POSition
:CALCulate:MARKer[1]|2|3|4:MODE:SPAN	:CALCulate:MARKer[1]|2|3|4:MODE:POSition

2. Span Pair Compatibility

In the past, the Span Pair function was used with a marker pair to set the band for Band Power. The following SCPI commands were used when performing this setup programmatically:

:CALCulate:MARKer[1]|2|3|4:X:CENTer <param>

:CALCulate:MARKer[1]|2|3|4:X:CENTer?

:CALCulate:MARKer[1]|2|3|4:X:SPAN <param>

:CALCulate:MARKer[1]|2|3|4:X:SPAN?

These commands are now aliased as follows to preserve the old functionality as much as possible:

Old command	Aliased to
:CALCulate:MARKer[1]|2|3|4:X:CENTer	:CALCulate:MARKer[1]|2|3|4:X
:CALCulate:MARKer[1]|2|3|4:X:SPAN	:CALCulate:MARKer[1]|2|3|4:FUNCtion:BAND:SPAN

3. Delta Pair/Band Pair functionality

Another way to set the marker pair for Band Power was with the Delta Pair function (Band Pair in ESA). The following SCPI commands were used when performing this setup programmatically:

:CALCulate:MARKer[1]|2|3|4:X:STARt <param>

:CALCulate:MARKer[1]|2|3|4:X:STARt?

:CALCulate:MARKer[1]|2|3|4:X:STOP <param>

:CALCulate:MARKer[1]|2|3|4:X:STOP?

These commands are now aliased as follows to preserve the old functionality as much as possible:

Old command	Aliased to
:CALCulate:MARKer[1]|2|3|4:X:STARt	:CALCulate:MARKer[1]|2|3|4:FUNCtion:BAND:LEFT
:CALCulate:MARKer[1]|2|3|4:X:STOP	:CALCulate:MARKer[1]|2|3|4:FUNCtion:BAND:RIGHt

4. Arbitrary Marker Pair functionality

Another use case was to use the STARt and STOP commands to arbitrarily set the frequency (time) of a delta marker and its reference marker without being in Band Power mode. This use case is not supported with a backwards compatibility command, but since in the X-Series you can arbitrarily set any marker's value and any reference marker's value, it is easy to fix this problem in code; but the user will have to change their code.

Old command	User must change to
:CALCulate:MARKer1:X:STARt <param>	:CALCulate:MARKer1:X <param>
:CALCulate:MARKer1:X:STOP <param>	:CALCulate:MARKer2:X <param>

(in the example marker 1 and marker 2 are used; in practice, use the reference marker number for the STOP marker number, which is usually marker number+1)

5. Band changes with analyzer settings

In the past, when a marker pair was used to set the width of the band for Band Power, the markers held their screen positions when analyzer frequency settings such as Span changed. The result of this was that as the Span changed, the frequency difference and hence the width of the band changed as well. In the X-Series, as a result of the change from position markers to value markers, the width of the band remains constant as frequency settings of the analyzer change.

6. Offscreen Markers

As a result of the change from position markers to value markers, markers can be at a frequency which is offscreen, whereas in the past, they were clipped to the screen edges and hence were never offscreen. Users who depended on this clipping behavior by setting Band Span to a high value in order to force Band Power markers to the left and right edges of the screen will have to rewrite their code.

Furthermore, since markers could never be offscreen, Band Power always returned a valid result. In the X-Series, if either edge of the Band is offscreen, Band Power returns not a number as a result.

7. Direct Marker Positioning

The following commands were used in ESA and PSA to directly set the marker to a specific trace point ("bucket") position when they were being used in Span Pair and Delta Pair/Band Pair modes:

:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer <param>

:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer?

:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN <param>

:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN?

:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt <param>

:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt?

:CALCulate:MARKer[1]|2|3|4:X:POSition:STOP <param>

:CALCulate:MARKer[1]|2|3|4:X:POSition:STOP?

They are aliased very similarly to the non-position commands (above) however a translation to/from trace points (buckets) is also performed:

Old command	Aliased to
:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer	:CALCulate:MARKer[1]|2|3|4:X:POSition
:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN	:CALCulate:MARKer[1]|2|3|4:FUNC:BAND:SPAN
:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt	:CALCulate:MARKer[1]|2|3|4:FUNC:BAND:LEFT
:CALCulate:MARKer[1]|2|3|4:X:POSition:STOP	:CALCulate:MARKer[1]|2|3|4:FUNC:BAND:RIGHt

In each case but the first (:X:POSition:CENTer),the analyzer first converts the specified value in trace points to the current X Axis Scale Units (for example, frequency or time) of the trace upon which the marker resides. Then, that value is used in the alias command to set the desired value.

The query form of the command returns the marker function span in trace points (buckets) by translating back based on the X Axis Scale settings at the time the query is sent.

NOTE The value in Trace Points is translated into the current X Axis Scale units for the purpose of setting the value of the marker. However, the marker's span value, LEFT value, or RIGHt value in X Axis Scale Units, **not** trace points, are preserved if a change is made to the X Axis scale settings. For example, if you use this command to set a marker function span of 500 buckets, which happens at that time to correspond to 13 GHz, and then you change the analyzer's Start Frequency so that 500 buckets is no longer 13 GHz, the span stays at 13 GHz, **not** at 500 buckets! This is important to realize as it differs from the legacy behavior.

NOTE The UP/DOWN parameters increment/decrement by one bucket. For this, the analyzer performs a conversion to buckets and back.

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term "selected marker" is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is

	done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

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Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.

Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Marker

Specifies the selected marker. The term “selected marker” is used throughout this document to specify which marker will be affected by the functions.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is done or a Band Function is turned on or for Signal Track or Continuous Peak.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Marker Noise

Turns on the Marker Noise function for the selected marker, making it a noise marker. If the selected marker is off, it is turned on in Normal mode and located at the center of the screen.

When Marker Noise is selected while in the Marker Function Off state, the Band Span or Interval Span is initialized to 5% of the screen width.

When Marker Noise is on, the marker’s Y Axis Result is the average noise level, normalized to a 1 Hz noise power bandwidth, in the band specified under the Band Adjust key.

See "More Information" on page 753.

See "Off-trace Markers" on page 753.

Key Path	Marker Function
Example	CALC:MARK:FUNC NOIS turns on marker 1 as a noise marker. CALC:MARK:FUNC? returns the current marker function for the marker specified. In this case it returns the string: NOIS. CALC:MARK:Y? returns the y-axis value of the Marker Noise function for marker 1 (if Marker Noise is ON for marker 1). Note that the delta value when the Y axis unit is Watt is the square of the delta value when the Y axis unit is Volt. For example, when the percent ratio with Y axis unit in Volt is 0.2, the percent ratio with Y axis unit in Watt will be 0.22 = 0.04. When you read the value out remotely you have to know whether your Y Axis Unit is log (dB), linear (V or A), or power (W).
Notes	See the description under the “"Marker Function" on page 742” key.
Dependencies	Fixed markers: It is not possible to change the Band Function for a Fixed marker; so all of the Band Function keys are grayed out for a Fixed marker.

Couplings	Average detector and Power Averaging auto selected when Marker Noise on If the selected (specified) marker is off, selecting Marker Noise via front panel or SCPI will turn the marker on.
Initial S/W Revision	Prior to A.02.00

More Information

To guarantee accurate data for noise-like signals, a correction for equivalent noise bandwidth is made by the analyzer. The Marker Noise function accuracy is best when the detector is set to Average or Sample, because neither of these detectors will peak-bias the noise. The tradeoff between sweep time and variance of the result is best when Average Type is set to Power Averaging. Therefore, Auto coupling chooses the Average detector and Power Averaging when Marker Noise is on. Though the Marker Noise function works with all settings of detector and Average Type, using the positive or negative peak detector gives less accurate measurement results.

Off-trace Markers

If a Normal or Delta noise marker is so near to the left or right edge of the trace that some of the band is off the trace, then it uses only that subset of the Band Width that is on-trace. If the marker itself is off-trace, its value becomes undefined.

Neither band/interval power nor band/interval density markers are defined if any part of the band is off-trace (unless they are Fixed with a stored function value in them), except that when the edges of the bandwidth are trivially off-screen, due to mathematical limitations in the analyzer or in the controlling computer, the result will still be considered valid.

Band/Interval Power

Turns on the Band/Interval Power function for the selected marker. If the selected marker is off it is turned on in Normal marker and located at the center of the screen.

When Band/Interval Power is selected while in the Marker Function Off state, the Band Span or Interval Span is initialized to 5% of the screen width.

If the detector mode for the detector on the marker's trace is set to Auto, the average detector is selected. If the Average type is set to Auto, Power Averaging is selected. Other choices for the detector or Average type will usually cause measurement inaccuracy.

Key Path	Marker Function
Example	CALC:MARK:FUNC BPOW turns on marker 1 as a band power marker. CALC:MARK2:FUNC? returns the current setting of marker function for marker 2. In this case it returns the string: BPOW. CALC:MARK:Y? returns the y-axis value of the Band Power function for marker 1. Note that the delta value when the Y axis unit is Watt is the square of the delta value when the Y axis unit is Volt. For example, when the percent ratio with Y axis unit in Volt is 0.2, the percent ratio with Y axis unit in Watt will be 0.22 = 0.04. When you read the value out remotely you have to know whether your Y

	Axis Unit is log (dB), linear (V or A), or power (W).
Notes	See the description under the “"Marker Function" on page 742” key, above.
Dependencies	Fixed markers: It is not possible to change the Band Function for a Fixed marker, so all of the Band Function keys are grayed out for a Fixed marker.
Couplings	If the detector mode for the detector on the marker’s trace is set to Auto, the average detector is selected. If the Average type is set to Auto, Power Averaging is selected. If the selected (specified) marker is off, selecting Band Power via thefront panel or SCPI will turn the marker on.
Initial S/W Revision	Prior to A.02.00

Band/Interval Density

Turns on the Band/Interval Density function for the selected marker. If the selected marker is off it is turned on in Normal marker mode and located at the center of the screen.

When Band/Interval Density is selected while in the Marker Function Off state, the Band Span or Interval Span is initialized to 5% of the screen width.

See "More Information" on page 755.

See "What is band/interval density? " on page 755

Key Path	Marker Function
Example	CALC:MARK:FUNC BDEN turns on marker 1 as a band density marker. CALC:MARK:FUNC? returns the current setting of band function for the marker specified. In this case it returns the string: BDEN. CALC:MARK:Y? returns the y-axis value of the Band Density function for marker 1. Note that the delta value when the Y axis unit is Watt is the square of the delta value when the Y axis unit is Volt. For example, when the percent ratio with Y axis unit in Volt is 0.2, the percent ratio with Y axis unit in Watt will be 0.22 = 0.04. When you read the value out remotely you have to know whether your Y Axis Unit is log (dB), linear (V or A), or power (W).
Notes	The zero-width case is treated as one bucket wide although it shows a width of 0. When the trace the marker is on crosses domains, the width crosses domains as well, to remain the same percentage of the trace.
Notes	See the description under the “"Marker Function" on page 742” key.
Dependencies	Fixed markers: It is not possible to change the Band Function for a Fixed marker, so all of the Band Function keys are grayed out for a Fixed marker.
Couplings	If the detector mode for the detector on the marker’s trace is set to Auto, the average detector is selected. If the Average type is set to Auto, Power Averaging is selected. If the selected (specified) marker is off, selecting Band Density via front panel or SCPI will turn the marker on.

State Saved	n/a.
Initial S/W Revision	Prior to A.02.00

More Information

It may seem like the band density marker function is exactly like a function of a noise marker with variable width. But they are somewhat different. The Noise markers assume that the signal to be measured is noise-like. Based on this assumption, we can actually make reasonable measurements under very nonideal conditions: any detector may be used, any averaging type, any VBW. In contrast, the Band Power and Band Density markers make no assumption about the statistics of the signal.

If the detector mode for the detector on the marker's trace is set to Auto, the average detector is selected. If the Average type is set to Auto, Power Averaging is selected. Other choices for the detector or Average type will usually cause measurement inaccuracy.

What is band/interval density?

On frequency domain traces, the average density across a band is the total band power divided by the bandwidth over which it is measured.

On time domain traces, interval density is the average power in the interval divided by the noise bandwidth of the RBW of the trace.

Marker Function Off

Turns off band functions for the selected marker.

Key Path	Marker Function
Example	:CALC:MARK:FUNC OFF turns off marker functions for marker 1
Notes	See the description under the "Marker" on page 689 key, above.
Dependencies	Fixed markers: It is not possible to change the Band Function for a Fixed marker, so all of the Band Function keys are grayed out for a Fixed marker, including Off
Couplings	Turning off the marker function has no effect on the band span nor does it turn the marker off.
Initial S/W Revision	Prior to A.02.00

Band Adjust

Opens a menu that lets you set the width or left or right edges of the band.

It is legal to change the width of the band even if there is no marker function on. Generally this can only happen by sending the SCPI command since access to the menu is restricted if no marker function is on.

Key Path	Marker Function
Dependencies	If the marker is Fixed, Band Adjust is grayed out. If the marker function is Off, Band Adjust is grayed out.

Couplings	If any of the Band Adjust functions are the active function, the wings and arms of the selected marker display in green; otherwise they display in white.
Backwards Compatibility Notes	If any of the band adjust SCPI commands (including the legacy compatibility commands documented under "Band Function Backwards Compatibility" on page 743) are sent while the marker function is off, they will be accepted and the value stored. If sent while the marker is off, they will be accepted and ignored.
Initial S/W Revision	Prior to A.02.00

Band/Interval Span

Sets the width of the span for the selected marker.

It is legal to change the width of the band even if there is no marker function on. Generally this can only happen by sending the SCPI command since access to the menu is restricted if no marker function is on.

In the table below, sweep_width = max(1,sweep_points−1) and sweep_points is the number of sweep points, set in the Sweep menu.

Key Path	Marker Function, Band Adjust
Remote Command	`:CALCulate:MARKer[1]|2|...12:FUNCtion:BAND:SPAN <freq>` `:CALCulate:MARKer[1]|2|...12:FUNCtion:BAND:SPAN?`
Example	:CALC:MARK12:FUNC:BAND:SPAN 20 MHz sets the band span of marker 12 to 20 MHz :CALC:MARK:FUNC:BAND:SPAN? queries the band span of Marker 1
Notes	Units are those of the trace's domain, Hz for frequency domain, s for time domain.
Notes	Sending this command selects the subopcoded marker The unit of the parameter must match the current domain of the trace the selected marker is on, or an invalid suffix error will be generated. If no unit is sent the fundamental unit for the trace domain will be used (Hz for freq domain traces, s for time domain traces). Note that all the values provided in this table are only valid for frequency domain traces. If the current domain of the trace is time domain, values and unit will be different. In frequency domain, the Preset value is dependent on the frequency range of the instrument. The default value 1.3245 GHz is appropriate only if the instrument is a 26.5 GHz instrument (Option 526). In a 26.5 GHz Instrument, the default span is 26.49 GHz, so 5% of the span corresponds to 1.3245 GHz.
Couplings	Changing the Band/Interval Span necessarily changes the Band/Interval Left and Band/Interval Right values Band/Interval Span is set to 0 when the marker is turned off Band/Interval Span is set to 5% of span when any marker function is turned on if and only if it is zero at that time
Preset	If 0, set to 5% of span, when a marker function is turned on
State Saved	Saved in instrument state
Min	0 Hz
Max	Infinity. Unlike legacy analyzers, where the markers were forced to be on screen, X-Series marker values are not limited and do not clip

Backwards Compatibility SCPI	`:CALCulate:MARKer[1]|2|...4:X:SPAN` See "Band Function Backwards Compatibility" on page 743
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Remote Command	`:CALCulate:MARKer[1]|2|...4:X:POSition:SPAN <param>` `:CALCulate:MARKer[1]|2|...4:X:POSition:SPAN?`
Preset	50
Backwards Compatibility Notes	The old command, :CALCulate:MARKer[n]:X:POSition:SPAN <param> was used to set the span between a delta marker and its reference marker in trace points (buckets) in Span Pair mode. There is no new command for setting the span of a Band Function in trace points. So, when this command is received, the analyzer first converts the specified span in trace points to the current X Axis Scale Units (e.g., frequency or time) of the trace upon which the marker resides. Then, that value is sent to the :CALC:MARKer[n]:FUNCtion:BAND:SPAN <param> command to set the span of the marker's Band Function. The query form of the command will return the marker function span in trace points (buckets) by translating back based on the X Axis Scale settings at the time the query is sent. ! See "Band Function Backwards Compatibility" on page 743 for more information
Initial S/W Revision	Prior to A.02.00

Band/Interval Left

Sets the left edge frequency or time for the band of the selected marker. The right edge is unaffected.

It is legal to change the width of the band even if there is no marker function on. Generally this can only happen by sending the SCPI command since access to the menu is restricted if no marker function is on.

In the table below, sweep_width = max(1,sweep_points–1) and sweep_points is the number of sweep points, set in the Sweep menu.

Key Path	Marker Function, Band Adjust
Remote Command	`:CALCulate:MARKer[1]|2|...12:FUNCtion:BAND:LEFT <freq>` `:CALCulate:MARKer[1]|2|...12:FUNCtion:BAND:LEFT?`
Example	:CALC:MARK12:FUNC:BAND:LEFT 20 GHz sets the left edge of the band span of marker 12 to 20 GHz :CALC:MARK:FUNC:BAND:LEFT? queries the band span of Marker 1
Notes	Units are those of the trace's domain, Hz for frequency domain, s for time domain. When the left edge is moved, the right edge stays anchored; thus, the marker's frequency will change.
Notes	Sending this command selects the subopcoded marker

	The unit of the parameter must match the current domain of the trace the selected marker is on, or an invalid suffix error will be generated.If no unit is sent the fundamental unit for the trace domain will be used (Hz for freq domain traces, s for time domain traces). Note that all the values provided in this table are only valid for frequency domain traces. If the current domain of the trace is time domain, values and unit will be different. In frequency domain, the Preset value is dependent on the frequency range of the instrument. The default value 1.3245 GHz is appropriate only if the instrument is a 26.5 GHz instrument (Option 526). In a 26.5 GHz Instrument, the default span is 26.49 GHz, so 5% of the span corresponds to 1.3245 GHz.
Couplings	Changing the Band/Interval Left necessarily changes the Band/Interval Span and Band/Interval Center values. Band/Interval Span is set to 0 when the marker is turned off so that means Band/Interval Left is set to the center value at this time. Band/Interval Span is set to 5% of span when any marker function is turned on if and only if it is zero at that time.
Preset	If 0, Band/Interval Span is set to 5% of span, when a marker function is turned on, which affects Band/Interval Left.
State Saved	Saved in instrument state
Min	0 Hz
Max	Infinity. Unlike legacy analyzers, where the markers were forced to be on screen, X-Series marker values are not limited and do not clip
Backwards Compatibility SCPI	`:CALCulate:MARKer[1]|2|...4:X:STARt` See "Band Function Backwards Compatibility" on page 743
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Remote Command	`:CALCulate:MARKer[1]|2|...4:X:POSition:STARt <integer>` `:CALCulate:MARKer[1]|2|...4:X:POSition:STARt?`
Preset	0
Backwards Compatibility SCPI	The legacy command, :CALCulate:MARKer[n]:X:POSition:STARt <param> was used to control the Reference marker in trace points (buckets) in Band Pair/Delta Pair mode. There is no new command for setting the start of a Band Function in trace points. So, when this command is received, the analyzer first converts the specified span in trace points to the current X Axis Scale Units (e.g., frequency or time) of the trace upon which the marker resides. :CALC:MARKer[n]:FUNCtion:BAND:LEFT <param> command to set the start of the marker's Band Function. The query form of the command will return the marker function LEFT value in trace points (buckets) by translating back based on the current X Axis Scale settings at the time the query is sent. See "Band Function Backwards Compatibility" on page 743 for more information
Initial S/W Revision	Prior to A.02.00

Band/Interval Right

Sets the right edge frequency or time for the band of the selected marker. The left edge is unaffected

In the table below, sweep_width = max(1,sweep_points–1) and sweep_points is the number of sweep points, set in the Sweep menu.

It is legal to change the width of the band even if there is no marker function on. Generally this can only happen by sending the SCPI command since access to the menu is restricted if no marker function is on.

Key Path	Marker Function, Band Adjust
Remote Command	`:CALCulate:MARKer[1]|2|...12:FUNCtion:BAND:RIGHt <freq>` `:CALCulate:MARKer[1]|2|...12:FUNCtion:BAND:RIGHt?`
Example	:CALC:MARK12:FUNC:BAND:RIGHt 20 GHz sets the right edge of the band span of marker 12 to 20 GHz :CALC:MARK:FUNC:BAND:RIGHt? queries the band span of Marker 1
Notes	Units are those of the trace's domain, Hz for frequency domain, s for time domain. When the right edge is moved, the left edge stays anchored; thus, the marker's frequency will change.
Notes	Sending this command selects the subopcoded marker The unit of the parameter must match the current domain of the trace the selected marker is on, or an invalid suffix error will be generated. If no unit is sent the fundamental unit for the trace domain will be used (Hz for freq domain traces, s for time domain traces). Note that all the values provided in this table are only valid for frequency domain traces. If the current domain of the trace is time domain, values and unit will be different. In frequency domain, the Preset value is dependent on the frequency range of the instrument. The default value 1.3245 GHz is appropriate only if the instrument is a 26.5 GHz instrument (Option 526). In a 26.5 GHz Instrument, the default span is 26.49 GHz, so 5% of the span corresponds to 1.3245 GHz.
Couplings	Changing the Band/Interval Right necessarily changes the Band/Interval Span and Band/Interval Center values Band/Interval Span is set to 5% of span when any marker function is turned on if and only if it is zero at that time
Preset	If 0, Band/Interval Span is set to 5% of span, when a marker function is turned on, which affects Band/Interval Right
State Saved	Saved in instrument state
Min	0 Hz
Max	Infinity. Unlike legacy analyzers, where the markers were forced to be on screen, X-Series marker values are not limited and do not clip
Backwards Compatibility SCPI	`:CALCulate:MARKer[1]|2|...4:X:STOP` See "Band Function Backwards Compatibility" on page 743
Initial S/W Revision	Prior to A.02.00

Remote Command	`:CALCulate:MARKer[1]|2|...4:X:POSition:STOP <integer>`

	:CALCulate:MARKer[1]|2|...4:X:POSition:STOP?
Preset	1000, the actual value is dependent on the selected number of sweep points.
Backwards Compatibility SCPI	The legacy command, :CALCulate:MARKer[n]:X:POSition:STOP <param> was used to control the Delta marker in trace points (buckets) in Band Pair/Delta Pair mode. There is no new command for setting the stop of a Band Function in trace points. So, when this command is received, the analyzer first converts the specified span in trace points to the current X Axis Scale Units (e.g., frequency or time) of the trace upon which the marker resides. Then, that value is sent to the :CALC:MARKer[n]:FUNCtion:BAND:RIGHt <param> command to set the stop of the marker's Band Function. The query form of the command will return the marker function RIGHt value in trace points (buckets) by translating back based on the current X Axis Scale settings at the time the query is sent. See "Band Function Backwards Compatibility" on page 743 for more information
Initial S/W Revision	Prior to A.02.00

Band Span Auto/Man

Determines whether the Band Span for Marker Noise will track the analyzer's Span.

Band Span is initialized as specified above, under Band/Interval Span. Subsequently, if the analyzer's Span is changed, the effect on Band Span depends on the Auto/Man setting of Band Span:

- If in Auto, then whenever the Span changes, the Band Span for Marker Noise is changed to 5% of the new Span.
- If in Man, the Band Span does not change when the Span is changed.

The Band Span is set to 5% regardless of whether or not this would place part of the Band offscreen. The Marker Noise function is well able to function with part of the band offscreen.

This function only affects Marker Noise. The key only appears when Maker Noise is the Marker Function for the selected marker.

Note that, if in Zero Span, "Span" should be replaced by "Sweep Time" and "Band Span" should be replaced by "Band Interval", in the above specification and in the table below:

Key Path	Marker Function, Band Adjust
Remote Command	:CALCulate:MARKer[1]|2|...12:FUNCtion:BAND:SPAN:AUTO ON|OFF :CALCulate:MARKer[1]|2|...12:FUNCtion:BAND:SPAN:AUTO?
Example	:CALC:MARK12:FUNC:BAND:SPAN:AUTO ON sets the band span of marker 12 to Auto :CALC:MARK:FUNC:BAND:SPAN:AUTO? queries the auto band span state of Marker 1
Dependencies	This only appears when the Marker Function for the selected marker is Marker Noise. If the SCPI command is sent to a marker that does not have Marker Noise selected, it is honored but of course, the user will not see any indication of this.

Couplings	When Auto Band Span is turned on, it immediately adjusts the band span to 5% of the Span. If the Band Span is changed, either by the Band/Interval Span key, the Band/Interval Left key, or the Band/Interval Right key, or the equivalent SCPI commands, this function is set to Man. This function is set to Auto on Preset and when the Auto Couple key is pressed. This function is set to Auto when Marker Noise is turned on, if the value of Band/Interval Span is 0. Note that this test must be performed before Band/Interval Span is initialized, because Band/Interval Span is initialized to 5% if Band/Interval Span is 0 when the marker function is turned on. Sending this command selects the subopcoded marker.
Preset	Auto
State Saved	Saved in instrument state
Backwards Compatibility Notes	In legacy analyzers, the Noise Marker had a width that was always equal to 5% of the span. But in the X-Series it is possible for the user to change the span of the Marker Noise band using the Band Adjust function. To preserve the legacy behavior, the Band Span Auto/Man function is provided. When it is in Auto, which it is by default, the Maker Noise band is always held at 5% of Span, even if the Span changes. When the user adjusts the Marker Noise Band Span, Band Span Auto/Man is set to Manual. So the legacy behavior is preserved, but now the user can set the Marker Noise Span as well and that setting will be preserved when Span is changed.
Initial S/W Revision	Prior to A.02.00

Measure at Marker

This key and all the keys in this menu only appear with the N6141A or W6141A application or when Option EMC is installed and licensed.

Key Path	Marker Function
Dependencies	The Measure at Marker menu is not available in Spectrogram.
Initial S/W Revision	A.02.00

Measure at Marker

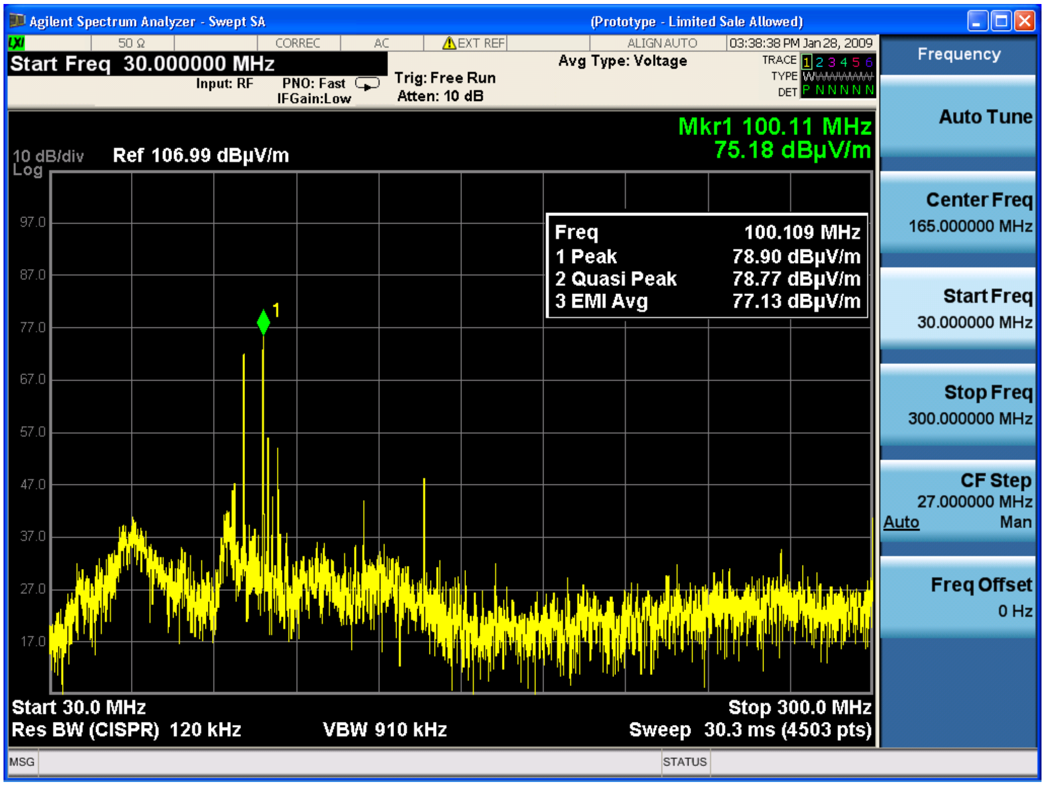
When this key is pressed, the analyzer executes one Measure at Marker function and then returns. Measure at Marker goes to the frequency of the selected marker and takes a reading with each of the three detectors selected in the Detectors menu, using the dwell times specified there, then displays the readings in a window on the display, using the current Y-Axis Unit.

When the Measure at Marker is complete, the analyzer restores all settings to their pre-Measure-at-Marker values and normal sweeps resume.

Key Path	Marker Function, Measure at Marker
Remote Command	`:CALCulate:MARKer[1]|2|...12:FUNCtion:MAMarker?`
Example	:CALC:MARK2:FUNC:MAM? Performs a Measure at Marker function at Marker 2's current frequency and, when completed, returns the results of the measure at marker window in a query

Notes	This query command returns comma separated values for the 3 specified detectors and the frequency value of the marker. If a Detector is off or if no measurement has yet completed, –999.0 will be returned. This can happen, for example, if you are operating with too large a value of (span/sweep points) and the Measure at Marker function does not execute but instead puts up the advisory message, "Span per point too large, narrow span or increase RBW or number of points" (see below). The size of the return data array is fixed at 4. The elements are: 1. Detector 1 value (if off, –999.0 for backwards compatibility) 2. Detector 2 value (if off, –999.0 for backwards compatibility) 3. Detector 3 value (if off, –999.0 for backwards compatibility) 4. Frequency of Marker If a sweep is in process when this function executes it aborts, and restarts after the function is complete.
Dependencies	If BW & Avg Type is in an Autocoupled state, the (up to three) measurements taken by Measure at Marker are taken with Auto Coupled settings for the functions in the BW menu, even if those functions are in manual.
Couplings	If the specified Marker is not on, the analyzer turns it on at the center of the screen and does a peak search before performing the function.
Status Bits/OPC dependencies	OPC goes true when the measurement is complete
Backwards Compatibility SCPI	`:MEASure:EMI:MARKer[1]|2|...12?` This command is included for compatibility with the E7400 and PSA option 239 . Performs a Measure at Marker function at the specified marker's current frequency and returns the results.
Initial S/W Revision	A.02.00

Measure at Marker presents its information in a separate window that normally appears in the upper right of the display, but it can be repositioned to the upper left.



The Measure at Marker box shows the detector name for the selected detectors and "Off" for those not selected. The names used are:

Name	Detector
Normal	Normal
Peak	Peak
Sample	Sample
Neg Peak	Negative Peak
RMS	Average detector with Power Average (RMS)
Log Avg	Average detector with Log-Pwr Average
VoltageAvg	Average detector with Voltage Average
Quasi Peak	Quasi Peak
EMI Avg	EMI Average
RMS Avg	RMS Average

The marker frequency is shown in the "Freq" field. The measured value is shown for all detectors except those that are "Off." For these, --- is displayed. The current Y-Axis unit is used, and the precision that is used for the detector value displays is exactly the same as for the Marker. The precision used for the Frequency display is six significant digits.

The sequence of steps in the measurement is as follows:

- Any sweep in progress is aborted.

- If in Zero Span, the Center Frequency is used as the frequency at which to take the reading, since in Zero Span, all markers are by definition at the Center Frequency
- If not in Zero Span:
  –If the selected marker is Off, it is first turned on in the center of the screen and a peak search performed.
  –If the selected marker is on, but offscreen, it is first moved to the center of the screen and a peak search performed. .
  –A frequency "zoom" function is performed to determine the frequency of the selected marker to the required precision. If you are operating with too large a value of (span/sweep points) then the Measure at Marker window will not display, but instead an advisory message, "Span per point too large, narrow span or increase RBW or number of points".This means you have chosen a combination of RBW, span and sweep points that makes each trace point much wider than the RBW, so that the trace point in which the signal appears is an inadequately precise measure of its frequency—for example, with a 30 MHz to 1000 MHz span, 601 trace points and 120 kHz RBW, each trace point is 13 times as wide as the RBW. In this case, a SCPI query of the results will yield –999 dBm for each detector.
  –If the zoom is successful, the analyzer goes to zero span at this frequency.
- Each detector is then read in successive single-point zero span sweeps, using a sweep time equal to the specified dwell time. The value displayed by Measure at Marker represents the maximum value output by the detector during the dwell timeAutocoupled bandwidth and average type settings are used for each detector unless the BW & Avg Type key is set to As Set, in which case the current bandwidth and average type settings are used.
- Each result is then displayed in the measure at marker window as it becomes available.
- The analyzer returns to its pre-Measure at Marker span and settings after executing a Measure at Marker function, including Bandwidth, Avg Type, and EMC Std - regardless of the setting of BW & Avg Type.
- Finally, if the sweep had to be aborted, the aborted sweep is restarted.

While the function is executing, all the fields except Freq show "---" for their values until the measurement is complete for that detector. As each detector is read, an informational message is displayed in the status line, for example:

Measuring with detector 1 (Peak) with RBW=120 kHz

After the last detector, the status line is cleared.

Meas at Marker Window

This key opens a menu which controls the Measure at Marker window.

Key Path	Marker Function, Measure at Marker
Readback	In square brackets, the state of the window then the window position, separated by commas, as [On, Left]
Initial S/W Revision	A.02.00

Window

This key turns the Measure at Marker window on and off. It turns on automatically when Measure at Marker is initiated and turns off on a Preset. If the Window is turned on without a Measure at Marker result, "---" is displayed for each result for which the detector is not "Off".

Key Path	Marker Function, Measure at Marker, Meas at Marker Window
Remote Command	`:DISPlay:WINDow:MAMarker[:STATe] ON|OFF|1|0` `:DISPlay:WINDow:MAMarker[:STATe]?`
Example	:DISP:WIND:MAM ON
Couplings	The window turns on automatically when Measure at Marker is initiated and turns off on a Preset.
Preset	Off
State Saved	Saved in instrument state
Readback Text	On|Off
Initial S/W Revision	A.02.00

Position

This key controls the placement of the Measure at Marker window on the display.

Key Path	Marker Function, Measure at Marker, Meas at Marker Window
Remote Command	`:DISPlay:WINDow:MAMarker:POSition LEFT|RIGHt` `:DISPlay:WINDow:MAMarker:POSition?`
Example	:DISP:WIND:MAM:POS RIGH
Preset	Right
State Saved	Saved in instrument state
Readback Text	Left|Right
Initial S/W Revision	A.02.00

Detectors

This key opens up a menu that allows you to configure the detectors to be used for the Measure at Marker reading. Any of the analyzer's detectors can be used for each of the three detectors, or any of the three can be turned off. The dwell time for each detector is also settable.

When performing a Meas at Marker, the dwell time settings that you select will depend on the characteristics of the emission you are measuring. The default dwell time (200 ms) should work well for typical EUT emissions, but sometimes you will encounter emissions for which the defaults are not optimal. This is especially the case for emissions that vary slowly over time or have a slow repetition rate. By lengthening the dwell times you can increase the likelihood of accurately measuring these low repetition rate signals.

When Measure at Marker is activated, the receiver makes a zero span measurement for each of the (up to) three detectors selected, using the Dwell Time set for each detector. If the signal's repetition period is greater than 200 ms (the default setting), the dwell time should be increased to capture at least two and preferably more repetitions of the signal. Additionally, if you do not need or do not wish to use a detector to make a measurement, that specific detector may be turned off.

If the Measure at Marker window is being displayed, and one of the detectors is changed, any value being displayed for that detector changes to “---“ until the next successful reading from that detector.

Key Path	Marker Function, Measure at Marker,
Remote Command	`:CALCulate:MAMarker:DETector[1] | 2 | 3 OFF | NORMal | AVERage | POSitive | SAMPle | NEGative | QPEak | EAVerage | RAVerage` `:CALCulate:MAMarker:DETector[1]|2|3?`
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

Key Path	Marker Function, Measure at Marker,
Remote Command	`:CALCulate:MAMarker:DETector[1]|2|3:DWELl <dwell time>` `:CALCulate:MAMarker:DETector[1]|2|3:DWELl?`
Example	:CALC:MAM:DET2:DWEL 500 ms Sets the detector for measure at marker detector 2 to dwell for 500 ms
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:DWELl <dwell time>` This command is included for compatibility with the E7400 and PSA option 239 . Sets all of the detectors’ dwell times to the specified amount
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF

	Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF

	Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the "Auto" key replaced by "Off".

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the "Auto" key replaced by "Off".

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 1

This menu lets you select the detector to be used for Detector 1, or turn Detector 1 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET OFF Sets the detector for measure at marker detector 1 to Off
Preset	Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF

	Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off

Preset	Quasi Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak

State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak
State Saved	Saved in instrument state

Readback Text	Detector name
Backwards Compatibility SCPI	[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1| This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1| This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards	[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1|

Compatibility SCPI	This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 2

This menu lets you select the detector to be used for Detector 2, or turn Detector 2 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2 QPE Sets the detector for measure at marker detector 2 to Quasi peak :CALC:MAM:DET2 OFF Sets the detector for measure at marker detector 2 to Off
Preset	Quasi Peak
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:QPEak[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 2 to Quasi Peak. If sent with Off as a parameter, sets detector 2 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.

Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak :CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 3

This menu lets you select the detector to be used for Detector 3, or turn Detector 3 off. This is a 1-of-N menu that shows the normal list of detectors, but with the “Auto” key replaced by “Off”.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3 QPE Sets the detector for measure at marker detector 1 to Quasi peak

	:CALC:MAM:DET3 OFF Sets the detector for measure at marker detector 1 to Off
Preset	EMI Average
State Saved	Saved in instrument state
Readback Text	Detector name
Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:DETector:AVERage[:STATe] OFF|ON|0|1|` This command is included for compatibility with the E7400 and PSA option 239 . If sent with On as a parameter, sets detector 3 to EMI Average. If sent with Off as a parameter, sets detector 3 to Off
Initial S/W Revision	A.02.00

Detector 1 Dwell Time

This is the time specified by the user to dwell while taking the measurement for detector 1. The minimum allowed dwell time is based on the current detector If “Off” is selected for detector 1, this key is grayed out and shows 200 ms.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET:DWEL 400 ms Sets the dwell time for detector 1 to 400 ms
Preset	200 ms
State Saved	Saved in instrument state
Min	1 ms
Max	60 s
Default Unit	s
Initial S/W Revision	A.02.00

Detector 2 Dwell Time

This is the time specified by the user to dwell while taking the measurement for detector 2. The minimum allowed dwell time is based on the current detector. If “Off” is selected for detector 2, this key is grayed out and shows 200 ms.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET2:DWEL 400 ms Sets the dwell time for detector 2 to 400 ms
Preset	200 ms
State Saved	Saved in instrument state

Min	1 ms
Max	60 s
Default Unit	s
Initial S/W Revision	A.02.00

Detector 3 Dwell Time

This is the time specified by the user to dwell while taking the measurement for detector 3. The minimum allowed dwell time is based on the current detector. If “Off” is selected for detector 3, this key is grayed out and shows 200 ms.

Key Path	Marker Function, Measure at Marker, Detectors
Remote Command	See "Detectors" on page 765.
Example	:CALC:MAM:DET3:DWEL 400 ms Sets the dwell time for detector 1 to 400 ms
Preset	200 ms
State Saved	Saved in instrument state
Min	1 ms
Max	60 s
Default Unit	s
Initial S/W Revision	A.02.00

BW & Avg Type

This key controls the type of bandwidth and average type coupling used in Measure at Marker.

If set to “Autocoupled”, then the RBW and Average Type are selected by the instrument during the Measure at Marker function, according to the normal Autocouple rules, regardless of whether RBW and Average Type are currently in Auto. If set to “As Set”, then the current value for RBW and Average Type are used (which could also be “Auto”).

Here are the details of the two modes:

If BW & Avg Type is set to Autocoupled, Measure at Marker behaves as follows:

1. The EMC Std changes to CISPR if any of the CISPR detectors (EMI Avg, RMS Avg, QPD) becomes selected; for all other detectors, the value of EMC Std that existed before Measure at Marker is used.
2. RBW autocouples throughout Measure at Marker, even if RBW is set to Manual. The autocouple rules are based on whatever the instantaneous setting of EMC Std, Span, and Center Freq are.

If BW & Avg Type is set to As Set, Measure at Marker behaves as follows:

1. The EMC Std never changes; so if it is set to None it stays at None throughout, even if one of the CISPR detectors is selected.

2. If RBW is set to Auto, then RBW autocouples throughout Measure at Marker. The autocouple rules are based on whatever the setting of EMC Std, Span, and Center Freq are.
3. If RBW is set to Manual, the RBW never changes at all throughout Measure at Marker, it stays at the value to which it was set before Measure at Marker began.

The analyzer returns to its pre-Measure at Marker span and settings after executing a Measure at Marker function, including Bandwidth, Avg Type, and EMC Std.

It is important to note that, when RBW is coupled to Frequency, as it is when EMC Std is anything but “None”, for all EMI measurements, the frequency it is coupled to for Measure at Marker is the MARKER frequency, not the Center Frequency.

Key Path	Marker Function, Measure at Marker
Remote Command	`:CALCulate:MAMarker:COUPling ON|OFF|1|0` `:CALCulate:MAMarker:COUPling?`
Example	:CALC:MAM:COUP ON
Preset	Autocoupled
State Saved	Saved in instrument state
Readback Text	Autocoupled|As Set
Initial S/W Revision	A.02.00

BW & Avg Type

This key controls the type of bandwidth and average type coupling used in Measure at Marker.

If set to “Autocoupled”, then the RBW and Average Type are selected by the instrument during the Measure at Marker function, according to the normal Autocouple rules, regardless of whether RBW and Average Type are currently in Auto. If set to “As Set”, then the current value for RBW and Average Type are used (which could also be “Auto”).

Here are the details of the two modes:

If BW & Avg Type is set to Autocoupled, Measure at Marker behaves as follows:

1. The EMC Std changes to CISPR if any of the CISPR detectors (EMI Avg, RMS Avg, QPD) becomes selected; for all other detectors, the value of EMC Std that existed before Measure at Marker is used.
2. RBW autocouples throughout Measure at Marker, even if RBW is set to Manual. The autocouple rules are based on whatever the instantaneous setting of EMC Std, Span, and Center Freq are.

If BW & Avg Type is set to As Set, Measure at Marker behaves as follows:

1. The EMC Std never changes; so if it is set to None it stays at None throughout, even if one of the CISPR detectors is selected.
2. If RBW is set to Auto, then RBW autocouples throughout Measure at Marker. The autocouple rules are based on whatever the setting of EMC Std, Span, and Center Freq are.
3. If RBW is set to Manual, the RBW never changes at all throughout Measure at Marker, it stays at the value to which it was set before Measure at Marker began.

The analyzer returns to its pre-Measure at Marker span and settings after executing a Measure at Marker function, including Bandwidth, Avg Type, and EMC Std.

It is important to note that, when RBW is coupled to Frequency, as it is when EMC Std is anything but “None”, for all EMI measurements, the frequency it is coupled to for Measure at Marker is the MARKER frequency, not the Center Frequency.

Key Path	Marker Function, Measure at Marker
Remote Command	`:CALCulate:MAMarker:COUPling ON|OFF|1|0` `:CALCulate:MAMarker:COUPling?`
Example	:CALC:MAM:COUP ON
Preset	Autocoupled
State Saved	Saved in instrument state
Readback Text	Autocoupled|As Set
Initial S/W Revision	A.02.00

BW & Avg Type

This key controls the type of bandwidth and average type coupling used in Measure at Marker.

If set to “Autocoupled”, then the RBW and Average Type are selected by the instrument during the Measure at Marker function, according to the normal Autocouple rules, regardless of whether RBW and Average Type are currently in Auto. If set to “As Set”, then the current value for RBW and Average Type are used (which could also be “Auto”).

Here are the details of the two modes:

If BW & Avg Type is set to Autocoupled, Measure at Marker behaves as follows:

1. The EMC Std changes to CISPR if any of the CISPR detectors (EMI Avg, RMS Avg, QPD) becomes selected; for all other detectors, the value of EMC Std that existed before Measure at Marker is used.
2. RBW autocouples throughout Measure at Marker, even if RBW is set to Manual. The autocouple rules are based on whatever the instantaneous setting of EMC Std, Span, and Center Freq are.

If BW & Avg Type is set to As Set, Measure at Marker behaves as follows:

1. The EMC Std never changes; so if it is set to None it stays at None throughout, even if one of the CISPR detectors is selected.
2. If RBW is set to Auto, then RBW autocouples throughout Measure at Marker. The autocouple rules are based on whatever the setting of EMC Std, Span, and Center Freq are.
3. If RBW is set to Manual, the RBW never changes at all throughout Measure at Marker, it stays at the value to which it was set before Measure at Marker began.

The analyzer returns to its pre-Measure at Marker span and settings after executing a Measure at Marker function, including Bandwidth, Avg Type, and EMC Std.

It is important to note that, when RBW is coupled to Frequency, as it is when EMC Std is anything but "None", for all EMI measurements, the frequency it is coupled to for Measure at Marker is the MARKER frequency, not the Center Frequency.

Key Path	Marker Function, Measure at Marker
Remote Command	`:CALCulate:MAMarker:COUPling ON|OFF|1|0` `:CALCulate:MAMarker:COUPling?`
Example	:CALC:MAM:COUP ON
Preset	Autocoupled
State Saved	Saved in instrument state
Readback Text	Autocoupled|As Set
Initial S/W Revision	A.02.00

Center Presel On/Off

This key controls the automatic centering of the preselector for the Measure at Marker function.

When Center Presel is On, the first step in performing the Measure at Marker function is to perform a Presel Center. This is not performed if the microwave preselector is off, or the selected marker's frequency is below Band 1. If the function is not performed, no message is generated.

Key Path	Marker Function, Measure at Marker
Remote Command	`:CALCulate:MAMarker:PCENter ON|OFF|1|0` `:CALCulate:MAMarker:PCENter?`
Example	:CALC:MAM:PCEN ON
Dependencies	Blank in models that do not include a preselector, such as option 503. If the SCPI is sent in these instruments, it is accepted without error, and the query always returns 0.
Preset	On

Backwards Compatibility SCPI	`[:SENSe]:EMI:MEASure:PCENter[:STATe] OFF|ON|0|1`
	`[:SENSe]:EMI:MEASure:PCENter[:STATe]?`
	This command is included for compatibility with the E7400 and PSA option 239 .

Initial S/W Revision	A.02.00

Marker To

The Marker -> key accesses menu keys that can copy the current marker value into other instrument parameters (for example, Center Freq). The currently selected marker is made the active function on entry to this menu (if the currently selected marker is not on when you press this front panel key, it will be turned on at the center of the screen as a normal type marker and then made the active function).

The Marker -> feature is used to quickly assign a marker's x- or y-axis value to another parameter. For example, if a marker's x-axis value is 500 MHz and y-axis value is –20 dBm, pressing Mkr -> CF assigns 500 MHz to Center Freq and pressing Mkr - >Ref Lvl assigns –20 dBm to Ref Level.

Key Path	Front-panel key
Notes	All Marker To functions executed from the front panel use the selected marker's values, while all Marker To remote commands specify in the command which marker's value to use. Consistent with other remote marker commands, sending a Marker To remote command will never change which marker is selected.
Initial S/W Revision	Prior to A.02.00

Mkr->CF

Sets the center frequency of the analyzer to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display. In delta marker mode, this function sets the center frequency to the x-axis value of the delta marker. When the frequency scale is in log mode, the center frequency is not at the center of the display.

If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the screen as a normal type marker.

Key Path	Marker ->
Remote Command	`:CALCulate:MARKer[1]|2|...12[:SET]:CENTer`
Example	CALC:MARK2:CENT sets the CF of the analyzer to the value of marker 2.
Notes	Sending this command selects the subopcoded marker If specified marker is off, this command will turn it on at the center of the screen as a normal type marker.
Dependencies	This function is not available (key is grayed out) when x-axis is the time domain
Couplings	All the usual couplings associated with setting Center Frequency apply.
Initial S/W Revision	Prior to A.02.00

Mkr->CF Step

Sets the center frequency (CF) step size of the analyzer to the marker frequency, or in a delta-marker mode, to the frequency difference between the delta and reference markers.

If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the screen as a normal type marker.

Key Path	Marker ->
Remote Command	:CALCulate:MARKer[1]|2|...12[:SET]:STEP
Example	CALC:MARK1:STEP sets the CF step to the value (or delta value) of marker 1.
Notes	Sending this command selects the subopcoded marker If specified marker is off, this command will turn it on at the center of the screen as a normal type marker.
Dependencies	This function is not available (key is grayed out) when x-axis is the time domain
Couplings	All the usual couplings associated with setting CF Step apply.
Initial S/W Revision	Prior to A.02.00

Mkr->Start

Changes the start frequency to the frequency of the selected marker. The marker stays at this frequency, so it moves to the left edge of the display. In delta marker mode, this function sets the start frequency to the x-axis value of the delta marker.

If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the screen as a normal type marker.

Key Path	Marker ->
Remote Command	:CALCulate:MARKer[1]|2|...12[:SET]:STARt
Example	CALC:MARK1:STAR sets the start frequency to the value (or delta value) of marker 1.
Notes	Sending this command selects the subopcoded marker If specified marker is off, this command will turn it on at the center of the screen as a normal type marker.
Dependencies	This function is not available (key is grayed out) when x-axis is the time domain
Couplings	All the usual couplings associated with setting Start Frequency apply.
Initial S/W Revision	Prior to A.02.00

Mkr->Stop

Changes the stop frequency to the frequency of the selected marker. The marker stays at this frequency, so it moves to the right edge of the display. In delta marker mode, this function sets the stop frequency to the x-axis value of the delta marker.

If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the screen as a normal type marker.

Key Path	Marker ->
Remote Command	:CALCulate:MARKer[1]|2|...12[:SET]:STOP
Example	CALC:MARK3:STOP sets the stop frequency to the value (or delta value) of marker 3.

Notes	Sending this command selects the subopcoded marker If specified marker is off, this command will turn it on at the center of the screen as a normal type marker.
Dependencies	This function is not available (key is grayed out) when x-axis is the time domain
Couplings	All the usual couplings associated with setting Stop Frequency apply.
Initial S/W Revision	Prior to A.02.00

Mkr->Ref Lvl

Sets the reference level to the amplitude value of the selected marker, moving the marked point to the reference level (top line of the graticule). The marker's mode (Normal, Delta, Fixed) doesn't matter in this case. For example, given a delta marker, if the delta marker is the selected marker, its amplitude is applied to the reference level. If the reference marker is selected, its amplitude is applied to the reference level.

If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the screen as a normal type marker, and its amplitude applied to the reference level.

Key Path	Marker ->
Remote Command	`:CALCulate:MARKer[1]|2|...12[:SET]:RLEVel`
Example	CALC:MARK2:RLEV sets the reference level of the analyzer to the amplitude of marker 2.
Notes	Sending this command selects the subopcoded marker If specified marker is off, this command will turn it on at the center of the screen as a normal type marker.
Couplings	All the usual couplings associated with setting Reference Level apply.
Backwards Compatibility Notes	Mkr-> RefLvl behavior for a delta marker is slightly different from earlier models. ESA would calculate the delta amplitude (difference between reference marker and delta marker in dB) and assign that value to the reference level (in dBm). PSA would just assign the delta marker's amplitude to the reference level, ignoring the reference marker altogether. The X-Series products allow the user to select either the reference or the delta marker individually. It is the selected marker's amplitude that will be applied to the reference level.
Initial S/W Revision	Prior to A.02.00

Mkr -> Zoom Center

Only appears in the Trace Zoom View of the Swept SA measurement.

Moves the zoom region so that it is centered at the selected marker in the top window. The Zoom Span is not changed, except as necessary to keep the entire Zoom Region between the top window Start and Stop frequencies. The center frequency of the lower window changes to reflect the new zoom center frequency.

If the marker frequency is entirely outside the current analyzer (top window) Start and Stop frequencies, a Mkr->CF function is first performed. (Note that if this Mkr->CF causes the Zoom Region to be outside the new Start and Stop frequencies, the Zoom Region is re-initialized to the new analyzer Center Freq with a span of 10% of the analyzer Span). After the Mkr->CF is performed, the Mkr->Zoom Center is performed.

Key Path	Marker ->
Remote Command	`:CALCulate:MARKer[1]|2|...12[:SET]:TZOom:CENTer`
Example	CALC:MARK2:TZO:CENT sets the Zoom CF to the value of marker 2.
Dependencies	Only appears in the Trace Zoom View of the Swept SA measurement. If the SCPI command is sent in other Views, gives an error.
Initial S/W Revision	A.07.01
Notes	Sending this command selects the subopcoded marker If specified marker is off, this command will first turn it on at the center of the screen as a normal type marker. Then the Mkr->Zoom Center function is performed.

Mkr -> Zone Center

Moves the zone so that it is centered at the selected marker in the top window. The zone span is not changed. The center frequency of the lower window changes to reflect the new zone center frequency. The lower window will not be updated until it is made active.

Key Path	Marker ->
Remote Command	`:CALCulate:MARKer[1]|2|...12[:SET]:ZSPan:CENTer`
Example	:CALC:MARK2:ZSP:CENT sets the Zone CF to the value of marker 2.
Notes	Sending this command selects the subopcoded marker If specified marker is off, this command will first turn it on at the center of the screen as a normal type marker. Then the Mkr->Zone Center function is performed.
Dependencies	Only appears in the Zone Span View of the Swept SA measurement. If the SCPI command is sent in other Views, gives an error. In addition, this function is not available when the bottom window is in Zero Span.
Initial S/W Revision	A.07.01

MkrΔ->CF

Sets the center frequency to the frequency difference between the selected marker and its reference marker. The marker is then changed to a Normal marker and placed at the center of span.

Key Path	Marker ->
Remote Command	`:CALCulate:MARKer[1]|2|...12[:SET]:DELTa:CENTer`
Example	CALC:MARK2:CENT sets the CF of the analyzer to the value of marker 2.
Notes	Sending this command selects the subopcoded marker
Dependencies	This function is only available when the selected marker is a delta marker. Otherwise the key is grayed out. In addition, this function is not available when x-axis is the time domain
Initial S/W Revision	Prior to A.02.00

MkrΔ->Span

Sets the start and stop frequencies to the values of the delta markers. That is, it moves the lower of the two marker frequencies to the start frequency and the higher of the two marker frequencies to the stop frequency. The marker mode is unchanged and the two markers (delta and reference) end up on opposite edges of the display.

Key Path	Marker ->
Remote Command	`:CALCulate:MARKer[1]|2|...12[:SET]:DELTa:SPAN`
Example	CALC:MARK2:DELT:SPAN sets the start and stop frequencies to the values of marker 2 and its reference marker.
Notes	Sending this command selects the subopcoded marker
Dependencies	This function is only available when the selected marker is a delta marker. Otherwise the key is grayed out. In addition, this function is not available when x-axis is the time domain
Couplings	All the usual couplings associated with setting Span apply (see “"SPAN X Scale" on page 1108”).
Backwards Compatibility SCPI	`:CALCulate:MARKer[1]|2|...12[:SET]:SPAN`
Backwards Compatibility Notes	In earlier ESA and PSA products, MkrΔ->Span would adjust the span and change the delta marker to a normal marker placing it at the center of screen. In all the X-Series products, this is no longer true. The markers will remain in delta mode and the delta and reference marker will end up on opposite edges of the display.
Initial S/W Revision	Prior to A.02.00

Meas

Pressing the Meas key displays a menu of measurements that are available in the current mode. For the N9061A RLC mode, there is only one available measurement selection: RLC Swept SA, which is selected by default.

NOTE Operation for some keys differs between measurements. The information displayed in Help pertains to the current measurement. To examine how a key operates in a different measurement, exit Help (press the Cancel Esc key), select the measurement, then reenter Help (press the Help key) and press that key.

TIP This topic describes the operation of the Meas key. For information about SCPI commands used for measurements, and data returned by the corresponding queries, see "RLC Swept SA Measurement Front-Panel & SCPI Reference" on page 790 and "Remote Measurement Functions" on page 163.

Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

RLC Swept SA Measurement Front-Panel & SCPI Reference

The Swept SA measurement uses both swept and FFT analysis, and the frequency and time domains. For more details, see "Swept SA Measurement Description" on page 792 .

NOTE In many of the key and command descriptions that follow, reference is made to the "Spectrum Analyzer Mode" and "Swept SA Measurement". In all cases, the information applicable to this mode and measurement also applies to the RLC Mode and RLC Swept SA Measurement.

Measurement Commands and their Results for Swept SA

The INITiate and CONFigure syntax, as well as the data returned by the queries FETCh, MEASure and READ, are described in this section.

Note that the data returned by FETCh?, MEASure? and READ? uses the data settings specified by the commands FORMat:BORDer (see "Format Data: Byte Order (Remote Command Only)" on page 175) and FORMat:DATA (see "Format Data: Numeric Data (Remote Command Only)" on page 174), and can return real or ASCII data. If the format is set to INT,32, it returns REAL,32 data.

For more measurement related commands, see the SENSe subsystem, and the "Remote Measurement Functions" on page 163.

NOTE The INITiate command works in a slightly different fashion in the Spectrogram view. In the other Views (Normal, Trace Zoom and Zone Span), the following two commands perform exactly the same function:

- :INITiate:RESTart
- :INITiate:IMMediate

However, in the Spectrogram View, the command :INITiate:RESTart works like the Restart key, and clears out the Spectrogram trace history. The command :INITiate:IMMediate does not clear out the Spectrogram trace history but performs all other functions of performing a restart.

The table below lists the measurement commands and their responses for the SANalyzer measurement. Note that the marker values are x, y pairs.

Command	n	Return Value
`INITiate:SANalyzer`	n/a	n/a
`CONFigure?`	n/a	long form name of current measurement, for example, "SANalyzer"
`CONFigure:SANalyzer`	n/a	n/a (selects SAN measurement with Meas Setup settings in preset state – same as Meas Preset)
`CONFigure:SANalyzer:NDEFault`	n/a	n/a (selects SAN measurement without affecting settings)

`FETCh:SANalyzer[n]?`
`MEASure:SANalyzer[n]?`
`READ:SANalyzer[n]?`
	0	Returns the following comma-separated results:
		1. 1 if there is any margin or limit failure, otherwise 0
		2. 0 (future).
		3. 0 (future).
		4. 0 (future).
		5. N dB points result (not a number if off)
		6. Current average count k (the current number of data measurements that have already been combined, in the averaging calculation).
		7. Number of points in the sweep
		8. 0 (future).
		9. 0 (future).
		10. 0 (future).
		11. Marker 1 value (x,y)
		12. Marker 2 value (x,y)
		13. Marker 3 value (x,y)
		14. Marker 4 value (x,y)
		15. Marker 5 value (x,y)
		16. Marker 6 value (x,y)
		17. Marker 7 value (x,y)
		18. Marker 8 value (x,y)
		19. Marker 9 value (x,y)
		20. Marker 10 value (x,y)
		21. Marker 11 value (x,y)

Command	n	Return Value
		22. Marker 12 value (x,y)
	not specified or n=1	This query returns Trace 1 data as a list of x,y pairs. The y-values are in the current Y Axis Unit of the analyzer. The x-axis values are the values of the trace, in the x-axis scale units of the trace (Hz for frequency domain traces, seconds for time domain traces). When querying trace data, it is best if the analyzer is not sweeping during the query. Therefore, it is good to be in Single Sweep, or Update=Off when querying trace data from the analyzer.
	2	Returns Trace 2 data as a series of x,y pairs
	3	Returns Trace 3 data as a series of x,y pairs
	4	Returns Trace 4 data as a series of x,y pairs
	5	Returns Trace 5 data as a series of x,y pairs
	6	Returns Trace 6 data as a series of x,y pairs
	7 & above	Future use

Swept SA Measurement Description

- Swept Spectrum Analysis (Freq Domain): The analyzer sweeps the LO to generate a heterodyned IF signal that can be detected to analyze the signal content of a range of frequencies. The x-axis of the display is frequency, the Y Axis is amplitude.
- Swept FFT Analysis (Freq Domain): In some cases there is an advantage to not actually sweeping the LO, but instead analyzing the signal by taking a time record and performing FFT analysis. This is what is done in swept FFT analysis, but the data is still presented as though it were a sweeping spectrum analyzer. The x-axis of the display is frequency, the Y Axis is amplitude.
- Zero Span Analysis (Time Domain): In Zero Span analysis, the analyzer stops sweeping the LO, placing it at the center frequency, and then takes time data from the detector while stopped at that frequency. Because the LO is not moving, the frequency span is zero. The time data is presented left to right across the screen just like on an oscilloscope. The x-axis of the display is time, and the Y Axis is amplitude.

All of the tools such as markers, peak tables, limit lines, trace math, N dB points, and marker functions are available in Zero Span measurement analysis, although some work differently in the time and frequency domains.

Key Path	Meas
Initial S/W Revision	Prior to A.02.00

Meas Setup

The Meas Setup key opens a menu of softkeys that allow you to control the most important parameters for the current measurement.

NOTE In the Meas Setup menu, you may configure Averaging, by setting the Average Number and the Average Type.

Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

Average/Hold Number

Sets the terminal count number N for Average, Max Hold and Min Hold trace types. This number is an integral part of how the average trace is calculated. Basically, increasing N results in a smoother average trace.

See "More Information" on page 794.

See "AVER:CLE command" on page 795.

Key Path	Meas Setup
Remote Command	`[:SENSe]:AVERage:COUNt <integer>` `[:SENSe]:AVERage:COUNt?`
Couplings	Restarting any of these functions (Average, Max Hold or Min Hold) restarts all of them, as there is only one count.
Preset	100
State Saved	Saved in instrument state
Min	1
Max	10000
Status Bits/OPC dependencies	See "Sweep/Control" on page 1117for a discussion of the Sweeping, Measuring, Settling and OPC bits, and the Hi Sweep line. All are affected when a sequence is reset.
Backwards Compatibility Notes	In the past, when changing the Average Count (now Average/Hold Number), you had to re-start the trace at the beginning of a sweep to ensure valid average data. Now, the system will ensure valid results when changing the count limit.
Initial S/W Revision	Prior to A.02.00

More Information

When in Single, the sweep stops when N is reached. You can add more sweeps by increasing the Average/Hold Number. For example, if you want to add one more Average, or one more trace to Max Hold or Min Hold, simply increment this number by one, which you can do by pressing the Up key while Average/Hold Number is the active function.

In Cont (continuous), averaging and holding continues even after N is reached. Therefore, using doing trace holding in Cont, the value of N is irrelevant. But for averaging, each new sweep is exponentially averaged in with a weighting equal to N.

For details of how the average trace is calculated and how this depends on the Average/Hold Number, see "Average Type" on page 795, below. For details on how the various control functions in the instrument start and restart averaging, see "Average Type" on page 795.

The Average/Hold Number is not affected by Auto Couple.

AVER:CLE command

The AVER:CLE command (below) resets the average/hold count and does an INIT:IMM, which begins another set of sweeps when trigger conditions are satisfied. It only does this if an active trace is in Average or Hold type.

Remote Command	`[:SENSe]:AVERage:CLEar`
Example	AVER:COUN 100 AVER:CLE sets the current count (k and K) to 1 and restarts the averaging process.
Notes	When the instrument receives this command it performs an INIT:IMM, if and only if there is an active trace in Max Hold, Min Hold, or Average type.
Default Unit	Enter
Initial S/W Revision	Prior to A.02.00

Average Type

Lets you control the way averaging is done by choosing one of the following averaging scales: log-power (video), power (RMS), or voltage averaging. Also lets you choose Auto Average Type (default).

When performing Trace Averaging, , the equation that is used to calculate the averaged trace depends on the average type. See the descriptions for the keys which select each Average Type ("Log-Pwr Avg (Video) " on page 797, "Pwr Avg (RMS)" on page 797, or "Voltage Avg" on page 798) for details on these equations.

See "More Information" on page 796.

Key Path	Meas Setup
Remote Command	`[:SENSe]:AVERage:TYPE:AUTO OFF|ON|0|1` `[:SENSe]:AVERage:TYPE:AUTO?`
Preset	ON
State Saved	Saved in Instrument State
Readback line	1-of-N selection as Log-Pwr (Video) for Log-Pwr (Video) Avg Pwr (RMS) for Power Avg Voltage for Voltage

Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:AVERage:TYPE RMS|LOG|SCALar [:SENSe]:AVERage:TYPE?`
Notes	Parameters map to avg types as: RMS = Pwr (RMS) Avg LOG = Log-Pwr (Video) Avg SCALar = Voltage Avg
Preset	LOG
Backwards Compatibility Notes	The following legacy parameters to the [:SENSe]:AVERage:TYPE command are aliased as shown: LINear aliased to SCALar, sets Scalar averaging VOLTage aliased to SCALar, sets Scalar averaging VIDeo aliased to LOG, sets Log-Power averaging LPOWer aliased to LOG, sets Log-Power averaging POWer aliased to RMS , sets RMS averaging
Initial S/W Revision	Prior to A.02.00

More Information

When you select log-power averaging, the measurement results are the average of the signal level in logarithmic units (decibels). When you select power average (RMS), all measured results are converted into power units before averaging and filtering operations, and converted back to decibels for displaying. Remember: there can be significant differences between the average of the log of power and the log of the average power.

These are the averaging processes within a spectrum analyzer and all of them are affected by this setting:

1. Trace averaging (see “"Trace/Detector" on page 1264”) averages signal amplitudes on a trace-to-trace basis. The average type applies to all traces in Trace Average (it is not set on a trace-by-trace basis).

2. Average detector (see “"Trace/Detector" on page 1264”) averages signal amplitudes during the time or frequency interval represented by a particular measurement point.

3. Noise Marker (see “"Marker Function" on page 742”) averages signal amplitudes across measurement points to reduce variations for noisy signals.

4. VBW filtering (see “"BW" on page 588”) adds video filtering which is a form of averaging of the video signal.

When Auto is selected, the analyzer chooses the type of averaging (see below). When one of the average types is selected manually, the analyzer uses that type regardless of other analyzer settings, and shows Man on the Average Type softkey.

Auto

Chooses the optimum type of averaging for the current instrument measurement settings.

Key Path	Meas setup, Average Type
Example	AVER:TYPE:AUTO ON
Notes	See Average Type, above
Couplings	Here are the auto-select rules for Average Type: Auto selects VoltageAveraging if the Detector for any active trace is EMI Average or QPD or RMS Average; otherwise it selects Power (RMS) Averaging if a Marker Function (Marker Noise, Band/Intvl Power) is on, or Detector is set to Man and Average; otherwise if Amplitude, Scale Type is set to Lin it selects Voltage Averaging; otherwise, if the EMC Standard is set to CISPR, it selects Voltage; otherwise Auto selects Log-Power Average. Note that these rules are only applied to active traces. Traces which are not updating do not impact the auto-selection of Average Type.
State Saved	Saved in instrument state
Readback	The type auto-selected is displayed in the readback line on the Average Type key
Initial S/W Revision	Prior to A.02.00

Log-Pwr Avg (Video)

Selects the logarithmic (decibel) scale for all filtering and averaging processes. This scale is sometimes called “Video” because it is the most common display and analysis scale for the video signal within a spectrum analyzer. This scale is excellent for finding CW signals near noise, but its response to noise-like signals is 2.506 dB lower than the average power of those noise signals. This is compensated for in the Marker Noise function.

The equation for trace averaging on the log-pwr scale is shown below, where K is the number of averages accumulated. (In continuous sweep mode, once K has reached the Average/Hold Number, K stays at that value, providing a continuous running average.)

New avg = ((K−1)Old avg + New data)/K

Assumes all values in decibel scale.

Key Path	Meas setup, Average Type
Example	AVER:TYPE LOG
Notes	See “"Average Type" on page 795”
Couplings	See “"Auto" on page 796”
Readback	Log-Pwr (Video)
Initial S/W Revision	Prior to A.02.00

Pwr Avg (RMS)

In this average type, all filtering and averaging processes work on the power (the square of the magnitude) of the signal, instead of its log or envelope voltage. This scale is best for measuring the true time average power of complex signals. This scale is sometimes called RMS because the resulting voltage is proportional to the square root of the mean of the square of the voltage.

In the equation for averaging on this scale (below), K is the number of averages accumulated. (In continuous sweep mode, once K has reached the Average/Hold Number, K stays at that value, providing a running average.)

New avg = 10 log ((1/K)((K−1)(10Old avg/10)+10New data/10))

Equation assumes all values are in the decibel scale.

Key Path	Meas setup, Average Type
Example	AVER:TYPE RMS
Notes	See "Average Type" on page 795
Couplings	See "Auto" on page 796
Readback	Pwr (RMS)
Initial S/W Revision	Prior to A.02.00

Voltage Avg

In this Average type, all filtering and averaging processes work on the voltage of the envelope of the signal. This scale is good for observing rise and fall behavior of AM or pulse-modulated signals such as radar and TDMA transmitters, but its response to noise-like signals is 1.049 dB lower than the average power of those noise signals. This is compensated for in the Marker Noise function.

In the equation for averaging on this scale (below), K is the number of averages accumulated. (In continuous sweep mode, once K has reached the Average/Hold Number, K stays at that value.)

New avg = 20 log ((1/K)((K−1)(10Old avg/20)+10New data/20))

Equation assumes all values are in the decibel scale.

Key Path	Meas setup, Average Type
Example	AVER:TYPE SCAL
Notes	See "Average Type" on page 795
Couplings	See "Auto" on page 796
Readback	Pwr (RMS)
Initial S/W Revision	Prior to A.02.00

Limits

The limits key opens a menu of softkeys to control the limits for the current measurement. Limits arrays can be entered by the user, sent over SCPI, or loaded from a file.

Key Path	Meas Setup

Dependencies	This key will only appear if you have the proper option installed in your instrument.
Preset	Limits are turned off by a Preset, but the Limits arrays (data) are only reset (deleted) by Restore Mode Defaults. They survive shutdown and restarting of the analyzer application, which means they will survive a power cycle.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.

State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Limit

Selects whether the limit and margin are displayed. If Test Limits is on, this also determines whether the test trace (see "Test Trace" on page 808) will be tested against the limit. If Limit On/Off is On, the following occurs:

- The limit line is displayed, in the same color as the limited trace, but paler. Portions of traces which fail the limits will be displayed in red.
- The margin line is displayed if Margin is on and the Margin Value is non-zero (see "Margin" on page 813). The margin line is displayed in the same color as the limit line, but paler still and dashed. Portions of traces which pass the limits but fail the margin will be displayed in amber.
- The trace is tested for the purpose of the "Trace Pass/Fail" indication in the graticule if, in addition to Limit On/Off being On, the trace is displayed and Test Limits (All Limits) is on (see "Test Limits" on page 823). If the trace is not tested, no report of the trace passing or failing is seen on the graticule. Note that the SCPI queries of Limit Pass/Fail are independent of these conditions; the test is always performed when queried over SCPI.

The PASS/FAIL box in the corner of the Meas Bar is only displayed if there is at least one "Trace Pass/Fail" indication displayed in the graticule.

Note that the red and amber coloring of traces which fail the limits and/or margins only applies to traces whose X-axis corresponds to the current analyzer X-axis. Traces which are not updating (in View, for example) will not change color if the analyzer X-axis settings (e.g., start and stop frequency) do not match those of the trace, for example if they have been changed since the trace stopped updating. In this case, the Invalid Data indicator (*) will appear in the upper right hand corner.

When the limits are frequency limits but the trace is a zero-span trace, the limit trace is drawn at the limit amplitude of the center frequency. When the limits are time limits but the trace is a frequency domain trace, the limit trace is drawn according to the current time axis, with the left of the screen being 0 and the right being equal to sweep time.

Key Path	Meas Setup, Limits
Remote Command	`:CALCulate:LLINe[1]|2|...6:DISPlay OFF|ON|0|1` `:CALCulate:LLINe[1]|2|...6:DISPlay?`
Example	:CALC:LLIN2:DISP ON turns on the display for limit line 2.
Dependencies	This command will generate an "Option not available" error message unless you have the proper option installed in your instrument.
Couplings	Limit display ON selects the limit. Testing is done on all displayed limits if Test Limits (All Limits) is ON. Entering the limit menu from the GUI turns on the selected limit.

Preset	OFF
State Saved	Saved in instrument state.
Backwards Compatibility SCPI	`:CALCulate:LLINe[1]|2:STATe OFF|ON|0|1` In the past you had to send the DISP command as well as the STATe command in order to get a limit on and testing. Now, the DISP command is sufficient, but we accept the state command and map it to DISP
Initial S/W Revision	A.02.00

Properties

Accesses a menu which lets you set the properties of the selected limit.

Key Path	Meas Setup, Limits
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits, Properties
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits, Properties
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits, Properties
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits, Properties
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits, Properties
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits, Properties
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.

State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Select Limit

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits, Properties
Notes	The selected limit is remembered even when not in the Limit Menu.
Preset	Limit 1, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Test Trace

Selects the trace you want the limit to test. A limit is applied to one and only one trace; each trace can have both an upper and a lower limit. When executing Limit Test, the limit is applied only to the specified trace.

A trace can have multiple limit lines simultaneously; in that case, only one upper and one lower limit line will affect the color of the trace. Other limit lines will be displayed, and will affect the pass/fail status, but the trace will not turn red if it crosses a secondary limit line.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:TRACe 1|2|3|4|5|6` `:CALCulate:LLINe[1]|2|...6:TRACe?`
Example	:CALC:LLIN3:TRAC 2 applies limit 3 to trace 2.
Notes	When the trace display is off, the trace is not tested. The trace is tested only when the trace display is on and Test Limits (see "Test Limits" on page 823) is on.
Couplings	This matters when testing a trace or limit line for failure, via :CALC:LLIN3:FAIL? or :CALC:TRAC2:FAIL?
Preset	Limits 1 and 2 preset to 1, Limits 3 and 4 preset to 2, Limits 5 and 6 preset to 3 Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Min	1
Max	6
Readback	Trace 1|2|3|4|5|6
Initial S/W Revision	A.02.00

Test Trace

Selects the trace you want the limit to test. A limit is applied to one and only one trace; each trace can have both an upper and a lower limit. When executing Limit Test, the limit is applied only to the specified trace.

A trace can have multiple limit lines simultaneously; in that case, only one upper and one lower limit line will affect the color of the trace. Other limit lines will be displayed, and will affect the pass/fail status, but the trace will not turn red if it crosses a secondary limit line.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:TRACe 1|2|3|4|5|6` `:CALCulate:LLINe[1]|2|...6:TRACe?`
Example	:CALC:LLIN3:TRAC 2 applies limit 3 to trace 2.
Notes	When the trace display is off, the trace is not tested. The trace is tested only when the trace display is on and Test Limits (see "Test Limits" on page 823) is on.
Couplings	This matters when testing a trace or limit line for failure, via :CALC:LLIN3:FAIL? or :CALC:TRAC2:FAIL?
Preset	Limits 1 and 2 preset to 1, Limits 3 and 4 preset to 2, Limits 5 and 6 preset to 3 Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Min	1
Max	6
Readback	Trace 1|2|3|4|5|6
Initial S/W Revision	A.02.00

Test Trace

Selects the trace you want the limit to test. A limit is applied to one and only one trace; each trace can have both an upper and a lower limit. When executing Limit Test, the limit is applied only to the specified trace.

A trace can have multiple limit lines simultaneously; in that case, only one upper and one lower limit line will affect the color of the trace. Other limit lines will be displayed, and will affect the pass/fail status, but the trace will not turn red if it crosses a secondary limit line.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:TRACe 1|2|3|4|5|6` `:CALCulate:LLINe[1]|2|...6:TRACe?`
Example	:CALC:LLIN3:TRAC 2 applies limit 3 to trace 2.
Notes	When the trace display is off, the trace is not tested. The trace is tested only when the trace display is on and Test Limits (see "Test Limits" on page 823) is on.
Couplings	This matters when testing a trace or limit line for failure, via :CALC:LLIN3:FAIL? or :CALC:TRAC2:FAIL?

Preset	Limits 1 and 2 preset to 1, Limits 3 and 4 preset to 2, Limits 5 and 6 preset to 3 Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Min	1
Max	6
Readback	Trace 1|2|3|4|5|6
Initial S/W Revision	A.02.00

Test Trace

Selects the trace you want the limit to test. A limit is applied to one and only one trace; each trace can have both an upper and a lower limit. When executing Limit Test, the limit is applied only to the specified trace.

A trace can have multiple limit lines simultaneously; in that case, only one upper and one lower limit line will affect the color of the trace. Other limit lines will be displayed, and will affect the pass/fail status, but the trace will not turn red if it crosses a secondary limit line.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:TRACe 1|2|3|4|5|6` `:CALCulate:LLINe[1]|2|...6:TRACe?`
Example	:CALC:LLIN3:TRAC 2 applies limit 3 to trace 2.
Notes	When the trace display is off, the trace is not tested. The trace is tested only when the trace display is on and Test Limits (see "Test Limits" on page 823) is on.
Couplings	This matters when testing a trace or limit line for failure, via :CALC:LLIN3:FAIL? or :CALC:TRAC2:FAIL?
Preset	Limits 1 and 2 preset to 1, Limits 3 and 4 preset to 2, Limits 5 and 6 preset to 3 Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Min	1
Max	6
Readback	Trace 1|2|3|4|5|6
Initial S/W Revision	A.02.00

Test Trace

Selects the trace you want the limit to test. A limit is applied to one and only one trace; each trace can have both an upper and a lower limit. When executing Limit Test, the limit is applied only to the specified trace.

A trace can have multiple limit lines simultaneously; in that case, only one upper and one lower limit line will affect the color of the trace. Other limit lines will be displayed, and will affect the pass/fail status, but the trace will not turn red if it crosses a secondary limit line.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:TRACe 1|2|3|4|5|6` `:CALCulate:LLINe[1]|2|...6:TRACe?`
Example	:CALC:LLIN3:TRAC 2 applies limit 3 to trace 2.
Notes	When the trace display is off, the trace is not tested. The trace is tested only when the trace display is on and Test Limits (see "Test Limits" on page 823) is on.
Couplings	This matters when testing a trace or limit line for failure, via :CALC:LLIN3:FAIL? or :CALC:TRAC2:FAIL?
Preset	Limits 1 and 2 preset to 1, Limits 3 and 4 preset to 2, Limits 5 and 6 preset to 3 Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Min	1
Max	6
Readback	Trace 1|2|3|4|5|6
Initial S/W Revision	A.02.00

Test Trace

Selects the trace you want the limit to test. A limit is applied to one and only one trace; each trace can have both an upper and a lower limit. When executing Limit Test, the limit is applied only to the specified trace.

A trace can have multiple limit lines simultaneously; in that case, only one upper and one lower limit line will affect the color of the trace. Other limit lines will be displayed, and will affect the pass/fail status, but the trace will not turn red if it crosses a secondary limit line.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:TRACe 1|2|3|4|5|6` `:CALCulate:LLINe[1]|2|...6:TRACe?`
Example	:CALC:LLIN3:TRAC 2 applies limit 3 to trace 2.
Notes	When the trace display is off, the trace is not tested. The trace is tested only when the trace display is on and Test Limits (see "Test Limits" on page 823) is on.
Couplings	This matters when testing a trace or limit line for failure, via :CALC:LLIN3:FAIL? or :CALC:TRAC2:FAIL?
Preset	Limits 1 and 2 preset to 1, Limits 3 and 4 preset to 2, Limits 5 and 6 preset to 3 Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Min	1

Max	6
Readback	Trace 1|2|3|4|5|6
Initial S/W Revision	A.02.00

Test Trace

Selects the trace you want the limit to test. A limit is applied to one and only one trace; each trace can have both an upper and a lower limit. When executing Limit Test, the limit is applied only to the specified trace.

A trace can have multiple limit lines simultaneously; in that case, only one upper and one lower limit line will affect the color of the trace. Other limit lines will be displayed, and will affect the pass/fail status, but the trace will not turn red if it crosses a secondary limit line.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:TRACe 1|2|3|4|5|6` `:CALCulate:LLINe[1]|2|...6:TRACe?`
Example	:CALC:LLIN3:TRAC 2 applies limit 3 to trace 2.
Notes	When the trace display is off, the trace is not tested. The trace is tested only when the trace display is on and Test Limits (see "Test Limits" on page 823) is on.
Couplings	This matters when testing a trace or limit line for failure, via :CALC:LLIN3:FAIL? or :CALC:TRAC2:FAIL?
Preset	Limits 1 and 2 preset to 1, Limits 3 and 4 preset to 2, Limits 5 and 6 preset to 3 Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Min	1
Max	6
Readback	Trace 1|2|3|4|5|6
Initial S/W Revision	A.02.00

Type

Selects whether the limit you are editing is an upper or lower limit. An upper limit fails if the trace exceeds the limit. A lower limit fails if the trace falls below the limit.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:TYPE UPPer|LOWer` `:CALCulate:LLINe[1]|2|...6:TYPE?`
Example	:CALC:LLIN2:TYPE LOW sets limit line 2 to act as a lower limit.
Couplings	If a margin has already been set for this limit line, and this key is used to change the limit type, then the margin value will reverse sign.

Preset	Upper for Line 1, 3, and 5; Lower for Line 2, 4, 6. Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Interpolation

Accesses a menu which lets you set the frequency and amplitude interpolation of the selected limit.

Key Path	Meas Setup, Limits, Properties
Readback	[Lin|Log Frequency, Lin|Log Amplitude]
Initial S/W Revision	A.02.00

Frequency Interpolation

This key is grayed out if Time is the selected X Axis Units. Sets the interpolation between frequency points, allowing you to determine how limit trace values are computed between points in a limit table. The available interpolation modes are linear and logarithmic. If frequency interpolation is logarithmic (Log), frequency values between limit points are computed by first taking the logarithm of both the table values and the intermediate value. A linear interpolation is then performed in this logarithmic frequency space. An exactly analogous manipulation is done for logarithmic amplitude interpolation.

Note that the native representation of amplitude is in dB.

For linear amplitude interpolation and linear frequency interpolation, the interpolation is computed as:

$$y = 20\log\left(\frac{10^{\frac{y_{i+1}}{20}} - 10^{\frac{y_i}{20}}}{f_{i+1} - f_i}\left(f - f_i\right) + 10^{\frac{y_i}{20}}\right)$$

For linear amplitude interpolation and log frequency interpolation, the interpolation is computed as:

$$y = 20\log\left(\frac{10^{\frac{y_{i+1}}{20}} - 10^{\frac{y_i}{20}}}{\log f_{i+1} - \log f_i}\left(\log f - \log f_i\right) + 10^{\frac{y_i}{20}}\right)$$

For log amplitude interpolation and linear frequency interpolation, the interpolation is computed as:

$$y = \frac{y_{i+1} - y_i}{f_{i+1} - f_i}\left(f - f_i\right) + y_i$$

For log amplitude interpolation and log frequency interpolation, the interpolation is computed as:

$$y = \frac{y_{i+1} - y_i}{\log f_{i+1} - \log f_i}\left(\log f - \log f_i\right) + y_i$$

NOTE Interpolation modes determine how limit values are computed between points in the limit table. The appearance of a limit trace is also affected by the amplitude scale, which may be linear or logarithmic.

Key Path	Meas Setup, Limits, Properties, Interpolation
Remote Command	`:CALCulate:LLINe[1]|2|...6:CONTrol:INTerpolate:TYPE LOGarithmic	LINear` `:CALCulate:LLINe[1]|2|...6:CONTrol:INTerpolate:TYPE?`
Example	:CALC:LLIN:CONT:INT:TYPE LIN sets limit line 1 frequency interpolation to linear.
Preset	Linear, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Amplitude Interpolation

Sets the interpolation to linear or logarithmic for the specified limiting points set, allowing you to determine how limit trace values are computed between points in a limit table. See Frequency Interpolation for the equations used to calculate limit values between points.

Key Path	Meas Setup, Limits, Properties, Interpolation
Remote Command	`:CALCulate:LLINe[1]|2|...6:AMPLitude:INTerpolate:TYPE LOGarithmic	LINear` `:CALCulate:LLINe[1]|2|...6:AMPLitude:INTerpolate:TYPE?`
Example	:CALC:LLIN:AMPL:INT:TYPE LIN sets limit line 1 amplitude interpolation to linear.
Preset	Logarithmic, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Fixed / Relative

Opens a menu which will allow you to specify that the selected limit is relative to either Center Frequency or Reference level.

Key Path	Meas Setup, Limits, Properties
Readback	Fixed|Rel to CF|Rel to RL|Rel to CF + RL (square brackets)
Backwards Compatibility Notes	You can now set relative amplitude and relative frequency independently for each limit line. :CALC:LLIN:CMOD REL makes all limit lines relative to the center frequency and reference level. :CALC:LLIN:CMOD? returns 1 if Limit Line 1 is set Relative to CF, and returns 0 otherwise.
Initial S/W Revision	A.02.00

Relative to CF

Chooses whether the limit line frequency points are coupled to the instrument center frequency, and whether the frequency points are expressed as an offset from the instrument center frequency. If the limit lines are specified with time, this has no effect. The limit table must in this case support negative frequencies.

For example, assume you have a frequency limit line, and the analyzer center frequency is at 1 GHz. If Relative to CF is “Off”, entering a limit line segment with a frequency coordinate of 300 MHz displays the limit line segment at 300 MHz, and the limit line segment will not change frequency if the center frequency changes. If Relative to CF is “On”, entering a limit line segment with a frequency coordinate of 300 MHz displays the limit line segment at CF + 300 MHz, or 1.3 GHz. Furthermore, if the center frequency changes to 2 GHz, the limit line segment will be displayed at CF + 300 MHz, or 2.3 GHz.

It is possible to change this setting after a limit line has been entered. When changing from On to Off or vice-versa, the frequency values in the limit line table change so that the limit line remains in the same position for the current frequency settings of the analyzer.

Pressing this button makes Center Frequency the active function.

Key Path	Meas Setup, Limits, Properties, Fixed/Relative
Remote Command	`:CALCulate:LLINe[1]|2|...6:FREQuency:CMODe:RELative ON | OFF | 1 | 0` `:CALCulate:LLINe[1]|2|...6:FREQuency:CMODe:RELative?`
Example	:CALC:LLIN:FREQ:CMOD:REL ON makes limit line 1 relative to the center frequency.
Notes	If the Trace Domain is changed to Time (:CALCulate:LLINe:CONTrol:DOMain TIME), the command : :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe:RELative ON|OFF|1|0 will have no effect.
Couplings	Pressing this button makes Center Frequency the active function.
Preset	Off, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Relative to RL

Chooses whether the limit line amplitude points are coupled to the instrument reference level, and whether the amplitude points are expressed as an offset from the instrument reference level.

For example, assume you have a limit line, and the reference level at –10 dBm. If Relative to RL is “Off”, entering a limit line segment with an amplitude coordinate of –20 dB displays the limit line segment at –20 dBm, and the limit line segment will not change amplitude if the reference level amplitude changes. If Relative to RL is “On”, entering a limit line segment with an amplitude coordinate of –20 dB displays the limit line segment at RL – 20 dB, or –30 dBm. Furthermore, if the reference level amplitude changes to –30 dBm, the limit line segment will be displayed at RL – 20 dB, or –50 dBm.

It is possible to change this setting after a limit line has been entered. When changing from On to Off or vice-versa, the amplitude values in the limit line table change so that the limit line remains in the same position for the current reference level settings of the analyzer.

Key Path	Meas Setup, Limits, Properties, Fixed/Relative
Remote Command	`:CALCulate:LLINe[1]|2|...6:AMPLitude:CMODe:RELative ON	OFF	1	0` `:CALCulate:LLINe[1]|2|...6:AMPLitude:CMODe:RELative?`
Example	:CALC:LLIN:AMPL:CMOD:REL ON makes limit line 1 relative to the reference level amplitude.
Couplings	Pressing this button makes Reference level the active function.
Preset	Off, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Description

Provides a description of up to 60 characters by which the operator can easily identify the limit. Will be stored in the exported file. Can be displayed in the active function area by selecting as the active function, if desired to be in a screen dump.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:DESCription "Description"` `:CALCulate:LLINe[1]|2|...6:DESCription?`
Example	:CALC:LLIN:DESC "European Emissions"
Dependencies	60 characters max
Preset	"" (null String), not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Readback	As much of the description will fit on one line of the key, followed by "..." if some of the description will not fit on one line of the key.
Initial S/W Revision	A.02.00

Comment

Sets an ASCII comment field,which will be stored in an exported file. Can be displayed in the active function area by selecting as the active function, if desired to be in a screen capture. The Limits .csv file supports this field.

Key Path	Meas Setup, Limits, Properties
Remote Command	`:CALCulate:LLINe[1]|2|...6:COMMent "text"` `:CALCulate:LLINe[1]|2|...6:COMMent?`
Example	:CALC:LLIN1:COMM "this is a comment"
Dependencies	60 characters max
Preset	"" (null String), not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.

Readback	As much of the description will fit on one line of the key, followed by "…" if some of the description will not fit on one line of the key.
Initial S/W Revision	A.02.00

Margin

Selects a margin for this limit, which will cause a trace to Fail Margin when the trace is between the limit line and the margin line.   Portions of the traces which pass the limit but fail the margin will be displayed in an amber color.

A margin is always specified in dB relative to a limit – an upper limit will always have a negative margin, and a lower limit will always have a positive margin. If a value is entered with the incorrect sign, the system will automatically take the negative of the entered value.

If the limit type is switched from lower to upper while margin is present, the margin will reverse sign.

When the Margin is selected, it may be turned off by pressing the Margin key until Off is underlined. This may also be done by performing a preset. Margin is the default active function whenever the margin is on, and it is not the active function whenever the margin is off.

The margin lines are displayed in the same color as limit lines, but paler. . If the limited trace is blanked then the limit line and the margin line will be blanked as well.

Key Path	Meas Setup, Limits

Remote Command	`:CALCulate:LLINe[1]|2|...6:MARGin <rel_ampl>`
	`:CALCulate:LLINe[1]|2|...6:MARGin?`
	`:CALCulate:LLINe[1]|2|...6:MARGin:STATe OFF|ON|0|1`
	`:CALCulate:LLINe[1]|2|...6:MARGin:STATe?`

Example	:CALC:LLIN1:MARG –2dB sets limit line 1's margin to –2 dB (Limit Line 1 is by default an upper limit). :CALC:LLIN2:MARG 1dB sets limit line 2's margin to 1 dB (Limit Line 2 is by default a lower limit). :CALC:LLIN2:MARG:STAT OFF !turns off the margin for limit line 2 and removes any tests associated with that margin line.
Notes	The queries "Limit Line Fail?" (:CALCulate:LLINe[1]|2|3|4|5|6:FAIL?) and "Trace Fail?" (:CALCulate:TRACe[1]|2|3|4|5|6:FAIL?) will return 1 if the margin fails.
Couplings	This will affect :CALC:LLIN3:FAIL or :CALC:TRAC2:FAIL?
Preset	Not affected by Mode Preset, set to 0 dB for all Limits by Restore Mode Defaults.
State Saved	Saved in instrument state.
Min	–40 dB (Upper); 0 dB (Lower)
Max	0 dB (Upper); 40 dB (Lower);
Default Unit	dB
Initial S/W Revision	A.02.00

Edit

Opens the Table Editor for the selected limit line.

When entering the menu, the editor window (with the limit table) turns on, the selected Limit is turned On and the amplitude scale is set to Log. The display of the trace to which the selected limit applies is turned on (thus, traces in Blank are set to View and traces in Background are set to On). Turning on the Limit means it's display will be on, and it's testing mode will be on as well. You should turn off any other limits that are on if they interfere with the editing of the selected limit.

NOTE The table editor will only operate properly if the analyzer is sweeping, because its updates are tied to the sweep system. Thus, you should not try to use the editor in single sweep, and it will be sluggish during compute-intensive operations like narrow-span FFT sweeps.

When exiting the edit menu (by using the Return key or by pressing an instrument front panel key), the editor window turns off, however the Limit is still on and displayed, and the amplitude scale remains Log.

Limits are turned off by a Preset, but the Limits arrays (data) are only reset (deleted) by Restore Mode Defaults. They survive shutdown and restarting of the analyzer application, which means they will survive a power cycle.

Key Path	Meas Setup, Limits
Couplings	A remote user can enter or access limit line data via :CALCulate:LLINe[1]|2|3|4|5|6:DATA
Initial S/W Revision	A.02.00

Navigate

Lets you move through the table to edit the desired point

Key Path	Meas Setup, Limits, Edit
Notes	There is no value readback on the key
Min	1
Max	2000
Initial S/W Revision	A.02.00

Frequency

Lets you edit the frequency of the current row.

Key Path	Meas Setup, Limits, Edit
Notes	There is no value readback on the key
Min	0
Max	1 THz
Initial S/W Revision	A.02.00

Amplitude

Lets you edit the Amplitude of the current row.

Key Path	Meas Setup, Limits, Edit
Notes	There is no value readback on the key
Min	–1000 dBm
Max	1000 dBm
Initial S/W Revision	A.02.00

Insert Point Below

Pressing this key inserts a point below the current point. The new point is a copy of the current point. And becomes the current point The new point is not yet entered into the underlying table, and the data in the row is displayed in light gray.

Key Path	Meas Setup, Limits, Edit
Initial S/W Revision	A.02.00

Delete Point

This is an immediate action key. It will immediately delete the currently-selected point, whether or not that point is being edited, and select Navigate. The point following the currently-selected point (or the point preceding if there is none) will be selected.

Key Path	Meas Setup, Limits, Edit
Initial S/W Revision	A.02.00

Copy from Limit

Copies an existing limit into the current limit, including all secondary parameters (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL).

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:COPY LLINE1	LLINE2	LLINE3	LLINE4	LLINE5	LLINE6`
Example	:CALC:LLINE2:COPY LLINE1 copies the data from line 1 into line 2.
Notes	Auto return to the Edit menu.
Initial S/W Revision	A.02.00

Copy from Limit

Copies an existing limit into the current limit, including all secondary parameters (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL).

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:COPY LLINE1 | LLINE2 | LLINE3 | LLINE4 | LLINE5 | LLINE6`
Example	:CALC:LLINE2:COPY LLINE1 copies the data from line 1 into line 2.
Notes	Auto return to the Edit menu.
Initial S/W Revision	A.02.00

Copy from Limit

Copies an existing limit into the current limit, including all secondary parameters (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL).

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:COPY LLINE1 | LLINE2 | LLINE3 | LLINE4 | LLINE5 | LLINE6`
Example	:CALC:LLINE2:COPY LLINE1 copies the data from line 1 into line 2.
Notes	Auto return to the Edit menu.
Initial S/W Revision	A.02.00

Copy from Limit

Copies an existing limit into the current limit, including all secondary parameters (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL).

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:COPY LLINE1 | LLINE2 | LLINE3 | LLINE4 | LLINE5 | LLINE6`
Example	:CALC:LLINE2:COPY LLINE1 copies the data from line 1 into line 2.
Notes	Auto return to the Edit menu.
Initial S/W Revision	A.02.00

Copy from Limit

Copies an existing limit into the current limit, including all secondary parameters (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL).

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:COPY LLINE1 | LLINE2 | LLINE3 | LLINE4 | LLINE5 | LLINE6`

Example	:CALC:LLINE2:COPY LLINE1 copies the data from line 1 into line 2.
Notes	Auto return to the Edit menu.
Initial S/W Revision	A.02.00

Copy from Limit

Copies an existing limit into the current limit, including all secondary parameters (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL).

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:COPY LLINE1 | LLINE2 | LLINE3 | LLINE4 | LLINE5 | LLINE6`
Example	:CALC:LLINE2:COPY LLINE1 copies the data from line 1 into line 2.
Notes	Auto return to the Edit menu.
Initial S/W Revision	A.02.00

Copy from Limit

Copies an existing limit into the current limit, including all secondary parameters (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL).

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:COPY LLINE1 | LLINE2 | LLINE3 | LLINE4 | LLINE5 | LLINE6`
Example	:CALC:LLINE2:COPY LLINE1 copies the data from line 1 into line 2.
Notes	Auto return to the Edit menu.
Initial S/W Revision	A.02.00

Build from Trace

Builds a limit using an existing trace. This command will overwrite all data in the limit. Since a straight copy would typically have hundreds or thousands of segments, the data will be approximated to better represent a limit line; small excursions whose width is less than 10 trace buckets will sometimes not be captured. Secondary parameters which are not associated with traces (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL) will be unchanged.

When taking a trace in order to build a limit, it will often work well to take the trace with a resolution bandwidth wider than the expected measurement, a video bandwidth lower than the expected measurement, and with the detector set to Max Hold or Min Hold.

Note that an upper limit will be built above the trace, while a lower limit will be built below the trace. If the trace is constant, the limit should pass after being built.

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:BUILd TRACE1	TRACE2	TRACE3	TRACE4	TRACE5	TRACE6`
Example	:CALC:LLIN2:BUIL TRACE1 builds limit line 2 based on the data in trace 1. This will overwrite the data in the table editor.
Notes	Auto return to Edit menu.
Initial S/W Revision	A.02.00

Build from Trace

Builds a limit using an existing trace. This command will overwrite all data in the limit. Since a straight copy would typically have hundreds or thousands of segments, the data will be approximated to better represent a limit line; small excursions whose width is less than 10 trace buckets will sometimes not be captured. Secondary parameters which are not associated with traces (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL) will be unchanged.

When taking a trace in order to build a limit, it will often work well to take the trace with a resolution bandwidth wider than the expected measurement, a video bandwidth lower than the expected measurement, and with the detector set to Max Hold or Min Hold.

Note that an upper limit will be built above the trace, while a lower limit will be built below the trace. If the trace is constant, the limit should pass after being built.

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:BUILd TRACE1	TRACE2	TRACE3	TRACE4	TRACE5	TRACE6`
Example	:CALC:LLIN2:BUIL TRACE1 builds limit line 2 based on the data in trace 1. This will overwrite the data in the table editor.
Notes	Auto return to Edit menu.
Initial S/W Revision	A.02.00

Build from Trace

Builds a limit using an existing trace. This command will overwrite all data in the limit. Since a straight copy would typically have hundreds or thousands of segments, the data will be approximated to better represent a limit line; small excursions whose width is less than 10 trace buckets will sometimes not be captured. Secondary parameters which are not associated with traces (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL) will be unchanged.

When taking a trace in order to build a limit, it will often work well to take the trace with a resolution bandwidth wider than the expected measurement, a video bandwidth lower than the expected measurement, and with the detector set to Max Hold or Min Hold.

Note that an upper limit will be built above the trace, while a lower limit will be built below the trace. If the trace is constant, the limit should pass after being built.

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:BUILd TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6`
Example	:CALC:LLIN2:BUIL TRACE1 builds limit line 2 based on the data in trace 1. This will overwrite the data in the table editor.
Notes	Auto return to Edit menu.
Initial S/W Revision	A.02.00

Build from Trace

Builds a limit using an existing trace. This command will overwrite all data in the limit. Since a straight copy would typically have hundreds or thousands of segments, the data will be approximated to better represent a limit line; small excursions whose width is less than 10 trace buckets will sometimes not be captured. Secondary parameters which are not associated with traces (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL) will be unchanged.

When taking a trace in order to build a limit, it will often work well to take the trace with a resolution bandwidth wider than the expected measurement, a video bandwidth lower than the expected measurement, and with the detector set to Max Hold or Min Hold.

Note that an upper limit will be built above the trace, while a lower limit will be built below the trace. If the trace is constant, the limit should pass after being built.

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:BUILd TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6`
Example	:CALC:LLIN2:BUIL TRACE1 builds limit line 2 based on the data in trace 1. This will overwrite the data in the table editor.
Notes	Auto return to Edit menu.
Initial S/W Revision	A.02.00

Build from Trace

Builds a limit using an existing trace. This command will overwrite all data in the limit. Since a straight copy would typically have hundreds or thousands of segments, the data will be approximated to better represent a limit line; small excursions whose width is less than 10 trace buckets will sometimes not be captured. Secondary parameters which are not associated with traces (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL) will be unchanged.

When taking a trace in order to build a limit, it will often work well to take the trace with a resolution bandwidth wider than the expected measurement, a video bandwidth lower than the expected measurement, and with the detector set to Max Hold or Min Hold.

Note that an upper limit will be built above the trace, while a lower limit will be built below the trace. If the trace is constant, the limit should pass after being built.

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:BUILd TRACE1	TRACE2	TRACE3	TRACE4	TRACE5	TRACE6`
Example	:CALC:LLIN2:BUIL TRACE1 builds limit line 2 based on the data in trace 1. This will overwrite the data in the table editor.
Notes	Auto return to Edit menu.
Initial S/W Revision	A.02.00

Build from Trace

Builds a limit using an existing trace. This command will overwrite all data in the limit. Since a straight copy would typically have hundreds or thousands of segments, the data will be approximated to better represent a limit line; small excursions whose width is less than 10 trace buckets will sometimes not be captured. Secondary parameters which are not associated with traces (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL) will be unchanged.

When taking a trace in order to build a limit, it will often work well to take the trace with a resolution bandwidth wider than the expected measurement, a video bandwidth lower than the expected measurement, and with the detector set to Max Hold or Min Hold.

Note that an upper limit will be built above the trace, while a lower limit will be built below the trace. If the trace is constant, the limit should pass after being built.

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:BUILd TRACE1	TRACE2	TRACE3	TRACE4	TRACE5	TRACE6`
Example	:CALC:LLIN2:BUIL TRACE1 builds limit line 2 based on the data in trace 1. This will overwrite the data in the table editor.
Notes	Auto return to Edit menu.
Initial S/W Revision	A.02.00

Build from Trace

Builds a limit using an existing trace. This command will overwrite all data in the limit. Since a straight copy would typically have hundreds or thousands of segments, the data will be approximated to better represent a limit line; small excursions whose width is less than 10 trace buckets will sometimes not be captured. Secondary parameters which are not associated with traces (Description, Associated Trace, Type, Margin, Interpolation, Relative to CF/RL) will be unchanged.

When taking a trace in order to build a limit, it will often work well to take the trace with a resolution bandwidth wider than the expected measurement, a video bandwidth lower than the expected measurement, and with the detector set to Max Hold or Min Hold.

Note that an upper limit will be built above the trace, while a lower limit will be built below the trace. If the trace is constant, the limit should pass after being built.

Key Path	Meas Setup, Limits, Edit
Remote Command	`:CALCulate:LLINe[1]|2|...6:BUILd TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6`
Example	:CALC:LLIN2:BUIL TRACE1 builds limit line 2 based on the data in trace 1. This will overwrite the data in the table editor.
Notes	Auto return to Edit menu.
Initial S/W Revision	A.02.00

Offset

Enters a menu which allows you to offset the limit trace by a specified frequency, time, or amplitude. The offsets will be immediately applied to the limit trace for display and failure calculation; the offset can also be applied to the points in the limit line.

Key Path	Meas Setup, Limits, Edit
Initial S/W Revision	A.02.00

X Offset

Offsets the limit trace by some specified frequency (for Frequency-based limit lines) or a time (for time-based limit lines).

Key Path	Meas Setup, Limits, Edit, Offset

Remote Command	`:CALCulate:LLINe[1]|2|...6:OFFSet:X <value>`
	`:CALCulate:LLINe[1]|2|...6:OFFSet:X?`
	<value> = <freq> if Limit X-Axis Unit is Frequency, <value> = <time> if Limit X-Axis Unit is Time

Example	:CALC:LLIN:OFFS:X –50MHZ sets the X axis offset to –50 MHz. :CALC:LLIN:OFFS:UPD will apply the X axis offset to all points in the limit line, then reset the X axis offset to zero.
Preset	0 Hz if Limit X-Axis Unit is Frequency 0 S if Limit X-Axis Unit is Time
State Saved	Saved in instrument state, survives Preset
Min	–500 GHz
Max	500 GHz
Default Unit	Determined by X axis scale.
Initial S/W Revision	A.02.00

Y Offset

Offsets all segments in the limit line by some specified amplitude.

Key Path	Meas Setup, Limits, Edit, Offset
Remote Command	`:CALCulate:LLINe[1]|2|...6:OFFSet:Y <rel ampl>` `:CALCulate:LLINe[1]|2|...6:OFFSet:Y?`
Example	:CALC:LLIN:OFFS:Y –3 dB sets the Y axis offset to –3 dB. :CALC:LLIN:OFFSet:UPD will apply the Y axis offset to all points in the limit line, then reset the Y axis offset to zero.
Preset	0 dB
State Saved	Saved in instrument state.
Min	-Infinity
Max	+Infinity
Default Unit	dB
Initial S/W Revision	A.02.00

Apply Offsets to Limit Table

Adds the X and Y offsets to each point in the limit table, then resets the X and Y offset values to zero. This has no effect on the position of the limit trace.

For example, if the X offset is –10 MHz and the Y offset is 1 dB, the values in the limit table will be updated as follows: 10 MHz will be subtracted from each X value, 1 dB will be added to each Y value. The offset values will then be reset to zero. The limit trace will not be moved and the limit table will be updated to accurately reflect the currently-displayed limit trace.

Key Path	Meas Setup, Limits, Edit, Offset
Remote Command	`:CALCulate:LLINe[1]|2|...6:OFFSet:UPDate`
Example	:CALC:LLIN:OFFS:UPD sets updates the limit table to reflect the X and Y offsets, then resets the offsets to zero.
State Saved	No state
Initial S/W Revision	A.02.00

Scale X Axis

Matches the X Axis to the selected Limit, as well as possible.

For frequency limits and a frequency-domain X-axis, sets the Start and Stop Frequency to contain the minimum and maximum Frequency of the selected Limit. The range between Start Frequency and Stop Frequency is 12.5% above the range between the minimum and maximum Frequency so that span exceeds this range by one graticule division on either side.

For time limits and a time-domain X-axis, sets the sweep time to match the maximum Time of the selected Limit.

If the domain of the selected limit does not match the domain of the X Axis, no action is taken. Standard clipping rules apply, if the value in the table is outside the allowable range for the X axis.

Key Path	Meas Setup, Limits, Edit
Dependencies	If either the first or last point in the array is outside the frequency range of the current input, an error message is generated: "–221. Settings conflict; Start or Stop Freq out of range for current input settings"
Initial S/W Revision	A.02.00

Delete Limit

Deletes the currently selected limit line. Pressing Delete Limit purges the data from the limit line tables.

Limit data – including secondary parameters such as description, margin value, etc. - will be cleared and returned to factory preset settings.

When this key is pressed a prompt is placed on the screen that says "Please press Enter or OK key to delete limit. Press ESC or Cancel to close this dialog." The deletion is only performed if you press OK or Enter; if so, after the deletion, the informational message "Limit deleted" appears in the MSG line.

Key Path	Meas Setup, Limits
Remote Command	`:CALCulate:LLINe[1]|2|...6:DELete`
Example	:CALC:LLIN2:DEL deletes all data for limit line 2.
Initial S/W Revision	A.02.00

Test Limits

Selects whether displayed traces are tested against displayed limits (i.e. those for which Limit On/Off is set to On).

For each displayed trace for which a Limit is turned on, a message will be displayed in the upper-left corner of the graticule to notify whether the trace passes or fails the limits.

If the trace is at or within the bounds of all applicable limits and margins, the text "Trace x Pass" will be displayed in green, where x is the trace number. A separate line is used for each reported trace.

If the trace is at or within the bounds of all applicable limits, but outside the bounds of some applicable margin, the text "Trace x Fail Margin" will be displayed in amber, where x is the trace number. A separate line is used for each reported trace.

If the trace is outside the bounds of some applicable limits, the text "Trace x Fail" will be displayed in red, where x is the trace number. A separate line is used for each reported trace.

If the trace has no enabled limits, or the trace itself is not displayed, no message is displayed for that trace.

The PASS/FAIL box in the corner of the Meas Bar is only displayed if there is at least one "Trace Pass/Fail" indication displayed in the graticule.

If two amplitude values are entered for the same frequency, a single vertical line is the result. In this case, if an upper line is chosen, the lesser amplitude is tested. If a lower line is chosen, the greater amplitude is tested.

This command only affects the display, and has no impact on remote behavior. Limit queries over SCPI test the trace against the limit regardless of whether the trace or the limit is turned on (exception: the query :CALCulate:TRACe[1]|2|3|4|5|6:FAIL? tests only the limits that are turned on for that trace).

Key Path	Meas Setup, Limits
Remote Command	`:CALCulate:LLINe:TEST OFF|ON|0|1` `:CALCulate:LLINe:TEST?`
Example	:CALC:LLIN:TEST ON turns on testing, and displays the results in the upper left corner.
Preset	On, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

X-Axis Unit

Selects how the limit-line segments are defined. Pressing X Axis Unit selects whether the limit lines will be entered using frequency (Freq) or sweep time (Time) to define the segments. They can be specified as a table of limit-line segments of amplitude versus frequency, or of amplitude versus time.. When the X-Axis Unit is set to Time, a time value of zero corresponds to the start of the sweep, which is at the left edge of the graticule, and the column and softkey in the Limit Table Editor will read Time instead of Frequency

Switching the limit-line definition between Freq and Time will erase all of the current limit lines. When you do this from the front panel, a warning dialog will pop up letting you know that you are about to erase all the limit lines, and prompting you to hit “OK” if you are sure:

Changing the X Axis Unit will erase all your limit lines. Are you sure you want to do this? Press Enter or OK to proceed, or Cancel(Esc) to cancel.

Key Path	Meas Setup, Limits
Remote Command	`:CALCulate:LLINe:CONTrol:DOMain FREQuency|TIME` `:CALCulate:LLINe:CONTrol:DOMain?`
Example	:CALC:LLIN:CONT:DOM FREQ deletes all currently existing limit lines, then sets all limit lines to be specified in terms of frequency.
Couplings	This affects all limit lines simultaneously, and resets all limit line data except the .wav file and email address stored in the Actions.
Preset	Freq, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Delete All Limits

Deletes all limit lines. Pressing Delete All Limits purges the data from all limit line tables.

All limit data will be cleared and returned to factory preset settings.

When this key is pressed a prompt is placed on the screen that says "Please press Enter or OK key to delete all limits. Press ESC or Cancel to close this dialog." The deletion is only performed if you press OK or Enter; if so, after the deletion, the informational message "All Limits deleted" appears in the MSG line.

Key Path	Meas Setup, Limits
Remote Command	`:CALCulate:LLINe:ALL:DELete`
Example	:CALC:LLIN:ALL:DEL deletes all data for all limit lines.
Initial S/W Revision	A.02.00

Limit Line Data (Remote Command Only)

Defines the limit line values, and destroys all existing data. Up to 200 points may be defined for each limit using the following parameters.

<x>Frequency or time values as specified by :Calculate:LLINe:CONTrol:DOMain. Units default to Hz (for frequency) and seconds (for time).

Range: –30 Gs to +30 Gs for time limits, –3 kHz to +350 GHz for frequency limits.

<ampl>Amplitude values units default to dBm. Up to two amplitude values can be provided for each x-axis value, by repeating <x-axis> in the data list.

Range: –1000 dBm to +1000 dBm

<connect> connect values are either "0" or "1." A "1" means this point will be connected to the previously defined point to define the limit line. A "0" means that it is a point of discontinuity and is not connected to the preceding point. The connect value is ignored for the first point.

Remote Command	`:CALCulate:LLINe[1]|2|...6:DATA <x>,<ampl>,<connect> {,<x>,<ampl>,<connect>}` `:CALCulate:LLINe[1]|2|...6:DATA?`
Example	:CALC:LLIN3:DATA 1E9, –20, 0, 2E9, –20, 1, 2E9, –10, 1, 3E9, –10, 1 describes a stair-stepped limit line.
Preset	Limit line data is cleared by Restore Mode Defaults. However, it survives shutdown/restart of the analyzer application (including power cycle)
State Saved	Saved in instrument state
Backwards Compatibility Notes	In the past it was possible to query the limit trace as though it were a normal trace. The query of the limit trace is not supported in the X-series.
Initial S/W Revision	A.02.00

Merge Limit Line Data (Remote Command Only)

Adds the points with the specified values to the current limit line, allowing you to merge limit line data. Up to two amplitude values are allowed for each X value. If more than 200 points are entered to be merged, the first 200 points are merged, then an error message ‘too many DATA entries’ is reported.

Remote Command	`:CALCulate:LLINe[1]|2|...6:DATA:MERGe <x-axis>,<ampl>,<connected>{,<x-axis>,<ampl>,<connected>}`
Example	:CALC:LLIN1:DATA:MERG 1000000000, –20, 0, 2000000000, –30, 1 merges the 10GHz segment and the 20GHz segment into limit line 1. Note that the 20GHz segment will be connected to the next lower point, which may or may not be the 10GHz point.
Notes	This SCPI command is supported for Backwards Compatibility. Although PSA had a limit of 200 points, it is acceptable to increase that limit.
Preset	Fixed
Initial S/W Revision	A.02.00

Limit Line Fail? (Remote Command Only)

Tests a limit line against its associated trace. Returns a 0 if the trace is within the limit and margin, a 1 if the trace exceeds either the limit or the margin.

Note that this command only tests one limit line – other limit lines are not tested when executing this command. To see whether a trace passed all limits, use :CALCulate:TRACe:FAIL?.

Note this command performs the test regardless of whether the trace or the limit is turned on the display.

Remote Command	`:CALCulate:LLINe[1]|2|...6:FAIL?`
Example	:CALC:LLIN:FAIL? returns a zero if limit line 1’s associated trace has no failure, 1 if there is a margin or limit failure.
Initial S/W Revision	A.02.00

Limit Line Control (Remote Command Only, SCPI standard conformance)

Defines a list of limit line control (frequency or time) values for a given limit line. Up to 2000 points may be defined for each limit using the following parameters.

<x>Frequency or time values as specified by :Calculate:LLINe:CONTrol:DOMain. Units default to Hz (for frequency) and seconds (for time).

Range: –30 Gs to +30 Gs for time limits, –3 kHz to +1200 GHz for frequency limits.

Note that X values may be repeated if a vertical step in the limit line is desired.

The points query returns the number of points in the control. It should match the number of points in the amplitude, that is, the number of values for the CONTrol axis and for the corresponding UPPer and/or LOWer limit lines must be identical. If one array is larger than the other, the limit trace is built using only as much data as is contained in the smaller array.

An empty array returns not a number (9.91e+37 to a data query), 0 to a POINts query.

Remote Command	`:CALCulate:LIMit[1]|2|...6:CONTrol[:DATA] <x>, <x>, …`

	`:CALCulate:LIMit[1]|2|...6:CONTrol[:DATA]?`
Example	:CALC:LIM:CONT 1GHz, 2GHz, 2GHz, 3GHz describes the X values of a stair-stepped limit line.
Preset	Limit line data is cleared by Restore Mode Defaults.
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

Remote Command	`:CALCulate:LIMit[1]|2|...6:CONTrol:POINts?`
Example	:CALC:LIM:CONT:POIN? returns the number of points in the limit line.
Preset	Limit line data is cleared by Restore Mode Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

Limit Line Upper / Lower (Remote Command Only, SCPI standard conformance)

Defines a list of amplitude values for a given limit line. Changing the number of elements in the list spectrum will automatically turn the limit line off. Using the "UPP" syntax defines an upper limit line, using the "LOW" syntax defines a lower limit line. Note that a line may not be simultaneously both upper and lower; the type of the limit line will automatically be changed as appropriate. Up to 200 points may be defined for each limit using the following parameters.

<ampl>Amplitude values units default to dBm.
Range: –200 dBm to +100 dBm

The points query returns the number of points in the amplitude list. It will not be possible to turn on the limit line unless the number of points in the control matches the number of points in the amplitude.

The points query returns the number of points in the amplitude list. It should match the number of points in the control, that is, the number of values for the CONTrol axis and for the corresponding UPPer and/or LOWer limit lines must be identical. If one array is larger than the other, the limit trace is built using only as much data as is contained in the smaller array.

An empty array returns the system error message "list is empty" to a data query, 0 to a POINts query.

Remote Command	`:CALCulate:LIMit[1]|2|...6:UPPer[:DATA] <ampl>, <ampl>, …` `:CALCulate:LIMit[1]|2|...6:UPPer[:DATA]?`
Example	:CALC:LIM:UPP –10, –10, –20, –20 describes the amplitude values of an upper limit line
Preset	Limit line data is cleared by Restore Mode Defaults.
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

Remote Command	`:CALCulate:LIMit[1]|2|...6:UPPer:POINts?`
Example	:CALC:LIM:UPP:POIN? returns the number of points in the upper limit line.
Preset	Upper Limit line data/points is cleared by Restore Mode Defaults.
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

Remote Command	`:CALCulate:LIMit[1]|2|...6:LOWer[:DATA] <ampl>, …` `:CALCulate:LIMit[1]|2|...6:LOWer[:DATA]?`
Example	:CALC:LIM:LOW –10, –10, –20, –20 describes the amplitude values of an lower limit line
Preset	Limit line data is cleared by Restore Mode Defaults.
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

Remote Command	`:CALCulate:LIMit[1]|2|...6:LOWer:POINts?`
Example	:CALC:LIM:UPP:POIN? returns the number of points in the lower limit line.
Preset	Limit line data/points is cleared by Restore Mode Defaults.
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

Limit Fail? (Remote Command Only, SCPI standard conformance)

Tests a limit line against its associated trace. Returns a 0 if the trace is within the limit and margin, a 1 if the trace exceeds either the limit or the margin. This command is identical to ":CALC:LLIN:FAIL?"

Note that this command only tests one limit line – other limit lines are not tested when executing this command. To see whether a trace passed all limits, use :CALCulate:TRACe:FAIL?.

Note this command performs the test regardless of whether the trace or the limit is turned on the display.

Remote Command	`:CALCulate:LIMit[1]|2|...6:FAIL?`
Example	:CALC:LIM:FAIL? returns a zero if limit line 1's associated trace has no failure, 1 if there is a margin or limit failure.
Couplings	This command is identical to :CALC:LLIN:FAIL?
Initial S/W Revision	A.02.00

Limit Clear (Remote Command Only, SCPI standard conformance)

Clears a limit line, and all associated data. This command is identical to ":CALC:LLIN:DEL"

Remote Command	`:CALCulate:LIMit[1]|2|...6:CLEar`
Example	:CALC:LIM2:CLE deletes all data for limit line 2.
Couplings	This command is identical to :CALC:LLIN:DEL
Initial S/W Revision	A.02.00

Trace Fail? (Remote Command Only)

Tests a trace against all associated limit lines. Returns a 0 if the trace is within all limits and margins, a 1 if the trace exceed either the limit or the margin. If no limits apply to the selected trace, this will automatically return a 0.

Only applies to limits that are turned on, if a Limit is off it will not be tested. If a Trace is not displaying it will still be tested, and if Test Limits (All Limits) is off the Trace will still be tested.

This command ignores limit lines that are assigned to other traces.

Remote Command	`:CALCulate:TRACe[1]|2|...6:FAIL?`
Example	:CALC:TRAC3:FAIL? returns a zero if there is no failure, 1 if the trace exceeds either the limit or the margin.
Initial S/W Revision	A.02.00

Fixed / Relative Limit (Remote Command Only)

This command sets both Relative to CF and Relative to RL simultaneously for all limits. If queried, it returns whether Limit Line 1 is set Relative to CF, and ignores all other fixed/relative data.

Remote Command	`:CALCulate:LLINe:CMODe FIXed|RELative` `:CALCulate:LLINe:CMODe?`
Example	:CALC:LLIN:CMOD REL makes all limit lines relative to the center frequency and reference level.
Notes	ThisSCPI command is supported for Backwards Compatibility. PSA offers only the following softkey, which is generic to all limit lines: Limits Fixed / Rel. On the X-Series, this functionality is provided by a softkey which is specific to each limit line, and which provides a sub-menu with 2 softkeys (Relative to CF / Relative to RL). In order to be consistent with the implementation of the following new commands: :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe:RELative ON|OFF|1|0 :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe:RELative? and :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:CMODe:RELative ON|OFF|1|0

	:CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:CMODe:RELative? The :CALCulate:LLINe:CMODe? Query will returns 1 if Limit Line 1 is set Relative to CF, and returns 0 otherwise.
Preset	Fixed
Initial S/W Revision	A.02.00

N dB Points

Turns N dB points on and off and allows you to set the N dB value. N dB uses the selected marker. If the selected marker is not on when N dB is turned on, the selected marker turns on, as a Normal marker, at center screen, and is used by N dB.

See "N dB Points Results Query" on page 830.

See "More Information" on page 831.

Key Path	Meas Setup

Remote Command	`:CALCulate:BWIDth|BANDwidth:NDB <rel_ampl>`
	`:CALCulate:BWIDth|BANDwidth:NDB?`
	`:CALCulate:BWIDth|BANDwidth[:STATe] OFF|ON|0|1`
	`:CALCulate:BWIDth|BANDwidth[:STATe]?`

Notes	If the selected marker is turned Off it turns off N dB Points. N DB Points is unaffected by Auto Couple
Preset	Off, –3.01 dB OFF
Preset	Off, –3.01 dB OFF
State Saved	The on/off status and the offset value are both saved in instrument state.
Min	–140 dB
Max	–0.01 dB
Backwards Compatibility Notes	In ESA, N dB points paid attention to the peak excursion and peak threshold set in the Search Criteria menu under Peak Search. This is not the case in the X-Series. In ESA, an invalid N dB reading was indicated, both onscreen and remotely, with a value of –100. In the X-Series it is indicated on screen by --- but remotely still by –100 Hz
Initial S/W Revision	Prior to A.02.00

N dB Points Results Query

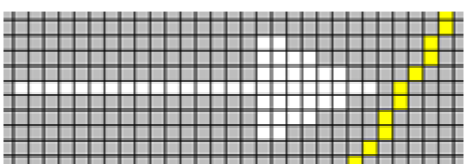
Remote Command	`:CALCulate:BWIDth|BANDwidth:RESult?`
Example	:CALC:MARK:AOFF Set selected marker to 1 :CALC:MARK:MAX Put marker 1 on peak

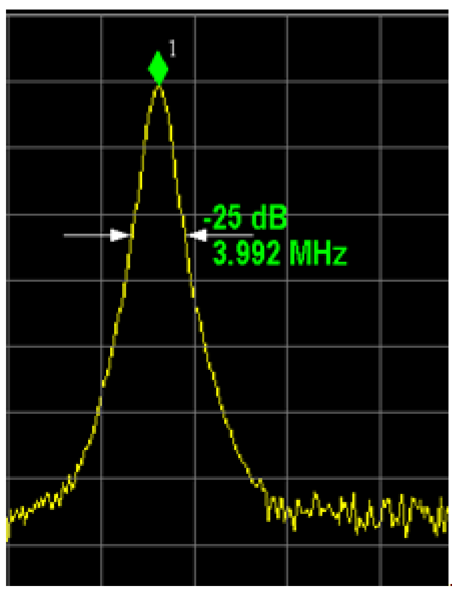
	:CALC:BWID ON Tturn on N dB for the selected marker (1) :CALC:BWID:NDB–3.01 Set the offset to –3.01 dB :CALC:BWID:RES? Query the result
Notes	–100 returned if invalid reading
Initial S/W Revision	Prior to A.02.00

More Information

A marker should be placed on the peak of interest before turning on N dB points. The N dB points function looks for the two points on the marker's trace closest to the marker's X Axis value that are N dB below the marker's amplitude, one above and the other below the marker's X Axis value. (That is, one point is to the right and one is to the left of the selected marker.) The selected N dB value is called the offset. The function reports the frequency difference (for frequency domain traces) or time difference (for time domain traces) between those two points.

Each point is identified by a horizontal arrow pointing towards the marker, next to the trace. The arrows used by the N dB Points function will be as shown in the figure below (where each square represents one pixel). They point in, horizontally, at the trace below a peak, on either side of its skirts. There is one pixel between the arrow and the trace





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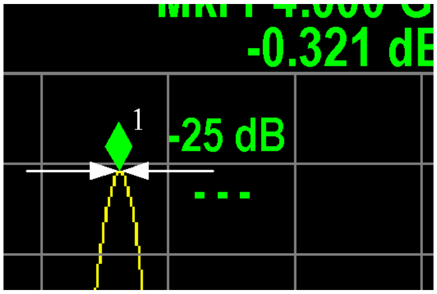
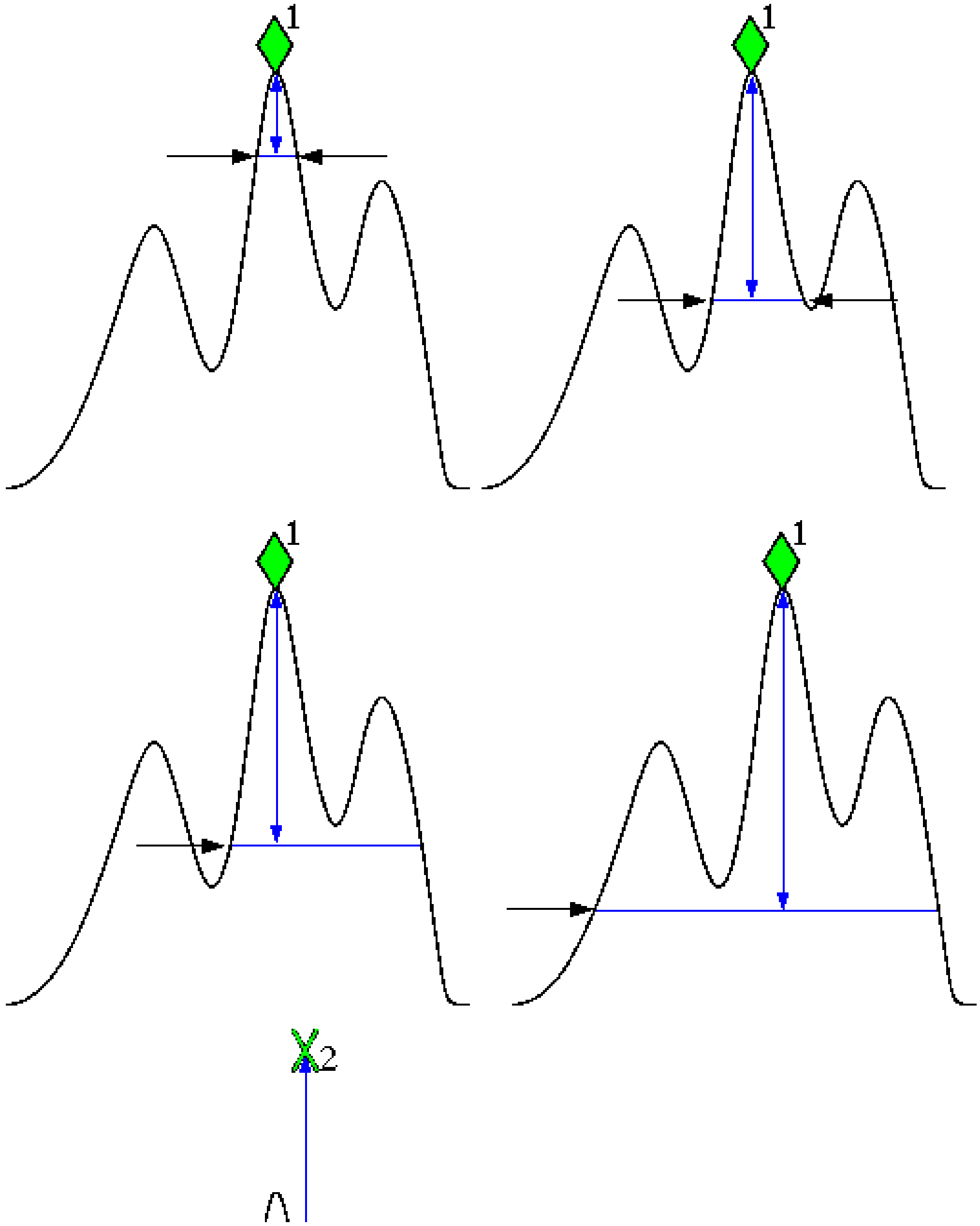
N dB Points can be used to measure the bandwidth of a signal; it is commonly used in conjunction with a tracking generator to measure filter bandwidths.

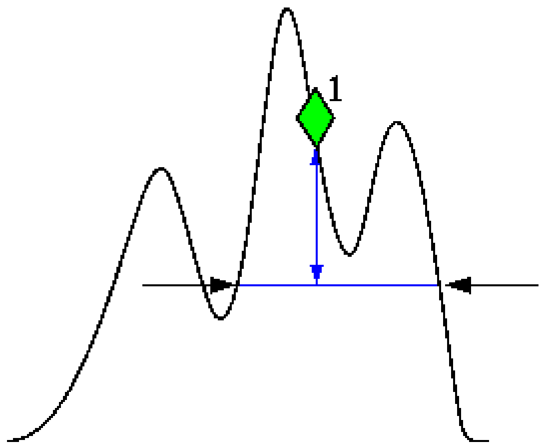
In one of the common use cases, the marker is placed on a peak, and the arrows are displayed N dB down the skirt from the marker on either side of the peak. The N dB value and the frequency difference between the two arrows is displayed around the arrow as shown in the figure above. Normally this displays on the right arrow, but if this would place any part of the text offscreen to the right then it displays on the left arrow.

If the analyzer is unable to find data that is N dB below the marker on either side of the marker, the arrows are displayed at the indicator point of the marker, no value (---) will be displayed as the result and –100 Hz returned remotely (see figure below):



Some sample N dB scenarios are shown below to illustrate how the function works in various cases. In each case, the two-headed blue arrow represents N dB of amplitude.





PhNoise Opt

Selects the LO (local oscillator) phase noise behavior for various desired operating conditions.

Key Path	Meas Setup
Remote Command	`[:SENSe]:FREQuency:SYNThesis[:STATe] 1|2|3` `[:SENSe]:FREQuency:SYNThesis[:STATe]?`
Example	FREQ:SYNT 2 selects optimization for best wide offset phase noise
Notes	Parameter: 1: optimizes phase noise for small frequency offsets from the carrier. 2: optimizes phase noise for wide frequency offsets from the carrier. 3: optimizes LO for tuning speed The actual behavior varies somewhat depending on model number and option; you always get fast tuning by choosing #3, but in some models, the “Fast Tuning” choice is identical to the “Best Close-In” choice. Specifically: • Models with option EP1 (for example PXA), have a two-loop local oscillator, which switches to a single loop for fast tuning • Models with option EP2 (available, for example, for MXA), use a different loop bandwidth for the fast-tuning choice, which is a compromise between tuning speed and phase noise, giving good tuning speed at all offsets, although not as good as for Close-In; this is useful when you have to look across a wide range of spans • In all other cases, Fast Tuning is the same as Best Close-In.
Dependencies	Does not appear in all models. The key is blank in those models, but the SCPI command is accepted for compatibility (although no action is taken).
Preset	Because this function is in Auto after preset, and because Span after preset > 314.16 kHz (see Auto rules, next section) the state of this function after Preset will be 2
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.12.00

Auto

Selects the LO (local oscillator) phase noise behavior to optimize dynamic range and speed for various instrument operating conditions.

The X-Series has several grades of LO that offer different configurations when in the Auto Mode.

- "Models with Option EP1" on page 834 (high-performance PXA)
- "Models with Option EP2" on page 834 (available for example in MXA for excellent phase noise)
- "Models with Option EP4" on page 835 (available in CXA for improved phase noise)
- "All other Models" on page 835

Key Path	Meas Setup, PhNoise Opt
Remote Command	`[:SENSe]:FREQuency:SYNThesis:AUTO[:STATe] OFF|ON|0|1` `[:SENSe]:FREQuency:SYNThesis:AUTO[:STATe]?`
Example	FREQ:SYNT:AUTO ON
Preset	ON
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.12.00

Models with Option EP1

Auto will choose:

Fast Tuning whenever:

Span > 44.44 MHz, or when

RBW > 1.9 MHz, or if

Source Mode is set to “Tracking”

otherwise Auto will choose Best Close in Phase Noise whenever:

Center frequency is < 195 kHz, or when

CF >= 1 MHz and Span <= 1.3 MHz and RBW <= 75 kHz

otherwise, Auto will choose Best Wide-offset Phase Noise

The RBW to be used in the calculations above is the equivalent –3 dB bandwidth of the current RBW filter.

These rules apply whether in swept spans, zero span, or FFT spans.

Models with Option EP2

Auto will choose:

Best Close-in Φ Noise whenever:

CF < 130 kHz , or when

CF > 12 MHz and Span < 495 kHz and RBW < 40 kHz

Otherwise, Auto will choose Fast Tuning whenever:

Span > 22 MHz, or when

RBW > 400 kHz, or when

CF ≤ 12 MHz and Span < 495 kHz and RBW < 23 kHz

Otherwise, Auto will choose Best Wide-offset Φ Noise.

The RBW to be used in the calculations above is the equivalent –3 dB bandwidth of the current RBW filter.

These rules apply whether in swept spans, zero span, or FFT spans.

Models with Option EP4

Auto will choose:

Fast Tuning whenever:

Span > 101 MHz or when

RBW > 1.15MHz or if

Source Mode is set to “Tracking”

otherwise, Auto will choose Best Close in Phase Noise whenever:

CF is < 109 kHz or when

CF >= 4.95 MHz and Span <= 666 kHz and RBW < 28 kHz

Otherwise, Auto will choose Best Wide-offset Φ Noise.

The RBW to be used in the calculations above is the equivalent –3 dB bandwidth of the current RBW filter.

These rules apply whether in swept spans, zero span, or FFT spans.

All other Models

Auto will choose:

Fast Tuning whenever:

Span > 12.34 MHz, or when

RBW > 250 kHz, or if

Source Mode is set to “Tracking”

Otherwise, Auto will choose Best Close in Phase Noise whenever:

Center frequency is < 25 kHz, or when

CF >= 1 MHz and Span <= 141.4 kHz and RBW <= 5 kHz

Otherwise, Auto will choose Best Wide-offset Phase Noise

Note that in these models, the hardware does not actually provide for an extra-fast tuning option, so the settings for Fast Tuning are actually the same as Best Close-in, but the rules are implemented this way so that the user who doesn't care about phase noise but does care about tuning speed doesn't have to remember which of the other two settings gives faster tuning.

The RBW to be used in the calculations above is the equivalent –3 dB bandwidth of the current RBW filter.

These rules apply whether in swept spans, zero span, or FFT spans.

Best Close-in Φ Noise

The LO phase noise is optimized for smaller offsets from the carrier, at the expense of phase noise farther out.

The actual frequency offset within which noise is optimized is shown with in square brackets, as this can vary depending on the hardware set in use. For example, in some analyzers this annotation appears as [offset <20 kHz]

Key Path	Meas Setup, PhNoise Opt
Example	FREQ:SYNT 1
Couplings	The frequency below which the phase noise is optimized is model dependent: PXA with option EP1: [offset <140 kHz] Models with option EP2: [offset <70 kHz] CXA with option EP4: [offset <90 kHz] CXA without option EP4: n/a All other models: [offset <20 kHz]
Readback	Close-in. If manually selected the “Man” will be underlined.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.12.00

Best Wide-offset Φ Noise

The LO phase noise is optimized for wider offsets from the carrier. Optimization is especially improved for offsets from 70 kHz to 300 kHz. Closer offsets are compromised and the throughput of measurements (especially remote measurements where the center frequency is changing rapidly), is reduced.

The actual frequency offset beyond which noise is optimized is shown with in square brackets, as this can vary depending on the hardware set in use. For example, in some analyzers this annotation appears as [offset >30 kHz]

Key Path	Meas Setup, PhNoise Opt
Example	FREQ:SYNT 2
Couplings	The frequency below which the phase noise is optimized is model dependent: PXA with option EP1: [offset >160 kHz]

	Models with option EP2: [offset >100 kHz] CXA with option EP4: [offset >130 kHz] CXA without option EP4: n/a All other models: [offset >30 kHz]
Readback	Wide-offset. If manually selected the “Man” will be underlined.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.12.00

Fast Tuning

In this mode, the LO behavior compromises phase noise at many offsets from the carrier in order to allow rapid measurement throughput when changing the center frequency or span. The term “fast tuning” refers to the time it takes to move the local oscillator to the start frequency and begin a sweep; this setting does not impact the actual sweep time in any way.

In this mode in PXA, the LO behavior compromises phase noise at offsets below 4 MHz in order to improve measurement throughput. The throughput is especially affected when moving the LO more than 2.5 MHz and up to 10 MHz from the stop frequency to the next start frequency.

(In models whose hardware does not provide for a fast tuning option, the settings for Best Close-in Φ Noise are used if Fast Tuning is selected. This gives the fastest possible tuning for that hardware set.)

Key Path	Meas Setup, PhNoise Opt
Example	FREQ:SYNT 3
Couplings	The Fast Tuning details are model dependent: CXA without option EP4: n/a PXA with option EP1: [single loop] Models with option EP2: [medium loop bandwidth] All other models: [same as Close-in]
State Saved	Saved in instrument state.
Readback	Fast Tuning. If manually selected the “Man” will be underlined.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.12.00

ADC Dither

Accesses the menu to control the ADC Dither function. The dither function enhances linearity for low level signals at the expense of reduced clipping-to-noise ratio. The reduced clipping-to-noise ratio results in higher noise, because we work to ensure that the clipping level of the ADC relative to the front terminals remains unchanged with the introduction of dither, and this results in reduced ADC dynamic range. So making measurements with ADC dither gives you better amplitude linearity, but turning ADC dither off gives you a lower noise floor (better sensitivity).

With dither on, the third-order distortions are usually invisible for mixer levels below –35 dBm. With dither off, these distortions can be visible, with typical power levels of –110 dBm referred to the mixer. Detection nonlinearity can reach 1 dB for dither off at mixer levels around –70 dBm and lower, while the specified nonlinearity is many times smaller with dither on.

When ADC Dither is on, the linearity of low-level signals is improved. The enhanced linearity is mostly improved scale fidelity. The linearity improvements of dither are most significant for RBWs of 3.9 kHz and less in swept mode, and FFT widths of 4 kHz and less in FFT mode.

The increased noise due to turning dither on is most significant in low band (0 to 3.6 GHz) with IF Gain set to Low, where it can be about 0.2 dB.

Key Path	Meas Setup
Remote Command	`[:SENSe]:ADC:DITHer[:STATe] OFF|ON|HIGH` `[:SENSe]:ADC:DITHer[:STATe]?`
Example	ADC:DITH:HIGH Sets the ADC dither setting to High ADC:DITH ON Sets the ADC dither setting to Medium In older instruments the “Medium” key was labeled “On” and the SCPI for this setting is NOT changing.
Dependencies	In some models, the “High” parameter is not available. In some instruments, the HIGH parameter is honored and the HIGH state set, and returned to a query, but the Medium dither level is actually used.
Preset	AUTO
Backwards Compatibility SCPI	The old command [:SENSe]:ADC:DITHer AUTO is aliased to [:SENSe]:ADC:DITHer:AUTO[:STATe] ON; because of this, the [:SENSe]:ADC:DITHer function cannot be a true Boolean, so the query, [:SENSe]:ADC:DITHer? returns OFF or ON (not 1 or 0 like a true Boolean)
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

Auto

Sets the ADC dither to automatic. The analyzer then chooses the dither level according to which is most likely to be the best selection, based on other settings within the digital IF.

When in Auto, the analyzer sets the dither to Medium whenever the effective IF Gain is Low by this definition of IF Gain = Low:

- When Sweep Type = Swept, IF Gain = Low whenever Swept IF Gain is set to Low Gain, whether by autocoupling or manual selection.
- When Sweep Type = FFT, IF Gain = Low whenever FFT IF Gain is set to "Low Gain," which cannot happen by autocoupling.

Whenever the IF Gain is not low by this definition, Auto sets the dither to Off.

Key Path	Meas Setup, ADC Dither
Remote Command	`[:SENSe]:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1` `[:SENSe]:ADC:DITHer:AUTO[:STATe]?`
Example	ADC:DITH:AUTO ON
Preset	ON
State Saved	Saved in instrument state
Readback	The “Auto” is underlined, and the readback value is whatever setting is auto-selected
Initial S/W Revision	Prior to A.02.00

High (Best Log Accy)

When ADC dither is set to High, the scale fidelity is especially good, most notably the relative scale fidelity. The tradeoff is that there is a modest loss of noise floor performance, up to about a decibel.

Key Path	Meas setup, ADC Dither
Example	ADC:DITH:HIGH
Readback	If manually selected, the readback is High, with the “Man” underlined
Initial S/W Revision	A.02.00

Medium (Log Accy)

The Medium setting of ADC Dither (known as “On” in earlier versions of the instrument software) improves the linearity of low-level signals at the expense of some noise degradation.

Key Path	Meas setup, ADC Dither
Example	ADC:DITH:ON
Readback	If manually selected, the readback is Medium, with the “Man” underlined
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

Off (Best Noise)

When ADC Dither is Off, the instrument noise floor is improved, because without the need to make room for the dither, you get a lower noise floor and better sensitivity.

Key Path	Meas setup, ADC Dither
Example	ADC:DITH:OFF
Readback	If manually selected, the readback is Off, with the “Man” underlined.
Initial S/W Revision	Prior to A.02.00

Swept IF Gain

To take full advantage of the RF dynamic range of the analyzer, there is an added switched IF amplifier with approximately 10 dB of gain. When you can turn it on without overloading the analyzer, the dynamic range is always better with it on than off. The Swept IF Gain key can be used to set the IF Gain function to Auto, or to High Gain (the extra 10 dB), or to Low Gain. These settings affect sensitivity and IF overloads.

This function is only active when in Swept sweeps. In FFT sweeps, the FFT IF Gain function is used instead.

Key Path	Meas Setup
Remote Command	`[:SENSe]:IF:GAIN:SWEPt[:STATe] OFF|ON|0|1` `[:SENSe]:IF:GAIN:SWEPt[:STATe]?`
Example	IF:GAIN:SWEP ON
Notes	where ON = high gain OFF = low gain
Couplings	The ‘auto’ rules for Swept IF Gain depend on attenuation, preamp state, start and stop frequency and the setting of FFT IF Gain. Set the Swept IF Gain to High (On) when the total input attenuation is 0 dB, the preamp is off, the start frequency is 10 MHz or more, and the FFT IF Gain is autocoupled, or manually set to Autorange, or manually set to High. Also set the Swept IF Gain to High (On) when the total input attenuation is 2 dB or less, the preamp is on, the start frequency is 10 MHz or more, and the stop frequency is 3.6 GHz or less and the FFT IF Gain is autocoupled, or manually set to Autorange, or manually set to High. Under all other circumstances, set the Swept IF Gain to Low (Off). If the sweep type is Swept, the start frequency of the instrument is less than 10 MHz, and you put Swept IF Gain in Manual On, a warning condition is generated and remains in effect as long as this condition exists. The warning message is about a possible IF overload. As with most parameters with an AUTO state, AUTO COUPLE sets it to Auto, and setting any specific value (for example on or off) will set the AUTO state to false.
Preset	Auto after a Preset which yields Off unless the Preamp is on. Auto and Off after Meas Preset.
State Saved	Saved in instrument state.
Readback Line	High Gain or Low Gain
Initial S/W Revision	Prior to A.02.00

Auto

Activates the auto rules for Swept IF Gain

Key Path	Meas setup
Remote Command	`[:SENSe]:IF:GAIN:SWEPt:AUTO[:STATe] OFF|ON|0|1` `[:SENSe]:IF:GAIN:SWEPt:AUTO[:STATe]?`
Example	IF:GAIN:SWEP:AUTO ON

Preset	ON
Initial S/W Revision	Prior to A.02.00

Low Gain (Best for Large Signals)

Forces Swept IF Gain to be off.

Key Path	Meas setup, ADC Ranging
Example	IF:GAIN:SWEP OFF
State Saved	Saved in instrument state.
Readback	Low Gain
Initial S/W Revision	Prior to A.02.00

High Gain (Best Noise Level)

Forces Swept IF Gain to be on.

Key Path	Meas setup, ADC Ranging
Example	IF:GAIN:SWEP ON
Dependencies	The High setting for Swept IF Gain is grayed out when FFT IF Gain is manually set to Low (not when Low is chosen by the auto-rules).
State Saved	Saved in instrument state.
Readback	High Gain
Initial S/W Revision	Prior to A.02.00

FFT IF Gain

Accesses the keys to set the ranging in the digital IF when doing FFT sweeps. When in Autorange mode, the IF checks its range once for every FFT chunk, to provide the best signal to noise ratio. You can specify the range for the best FFT speed, and optimize for noise or for large signals.

When the sweep type is FFT and this function is in Autorange, the IF Gain is set ON initially for each chunk of data. The data is then acquired. If the IF overloads, then the IF Gain is set OFF and the data is re-acquired. Because of this operation, the Auto setting uses more measurement time as the instrument checks/resets its range. You can get faster measurement speed by forcing the range to either the high or low gain setting. But you must know that your measurement conditions will not overload the IF (in the high gain range) and that your signals are well above the noise floor (for the low gain range), and that the signals are not changing.

Key Path	Meas Setup
Remote Command	`[:SENSe]:IF:GAIN:FFT[:STATe] AUTOrange|LOW|HIGH` `[:SENSe]:IF:GAIN:FFT[:STATe]?`
Couplings	As with most parameters with an AUTO state, AUTO COUPLE sets it to Auto, which then picks AUTOrange, and setting any specific value (AUTOrange, LOW or HIGH) will set the AUTO state to false.
Preset	AUTOrange
State Saved	Saved in instrument state.
Readback Line	Autorange, High Gain or Low Gain
Initial S/W Revision	Prior to A.02.00

Auto

Allows the instrument to pick the FFT IF Gain method as appropriate. This “Auto” state is set by the Auto Couple key, and it puts it in Autorange.

Key Path	Meas Setup
Remote Command	`[:SENSe]:IF:GAIN:FFT:AUTO[:STATe] OFF|ON|0|1` `[:SENSe]:IF:GAIN:FFT:AUTO[:STATe]?`
Example	IF:GAIN:FFT:AUTO ON
Preset	ON
State Saved	Saved in instrument state.
Backwards Compatibility SCPI	`DISPlay:WINDow[1]:TRACe:Y[:SCALe]:LOG:RANGe:AUTO` Included for ESA compatibility
Backwards Compatibility SCPI	`[:SENSe]:ADC:RANGe AUTO|NONE` Included for PSA compatibility. Accepted without error but ignored; the query is ignored as well
Initial S/W Revision	Prior to A.02.00

Autorange (Slower – Follows Signals)

Turns the ADC ranging to automatic which provides the best signal to noise ratio. Autorange is usually preferred over the manual range choices.

Key Path	Meas setup, FFT IF Gain
Example	IF:GAIN:FFT AUTOrange
State Saved	Saved in instrument state.
Readback	Autorange
Initial S/W Revision	Prior to A.02.00

Low Gain (Best for Large Signals)

Forces FFT IF Gain to be off.

Key Path	Meas Setup, FFT IF Gain
Example	IF:GAIN:FFT LOW
State Saved	Saved in instrument state.
Readback	Low Gain
Initial S/W Revision	Prior to A.02.00

High Gain (Best Noise Level)

Forces FFT IF Gain to be on.

Key Path	Meas S0etup, FFT IF Gain
Example	IF:GAIN:FFT HIGH
Dependencies	The High setting for FFT IF Gain is grayed out when Swept IF Gain is manually set to Low (not when Low is chosen by the auto-rules).
State Saved	Saved in instrument state.
Readback	High Gain
Initial S/W Revision	Prior to A.02.00

Analog Demod Tune & Listen

The Analog Demod Tune & Listen key opens the Analog Demod menu which contains keys to turn the demod function on and off and select modulation type. This key only appears if the N9063A Analog Demod mode, the N6141A or W6141A application, or Option EMC is installed and licensed.

When the function is on (set to AM, FM, or ΦM), the demodulated signal is fed to the analyzer's speaker. Muting and volume control functions are done through the standard Windows speaker volume control interface.

Key Path	Meas Setup
Remote Command	`[:SENSe]:DEMod AM|FM|PM|OFF` `[:SENSe]:DEMod?`
Example	DEM AM turns amplitude demodulation function ON
Dependencies	When Tune & Listen is turned on, all active traces are forced to use the same detector. CISPR detectors (QPD, EMI Avg, RMS Avg) and Tune & Listen are mutually exclusive. No sound output will be heard if one of these detectors is selected.
Preset	OFF

State Saved	Saved in instrument state.
Backwards Compatibility Notes	In ESA, the command [:SENSe]:DEMod AM|FM would select the demodulation type but would not activate it (turn it on). In X-Series this command will both select and activate demodulation. The X-Series implementation of Demod Tune and Listen does not include Squelch Control as was supported in ESA. The speaker control for Tune and Listen for X-Series is done with the volume up/down and mute hardkeys on the front panel and is handled by the Windows operating system. There is no software speaker on/off control as was supported in ESA.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

AM

Pressing this key, when it is not selected, selects and activates the AM demodulation function. Pressing it a second time branches to the AM Demod menu where AM demodulation settings can be adjusted.

Key Path	Meas Setup, Analog Demod Tune&Listen
Example	DEM AM
State Saved	Saved in instrument state.
Backwards Compatibility SCPI	`[:SENSe]:DEMod:STATe ON|1` Sending DEM:STAT ON will have the same effect as sending DEM:AM, turning AM Demod on.
Initial S/W Revision	Prior to A.02.00

Channel BW (AM Demod)

Sets the RBW setting used by the hardware during the demodulation period in nonzero spans. Note that this is a separate parameter only for the demodulation function and does not affect the RBW setting in the BW menu which is used during the normal sweep. The flat top filter type must be used during the demodulation period. A 5 kHz Video Bandwidth filter is used.

In Zero Span, the instrument’s RBW & VBW filters are used for the demodulation; thus, the Channel BW (and RBW filter type) will match those of the instrument. This allows gap-free listening. The Channel BW key is grayed out and the value displayed on the key matches the current RBW of the instrument. Upon leaving zero span, the non-zero-span setting of Channel BW is restored as well as the flattop filter type.

Key Path	Meas Setup, Analog Demod Tune&Listen, AM
Remote Command	`[:SENSe]:DEMod:AM:BANDwidth:CHANnel <freq>` `[:SENSe]:DEMod:AM:BANDwidth:CHANnel?`
Example	DEM:AM:BAND:CHAN 200 kHz
Notes	This key/command is grayed out in zero span.
Dependencies	Unavailable in zero span.
Couplings	In zero span only, the value is set equal to the instrument’s current RBW value and it displays that

	value on the softkey, but the softkey is grayed out.
Preset	30 kHz
State Saved	Saved in instrument state.
Min	390 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00

FM

Pressing this key, when it is not selected, selects and activates the FM demodulation function. Pressing it a second time branches to the FM Demod menu where FM demodulation settings can be adjusted.

Key Path	Meas Setup, Analog Demod Tune&Listen
Example	DEM FM
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Channel BW (FM Demod)

Sets the RBW setting used by the hardware during the demodulation period in nonzero spans. Note that this is a separate parameter only for the demodulation function and does not affect the RBW setting in the BW menu which is used during the normal sweep. The flat top filter type must be used during the demodulation period. A 5 kHz Video Bandwidth filter is used.

In Zero Span, the instrument’s RBW & VBW filters are used for the demodulation; thus, the Channel BW (and RBW filter type) will match those of the instrument. This allows gap-free listening. The Channel BW key is grayed out and the value displayed on the key matches the current RBW of the instrument. Upon leaving zero span, the previous setting of Channel BW and the flattop filter type are restored.

Key Path	Meas Setup, Analog Demod Tune&Listen, FM
Remote Command	`[:SENSe]:DEMod:FM:BANDwidth:CHANnel <freq>` `[:SENSe]:DEMod:FM:BANDwidth:CHANnel?`
Example	DEM:FM:BAND:CHAN 200 MHz
Notes	This key / command is grayed out in zero span
Dependencies	Unavailable in zero span.
Couplings	In zero span only, the value is set equal to the instrument’s current RBW value and it displays that value on the softkey, but the softkey is grayed out.
Preset	150 kHz
State Saved	Saved in instrument state.

Min	390 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00

De-emphasis (FM Demod only)

The De-emphasis setting controls a single-pole filter (6 dB/octave roll off), usually to counter intentional pre-emphasis in the transmitter. When De-emphasis state is OFF the hardware digital filter is bypassed, otherwise the setting is applied

The De-emphasis softkey is only available when FM is the demod selected. It is grayed out for AM and PM.

Key Path	Meas Setup, Analog Demod Tune & Listen, FM
Remote Command	`[:SENSe]:DEMod:FM:DEEMphasis OFF|US25|US50|US75|US750` `[:SENSe]:DEMod:FM:DEEMphasis?`
Example	DEM:FM:DEEM US75 DEM:FM:DEEM?
Dependencies	Only available in FM. Grayed out for AM and PM.
Preset	US75 (recommended for US commercial FM 75 µs pre-emphasis)
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

De-emphasis (FM Demod only)

The De-emphasis setting controls a single-pole filter (6 dB/octave roll off), usually to counter intentional pre-emphasis in the transmitter. When De-emphasis state is OFF the hardware digital filter is bypassed, otherwise the setting is applied

The De-emphasis softkey is only available when FM is the demod selected. It is grayed out for AM and PM.

Key Path	Meas Setup, Analog Demod Tune & Listen, FM
Remote Command	`[:SENSe]:DEMod:FM:DEEMphasis OFF|US25|US50|US75|US750` `[:SENSe]:DEMod:FM:DEEMphasis?`
Example	DEM:FM:DEEM US75 DEM:FM:DEEM?
Dependencies	Only available in FM. Grayed out for AM and PM.
Preset	US75 (recommended for US commercial FM 75 µs pre-emphasis)
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

De-emphasis (FM Demod only)

The De-emphasis setting controls a single-pole filter (6 dB/octave roll off), usually to counter intentional pre-emphasis in the transmitter. When De-emphasis state is OFF the hardware digital filter is bypassed, otherwise the setting is applied

The De-emphasis softkey is only available when FM is the demod selected. It is grayed out for AM and PM.

Key Path	Meas Setup, Analog Demod Tune & Listen, FM
Remote Command	`[:SENSe]:DEMod:FM:DEEMphasis OFF|US25|US50|US75|US750` `[:SENSe]:DEMod:FM:DEEMphasis?`
Example	DEM:FM:DEEM US75 DEM:FM:DEEM?
Dependencies	Only available in FM. Grayed out for AM and PM.
Preset	US75 (recommended for US commercial FM 75 µs pre-emphasis)
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

De-emphasis (FM Demod only)

The De-emphasis setting controls a single-pole filter (6 dB/octave roll off), usually to counter intentional pre-emphasis in the transmitter. When De-emphasis state is OFF the hardware digital filter is bypassed, otherwise the setting is applied

The De-emphasis softkey is only available when FM is the demod selected. It is grayed out for AM and PM.

Key Path	Meas Setup, Analog Demod Tune & Listen, FM
Remote Command	`[:SENSe]:DEMod:FM:DEEMphasis OFF|US25|US50|US75|US750` `[:SENSe]:DEMod:FM:DEEMphasis?`
Example	DEM:FM:DEEM US75 DEM:FM:DEEM?
Dependencies	Only available in FM. Grayed out for AM and PM.
Preset	US75 (recommended for US commercial FM 75 µs pre-emphasis)
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

De-emphasis (FM Demod only)

The De-emphasis setting controls a single-pole filter (6 dB/octave roll off), usually to counter intentional pre-emphasis in the transmitter. When De-emphasis state is OFF the hardware digital filter is bypassed,

otherwise the setting is applied

The De-emphasis softkey is only available when FM is the demod selected. It is grayed out for AM and PM.

Key Path	Meas Setup, Analog Demod Tune & Listen, FM
Remote Command	`[:SENSe]:DEMod:FM:DEEMphasis OFF|US25|US50|US75|US750` `[:SENSe]:DEMod:FM:DEEMphasis?`
Example	DEM:FM:DEEM US75 DEM:FM:DEEM?
Dependencies	Only available in FM. Grayed out for AM and PM.
Preset	US75 (recommended for US commercial FM 75 µs pre-emphasis)
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

De-emphasis (FM Demod only)

The De-emphasis setting controls a single-pole filter (6 dB/octave roll off), usually to counter intentional pre-emphasis in the transmitter. When De-emphasis state is OFF the hardware digital filter is bypassed, otherwise the setting is applied

The De-emphasis softkey is only available when FM is the demod selected. It is grayed out for AM and PM.

Key Path	Meas Setup, Analog Demod Tune & Listen, FM
Remote Command	`[:SENSe]:DEMod:FM:DEEMphasis OFF|US25|US50|US75|US750` `[:SENSe]:DEMod:FM:DEEMphasis?`
Example	DEM:FM:DEEM US75 DEM:FM:DEEM?
Dependencies	Only available in FM. Grayed out for AM and PM.
Preset	US75 (recommended for US commercial FM 75 µs pre-emphasis)
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

ΦM

Pressing this key, when it is not selected, selects and activates the ΦM demodulation function. Pressing it a second time branches to the ΦM Demod menu where ΦM demodulation settings can be adjusted.

Key Path	Meas Setup, Analog Demod Tune&Listen
Example	DEM PM

State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Channel BW (ΦM Demod)

Sets the RBW setting used by the hardware during the demodulation period in nonzero spans. Note that this is a separate parameter only for the demodulation function and does not affect the RBW setting in the BW menu which is used during the normal sweep. The flat top filter type must be used during the demodulation period. A 5 kHz Video Bandwidth filter is used.

In Zero Span, the instrument's RBW & VBW filters are used for the demodulation; thus, the Channel BW (and RBW filter type) will match those of the instrument. This allows gap-free listening. The Channel BW key is grayed out and the value displayed on the key matches the current RBW of the instrument. Upon leaving zero span, the previous setting of Channel BW and the flattop filter type are restored.

Key Path	Meas Setup, Analog Demod Tune&Listen, ΦM
Remote Command	`[:SENSe]:DEMod:PM:BANDwidth:CHANnel <freq>` `[:SENSe]:DEMod:PM:BANDwidth:CHANnel?`
Example	DEM:PM:BAND:CHAN 200 MHz
Notes	This key / command is grayed out in zero span
Dependencies	Unavailable in zero span.
Couplings	In zero span only, the value is set equal to the instrument's current RBW value and it displays that value on the softkey, but the softkey is grayed out.
Preset	100 kHz
State Saved	Saved in instrument state.
Min	390 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00

Off

Pressing this key, turns the demodulation function off.

Key Path	Meas Setup, Analog Demod Tune&Listen
Example	DEM OFF turns the demodulation function OFF
State Saved	Saved in instrument state.
Backwards Compatibility SCPI	`[:SENSe]:DEMod:STATe OFF|0`
Initial S/W Revision	Prior to A.02.00

Demod Time

Sets the amount of time the instrument demodulates the signal after each sweep. The demodulated signal can be heard through the speaker during demodulation. In zero span, demodulation can be performed continuously, making this parameter not applicable, hence it is grayed out in zero span.

Key Path	Meas Setup, Analog Demod Tune&Listen
Remote Command	`[:SENSe]:DEMod:TIME <time>` `[:SENSe]:DEMod:TIME?`
Example	DEM:TIME 500 ms DEM:TIME?
Notes	This key / command is grayed out in zero span
Dependencies	Unavailable in zero span.
Preset	500 ms
State Saved	Saved in instrument state.
Min	2 ms
Max	100 s
Initial S/W Revision	Prior to A.02.00

Demod State (Remote Command Only)

Sets or queries the state of the Analog Demod Tune and Listen function. Setting the state to ON with this command will select AM demodulation by default and activate it (turn it on).

The response to the query is determined by the current setting of [:SENSE]:DEMod AM|FM|PM|OFF. The response will be 1 if AM, FM, PM are selected, or 0 if OFF is selected..

Remote Command	`[:SENSe]:DEMod:STATe OFF|ON|0|1` `[:SENSe]:DEMod:STATe?`
Preset	OFF
Initial S/W Revision	Prior to A.02.00

Noise Source

This menu allows you to turn the noise source power on or off when making manual noise figure measurements.

See "More Information" on page 851.

Key Path	Meas Setup
Remote Command	`:SOURce:NOISe:TYPE NORMal | SNS`

	:SOURce:NOISe:TYPE?
Example	SOUR:NOIS:TYPE NORM
Couplings	If no SNS is connected, this parameter will be set to “Normal” When Type is set to “SNS” and the SNS is disconnected, this parameter gets bumped to “Normal” When an SNS is not connected, the SNS type will be grayed (disabled).
Preset	Normal
State Saved	Saved in instrument state.
Range	Normal | SNS
Backwards Compatibility Notes	In previous Noise Figure analysis applications, this command could optionally be preceded with the :SENSe keyword. The optional :SENSe keyword is no longer supported.
Initial S/W Revision	Prior to A.02.00

More Information

There are 2 types of noise sources: a Smart Noise Source (SNS), and a "Normal" noise source - e.g. 346 series. This menu allows the user to control both. The SNS has its own connector on the rear of the analyzer and when it is connected the user can then select it from the “Type” 1 of N, allowing the State parameter to then control the SNS. The "Normal" source is controlled by a BNC connector that supplies 28V. If SNS is NOT connected then the “state” parameter controls the "Normal" noise source 28V BNC port. If both are connected the “Type” parameter will determine which source the “State” parameter will control. Two sources can never be controlled together. The “SNS attached” SCPI query detailed below can be used remotely to determine if an SNS is connected. SNS functionality is limited to turning on and off only. The SNS ENR data and temperature cannot be queried, unless the Noise Figure application is installed. The SNS ENR data is issued in printed form when an SNS is purchased or can be read from the analyzer’s Noise Figure application if installed, or other Keysight noise figure instruments that support the SNS (NFA and ESA with option 219).

When first entering the Swept SA measurement the “State” will be set to OFF and the 28v BNC drive and SNS turned off to ensure the two are in sync. When the Swept SA measurement is exited, the “State” parameter will be set to OFF and the 28v BNC and SNS drive turned off.

For making manual noise figure measurements the following setup is recommended:

- Set the SPAN to Zero
- Set attenuation to 0 dB
- Set the PRE-AMP ON
- Set the RBW to 4MHz
- Set the Detector to AVERAGE
- Set the sweep time to 16ms - sets the variance correctly for good results.
- Set a Band/Interval Power Marker function and set the interval over the full width of trace i.e. Left to 0s and Right to 16ms

Noise Source

This menu allows you to turn the noise source power on or off when making manual noise figure measurements.

See "More Information" on page 852.

Key Path	Meas Setup
Remote Command	`:SOURce:NOISe:TYPE NORMal | SNS` `:SOURce:NOISe:TYPE?`
Example	SOUR:NOIS:TYPE NORM
Couplings	If no SNS is connected, this parameter will be set to "Normal" When Type is set to "SNS" and the SNS is disconnected, this parameter gets bumped to "Normal" When an SNS is not connected, the SNS type will be grayed (disabled).
Preset	Normal
State Saved	Saved in instrument state.
Range	Normal | SNS
Backwards Compatibility Notes	In previous Noise Figure analysis applications, this command could optionally be preceded with the :SENSe keyword. The optional :SENSe keyword is no longer supported.
Initial S/W Revision	Prior to A.02.00

More Information

There are 2 types of noise sources: a Smart Noise Source (SNS), and a "Normal" noise source - e.g. 346 series. This menu allows the user to control both. The SNS has its own connector on the rear of the analyzer and when it is connected the user can then select it from the "Type" 1 of N, allowing the State parameter to then control the SNS. The "Normal" source is controlled by a BNC connector that supplies 28V. If SNS is NOT connected then the "state" parameter controls the "Normal" noise source 28V BNC port. If both are connected the "Type" parameter will determine which source the "State" parameter will control. Two sources can never be controlled together. The "SNS attached" SCPI query detailed below can be used remotely to determine if an SNS is connected. SNS functionality is limited to turning on and off only. The SNS ENR data and temperature cannot be queried, unless the Noise Figure application is installed. The SNS ENR data is issued in printed form when an SNS is purchased or can be read from the analyzer's Noise Figure application if installed, or other Keysight noise figure instruments that support the SNS (NFA and ESA with option 219).

When first entering the Swept SA measurement the "State" will be set to OFF and the 28v BNC drive and SNS turned off to ensure the two are in sync. When the Swept SA measurement is exited, the "State" parameter will be set to OFF and the 28v BNC and SNS drive turned off.

For making manual noise figure measurements the following setup is recommended:

- Set the SPAN to Zero
- Set attenuation to 0 dB
- Set the PRE-AMP ON

- Set the RBW to 4MHz
- Set the Detector to AVERAGE
- Set the sweep time to 16ms - sets the variance correctly for good results.
- Set a Band/Interval Power Marker function and set the interval over the full width of trace i.e. Left to 0s and Right to 16ms

Noise Source

This menu allows you to turn the noise source power on or off when making manual noise figure measurements.

See "More Information" on page 853.

Key Path	Meas Setup
Remote Command	`:SOURce:NOISe:TYPE NORMal | SNS` `:SOURce:NOISe:TYPE?`
Example	SOUR:NOIS:TYPE NORM
Couplings	If no SNS is connected, this parameter will be set to “Normal” When Type is set to “SNS” and the SNS is disconnected, this parameter gets bumped to “Normal” When an SNS is not connected, the SNS type will be grayed (disabled).
Preset	Normal
State Saved	Saved in instrument state.
Range	Normal | SNS
Backwards Compatibility Notes	In previous Noise Figure analysis applications, this command could optionally be preceded with the :SENSe keyword. The optional :SENSe keyword is no longer supported.
Initial S/W Revision	Prior to A.02.00

More Information

There are 2 types of noise sources: a Smart Noise Source (SNS), and a "Normal" noise source - e.g. 346 series. This menu allows the user to control both. The SNS has its own connector on the rear of the analyzer and when it is connected the user can then select it from the “Type” 1 of N, allowing the State parameter to then control the SNS. The "Normal" source is controlled by a BNC connector that supplies 28V. If SNS is NOT connected then the “state” parameter controls the "Normal" noise source 28V BNC port. If both are connected the “Type” parameter will determine which source the “State” parameter will control. Two sources can never be controlled together. The “SNS attached” SCPI query detailed below can be used remotely to determine if an SNS is connected. SNS functionality is limited to turning on and off only. The SNS ENR data and temperature cannot be queried, unless the Noise Figure application is installed. The SNS ENR data is issued in printed form when an SNS is purchased or can be read from the analyzer’s Noise Figure application if installed, or other Keysight noise figure instruments that support the SNS (NFA and ESA with option 219).

When first entering the Swept SA measurement the “State” will be set to OFF and the 28v BNC drive and SNS turned off to ensure the two are in sync. When the Swept SA measurement is exited, the “State” parameter will be set to OFF and the 28v BNC and SNS drive turned off.

For making manual noise figure measurements the following setup is recommended:

- Set the SPAN to Zero
- Set attenuation to 0 dB
- Set the PRE-AMP ON
- Set the RBW to 4MHz
- Set the Detector to AVERAGE
- Set the sweep time to 16ms - sets the variance correctly for good results.
- Set a Band/Interval Power Marker function and set the interval over the full width of trace i.e. Left to 0s and Right to 16ms

Noise Source

This menu allows you to turn the noise source power on or off when making manual noise figure measurements.

See "More Information" on page 854.

Key Path	Meas Setup
Remote Command	`:SOURce:NOISe:TYPE NORMal | SNS` `:SOURce:NOISe:TYPE?`
Example	SOUR:NOIS:TYPE NORM
Couplings	If no SNS is connected, this parameter will be set to “Normal” When Type is set to “SNS” and the SNS is disconnected, this parameter gets bumped to “Normal” When an SNS is not connected, the SNS type will be grayed (disabled).
Preset	Normal
State Saved	Saved in instrument state.
Range	Normal | SNS
Backwards Compatibility Notes	In previous Noise Figure analysis applications, this command could optionally be preceded with the :SENSe keyword. The optional :SENSe keyword is no longer supported.
Initial S/W Revision	Prior to A.02.00

More Information

There are 2 types of noise sources: a Smart Noise Source (SNS), and a "Normal" noise source - e.g. 346 series. This menu allows the user to control both. The SNS has its own connector on the rear of the analyzer and when it is connected the user can then select it from the “Type” 1 of N, allowing the State parameter to then control the SNS. The "Normal" source is controlled by a BNC connector that supplies 28V. If SNS is NOT connected then the “state” parameter controls the "Normal" noise source 28V BNC port. If both are connected the “Type” parameter will determine which source the “State” parameter will control. Two sources can never be controlled together. The “SNS attached” SCPI query detailed below can be used remotely to determine if an SNS is connected. SNS functionality is limited to turning on and off only. The SNS ENR data and temperature cannot be queried, unless the Noise Figure application is installed. The SNS ENR data is issued in printed form when an SNS is purchased or can be read from the analyzer's Noise Figure application if installed, or other Keysight noise figure instruments that support the SNS (NFA and ESA with option 219).

When first entering the Swept SA measurement the "State" will be set to OFF and the 28v BNC drive and SNS turned off to ensure the two are in sync. When the Swept SA measurement is exited, the "State" parameter will be set to OFF and the 28v BNC and SNS drive turned off.

For making manual noise figure measurements the following setup is recommended:

- Set the SPAN to Zero
- Set attenuation to 0 dB
- Set the PRE-AMP ON
- Set the RBW to 4MHz
- Set the Detector to AVERAGE
- Set the sweep time to 16ms - sets the variance correctly for good results.
- Set a Band/Interval Power Marker function and set the interval over the full width of trace i.e. Left to 0s and Right to 16ms

State

This key turns the Noise Source on and off.

Key Path	Meas Setup
Remote Command	`:SOURce:NOISe[:STATe] ON|OFF|1|0` `:SOURce:NOISe[:STATe]?`
Example	SOUR:NOIS OFF
Couplings	If an SNS is connected, and the Type is set to SNS, this parameter turns the SNS on and off. When an SNS is not connected this parameter turns the BNC 28V output on and off. When the SA mode is first entered this parameter is set to OFF and the 28v drive turned OFF. When the SA mode is exited this parameter is set to OFF and the 28v drive turned OFF.
Preset	OFF
State Saved	Saved in instrument state.
Backwards Compatibility Notes	In previous Noise Figure analysis applications, this command could optionally be preceded with the :SENSe keyword. The optional :SENSe keyword is no longer supported.
Initial S/W Revision	Prior to A.02.00

SNS Attached (Remote Command Only)

If an Smart Noise Source (SNS) is present this command will return 1 otherwise it will return 0.

Remote Command	`:SOURce:NOISe:SNS:ATTached?`

Example	SOUR:NOIS:SNS:ATT?
Preset	OFF
State Saved	No
Backwards Compatibility Notes	In previous Noise Figure analysis applications, this command could optionally be preceded with the :SENSe keyword. The optional :SENSe keyword is no longer supported.
Initial S/W Revision	Prior to A.02.00

Meas Preset

This key returns the Meas Local variables in the Swept SA measurement to their preset values. This is the same as sending the SCPI command CONF:SAN.

The only exception is Limits On/Off, which is a persistent Meas Local variable. It will be set to Off by a Mode Preset but not by Meas Preset.

Key Path	Meas Setup
Initial S/W Revision	Prior to A.02.00

Mode

The Mode key allows you to select the available Measurement Applications or "Modes". Modes are a collection of measurement capabilities packaged together to provide an instrument personality that is specific to your measurement needs. Each application software product is ordered separately by Model Number, and must be licensed to be available. Once an instrument mode is selected, only the commands that are valid for that mode can be executed.

NOTE Key operation can differ between modes. The information displayed in Help applies to the current mode.

To access Help for a different Mode, you must first exit Help (by pressing the Cancel (Esc) key). Then select the desired mode and re-access Help.

For more information on Modes, pre-loading Modes, and memory requirements for Modes, see "More Information" on page 858 below.

Key Path	Front-panel key
Remote Command	`:INSTrument[:SELect] SA | SEQAN | EMI | BASIC | WCDMA | EDGEGSM | WIMAXOFDMA | VSA | PNOISE | NFIGure | ADEMOD | BTooth | TDSCDMA | CDMA2K | CDMA1XEV | LTE | LTETDD | MSR | DVB | DTMB | DCATV | ISDBT | CMMB | WLAN | CWLAN | CWIMAXOFDM | WIMAXFIXED | IDEN | RLC | SCPILC | VSA89601` `:INSTrument[:SELect]?`
Example	:INST SA
Notes	The available parameters are dependent upon installed and licensed applications resident in the instrument. Parameters given here are an example, specific parameters are in the individual Application. Use the INST:CAT? query to obtain a list of valid mode choices.
Preset	Not affected by Preset. Set to SA following Restore System Defaults, if SA is the default mode.
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:INSTrument[:SELect] GSM` Provided for backwards compatibility. GSM is mapped to EDGEGSM.

Backwards Compatibility SCPI	`:INSTrument[:SELect] SANalyzer`
	Provided for ESU compatibility. When this command is received, the analyzer aliases it to the following:
	`INST:SEL SCPILC`
	This results in the analyzer being placed in SCPI Language Compatibility Mode, in order to emulate the ESU Spectrum Analyzer Mode.

Backwards Compatibility SCPI	`:INSTrument[:SELect] RECeiver`
	provided for ESU compatibility. When this command is received, the instrument aliases it to the following:
	`:INST:SEL EMI`
	`:CONF FSC`
	This results in the instrument being placed in the EMI Receiver Mode, running the Frequency Scan measurement, in order to emulate the ESU Receiver Mode.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.01

Example	:INST 'SA'
Notes	The query is **not** a quoted string. It is an enumeration as indicated in the Instrument Select table above. The command must be sequential: that is, continued parsing of commands cannot proceed until the instrument select is complete and the resultant SCPI trees are available.
Backwards Compatibility SCPI	`:INSTrument[:SELect] 'SA'|'PNOISE'|'EDGE'|'GSM'|'BASIC'`
Initial S/W Revision	Prior to A.02.00

More Information

The Mode name appears on the banner after the word "Keysight" followed by the Measurement Title. For example, for the Spectrum Analyzer mode with the Swept SA measurement running displays:

It is possible to specify the order in which the Modes appear in the Mode menu, using the Configure Applications utility (System, Power On, Configure Applications). It is also possible, using the same utility, to specify a subset of the available applications to load into memory at startup time, which can significantly decrease the startup time of the analyzer. During runtime, if an application that is not loaded into memory is selected (by either pressing that application's Mode key or sending that application's :INST:SEL command over SCPI), there will be a pause while the application is loaded. During this pause a message box appears stating "Loading application, please wait…".

Each application (Mode) that runs in an X-Series instrument consumes virtual memory. The various applications consume varying amounts of virtual memory, and as more applications run, the memory consumption increases. Once an application has been loaded, some of its memory remains allocated even when it is not running, and is not released until the analyzer program (xSA.exe) shuts down.

Keysight characterizes each Mode and assigns a memory usage quantity based on a conservative estimate. There is a limited amount of virtual memory available to applications (note that this is virtual memory and is independent of how much physical RAM is in the instrument). The instrument keeps track of how much memory is being used by all loaded applications – which includes those that preloaded at startup, and all of those that have been run since startup.

When you request a Mode that is not currently loaded, the instrument looks up the memory estimate for that Mode, and adds it to the residual total for all currently loaded Modes. If there is not enough virtual memory to load the Mode, a dialog box appears with four options:

1. Close and restart the analyzer program without changing your configured preloads. This may free up enough memory to load the requested Mode, depending on your configured preloads

2. Clear out all preloads and close and restart the analyzer program with only the requested application preloaded, and with that application running. This choice is guaranteed to allow you to run the requested application; but you will lose your previously configured preloads. In addition, there may be little or no room for other applications, depending on the size of the requested application.
3. Start the Configure Applications utility, in order to reconfigure the preloaded applications to make room for the applications you want to run (this will then require restarting the analyzer program with your new configuration). This is the recommended choice because it gives you full flexibility to select exactly what you want.
4. Exit the dialog box without doing anything, which means you will be unable to load the application you requested.

Except for case 4, selecting any option from the dialog causes the analyzer software to close, and you will lose all unsaved traces and results.

If you attempt to load a mode via SCPI that exceeds memory capacity, the Mode does not load and an error message is returned:

–225,"Out of memory;Insufficient resources to load Mode (mode name)"

where “mode name” is the SCPI parameter for the mode in question, for example, SA for Spectrum Analyzer Mode.

Spectrum Analyzer

Selects the Spectrum Analyzer mode for general purpose measurements. There are several measurements available in this mode. General spectrum analysis measurements, in swept and zero span, can be done using the first key in the Meas menu, labeled Swept SA. Other measurements in the Meas Menu are designed to perform specialized measurement tasks, including power and demod measurements.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL SA INST:NSEL 1
Initial S/W Revision	Prior to A.02.00

EMI Receiver

The EMI Receiver Mode makes EMC measurements. Several measurements are provided to aid the user in characterizing EMC performance of their systems, including looking at signals with CISPR–16 compliant detectors, performing scans for interfering signals, and determining and charting interfering signals over time.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL EMI INST:NSEL 141
Initial S/W Revision	A.07.01

IQ Analyzer (Basic)

The IQ Analyzer Mode makes general purpose frequency domain and time domain measurements. These measurements often use alternate hardware signal paths when compared with a similar measurement in the Signal Analysis Mode using the Swept SA measurement. These frequency domain and time domain measurements can be used to output I/Q data results when measuring complex modulated digital signals.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL BASIC INST:NSEL 8
Initial S/W Revision	Prior to A.02.00

W-CDMA with HSPA+

Selects the W-CDMA with HSPA+ mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL WCDMA INST:NSEL 9
Initial S/W Revision	Prior to A.02.00

GSM/EDGE/EDGE Evo

Selects the GSM with EDGE mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL EDGEGSM

	INST:NSEL 13
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

802.16 OFDMA (WiMAX/WiBro)

Selects the OFDMA mode for general purpose measurements of WiMAX signals. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL WIMAXOFDMA INST:NSEL 75
Initial S/W Revision	Prior to A.02.00

Vector Signal Analyzer (VXA)

The N9064A (formerly 89601X) VXA Vector signal and WLAN modulation analysis application provides solutions for basic vector signal analysis, analog demodulation, and digital demodulation. The digital demodulation portion of N9064A allows you to perform measurements on standard-based formats such as cellular, wireless networking and digital video as well as general purpose flexible modulation analysis for wide range of digital formats, FSK to 1024QAM, with easy-to-use measurements and display tools such as constellation and eye diagram, EVM traces and up to four simultaneous displays. Analog baseband analysis is available using the MXA with option BBA. Option 3FP WLAN has been discontinued.

N9064A honors existing 89601X licenses with all features and functionalities found on X-Series software versions prior to A.06.00. Specifically:

N9064A–1 is equivalent to 89601X–205

N9064A–2 is equivalent to 89601X-AYA

N9064A–3 is equivalent to 89601X-B7R

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL VSA INST:NSEL 100
Initial S/W Revision	Prior to A.02.00

Phase Noise

The Phase Noise mode provides pre-configured measurements for making general purpose measurements of device phase noise.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL PNOISE or INST:NSEL 14
Initial S/W Revision	Prior to A.02.00

Noise Figure

The Noise Figure mode provides pre-configured measurements for making general purpose measurements of device noise figure.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL NFIGURE INST:NSEL 219
Initial S/W Revision	Prior to A.02.00

Analog Demod

Selects the Analog Demod mode for making measurements of AM, FM and phase modulated signals.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL ADEMOD INST:NSEL 234
Initial S/W Revision	Prior to A.02.00

TD-SCDMA with HSPA/8PSK

Selects the TD-SCDMA mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL TDSCDMA INST:NSEL 211
Initial S/W Revision	Prior to A.02.00

cdma2000

Selects the cdma2000 mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL CDMA2K INST:NSEL 10
Initial S/W Revision	Prior to A.02.00

1xEV-DO

Selects the 1xEV-DO mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL CDMA1XEV INST:NSEL 15
Initial S/W Revision	Prior to A.02.00

LTE

Selects the LTE mode for general purpose measurements of signals following the LTE FDD standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL LTE

	INST:NSEL 102
Initial S/W Revision	Prior to A.02.00

LTE TDD

Selects the LTE TDD mode for general purpose measurements of signals following the LTE TDD standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL LTETDD INST:NSEL 105
Initial S/W Revision	A.03.00

DVB-T/H with T2

Selects the DVB-T/H mode for measurements of digital video signals using this format. There are several power and demod measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL DVB INST:NSEL 235
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.07.00

DTMB (CTTB)

Selects the DTMB (CTTB) mode for measurements of digital video signals using this format. There are several power and demod measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL DTMB INST:NSEL 236
Initial S/W Revision	A.02.00

ISDB-T

Selects the ISDB-T mode for measurements of digital video signals using this format. There are several power and demod measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL ISDBT INST:NSEL 239
Initial S/W Revision	A.03.00

CMMB

Selects the CMMB mode for measurements of digital video signals using this format. There are several power and demod measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL CMMB INST:NSEL 240
Initial S/W Revision	A.03.00

Combined WLAN

Selects the CWLAN mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL CWLAN INST:NSEL 19
Initial S/W Revision	A.02.00

Combined Fixed WiMAX

Selects the Combined Fixed WiMAX mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL CWIMAXOFDM INST:NSEL 81
Initial S/W Revision	A.02.00

802.16 OFDM (Fixed WiMAX)

Selects the 802.16 OFDM (Fixed WiMAX) mode. This mode allows modulation quality measurements of signals that comply with IEEE 802.16a–2003 and IEEE 802.16–2004 standards, with flexibility to measure nonstandard OFDM formats. Along with the typical digital demodulation measurement results, several additional 802.16 OFDM unique trace data formats and numeric error data results provide enhanced data analysis.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL WIMAXFIXED INST:NSEL 104
Initial S/W Revision	A.02.00

iDEN/WiDEN/MOTOTalk

Selects the iDEN/WiDEN/MOTOTalk mode for general purpose measurements of iDEN and iDEN-related signals. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL IDEN INST:NSEL 103
Initial S/W Revision	A.02.00

Remote Language Compatibility

The Remote Language Compatibility (RLC) mode provides remote command backwards compatibility for the 8560 series of spectrum analyzers, known as legacy spectrum analyzers.

NOTE After changing into or out of this mode, allow a 1 second delay before sending any subsequent commands.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL RLC Or INST:NSEL 266
Initial S/W Revision	Prior to A.02.00

89601 VSA

Selecting the 89601 VSA mode will start the 89600-Series VSA software application. The 89600 VSA software is powerful, PC-based software, offering the industry's most sophisticated general purpose and standards specific signal evaluation and troubleshooting tools for the R&D engineer. Reach deeper into signals, gather more data on signal problems, and gain greater insight.

- Over 30 general-purpose analog and digital demodulators ranging from 2FSK to 1024QAM
- Standards specific modulation analysis including:
- Cell: GSM, cdma2000, WCDMA, TD-SCDMA and more
- Wireless networking: 802.11a/b/g, 802.11n, 802.16 WiMAX (fixed/mobile), UWB
- RFID
- Digital satellite video and other satellite signals, radar, LMDS
- Up to 400K bin FFT, for the highest resolution spectrum analysis
- A full suite of time domain analysis tools, including signal capture and playback, time gating, and CCDF measurements
- Six simultaneous trace displays and the industry's most complete set of marker functions
- Easy-to-use Microsoft ® Windows ® graphical user interface

For more information see the Keysight 89600 Series VSA web site at www.agilent.com/find/89600

To learn more about how to use the 89600 VSA running in the X-Series, after the 89600 VSA application is running, open the 89600 VSA Help and open the "About Keysight X-Series Signal Analyzers (MXA/EXA) with 89600-Series Software" help topic.

Key Path	Mode
Example	INST:SEL VSA89601 INST:NSEL 101
Initial S/W Revision	Prior to A.02.00

Bluetooth

Selects the Bluetooth mode for Bluetooth specific measurements. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL BT INST:NSEL 228
Initial S/W Revision	A.06.01

SCPI Language Compatibility

The SCPI Language Compatibility mode provides remote language compatibility for SCPI-based instruments, such as the Rohde and Schwartz FSP and related series of spectrum analyzers.

NOTE After changing into or out of this mode, allow a 1 second delay before sending any subsequent commands.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL SCPILC Or INST:NSEL 270
Initial S/W Revision	A.06.00

Digital Cable TV

Selects the Digital Cable TV mode for measurements of digital cable television systems. There are several power and demod measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL DCATV INST:NSEL 238
Initial S/W Revision	A.07.00

MSR

Selects the MSR mode. The MSR mode makes several measurements for Cellular Communication devices that can be configured with multiple radio formats simultaneously following the 3GPP standard of Multi-Standard Radio, including GSM/EDGE, WCDMA/HSPA+ and LTE.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL MSR INST:NSEL 106
Initial S/W Revision	A.10.01

WLAN

Selects the WLAN mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
Example	INST:SEL WLAN INST:NSEL 217
Initial S/W Revision	A.10.01

Application Mode Number Selection (Remote Command Only)

Select the measurement mode by its mode number. The actual available choices depend upon which applications are installed in your instrument. The modes appear in this table in the same order they appear in the Mode menu (if the order is not changed by the Configure Applications utility found in the System, Power On menu). See "Detailed List of Modes" on page 874 for Mode details.

The Mode Number is the parameter for use with the :INSTrument:NSELect command. The Mode Parameter is the parameter for use with the :INSTrument[:SELect] command.

Mode	**Mode Number**	**Mode Parameter**
Spectrum Analyzer	1	SA
Sequence Analyzer	400	SEQAN
EMI Receiver	141	EMI
I/Q Analyzer (Basic)	8	BASIC

WCDMA with HSPA+	9	WCDMA
GSM/EDGE/EDGE Evo	13	EDGEGSM
802.16 OFDMA (WiMAX/WiBro)	75	WIMAXOFDMA
Vector Signal Analyzer (VXA)	100	VSA
Phase Noise	14	PNOISE
Noise Figure	219	NFIGure
Analog Demod	234	ADEMOD
Bluetooth	228	BTooth
TD-SCDMA with HSPA/8PSK	211	TDSCDMA
cdma2000	10	CDMA2K
1xEV-DO	15	CDMA1XEV
LTE	102	LTE
LTE TDD	105	LTETDD
MSR	106	MSR
DVB-T/H with T2	235	DVB
DTMB (CTTB)	236	DTMB
Digital Cable TV	238	DCATV
ISDB-T	239	ISDBT
CMMB	240	CMMB
WLAN	217	WLAN
Combined WLAN	19	CWLAN
Combined Fixed WiMAX	81	CWIMAXOFDM
802.16 OFDM (Fixed WiMAX)	104	WIMAXFIXED
iDEN/WiDEN/MotoTalk	103	IDEN
Remote Language Compatibility	266	RLC
SCPI Language Compatibility	270	SCPILC
89601 VSA	101	VSA89601

Remote Command	`:INSTrument:NSELect <integer>` `:INSTrument:NSELect?`
Example	:INST:NSEL 1
Notes	SA mode is 1 The command must be sequential: i.e. continued parsing of commands cannot proceed until the instrument select is complete and the resultant SCPI trees are available.
Preset	Not affected by Preset. Set to default mode (1 for SA mode) following Restore System Defaults.

State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Application Mode Catalog Query (Remote Command Only)

Returns a string containing a comma separated list of names of all the installed and licensed measurement modes (applications). These names can only be used with the :INSTrument[:SELect] command.

Remote Command	`:INSTrument:CATalog?`
Example	:INST:CAT?
Notes	Query returns a quoted string of the installed and licensed modes separated with a comma. Example: "SA,PNOISE,WCDMA"
Backwards Compatibility Notes	VSA (E4406A) :INSTrument:CATalog? returned a list of installed INSTrument:SELECT items as a comma separated list of string values: "BASIC","GSM","EDGEGSM","CDMA","NADC","PDC","WCDMA","CDMA2K","CDMA1XEV","IDEN","WIDEN","WLAN","SERVICE" X-Series uses the ESA/PSA compatible query of a string contain comma separated values: "SA,PNOISE,NFIGURE,BASIC,CDMA,CDMA2K,WCDMA,CDMA1XEV,EDGEGSM,GSM,NADC,PDC,TDSCDMA,DMODULATION,WLAN"
Initial S/W Revision	Prior to A.02.00

Application Identification (Remote Commands Only)

Each entry in the Mode Menu will have a Model Number and associated information: Version, and Options.

This information is displayed in the Show System screen. The corresponding SCPI remote commands are defined here.

"Current Application Model " on page 871

"Current Application Revision" on page 872

"Current Application Options" on page 872

Current Application Model

Returns a string that is the Model Number of the currently selected application (mode).

Remote Command	`:SYSTem:APPLication[:CURRent][:NAME]?`
Example	:SYST:APPL?
Notes	Query returns a quoted string that is the Model Number of the currently selected application (Mode). Example:

	"N9060A" String length is 6 characters.
Preset	Not affected by Preset
State Saved	Not saved in state, the value will be the selected application when a Save is done.
Initial S/W Revision	Prior to A.02.00

Current Application Revision

Returns a string that is the Revision of the currently selected application (mode).

Remote Command	`:SYSTem:APPLication[:CURRent]:REVision?`
Example	:SYST:APPL:REV?
Notes	Query returns a quoted string that is the Revision of the currently selected application (Mode). Example: "1.0.0.0" String length is a maximum of 23 characters. (each numeral can be an integer + 3 decimal points)
Preset	Not affected by a Preset
State Saved	Not saved in state, the value will be the selected application when a Save is done.
Initial S/W Revision	Prior to A.02.00

Current Application Options

Returns a string that is the Options list of the currently selected application (Mode).

Remote Command	`:SYSTem:APPLication[:CURRent]:OPTion?`
Example	:SYST:APPL:OPT?
Notes	Query returns a quoted string that is the Option list of the currently selected application (Mode). The format is the name as the *OPT? or SYSTem:OPTion command: a comma separated list of option identifiers. Example: "1FP,2FP" String length is a maximum of 255 characters.
Preset	Not affected by a Preset
State Saved	Not saved in state per se, the value will be the selected application when a Save is invoked.
Initial S/W Revision	Prior to A.02.00

Application Identification Catalog (Remote Commands Only)

A catalog of the installed and licensed applications (Modes) can be queried for their identification.

"Application Catalog Number of Entries" on page 873

"Application Catalog Model Numbers" on page 873

"Application Catalog Revision" on page 873

"Application Catalog Options" on page 874

Application Catalog Number of Entries

Returns the number of installed and licensed applications (Modes).

Remote Command	`:SYSTem:APPLication:CATalog[:NAME]:COUNt?`
Example	:SYST:APPL:CAT:COUN?
Preset	Not affected by Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Application Catalog Model Numbers

Returns a list of Model Numbers for the installed and licensed applications (Modes).

Remote Command	`:SYSTem:APPLication:CATalog[:NAME]?`
Example	:SYST:APPL:CAT?
Notes	Returned value is a quoted string of a comma separated list of Model Numbers. Example, if SAMS and Phase Noise are installed and licensed: "N9060A,N9068A" String length is COUNt * 7 – 1. (7 = Model Number length + 1 for comma. –1 = no comma for the 1st entry.)
Preset	Not affected by a Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Application Catalog Revision

Returns the Revision of the provided Model Number.

Remote Command	`:SYSTem:APPLication:CATalog:REVision? <model>`
Example	:SYST:APPL:CAT:REV? 'N9060A'
Notes	Returned value is a quoted string of revision for the provided Model Number. The revision will be a null-string ("") if the provided Model Number is not installed and licensed. Example, if SAMS is installed and licensed: "1.0.0.0"
Preset	Not affected by a Preset.

State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Application Catalog Options

Returns a list of Options for the provided Model Number

Remote Command	`:SYSTem:APPLication:CATalog:OPTion? <model>`
Example	:SYST:APPL:CAT:OPT? 'N9060A'
Notes	Returned value is a quoted string of a comma separated list of Options, in the same format as *OPT? or :SYSTem:OPTion?. If the provided Model Number is not installed and licensed a null-string ("") will be returned. Example, if SAMS is installed and licensed: "2FP" String length is a maximum of 255 characters.
Preset	Not affected by a Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Detailed List of Modes

This topic contains an alphabetical list of measurement applications (modes) currently available in the X-Series, with links to the detailed description of each mode.

NOTE	With the exception of 89601 VSA mode, only **licensed** applications appear in the Mode menu. The 89601 VSA mode always appears, because its licensing is handled differently.

- "1xEV-DO" on page 863
- "802.16 OFDM (Fixed WiMAX)" on page 866
- "802.16 OFDMA (WiMAX/WiBro)" on page 861
- "89601 VSA" on page 867
- "Analog Demod" on page 862
- "Bluetooth" on page 868
- "cdma2000" on page 863
- "CMMB" on page 865
- "Combined Fixed WiMAX" on page 865
- "Combined WLAN" on page 865

- "Digital Cable TV" on page 868
- "DTMB (CTTB)" on page 864
- "DVB-T/H with T2" on page 864
- "EMI Receiver" on page 859
- "GSM/EDGE/EDGE Evo" on page 860
- "iDEN/WiDEN/MOTOTalk" on page 866
- "IQ Analyzer (Basic)" on page 860
- "ISDB-T" on page 865
- "LTE TDD" on page 864
- "LTE" on page 863
- "MSR" on page 869
- "Noise Figure" on page 862
- "Phase Noise" on page 862
- "Remote Language Compatibility" on page 866
- "SCPI Language Compatibility " on page 868
- "Spectrum Analyzer" on page 859
- "TD-SCDMA with HSPA/8PSK" on page 862
- "Vector Signal Analyzer (VXA)" on page 861
- "W-CDMA with HSPA+" on page 860
- "WLAN" on page 869

Mode Preset

Returns the active mode to a known state.

Mode Preset does the following for the currently active mode:

- Aborts the currently running measurement.
- Brings up the default menu for the mode, with no active function.
- Sets measurement Global settings to their preset values for the active mode only.
- Activates the default measurement.
- Brings up the default menu for the mode.
- Clears the input and output buffers.
- Sets Status Byte to 0.

Mode Preset does not:

- Cause a mode switch
- Affect mode persistent settings
- Affect system settings

See "How-To Preset" on page 877 for more information.

Key Path	Front-panel key
Remote Command	`:SYSTem:PRESet`
Example	:SYST:PRES
Notes	*RST is preferred over :SYST:PRES for remote operation. *RST does a Mode Preset, as done by the :SYST:PRES command, and it sets the measurement mode to Single measurement rather than Continuous for optimal remote control throughput. Clears all pending OPC bits. The Status Byte is set to 0.
Couplings	A Mode Preset aborts the currently running measurement, activates the default measurement, and. gets the mode to a consistent state with all of the default couplings set.
Backwards Compatibility Notes	In the X-Series, the legacy "Factory Preset" has been replaced with Mode Preset, which only presets the currently active mode, not the entire instrument. In the X-Series, the way in to preset the entire instrument is by using System, Restore System Defaults All, which behaves essentially the same way as restore System Defaults does on ESA and PSA. There is also no "Preset Type" as there is on the PSA. There is a green Mode Preset front-panel key that does a Mode Preset and a white-with-green-letters User Preset front-panel key that does a User Preset. The old PRESet:TYPE command is ignored (without generating an error), and SYST:PRES without a parameter does a Mode Preset, which should cover most backward code compatibility issues. The settings and correction data under the Input/Output front-panel key (examples: Input Z Corr, Ext Amp Gain, etc.) are no longer part of any Mode, so they will not be preset by a Mode Preset. They are

	preset using Restore Input/Output Defaults, Restore System Defaults All. Note that because User Preset does a Recall State, and all of these settings are saved in State, they ARE recalled when using User Preset.
Initial S/W Revision	Prior to A.02.00

How-To Preset

The table below shows all possible presets, their corresponding SCPI commands and front-panel access (key paths). Instrument settings depend on the current measurement context. Some settings are local to the current measurement, some are global (common) across all the measurements in the current mode, and some are global to all the available modes. In a similar way, restoring the settings to their preset state can be done within the different contexts.

- Auto Couple - is a measurement local key. It sets all Auto/Man parameter couplings in the measurement to Auto. Any Auto/Man selection that is local to other measurements in the mode will not be affected.
- Meas Preset - is a measurement local key. Meas Preset resets all the variables local to the current measurement except the persistent ones.
- Mode Preset - resets all the current mode's measurement local and measurement global variables except the persistent ones.
- Restore Mode Defaults - resets ALL the Mode variables (and all the Meas global and Meas local variables), including the persistent ones.

Type Of Preset	SCPI Command	Front Panel Access
Auto Couple	:COUPle ALL	Auto Couple front-panel key
Meas Preset	:CONFigure:<Measurement>	Meas Setup Menu
Mode Preset	:SYSTem:PRESet	Mode Preset (green key)
Restore Mode Defaults	:INSTrument:DEFault	Mode Setup Menu
Restore All Mode Defaults	:SYSTem:DEFault MODes	System Menu; Restore System Default Menu
*RST	*RST	not possible (Mode Preset with Single)
Restore Input/Output Defaults	:SYSTem:DEFault INPut	System Menu; Restore System Default Menu
Restore Power On Defaults	:SYSTem:DEFault PON	System Menu; Restore System Default Menu
Restore Alignment Defaults	:SYSTem:DEFault ALIGn	System Menu; Restore System Default Menu
Restore Miscellaneous Defaults	:SYSTem:DEFault MISC	System Menu; Restore System Default Menu

Restore All System Defaults	:SYSTem:DEFault [ALL] :SYSTem:PRESet:PERSistent	System Menu; Restore System Default Menu
User Preset	:SYSTem:PRESet:USER	User Preset Menu
User Preset All Modes	:SYSTem:PRESet:USER:ALL	User Preset Menu
Power On Mode Preset	:SYSTem:PON:TYPE MODE	System Menu
Power On User Preset	:SYSTem:PON:TYPE USER	System Menu
Power On Last State	:SYSTem:PON:TYPE LAST	System Menu

Mode Setup

This menu allows you to select 8560 series analyzer emulation, or 8566A/B, 8568A/B emulation, and hence the remote control command set that will be recognized by the X-Series instrument.

Key Path	Front-panel Key
Remote Command	`:SYSTem:LANGuage HP8560E | HP8561E | HP8562E | HP8563E | HP8564E | HP8565E | HP8566A | HP8566B | HP8568A | HP8568B` `:SYSTem:LANGuage?`
Default	HP8563E

HP8560 series, HP8566/68

These keys have submenus that allow you to select which legacy analyzer to emulate. The selected analyzer type determines the response to the ID? command, and affects the behavior of commands such as IP. You can use any command offered by any of the legacy analyzers, regardless of the language setting. However, if the command is not correct for the selected legacy analyzer, the command may not work as expected.

The legacy analyzer emulation selection in this menu does not affect the response to the SCPI query *IDN?. This query still returns the model number and firmware version number of the X-Series instrument.

The legacy instrument selections are as follows:

Key	Response to Command ID?	Notes
8560E/EC	HP8560E	Selects 8560E/EC remote programming language
8561E/EC	HP8561E	Selects 8561E/EC remote programming language
8562E/EC	HP8562E	Selects 8562E/EC remote programming language
8563E/EC	HP8563E	Selects 8563E/EC remote programming language This is the **default** selection for the N9061A application.
8564E/EC	HP8564E	Selects 8564E/EC remote programming language
8565E/EC	HP8565E	Selects 8565E/EC remote programming language
HP8566A	HP8566A	Selects HP8566A remote programming language
HP8566B	HP8566B	Selects HP8566B remote programming language
HP8568A	HP8568A	Selects HP8568A remote programming language
HP8568B	HP8568B	Selects HP8568B remote programming language

Selecting any legacy analyzer from this menu performs an instrument preset and sets Span, Trace Points, couplings, VBW/RBW ratio, and Span/RBW ratio appropriately, as shown in the table below.

Span, Trace Points, Couplings, VBW/RBW Ratio, and Span/RBW Ratio Settings

Remote Language	Start Freq.	Stop Freq.	Number of Trace Points	RF Coupling	VBW/RBW Ratio	Span/RBW Ratio
8560E/EC	30 Hz	2.9 GHz	601	AC	1	91
8561E/EC	30 Hz	6.5 GHz	601	AC	1	91
8562E/EC	30 Hz	13.2 GHz	601	AC	1	91
8563E/EC	30 Hz	26.5 GHz	601	DC	1	91
8564E/EC	30 Hz	40 GHz	601	DC	1	91
8565E/EC	30 Hz	50 GHz	601	DC	1	91
HP8566A	2 GHz	22 GHz	1001	DC	3 (VBW one step wider than RBW)	106
HP8566B	2 GHz	22 GHz	1001	DC	3 (VBW one step wider than RBW)	106
HP8568A	0 Hz	1.5 GHz	1001	DC	3 (VBW one step wider than RBW)	106
HP8568B	0 Hz	1.5 GHz	1001	DC	3 (VBW one step wider than RBW)	106

Key Path	Mode Setup

Cmd Error

Turning Cmd Error On or Off enables or disables the display of the "CMD ERR" error messages. The default setting is On. The error message appears in the Message bar and also can be queried using ERR?. The error message occurs if either the command syntax or any of its parameters are incorrectly formed. The selected value is preserved after presetting or power cycling the instrument. Disabling the display of command errors disables the display of all error types.

The format of the errors are as follows:

1. CMD ERR, <string>

This string is limited to the first 20 characters of the input string (message unit).

Further details of these errors, after they have occurred, can be reviewed in the Cmd Error Log, provided that Cmd Error Logging is enabled.

Key Path	Mode Setup

Preset	Previously-selected value
Default	On

Logging

N9061A supports logging of errors. These errors comprise details of command errors and legacy commands that have been received but are not supported by the N9061A application.

To enable and view the error log, press the Mode Setup hardkey on the front panel, then press the Logging softkey.

Key Path	Mode Setup

Previous Page/Next Page

When you are in the Logging menu, the main Signal Analysis display is obscured by the logging page. The most recent log starts from the bottom of the window. Previous Page and Next Page allow you to scroll through the log file. To include commands sent to the instrument since the log window display was opened, press Refresh.

Key Path	Mode Setup, Logging

Cmd Error Log

Allows you to turn the command error logging on or off.

Logging should not be used in a secure environment.

- When set to On, all error messages are stored in a log file, regardless of whether they have been displayed on the screen.
- When set to Off, no further command error messages are written to the log file. Switching Cmd Error Log to Off does not clear the log file. The default is Off.

The log file is also stored as a text file, called Logfile.txt, on the instrument. It is stored in the D:\ drive, in the folder: \User_My_Documents\[USERNAME]\My Documents\RLC\data.

The maximum size of the log is 10 MB. When the file reaches its maximum size, the first ten percent of the file is automatically discarded, to clear space for subsequent error messages.

Key Path	Mode Setup, Logging

Refresh

To update the log page with new entries, select Refresh.

Key Path	Mode Setup, Logging

Clear Log

Clears the error log.

The log can only be cleared by using the Clear Log function. It is **not** cleared on power-up, remote language switch or mode switch.

Key Path	Mode Setup, Logging

Preferences

The Preferences menu allows you to configure some instrument settings.

Preferences are not affected by a power cycle, a remote language change, a mode switching or a mode preset. They are only preset to their default state by using the Restore Mode Defaults key in the "Mode Setup" on page 879 menu , or by sending the :INSTrument:DEFault (see "Restore Mode Defaults" on page 884) or :SYSTem:PRESet (see "Mode Preset" on page 876) commands.

Key Path	Mode Setup

Limit RBW/VBW

Setting Limit RBW/VBW to ON limits the valid resolution bandwidth (RBW) and video bandwidth (VBW) values to those appropriate for the currently selected remote language. While this limitation reduces measurement flexibility, it helps to ensure that the measurement time in emulation mode is the same as the legacy measurement time, and ensures that the responses to RB? and VB? match the legacy instrument.

Setting this key to OFF causes the RBW and VBW filters to use the X-Series instrument range of values for all remote languages.

Key Path	Mode Setup, Preferences
Remote Command	`[:SENSe]:RLC:BANDwidth:LIMit ON|OFF|1|0` `[:SENSe]:RLC:BANDwidth:LIMit?`
Preset	ON
Notes	If the selected RLC Language is HP8566A/B or HP8568A/B, setting this parameter to ON causes the Resolution and Video Bandwidths to be limited to the following range of values: • Resolution Bandwidth Range: 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300kHz, 1 MHz, 3 MHz • Video Bandwidth Range: 1 Hz, 3 Hz, 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300kHz, 1 MHz, 3 MHz If the selected RLC Language is HP856x, setting this parameter to ON causes the Resolution and Video Bandwidths to be limited to the following range of values: • Resolution Bandwidth Range: 1 Hz, 3 Hz, 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1

kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300kHz, 1 MHz, 2 MHz

- Video Bandwidth Range: 1 Hz, 3 Hz, 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300kHz, 1 MHz, 3 MHz

If the detector type is set to Quasi Peak, EMI Peak, MIL Peak, EMI Average or Average, these restrictions on Resolution and Video Bandwidth range switch to the base X-Series range of bandwidths.

Setting this parameter to OFF causes the Resolution & Video bandwidth filters to use the base X-Series range of values.

Unaffected by power cycle or mode preset, but may be preset using "Restore Mode Defaults" on page 884.

Atten Offset

Setting Atten Offset to ON allows greater input power to be applied to the instrument, while significantly increasing the noise floor. Since many of the older spectrum analyzers had noise floor 10 dB higher than the X-Series instruments, this gives the most accurate emulation.

The default state is OFF.

Key Path	Mode Setup, Preferences
Remote Command	`[:SENSe]:RLC:ATTenuation:STATe ON|OFF|1|0` `[:SENSe]:RLC:ATTenuation:STATe?`
Preset	OFF
Notes	Unaffected by power cycle or mode preset, but may be preset using "Restore Mode Defaults" on page 884.

Swp Type Rule

Changes the Auto rules for determining whether the instrument uses FFT or Swept mode (this can be manually overridden). FFT mode offers substantially faster measurements in some cases.

The HP8566A/B, 8568A/B series did not have FFT mode capability, so most accurate emulation requires that the instrument preserves Swept mode, unless you manually override that setting.

The 8560-series analyzers use both FFT and Swept mode, in which case “Legacy” is equivalent to “Dynamic range”.

Key Path	Mode Setup, Preferences
Remote Command	`[:SENSe]:RLC:SWEep:TYPE:AUTO:RULes AUTO|SPEed|DRANge|LEGACY` `[:SENSe]:RLC:SWEep:TYPE:AUTO:RULes?`
Preset	AUTO
Notes	Unaffected by power cycle or mode preset, but may be preset using "Restore Mode Defaults" on page 884.

Limit Swp Time

Allows you to constrain the sweep time to no less than the minimum sweep time of the legacy instrument.

- If set to ON, the sweep time is constrained to no less than the value listed below.
- If set to OFF, no constraint is applied.

Minimum Sweep Time for the Legacy Instruments

Instrument	Sweep Time (Non-Zero Span)	Sweep Time (Zero Span)
HP8566A/B, HP8568A/B	20 ms	1 µs
HP8560 series	50 ms	50 µs

Key Path	Mode Setup, Preferences
Remote Command	`[:SENSe]:RLC:SWEep:TIME:LIMit ON|OFF|1|0` `[:SENSe]:RLC:SWEep:TIME:LIMit?`
Preset	OFF
Notes	Unaffected by power cycle or mode preset, but may be preset using "Restore Mode Defaults" on page 884

Restore Mode Defaults

Resets the state for the currently active mode by resetting the mode persistent setting to their default values and by performing a mode preset. This function never causes a mode switch. This function performs a full preset on the active mode.

Remote Command	`:INSTrument:DEFault`
Key Path	Mode Setup

Preset Type (Remote Command Only)

For compatibility with ESA/PSA, the command PRESet:TYPE is implemented as a no-op.

Mode	All
Remote Command	`:SYSTem:PRESet:TYPE FACTory|MODE|USER` `:SYSTem:PRESet:TYPE?`
Example	:SYST:PRES:TYPE FACT
Notes	This command is supported for backward compatibility only. It is a no-op and does not change the behavior of any preset operation.
Preset	This is unaffected by Preset, but is set to MODE by Restore System Defaults, All.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Global Settings

Opens a menu that allows you to switch certain Meas Global parameters to a Mode Global state. These switches apply to all Modes that support global settings. No matter what Mode you are in when you set the "Global Center Frequency" switch to on, it applies to all Modes that support Global Settings.

Key Path	Mode Setup
Initial S/W Revision	Prior to A.02.00

Global Center Freq

The software maintains a Mode Global value called "Global Center Freq".

When the Global Center Freq key is switched to On in any mode, the current mode's center frequency is copied into the Global Center Frequency, and from then on all modes that support global settings use the Global Center Frequency. So you can switch between any of these modes and the Center Freq will remain unchanged.

Adjusting the Center Freq of any mode which supports Global Settings, while Global Center Freq is On, will modify the Global Center Frequency.

When Global Center Freq is turned Off, the Center Freq of the current mode is unchanged, but now the Center Freq of each mode is once again independent.

When Mode Preset is pressed while Global Center Freq is On, the Global Center Freq is preset to the preset Center Freq of the current mode.

This function is reset to Off when the Restore Defaults key is pressed in the Global Settings menu, or when System, Restore Defaults, All Modes is pressed.

Key Path	Mode Setup, Global Settings
Scope	Mode Global
Remote Command	`:INSTrument:COUPle:FREQuency:CENTer ALL|NONE` `:INSTrument:COUPle:FREQuency:CENTer?`
Example	INST:COUP:FREQ:CENT ALL INST:COUP:FREQ:CENT?
Preset	Set to Off on Global Settings, Restore Defaults and System, Restore Defaults, All Modes
Range	On|Off
Initial S/W Revision	Prior to A.02.00

Remote Command	`:GLOBal:FREQuency:CENTer[:STATe] 1|0|ON|OFF` `:GLOBal:FREQuency:CENTer[:STATe]?`

Preset	Off
Initial S/W Revision	Prior to A.02.00

Restore Defaults

This key resets all of the functions in the Global Settings menu to Off. This also occurs when System, Restore Defaults, All Modes is pressed.

Key Path	Mode Setup, Global Settings
Remote Command	`:INSTrument:COUPle:DEFault`
Example	INST:COUP:DEF
Backwards Compatibility SCPI	`:GLOBal:DEFault`
Initial S/W Revision	Prior to A.02.00

Peak Search

Pressing the Peak Search key displays the Peak Search menu and places the selected marker on the trace point with the maximum y-axis value for that marker's trace. The Peak Search features allow you to define specific search criteria to determine which signals can be considered peaks, excluding unwanted signals from the search.

For all Peak Search functions, if you are in the Trace Zoom View of the Swept SA measurement, and the bottom window is selected, the search function will operate **only** within that window. This allows you to perform a Peak Search over a specified, limited frequency range, while still viewing the larger frequency range in the top window.

See "More Information" on page 887.

Key Path	Front-panel key
Remote Command	`:CALCulate:MARKer[1]|2|...12:MAXimum`
Example	CALC:MARK2:MAX performs a peak search using marker 2. CALC:MARK2:Y? queries the marker amplitude (Y-axis) value for marker 2. CALC:MARK2:X? queries the marker frequency or time (X-axis) value for marker 2. SYST:ERR?can be used to query the errors to determine if a peak is found. The message "No peak found" will be returned after an unsuccessful search.
Notes	Sending this command selects the sub-opcoded marker.
Initial S/W Revision	Prior to A.02.00

More Information

The behavior of a Peak Search is dependent on settings under the Peak Criteria softkey on the second page of the menu. If Same as "Next Peak" Criteria is selected, and either Pk Excursion or Pk Threshold are on, a signal must meet those criteria to be considered a peak. If no valid peak is found, a "No peak found" message is generated and the marker is not moved.. When Highest Peak is on, or both Pk Excursion and Pk Threshold are off, the marker is always placed at the point on the trace with the maximum y-axis value, even if that point is on the very edge of the trace (exception: negative frequencies and signals close to the LO are not searched at all.

Pressing Peak Search with the selected marker off causes the selected marker to be set to Normal at the center of the screen, then a peak search is immediately performed.

Pressing the front panel Peak Search key always does a peak search. Occasionally, you may need to get to the Peak Search menu key functions without doing a peak search. You can do this by first accessing the Peak Search menu. Then go to the other menus that you need to access. Finally, you can get back to the Peak Search key menu by using the front panel Return key and pressing it as many times as required to navigate back through the previously accessed menus until you get back to the Peak Search menu.

Next Peak

Pressing Next Peak moves the selected marker to the peak that has the next highest amplitude less than the marker's current value. Only peaks which meet all enabled peak criteria are considered. If there is no valid peak lower than the current marker position, a “No peak found” message is generated and the marker is not moved.

If the selected marker was off, then it is turned on as a normal marker and a peak search is performed.

Key Path	Peak Search
Remote Command	`:CALCulate:MARKer[1]|2|...12:MAXimum:NEXT`
Example	CALC:MARK2:MAX:NEXT Selects marker 2 and moves it to the peak that is closest in amplitude to the current peak, but the next lower value.
Notes	Sending this command selects the subopcoded marker.
State Saved	Not part of saved state.
Initial S/W Revision	Prior to A.02.00

Next Pk Right

Pressing Next Pk Right moves the selected marker to the nearest peak right of the current marker that meets all enabled peak criteria. If there is no valid peak to the right of the current marker position, a “No peak found” message is generated and the marker is not moved.

If the selected marker was off, then it is turned on as a normal marker and a peak search is performed.

Key Path	Peak Search
Remote Command	`:CALCulate:MARKer[1]|2|...12:MAXimum:RIGHt`
Example	CALC:MARK2:MAX:RIGH Selects marker 2 and moves it to the next peak to the right of the current marker position.
Notes	Sending this command selects the subopcoded marker.
State Saved	Not part of saved state.
Initial S/W Revision	Prior to A.02.00

Next Pk Left

Pressing Next Pk Left moves the selected marker to the nearest peak left of the current marker that meets all enabled peak criteria. If there is no valid peak to the left of the current marker position, a “No peak found” message is generated and the marker is not moved.

If the selected marker was off, then it is turned on as a normal marker and a peak search is performed.

Key Path	Peak Search
Remote Command	`:CALCulate:MARKer[1]|2|...12:MAXimum:LEFT`
Example	CALC:MARK2:MAX:LEFT selects marker 2 and moves it to the next peak to the left of the current marker position.
State Saved	Not part of saved state.
Initial S/W Revision	Prior to A.02.00

Marker Delta

Performs the same function as the Delta 1-of-N selection key in the Marker menu. Basically this sets the control mode for the selected marker to Delta mode. See the Section “"Marker" on page 689” for the complete description of this function. The key is duplicated here in the Peak Search Menu to allow you to conveniently perform a peak search and change the marker’s control mode to Delta without having to access two separate menus.

Key Path	Peak Search or Marker
Notes	Whenever the selected marker is in Delta mode and you are in the Peak Search menu, the Marker Delta key should be highlighted and the active function for setting its delta value turned on.
Initial S/W Revision	Prior to A.02.00

Mkr->CF

Assigns the selected marker’s frequency to the Center Frequency setting. See the Section “"Marker To" on page 785” for the description of this function. The key is duplicated here in the Peak Search Menu to allow you to conveniently perform a peak search and marker to CF without having to access two separate menus.

Key Path	Peak Search or Marker ->
Dependencies	Same as specified under Marker To
Initial S/W Revision	Prior to A.02.00

Mkr->Ref Lvl

Assigns the selected marker’s level to the Reference Level setting. See the Section “"Marker To" on page 785” for the description of this function. The key is duplicated here in the Peak Search Menu to allow you to conveniently perform a peak search and marker to RL without having to access two separate menus.

Key Path	Peak Search or Marker ->
Dependencies	Same as specified under Marker To
Initial S/W Revision	Prior to A.02.00

Peak Criteria

Pressing this key opens the Peak Criteria menu and allows you to adjust the Pk Threshold and Pk Excursion parameters used for peak search functions.

For a signal to be identified as a peak it must meet certain criteria. Signals in the negative frequency range and signals very close to 0 Hz are ignored. If either the peak excursion or peak threshold functions are on, then the signal must satisfy those criteria before being identified as a peak.

When peak excursion and peak threshold are both off:

- Peak Search, Continuous Peak Search, and maximum part of Pk-Pk Search will search the trace for the point with the highest y-axis value which does not violate the LO feedthrough rules. A rising and falling slope are not required for these three peak search functions.
- The remaining search functions Next Peak, Next Pk Right, etc. will only consider trace points which have a rising and falling slope on the left and right respectively.

Key Path	Peak Search
Backwards Compatibility Notes	In the ESA, this menu was called Search Criteria; in the PSA, it was called Search Param. The menu structure in X-Series is different (for clarity) but the functionality is essentially the same. Basically, the Peak Excursion and Peak Threshold keys appeared at the top level of this menu in the PSA/ESA, whereas in the X-Series they are one level down under “Next Peak” Criteria
Initial S/W Revision	Prior to A.02.00

“Peak Search” Criteria

This menu lets you decide what kind of search you want to do when the Peak Search key is pressed (or the equivalent SCPI command sent).

Note that there are two “types” of peak search functions. One type is the “Peak Search” type, the other type is the “Next Peak” type. “Next Peak” searches (for example, Next Peak, Next Pk Left, Next Pk Right) are always checked using the Excursion and Threshold criteria as long as these criteria are On.The “Peak Search” type of search, simply finds the highest point on the trace. However you can change the “Peak Search” type of search so that it also uses the Excursion and Threshold criteria. This allows you to find the Maximum point on the trace that also obeys the Excursion and/or Threshold criteria.

When Highest Peak is selected, pressing Peak Search simply finds the highest peak on the marker’s trace. If Same as “Next Peak” Criteria is selected, then the search is also forced to consider the Excursion and Threshold found under the “Next Peak” Criteria menu.

Key Path	Peak Search, Peak Criteria
Remote Command	`:CALCulate:MARKer:PEAK:SEARch:MODE MAXimum|PARameter` `:CALCulate:MARKer:PEAK:SEARch:MODE?`
Notes	MAXimum corresponds to the Highest Peak setting PARameter corresponds to the Same as “Next Peak” Criteria setting
Preset	MAXimum
State Saved	Saved in instrument state.
Readback line	Current state
Backwards Compatibility Notes	The submenu called “Peak Search” Criteria in the X-Series was called Peak Seach Type in the ESA, and in the PSA was not a submenu but a single called Peak Search with a toggle between Param and Max. Nonetheless, the functionality and SCPI commands are identical in all three,only the structure of the user interface is different
Initial S/W Revision	Prior to A.02.00

Highest Peak

When this key is selected, pressing the Peak Search key or issuing the equivalent SCPI command finds the maximum point on the trace, subject to the peak-search qualifications. This also affects the Peak Search half of Pk-Pk search and the Continuous Peak Search.

Key Path	Peak Search, Peak Criteria, “Peak Search” Criteria
Example	CALC:MARK:PEAK:SEAR:MODE MAX
Readback	Highest Peak
Initial S/W Revision	Prior to A.02.00

Same as “Next Peak” Criteria

When this key is selected, pressing the Peak Search key or issuing the equivalent SCPI command finds the maximum point on the trace, but subject to the Excursion and Threshold set under the Next Peak Criteria menu. The search is, of course, also subject to the peak-search qualifications. This also affects the Peak Search half of Pk-Pk search and the Continuous Peak Search.

Key Path	Peak Search, Peak Criteria, “Peak Search” Criteria
Example	CALC:MARK:PEAK:SEAR:MODE PAR
Readback	Use Excurs & Thr
Initial S/W Revision	Prior to A.02.00

“Next Peak” Criteria

This key opens up a menu which allows you to independently set the Peak Excursion and Peak Threshold and turn them on and off.

Key Path	Peak Search, Peak Criteria
Backwards Compatibility Notes	In the X-Series, you can enable Pk Excursion and Pk Threshold independently, but they default to “both on”. Since “both on” is always the case in ESA and PSA, this difference should not cause code compatibility problems.
Initial S/W Revision	Prior to A.02.00

Pk Excursion

Turns the peak excursion requirement on/off and sets the excursion value. The value defines the minimum amplitude variation (rise and fall) required for a signal to be identified as peak. For example, if a value of 6 dB is selected, peak search functions like the marker Next Pk Right function move only to peaks that rise and fall 6 dB or more.

When both Pk Excursion and Pk Threshold are on, a signal must rise above the Pk Threshold value by at least the Peak Excursion value and then fall back from its local maximum by at least the Peak Excursion value to be considered a peak.

NOTE In the event that a sequence of trace points with precisely the same values represents the maximum, the leftmost point is found.

See "More Information" on page 892.

Key Path	Peak Search, Peak Criteria, “Next Peak” Criteria
Remote Command	:CALCulate:MARKer:PEAK:EXCursion <rel_ampl> :CALCulate:MARKer:PEAK:EXCursion? :CALCulate:MARKer:PEAK:EXCursion:STATe OFF|ON|0|1 :CALCulate:MARKer:PEAK:EXCursion:STATe?
Example	:CALC:MARK:PEAK:EXC:STAT ON :CALC:MARK:PEAK:EXC 30 DB sets the minimum peak excursion requirement to 30 dB
Dependencies	Available only when Y axis unit is amplitude units, otherwise grayed out.
Couplings	Whenever you adjust the value of Pk Excursion (with the knob, step keys, or by completing a numeric entry), and Peak Threshold is turned ON, the Peak Threshold Line and the Peak Excursion Region are displayed.
Preset	6.0 dB ON
Preset	6.0 dB ON
State Saved	Saved in instrument state
Min	0.0 dB
Max	100.0 dB
Initial S/W Revision	Prior to A.02.00

More Information

If two signals are very close together and the peak excursion and threshold criteria are met at the outside edges of the combined signals, this function finds the highest of these two signals as a peak (or next peak). However, if a signal appears near the edge of the screen such that the full extent of either the rising or falling edge cannot be determined, and the portion that is on screen does not meet the excursion criteria, then the signal cannot be identified as a peak.

When measuring signals near the noise floor, you can reduce the excursion value even further to make these signals recognizable. To prevent the marker from identifying noise as signals, reduce the noise floor variations to a value less than the peak-excursion value by reducing the video bandwidth or by using trace averaging.

Pk Threshold

Turns the peak threshold requirement on/off and sets the threshold value. The peak threshold value defines the minimum signal level (or min threshold) that the peak identification algorithm uses to recognize a peak.

When both Pk Excursion and Pk Threshold are on, a signal must rise above the Pk Threshold value by at least the Peak Excursion value and then fall back from its local maximum by at least the Peak Excursion value to be considered a peak.

For example, if a threshold value of –90 dBm is selected, the peak search algorithm will only consider signals with amplitude greater than the –90 dBm threshold. If a threshold value of –90 dBm is selected, and Peak Excursion is On and set to 6 dB, the peak search algorithm will only consider signals with amplitude greater than the –90 dBm threshold which rise 6 dB above the threshold and then fall back to the threshold.

Key Path	Peak Search, Peak Criteria, "Next Peak Criteria"

Remote Command	`:CALCulate:MARKer:PEAK:THReshold <ampl>`
	`:CALCulate:MARKer:PEAK:THReshold?`
	`:CALCulate:MARKer:PEAK:THReshold:STATe OFF|ON|0|1`
	`:CALCulate:MARKer:PEAK:THReshold:STATe?`

Example	CALC:MARK:PEAK:THR:STAT ON turns on the threshold criterion. CALC:MARK:PEAK:THR –60 dBm sets the threshold to –60 dBm.
Dependencies	When Ref Level Offset changes, Peak Threshold must change by the same amount.
Preset	–90.0 dBm ON
State Saved	Saved in instrument state.
Min	The current displayed Ref Level – 200 dB. The current displayed Ref Level is the current Ref Level, offset by the Ref Level Offset.
Max	The current displayed Ref Level. This means the current Ref Level, offset by the Ref Level Offset.
Default Unit	depends on the current selected Y axis unit
Initial S/W Revision	Prior to A.02.00

Pk Threshold Line

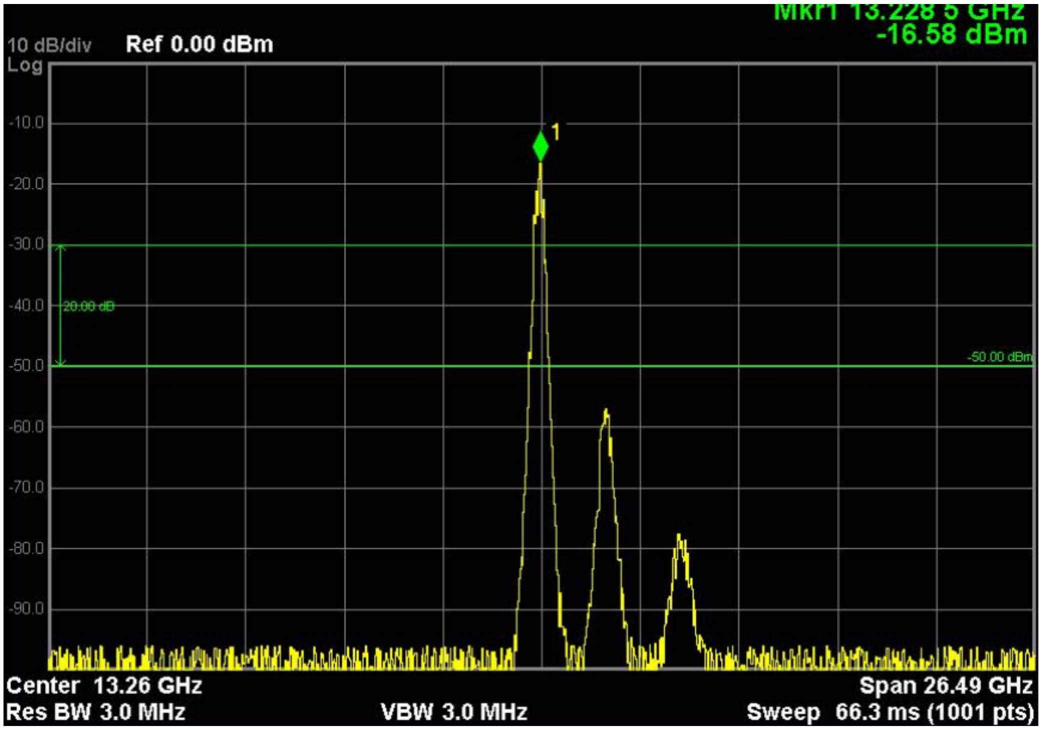
Turns the peak threshold line on or off. Preset state is off. No equivalent SCPI command.

See "More Information" on page 893.

Key Path	Peak Search, Peak Criteria, "Next Peak" Criteria
Initial S/W Revision	Prior to A.02.00

More Information

The Peak Threshold line is green and has the value of the peak threshold (for example, "–20.3 dBm") written above its right side, above the line itself. If Peak Excursion is ON it shows on the left side as a region above the Peak Threshold line. As with all such lines (Display Line, Trigger Level line, etc) it is drawn on top of all traces.



This function is automatically set to ON (thus turning on the Peak Threshold line) whenever the value of Peak Threshold or Peak Excursion becomes the active function, unless Peak Threshold is OFF. It is automatically set to OFF whenever Peak Threshold is set to OFF. Manually turning it ON automatically turns on Pk Threshold.

The Peak Excursion part is on whenever the Pk Threshold part is on, unless Peak Excursion is OFF.

Peak Table

Opens the Peak Table menu.

The Peak Table provides a displayed list of up to 20 signal peaks from the selected trace. If more than one trace window is displayed, the selected trace in the selected window is used. If there are more than 20 signals which meet the peak search criteria, only the 20 highest peaks are listed.

The Peak Table is updated after each sweep. The list of peaks in the Peak Table can be ordered either by ascending frequency or by descending amplitude. In either case, the entire trace is first evaluated and the 20 highest peaks are selected for inclusion in the list. After the peaks are selected, they are then sorted and displayed according to the Peak Sort setting.

Key Path	Peak Search
Initial S/W Revision	Prior to A.02.00

Peak Table On/Off

Turns Peak Table on/off. When turned on, the display is split into a measurement window and a peak table display window.

Turning the Peak Table on turns the Marker Table off and vice versa.

Key Path	Peak Search, Peak Table
Remote Command	`:CALCulate:MARKer:PEAK:TABLe:STATe OFF|ON|0|1` `:CALCulate:MARKer:PEAK:TABLe:STATe?`
Example	CALC:MARK:PEAK:TABL:STAT ON Turns on and displays the peak table.
Dependencies	When the Peak Table turns on, if Peak Threshold is On then it becomes the active function.
Preset	OFF
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Peak Sort

Sets the peak table sorting routine to list the peaks in order of descending amplitude or ascending frequency. The remote command can also be used to sort the peaks found using the :CALCulate:DATA:PEAKs command.

Key Path	Peak Search, Peak Table
Remote Command	`:CALCulate:MARKer:PEAK:SORT FREQuency|AMPLitude` `:CALCulate:MARKer:PEAK:SORT?`
Example	CALC:MARK:PEAK:SORT AMPL Sets sorting routine to list peaks in order of descending amplitude. CALC:MARK:PEAK:SORT?
Preset	AMPLitude
Preset	AMPLitude
State Saved	Saved in instrument state.
Backwards Compatibility SCPI	`:TRACe:MATH:PEAK:SORT` for ESA backward compatibility.
Backwards Compatibility Notes	In the ESA, when Peak Sort was set to ascending frequency, the Peak Table search algorithm would search left to right, including every peak which met the search criteria until the table was full, even if that meant only part of the trace was searched. In the X-Series, the sort is done correctly, sorting the top 20 peaks by ascending frequency.
Initial S/W Revision	Prior to A.02.00

Peak Readout

Shows up to twenty signal peaks as defined by the setting:

All (ALL) – lists all the peaks defined by the peak criteria, in the current sort setting.

Above Display Line (GTDLine) – lists the peaks that are greater than the defined display line, and that meet the peak criteria. They are listed in the current sort order.

Below Display Line (LTDLine) - lists the peaks that are less than the defined display line, and that meet the peak criteria. They are listed in the current sort order.

If the peak threshold is defined and turned on, then the peaks must meet this peak criteria in addition to the display line requirements.

See "More Information" on page 896.

Key Path	Peak Search, Peak Table
Remote Command	`:CALCulate:MARKer:PEAK:TABLe:READout ALL|GTDLine|LTDLine` `:CALCulate:MARKer:PEAK:TABLe:READout?`
Example	CALC:MARK:PEAK:TABL:READ GTDL
Dependencies	Turning Display Line off forces Readout to ALL
Preset	All
Preset	All
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Backwards Compatibility Notes	In ESA the display line does not have to be on for a peak to be qualified “above display line” or “below display line.” In X-Series the display line has to be on to be used to exclude peaks.
Initial S/W Revision	Prior to A.02.00

More Information

If the Display Line (see the Section “View/Display”) is turned on, the Peak Table can be selected to include all peaks, only those above the Display Line, or only those below the Display Line. See Figures 1–2 and 1–3 to understand what happens if both Display Line and Pk Threshold are turned on.

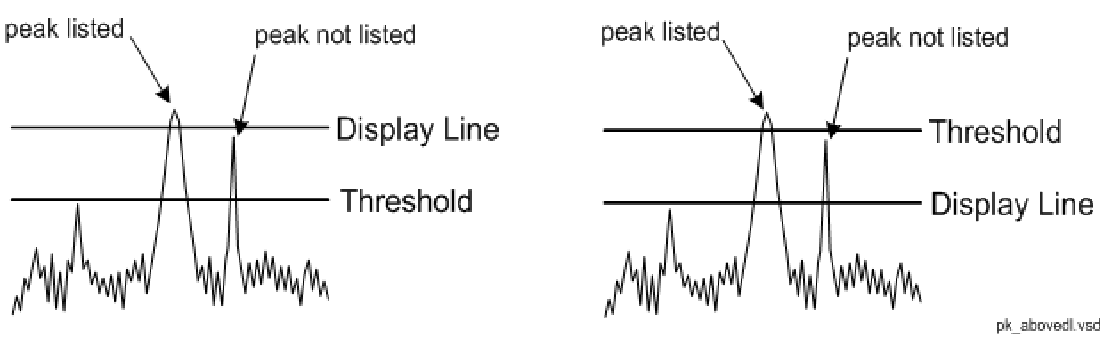


Figure 1- 2 Above Display Line Peak Identification

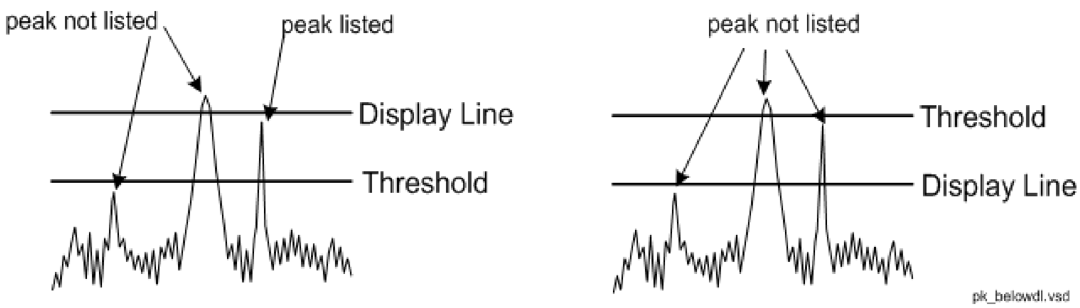


Figure 1- 3Below Display Line Peak Identification

All

Sets the peak table to display the 20 highest peaks in the order specified by the current Peak Sort setting. If the Peak Criteria are turned on, then only peaks that meet the defined Pk Excursion and Pk Threshold values will be found.

Key Path	Peak Search, Peak Table, Peak Readout
Example	CALC:MARK:PEAK:TABL:READ ALL
Notes	Auto return after pressed
Readback	All
Initial S/W Revision	Prior to A.02.00

Above Display Line

Sets the peak table to display only the 20 highest peaks above the display line in the order specified by the current Sort setting. If the Peak Criteria are turned on, then only peaks that meet the defined criteria will be found. If the display line is not already on, it is turned on (it has to be on or it cannot be used to exclude peaks).

Key Path	Peak Search, Peak Table, Peak Readout
Example	CALC:MARK:PEAK:TABL:READ GTDL
Notes	Auto return after pressed
Dependencies	When Above Display Line is selected, Display Line is turned on and becomes the active function.
Readback	Above DL
Initial S/W Revision	Prior to A.02.00

Below Display Line

Sets the peak table to display only the 20 highest peaks below the display line as defined by the peak in the order specified by the current Sort setting. If the Peak Criteria are turned on, then only peaks that meet the defined criteria will be found. If the display line is not already on, it is turned on (it has to be on or it cannot be used to exclude peaks).

Key Path	Peak Search, Peak Table, Peak Readout
Example	CALC:MARK:PEAK:TABL:READ LTDL
Notes	Auto return after pressed
Dependencies	When Below Display Line is selected, Display Line is turned on and becomes the active function.
Readback	Below DL
Initial S/W Revision	Prior to A.02.00

Continuous Peak Search

Turns Continuous Peak Search on or off. When Continuous Peak Search is on, a peak search is automatically performed for the selected marker after each sweep. The rules for finding the peak are exactly the same as for Peak Search, including the use of the peak criteria rules. If no valid peak is found, a “No peak found” message is generated after each sweep.

See "More Information" on page 899.

Key Path	Peak Search
Remote Command	`:CALCulate:MARKer[1]|2|...12:CPSearch[:STATe] ON|OFF|1|0` `:CALCulate:MARKer[1]|2|...12:CPSearch[:STATe]?`
Example	CALC:MARK:CPS ON Turns on Continuous Peak Search.
Notes	Sending this command selects the subopcoded marker
Couplings	The Continuous Peak Search key is grayed out when the selected marker is a Fixed marker. Also, if Continuous Peak Search is on and the selected marker becomes a fixed marker, then Continuous Peak Search is turned off and the key grayed out. Signal Track and Continuous Peak Search are mutually exclusive so if Signal Track is on, Continuous Peak Search will be grayed out and vice versa.
Preset	Mode Preset
State Saved	Saved in instrument state.
Status Bits/OPC dependencies	The Measuring bit should remain set while this command is operating and should not go false until the marker position has been updated.
Backwards Compatibility Notes	In ESA and PSA, the Continuous Pk function would only consider a peak within a small window relative to the marker’s previous position, and thus was designed to track a signal drifting in frequency but with similar amplitude. The new Continuous Peak Search function simply performs a Peak Search operation after each sweep with no regard for the marker’s previous position. Because of this difference, the SCPI commands for the old command (CPEak) is not accepted by the X-Series. Also in ESA and PSA, Continuous Pk was grayed out when span equaled zero. The new Continuous Peak Search function will be available within zero span. Also in ESA and PSA, turning Continuous Pk on would not automatically execute a peak search. A peak search would not be performed until the end of the next sweep. The new Continuous Peak Search function will perform a peak search when it is turned on, without waiting for the next sweep

	to complete.
Initial S/W Revision	Prior to A.02.00

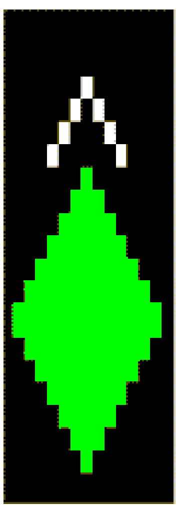
More Information

When Continuous Peak Search is turned on a peak search is immediately performed and then is repeated after each sweep. If Continuous Peak Search is turned on with the selected marker off, the selected marker is set to Normal at the center of the screen, and then a peak search is immediately performed and subsequently repeated after each sweep.

When in Continuous Peak Search, *OPC will not return true, nor will READ or MEASure return any data, until the sweep is complete and the marker has been re-peaked. Note further that if the analyzer is in a measurement such as averaging, and Continuous Peak Search is on, the entire measurement will be allowed to complete (i.e., all the averages taken up to the average number) before the repeak takes place, and only THEN will *OPC go true and READ or MEASure return data.

Note that this function is not the “Continuous Peak” function found in some other instruments. That function was designed to track the signal; this function simply does a Peak Search after each sweep.

When Continuous Peak Search is turned on for a marker, a little “hat” is placed above the marker.



Pk-Pk Search

Finds and displays the amplitude and frequency (or time, if in zero span) differences between the highest and lowest y-axis value. It places the selected marker on the minimum value on its selected trace. And it places that marker’s reference marker on the peak of its selected trace. This function turns on the reference marker and sets its mode to Fixed if it is not already on. (These markers may be on two different traces.)

The rules for finding the maximum peak are exactly the same as for Peak Search, including the use of the peak criteria rules. However, the minimum trace value is not required to meet any criteria other than being the minimum y-axis value in the trace.

If the selected marker is off, a delta type marker is turned on and the peak-to-peak search is done. If the selected marker is on, but it is not a delta marker, then it is changed to delta which turns on the reference marker if needed, and then it performs the peak-to-peak function.

Key Path	Peak Search
Remote Command	`:CALCulate:MARKer[1]|2|...12:PTPeak`
Example	CALC:MARK:PTP CALC:MARK:Y? queries the delta amplitude value for marker 1.
Notes	Turns on the Marker Δ active function.
Notes	Sending this command selects the subopcoded marker.
Dependencies	Pk-Pk Search is grayed out when Coupled Markers is on.
Couplings	The selected marker becomes a delta marker if not already in delta mode.
State Saved	Not part of saved state.
Initial S/W Revision	Prior to A.02.00

Min Search

Moves the selected marker to the minimum y-axis value on the current trace. Minimum (negative) peak searches do not have to meet the peak search criteria. It just looks for the lowest y-axis value. If the selected marker is Off, it is turned on before the minimum search is performed.

Key Path	Peak Search
Remote Command	`:CALCulate:MARKer[1]|2|...12:MINimum`
Example	CALC:MARK:MIN Selects marker 1 and moves it to the minimum amplitude value.
Notes	Sending this command selects the subopcoded marker.
State Saved	Not part of saved state.
Initial S/W Revision	Prior to A.02.00

Peak Data Query (RemoteCommand Only)

This command works the same way in this and many other measurements. For details about this key, see "Remote Measurement Functions" on page 163.

Query the Signal Peaks (Remote Command Only)

Provided for backwards compatibility with ESA and PSA. It is recommended that you use CALC:DATA:PEAK instead.

Outputs the signal peaks by frequency or by amplitude. This command uses only Trace 1 data. The sort mode is determined by the command :TRACe:MATH:PEAK:SORT. The commands :CALCulate:MARKer:PEAK:EXCursion and :CALCulate:MARKer:PEAK:THReshold are used to determine what is a signal peak. To get the number of signals found meeting the specified limits, use the query :TRACe:MATH:PEAK:POINts?

Remote Command	:TRACe:MATH:PEAK[:DATA]?
Example	TRAC:MATH:PEAK? Will identify the peaks of trace 1 that are above the Peak Threshold (if Threshold is ON) and have an excursion above the Peak Excursion (if Excursion is ON).
Initial S/W Revision	Prior to A.02.00

Query Number of Peaks Found (Remote Command Only)

Provided for backwards compatibility with ESA and PSA. It is recommended that you use CALC:DATA:PEAK instead.

Outputs the number of signal peaks identified. The amplitude of the peaks can then

be queried with :TRACe:MATH:PEAK:DATA? This command uses only Trace 1

data.

Remote Command	:TRACe:MATH:PEAK:POINts?
Example	TRAC:MATH:PEAK:POINts? Will identify the number of peaks of trace 1 that are above the Peak Threshold (if Threshold is ON) and have an excursion above the Peak Excursion (if Excursion is ON).
Initial S/W Revision	Prior to A.02.00

Peak Search All Traces

In the Spectrogram View, when the Peak Search All Traces key is pressed, a Peak Search is executed that finds the highest point on ALL of the drawn traces in the Spectrogram window. The marker moves there and the Display Trace changes to the trace on which the peak was found.

This function obeys the Peak Criteria in the same way as the normal Peak Search function does.

Remote Command	:CALCulate:MARKer[1]|2|...12:MAXimum:ALL
Example	CALC:MARK2:MAX:ALL SYST:ERR? can be used to query the errors to determine if a peak is found. The message “No peak found” will be returned after an unsuccessful search.
Notes	Sending this command selects the subopcoded marker.
Dependencies	Only appears in the Spectrogram View. If sent outside of Spectrogram, generates an error
Initial S/W Revision	A.10.01

Quick Save

The Quick Save front-panel key repeats the most recent save that was performed from the Save menu, with the following exceptions:

- Register saves are not remembered as Saves for the purpose of the Quick Save function
- If the current measurement does not support the last non-register save that was performed, an informational message is generated, “File type not supported for this measurement”

Quick Save repeats the last type of qualified save (that is, a save qualified by the above criteria) in the last save directory by creating a unique filename using the Auto File Naming algorithm described below.

If Quick Save is pressed after startup and before any qualified Save has been performed, the Quick Save function performs a Screen Image save using the current settings for Screen Image saves (current theme, current directory), which then becomes the “last save” for the purpose of subsequent Quick Saves.

The Auto File Naming feature automatically generates a file name for use when saving a file. The filename consists of a prefix and suffix separated by a dot, as is standard for the Windows® file system. A default prefix exists for each of the available file types:

Type	Default Prefix	Menu
State	State_	(Save/Recall)
Trace + State	State_	(Save/Recall)
Screen	Screen_	(Save/Recall)
Amplitude Corrections	Ampcor_	(Import/Export)
Traces	Trace_	(Import/Export)
Limit Lines	LLine_	(Import/Export)
Measurement Result	MeasR_	(Import/Export)
Capture Buffer	CapBuf_	(Import/Export)

A four digit number is appended to the prefix to create a unique file name. The numbering sequence starts at 0000 within each Mode for each file type and updates incrementally to 9999, then wraps to 0000 again. It remembers where it was through a Mode Preset and when leaving and returning to the Mode. It is reset by Restore Misc Defaults and Restore System Defaults and subsequent running of the instrument application. So, for example, the first auto file name generated for State files is State_0000.state. The next is State_0001, and so forth.

One of the key features of Auto File Name is that we guarantee that the Auto File Name will never conflict with an existing file.The algorithm looks for the next available number. If it gets to 9999, then it looks for holes. If it find no holes, that is no more numbers are available, it gives an error.

For example, if when we get to State_0010.state there is already a State_0010.state file in the current directory, it advances the counter to State_0011.state to ensure that no conflict will exist (and then it verifies that State_0011.state also does not exist in the current directory and advances again if it does, and so forth).

If you enter a file name for a given file type, then the prefix becomes the filename you entered instead of the default prefix, followed by an underscore. The last four letters (the suffix) are the 4-digit number.

For example, if you save a measurement results file as “fred.csv”, then the next auto file name chosen for a measurement results save will be fred_0000.csv.

NOTE	Although 0000 is used in the example above, the number that is used is actually the current number in the Meas Results sequence, that is, the number that would have been used if you had not entered your own file name.

.

NOTE	If the filename you entered ends with _dddd, where d=any number, making it look just like an auto file name, then the next auto file name picks up where you left off, with the suffix being dddd + 1.

Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00

Recall

The Recall menu lets you choose what you want to recall, and where you want to recall it from. Among the types of files you can recall are States andTraces. In addition, an Import (Data) option lets you recall a number of data types stored in CSV files (as used by Excel and other spreadsheet programs).

The default paths for Recall are data type dependent and are the same as for the Save key.

Key Path	Front-panel key
Notes	No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe <filename>. If you try to recall a State file for a mode that is not licensed or not available in the instrument, an error message will occur and the state will not change.
Backwards Compatibility Notes	In legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly (since User Preset is actually loading a state), it was possible to do a User Preset without affecting the trace data, limit lines or correction data. In the X-Series, “state” always includes all of this data; so whenever state is loaded, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.
Backwards Compatibility Notes	Recall for the X-Series supports backward compatibility in the sense that you can recall a state file from any X-Series model number and any version of X-Series software. If you try to recall a state file onto an instrument with less capability than what was available on the instrument during the save, the recall will ignore the state it doesn’t support and it will limit the recalled setting to what it allows. Example: if the saved state includes preamp ON, but the recalling instrument does not have a preamp; the preamp is limited to OFF. Conversely, if you save a state without a preamp, the preamp is OFF in the state file. When this saved file is recalled on an instrument with a licensed preamp, the preamp is changed to OFF. Another example is if the saved state has center frequency set to 20 GHz, but the instrument recalling the saved state is a different model and only supports 13.5 GHz. In this case, the center frequency is limited along with any other frequency based settings. Since the center frequency can’t be preserved in this case, the recall limiting tries to at least preserve span to keep the measurement setup as intact as possible. Note that there is no state file compatibility outside of the X-Series. For example, you cannot recall a state file from ESA or PSA.
Initial S/W Revision	Prior to A.02.00

State

The Recall State menu lets you choose a register or file from which to recall the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings that were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings affected by Restore Mode Defaults; all of the Mode’s settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode’s state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either a Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

Since each state file is only for one Mode, the settings for other Modes are unaffected when it is loaded. Recall State will cause a mode switch if the state being recalled is not from the current active mode.

After the recall completes, the message "File <filename> recalled" or “Recalled State Register <register number>” is displayed.

For rapid recalls, the State menu lists 16 registers that you can choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files is:

My Documents\<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

See "More Information" on page 906.

Key Path	Recall
Mode	All
Remote Command	`:MMEMory:LOAD:STATe <filename>`
Example	:MMEM:LOAD:STAT "myState.state" This recalls the file myState.state on the default path
Example	MMEM:LOAD:STAT "MyStateFile.state" This loads the state file data (on the default file directory path) into the instrument state.
Notes	When you pick a file to recall, the analyzer first verifies that the file is recallable in the current instrument by checking the software version and model number of the instrument. If everything matches, a full recall proceeds by aborting the currently running measurement, clearing any pending operations, and then loading the State from the saved state file. You can open state files from any mode, so recalling a State file switches to the mode that was active when the save occurred. After switching to the mode of the saved state file, mode settings and data (if any for the mode) are loaded with values from the saved file. The saved measurement of the mode becomes the newly active measurement and the data relevant to the measurement (if there is any) is recalled. If there is a mismatch between file version or model number or instrument version or model number, the recall functiontries to recall as much as possible and returns a warning message. It may limit settings that differ based on model number, licensing or version number. After recalling the state, the Recall State function does the following: • Makes the saved measurement for the mode the active measurement. • Clears the input and output buffers. • Status Byte is set to 0. • Executes a *CLS If the file specified is empty an error is generated. If the specified file does not exist, another error is generated. If there is a mismatch between the file and the proper file type, an error is generated. If there is a mismatch between file version or model number or instrument version or model number, a warning is displayed. Then it returns to the State menu and File Open dialog goes away. After the Recall, the analyzer exits the Recall menu and returns to the previous menu.

Backwards Compatibility SCPI	`:MMEMory:LOAD:STATe 1,<filename>` For backwards compatibility, the above syntax is supported. The "1" is simply ignored.
Initial S/W Revision	Prior to A.02.00

More Information

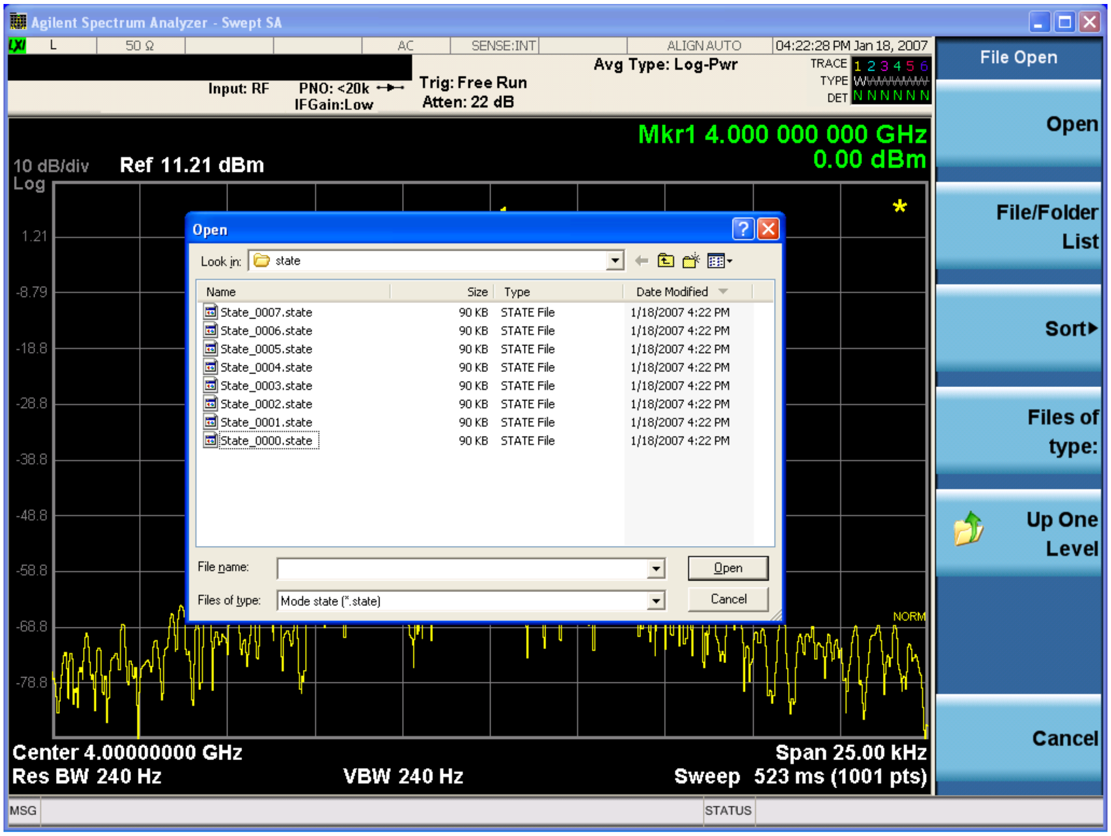
In measurements that support saving Traces, for example, Swept SA, the Trace data is saved along with the State in the State file. When recalling the State, the Trace data is recalled as well. Traces are recalled exactly as they were stored, including the writing mode and update and display modes. If a Trace was updating and visible when the State was saved, it will come back updating and visible,and its data will be rewritten right away. When you use State to save and recall traces, any trace whose data must be preserved should be placed in View or Blank mode before saving.

The following table describes the Trace Save and Recall possibilities:

You want to recall state and one trace's data, leaving other traces unaffected.	Save Trace+State from 1 trace. Make sure that no other traces are updating (they should all be in View or Blank mode) when the save is performed.	On Recall, specify the trace you want to load the one trace's data into. This trace will load in View. All other traces' data will be unaffected, although their trace mode will be as it was when the state save was performed.
You want to recall all traces	Save Trace+State from ALL traces.	On Recall, all traces will come back in View (or Blank if they were in Blank or Background when saved)
You want all traces to load exactly as they were when saved.	Save State	On recall, all traces' mode and data will be exactly as they were when saved. Any traces that were updating willhave their data immediately overwritten.

From File...

When you press "From File", the analyzer brings up a Windows dialog and a menu entitled "**File Open.**" This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Open

Performs the recall of the specified file. While the recall is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Look In.

Look In

The Look In field shows the path from which the file will be recalled and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Look In field** first uses the last path from the Save As dialog **Save In:** path for that same file type. There is no softkey for directly navigating to the Look In field, but you can use the left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

Sort

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

Files of Type

This field shows the file suffix for the type of file you have selected to recall. For example, if you navigated here while recalling State, "Mode state (*.state)" is in the field. If you navigated here while recalling Trace, ""Mode state (*.trace)" is in the field. If you navigated here while importing a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown menu, which you can select by using the up and down arrow keys and Enter.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

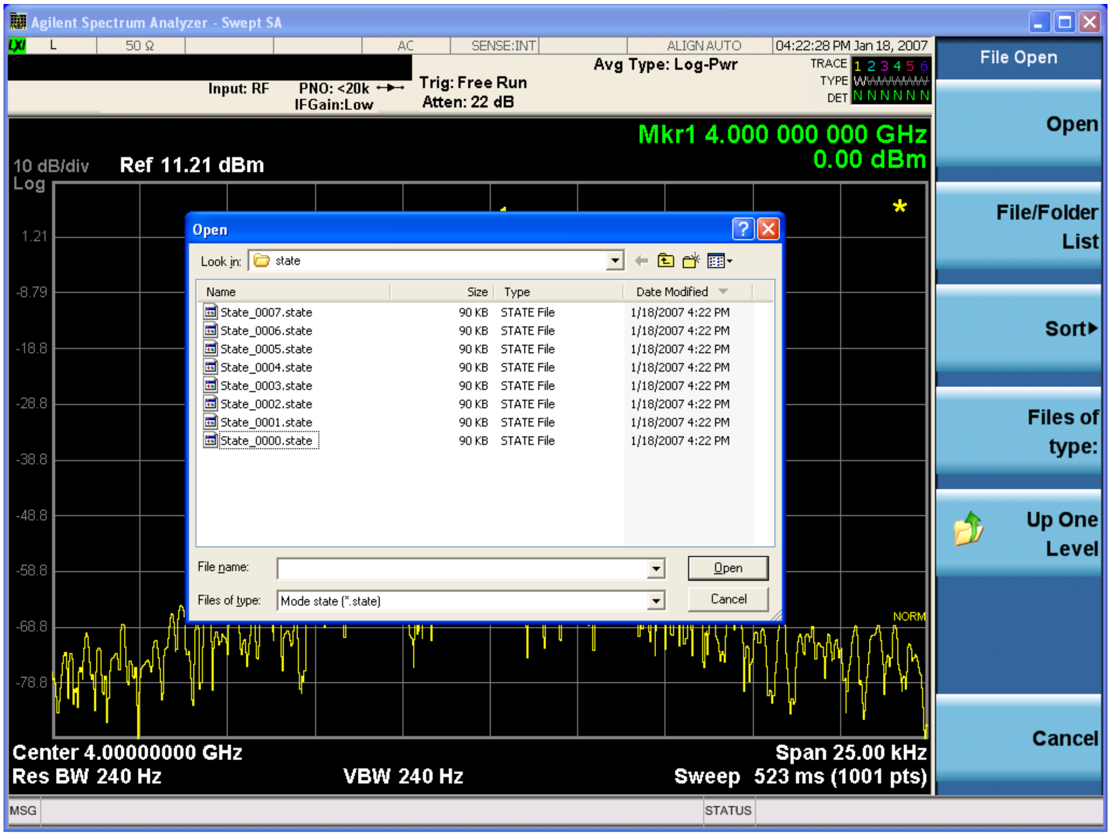
Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Open** request to be cancelled. The ESC key does the same thing.

Key Path	Recall, State
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

From File...

When you press “From File”, the analyzer brings up a Windows dialog and a menu entitled “**File Open.”** This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Open

Performs the recall of the specified file. While the recall is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Look In.

Look In

The Look In field shows the path from which the file will be recalled and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Look In field** first uses the last path from the Save As dialog **Save In:** path for that same file type. There is no softkey for directly navigating to the Look In field, but you can use the left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

Sort

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

Files of Type

This field shows the file suffix for the type of file you have selected to recall. For example, if you navigated here while recalling State, "Mode state (*.state)" is in the field. If you navigated here while recalling Trace, ""Mode state (*.trace)" is in the field. If you navigated here while importing a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown menu, which you can select by using the up and down arrow keys and Enter.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Open** request to be cancelled. The ESC key does the same thing.

Key Path	Recall, State
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

From File...

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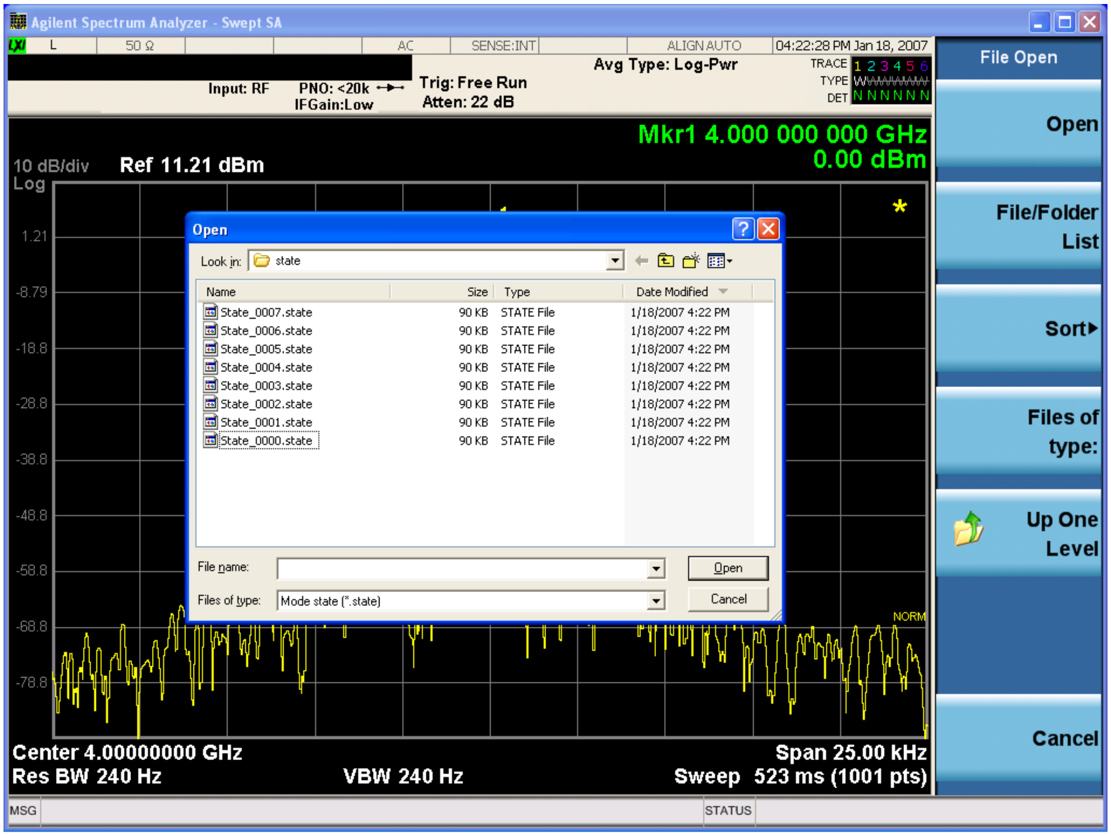

Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Open

Performs the recall of the specified file. While the recall is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Look In.

Look In

The Look In field shows the path from which the file will be recalled and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Look In field** first uses the last path from the Save As dialog **Save In:** path for that same file type. There is no softkey for directly navigating to the Look In field, but you can use the left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

Sort

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

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Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

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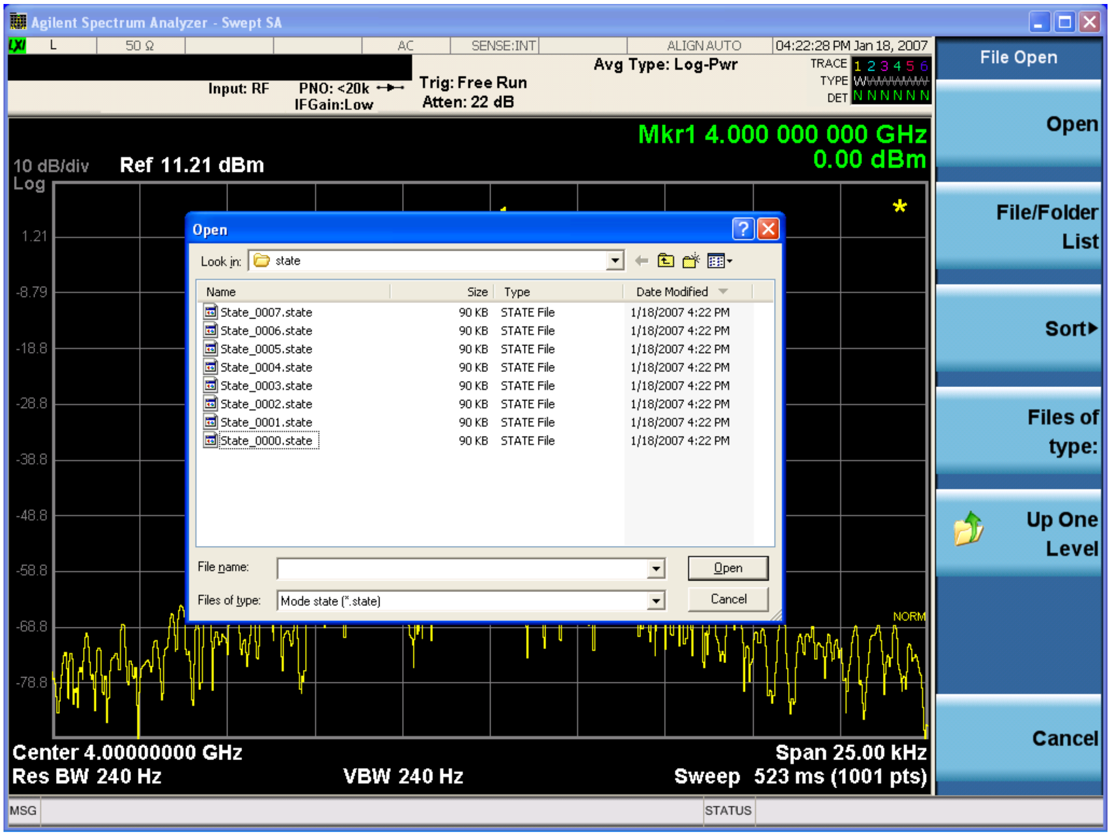

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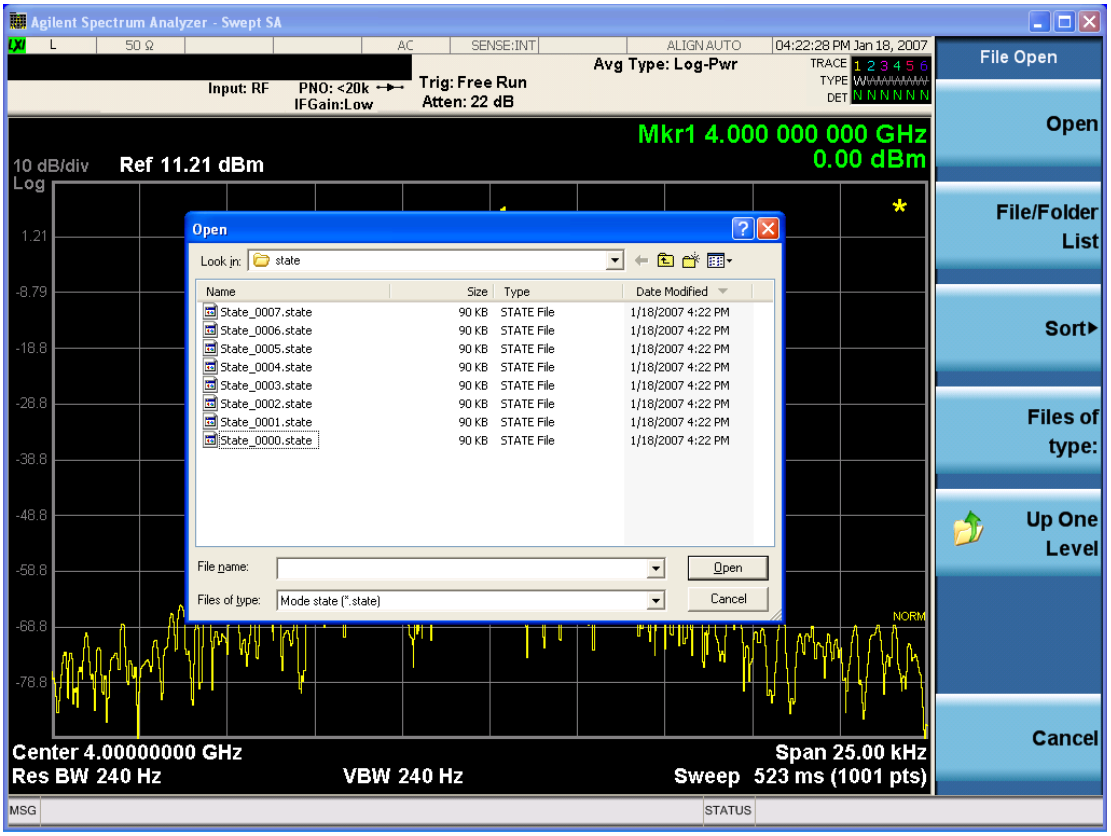

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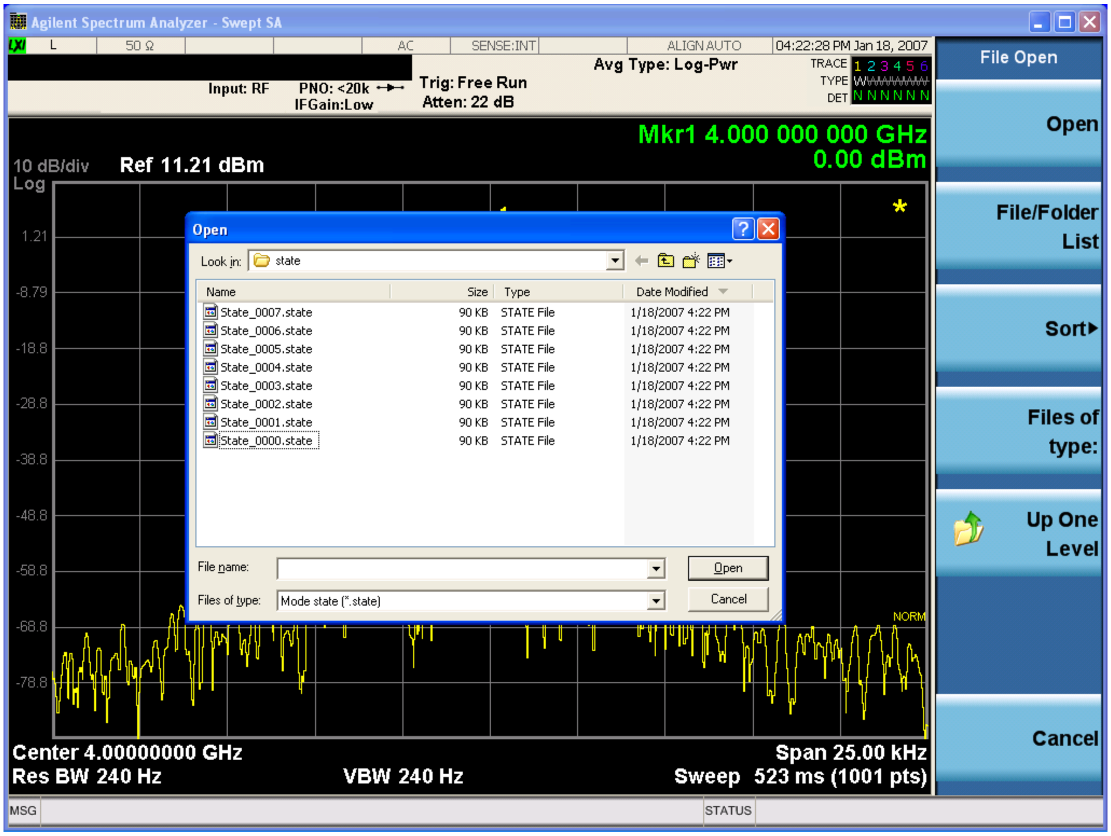

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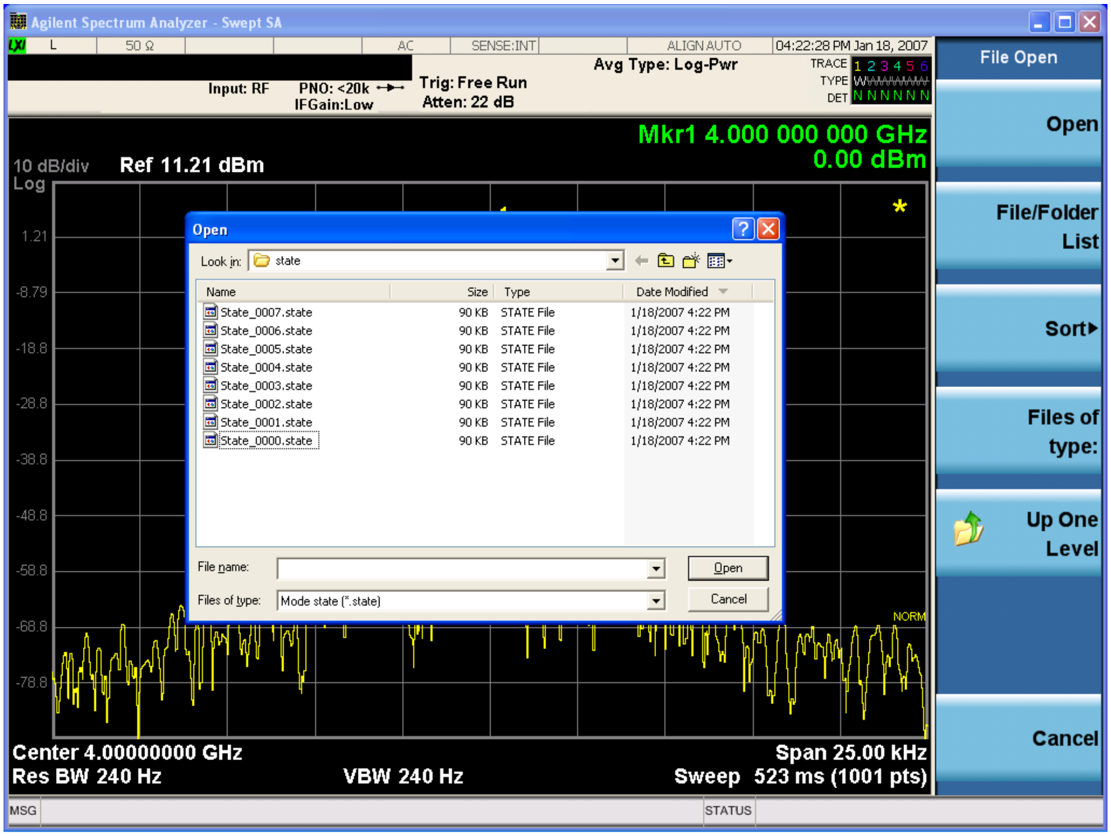

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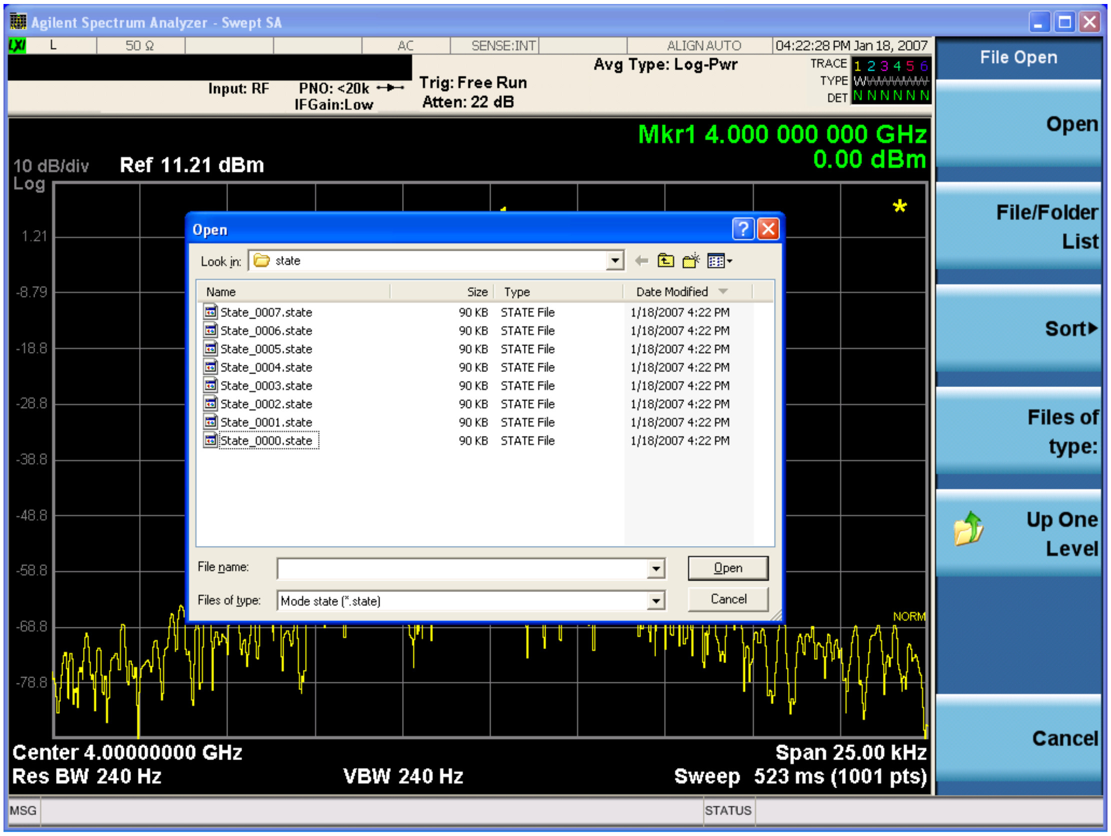

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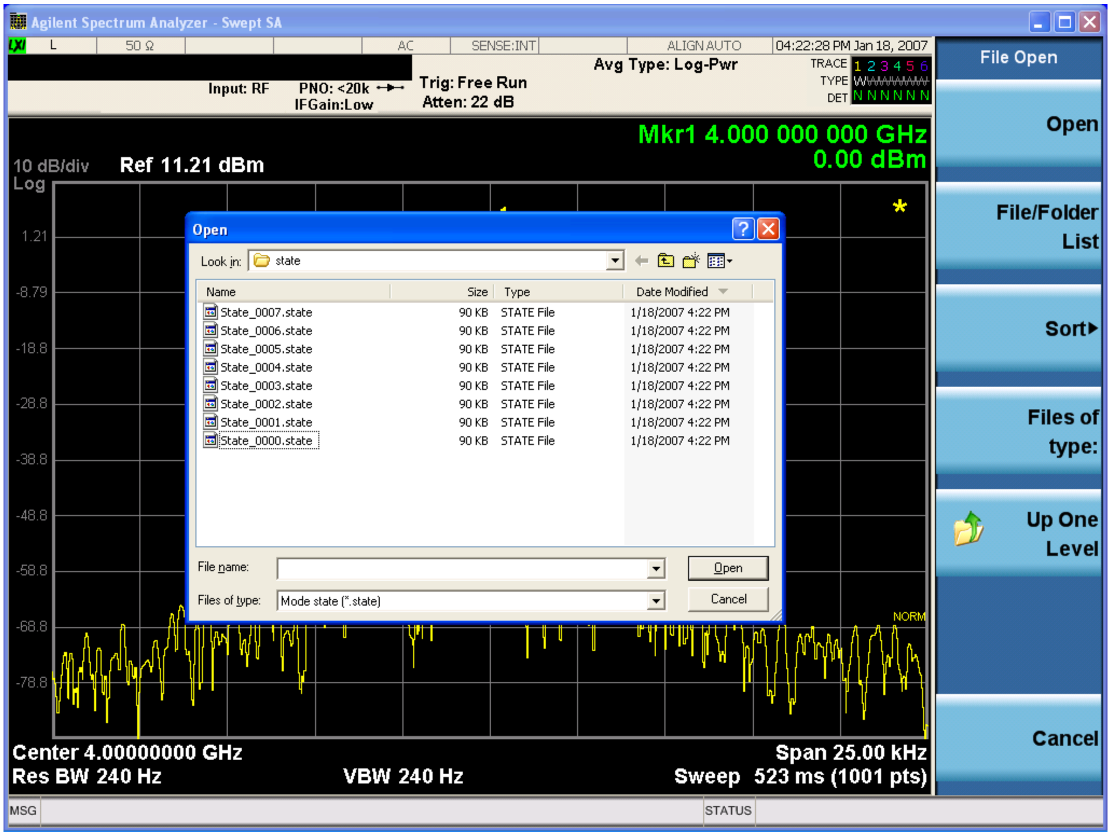

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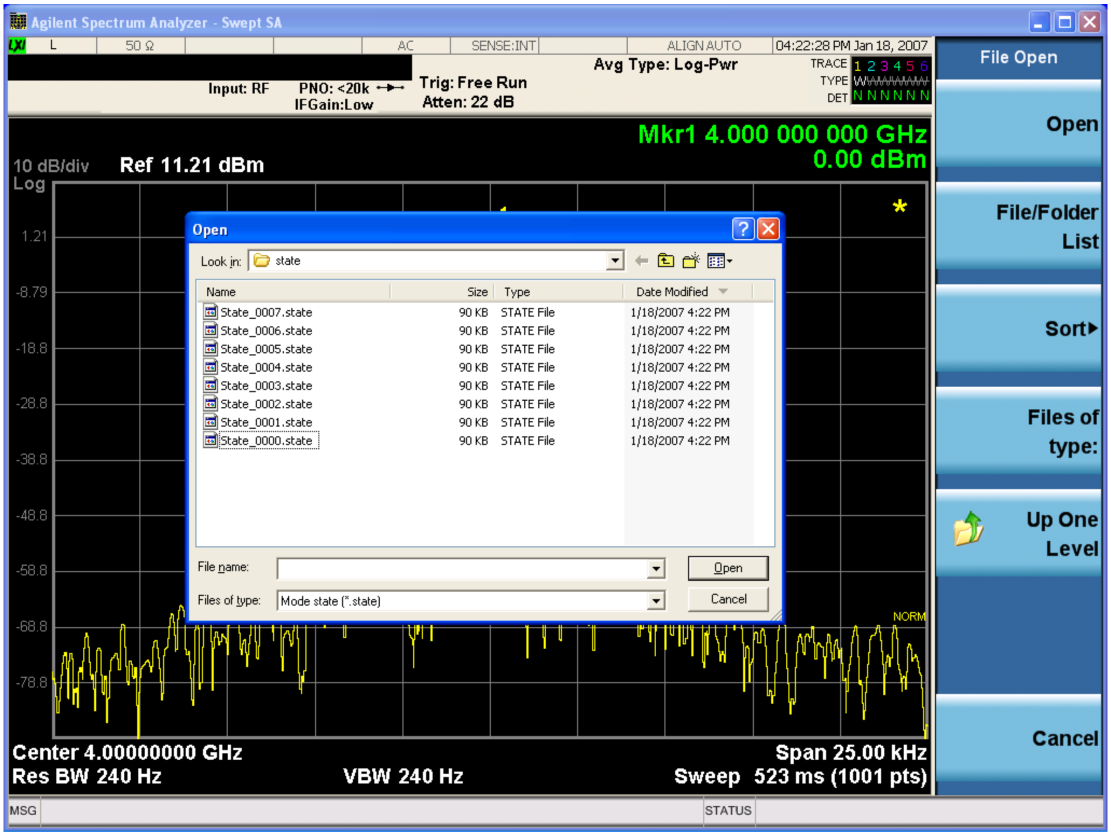

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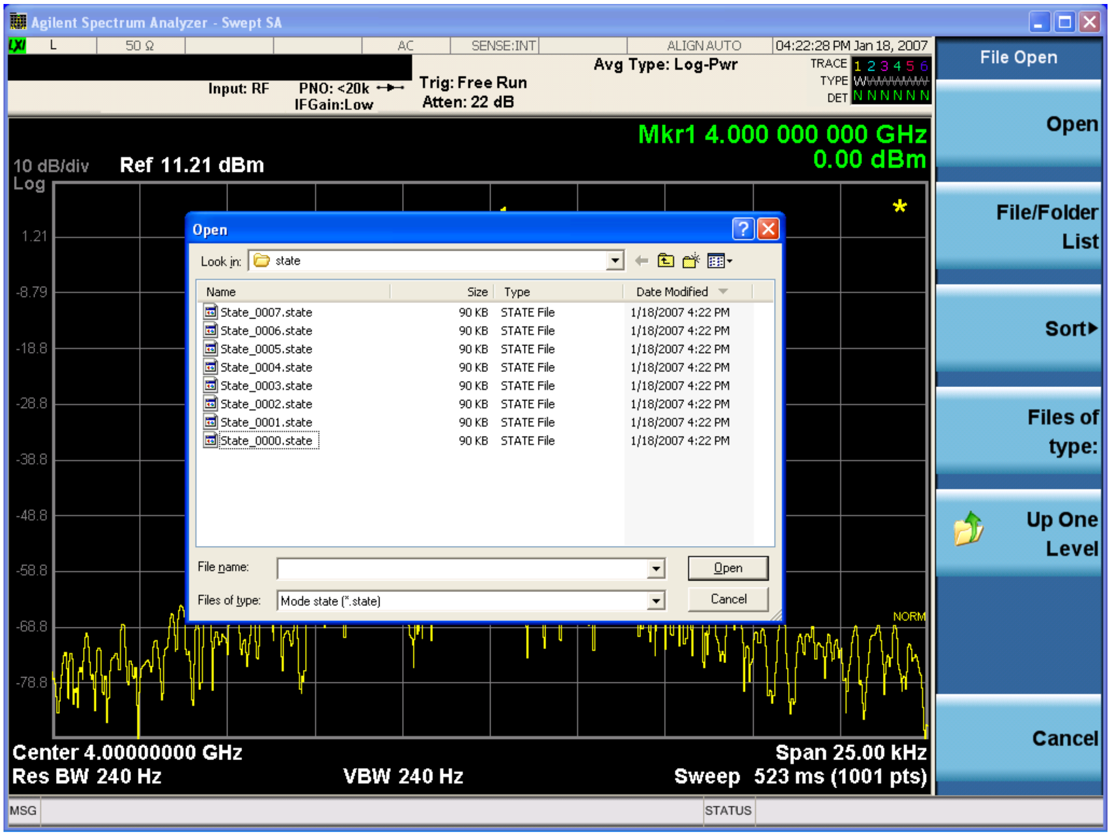

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Register 1 thru Register 16

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Each of the register keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key under Save, State to enter custom names for each register.

Registers are shared by all modes, so recalling from any one of the registers will cause a mode switch to the mode that was active when the save to the Register occurred.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the *RCL command.

After the recall completes, the message "Register <register number> recalled" appears in the message bar. If you are in the Spectrum Analyzer Mode, and you are recalling a register that was saved in the Spectrum Analyzer Mode, then after the recall, you will still be in the Recall Register menu. If the Recall causes you to switch modes, then after the Recall, you will be in the Frequency menu.

If a requested register is empty an error is generated.

Key Path	Recall, State
Example	*RCL 1

Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Save, State,Edit Register Names key OR "(empty)" if no prior save operation has been performed to this register.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	Prior to A.11.00

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If a requested register is empty an error is generated.

Key Path	Recall, State
Example	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Save, State,Edit Register Names key OR “(empty)" if no prior save operation has been performed to this register.
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Modified at S/W Revision	Prior to A.11.00

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Example	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key

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Trace (+State)

The Recall Trace (+State) menu lets you choose a register or file from which to recall the Trace+State state file.

A saved state contains all of the settings and data required to return the analyzer as closely as possible to the exact setup it had when the save occurred. This includes the Input/Output settings, even though they are outside of the Mode's state, because they are needed to restore the complete setup. A Trace+State file also includes trace data from one trace or all traces, which will load in View mode when the

Trace+State file is recalled. Recall Trace (+State) will also cause a mode switch if the state being recalled is not for the current active mode.

After the recall completes, the message "File <filename> recalled" or “Recalled Trace Register <register number>” is displayed.

For rapid recalls, the Trace (+State) menu lists 5 registers to choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files including .trace files is:

My Documents\<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Recall
Mode	SA
Remote Command	`:MMEMory:LOAD:TRACe TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6,<filename>` `:MMEMory:LOAD:TRACe:REGister TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6,<integer>`
Example	MMEM:LOAD:TRAC TRACE2, "MyTraceFile.trace" This loads the trace file data (on the default file directory path) into the specified trace; if it is a "single trace" save file, that trace is loaded to trace 2, andis set to be not updating. :MMEM:LOAD:TRAC:REG TRACE1,2 restores the trace data in register 2 to Trace 1
Notes	When you perform the recall, the recalling Trace function must first verify the file is recallable in this instrument by checking instrument software version and model number, since it includes State. If everything matches, a full recall proceeds by aborting the currently running measurement, and loading the state from the saved state file to as close as possible to the context in which the save occurred. You can open .trace files from any mode that supports them, so recalling a Trace file switches to the mode that was active when the save occurred. After switching to the mode of the saved state file, mode settings and data (if any for the mode) are loaded with values from the saved file and the saved measurement of the mode becomes the newly active measurement, and the data relevant to the measurement (if there is any) is recalled. Once the state is loaded, the trace data must be loaded. The internal flags are consulted to see which trace to load and the "To Trace" setting to see where to load it. Trace data is always loaded with the specified trace set to View, so that the data is visible and not updating(so as not to erase the recalled data). If the file is an "all trace" file, all traces are loaded with the saved data(to the original trace the data was saved from) and set to View. Traces whose data is not loaded are restored to the update state that existed when they were saved. After the Recall the analyzer exits the Recall menu and returns to the previous menu. Some modes and measurements do not have available all 6 traces. Phase Noise mode command, for example, is: MMEMory:LOAD:TRACe TRACE1|TRACE2|TRACE3,<filename>
Initial S/W Revision	Prior to A.02.00

To Trace

These menu selections let you choose the Trace where the recalled saved trace will go. Not all modes have the full 6 traces available. The default is the currently selected trace, selected in this menu or in the Trace/Detector, Export Data, Import Data, or Save Trace menus, except if you have chosen All, then it remains chosen until you specifically change it to a single trace.

If the .trace file is an "all trace" file, "To Trace" is ignored and the traces each go back to the trace from which they were saved.

Once selected, the key returns back to the Recall Trace menu and the selected Trace number is annotated on the key. Now you have selected exactly where the trace needs to be recalled.To trigger a recall of the selected Trace, you must select the Open key in the Recall Trace menu.

When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Save, Data, Trace
Mode	SA
Initial S/W Revision	Prior to A.02.00

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Key Path	Recall, State
Example	*RCL 1
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Modified at S/W Revision	Prior to A.11.00

Register 1 thru Register 16

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Each of the register keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key under Save, State to enter custom names for each register.

Registers are shared by all modes, so recalling from any one of the registers will cause a mode switch to the mode that was active when the save to the Register occurred.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the *RCL command.

After the recall completes, the message "Register <register number> recalled" appears in the message bar. If you are in the Spectrum Analyzer Mode, and you are recalling a register that was saved in the Spectrum Analyzer Mode, then after the recall, you will still be in the Recall Register menu. If the Recall causes you to switch modes, then after the Recall, you will be in the Frequency menu.

If a requested register is empty an error is generated.

Key Path	Recall, State
Example	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Save, State,Edit Register Names key OR

	“(empty)" if no prior save operation has been performed to this register.
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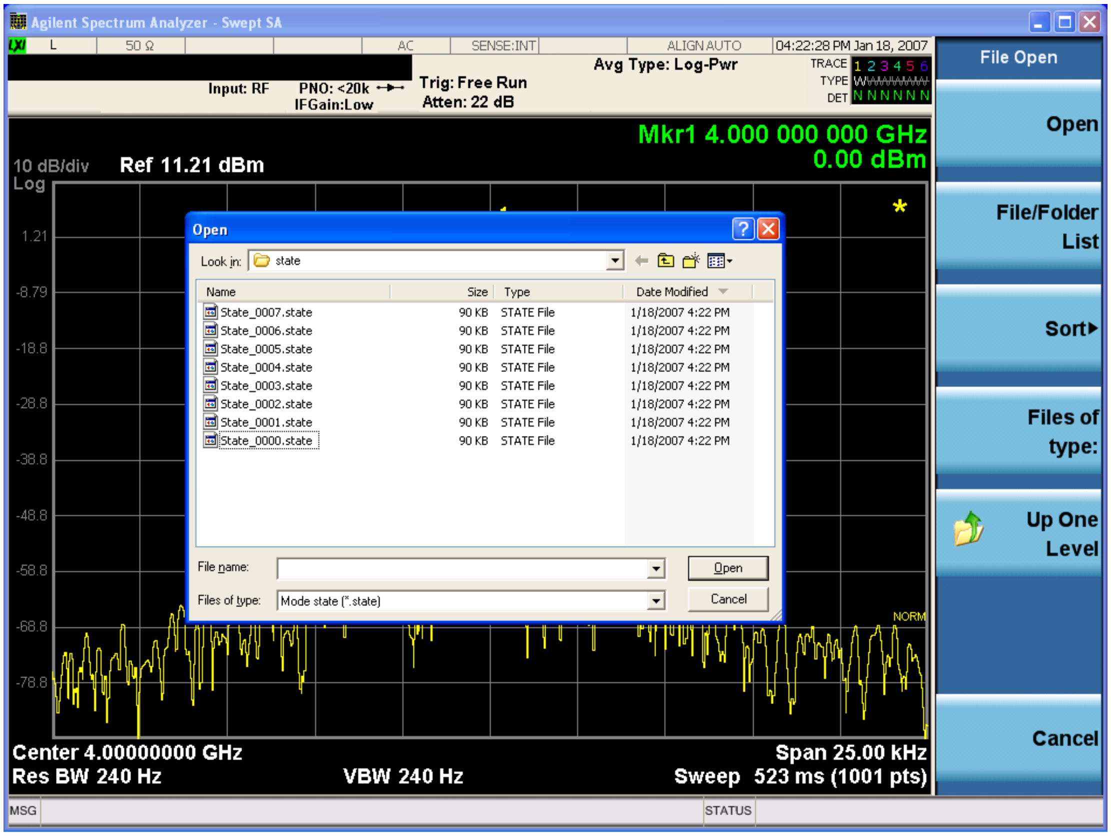

Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Open

Performs the recall of the specified file. While the recall is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Look In.

Look In

The Look In field shows the path from which the file will be recalled and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Look In field** first uses the last path from the Save As dialog **Save In:** path for that same file type. There is no softkey for directly navigating to the Look In field, but you can use the left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

Sort

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

Files of Type

This field shows the file suffix for the type of file you have selected to recall. For example, if you navigated here while recalling State, "Mode state (*.state)" is in the field. If you navigated here while recalling Trace, ""Mode state (*.trace)" is in the field. If you navigated here while importing a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown menu, which you can select by using the up and down arrow keys and Enter.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Open** request to be cancelled. The ESC key does the same thing.

Key Path	Recall, State
Notes	Brings up the Open dialog for recalling a State Save Type
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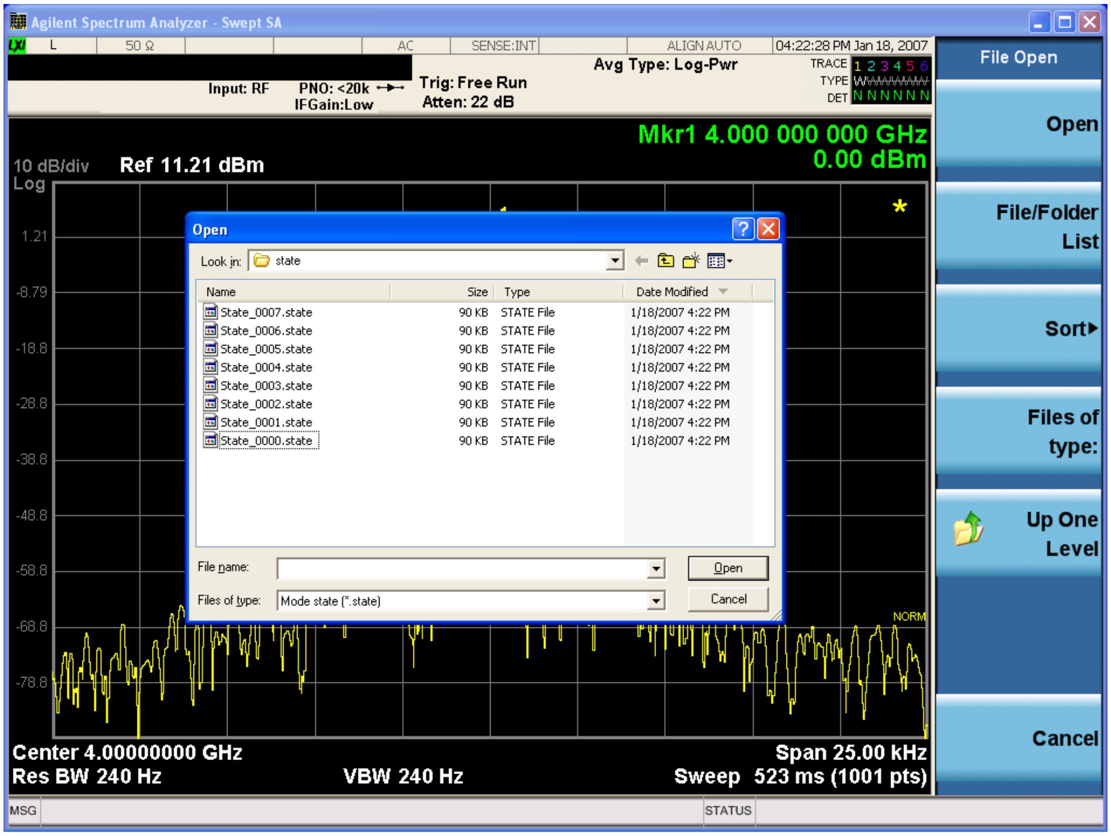

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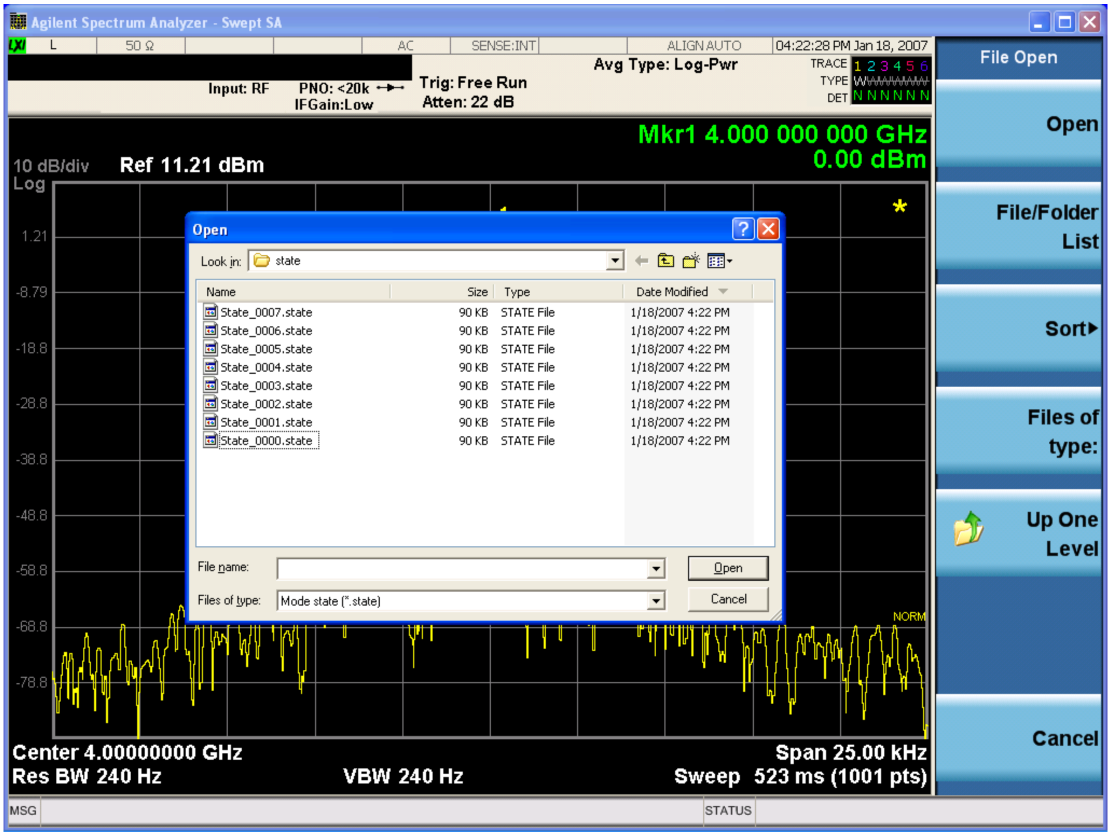

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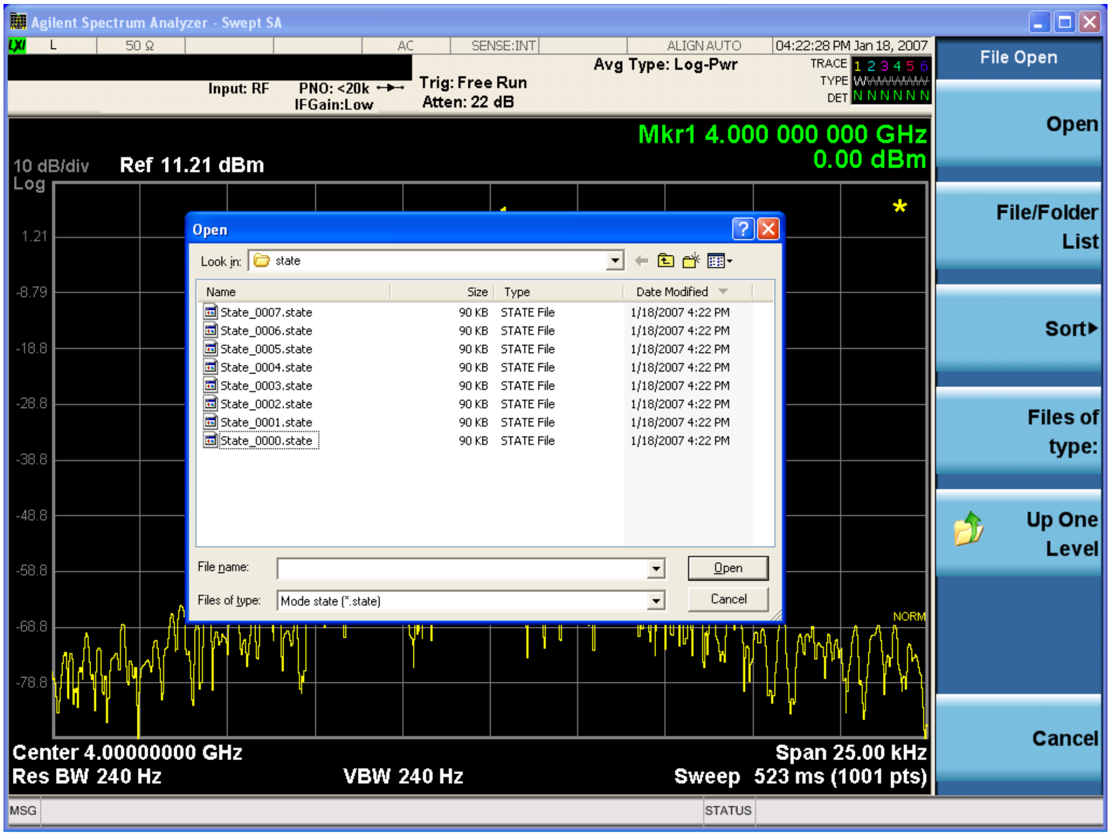

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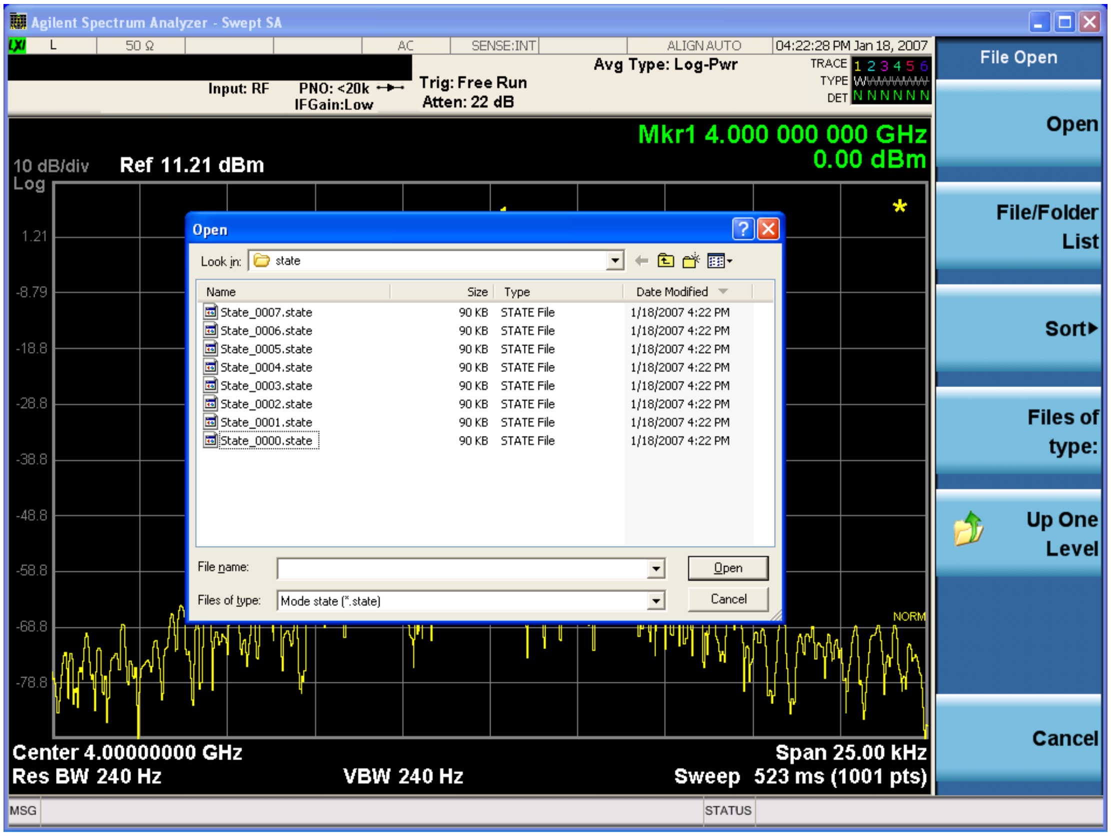

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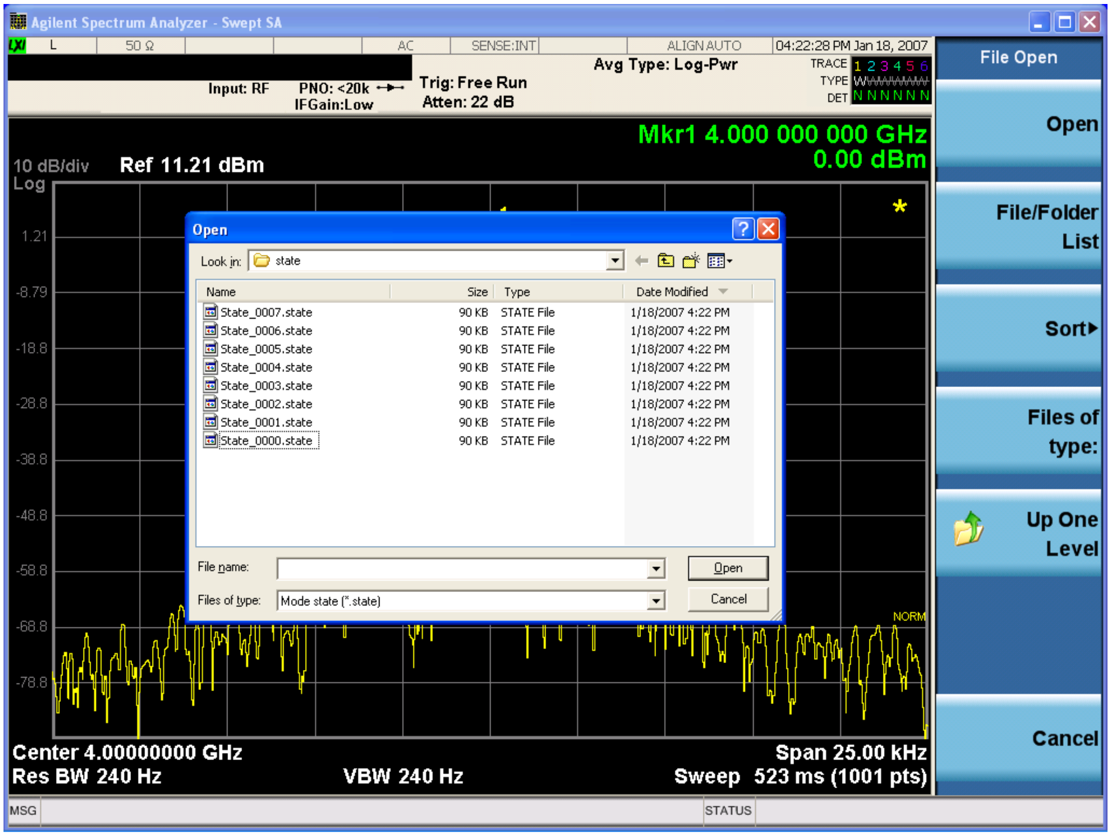

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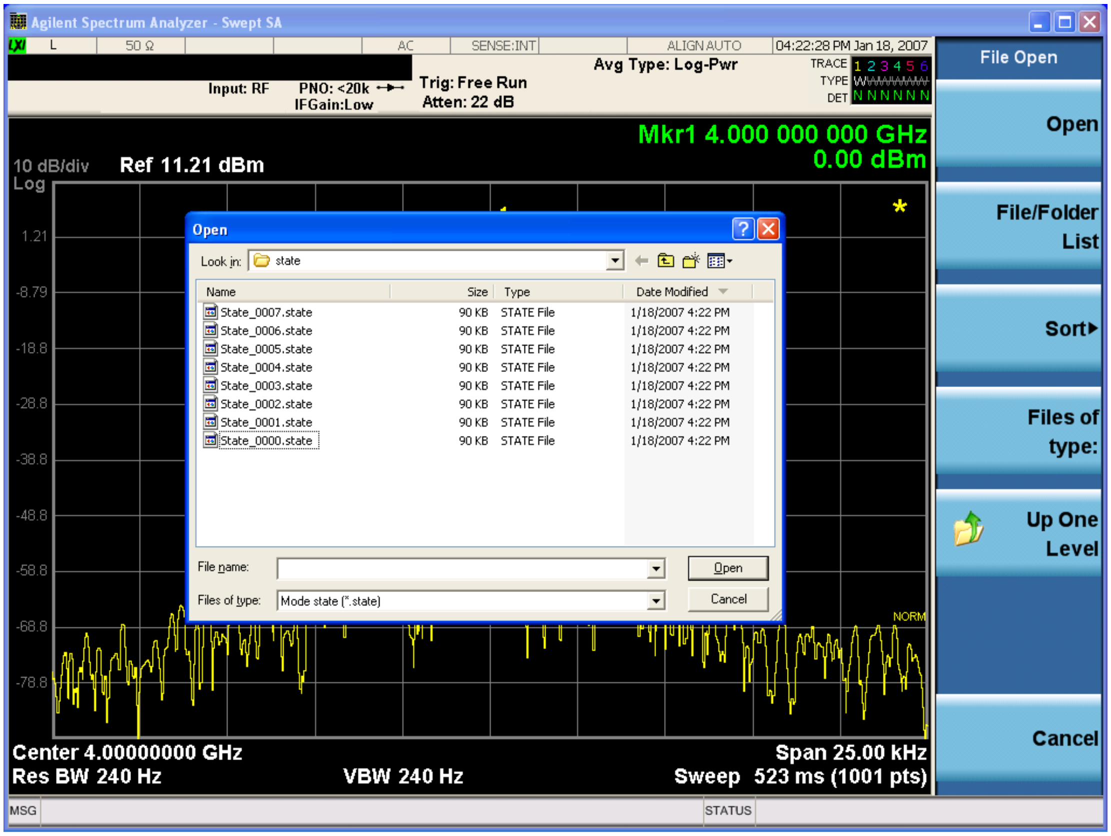

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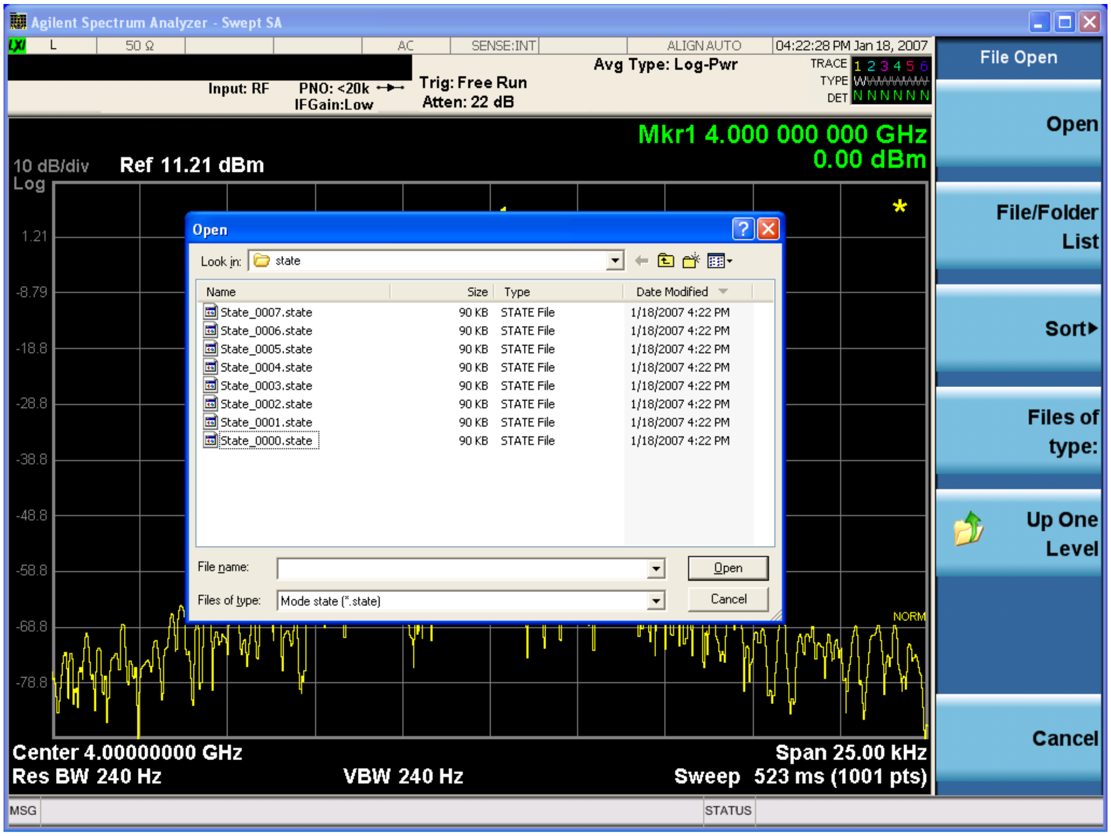

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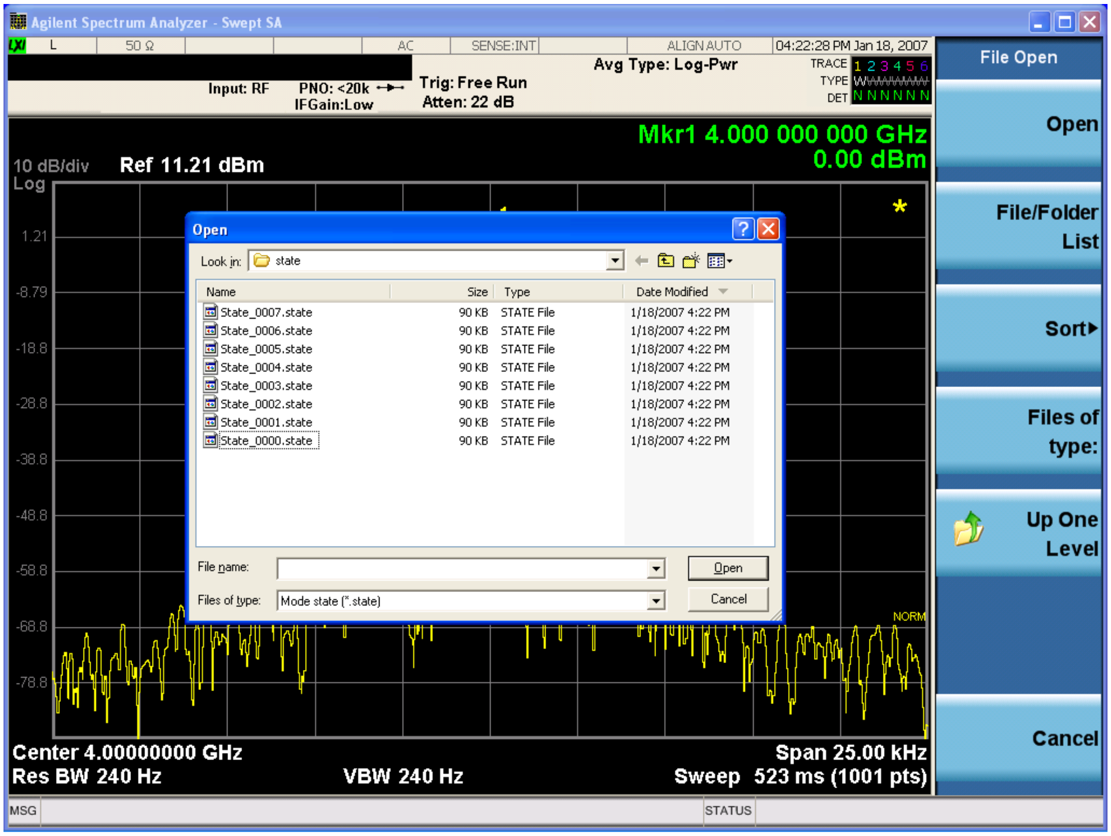

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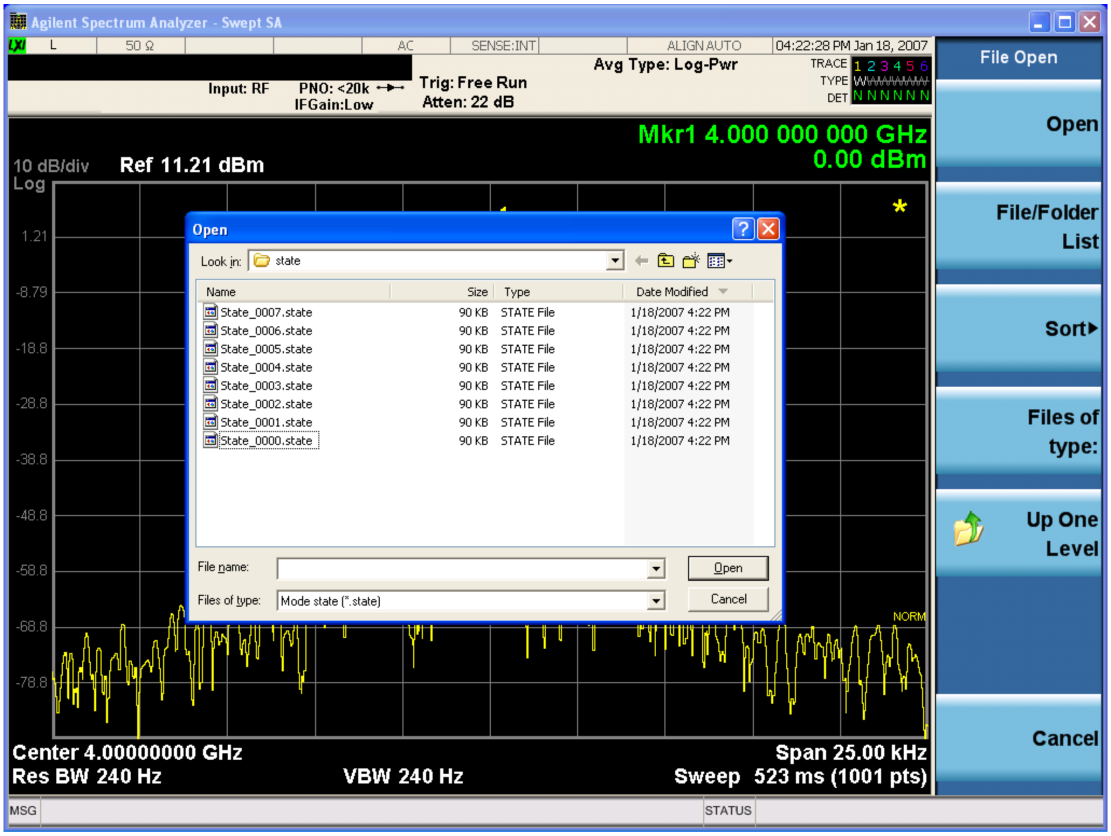

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Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Look In.

Look In

The Look In field shows the path from which the file will be recalled and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Look In field** first uses the last path from the Save As dialog **Save In:** path for that same file type. There is no softkey for directly navigating to the Look In field, but you can use the left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

Sort

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

Files of Type

This field shows the file suffix for the type of file you have selected to recall. For example, if you navigated here while recalling State, "Mode state (*.state)" is in the field. If you navigated here while recalling Trace, ""Mode state (*.trace)" is in the field. If you navigated here while importing a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown menu, which you can select by using the up and down arrow keys and Enter.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

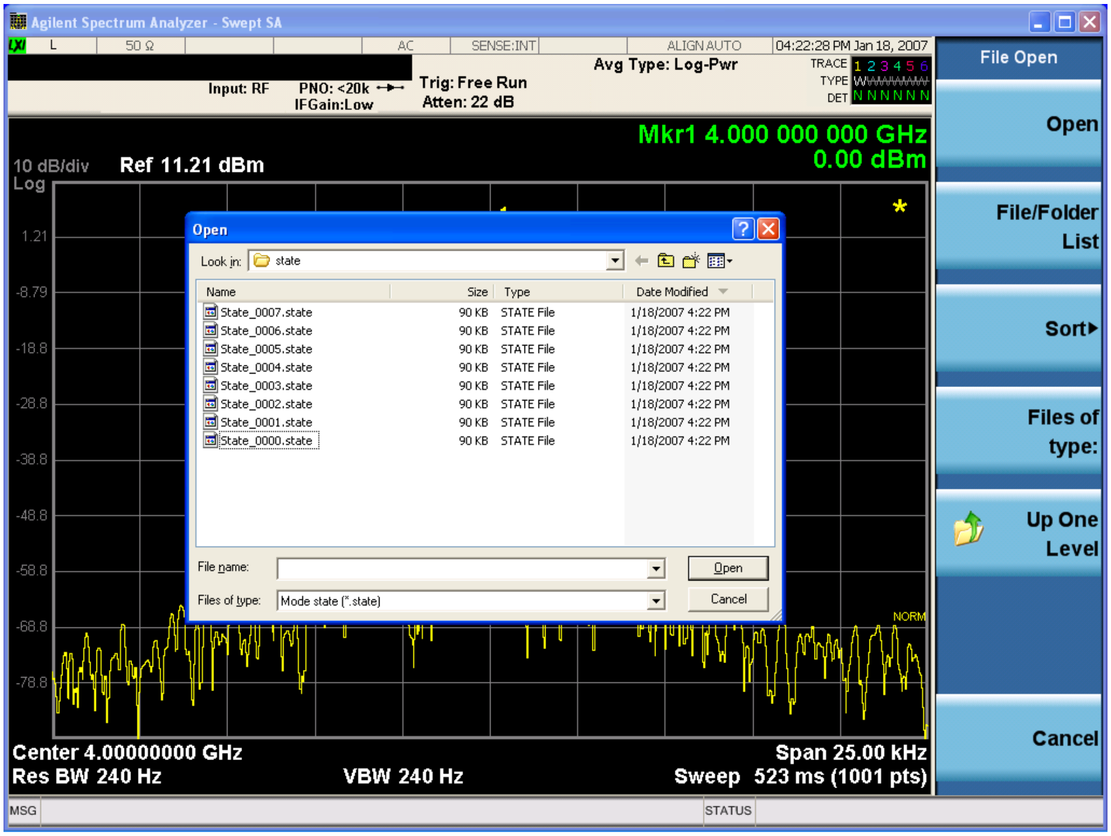
Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Open** request to be cancelled. The ESC key does the same thing.

Key Path	Recall, State
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

From File...

When you press “From File”, the analyzer brings up a Windows dialog and a menu entitled “**File Open.”** This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Open

Performs the recall of the specified file. While the recall is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Look In.

Look In

The Look In field shows the path from which the file will be recalled and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Look In field** first uses the last path from the Save As dialog **Save In:** path for that same file type. There is no softkey for directly navigating to the Look In field, but you can use the left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

Sort

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

Files of Type

This field shows the file suffix for the type of file you have selected to recall. For example, if you navigated here while recalling State, "Mode state (*.state)" is in the field. If you navigated here while recalling Trace, ""Mode state (*.trace)" is in the field. If you navigated here while importing a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown menu, which you can select by using the up and down arrow keys and Enter.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Open** request to be cancelled. The ESC key does the same thing.

Key Path	Recall, State
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

Data (Import)

Importing a data file loads data that was previously saved from the current measurement or from other measurements and/or modes that produce compatible data files. The Import Menu only contains Data Types that are supported by the current measurement.

Since the commonly exported data files are in .csv format, the data can be edited by the user prior to importing. This allows you to export a data file, manipulate the data in Excel (the most common PC Application for manipulating .csv files) and then import it.

Importing Data loads measurement data from the specified file into the specified or default destination, depending on the data type selected. Selecting an Import Data menu key will not actually cause the importing to occur, since the analyzer still needs to know from where to get the data. Pressing the Open key in this menu brings up the Open dialog and Open menu that provides you with the options from where to recall the data. Once a filename has been selected or entered in the Open menu, the recall occurs as soon as the Open button is pressed.

Key Path	Recall
Mode	All
Notes	The menu is built from whatever data types are available for the mode. Some keys will be missing completely, so the key locations in the sub-menu will vary. No SCPI command directly controls the Data Type that this key controls. The Data Type is included in the MMEM:LOAD commands.

Dependencies	If a file type is not used by a certain measurement, it is grayed out for that measurement. The key for a file type will not show at all if there are no measurements in the Mode that support it.
Preset	Is not affected by Preset or shutdown, but is reset during Restore Mode Defaults
Readback	The data type that is currently selected
Initial S/W Revision	Prior to A.02.00

Amplitude Correction

This key selects the Amplitude Corrections as the data type to be imported. When pressed a second time, it brings up the Select Menu, which lets you select the Correction into which the data will be imported.

Amplitude Corrections are fully discussed in the documentation of the Input/Output key, under the Corrections key.

A set of preloaded Corrections files can be found in the directory

/My Documents/ EMC Limits and Ampcor.

Under this directory, the directory called Ampcor (Legacy Naming) contains a set of legacy corrections files, generally the same files that were supplied with older Agilent EMI analyzers, that use the legacy suffixes .ant, .oth, .usr, and .cbl, and the old 8-character file names. In the directory called Ampcor, the same files can be found, with the same suffixes, but with longer, more descriptive filenames.

When the Amplitude Correction is an Antenna correction and the Antenna Unit in the file is not None, the Y Axis Unit setting will change to match the Antenna Unit in the file.

Key Path	Recall
Mode	SA|EDGEGSM|PN
Remote Command	`:MMEMory:LOAD:CORRection 1|2|3|4|5|6, <filename>`
Example	:MMEM:LOAD:CORR 2 "myAmpcor.csv" recalls the Amplitude Correction data from the file myAmpcor.csv in the current directory to the 2nd Amplitude Correction table, and turns on Correction 2. The default path is My Documents\amplitudeCorrections.
Dependencies	Only the first correction array (Correction 1) supports antenna units. This means that a correction file with an Antenna Unit can only be loaded into the Corrections 1 register. Consequently only for Correction 1 does the dropdown in the Recall dialog include.ant, and if an attempt is made to load a correction file into any other Correction register which DOES contain an antenna unit, a Mass Storage error is generated. Corrections are not supported by all Measurements. If in a Mode in which some Measurements support it, this key will be grayed out in measurements that do not. The key will not show at all if no measurements in the Mode support it. Errors are reported if the file is empty or missing, or if the file type does not match, or if there is a mismatch between the file type and the destination data type. If any of these occur during manual operation, the analyzer returns to the Import Data menu and the File Open dialog goes away. This key does not appear unless you have the proper option installed in your instrument. This command will generate an “Option not available” error unless you have the proper option installed in your instrument.

Couplings	When a correction file is loaded from mass storage, it is automatically turned on (**Correction** ON) and **ApplyCorrections is** set to On. This allows you to see its effect, thus confirming the load.
Readback	selected Correction
Backwards Compatibility SCPI	`:MMEMory:LOAD:CORRection ANTenna | CABLe | OTHer | USER, <filename>` For backwards compatibility, ANTenna maps to 1, CABle maps to 2, OTHer maps to 3 and USER maps to 4
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you select which Correction to import the data into. Once selected, the key returns back to the Import Data menu and the selected Correction number is annotated on the key. The next step is to select the Open key in the Import Data menu.

Antenna corrections are a particular kind of Amplitude Corrections – they are distinguished in the corrections file by having the Antenna Unit set to a value other than None. Only Correction 1 supports Antenna Units.

Key Path	Recall, Data, Amplitude Correction
Notes	auto return
Dependencies	Only Correction 1 may be used to load a Correction that contains an Antenna Unit other than None
Preset	Not part of Preset, but is reset to Correction 1 by Restore Input/Output Defaults; survives shutdown.
State Saved	The current Correction number is saved in instrument state
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you select which Correction to import the data into. Once selected, the key returns back to the Import Data menu and the selected Correction number is annotated on the key. The next step is to select the Open key in the Import Data menu.

Antenna corrections are a particular kind of Amplitude Corrections – they are distinguished in the corrections file by having the Antenna Unit set to a value other than None. Only Correction 1 supports Antenna Units.

Key Path	Recall, Data, Amplitude Correction
Notes	auto return
Dependencies	Only Correction 1 may be used to load a Correction that contains an Antenna Unit other than None
Preset	Not part of Preset, but is reset to Correction 1 by Restore Input/Output Defaults; survives shutdown.
State Saved	The current Correction number is saved in instrument state
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you select which Correction to import the data into. Once selected, the key returns back to the Import Data menu and the selected Correction number is annotated on the key. The next step is to select the Open key in the Import Data menu.

Antenna corrections are a particular kind of Amplitude Corrections – they are distinguished in the corrections file by having the Antenna Unit set to a value other than None. Only Correction 1 supports Antenna Units.

Key Path	Recall, Data, Amplitude Correction
Notes	auto return
Dependencies	Only Correction 1 may be used to load a Correction that contains an Antenna Unit other than None
Preset	Not part of Preset, but is reset to Correction 1 by Restore Input/Output Defaults; survives shutdown.
State Saved	The current Correction number is saved in instrument state
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you select which Correction to import the data into. Once selected, the key returns back to the Import Data menu and the selected Correction number is annotated on the key. The next step is to select the Open key in the Import Data menu.

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Notes	auto return
Dependencies	Only Correction 1 may be used to load a Correction that contains an Antenna Unit other than None
Preset	Not part of Preset, but is reset to Correction 1 by Restore Input/Output Defaults; survives shutdown.
State Saved	The current Correction number is saved in instrument state
Initial S/W Revision	A.02.00

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These keys let you select which Correction to import the data into. Once selected, the key returns back to the Import Data menu and the selected Correction number is annotated on the key. The next step is to select the Open key in the Import Data menu.

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Key Path	Recall, Data, Amplitude Correction
Notes	auto return
Dependencies	Only Correction 1 may be used to load a Correction that contains an Antenna Unit other than None
Preset	Not part of Preset, but is reset to Correction 1 by Restore Input/Output Defaults; survives shutdown.
State Saved	The current Correction number is saved in instrument state
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you select which Correction to import the data into. Once selected, the key returns back to the Import Data menu and the selected Correction number is annotated on the key. The next step is to select the Open key in the Import Data menu.

Antenna corrections are a particular kind of Amplitude Corrections – they are distinguished in the corrections file by having the Antenna Unit set to a value other than None. Only Correction 1 supports Antenna Units.

Key Path	Recall, Data, Amplitude Correction
Notes	auto return
Dependencies	Only Correction 1 may be used to load a Correction that contains an Antenna Unit other than None
Preset	Not part of Preset, but is reset to Correction 1 by Restore Input/Output Defaults; survives shutdown.
State Saved	The current Correction number is saved in instrument state
Initial S/W Revision	A.02.00

Trace

This key selects Trace as the data type to be imported. When pressed a second time, it brings up the Trace Menu, which lets you select the Trace into which the data will be imported.

The trace file contains “meta” data which describes the state of the analyzer when the trace was exported (see "Trace File Contents" on page 1022). If the meta data in the file does not match the current SA state, the “invalid data indicator” (*) is displayed.

Key Path	Recall, Data
Remote Command	`:MMEMory:LOAD:TRACe:DATA TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6,<filename>`
Example	:MMEM:LOAD:TRAC DATA TRACE2, "myTrace2.csv" Imports the 2nd trace from the file myTrace2.csv in the current path. The default path is My Documents\SA\data\traces
Dependencies	For SA measurements, a trace cannot be recalled from a trace file that was exported with ALL traces selected. A trace cannot be imported if the number of trace points in the file do not match the number of sweep points currently set for the measurement. If this happens, an error message is generated.

	Errors are reported if the file is empty or missing, or if the file type does not match, or if there is a mismatch between the file type and the destination data type. If any error occurs while trying to load a file manually (as opposed to during remote operation), the analyzer returns to the Import Data menu and the File Open dialog goes away.
Couplings	When a trace is imported, **Trace Update** is always turned OFF for that trace and **Trace Display** is always turned ON.
Readback	Selected Trace
Status Bits/OPC dependencies	Sequential - aborts the current measurement.
Initial S/W Revision	Prior to A.02.00

Select Trace

These keys let you pick the Trace into which to import the data; either 1, 2, 3, 4, 5 or 6. The default is the currently selected trace, selected in this menu or in the Trace/Det, Export Data, Recall Trace, or Save Trace menus; except if you have chosen All then All remains chosen until you specifically change it to a single trace.

Once selected, the key returns back to the Import Data menu and the selected Trace number is annotated on the key. The next step is to select the Open key in the Import Data menu.

Key Path	Recall, Data, Trace
Notes	Auto return
Couplings	When you select the trace into which to import the data, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in State
Initial S/W Revision	Prior to A.02.00

Select Trace

These keys let you pick the Trace into which to import the data; either 1, 2, 3, 4, 5 or 6. The default is the currently selected trace, selected in this menu or in the Trace/Det, Export Data, Recall Trace, or Save Trace menus; except if you have chosen All then All remains chosen until you specifically change it to a single trace.

Once selected, the key returns back to the Import Data menu and the selected Trace number is annotated on the key. The next step is to select the Open key in the Import Data menu.

Key Path	Recall, Data, Trace
Notes	Auto return
Couplings	When you select the trace into which to import the data, it makes that trace the current trace, so it displays on top of all of the other traces.

Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in State
Initial S/W Revision	Prior to A.02.00

Select Trace

These keys let you pick the Trace into which to import the data; either 1, 2, 3, 4, 5 or 6. The default is the currently selected trace, selected in this menu or in the Trace/Det, Export Data, Recall Trace, or Save Trace menus; except if you have chosen All then All remains chosen until you specifically change it to a single trace.

Once selected, the key returns back to the Import Data menu and the selected Trace number is annotated on the key. The next step is to select the Open key in the Import Data menu.

Key Path	Recall, Data, Trace
Notes	Auto return
Couplings	When you select the trace into which to import the data, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in State
Initial S/W Revision	Prior to A.02.00

Select Trace

These keys let you pick the Trace into which to import the data; either 1, 2, 3, 4, 5 or 6. The default is the currently selected trace, selected in this menu or in the Trace/Det, Export Data, Recall Trace, or Save Trace menus; except if you have chosen All then All remains chosen until you specifically change it to a single trace.

Once selected, the key returns back to the Import Data menu and the selected Trace number is annotated on the key. The next step is to select the Open key in the Import Data menu.

Key Path	Recall, Data, Trace
Notes	Auto return
Couplings	When you select the trace into which to import the data, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in State
Initial S/W Revision	Prior to A.02.00

Select Trace

These keys let you pick the Trace into which to import the data; either 1, 2, 3, 4, 5 or 6. The default is the currently selected trace, selected in this menu or in the Trace/Det, Export Data, Recall Trace, or Save Trace menus; except if you have chosen All then All remains chosen until you specifically change it to a single trace.

Once selected, the key returns back to the Import Data menu and the selected Trace number is annotated on the key.   The next step is to select the Open key in the Import Data menu.

Key Path	Recall, Data, Trace
Notes	Auto return
Couplings	When you select the trace into which to import the data, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in State
Initial S/W Revision	Prior to A.02.00

Select Trace

These keys let you pick the Trace into which to import the data; either 1, 2, 3, 4, 5 or 6. The default is the currently selected trace, selected in this menu or in the Trace/Det, Export Data, Recall Trace, or Save Trace menus; except if you have chosen All then All remains chosen until you specifically change it to a single trace.

Once selected, the key returns back to the Import Data menu and the selected Trace number is annotated on the key.   The next step is to select the Open key in the Import Data menu.

Key Path	Recall, Data, Trace
Notes	Auto return
Couplings	When you select the trace into which to import the data, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in State
Initial S/W Revision	Prior to A.02.00

Limit

This key selects Limit Lines as the data type to be imported. When pressed a second time, it brings up the Limits Menu, which lets you select into which Limit the data will be imported.

A set of preloaded Limits files can be found in the directory

/My Documents/ EMC Limits and Ampcor.

Under this directory, the directory called Limits (Legacy Naming) contains a set of legacy limits, generally the same files that were supplied with older Agilent EMC analyzers, that use the legacy suffix .lim, and the old 8-character file names. In the directory called Limits, the same files can be found, with the same suffix, but with longer, more descriptive filenames.

Key Path	Recall, Data
Remote Command	:MMEMory:LOAD:LIMit LLINE1|LLINE2,<filename>
Example	:MMEM:LOAD:LIM LLINE2, "myLimitLine2.csv" Imports the 2nd Limit Line from the file myLimitLine2.csv in the current path. The default path is My Documents\SA\data\limits
Dependencies	Errors are reported if the file is empty or missing, or if the file type does not match, or if there is a mismatch between the file type and the destination data type. If any of these occur during manual operation, the analyzer returns to the Import Data menu and the File Open dialog goes away. This key will only appear if you have the proper option installed in your instrument.
Couplings	When a limit line is loaded from mass storage, it is automatically turned on. This allows the user to see it, thus confirming the load. The Margin settings will match those when the limit was saved The instrument cannot mix Limits domains (X Axis Unit must be Frequency or Time for both Limits). So when a Limits file is loaded, the analyzer will set the Limits domain (X Axis Unit) to match that of the file. If this changes the Limits domain from what it was before the file was loaded, all Limits data in all Limits sets will be erased before the data loads. If this operation is over the remote interface there will be no warning if this occurs, so care should be taken to know the domain of the file you are loading.
Readback	Selected Limit Line
Status Bits/OPC dependencies	Sequential - aborts the current measurement
Initial S/W Revision	A.02.00

Limit Selection

These keys let you pick which Limit Line to import the data into; either 1, 2, 3, 4, 5 or 6. The default is the currently selected limit. Once selected, the key returns back to the Import Data menu and the selected Limit Line number is annotated on the key. Now you have selected exactly what needs to be imported. In order to trigger an import of the selected Limit Line, you must select the Open key in the Import Data menu.

An example of using this menu is: If you select 2 and continue to the File Open menu, Limit Line 2 will be imported from the file selected or entered in File Name option in the File Open dialog.

Key Path	Recall, Data, Limit Line
Notes	Auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives a shutdown.
State Saved	The selected limit number is saved in instrument state
Initial S/W Revision	A.02.00

Limit Selection

These keys let you pick which Limit Line to import the data into; either 1, 2, 3, 4, 5 or 6. The default is the currently selected limit. Once selected, the key returns back to the Import Data menu and the selected Limit Line number is annotated on the key. Now you have selected exactly what needs to be imported. In order to trigger an import of the selected Limit Line, you must select the Open key in the Import Data menu.

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Key Path	Recall, Data, Limit Line
Notes	Auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives a shutdown.
State Saved	The selected limit number is saved in instrument state
Initial S/W Revision	A.02.00

Limit Selection

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Key Path	Recall, Data, Limit Line
Notes	Auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives a shutdown.
State Saved	The selected limit number is saved in instrument state
Initial S/W Revision	A.02.00

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Key Path	Recall, Data, Limit Line
Notes	Auto return

Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives a shutdown.
State Saved	The selected limit number is saved in instrument state
Initial S/W Revision	A.02.00

Limit Selection

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Key Path	Recall, Data, Limit Line
Notes	Auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives a shutdown.
State Saved	The selected limit number is saved in instrument state
Initial S/W Revision	A.02.00

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An example of using this menu is: If you select 2 and continue to the File Open menu, Limit Line 2 will be imported from the file selected or entered in File Name option in the File Open dialog.

Key Path	Recall, Data, Limit Line
Notes	Auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives a shutdown.
State Saved	The selected limit number is saved in instrument state
Initial S/W Revision	A.02.00

Open...

When you press “Open”, the analyzer brings up a Windows dialog and a menu entitled “**File Open.”** This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See "From File..." on page 967in Recall, State, for a full description of this dialog and menu.

Key Path	Recall, Data
Notes	The key location is mode-dependent and will vary. Brings up Open dialog for recalling a <mode specific> Save Type
Initial S/W Revision	Prior to A.02.00

Open...

When you press “Open”, the analyzer brings up a Windows dialog and a menu entitled “**File Open.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

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Key Path	Recall, Data
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Initial S/W Revision	Prior to A.02.00

Open...

When you press “Open”, the analyzer brings up a Windows dialog and a menu entitled “**File Open.”** This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See "From File..." on page 967in Recall, State, for a full description of this dialog and menu.

Key Path	Recall, Data
Notes	The key location is mode-dependent and will vary. Brings up Open dialog for recalling a <mode specific> Save Type
Initial S/W Revision	Prior to A.02.00

Open...

When you press “Open”, the analyzer brings up a Windows dialog and a menu entitled “**File Open.”** This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See "From File..." on page 967in Recall, State, for a full description of this dialog and menu.

Key Path	Recall, Data
Notes	The key location is mode-dependent and will vary. Brings up Open dialog for recalling a <mode specific> Save Type
Initial S/W Revision	Prior to A.02.00

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See "From File..." on page 967in Recall, State, for a full description of this dialog and menu.

Key Path	Recall, Data
Notes	The key location is mode-dependent and will vary. Brings up Open dialog for recalling a <mode specific> Save Type
Initial S/W Revision	Prior to A.02.00

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See "From File..." on page 967in Recall, State, for a full description of this dialog and menu.

Key Path	Recall, Data
Notes	The key location is mode-dependent and will vary. Brings up Open dialog for recalling a <mode specific> Save Type
Initial S/W Revision	Prior to A.02.00

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See "From File..." on page 967in Recall, State, for a full description of this dialog and menu.

Key Path	Recall, Data
Notes	The key location is mode-dependent and will vary. Brings up Open dialog for recalling a <mode specific> Save Type

Initial S/W Revision	Prior to A.02.00

Restart

The Restart function restarts the current sweep, or measurement, or set of averaged/held sweeps or measurements. If you are Paused, pressing Restart does a Resume.

The Restart function is accessed in several ways:

- Pressing the Restart key
- Sending the remote command INIT:IMMediate
- Sending the remote command INIT:RESTart

See "More Information" on page 984

Key Path	Front-panel key
Remote Command	`:INITiate[:IMMediate]` `:INITiate:RESTart`
Example	:INIT:IMM :INIT:REST
Notes	:INITiate:RESTart and :INITiate:IMMediate perform exactly the same function.
Couplings	Resets average/hold count k. For the first sweep overwrites all active (update=on) traces with new current data. For application modes, it resets other parameters as required by the measurement.
Status Bits/OPC dependencies	This is an Overlapped command. The STATus:OPERation register bits 0 through 8 are cleared. The STATus:QUEStionable register bit 9 (INTegrity sum) is cleared. The SWEEPING bit is set. The MEASURING bit is set.
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, the Restart hardkey and the INITiate:RESTart command restart trace averages (displayed average count reset to 1) for a trace in Clear Write, but did not restart Max Hold and Min Hold. In the X-Series, the Restart hardkey and the INITiate:RESTart command restart not only Trace Average, but MaxHold and MinHold traces as well. For wireless comms modes in ESA and PSA, the Restart hardkey and the INITiate:RESTart command restart every measurement, which includes all traces and numeric results. There is no change to this operation.
Initial S/W Revision	Prior to A.02.00

More Information

The **Restart** function first aborts the current sweep/measurement as quickly as possible. It then resets the sweep and trigger systems, sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met.

If the analyzer is in the process of aligning when **Restart** is executed, the alignment finishes before the restart function is performed.

Even when set for Single operation, multiple sweeps may be taken when Restart is pressed (for example, when averaging/holding is on). Thus when we say that **Restart** "restarts a measurement," we may mean:

- It restarts the current sweep
- It restarts the current measurement
- It restarts the current set of sweeps if any trace is in Trace Average, Max Hold or Min Hold
- It restarts the current set of measurements if Averaging, or Max Hold, or Min Hold is on for the measurement
- depending on the current settings.

With **Average/Hold Number** (in **Meas Setup** menu) set to 1, or Averaging off, or no trace in Trace Average or Hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met; and the analyzer stops sweeping once that sweep has completed. However, with **Average/Hold Number** >1 and at least one trace set to **Trace Average**, **Max Hold**, or **Min Hold (SA Measurement)** or **Averaging on (most other measurements)**, multiple sweeps/data acquisitions are taken for a single measurement. The trigger condition must be met prior to each sweep. The sweep is stopped when the average count k equals the number N set for **Average/Hold Number**. A measurement average usually applies to all traces, marker results, and numeric results; but sometimes it only applies to the numeric results.

Once the full set of sweeps has been taken, the analyzer will go to idle state. To take one more sweep without resetting the average count, increment the average count by 1, by pressing the step up key while **Average/Hold Number** is the active function, or sending the remote command CALC:AVER:TCON UP.

Save

The Save menu lets you choose what you want to save and where you want to save it. Among the types of files you can save are **States**, **Traces**, and **Screen Images**. In addition, an Export (Data) option lets you save a number of data types as CSV files for easy import into Excel and other spreadsheet programs.

Key Path	Front-panel key
Mode	All
Notes	No remote command for this key specifically, but the :MMEM:STORe command is available for specific file types. An example is :MMEM:STOR:STATe <filename>.
Initial S/W Revision	Prior to A.02.00

State

The Save State menu lets you choose a register or file for saving the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings which were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings affected by Restore Mode Defaults; all of the Mode’s settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode’s state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

After the save completes, the message "File <filename> saved" or "State Register <register number> saved" is displayed.

For rapid saving, the State menu lists 16 registers to save to. Pressing a Register key initiates the save. You can also select a file to save to.

The default path for all State Files is:

My Documents\<mode name>\state

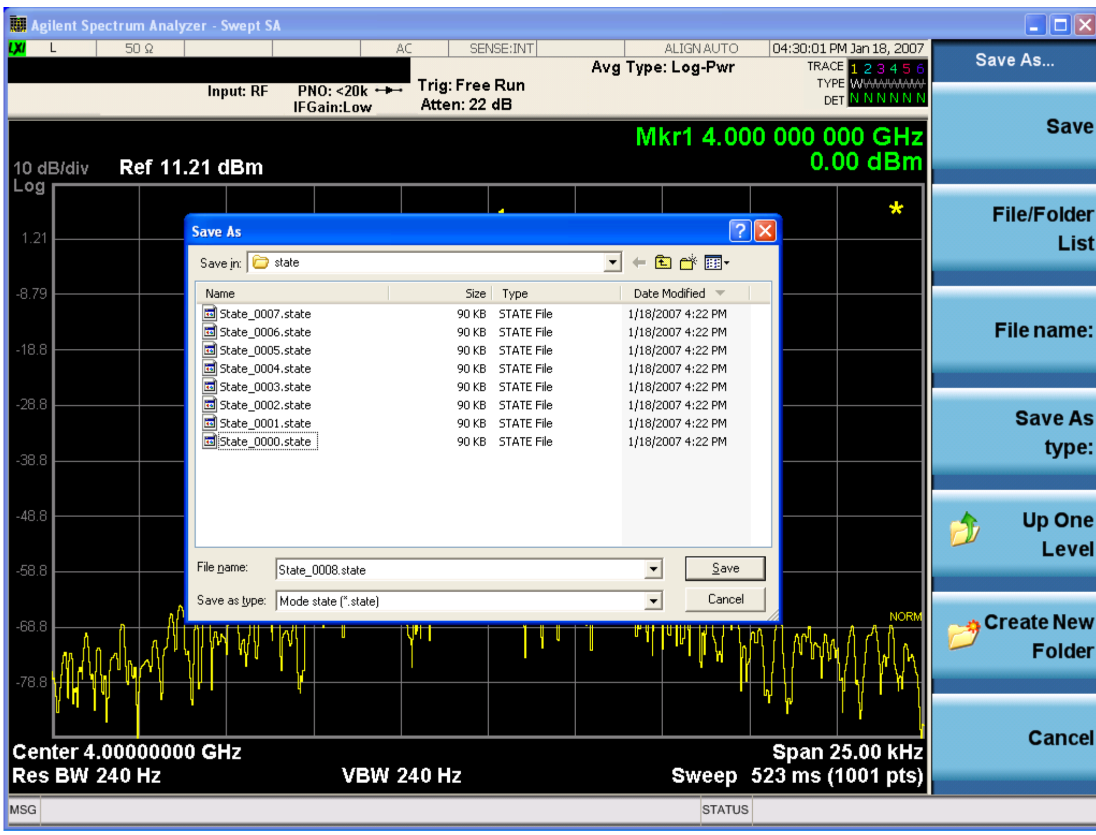
where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save
Mode	All
Remote Command	`:MMEMory:STORe:STATe <filename>`
Example	MMEM:STOR:STATe "MyStateFile.state" This stores the current instrument state data in the file MyStateFile.state in the default directory.
Notes	Both single and double quotes are supported for any filename parameter over remote. After saving to a register, that register’s menu key is updated with the date the time, unless a custom label has been entered for that key. After saving to a register, you remain in the Save State menu, so that you can see the Register key

	update. After saving to a file, the analyzer automatically returns to the previous menu and any Save As dialog goes away.
Backwards Compatibility SCPI	`:MMEMory:STORe:STATe 1,<filename>` For backwards compatibility, the above syntax is supported. The "1" is simply ignored. The command is sequential.
Initial S/W Revision	Prior to A.02.00

To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



The Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Save

Performs the save to the specified file of the selected type. If the file already exists, a dialog will appear that allows you to replace the existing file by selecting OK, or you can Cancel the request. If you select OK, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.

While the save is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "Quick Save " on page 902 documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

Save As Type

This field shows the file suffix for the type of file you have selected to save. For example, if you navigated here while saving State, "Mode state (*.state)" is in the field. If you navigated here from saving Trace, ""Mode state (*.trace)" is in the field. If you navigated here while exporting a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown, which you can select by using the up and down arrow keys and Enter.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Create New Folder

This key corresponds to the icon of a folder with the "*" that is in the tool bar of the dialog. When pressed, a new folder is created in the current directory with the name **New Folder** and you can enter a new folder name using the Alpha Editor.

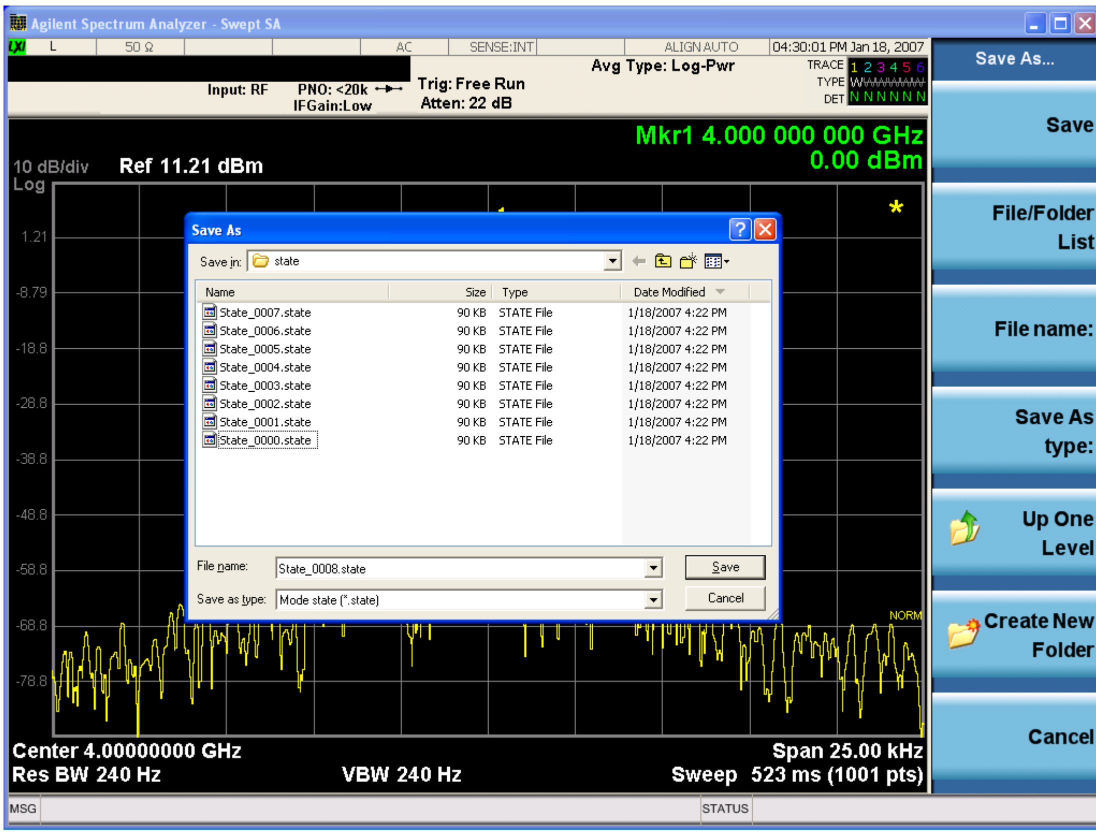
Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State
Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



The Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Save

Performs the save to the specified file of the selected type. If the file already exists, a dialog will appear that allows you to replace the existing file by selecting OK, or you can Cancel the request. If you select OK, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.

While the save is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "Quick Save " on page 902 documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

Save As Type

This field shows the file suffix for the type of file you have selected to save. For example, if you navigated here while saving State, "Mode state (*.state)" is in the field. If you navigated here from saving Trace, ""Mode state (*.trace)" is in the field. If you navigated here while exporting a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown, which you can select by using the up and down arrow keys and Enter.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Create New Folder

This key corresponds to the icon of a folder with the "*" that is in the tool bar of the dialog. When pressed, a new folder is created in the current directory with the name **New Folder** and you can enter a new folder name using the Alpha Editor.

Cancel

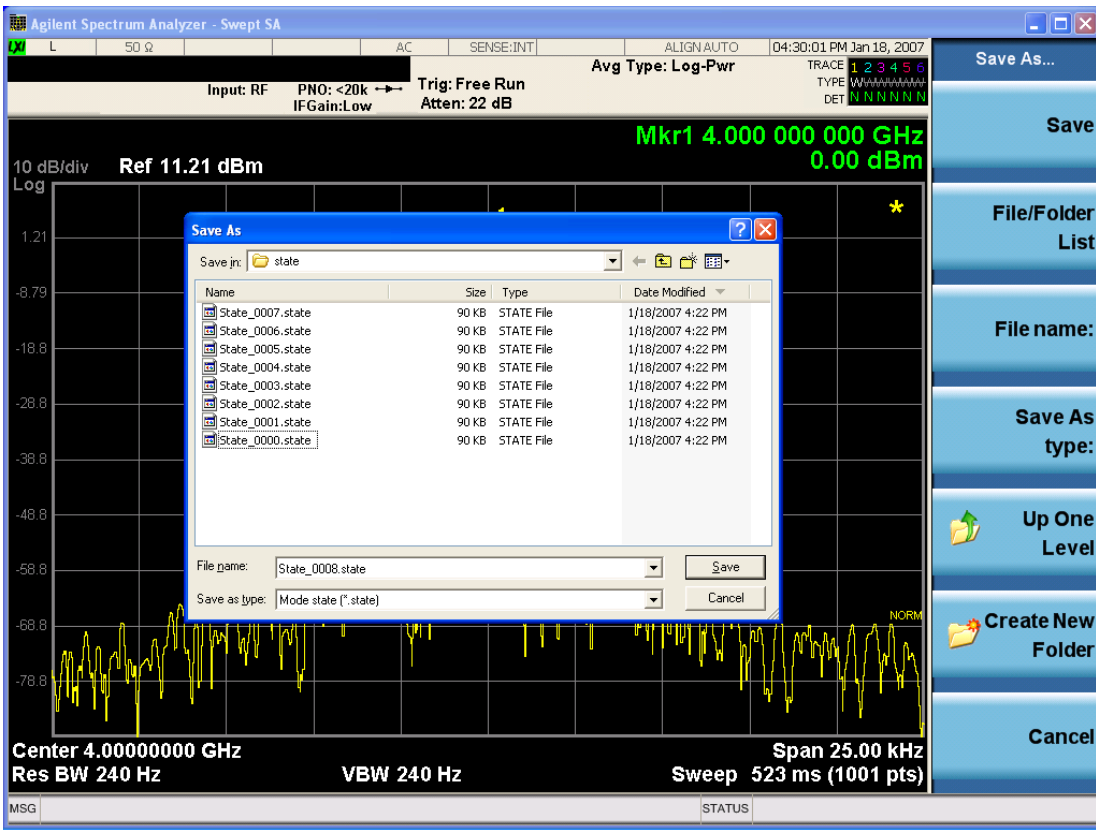
This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State

Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



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While the save is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "Quick Save " on page 902 documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

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Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Create New Folder

This key corresponds to the icon of a folder with the "*" that is in the tool bar of the dialog. When pressed, a new folder is created in the current directory with the name **New Folder** and you can enter a new folder name using the Alpha Editor.

Cancel

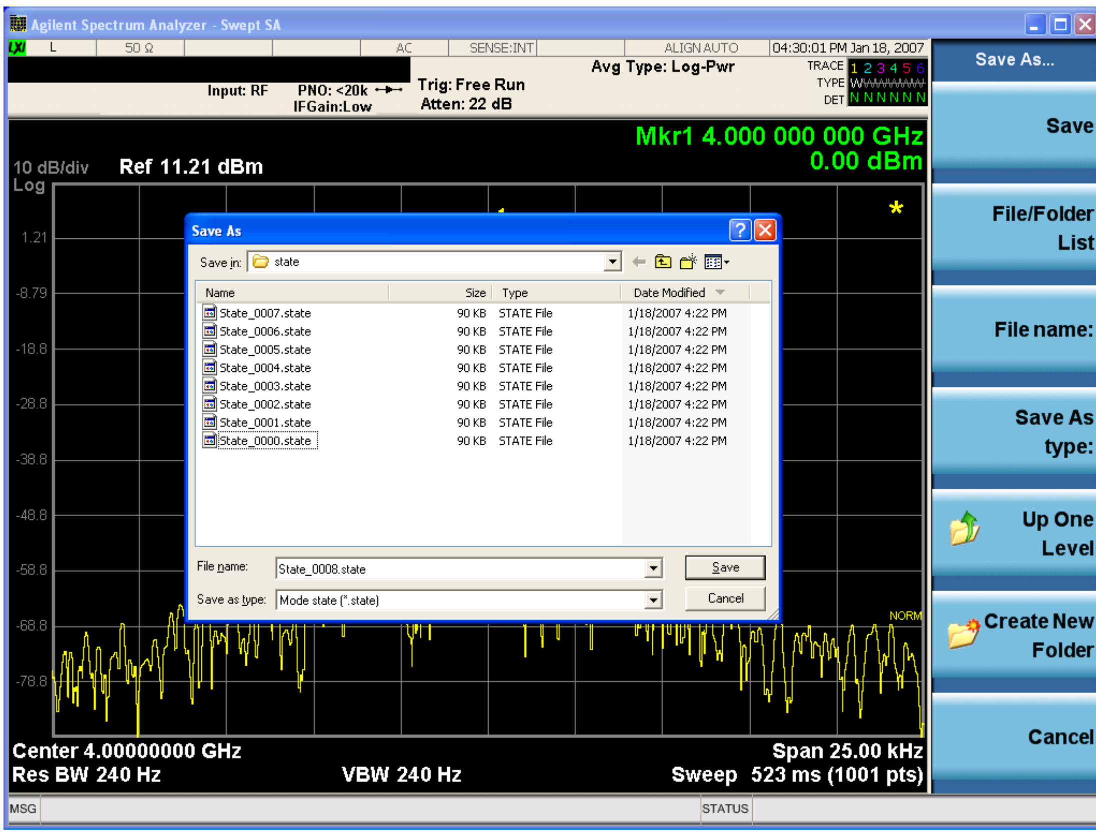
This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State

Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



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While the save is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "Quick Save " on page 902 documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

Save As Type

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Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Create New Folder

This key corresponds to the icon of a folder with the "*" that is in the tool bar of the dialog. When pressed, a new folder is created in the current directory with the name **New Folder** and you can enter a new folder name using the Alpha Editor.

Cancel

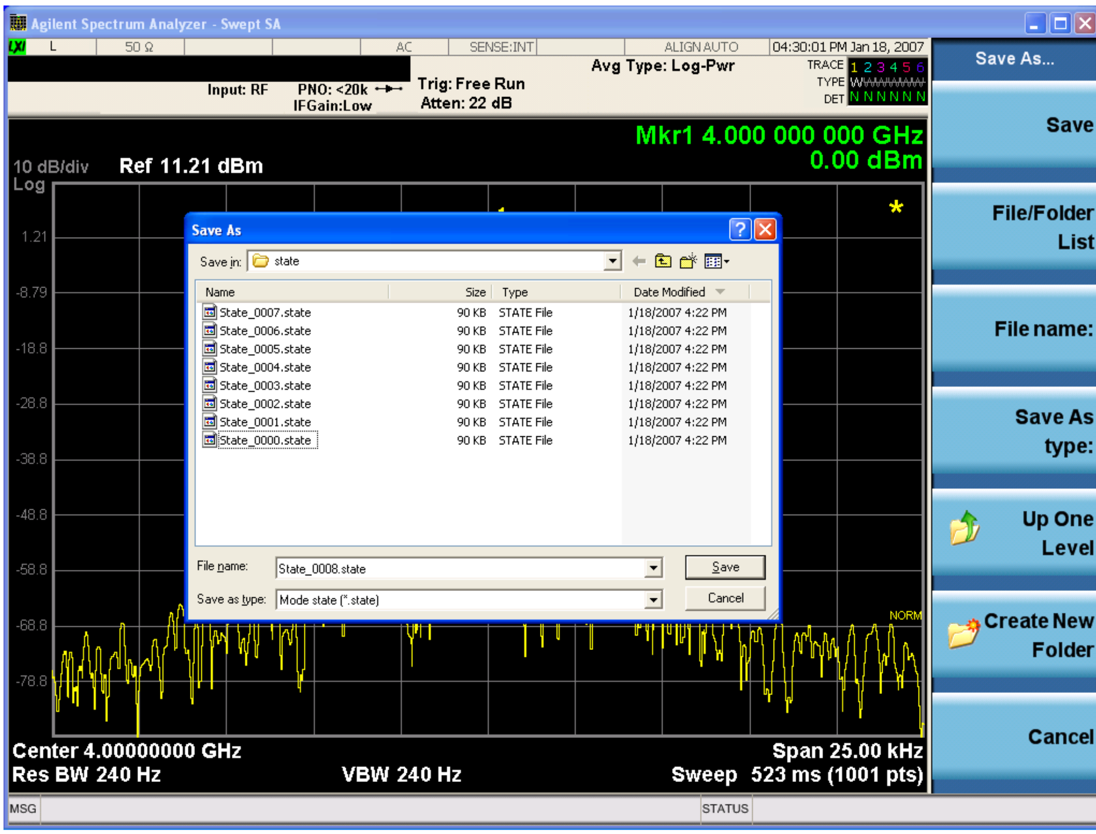
This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State

Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

To File . . .

When you press "To File", the analyzer brings up a Windows dialog and a menu entitled "**Save As.**" This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



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While the save is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "Quick Save " on page 902 documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

Save As Type

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Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Create New Folder

This key corresponds to the icon of a folder with the "*" that is in the tool bar of the dialog. When pressed, a new folder is created in the current directory with the name **New Folder** and you can enter a new folder name using the Alpha Editor.

Cancel

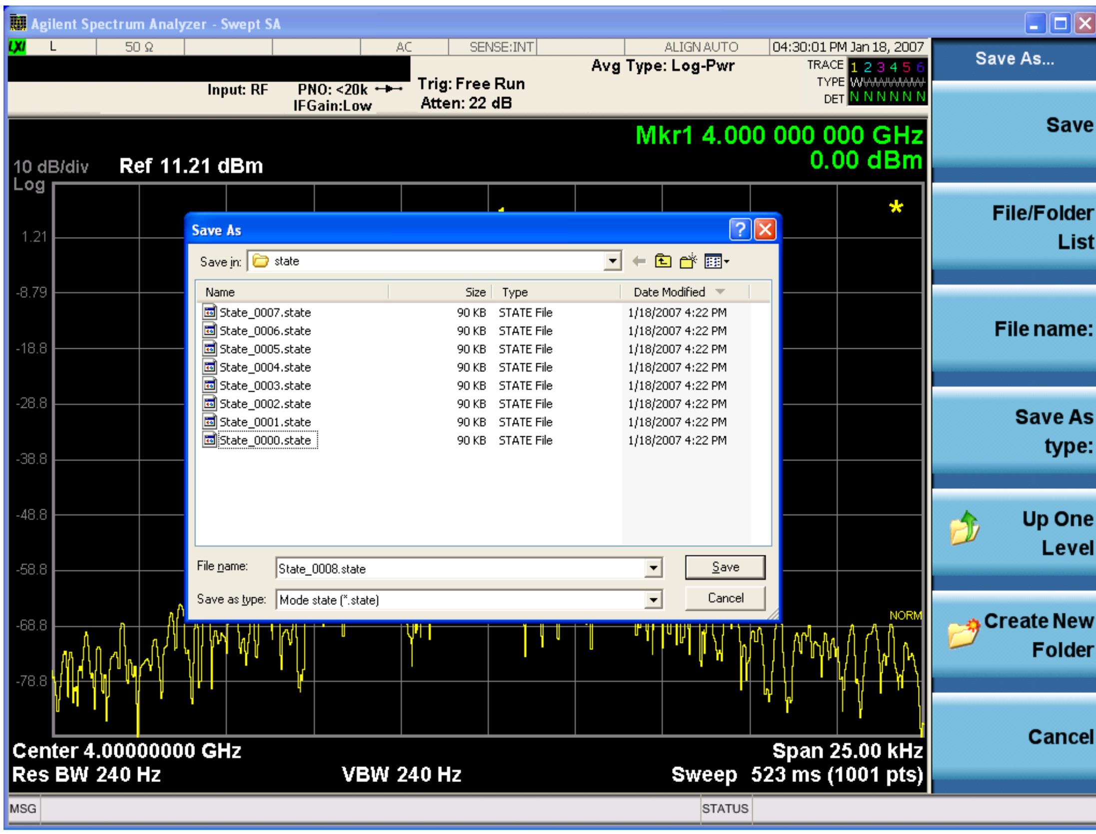
This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State

Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



The Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Save

Performs the save to the specified file of the selected type. If the file already exists, a dialog will appear that allows you to replace the existing file by selecting OK, or you can Cancel the request. If you select OK, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.

While the save is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "Quick Save " on page 902 documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

Save As Type

This field shows the file suffix for the type of file you have selected to save. For example, if you navigated here while saving State, "Mode state (*.state)" is in the field. If you navigated here from saving Trace, ""Mode state (*.trace)" is in the field. If you navigated here while exporting a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown, which you can select by using the up and down arrow keys and Enter.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

Create New Folder

This key corresponds to the icon of a folder with the "*" that is in the tool bar of the dialog. When pressed, a new folder is created in the current directory with the name **New Folder** and you can enter a new folder name using the Alpha Editor.

Cancel

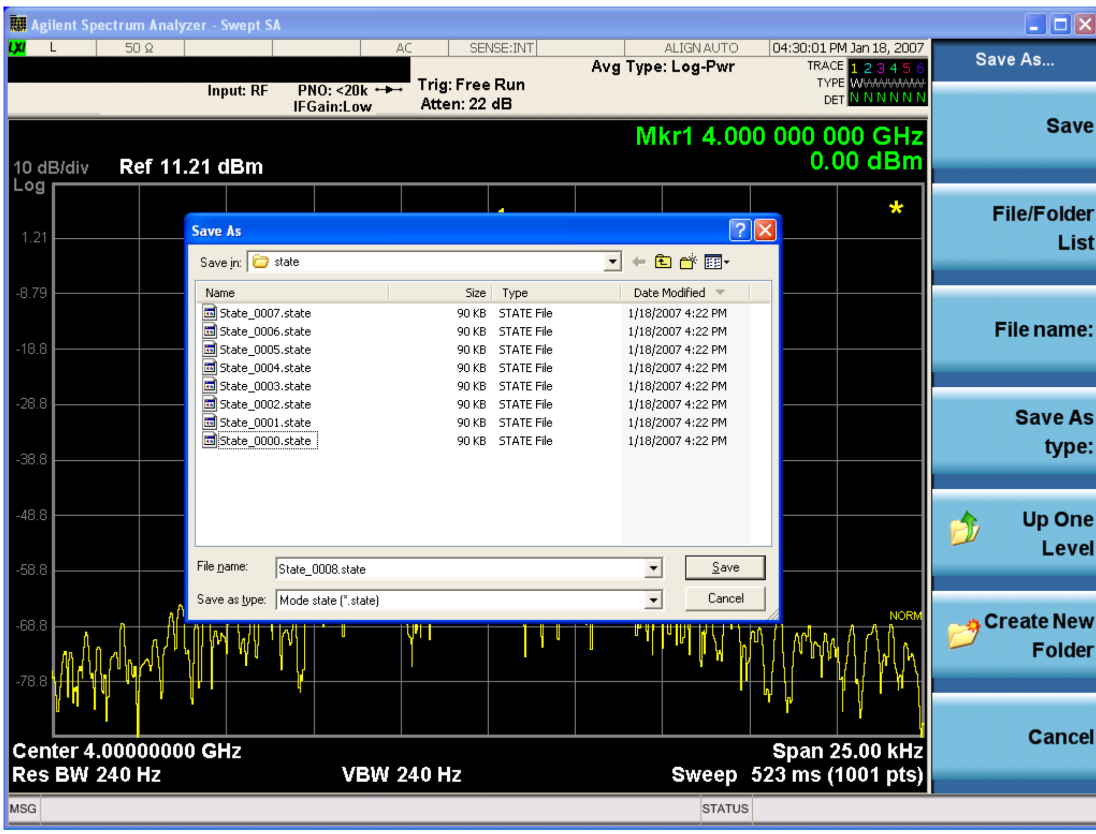
This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State

Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



The Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Save

Performs the save to the specified file of the selected type. If the file already exists, a dialog will appear that allows you to replace the existing file by selecting OK, or you can Cancel the request. If you select OK, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.

While the save is being performed, the floppy icon appears briefly in the Meas bar.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "Quick Save " on page 902 documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

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This field shows the file suffix for the type of file you have selected to save. For example, if you navigated here while saving State, "Mode state (*.state)" is in the field. If you navigated here from saving Trace, ""Mode state (*.trace)" is in the field. If you navigated here while exporting a trace data file, "Trace Data (*.csv)" is in the field. For some file types, there is more than one choice in the dropdown, which you can select by using the up and down arrow keys and Enter.

Up One Level

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Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State

Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

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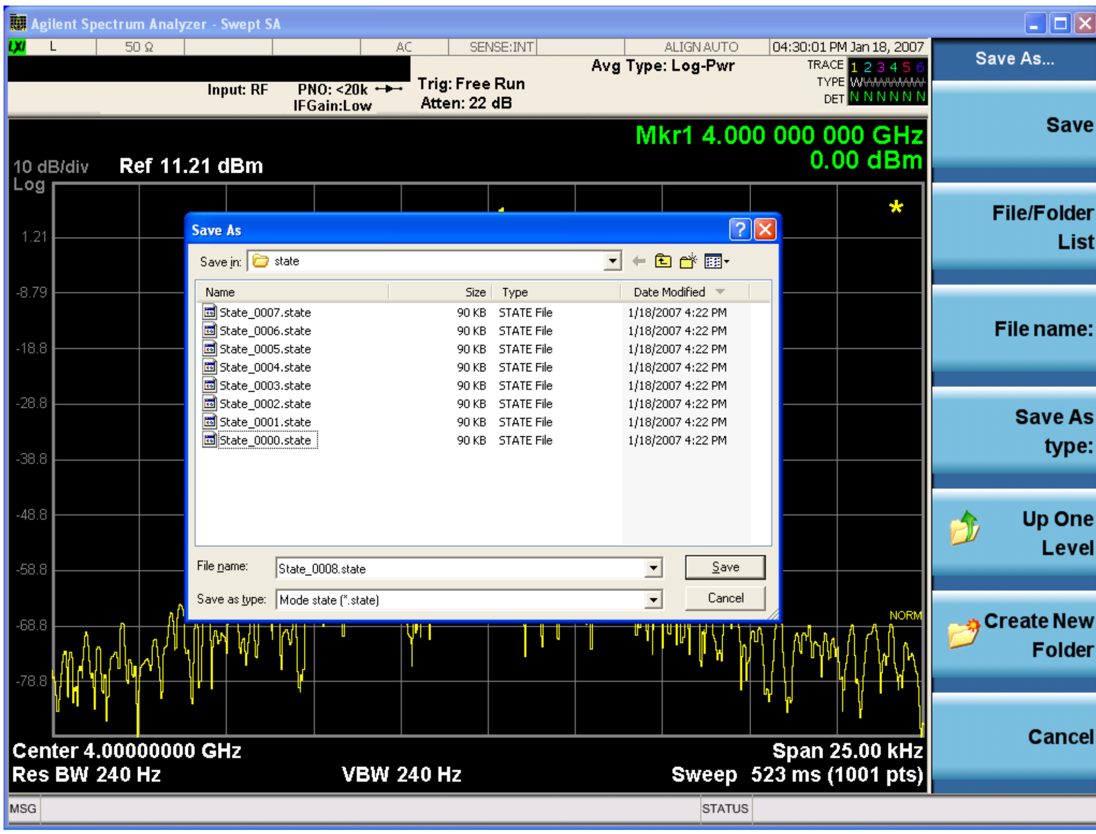

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User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "Quick Save " on page 902 documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

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Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State

Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

Register 1 thru Register 16

Selecting any one of these register menu keys causes the State of the currently active mode to be saved to the specified Register. The registers are provided for rapid saving and recalling, since you do not need to specify a filename or navigate to a file. Each of the register menu keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key to enter custom names for each register.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the *SAV command.

There is one set of 128 state registers in the instrument, not one set for each Mode. When a state is saved, the Mode it was saved from is saved with it; then when it is recalled, the instrument switches to that Mode.

After the save completes, the corresponding register menu key annotation is updated with the date and time and the message "Register <register number> saved" is displayed.

Key Path	Save, State
Mode	All
Example	*SAV 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Edit Register Names key OR "(empty)" if no prior save operation has been performed to this register.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.11.00

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Edit Register Names

You may enter a custom name on any of the Register keys, to help you remember what you are using that state to save. To do this, press the Edit Register Names key, choose the register whose name you wish to edit, and then enter the desired label using the Alpha Editor or an external PC keyboard.

The maximum number of characters that can be added is 30. In most cases, 30 characters will fit on two lines of the key.

See "More Information" on page 1015

Key Path	Save, State
Mode	All
Remote Command	`:MMEMory:REGister:STATe:LABel <reg number>,”label”` `:MMEMory:REGister:STATe:LABel? <reg number>`
Example	:MMEM:REG:STAT:LAB 1,”my label”
Notes	<reg number> is an integer from 1 to 16. If the SCPI specifies an invalid register number an error message is generated, –222,"Data out of range;Invalid register label number" “label” is a string from 0 to 30 characters in length. If a label exceeds 30 characters, an error message is generated, –150,“String data error;Label clipped to 30 characters” “label” of length 0 erases the custom label and restores the default (time and date) label. E.g.: :MMEM:REG:STAT:LAB 1,””

Dependencies	N9060A-7FP or N9060B-2FP license required to edit the register names. When the feature is not licensed, sending this command generates an error, -221,"Settings conflict;Option not available"
Preset	The names are unaffected by Preset or power cycle but are set to the default label (time and date) on a “Restore System Defaults->Misc”
Initial S/W Revision	A.11.00

More Information

When you edit one of the register names, the time and date field will be replaced by the custom name.

If you delete all the characters in the custom name, it restores the default (time and date).

The register names are stored within the state files, but they are not part of the instrument state; that is, once you have edited a register name, loading a new state will not change that register name. Another consequence of this is that the names will be persistent through a power cycle. Also, if a named state file is transferred to another analyzer, it will bring its custom name along with it.

If you try to edit the name of an empty register, the analyzer will first save the state to have a file to put the name in. If you load a named state file into an analyzer with older firmware it will ignore the metadata.

The *SAV and *RCL commands will not be affected by the custom register names, nor will the MMEM commands.

Trace (+State)

The Save Trace (+State) menu lets you choose a register or file specifying where to save the Trace+State state file.

A saved state contains all of the settings and data required to return the analyzer as closely as possible to the exact setup it had when the save occurred. This includes the Input/Output settings, even though they are outside of the Mode’s state, because they are needed to restore the complete setup. A Trace+State file also includes trace data from one trace or all traces, which will load in View mode when the Trace+State file is recalled.

After the save completes, the message "File <filename> saved" or "Trace Register <register number> saved" is displayed.

For rapid saves, the Trace (+State) menu lists 5 registers to save to. Pressing a Register key initiates the save. You can also select a file to save to.

The default path for all State Files including .trace files is:

My Documents\<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

This key is grayed out for measurements that do not support trace saves. It is blanked for modes that do not support trace saves. Saving Trace is identical to saving State except a .trace extension is used on the file instead of .state, and internal flags are set in the file indicating which trace was saved. You may select to save one trace or ALL traces.

Key Path	Save
Mode	SA
Remote Command	`:MMEMory:STORe:TRACe TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6 | ALL,<filename>` `:MMEMory:STORe:TRACe:REGister TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6 | ALL,<integer>`
Example	:MMEM:STOR:TRAC TRACE1, "myState.trace" saves the file myState.trace on the default path and flags it as a "single trace" file with Trace 1 as the single trace (even though all of the traces are in fact stored). :MMEM:STOR:TRAC ALL, "myState.trace" saves the file myState.trace on the default path and flags it as an "all traces" file :MMEM:STOR:TRAC:REG TRACE1, 2 stores trace 1 data in trace register 2
Notes	This command actually performs a save state, which in the Swept SA measurement includes the trace data. However it flags it (in the file) as a "save trace" file of the specified trace (or all traces). Some modes and measurements do not have available all 6 traces. The Phase Noise mode command, for example, is: MMEMory:STORe:TRACe TRACE1|TRACE2|TRACE3|ALL,<filename> The range for the register parameter is 1–5 When you initiate a save, if the file already exists, a dialog will appear that allows you to replace the existing file by selecting OK or you can Cancel the request. If you select OK, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over remote. After saving to a register, that register's menu key is updated with the date and time of the save. After saving to a register, you remain in the Save Trace menu, so that you can see the Register key update. After saving to a file, the analyzer automatically returns to the previous menu and any Save As dialog goes away.
Initial S/W Revision	Prior to A.02.00

Data (Export)

Exporting a data file stores data from the current measurement to mass storage files. The Export Menu only contains data types that are supported by the current measurement.

Since the commonly exported data files are in .csv format, the data can be edited by you prior to importing. This allows youto export a data file, manipulate the data in Excel (the most common PC Application for manipulating .csv files) and then import it.

Selecting an Export Data menu key will not actually cause the exporting to occur, since the analyzer still needs to know where you wish to save the data. Pressing the Save As key in this menu brings up the Save As dialog and Save As menu that allows you to specify the destination file and directory. Once a filename has been selected or entered in the Open menu, the export will occur as soon as the Save key is pressed.

Key Path	Save
Mode	All

Notes	The menu is built from whatever data types are available for the mode. So the key locations in the sub menu will vary. No SCPI command directly controls the Data Type that this key controls. The Data Type is included in the MMEM:STORe commands.
Dependencies	If a file type is not used by a certain measurement, that type is grayed out for that measurement. The key for a file type will not show at all if there are no measurements in the Mode that support it.
Preset	Is not affected by a Preset or shutdown, but is reset during Restore Mode Defaults
Readback	The data type that is currently selected
Initial S/W Revision	Prior to A.02.00

Amplitude Correction

Pressing this key selects **Amplitude Corrections** as the data type to be exported. Pressing this key again brings up the Select Menu, which allows the user to select which **Amplitude Correction** to save.

Amplitude Corrections are fully discussed in the documentation of the Input/Output key, under the Corrections softkey.

See "Correction Data File " on page 1017

Key Path	Save
Remote Command	`:MMEMory:STORe:CORRection 1|2|3|4|5|6, <filename>`
Example	:MMEM:STOR:CORR 2 "myAmpcor.csv" saves Correction 2 to the file myAmpcor.csv on the current path. The default path is My Documents\amplitudeCorrections.
Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over SCPI.
Dependencies	Corrections are not supported by all Measurements. If in a Mode in which some Measurements support it, this key will be grayed out in measurements that do not. The key will not show at all if no measurements in the Mode support it. This key will not appear unless you have the proper option installed in your instrument.
Readback	Selected Correction
Backwards Compatibility SCPI	`:MMEMory:STORe:CORRection ANTenna	CABLe	OTHer	USER, <filename>` For backwards compatibility, ANTenna maps to 1, CABle maps to 2, OTHer maps to 3 and USER maps to 4
Initial S/W Revision	A.02.00

Correction Data File

A Corrections Data File contains a copy of one of the analyzer correction tables. Corrections provide a way to adjust the trace display for predetermined gain curves (such as for cable loss).

Corrections files are text files in .csv (comma separated values) form, to make them importable into Excel or other spreadsheet programs. The format for Corrections files is as follows.

Line #	Type of field	Example	Notes
1	File type, must be "Amplitude Correction"	Amplitude Correction	May not be omitted
2	File Description (in quotes)	"Correction Factors for 11966E"	60 characters max; may be empty but may not be omitted. If exceeds 60 characters, error –233 Too much data reported
3	Comment (in quotes)	"Class B Radiated"	60 characters max; may be empty but may not be omitted. . If exceeds 60 characters, error –233 Too much data reported
4	Instrument Version, Model #	A.02.06,N9020A	May be empty but may not be omitted
5	Option List, File Format Version	K03 LFE EXM ,01	May be empty but may not be omitted
6	Freq Unit to be used for all frequency values in the file	Frequency Unit,MHz	assumed to be Hz if omitted
7	Antenna Unit	Antenna Unit,None	If omitted leaves the Antenna unit unchanged. The amplitude unit in the Antenna Unit field is a conversion factor that is used to adjust the Y Axis Units of the current mode, if the mode supports Antenna Units. For more details on antenna correction data, refer to the Input/Output,Corrections key description. Allowable values: dBuv/m, dBuA/m, dBG, dBpT, None
8	Freq Interpolation	Frequency Interpolation,Linear	if omitted leaves the Freq Interpolation unchanged. Allowable values: Linear, Logarithmic
9	Bias value in mA	Bias,0.00	If omitted leaves the Bias value unchanged (added as of A.08.50)
10	Bias State	Bias State,On	If omitted leaves the Bias State unchanged. Allowable values: On, Off (added as of A.08.50)
11	Overlap, two values, Freq1 and Freq2, separated by commas.	Overlap,33500,40000	Uses Freq Unit from line 6. Thus, in this example Freq1=33.5 GHz, Freq2= 40.0 GHz (see note below). If omitted leaves the overlap unchanged (added as of A.08.50)
12	DATA marker	DATA	Corrections data begins in the next line

Lines 2 through 5 can be empty but must appear in the file. Lines 6 through 11 are optional, the lines can be left out of the file altogether.

The Overlap row and the two Bias rows apply only to external mixing. Both are read-only, they are never written by the analyzer. The only way to insert or modify these rows is to edit the file with a text editor or a spreadsheet editor. These rows are intended for use by mixer manufacturers, as they allow the manufacturer to insert data about how the mixer corrections were generated and how they should be applied. The Bias rows allow you to specify whether to turn Bias on or off when the Correction is turned on and to specify a Bias value (turning off the Correction does not change the Bias, but turning it back on again sets it to the value specified in the file). The Overlap row allows you to specify an overlap region in which two different corrections may be applied. It is expected that in the corrections data itself, there will be TWO corrections values exactly at Max Freq, otherwise Overlap is ignored. The way the overlap is processed is as follows: if at any given time the current analyzer Start Freq is greater than Freq 1 and lower than Freq 2, and the current Stop Freq is greater than Freq 2, extend the first correction point at or above Freq 2 down to Freq 1, rather than using the correction data between Freq1 and Freq2.

The Antenna Unit row can only be used in Correction register 1, because there can only be one setting for Antenna Unit at any given time. If a Correction whose Antenna Unit is set to anything but None is loaded into any Correction register but 1, an error is generated (Mass storage error; Can only load an Antenna Unit into Correction 1). When a correction file is saved from any Correction register but 1, Antenna Unit is always written as None.

Similarly, the Bias rows can only be used in Correction register 1, because there can only be one setting for Bias at any given time. If a Correction file with a Biasor Bias State row is loaded into any Correction register but 1, an error is generated: Mass storage error; Can only load Bias Settings into Correction 1

The data follows the DATA row, as comma separated X, Y pairs; one pair per line.

For example, suppose you have an Antenna to correct for on an N9020A version A.02.06 and the correction data is:

0 dB at 200 MHz

17 dB at 210 MHz

14.8 dB at 225 MHz

Then the file will look like:

Amplitude Correction

"Correction Factors for 11966E"

"Class B Radiated"

A.02.06,N9020A

P13 EA3 UK6,01

Frequency Unit,MHz

Antenna Unit,dBuV/m

Frequency Interpolation,Linear

DATA

200.000000,0.00

210.000000,17.00

225.000000,14.80

The choices for the 1 of N fields in the metadata are as follows:

- Frequency Unit: Hz, kHz, MHz, GHz
- Antenna Unit: dBuv/m, dBuA/m, dBG, dBpT, None
- Frequency Interpolation: Logarithmic, Linear

Amplitude Correction

These keys let you choose which Correction to save. Once selected, the key returns back to the Export Data menu and the selected Correction number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Amplitude Correction
Preset	Not part of a Preset, but is reset to Correction 1 by Restore Input/Output Defaults. Survives a shutdown.
Readback	1
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you choose which Correction to save. Once selected, the key returns back to the Export Data menu and the selected Correction number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Amplitude Correction
Preset	Not part of a Preset, but is reset to Correction 1 by Restore Input/Output Defaults. Survives a shutdown.
Readback	1
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you choose which Correction to save. Once selected, the key returns back to the Export Data menu and the selected Correction number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Amplitude Correction
Preset	Not part of a Preset, but is reset to Correction 1 by Restore Input/Output Defaults. Survives a

	shutdown.
Readback	1
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you choose which Correction to save. Once selected, the key returns back to the Export Data menu and the selected Correction number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Amplitude Correction
Preset	Not part of a Preset, but is reset to Correction 1 by Restore Input/Output Defaults. Survives a shutdown.
Readback	1
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you choose which Correction to save. Once selected, the key returns back to the Export Data menu and the selected Correction number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Amplitude Correction
Preset	Not part of a Preset, but is reset to Correction 1 by Restore Input/Output Defaults. Survives a shutdown.
Readback	1
Initial S/W Revision	A.02.00

Amplitude Correction

These keys let you choose which Correction to save. Once selected, the key returns back to the Export Data menu and the selected Correction number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Amplitude Correction
Preset	Not part of a Preset, but is reset to Correction 1 by Restore Input/Output Defaults. Survives a shutdown.
Readback	1
Initial S/W Revision	A.02.00

Trace

Pressing this key selects Traces as the data type to be exported. Pressing this key when it is already selected brings up the Trace Menu, which allows you to select which Trace to save.

The trace file contains "meta" data which describes the current state of the analyzer. The metadata is detailed in "Trace File Contents" on page 1022 below.

Key Path	Save, Data
Remote Command	`:MMEMory:STORe:TRACe:DATA TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6 | ALL,<filename>`
Example	:MMEM:STOR:TRAC:DATA TRACE2, "myTrace2.csv" Exports the 2nd trace to the file myTrace2.csv in the current path. The default path is My Documents\SA\data\traces
Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over SCPI.
Dependencies	For SA measurements, traces cannot be recalled from a trace file that was saved with ALL traces selected.
Couplings	When you select which trace to save, it makes that trace the current trace, so it displays on top of all of the other traces.
Readback	selected Trace
Status Bits/OPC dependencies	Sequential - waits for previous measurement to complete
Initial S/W Revision	Prior to A.02.00

Trace File Contents

A Trace Data File contains the data for one trace.

Metadata: Trace Specific

Besides the trace data, there is metadata describing the context by which the trace was produced. Some of the metadata is trace specific:

- Trace Type
- Detector
- Trace math (function, operand1, operand2, offset, reference)
- Trace name/number

When importing a trace, the detector and/or trace math function specified in the metadata is imported with the trace, so that the annotation correctly shows the detector and/or math type that was used to generate the data

Metadata: Display Specific

There is also some display-related metadata:

- Ref Level Offset
- External Gain
- X-Axis Unit
- Y-Axis Unit

Metadata: Measurement Related

The rest of the metadata is measurement specific and reflects the state of the measurement the last time the trace was updated. These are the “measurement-related instrument settings” which, if changed, cause a measurement restart.

- Number of Points
- Sweep Time
- Start Frequency
- Stop Frequency
- Average Count (actual; not the limit for the instrument)
- Average Type
- RBW
- RBW Filter Type
- RBW Filter BW Type
- VBW
- Sweep Type (FFT vs. Swept)
- Log/Lin X Scale (sometimes called Log Sweep)
- Preamp (on/off, band)
- Trigger (source, level, slope, delay)
- Phase Noise optimization setting
- Swept IF Gain
- FFT IF Gain
- AC/DC setting (RF Coupling)
- FFT Width
- External Reference setting
- Input (which input is in use)
- RF calibrator on/off
- Attenuation

Because any inactive trace can have a value that does not match the rest of the measurement, when performing a Save the metadata for each trace is pulled from the individual trace, not from the measurement.

A revision number is also included in the trace database, to allow for future changes.

The choices for the various 1 of N and binary fields are as follows:

- Average Type: Power(RMS), Voltage, LogPower(Video)
- RBW Filter Type: Flattop, EMI, Gaussian
- RBW Filter BW: 3dB, 6dB, Noise, Impulse
- Sweep Type: Swept, FFT
- PreAmp State: On, Off
- PreAmp Band: Low, Full
- Trigger Source: Free, RFBurst, Video, Line, Periodic, Ext1, Ext2, TV
- Trigger Slope: Positive, Negative
- Phase Noise Optimization: Fast, Narrow, Wide
- Swept IF Gain: Low, High
- FFT If Gain: Autorange, Low, High
- Input: RF, BBIQ
- RF Calibrator: 50M, 400G, Comb, Off
- Trace Type: ClearWrite, TraceAverage, MaxHold, MinHold
- Detector: Normal, Average, Peak, NegPeak, Sample
- Trace Math: Off, PowerDifference, PowerSum, LogOffset, LogDifference
- Y Axis Unit: dBm, dBmV, dBmA, W, V, A, dBuV, dBuA, dBuV/m, dBuA/m, dBuV, dBpT, dBG, dB

After the header, just before the trace data, a line with just the word DATA on it is inserted to flag the start of the trace data.

The following file example shows the first lines of a Trace 1 file with X Axis Unit = Hz and Y Axis Unit = dBuV, after importing into Excel (the second row contains the Title):

Trace	
"AS/NZS 1044; Conducted >1000 W, Motors, Average"	
A.01.00	E4410A
526 EA3 B25 P26 PFR	1
Segment	0
Number of Points	1001

Sweep Time	0.066266667
Start Frequency	18827440
Stop Frequency	24463718
Average Count	0
Average Type	Power(RMS)
RBW	51000
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	51000
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Video
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	1.00E–06
Phase Noise Optimization	Fast
Swept IF Gain	Low
FFT IF Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF
RF Calibrator	Off
Attenuation	10
Ref Level Offset	0
External Gain	0
Trace Type	ClearWrite
Detector	Normal
Trace Math	Off
Trace Math Oper1	Trace5
Trace Math Oper2	Trace6
Trace Math Offset	0
Trace Name	Trace1
X Axis Unit	Hz
Y Axis Unit	dBm

DATA	
1.6009301E+07	4.82047E+01
1.6018694E+07	4.69737E+01
1.6028087E+07	4.81207E+01
1.6037480E+07	4.72487E+01
1.6046873E+07	4.66437E+01
1.6056266E+07	4.66237E+01
1.6065659E+07	4.66967E+01
1.6075052E+07	4.77117E+01
1.6084445E+07	4.75787E+01
1.6093838E+07	4.83297E+01
1.6103231E+07	4.71327E+01
1.6112624E+07	4.78957E+01
1.6122017E+07	4.67507E+01
1.6131410E+07	4.81137E+01

Select Trace

These softkeys let you pick which Trace to save. Once selected, the key returns back to the Export Data menu and the selected trace name/number is annotated on the key. The default is the currently selected trace, selected in this menu or in the Trace/Det, Import Data, Recall Trace or Save Trace menus, except if you have chosen All then All remains chosen until you specifically change it to a single trace.

The All selection saves all six traces in one .csv file with the x-axis data in the first column and the individual trace data in succeeding columns. The header data and x-axis data in this file reflect the current settings of the measurement. Note that any traces which are in View or Blank may have different x-axis data than the current measurement settings; but this different x-axis data will not be output to the file.

This menu is the same as the Select Trace menu under Trace. The trace selected on that menu appears selected here, and selecting a trace here causes the same trace to be selected on the Select Trace menu. (That is, there is only one "selected trace".)

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Trace
Notes	auto return
Couplings	When you select which trace to save, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Trace

These softkeys let you pick which Trace to save. Once selected, the key returns back to the Export Data menu and the selected trace name/number is annotated on the key. The default is the currently selected trace, selected in this menu or in the Trace/Det, Import Data, Recall Trace or Save Trace menus, except if you have chosen All then All remains chosen until you specifically change it to a single trace.

The All selection saves all six traces in one .csv file with the x-axis data in the first column and the individual trace data in succeeding columns. The header data and x-axis data in this file reflect the current settings of the measurement. Note that any traces which are in View or Blank may have different x-axis data than the current measurement settings; but this different x-axis data will not be output to the file.

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The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Trace
Notes	auto return
Couplings	When you select which trace to save, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Trace

These softkeys let you pick which Trace to save. Once selected, the key returns back to the Export Data menu and the selected trace name/number is annotated on the key. The default is the currently selected trace, selected in this menu or in the Trace/Det, Import Data, Recall Trace or Save Trace menus, except if you have chosen All then All remains chosen until you specifically change it to a single trace.

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The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Trace
Notes	auto return
Couplings	When you select which trace to save, it makes that trace the current trace, so it displays on top of all of the other traces.

Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Trace

These softkeys let you pick which Trace to save. Once selected, the key returns back to the Export Data menu and the selected trace name/number is annotated on the key. The default is the currently selected trace, selected in this menu or in the Trace/Det, Import Data, Recall Trace or Save Trace menus, except if you have chosen All then All remains chosen until you specifically change it to a single trace.

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The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Trace
Notes	auto return
Couplings	When you select which trace to save, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Trace

These softkeys let you pick which Trace to save. Once selected, the key returns back to the Export Data menu and the selected trace name/number is annotated on the key. The default is the currently selected trace, selected in this menu or in the Trace/Det, Import Data, Recall Trace or Save Trace menus, except if you have chosen All then All remains chosen until you specifically change it to a single trace.

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This menu is the same as the Select Trace menu under Trace. The trace selected on that menu appears selected here, and selecting a trace here causes the same trace to be selected on the Select Trace menu. (That is, there is only one "selected trace".)

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Trace
Notes	auto return
Couplings	When you select which trace to save, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Trace

These softkeys let you pick which Trace to save. Once selected, the key returns back to the Export Data menu and the selected trace name/number is annotated on the key. The default is the currently selected trace, selected in this menu or in the Trace/Det, Import Data, Recall Trace or Save Trace menus, except if you have chosen All then All remains chosen until you specifically change it to a single trace.

The All selection saves all six traces in one .csv file with the x-axis data in the first column and the individual trace data in succeeding columns. The header data and x-axis data in this file reflect the current settings of the measurement. Note that any traces which are in View or Blank may have different x-axis data than the current measurement settings; but this different x-axis data will not be output to the file.

This menu is the same as the Select Trace menu under Trace. The trace selected on that menu appears selected here, and selecting a trace here causes the same trace to be selected on the Select Trace menu. (That is, there is only one "selected trace".)

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Trace
Notes	auto return
Couplings	When you select which trace to save, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Select Trace

These softkeys let you pick which Trace to save. Once selected, the key returns back to the Export Data menu and the selected trace name/number is annotated on the key. The default is the currently selected trace, selected in this menu or in the Trace/Det, Import Data, Recall Trace or Save Trace menus, except if you have chosen All then All remains chosen until you specifically change it to a single trace.

The All selection saves all six traces in one .csv file with the x-axis data in the first column and the individual trace data in succeeding columns. The header data and x-axis data in this file reflect the current settings of the measurement. Note that any traces which are in View or Blank may have different x-axis data than the current measurement settings; but this different x-axis data will not be output to the file.

This menu is the same as the Select Trace menu under Trace. The trace selected on that menu appears selected here, and selecting a trace here causes the same trace to be selected on the Select Trace menu. (That is, there is only one "selected trace".)

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Trace
Notes	auto return
Couplings	When you select which trace to save, it makes that trace the current trace, so it displays on top of all of the other traces.
Preset	Not part of Preset, but is reset to TRACE1 by Restore Mode Defaults; survives shutdown
State Saved	The current trace number is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Limit

Pressing this key selects Limit Lines as the data type to be exported. Pressing the key a second time brings up the Limit Menu that allows you to select which **Limit Line** to save.

See "Limits File Contents" on page 1031.

See ".csv file format" on page 1031

See ".lim file format" on page 1032

Key Path	Save, Data
Remote Command	`:MMEMory:STORe:LIMit LLINE1|LLINE2,<filename>`
Example	:MMEM:STOR:LIM LLINE2, "myLimitLine2.csv" Saves the 2nd Limit Line to the file myLimitLine2.csv in the current path. The default path is My Documents\SA\data\limits
Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over SCPI.
Dependencies	This key will only appear if you have the proper option installed in your instrument.
Preset	1; not part of Preset, but is reset by Restore Mode Defaults and survives power cycles
State Saved	The selected Limit number is saved in instrument state.
Readback	selected Limit Line
Status Bits/OPC dependencies	Sequential - waits for previous measurement to complete
Initial S/W Revision	A.02.00

Limits File Contents

Limits may be exported into a data file with a .csv extension. They may be imported from that data file; they may also be imported from a legacy limit file with a .lim extension. The .lim files meet the specification for limit files contained in the EMI measurement guide, HP E7415A.

.csv file format

Except for information in quotes, limit line files are not case sensitive. Information in bold is required verbatim; other text is example text, and italic text is commentary which should not be present in the file.

The first five lines are system-required header lines, and must be in the correct order.

LimitData file type name
"FCC Part 15"File Description
"Class B Radiated"Comment
A.01.00.R0001,N9020AInstrument Version, Model Number
P13 EA3 UK6 ,01Option List, File Format Version

The next few lines describe the parameters; on export they will be in the order shown, on import they can be in any order. If some parameters are missing, they will revert to the default.

Type, UpperUpper|Lower
X Axis Unit, MHzMHz|S; other units should be converted; this also specifies the domain
Amplitude Unit, dBmdBm|V; all other units should be converted appropriately
Frequency Interpolation, LinearLogarithmic|Linear
Amplitude Interpolation, Logarithmic Logarithmic|Linear
X Control, FixedFixed|Relative; on input we consider only the first three characters
Y Control, FixedFixed|Relative; on input we consider only the first three characters
Margin, 0Always in dB. A 0 margin is equivalent to margin off
X Offset, 10Expressed in the X axis units
Y Offset, 5Expressed in the Amplitude units

The Amplitude Unit line in the limits file may contain an antenna factor unit, for example:

Amplitude Unit=dBuV/m

Antenna factor units are dBuV/m, dBuA/m, dBpT, and dBG. In this case, the unit is treated exactly as though it were dBuV, meaning that all of the limits are interpreted to have units of dBuV. The box does NOT change Y Axis Units when such a limit is loaded in.

The X axis unit also specifies the domain (time or frequency). It is not possible to have both time-domain lines and frequency-domain lines at the same time; if a time-domain line is imported while the other lines are in the frequency domain (or vice-versa), all limit lines will be deleted prior to import.

If the sign of the margin is inappropriate for the limit type (for example a positive margin for an upper limit), the sign of the margin will be changed internally so that it is appropriate.

The remaining lines describe the data. Each line in the file represents an X-Y pair. The X values should be monotonically non-decreasing, although adjacent lines in the file can have the same X value as an aid to building a stair-stepped limit line. To specify a region over which there is no limit, use +1000 dBm for upper limits or –1000 dBm for lower limits.

The data region begins with the keyword DATA:

DATA
200.000000,–10.00
300.000000,–10.00
300.000000,–20.00
500.000000,–20.00

.lim file format

This is a legacy format which allows files saved from older analyzers to be loaded into the X-Series. Design of files in this format is not recommended.

Limit Selection

These keys let you pick which Limit Line to save. Once selected, the key returns back to the **Export Data** menu and the selected Limit Line number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Limit Line
Notes	auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives shutdown
Initial S/W Revision	A.02.00

Limit Selection

These keys let you pick which Limit Line to save. Once selected, the key returns back to the **Export Data** menu and the selected Limit Line number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Limit Line
Notes	auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives shutdown
Initial S/W Revision	A.02.00

Limit Selection

These keys let you pick which Limit Line to save. Once selected, the key returns back to the **Export Data** menu and the selected Limit Line number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Limit Line
Notes	auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives shutdown
Initial S/W Revision	A.02.00

Limit Selection

These keys let you pick which Limit Line to save. Once selected, the key returns back to the **Export Data** menu and the selected Limit Line number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Limit Line
Notes	auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives shutdown
Initial S/W Revision	A.02.00

Limit Selection

These keys let you pick which Limit Line to save. Once selected, the key returns back to the **Export Data** menu and the selected Limit Line number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Limit Line
Notes	auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives shutdown
Initial S/W Revision	A.02.00

Limit Selection

These keys let you pick which Limit Line to save. Once selected, the key returns back to the **Export Data** menu and the selected Limit Line number is annotated on the key.

The next step in the Save process is to select the Save As key in the Export Data menu.

Key Path	Save, Data, Limit Line
Notes	auto return
Preset	Not part of Preset, but is reset to LLINE1 by Restore Mode Defaults; survives shutdown
Initial S/W Revision	A.02.00

Measurement Results

Pressing this key selects Meas Results as the data type to be exported. Pressing the key a second time brings up the Meas Results menu, which allows you to select which **Meas Result** to save. In the Swept SA measurement, there are three types of Measurement Results files: Peak Table, Marker Table and Spectrogram.

See "Meas Results File Contents" on page 1034.

See "Marker Table" on page 1034.

See "Peak Table" on page 1037.

See Spectrogram

Remote Command	:MMEMory:STORe:RESults:MTABle|PTABle|SPECtrogram <filename>
Example	:MMEM:STOR:RES:MTAB "myResults.csv" Saves the results from the current marker table to the file myResults.csv in the current path. :MMEM:STOR:RES:PTAB "myResults.csv" Saves the results from the current peak table to the file myResults.csv in the current path. :MMEM:STOR:RES:SPEC "myResults.csv" Saves the results from the current Spectrogram display to the file myResults.csv in the current path. The default path is My Documents\SA\data\SAN\results
Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over SCPI.
Dependencies	If a save of Marker Table results is requested and the Marker Table is not on, no file is saved and a message is generated If a save of Peak Table results is requested and the Peak Table is not on, no file is saved and a message is generated If a save of Spectrogram results is requested and the Spectrogram is not on, no file is saved and a message is generated. The Spectrogram choice only appears if option EDP is licensed.
Preset	Not part of Preset, but is reset to Peak Table by Restore Mode Defaults. Survives a shutdown.
Initial S/W Revision	Prior to A.02.00

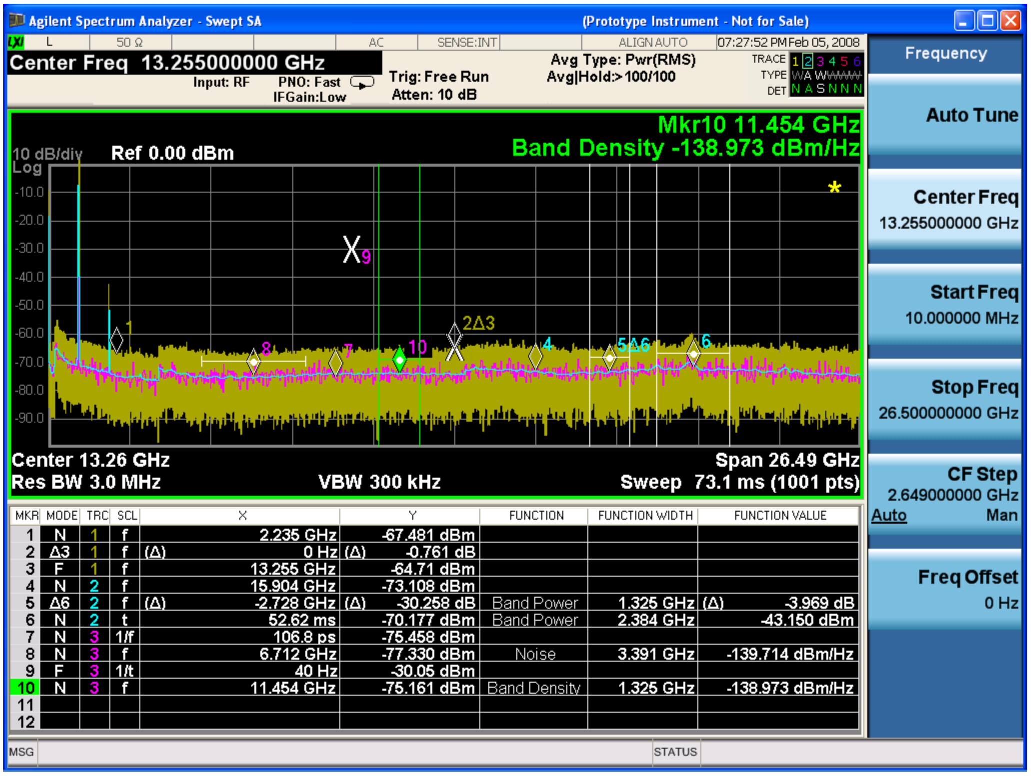
Meas Results File Contents

All files are .csv files. The following section details the data in each file type.

Marker Table

This section discusses the Marker Table Meas Results file format.

Imagine that, at the point where a Marker Table Meas Result is requested, the following screen is showing:



Then the Meas Results file, when opened, would show the following data:

MeasurementResult	
Swept SA	
A.01.40_R0017	N9020A
526 B25 PFR P26 EA3	1
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower (Video)
RBW	3000000

RBW Filter	Gaussian								
RBW Filter BW	3dB								
VBW	3000000								
Sweep Type	Swept								
X Axis Scale	Lin								
PreAmp State	Off								
PreAmp Band	Low								
Trigger Source	Free								
Trigger Level	1.2								
Trigger Slope	Positive								
Trigger Delay	1.00E–06								
Phase Noise Optimization	Fast								
Swept If Gain	Low								
FFT If Gain	Autorange								
RF Coupling	AC								
FFT Width	411900								
Ext Ref	10000000								
Input	RF								
RF Calibrator	Off								
Attenuation	10								
Ref Level Offset	0								
External Gain	0								
X Axis Units	Hz								
Y Axis Units	dBm								
DATA									
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	FUNCTION UNIT
1	Normal	1	Frequency	2.2350E+09	–67.481	Off	0.0000E+00	0	None
2	Delta3	1	Frequency	0.0000E+00	–0.761	Off	0.0000E+00	0	None
3	Fixed	1	Frequency	1.3255E+10	–64.71	Off	0.0000E+00	0	None
4	Normal	2	Frequency	1.5904E+10	–73.1	Off	0.0000E+00	0	None

					08				
5	Delta7	2	Frequency	–2.7280E+09	–30.258	Band Power	1.3250E+06	-3.969	dB
6	Normal	2	Time	5.2620E–02	–70.177	Band Power	2.3840E+06	-43.15	dBm
7	Normal	3	Period	1.0680E–10	–75.458	Off	0.0000E+00	0	None
8	Normal	3	Frequency	6.7120E+09	–77.33	Noise	3.3910E+06	–139.714	dBm/Hz
9	Fixed	3	Inverse Time	4.0000E+01	–30.05	Off	0.0000E+00	0	None
10	Normal	3	Frequency	1.1454E+10	–75.161	Band Density	1.3250E+06	–138.973	dBm/Hz
11	Off	1	Frequency	0.0000E+00	0	Off	0.0000E+00	0	None
12	Off	1	Frequency	0.0000E+00	0	Off	0.0000E+00	0	None

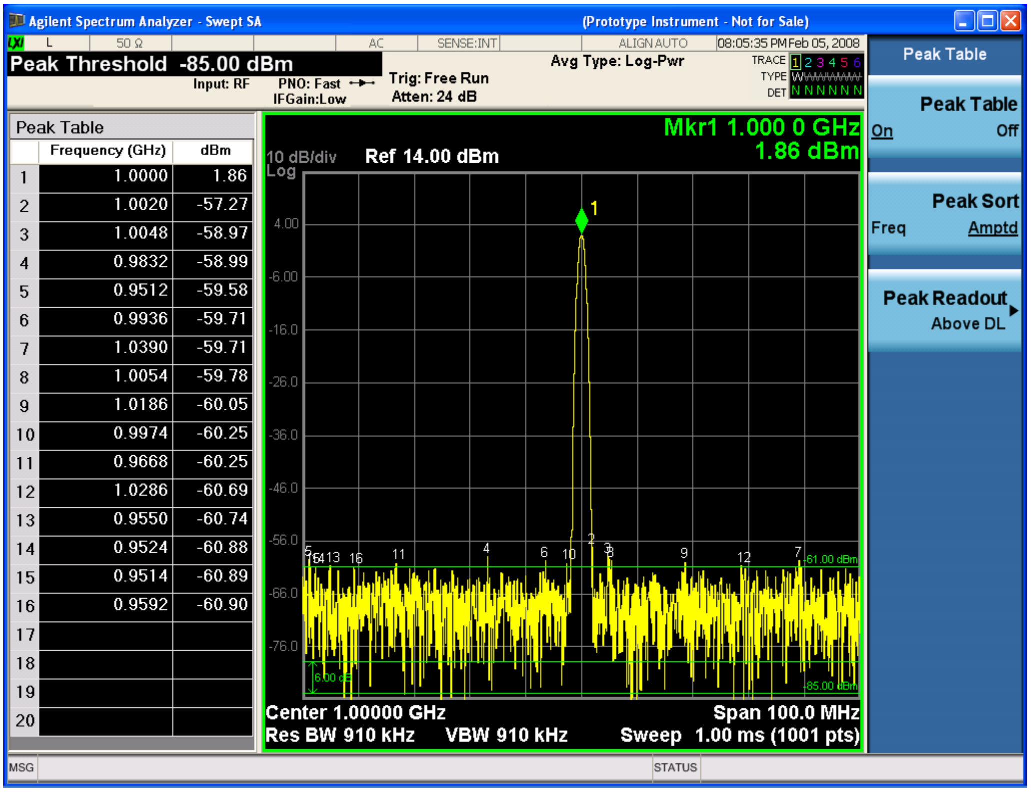
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

The metadata header is very similar to the metadata used in the trace data .csv files. See "Trace File Contents" on page 1022. The only new information concerns the 1-of-N fields in the marker table itself.

Peak Table

This section discusses the Peak Table Meas Results file format.

Imagine that, at the point where a Marker Table Meas Result is requested, the following screen is showing:



Then the Meas Results file, when opened, would show the header data (the same as for the Marker Table except that the Result Type is Peak Table) ending with a few fields of specific interest to Peak Table users:

- Peak Threshold
- Peak Threshold State (On|Off)
- Peak Excursion
- Peak Excursion State (On|Off)
- Display Line
- Peak Readout (All|AboveDL|BelowDL)
- Peak Sort (Freq|Amptd)

These fields are then followed by the data for the Peak Table itself.

Note that the label for the Frequency column changes to Time in 0 span.

Here is what the table for the above display looks like:

MeasurementResult	
Swept SA	
A.01.40_R0017	N9020A
526 B25 PFR P26 EA3	1

Result Type	Peak Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower(Video)
RBW	3000000
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	3000000
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	1.00E–06
Phase Noise Optimization	Fast
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF
RF Calibrator	Off
Attenuation	10
Ref Level Offset	0
External Gain	0
X Axis Units	Hz
Y Axis Units	dBm
Peak Threshold	–85
Peak Threshold State	On
Peak Excursion	6
Peak Excursion State	On

Display Line	–61	
Peak Readout	AboveDL	
Peak Sort	Amptd	
DATA		
Peak	Frequency	Amplitude
1	1.0000E+06	1.86
2	1.0020E+06	–57.27
3	1.0048E+06	–58.97
4	9.8320E+05	–58.99
5	9.5120E+05	–59.58
6	9.9360E+05	–59.71
7	1.0390E+06	–59.71
8	1.0054E+06	–59.78
9	1.1086E+06	–60.05
10	9.9740E+05	–60.25
11	9.6680E+05	–60.25
12	1.0286E+06	–60.69
13	9.5500E+05	–60.74
14	9.5240E+05	–60.88
15	9.5140E+05	–60.89
16	9.5920E+05	–60.90
17		
18		
19		
20		

Spectrogram

This section discusses the Spectrogram Results file format.   The Spectrogram choice only appears if option EDP is licensed.

The Spectrogram results are the same as a Trace data export, except that instead of having just one trace's data, all 300 traces appear one after the other.

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Each trace has its own data mark; the data for Spectrogram Trace 0 follows the row marked DATA, the data for Spectrogram Trace 1 follows the row marked DATA1, for Spectrogram Trace 2 follows the row marked DATA2, and so on.

Each DATA row has a timestamp in the second column (as of firmware revision A.11.01). So, for example, if Trace 0 had a relative start time of 1729.523 sec, then the first DATA row would look like this:

DATA,1729.523

And if Trace 13 had a relative start time of 100.45 sec, then the fourteenth data row would look like:

DATA13,100.453

To find the absolute time for the relative timestamps of each trace, the last row before the first DATA row gives the absolute start time of the Spectrogram, in the form YYYYMMDDHHMMSS

So, for example, if the absolute start time is 13:23:45:678 on January 30, 2012, this row would look like:

Start Time,20120130132345678

NOTE: the resolution of the absolute time stored is 1 ms, which matches up with the fact that the fastest sweep time is also 1 ms. However, there is no specification for the absolute accuracy of the clock in the analyzer, nor is there any facility provided to allow the user to set this time to any particular degree of accuracy.

Traces that have not yet been filled in the Spectrogram display are empty; there is no DATA header for them. The file ends after the last non-empty trace.

Imagine that, at the point where a Spectrogram Meas Result is requested, the following screen is showing:

For the purpose of this example, we have set the Average/Hold Number to 10, thus we have only traces 0 thru 10. The Spectrogram was started at 02:28:08:700 pm on April 25, 2012 (that is, 700 ms after 2:28:08 pm), although the screen dump itself shows a duifferent time, as it was taken ten minutes after the

Spectrogram data. Trace 0 is showing a start time of 5.30 seconds, meaning 5.3 secodns after the Spectrogram started (trace 10 has a strat time of 0, as it was the first trace taken but has now rolled up into the tenth trace slot).

The Meas Results file, when opened, shows the header data and ten traces of trace data. Below is an extract from the result file for the above display. Note the start time of 20120425142808700 showing in the last row before the first DATA row, and the relative time of 5.299231048 showing in the first DATA row:

Result Type	Spectrogram
MeasResult	
Swept SA	
A.11.00.01	N9020A
503 508 513 526 ALL ALV B1C B1X B25 B2X B40 BAB BBA CR3 CRP DP2 DRD EA3 EDP EMC EP1 ERC ESC ESP EXM FSA HBA K03 LFE MPB P03 P08 P13 P26 PFR RTL RTS S40 SB1 SEC SM1 UK6 YAS YAV	1
Segment	0
Number of Points	1001
Sweep Time	0.523333333
Start Frequency	5999984415
Stop Frequency	6000009415
Average Count	0
Average Type	LogPower(Video)
RBW	240
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	240
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	0
Phase Noise Optimization	Wide
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC

Result Type	Spectrogram
FFT Width	411900
Ext Ref	10000000
Input	RF
RF Calibrator	Off
Attenuation	14
Ref Level Offset	0
External Gain	0
Trace Type	Clearwrite
Detector	Normal
Trace Math	Off
Trace Math Oper1	Trace5
Trace Math Oper2	Trace6
Trace Math Offset	0
Trace Name	Trace1
X Axis Units	Hz
Y Axis Units	dBm
Start Time	20120425142808700
DATA	5.299231048
5999984415	–76.34749519
5999984440	–77.28097006
5999984465	–75.32317869
5999984490	–73.64417681
5999984515	–72.67154604

o

o

o

6000009315	–77.94423277
6000009340	–79.51829697
6000009365	–78.46108961
6000009390	–78.46108957
6000009415	–76.59570596
DATA2	4.708697055
5999984415	–80.98197882
5999984440	–80.98197879

5999984465	-75.83142132
5999984490	-74.02712079
5999984515	-73.57213005

o

o

o

6000009315	-75.9183103
6000009340	-79.53787488
6000009365	-78.82602191
6000009390	-78.82602188
6000009415	-76.37486709
DATA10	0
5999984415	-75.56751112
5999984440	-75.76485645
5999984465	-76.67718717
5999984490	-78.79238489
5999984515	-83.72680212

o

o

o

6000009315	-71.3942461
6000009340	-72.28308332
6000009365	-73.92684489
6000009390	-75.45548832
6000009415	-75.17904815

Measurement Results

Pressing this key selects Meas Results as the data type to be exported. Pressing the key a second time brings up the Meas Results menu, which allows you to select which **Meas Result** to save. In the Swept SA measurement, there are three types of Measurement Results files: Peak Table, Marker Table and Spectrogram.

See "Meas Results File Contents" on page 1045.

See "Marker Table" on page 1045.

See "Peak Table" on page 1048.

See Spectrogram

Remote Command	`:MMEMory:STORe:RESults:MTABle|PTABle|SPECtrogram <filename>`
Example	:MMEM:STOR:RES:MTAB “myResults.csv” Saves the results from the current marker table to the file myResults.csv in the current path. :MMEM:STOR:RES:PTAB “myResults.csv” Saves the results from the current peak table to the file myResults.csv in the current path. :MMEM:STOR:RES:SPEC “myResults.csv” Saves the results from the current Spectrogram display to the file myResults.csv in the current path. The default path is My Documents\SA\data\SAN\results
Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over SCPI.
Dependencies	If a save of Marker Table results is requested and the Marker Table is not on, no file is saved and a message is generated If a save of Peak Table results is requested and the Peak Table is not on, no file is saved and a message is generated If a save of Spectrogram results is requested and the Spectrogram is not on, no file is saved and a message is generated. The Spectrogram choice only appears if option EDP is licensed.
Preset	Not part of Preset, but is reset to Peak Table by Restore Mode Defaults. Survives a shutdown.
Initial S/W Revision	Prior to A.02.00

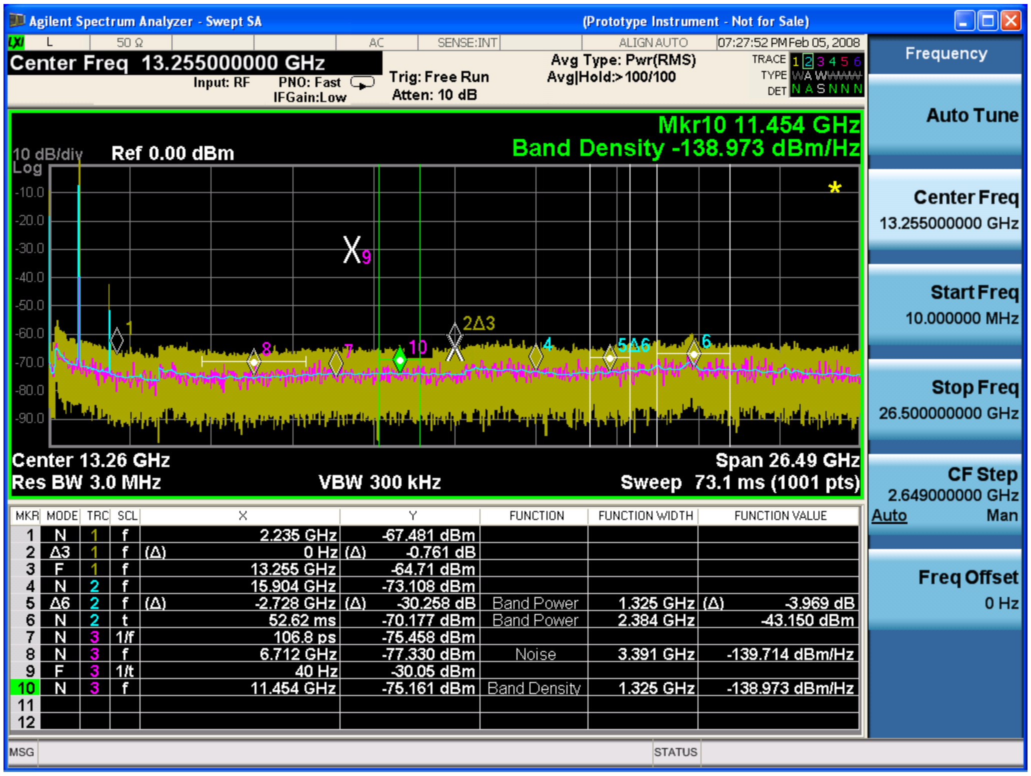
Meas Results File Contents

All files are .csv files. The following section details the data in each file type.

Marker Table

This section discusses the Marker Table Meas Results file format.

Imagine that, at the point where a Marker Table Meas Result is requested, the following screen is showing:



Then the Meas Results file, when opened, would show the following data:

MeasurementResult	
Swept SA	
A.01.40_R0017	N9020A
526 B25 PFR P26 EA3	1
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower (Video)
RBW	3000000

RBW Filter	Gaussian								
RBW Filter BW	3dB								
VBW	3000000								
Sweep Type	Swept								
X Axis Scale	Lin								
PreAmp State	Off								
PreAmp Band	Low								
Trigger Source	Free								
Trigger Level	1.2								
Trigger Slope	Positive								
Trigger Delay	1.00E–06								
Phase Noise Optimization	Fast								
Swept If Gain	Low								
FFT If Gain	Autorange								
RF Coupling	AC								
FFT Width	411900								
Ext Ref	10000000								
Input	RF								
RF Calibrator	Off								
Attenuation	10								
Ref Level Offset	0								
External Gain	0								
X Axis Units	Hz								
Y Axis Units	dBm								
DATA									
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	FUNCTION UNIT
1	Normal	1	Frequency	2.2350E+09	–67.481	Off	0.0000E+00	0	None
2	Delta3	1	Frequency	0.0000E+00	–0.761	Off	0.0000E+00	0	None
3	Fixed	1	Frequency	1.3255E+10	–64.71	Off	0.0000E+00	0	None
4	Normal	2	Frequency	1.5904E+10	–73.1	Off	0.0000E+00	0	None

					08				
5	Delta7	2	Frequency	–2.7280E+09	–30.258	Band Power	1.3250E+06	–3.969	dB
6	Normal	2	Time	5.2620E–02	–70.177	Band Power	2.3840E+06	–43.15	dBm
7	Normal	3	Period	1.0680E–10	–75.458	Off	0.0000E+00	0	None
8	Normal	3	Frequency	6.7120E+09	–77.33	Noise	3.3910E+06	–139.714	dBm/Hz
9	Fixed	3	Inverse Time	4.0000E+01	–30.05	Off	0.0000E+00	0	None
10	Normal	3	Frequency	1.1454E+10	–75.161	Band Density	1.3250E+06	–138.973	dBm/Hz
11	Off	1	Frequency	0.0000E+00	0	Off	0.0000E+00	0	None
12	Off	1	Frequency	0.0000E+00	0	Off	0.0000E+00	0	None

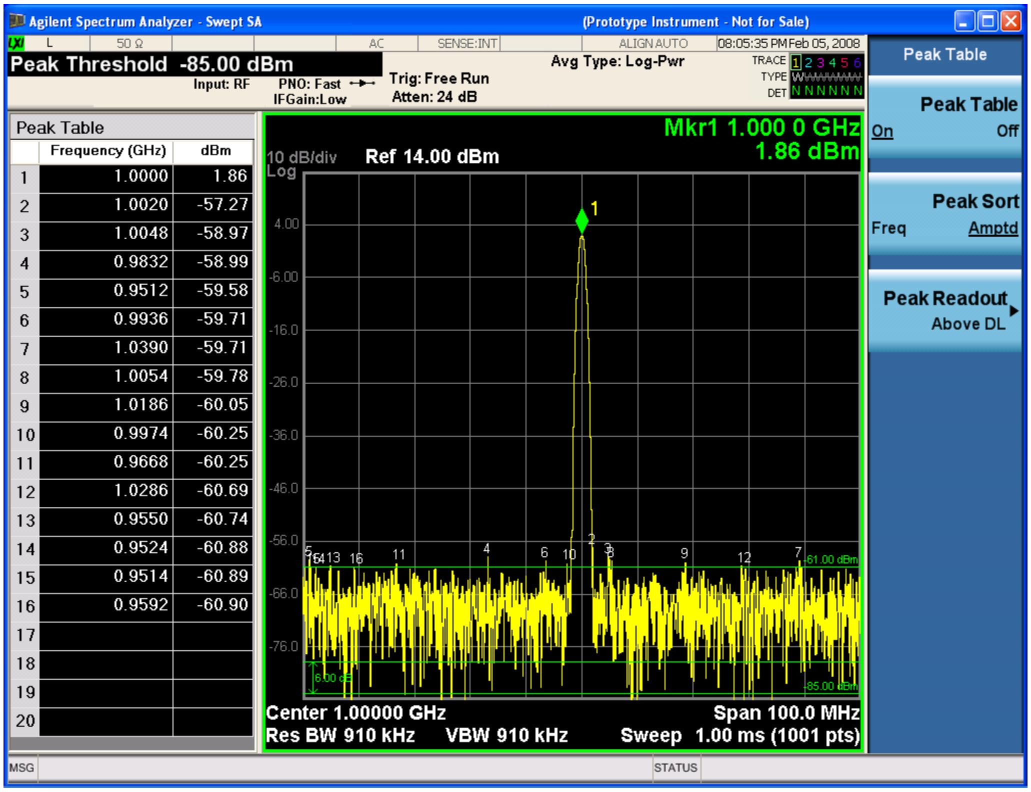
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

The metadata header is very similar to the metadata used in the trace data .csv files. See "Trace File Contents" on page 1022. The only new information concerns the 1-of-N fields in the marker table itself.

Peak Table

This section discusses the Peak Table Meas Results file format.

Imagine that, at the point where a Marker Table Meas Result is requested, the following screen is showing:



Then the Meas Results file, when opened, would show the header data (the same as for the Marker Table except that the Result Type is Peak Table) ending with a few fields of specific interest to Peak Table users:

- Peak Threshold
- Peak Threshold State (On|Off)
- Peak Excursion
- Peak Excursion State (On|Off)
- Display Line
- Peak Readout (All|AboveDL|BelowDL)
- Peak Sort (Freq|Amptd)

These fields are then followed by the data for the Peak Table itself.

Note that the label for the Frequency column changes to Time in 0 span.

Here is what the table for the above display looks like:

MeasurementResult	
Swept SA	
A.01.40_R0017	N9020A
526 B25 PFR P26 EA3	1

Result Type	Peak Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower(Video)
RBW	3000000
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	3000000
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	1.00E–06
Phase Noise Optimization	Fast
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF
RF Calibrator	Off
Attenuation	10
Ref Level Offset	0
External Gain	0
X Axis Units	Hz
Y Axis Units	dBm
Peak Threshold	–85
Peak Threshold State	On
Peak Excursion	6
Peak Excursion State	On

Display Line	–61	
Peak Readout	AboveDL	
Peak Sort	Amptd	
DATA		
Peak	Frequency	Amplitude
1	1.0000E+06	1.86
2	1.0020E+06	–57.27
3	1.0048E+06	–58.97
4	9.8320E+05	–58.99
5	9.5120E+05	–59.58
6	9.9360E+05	–59.71
7	1.0390E+06	–59.71
8	1.0054E+06	–59.78
9	1.1086E+06	–60.05
10	9.9740E+05	–60.25
11	9.6680E+05	–60.25
12	1.0286E+06	–60.69
13	9.5500E+05	–60.74
14	9.5240E+05	–60.88
15	9.5140E+05	–60.89
16	9.5920E+05	–60.90
17		
18		
19		
20		

Spectrogram

This section discusses the Spectrogram Results file format. The Spectrogram choice only appears if option EDP is licensed.

The Spectrogram results are the same as a Trace data export, except that instead of having just one trace’s data, all 300 traces appear one after the other.

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Each trace has its own data mark; the data for Spectrogram Trace 0 follows the row marked DATA, the data for Spectrogram Trace 1 follows the row marked DATA1, for Spectrogram Trace 2 follows the row marked DATA2, and so on.

Each DATA row has a timestamp in the second column (as of firmware revision A.11.01). So, for example, if Trace 0 had a relative start time of 1729.523 sec, then the first DATA row would look like this:

DATA,1729.523

And if Trace 13 had a relative start time of 100.45 sec, then the fourteenth data row would look like:

DATA13,100.453

To find the absolute time for the relative timestamps of each trace, the last row before the first DATA row gives the absolute start time of the Spectrogram, in the form YYYYMMDDHHMMSS

So, for example, if the absolute start time is 13:23:45:678 on January 30, 2012, this row would look like:

Start Time,20120130132345678

NOTE: the resolution of the absolute time stored is 1 ms, which matches up with the fact that the fastest sweep time is also 1 ms. However, there is no specification for the absolute accuracy of the clock in the analyzer, nor is there any facility provided to allow the user to set this time to any particular degree of accuracy.

Traces that have not yet been filled in the Spectrogram display are empty; there is no DATA header for them. The file ends after the last non-empty trace.

Imagine that, at the point where a Spectrogram Meas Result is requested, the following screen is showing:

For the purpose of this example, we have set the Average/Hold Number to 10, thus we have only traces 0 thru 10. The Spectrogram was started at 02:28:08:700 pm on April 25, 2012 (that is, 700 ms after 2:28:08 pm), although the screen dump itself shows a duifferent time, as it was taken ten minutes after the Spectrogram data. Trace 0 is showing a start time of 5.30 seconds, meaning 5.3 secodns after the Spectrogram started (trace 10 has a strat time of 0, as it was the first trace taken but has now rolled up into the tenth trace slot).

The Meas Results file, when opened, shows the header data and ten traces of trace data. Below is an extract from the result file for the above display. Note the start time of 20120425142808700 showing in the last row before the first DATA row, and the relative time of 5.299231048 showing in the first DATA row:

Result Type	Spectrogram
MeasResult	
Swept SA	
A.11.00.01	N9020A
503 508 513 526 ALL ALV B1C B1X B25 B2X B40 BAB BBA CR3 CRP DP2 DRD EA3 EDP EMC EP1 ERC ESC ESP EXM FSA HBA K03 LFE MPB P03 P08 P13 P26 PFR RTL RTS S40 SB1 SEC SM1 UK6 YAS YAV	1
Segment	0
Number of Points	1001
Sweep Time	0.523333333
Start Frequency	5999984415
Stop Frequency	6000009415
Average Count	0
Average Type	LogPower(Video)
RBW	240
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	240
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	0
Phase Noise Optimization	Wide
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF

Result Type	Spectrogram
RF Calibrator	Off
Attenuation	14
Ref Level Offset	0
External Gain	0
Trace Type	Clearwrite
Detector	Normal
Trace Math	Off
Trace Math Oper1	Trace5
Trace Math Oper2	Trace6
Trace Math Offset	0
Trace Name	Trace1
X Axis Units	Hz
Y Axis Units	dBm
Start Time	20120425142808700
DATA	5.299231048
5999984415	–76.34749519
5999984440	–77.28097006
5999984465	–75.32317869
5999984490	–73.64417681
5999984515	–72.67154604

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6000009315	–77.94423277
6000009340	–79.51829697
6000009365	–78.46108961
6000009390	–78.46108957
6000009415	–76.59570596
DATA2	4.708697055
5999984415	–80.98197882
5999984440	–80.98197879
5999984465	–75.83142132
5999984490	–74.02712079
5999984515	–73.57213005

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6000009315	-75.9183103
6000009340	-79.53787488
6000009365	-78.82602191
6000009390	-78.82602188
6000009415	-76.37486709
DATA10	0
5999984415	-75.56751112
5999984440	-75.76485645
5999984465	-76.67718717
5999984490	-78.79238489
5999984515	-83.72680212

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o

6000009315	-71.3942461
6000009340	-72.28308332
6000009365	-73.92684489
6000009390	-75.45548832
6000009415	-75.17904815

Measurement Results

Pressing this key selects Meas Results as the data type to be exported. Pressing the key a second time brings up the Meas Results menu, which allows you to select which **Meas Result** to save. In the Swept SA measurement, there are three types of Measurement Results files: Peak Table, Marker Table and Spectrogram.

See "Meas Results File Contents" on page 1056.

See "Marker Table" on page 1056.

See "Peak Table" on page 1059.

See Spectrogram

Remote Command	:MMEMory:STORe:RESults:MTABle|PTABle|SPECtrogram <filename>
Example	:MMEM:STOR:RES:MTAB "myResults.csv" Saves the results from the current marker table to the file myResults.csv in the current path. :MMEM:STOR:RES:PTAB "myResults.csv" Saves the results from the current peak table to the file myResults.csv in the current path. :MMEM:STOR:RES:SPEC "myResults.csv" Saves the results from the current Spectrogram display to the file myResults.csv in the current path. The default path is My Documents\SA\data\SAN\results
Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over SCPI.
Dependencies	If a save of Marker Table results is requested and the Marker Table is not on, no file is saved and a message is generated If a save of Peak Table results is requested and the Peak Table is not on, no file is saved and a message is generated If a save of Spectrogram results is requested and the Spectrogram is not on, no file is saved and a message is generated. The Spectrogram choice only appears if option EDP is licensed.
Preset	Not part of Preset, but is reset to Peak Table by Restore Mode Defaults. Survives a shutdown.
Initial S/W Revision	Prior to A.02.00

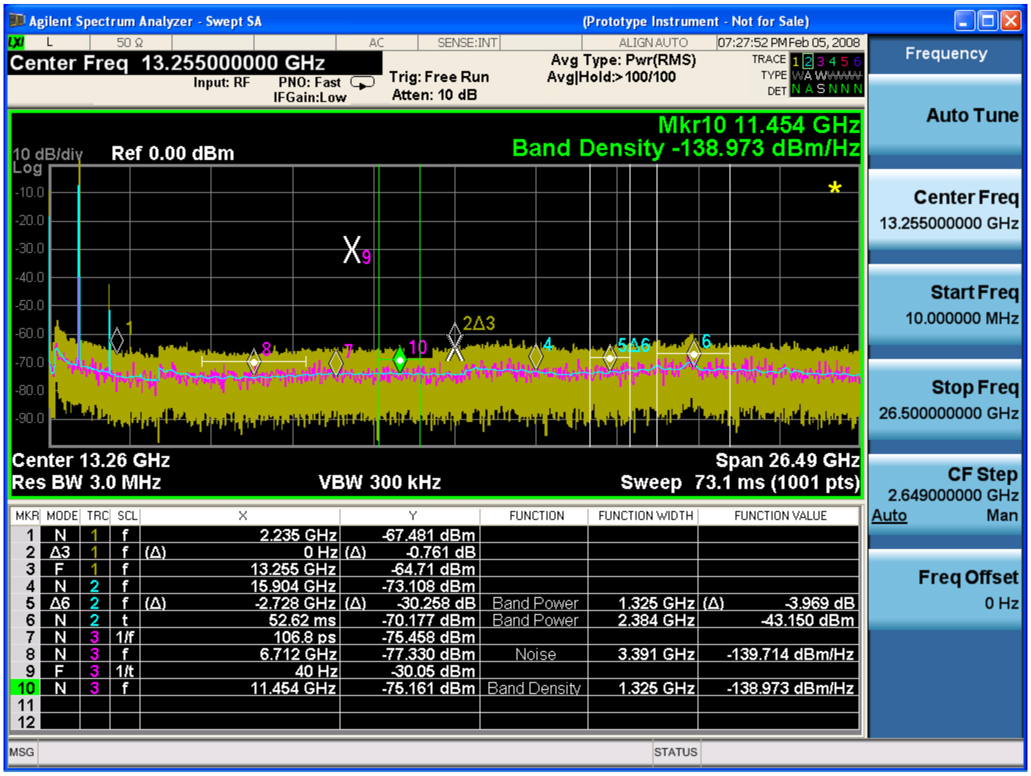
Meas Results File Contents

All files are .csv files. The following section details the data in each file type.

Marker Table

This section discusses the Marker Table Meas Results file format.

Imagine that, at the point where a Marker Table Meas Result is requested, the following screen is showing:



Then the Meas Results file, when opened, would show the following data:

MeasurementResult	
Swept SA	
A.01.40_R0017	N9020A
526 B25 PFR P26 EA3	1
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower (Video)
RBW	3000000

RBW Filter	Gaussian								
RBW Filter BW	3dB								
VBW	3000000								
Sweep Type	Swept								
X Axis Scale	Lin								
PreAmp State	Off								
PreAmp Band	Low								
Trigger Source	Free								
Trigger Level	1.2								
Trigger Slope	Positive								
Trigger Delay	1.00E–06								
Phase Noise Optimization	Fast								
Swept If Gain	Low								
FFT If Gain	Autorange								
RF Coupling	AC								
FFT Width	411900								
Ext Ref	10000000								
Input	RF								
RF Calibrator	Off								
Attenuation	10								
Ref Level Offset	0								
External Gain	0								
X Axis Units	Hz								
Y Axis Units	dBm								
DATA									
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	FUNCTION UNIT
1	Normal	1	Frequency	2.2350E+09	–67.481	Off	0.0000E+00	0	None
2	Delta3	1	Frequency	0.0000E+00	–0.761	Off	0.0000E+00	0	None
3	Fixed	1	Frequency	1.3255E+10	–64.71	Off	0.0000E+00	0	None
4	Normal	2	Frequency	1.5904E+10	–73.1	Off	0.0000E+00	0	None

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5	Delta7	2	Frequency	–2.7280E+09	–30.258	Band Power	1.3250E+06	–3.969	dB
6	Normal	2	Time	5.2620E–02	–70.177	Band Power	2.3840E+06	–43.15	dBm
7	Normal	3	Period	1.0680E–10	–75.458	Off	0.0000E+00	0	None
8	Normal	3	Frequency	6.7120E+09	–77.33	Noise	3.3910E+06	–139.714	dBm/Hz
9	Fixed	3	Inverse Time	4.0000E+01	–30.05	Off	0.0000E+00	0	None
10	Normal	3	Frequency	1.1454E+10	–75.161	Band Density	1.3250E+06	–138.973	dBm/Hz
11	Off	1	Frequency	0.0000E+00	0	Off	0.0000E+00	0	None
12	Off	1	Frequency	0.0000E+00	0	Off	0.0000E+00	0	None

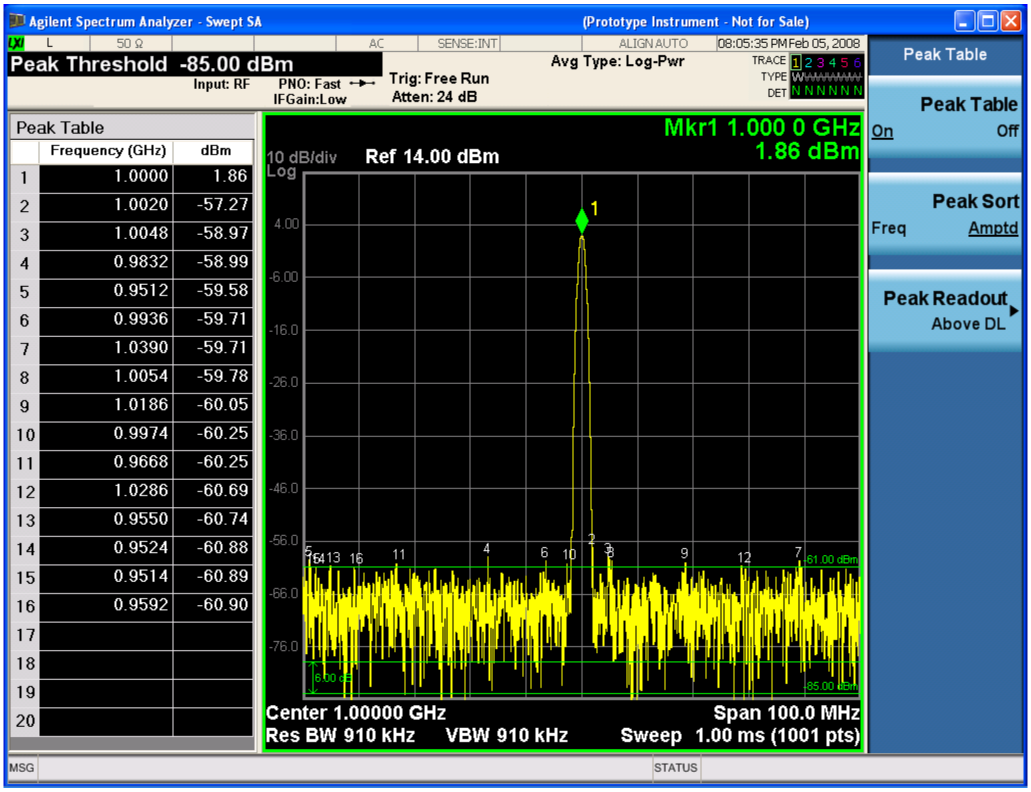
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

The metadata header is very similar to the metadata used in the trace data .csv files. See "Trace File Contents" on page 1022. The only new information concerns the 1-of-N fields in the marker table itself.

Peak Table

This section discusses the Peak Table Meas Results file format.

Imagine that, at the point where a Marker Table Meas Result is requested, the following screen is showing:



Then the Meas Results file, when opened, would show the header data (the same as for the Marker Table except that the Result Type is Peak Table) ending with a few fields of specific interest to Peak Table users:

- Peak Threshold
- Peak Threshold State (On|Off)
- Peak Excursion
- Peak Excursion State (On|Off)
- Display Line
- Peak Readout (All|AboveDL|BelowDL)
- Peak Sort (Freq|Amptd)

These fields are then followed by the data for the Peak Table itself.

Note that the label for the Frequency column changes to Time in 0 span.

Here is what the table for the above display looks like:

MeasurementResult	
Swept SA	
A.01.40_R0017	N9020A
526 B25 PFR P26 EA3	1

Result Type	Peak Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower(Video)
RBW	3000000
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	3000000
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	1.00E–06
Phase Noise Optimization	Fast
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF
RF Calibrator	Off
Attenuation	10
Ref Level Offset	0
External Gain	0
X Axis Units	Hz
Y Axis Units	dBm
Peak Threshold	–85
Peak Threshold State	On
Peak Excursion	6
Peak Excursion State	On

Display Line	–61	
Peak Readout	AboveDL	
Peak Sort	Amptd	
DATA		
Peak	Frequency	Amplitude
1	1.0000E+06	1.86
2	1.0020E+06	–57.27
3	1.0048E+06	–58.97
4	9.8320E+05	–58.99
5	9.5120E+05	–59.58
6	9.9360E+05	–59.71
7	1.0390E+06	–59.71
8	1.0054E+06	–59.78
9	1.1086E+06	–60.05
10	9.9740E+05	–60.25
11	9.6680E+05	–60.25
12	1.0286E+06	–60.69
13	9.5500E+05	–60.74
14	9.5240E+05	–60.88
15	9.5140E+05	–60.89
16	9.5920E+05	–60.90
17		
18		
19		
20		

Spectrogram

This section discusses the Spectrogram Results file format. The Spectrogram choice only appears if option EDP is licensed.

The Spectrogram results are the same as a Trace data export, except that instead of having just one trace's data, all 300 traces appear one after the other.

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Each trace has its own data mark; the data for Spectrogram Trace 0 follows the row marked DATA, the data for Spectrogram Trace 1 follows the row marked DATA1, for Spectrogram Trace 2 follows the row marked DATA2, and so on.

Each DATA row has a timestamp in the second column (as of firmware revision A.11.01). So, for example, if Trace 0 had a relative start time of 1729.523 sec, then the first DATA row would look like this:

DATA,1729.523

And if Trace 13 had a relative start time of 100.45 sec, then the fourteenth data row would look like:

DATA13,100.453

To find the absolute time for the relative timestamps of each trace, the last row before the first DATA row gives the absolute start time of the Spectrogram, in the form YYYYMMDDHHMMSS

So, for example, if the absolute start time is 13:23:45:678 on January 30, 2012, this row would look like:

Start Time,20120130132345678

NOTE: the resolution of the absolute time stored is 1 ms, which matches up with the fact that the fastest sweep time is also 1 ms. However, there is no specification for the absolute accuracy of the clock in the analyzer, nor is there any facility provided to allow the user to set this time to any particular degree of accuracy.

Traces that have not yet been filled in the Spectrogram display are empty; there is no DATA header for them. The file ends after the last non-empty trace.

Imagine that, at the point where a Spectrogram Meas Result is requested, the following screen is showing:

For the purpose of this example, we have set the Average/Hold Number to 10, thus we have only traces 0 thru 10. The Spectrogram was started at 02:28:08:700 pm on April 25, 2012 (that is, 700 ms after 2:28:08 pm), although the screen dump itself shows a duifferent time, as it was taken ten minutes after the Spectrogram data. Trace 0 is showing a start time of 5.30 seconds, meaning 5.3 secodns after the Spectrogram started (trace 10 has a strat time of 0, as it was the first trace taken but has now rolled up into the tenth trace slot).

The Meas Results file, when opened, shows the header data and ten traces of trace data. Below is an extract from the result file for the above display. Note the start time of 20120425142808700 showing in the last row before the first DATA row, and the relative time of 5.299231048 showing in the first DATA row:

Result Type	Spectrogram
MeasResult	
Swept SA	
A.11.00.01	N9020A
503 508 513 526 ALL ALV B1C B1X B25 B2X B40 BAB BBA CR3 CRP DP2 DRD EA3 EDP EMC EP1 ERC ESC ESP EXM FSA HBA K03 LFE MPB P03 P08 P13 P26 PFR RTL RTS S40 SB1 SEC SM1 UK6 YAS YAV	1
Segment	0
Number of Points	1001
Sweep Time	0.523333333
Start Frequency	5999984415
Stop Frequency	6000009415
Average Count	0
Average Type	LogPower(Video)
RBW	240
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	240
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	0
Phase Noise Optimization	Wide
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF

Result Type	Spectrogram
RF Calibrator	Off
Attenuation	14
Ref Level Offset	0
External Gain	0
Trace Type	Clearwrite
Detector	Normal
Trace Math	Off
Trace Math Oper1	Trace5
Trace Math Oper2	Trace6
Trace Math Offset	0
Trace Name	Trace1
X Axis Units	Hz
Y Axis Units	dBm
Start Time	20120425142808700
DATA	5.299231048
5999984415	–76.34749519
5999984440	–77.28097006
5999984465	–75.32317869
5999984490	–73.64417681
5999984515	–72.67154604

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6000009315	–77.94423277
6000009340	–79.51829697
6000009365	–78.46108961
6000009390	–78.46108957
6000009415	–76.59570596
DATA2	4.708697055
5999984415	–80.98197882
5999984440	–80.98197879
5999984465	–75.83142132
5999984490	–74.02712079
5999984515	–73.57213005

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6000009315	-75.9183103
6000009340	-79.53787488
6000009365	-78.82602191
6000009390	-78.82602188
6000009415	-76.37486709
DATA10	0
5999984415	-75.56751112
5999984440	-75.76485645
5999984465	-76.67718717
5999984490	-78.79238489
5999984515	-83.72680212

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6000009315	-71.3942461
6000009340	-72.28308332
6000009365	-73.92684489
6000009390	-75.45548832
6000009415	-75.17904815

Measurement Results

Pressing this key selects Meas Results as the data type to be exported. Pressing the key a second time brings up the Meas Results menu, which allows you to select which **Meas Result** to save. In the Swept SA measurement, there are three types of Measurement Results files: Peak Table, Marker Table and Spectrogram.

See "Meas Results File Contents" on page 1067.

See "Marker Table" on page 1067.

See "Peak Table" on page 1070.

See Spectrogram

Remote Command	`:MMEMory:STORe:RESults:MTABle|PTABle|SPECtrogram <filename>`
Example	:MMEM:STOR:RES:MTAB “myResults.csv” Saves the results from the current marker table to the file myResults.csv in the current path. :MMEM:STOR:RES:PTAB “myResults.csv” Saves the results from the current peak table to the file myResults.csv in the current path. :MMEM:STOR:RES:SPEC “myResults.csv” Saves the results from the current Spectrogram display to the file myResults.csv in the current path. The default path is My Documents\SA\data\SAN\results
Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over SCPI.
Dependencies	If a save of Marker Table results is requested and the Marker Table is not on, no file is saved and a message is generated If a save of Peak Table results is requested and the Peak Table is not on, no file is saved and a message is generated If a save of Spectrogram results is requested and the Spectrogram is not on, no file is saved and a message is generated. The Spectrogram choice only appears if option EDP is licensed.
Preset	Not part of Preset, but is reset to Peak Table by Restore Mode Defaults. Survives a shutdown.
Initial S/W Revision	Prior to A.02.00

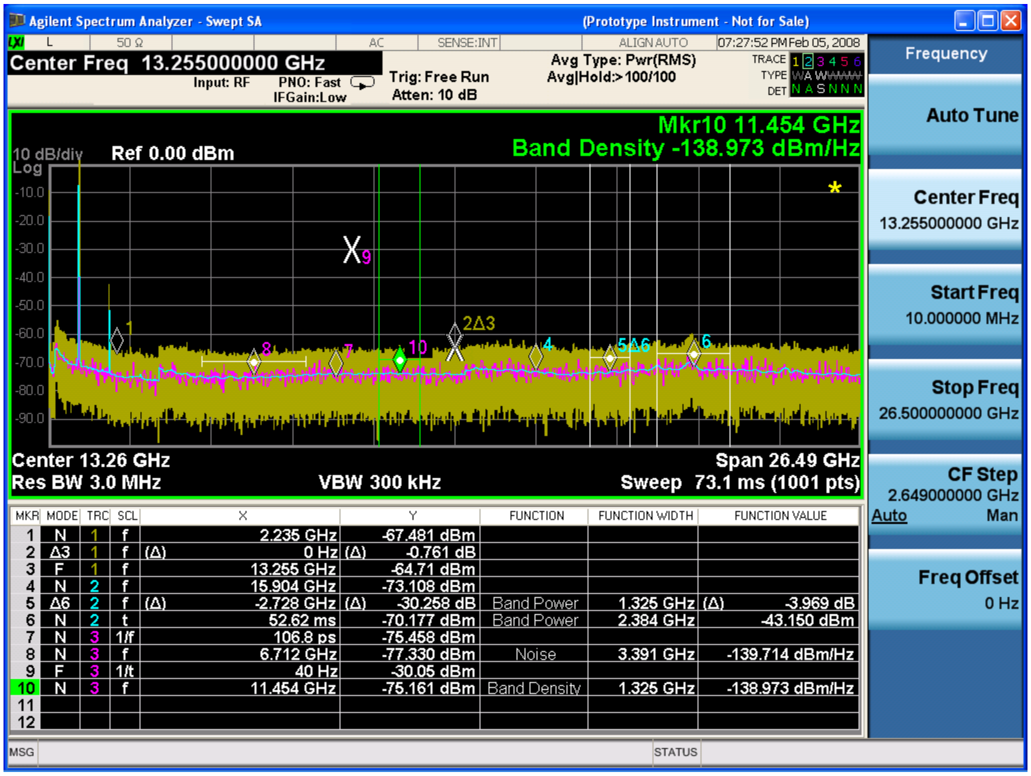
Meas Results File Contents

All files are .csv files. The following section details the data in each file type.

Marker Table

This section discusses the Marker Table Meas Results file format.

Imagine that, at the point where a Marker Table Meas Result is requested, the following screen is showing:



Then the Meas Results file, when opened, would show the following data:

MeasurementResult	
Swept SA	
A.01.40_R0017	N9020A
526 B25 PFR P26 EA3	1
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower (Video)
RBW	3000000

RBW Filter	Gaussian								
RBW Filter BW	3dB								
VBW	3000000								
Sweep Type	Swept								
X Axis Scale	Lin								
PreAmp State	Off								
PreAmp Band	Low								
Trigger Source	Free								
Trigger Level	1.2								
Trigger Slope	Positive								
Trigger Delay	1.00E–06								
Phase Noise Optimization	Fast								
Swept If Gain	Low								
FFT If Gain	Autorange								
RF Coupling	AC								
FFT Width	411900								
Ext Ref	10000000								
Input	RF								
RF Calibrator	Off								
Attenuation	10								
Ref Level Offset	0								
External Gain	0								
X Axis Units	Hz								
Y Axis Units	dBm								
DATA									
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	FUNCTION UNIT
1	Normal	1	Frequency	2.2350E+09	–67.481	Off	0.0000E+00	0	None
2	Delta3	1	Frequency	0.0000E+00	–0.761	Off	0.0000E+00	0	None
3	Fixed	1	Frequency	1.3255E+10	–64.71	Off	0.0000E+00	0	None
4	Normal	2	Frequency	1.5904E+10	–73.1	Off	0.0000E+00	0	None

					08				
5	Delta7	2	Frequency	–2.7280E+09	–30.258	Band Power	1.3250E+06	–3.969	dB
6	Normal	2	Time	5.2620E–02	–70.177	Band Power	2.3840E+06	–43.15	dBm
7	Normal	3	Period	1.0680E–10	–75.458	Off	0.0000E+00	0	None
8	Normal	3	Frequency	6.7120E+09	–77.33	Noise	3.3910E+06	–139.714	dBm/Hz
9	Fixed	3	Inverse Time	4.0000E+01	–30.05	Off	0.0000E+00	0	None
10	Normal	3	Frequency	1.1454E+10	–75.161	Band Density	1.3250E+06	–138.973	dBm/Hz
11	Off	1	Frequency	0.0000E+00	0	Off	0.0000E+00	0	None
12	Off	1	Frequency	0.0000E+00	0	Off	0.0000E+00	0	None

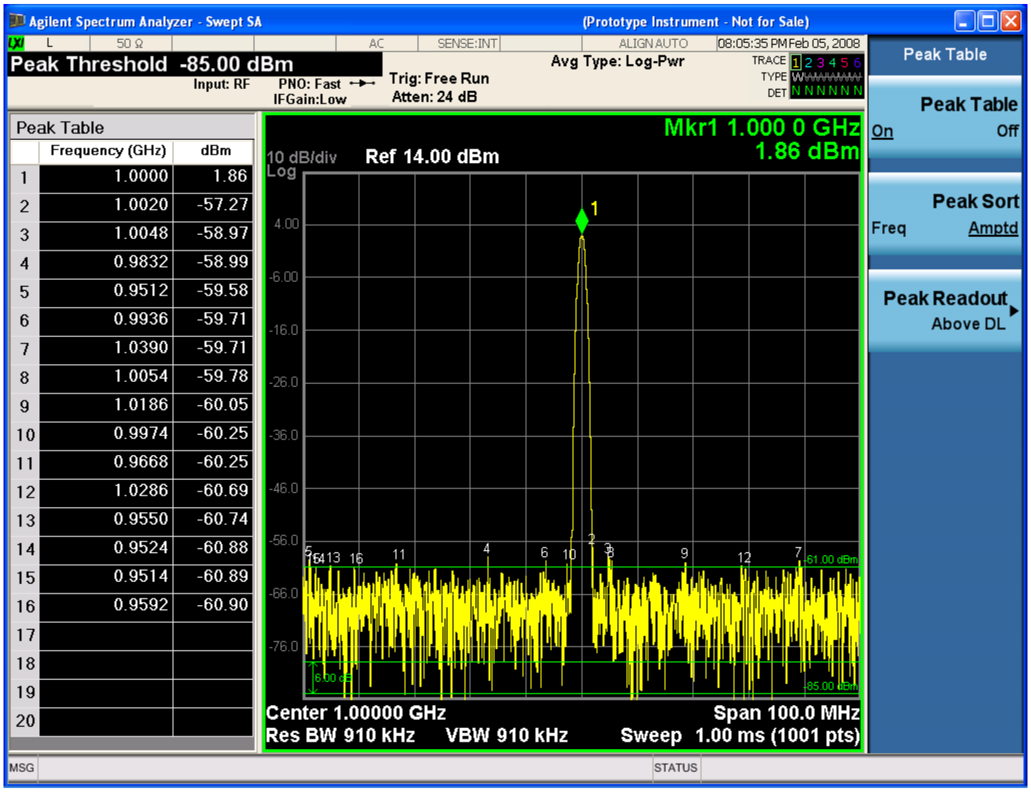
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

The metadata header is very similar to the metadata used in the trace data .csv files. See "Trace File Contents" on page 1022. The only new information concerns the 1-of-N fields in the marker table itself.

Peak Table

This section discusses the Peak Table Meas Results file format.

Imagine that, at the point where a Marker Table Meas Result is requested, the following screen is showing:



Then the Meas Results file, when opened, would show the header data (the same as for the Marker Table except that the Result Type is Peak Table) ending with a few fields of specific interest to Peak Table users:

- Peak Threshold
- Peak Threshold State (On|Off)
- Peak Excursion
- Peak Excursion State (On|Off)
- Display Line
- Peak Readout (All|AboveDL|BelowDL)
- Peak Sort (Freq|Amptd)

These fields are then followed by the data for the Peak Table itself.

Note that the label for the Frequency column changes to Time in 0 span.

Here is what the table for the above display looks like:

MeasurementResult	
Swept SA	
A.01.40_R0017	N9020A
526 B25 PFR P26 EA3	1

Result Type	Peak Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower(Video)
RBW	3000000
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	3000000
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	1.00E–06
Phase Noise Optimization	Fast
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF
RF Calibrator	Off
Attenuation	10
Ref Level Offset	0
External Gain	0
X Axis Units	Hz
Y Axis Units	dBm
Peak Threshold	–85
Peak Threshold State	On
Peak Excursion	6
Peak Excursion State	On

Display Line	–61	
Peak Readout	AboveDL	
Peak Sort	Amptd	
DATA		
Peak	Frequency	Amplitude
1	1.0000E+06	1.86
2	1.0020E+06	–57.27
3	1.0048E+06	–58.97
4	9.8320E+05	–58.99
5	9.5120E+05	–59.58
6	9.9360E+05	–59.71
7	1.0390E+06	–59.71
8	1.0054E+06	–59.78
9	1.1086E+06	–60.05
10	9.9740E+05	–60.25
11	9.6680E+05	–60.25
12	1.0286E+06	–60.69
13	9.5500E+05	–60.74
14	9.5240E+05	–60.88
15	9.5140E+05	–60.89
16	9.5920E+05	–60.90
17		
18		
19		
20		

Spectrogram

This section discusses the Spectrogram Results file format. The Spectrogram choice only appears if option EDP is licensed.

The Spectrogram results are the same as a Trace data export, except that instead of having just one trace's data, all 300 traces appear one after the other.

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Each trace has its own data mark; the data for Spectrogram Trace 0 follows the row marked DATA, the data for Spectrogram Trace 1 follows the row marked DATA1, for Spectrogram Trace 2 follows the row marked DATA2, and so on.

Each DATA row has a timestamp in the second column (as of firmware revision A.11.01). So, for example, if Trace 0 had a relative start time of 1729.523 sec, then the first DATA row would look like this:

DATA,1729.523

And if Trace 13 had a relative start time of 100.45 sec, then the fourteenth data row would look like:

DATA13,100.453

To find the absolute time for the relative timestamps of each trace, the last row before the first DATA row gives the absolute start time of the Spectrogram, in the form YYYYMMDDHHMMSS

So, for example, if the absolute start time is 13:23:45:678 on January 30, 2012, this row would look like:

Start Time,20120130132345678

NOTE: the resolution of the absolute time stored is 1 ms, which matches up with the fact that the fastest sweep time is also 1 ms. However, there is no specification for the absolute accuracy of the clock in the analyzer, nor is there any facility provided to allow the user to set this time to any particular degree of accuracy.

Traces that have not yet been filled in the Spectrogram display are empty; there is no DATA header for them. The file ends after the last non-empty trace.

Imagine that, at the point where a Spectrogram Meas Result is requested, the following screen is showing:

For the purpose of this example, we have set the Average/Hold Number to 10, thus we have only traces 0 thru 10. The Spectrogram was started at 02:28:08:700 pm on April 25, 2012 (that is, 700 ms after 2:28:08 pm), although the screen dump itself shows a duifferent time, as it was taken ten minutes after the Spectrogram data. Trace 0 is showing a start time of 5.30 seconds, meaning 5.3 secodns after the Spectrogram started (trace 10 has a strat time of 0, as it was the first trace taken but has now rolled up into the tenth trace slot).

The Meas Results file, when opened, shows the header data and ten traces of trace data. Below is an extract from the result file for the above display. Note the start time of 20120425142808700 showing in the last row before the first DATA row, and the relative time of 5.299231048 showing in the first DATA row:

Result Type	Spectrogram
MeasResult	
Swept SA	
A.11.00.01	N9020A
503 508 513 526 ALL ALV B1C B1X B25 B2X B40 BAB BBA CR3 CRP DP2 DRD EA3 EDP EMC EP1 ERC ESC ESP EXM FSA HBA K03 LFE MPB P03 P08 P13 P26 PFR RTL RTS S40 SB1 SEC SM1 UK6 YAS YAV	1
Segment	0
Number of Points	1001
Sweep Time	0.523333333
Start Frequency	5999984415
Stop Frequency	6000009415
Average Count	0
Average Type	LogPower(Video)
RBW	240
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	240
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	0
Phase Noise Optimization	Wide
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF

Result Type	Spectrogram
RF Calibrator	Off
Attenuation	14
Ref Level Offset	0
External Gain	0
Trace Type	Clearwrite
Detector	Normal
Trace Math	Off
Trace Math Oper1	Trace5
Trace Math Oper2	Trace6
Trace Math Offset	0
Trace Name	Trace1
X Axis Units	Hz
Y Axis Units	dBm
Start Time	20120425142808700
DATA	5.299231048
5999984415	–76.34749519
5999984440	–77.28097006
5999984465	–75.32317869
5999984490	–73.64417681
5999984515	–72.67154604

o

o

o

6000009315	–77.94423277
6000009340	–79.51829697
6000009365	–78.46108961
6000009390	–78.46108957
6000009415	–76.59570596
DATA2	4.708697055
5999984415	–80.98197882
5999984440	–80.98197879
5999984465	–75.83142132
5999984490	–74.02712079
5999984515	–73.57213005

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6000009315	-75.9183103
6000009340	-79.53787488
6000009365	-78.82602191
6000009390	-78.82602188
6000009415	-76.37486709
DATA10	0
5999984415	-75.56751112
5999984440	-75.76485645
5999984465	-76.67718717
5999984490	-78.79238489
5999984515	-83.72680212

o

o

o

6000009315	-71.3942461
6000009340	-72.28308332
6000009365	-73.92684489
6000009390	-75.45548832
6000009415	-75.17904815

Save As . . .

When you press “Save As”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See "To File . . ." on page 1001 in Save, State for a full description of this dialog and menu.

The default path for saving files is:

For all of the Trace Data Files:

My Documents\<mode name>\data\traces

For all of the Limit Data Files:

My Documents\<mode name>\data\limits

For all of the Measurement Results Data Files:

My Documents\<mode name>\data\<measurement name>\results

For all of the Capture Buffer Data Files:

My Documents\<mode name>\data\captureBuffer

Key Path	Save, Data
Mode	All
Notes	The key location is mode-dependent and will vary. Brings up the Save As dialog for saving a <mode specific> Save Type. The save is performed immediately and does not wait until the measurement is complete.
Initial S/W Revision	Prior to A.02.00

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For all of the Capture Buffer Data Files:

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Initial S/W Revision	Prior to A.02.00

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For all of the Measurement Results Data Files:

My Documents\<mode name>\data\<measurement name>\results

For all of the Capture Buffer Data Files:

My Documents\<mode name>\data\captureBuffer

Key Path	Save, Data
Mode	All
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Initial S/W Revision	Prior to A.02.00

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For all of the Capture Buffer Data Files:

My Documents\<mode name>\data\captureBuffer

Key Path	Save, Data
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Initial S/W Revision	Prior to A.02.00

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For all of the Capture Buffer Data Files:

My Documents\<mode name>\data\captureBuffer

Key Path	Save, Data
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Notes	The key location is mode-dependent and will vary. Brings up the Save As dialog for saving a <mode specific> Save Type. The save is performed immediately and does not wait until the measurement is complete.
Initial S/W Revision	Prior to A.02.00

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My Documents\<mode name>\data\<measurement name>\results

For all of the Capture Buffer Data Files:

My Documents\<mode name>\data\captureBuffer

Key Path	Save, Data
Mode	All
Notes	The key location is mode-dependent and will vary. Brings up the Save As dialog for saving a <mode specific> Save Type. The save is performed immediately and does not wait until the measurement is complete.
Initial S/W Revision	Prior to A.02.00

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My Documents\<mode name>\data\limits

For all of the Measurement Results Data Files:

My Documents\<mode name>\data\<measurement name>\results

For all of the Capture Buffer Data Files:

My Documents\<mode name>\data\captureBuffer

Key Path	Save, Data
Mode	All
Notes	The key location is mode-dependent and will vary. Brings up the Save As dialog for saving a <mode specific> Save Type. The save is performed immediately and does not wait until the measurement is complete.
Initial S/W Revision	Prior to A.02.00

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My Documents\<mode name>\data\limits

For all of the Measurement Results Data Files:

My Documents\<mode name>\data\<measurement name>\results

For all of the Capture Buffer Data Files:

My Documents\<mode name>\data\captureBuffer

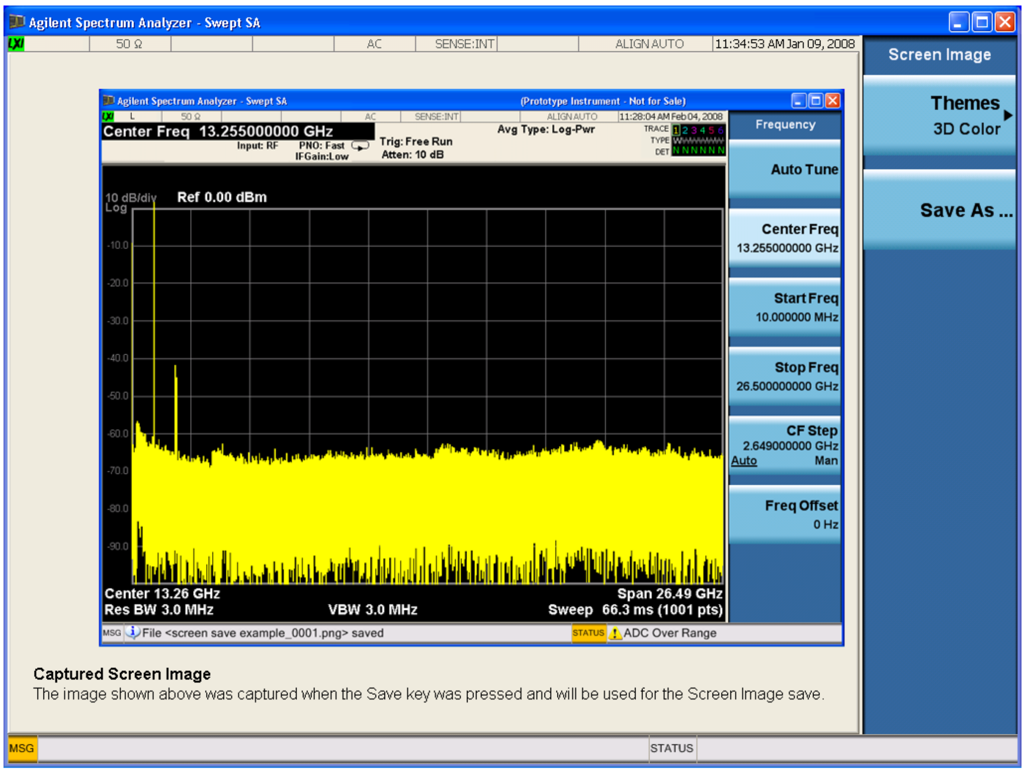
Key Path	Save, Data
Mode	All
Notes	The key location is mode-dependent and will vary. Brings up the Save As dialog for saving a <mode specific> Save Type. The save is performed immediately and does not wait until the measurement is complete.
Initial S/W Revision	Prior to A.02.00

Screen Image

Pressing Screen Image accesses a menu of functions that enable you to specify a format and location for the saved screen image. It brings up a menu that allows you to specify the color scheme of the Screen Image (Themes) or navigate to the Save As dialog to perform the actual save.

Screen Image files contain an exact representation of the analyzer display. They cannot be loaded back onto the analyzer, but they can be loaded into your PC for use in many popular applications.

The image to be saved is actually captured when the Save front panel key is pressed, and kept in temporary storage to be used if you ask for a Screen Image save. When the Screen Image key is pressed, a "thumbnail" of the captured image is displayed, as shown below:



When you continue on into the Save As menu and complete the Screen Image save, the image depicted in the thumbnail is the one that gets saved, showing the menus that were on the screen before going into the Save menus. The save is performed immediately and does not wait until the measurement is complete.

After you have completed the save, the Quick Save front-panel key lets you quickly repeat the last save performed, using an auto-named file, with the current screen data.

NOTE	For versions previous to A.01.55, if you initiate a screen image save by navigating through the Save menus, the image that is saved will contain the Save menu softkeys, not the menus and the active function that were on the screen when you first pressed the Save front panel key.

Key Path	Save

Mode	All
Remote Command	:MMEMory:STORe:SCReen <filename>
Example	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
Initial S/W Revision	Prior to A.02.00

Themes

Accesses a menu of functions that enable you to choose the theme to be used when saving the screen image.

The **Themes** option is the same as the **Themes** option under the **Display** and **Page Setup** dialogs. It allows you to choose between themes to be used when saving the screen image.

Key Path	Save, Screen Image
Remote Command	:MMEMory:STORe:SCReen:THEMe TDColor | TDMonochrome | FCOLor | FMONochrome :MMEMory:STORe:SCReen:THEMe?
Example	:MMEM:STOR:SCR:THEM TDM
Preset	3D Color; Is not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.
Readback	3D Color | 3D Mono | Flat Color | Flat Mono
Backwards Compatibility Notes	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if the user selected Reverse Bitmap AND a black&white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
Initial S/W Revision	Prior to A.02.00

3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM TDC
Readback	3D Color
Initial S/W Revision	Prior to A.02.00

3D Monochrome

Selects a format that is like 3D color but shades of gray are used instead of colors.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM TDM
Readback	3D Mono
Initial S/W Revision	Prior to A.02.00

Flat Color

Selects a format that is best when the screen is to be printed on an ink printer.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
Initial S/W Revision	Prior to A.02.00

Flat Monochrome

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

Save As...

When you press “Save As”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See "To File . . ." on page 1001 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\<mode name>\screen.

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

Save As...

When you press “Save As”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

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Initial S/W Revision	Prior to A.02.00

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Initial S/W Revision	Prior to A.02.00

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where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

Save As...

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The default path for Screen Images is

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where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

Save As...

When you press “Save As”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See "To File . . ." on page 1001 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\<mode name>\screen.

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

Save As...

When you press “Save As”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See "To File . . ." on page 1001 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\<mode name>\screen.

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

Save As...

When you press “Save As”, the analyzer brings up a Windows dialog and a menu entitled “**Save As.**” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See "To File . . ." on page 1001 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\<mode name>\screen.

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

Mass Storage Catalog (Remote Command Only)

Remote Command	`:MMEMory:CATalog? [<directory_name>]`
Notes	The string must be a valid logical path. Queries disk usage information (drive capacity, free space available) and obtains a list of files and directories in a specified directory in the following format: <numeric_value>,<numeric_value>,{<file_entry>} It returns two numeric parameters and as many strings as there are files and directories. The first parameter indicates the total amount of storage currently used in bytes. The second parameter indicates the total amount of storage available, also in bytes. The <file_entry> is a string. Each <file_

	entry> indicates the name, type, and size of one file in the directory list: <file_name>,<file_type>,<file_size> As the windows file system has an extension that indicates file type, <file_type> is always empty. <file_size> provides the size of the file in bytes. For directories, <file_entry> is surrounded by square brackets and both <file_type> and <file_size> are empty
Initial S/W Revision	Prior to A.02.00

Mass Storage Change Directory (Remote Command Only)

Remote Command	`:MMEMory:CDIRectory [<directory_name>]` `:MMEMory:CDIRectory?`
Notes	The string must be a valid logical path. Changes the default directory for a mass memory file system. The <directory_name> parameter is a string. If no parameter is specified, the directory is set to the *RST value. At *RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal. Query returns full path of the default directory.
Initial S/W Revision	Prior to A.02.00

Mass Storage Copy (Remote Command Only)

Remote Command	`:MMEMory:COPY <string>,<string>[,<string>,<string>]`
Notes	The string must be a valid logical path. Copies an existing file to a new file or an existing directory to a new directory. Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination. The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists. This command will generate an "access denied" error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.

Mass Storage Delete (Remote Command Only)

Remote Command	`:MMEMory:DELete <file_name>[,<directory_name>]`
Notes	The string must be a valid logical path. Removes a file from the specified directory. The <file_name> parameter specifies the file name to be removed. This command will generate an "access denied" error if the file is in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

Mass Storage Data (Remote Command Only)

Creates a file containing the specified data OR queries the data from an existing file.

Remote Command	`:MMEMory:DATA <file_name>, <data>` `:MMEMory:DATA? <file_name>`
Notes	The string must be a valid logical path. The command form is MMEMory:DATA <file_name>,<data>. It loads <data> into the file <file_name>. <data> is in 488.2 block format. <file_name> is string data. The query form is MMEMory:DATA? <file_name> with the response being the associated <data> in block format.
Initial S/W Revision	Prior to A.02.00

Mass Storage Make Directory (Remote Command Only)

Remote Command	`:MMEMory:MDIRectory <directory_name>`
Notes	The string must be a valid logical path. Creates a new directory. The <directory_name> parameter specifies the name to be created. This command will generate an “access denied” error if the new directory would be in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

Mass Storage Move (Remote Command Only)

Remote Command	`:MMEMory:MOVE <string>,<string>[,<string>,<string>]`
Notes	The string must be a valid logical path. Moves an existing file to a new file or an existing directory to a new directory. Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination. The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the source. The second pair specifies the destination. An error is generated if the source doesn’t exist or the destination file already exists. This command will generate an “access denied” error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

Mass Storage Remove Directory (Remote Command Only)

Remote Command	`:MMEMory:RDIRectory <directory_name>`
Notes	The string must be a valid logical path. Removes a directory. The <directory_name> parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed. This command will generate an “access denied” error if the folder is a restricted folder (e.g., C:\Windows) or is in a restricted folder and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

Single (Single Measurement/Sweep)

Sets the analyzer for Single measurement operation. The single/continuous state is Meas Global, so the setting will affect all the measurements. If you are Paused, pressing Single does a Resume.

See "More Information" on page 1092

Key Path	Front-panel key
Example	:INIT:CONT OFF
Notes	See Cont key description.
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, the Single hardkey and the INITiate:IMM switched from continuous measurement to single measurement and restarted sweeps and averages (displayed average count reset to 1), but did not restart Max Hold and Min Hold. In the X-Series, the Single hardkey and the INITiate:IMM command initiate a sweep/ measurement/ average sequence/hold sequence including MaxHold and MinHold. For Spectrum Analysis mode in ESA and PSA, the Single hardkey restarted the sweep regardless of whether or not you were in an active sweep or sweep sequence. In the X-Series, Restart does this but Single only restarts the sweep or sweep sequence if you are in the idle state. INIT[:IMM] in ESA & PSA Spectrum Analysis Mode does an implied ABORt. In some other PSA Modes, INIT[:IMM] is ignored if not in the idle state. . The X-Series follows the ESA/PSA SA Mode model, which may cause some Modes to have compatibility problems.
Initial S/W Revision	Prior to A.02.00

More Information

See "Restart" on page 984 for details on the INIT:IMMediate (Restart) function.

If you are already in single sweep, the INIT:CONT OFF command has no effect.

If you are already in Single Sweep, then pressing the Single key in the middle of a sweep does not restart the sweep or sequence. Similarly, pressing the Single key does not restart the sweep or sequence if the sweep is not in the idle state (for example, if you are taking a very slow sweep, or the analyzer is waiting for a trigger). Instead, it results in a message. "Already in Single, press Restart to initiate a new sweep or sequence". Even though pressing the Single key in the middle of a sweep does not restart the sweep, sending INIT:IMMediate does reset it.

To take one more sweep without resetting the average count, increment the average count by 1, by pressing the step up key while **Average/Hold Number** is the active function, or sending the remote command CALC:AVER:TCON UP.

Source

There is no Source control functionality for this measurement. When this key is pressed, the screen either displays a blank menu, or the previously-selected menu remains unchanged.

Key Path	Front-panel key

RF Output

Allows you to turn the source RF Power on or off.

NOTE: As stated below, when the RF Output is turned on, the Source Mode is set to Tracking. See the "Source Mode" on page 1101 key description for special considerations concerning how to configure your N5172B or N5182B source for use with External Source Control.

Key Path	Source
Scope	Meas Global
Remote Command	`:OUTPut[:EXTernal] [:STATe] ON|OFF|1|0` `:OUTPut[:EXTernal] [:STATe]?`
Example	:OUTP ON :OUTP?
Dependencies	Grayed out in measurements that do not support a source. If you go to such a measurement the output will be forced to Off. Grayed out if there is no valid source selection, in this case go to the Select Source menu to choose, configure and/or verify your source When there is no available Source Mode (other than Off), due to other couplings, then the RF Ouput key is grayed out.
Couplings	When RF Output is turned On, Source Mode is set to Tracking When Source Mode is turned Off, RF Output is turned Off. When Source Mode is turned Off (or forced to Off by another coupling), RF Output is turned Off. Turning RF Output Off does not affect Source Mode or other settings.
Preset	OFF (on either a Mode Preset, a Source Preset, or Restore Input/Output Defaults)
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state.
Range	On | Off
Initial S/W Revision	A.06.01
Modified at S/W Revision	A.10.01

Amplitude

Allows you to access the Amplitude sub-menu to control various amplitude parameters of the Source. The resolution of the Source amplitude parameters is coupled to match the minimum resolution of the source when the source is acquired. When the source is released, the amplitude parameter resolution reverts to default values.

Key Path	Source
Readback	In square brackets, the amplitude value from Amplitude key in the next menu level down
Initial S/W Revision	A.06.01

Amplitude

Allows you to adjust the power level of the selected source. Note that the actual amplitude is also affected by the Amplitude Offset and Power Sweep parameters.

Key Path	Source, Amplitude
Scope	Mode Global
Remote Command	`:SOURce[:EXTernal]:POWer[:LEVel][:IMMediate][:AMPLitude] <ampl>` `:SOURce[:EXTernal]:POWer[:LEVel][:IMMediate][:AMPLitude]?`
Example	:OUTP ON :SOUR:POW –10dBm
Dependencies	If the requested setting of Source Amplitude causes the calculated external source start or stop Amplitude to exceed the external source capability, a warning status message is generated, “Data out of Range; clipped to source max/min” The “Show Source Capabilities and Settings” menu can then be examined to check the source capabilities. This parameter test and clip is also performed at source acquisition.
Preset	–10.00 dBm (On Source Preset and Restore Input/Output Defaults) Not affected by Mode Preset
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state.
Min	The range of the amplitude parameter is dependent on the amplitude range of the source that is selected, and the settings of Amplitude Offset and Power Sweep.
Max	The range of the amplitude parameter is dependent on the amplitude range of the source that is selected, and the settings of Amplitude Offset and Power Sweep.

Backwards Compatibility SCPI	`:SOURce:POWer:STARt <ampl>`
	`:SOURce:POWer:STARt?`
	This alias is for the ESA tracking generator. It specifies the source output power level at the start of the power sweep, just as does :SOURce:POWer.

Initial S/W Revision	A.06.01
Modified at S/W Revision	A.10.01

Power Sweep

Allows you to set up a Power Sweep. Power Sweep is useful for measuring saturation behavior in a test device, such as a power amplifier.

Pressing the key sets the power-sweep function to On or Off. The value of the power-sweep range is displayed in the active function block, and can be adjusted, when set to On.

The source will sweep the power between the start power defined by the Amplitude function and the stop power = start power + power sweep value:

- Source (start) amplitude = Amplitude – Amplitude Offset
- Source (stop) amplitude = Amplitude – Amplitude Offset + Power Sweep

If an external source is used, the analyzer controls the source with step sweep mode, which provides a linear progression from one selected frequency, amplitude, or both, to another, pausing at linearly spaced points (steps) along the sweep. The analyzer continues to sweep the specified frequency range when power sweep is on, although generally Power Sweep is performed in Zero Span.

With options T03, T06 and SCT, the hardware is capable of continuous power sweeps. This makes it possible to use the swept sweep time rules and should be employed for faster sweeps. Care should be taken to limit the sweep time you use as there are no sweep time couplings to Power Sweep settings. The recommended minimum sweep time depends on the RBW and power-sweep range. Start by computing (1.28/RBW)* (abs(startPower – stopPower)/(5 dB)). The recommended minimum sweep time is the larger of this value and 50 ms.

Some external Sources have mechanical attenuators, which are not used in Power Sweep in order to save wear on the attenuators. To allow an acceptable range of Power Sweep without changing the mechanical attenuation, the Sources are put in a mode that allows the Source to handle a wide amplitude range without switching the attenuators. When the Power Sweep settings put the Source in an amplitude range that requires the mechanical attenuators, the analyzer displays a condition warning message:

Settings Alert;Src pwr ramp>ALC range

Key Path	Source, Amplitude
Mode	SA
Scope	Mode Global

Remote Command	`:SOURce:POWer:SWEep <rel_ampl>`
	`:SOURce:POWer:SWEep?`
	`:SOURce:POWer:SWEep:STATe ON|OFF|1|0`
	`:SOURce:POWer:SWEep:STATe?`

Example	:SOUR:POW –5 :SOUR:POW:SWE:STAT ON :SOUR:POW:SWE 10 Set source start power to – 5 dBm and stop power + 5dBm (–5 + 10).
Example	:SOUR:POW:SWE:STAT ON
Dependencies	If the requested setting of Power Sweep causes the calculated external source start or stop Amplitude to exceed the external source capability, a warning status message is generated, “Data out of Range; clipped to source max/min”. The Show Source Capabilities and Settings menu can then be examined to check the source capabilities. This parameter test and clip is also performed at source acquisition.
Preset	This is unaffected by “Mode Preset” but is set to 0dB on a “Source Preset” or "Restore Input/Output

	Defaults".
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state.
Min	–500 dB
Max	+500 dB

Backwards Compatibility SCPI	`:SOURce[:EXTernal][:SWEep]:POWer:SPAN <rel_ampl>`
	`:SOURce[:EXTernal][:SWEep]:POWer:SPAN?`
	This alias is for the ESA tracking generator and PSA option 215. It specifies the range of power levels through which the source output will sweep just as does :SOURce:POWer:SWEep.

Initial S/W Revision	A.06.01

Remote Command	`:SOURce[:EXTernal]:POWer:MODE FIXed|SWEep` `:SOURce[:EXTernal]:POWer:MODE?`
Notes	The ESA tracking generator and the PSA option 215 support this SCPI command. It sets the source output to be at a single amplitude (fixed) or to sweep through a range of power levels • SOURce:POWer:MODE FIXed is equivalent to :SOURce:POWer:SWEep:STATe OFF • SOURce:POWer:MODE SWEep is equivalent to :SOURce:POWer:SWEep:STATe ON
Preset	This is unaffected by “Mode Preset” but is set to FIXed on a “Source Preset” or "Restore Input/Output Defaults".
Initial S/W Revision	A.06.01
Modified at S/W Revision	A.10.01

Amptd Offset

Offsets the displayed power of the source in the Amplitude parameter. Using the amplitude offset allows you to take into account any system losses or gains (for example, due to cable loss), thereby displaying the actual power delivered to the device under test. See the equations under the Source, Amplitude, Power Sweep key.

Key Path	Source, Amplitude
Mode	SA
Scope	Mode Global
Remote Command	`:SOURce:CORRection:OFFSet <rel_ampl>` `:SOURce:CORRection:OFFSet?`
Example	:SOUR:CORR:OFFS 5 Sets the displayed source offset power to 5 dB.
Dependencies	If the requested setting of Amptd Offset causes the calculated external source start or stop Amplitude to exceed the external source capability, a warning status message is generated, “Data out of Range; clipped to source max/min”. The Show Source Capabilities and Settings menu can then be examined to check the source capabilities.

	This parameter test and clip is also performed at source acquisition.
Preset	This is unaffected by Mode Preset but is set to 0.00dBm on a Source Preset or Restore Input/Output Defaults.
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state.
Min	–1000 dB
Max	+1000 dB
Initial S/W Revision	A.06.01

Amptd Step Auto/Man

Allows you to set the step size associated with the Source > Amplitude key. When auto-coupled, the step size is the current Scale/Div setting under the Amplitude hardkey (note that this is true even if the analyzer is currently in Linear amplitude scale).

Once a step size has been selected and the Source Amplitude function is active, the step keys (and the UP|DOWN parameters for Source Amplitude from remote commands) change the Source Amplitude by the step-size value.

You may change the step size manually by pressing Amptd Step and entering a value. The function (and the step size) will return to Auto when a Mode Preset or Auto Couple is performed.

Key Path	Source, Amplitude
Scope	Mode Global

Remote Command	`:SOURce:POWer:STEP[:INCRement] <ampl>`
	`:SOURce:POWer:STEP[:INCRement]?`
	`:SOURce:POWer:STEP:AUTO OFF|ON|0|1`
	`:SOURce:POWer:STEP:AUTO?`

Example	:SOUR:POW:STEP 0.1 Set amplitude step to 0.1 dB :SOUR:POW:STEP:AUTO ON
Couplings	In Auto, coupled to the size of one logarithmic vertical graticule division
Preset	Auto
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state.
Min	0.1 dB
Max	20 dB
Initial S/W Revision	A.06.01

Frequency

Allows a you to access the Frequency submenu. This menu lets you use a stepped tracking source for stimulus/response measurements for some added flexibility. With such a source, the source frequency does not need to track 1:1 with the analyzer LO frequency, it is possible to measure scalar harmonic and subharmonic responses of devices. For example, the second harmonic response is measured by stepping the analyzer and source so that the analyzer is always at twice the source frequency. In addition, the frequency offset capability allows the measurement of frequency conversion devices (like mixers).

In tracking mode, the source frequency tracks the analyzer frequency according to the source frequency equation:

Source Frequency = (Analyzer Frequency *Multiplier Numerator / Multiplier Denominator) + Source Frequency Offset

Analyzer Frequency is the frequency to which the analyzer is set, which is the analyzer's displayed frequency, offset by any Freq Offset set under the Frequency hardkey. Source Frequency Offset is the value set under Source, Frequency, Freq Offset.

Key Path	Source
Readback	none in Tracking Source mode
Initial S/W Revision	A.06.01

Multiplier Numerator

The multiplier numerator parameter offsets the source frequency from the analyzer frequency. The source frequency tracks the SA frequency according to the source frequency equation shown under the Source, Frequency key description.

The multiplier numerator must be restricted to operate within the range of the source minimum and maximum frequencies.

Key Path	Source, Frequency
Mode	SA
Scope	Mode Global
Remote Command	`:SOURce:FREQuency[:MULTiplier]:NUMerator <integer>` `:SOURce:FREQuency[:MULTiplier]:NUMerator?`
Example	:SOUR:FREQ:NUM 3 Sets the source frequency multiplier numerator to 3.
Dependencies	If the currently selected source does not support this capability (for example, an internal Tracking Generator which must track the LO), this key is forced to its Preset value and grayed out
Preset	This is unaffected by Mode Preset but is set to 1 on a Source Preset or Restore Input/Output Defaults.
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state.
Min	1
Max	1000
Initial S/W Revision	A.06.01

Multiplier Denominator

The multiplier denominator parameter offsets the source frequency from the analyzer frequency. The source frequency tracks the SA frequency according to the source frequency equation shown under the Source, Frequency key description.

The multiplier denominator must be restricted to operate within the range of the source minimum and maximum frequencies.

Key Path	Source, Frequency
Mode	SA
Scope	Mode Global
Remote Command	`:SOURce:FREQuency[:MULTiplier]:DENominator <integer>` `:SOURce:FREQuency[:MULTiplier]:DENominator?`
Example	:SOUR:FREQ:DEN 3 Sets the source frequency multiplier denominator to 3
Dependencies	If the currently selected source does not support this capability (for example, an internal Tracking Generator which must track the LO), this key is forced to its Preset value and grayed out
Preset	This is unaffected by Mode Preset but is set to 1 on a Source Preset or Restore Input/Output Defaults.
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state
Min	1
Max	1000
Initial S/W Revision	A.06.01

Source Sweep Reverse

Allows you to reverse the source sweep direction

Normally, the source will sweep from a lower frequency to a higher frequency. However, there are test scenarios in which the source sweep needs to be “reversed”. In this case, it sweeps from a higher frequency to a lower frequency. For example, when the DUT is a frequency converter and a measurement of the Lower Side Band characteristics is desired, a reverse sweep is employed. Reverse sweeps are supported for such scenarios, but two cautions are in order:

1. Reverse Sweep only reverses the direction of the source’s sweep, not the analyzer’s sweep. Unless you are actually using a device like a frequency converter and looking at the lower sideband, thus effectively reversing the direction of the source’s sweep, the source will be sweeping in the opposite direction from the analyzer, and it will not be possible track the desired device output frequency.

2. Any time you are using a frequency converter, care must be taken in setting up all of the sweep parameters, including analyzer start/stop frequency and source multiplier, to make sure that the analyzer’s sweep tracks the output of the converter device.

Key Path	Source, Frequency
Mode	SA
Scope	Mode Global
Remote Command	`:SOURce:FREQuency:SSReverse:ON|OFF|0|1` `:SOURce:FREQuency:SSReverse?`
Example	SOUR:FREQ:SSR:OFF SOUR:FREQ:SSR?
Notes	You must be in Spectrum Analyzer mode to use this command. Use INSTrument:SELect to set the mode.
Dependencies	If the currently selected source does not support this capability (for example, an internal Tracking Generator which must track the LO), this key is forced to its Preset value and grayed out
Preset	This is unaffected by Mode Preset but is set to OFF on a Source Preset or Restore Input/Output Defaults.
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state
Range	On|Off
Initial S/W Revision	A.06.01

Freq Offset

The frequency offset parameter offsets the source frequency from the analyzer frequency. The source frequency tracks the SA frequency according to the equations under the Source, Frequency key.

Pressing the key sets the Freq Offset function to On or Off. The value of Freq Offset is displayed in the active function block, and can be adjusted, when set to On.

The frequency offset must be restricted to operate within the range of the source minimum and maximum frequencies.

Key Path	Source, Frequency
Mode	SA
Scope	Mode Global

Remote Command	`:SOURce:FREQuency:OFFSet <freq>`
	`:SOURce:FREQuency:OFFSet?`
	`:SOURce:FREQuency:OFFSet:STATe ON|OFF|1|0`
	`:SOURce:FREQuency:OFFSet:STATe?`

Example	:SOUR:FREQ:OFFS 10MHz Sets the source frequency offset to 10MHz.
Dependencies	If the currently selected source does not support this capability (for example, an internal Tracking Generator which must track the LO), this key is forced to its Preset value and grayed out
Preset	This is unaffected by Mode Preset but is set to 0.00Hz on a Source Preset or Restore Input/Output Defaults.

State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state
Min	–10 GHz
Max	10 GHz

Backwards Compatibility SCPI	`:SOURce:EXTernal:SWEep:OFFSet:FREQuency <freq>`
	`:SOURce:EXTernal:SWEep:OFFSet:FREQuency?`
	The PSA option 215 supports this SCPI command. This command is equivalent to : SOURce:FREQuency:OFFSet

Initial S/W Revision	A.06.01
Modified at S/W Revision	A.10.01

Source Mode

Accesses the Source Mode softkey menu. This menu lets you select Tracking mode for the Source, and also allows you to set the Source Mode to OFF.

The Source Mode can be set to Tracking without the user setting it directly. There are several couplings that cause Source Mode to be automatically set to Tracking (detailed in the table below). One important coupling is that Source Mode is forced to Tracking when the RF Output is turned on if the measurement supports Tracking. Since Source Mode is set to Off on a Mode Preset, this means that you will rarely need to change the Source Mode setting directly.

Note:

As stated above, when the Source Mode is set to Tracking, the analyzer acquires control of the source. When this happens the source is told to save its state and then perform a preset. Usually both of these operations take very little time; however, on an N5172B or an N5182B, if many Source real-time apps are in use, both save and preset can take several seconds. If it takes longer than the analyzer expects to acquire control, you will see an error: “Source connection lost, check interface connection”. If you see this error, and you are using an N5172B or an N5182B, you can shorten the acquire time by presetting your MXG before attempting to use External Source Control.

Key Path	Source
Scope	Meas Global
Remote Command	`:INSTrument:SOURce[:SELect] TRACking|OFF` `:INSTrument:SOURce[:SELect]?`
Example	:INST:SOUR TRAC
Dependencies	Grayed out if no Source is selected, in this case go to the Select Source menu to choose, configure and/or verify your source Grayed out and forced to Off if either BBIQ or External Mixing are selected Blanked in Modes that do not support a source Grayed out in Measurements that do not support a source Tracking is grayed out when Manual FFT is selected Tracking is grayed out when the RF Preselector is on (in models which support the RF Preselector).

Couplings	When RF Output is turned On, Source Mode is set to Tracking. When Source Mode is turned Off, RF Output is turned Off. Whenever you switch to an application (Mode) in which the Source Mode was previously set to Tracking, it is again set to Tracking. That is, the last setting of the Source Mode is remembered when you leave an application (Mode) and restored when you return Source Mode is forced to Tracking when the RF Output is turned on if the measurement supports Tracking If Source Mode is set to Tracking, then it is forced to Off when you select a measurement that does not support Tracking. If Source Mode is set to Tracking, then it is forced to Off when you turn on the RF Preselector (in models which support the RF Preselector). Whenever the Source Mode is set to Tracking, the analyzer acquires the Source. Similarly, the Source is released whenever the Source Mode is set to Off. This is true whether the Source Mode was set directly by you, was set indirectly through a coupling, if you switched to an application (Mode) that had previously been set to Tracking, or if you switched to an application (Mode) in which the Source Mode is not set to Tracking. For an external source, "acquiring the source" involves contacting the external instrument over the remote interface (which puts it into Remote) and taking control of it. When you set the Source Mode to OFF, it releases the Source (and puts it into Local). For an external source, this means you are now free to operate the source for other purposes. When the Source is acquired, its previous state is saved, and when it is released, that state is restored, so that you can acquire and then release the source and it will return to the state it was in before you acquired it.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	A.06.01
Modified at S/W Revision	A.10.01

Select Source

The Select Source menu allows you to maintain a list of available external Sources, and choose the Source that you want to use from the list. It shows the currently selected source at the bottom of the screen.

While in the Select Source menu, you can see, and select from, a list of the currently available sources. The sources listed in this table are as follows:

- Any internal sources which are installed and licensed

  NOTE Only one internal source can be installed, displayed at address "INTERNAL"

- Any external sources which you have previously configured, whether or not they are currently connected, displayed with their VISA address

Note that only external sources that are supported by the Tracking Source Mode are displayed in the Available Source List. Here are the Sources currently supported:

Source	PXA	MXA	EXA	CXA	MXE (Presel off)
Keysight MXG N5181A	X	X	X	X	X
Keysight MXG N5182A	X	X	X	X	X
Keysight MXG N5183A	X	X	X		X
Keysight EXG N5171B	X	X	X	X	X
Keysight MXG N5181B	X	X	X	X	X
Keysight EXG N5172B	X	X	X	X	X
Keysight MXG N5182B	X	X	X	X	X
Keysight PSG E8257D	X	X	X		
Keysight PSG E8267D	X	X	X		

NOTE For X-Series software versions earlier than A.10.01, option UNZ (Fast switching) was required on the MXG for some use cases. This is no longer the case, option ESC now works without MXG option UNZ for all use cases. (Note that you will get better performance if your MXG has option UNZ, because without option UNZ your sweep speeds will be noticeably slower.)

While in the Select Source menu and its submenus, detailed instructions are presented that tell you how to operate the Select Source functions. Basically they tell you to first use the up and down arrow keys to move the selection highlighted in the "Available Source List" to the source that you want to use. The list of available sources includes any sources that you have previously used (unless you have deleted them) and any found while in the "Add Source to List" menu.

When the source you want to use is highlighted, press "Select Highlighted Source" or "Enter". The source you have selected shows up at the bottom of the screen as the "Current Source". Press "Verify Current Source Connection" to make sure that the interface connection to the Source is still functional.

At any time you may use the "Add Source to List" or "Delete Highlighted Source" keys to find new sources or remove a source from the list of available sources.

Key Path	Source
Readback Text	Two lines of readback give the type information and serial number of the current source, in square brackets
Initial S/W Revision	A.06.01

Point Trigger

Shows point trigger type selected and navigates to the Point Trigger menu.

The Point Trigger menu lists all analyzer point trigger types. The analyzer and source point trigger synchronization can be done using SCPI bus commands or by using external trigger output and input lines.

NOTE For X-Series software versions earlier than A.10.01, hardware triggering was unavailable in stepped tracking at frequencies above 3.6 GHz, so above 3.6 GHz, software triggering was always used. This is no longer the case.

Key Path	Source, Source Setup
Mode	SA
Scope	Mode Global
Remote Command	`:SOURce:TRIGger:TYPE BUS|EXTernal[1]|EXTernal2` `:SOURce:TRIGger:TYPE?`
Example	:SOUR:TRIG:TYPE EXT1 Selects analyzer external trigger 1 in and out for point trigger synchronization with selected source
Dependencies	If an internal Tracking Generator is selected, then this menu is unavailable, Additionally, the External 1 and External 2 Trigger keys on the Spectrum Analyzer are released from any grayout that may have been forced on them by the external source Point Trigger selection. In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a “Hardware missing; Not available for this model number” message.
Couplings	The source control point trigger selection can select external trigger 1 or 2 in for synchronized point triggering. This can conflict with the selection under the Trigger hardkey, if it has External 1 or 2 selected. If there is a conflict when the selection is made under the Point Trigger menu, the Trigger selection under the Trigger hardkey will be changed to Free Run.
Preset	This is unaffected by “Mode Preset” but is set to EXTernal1 on a “Source Preset” or "Restore Input/Output Defaults".
State Saved	Part of the Input/Output system, which means it is Loaded and Saved with state
Readback	1-of-N selection
Initial S/W Revision	A.06.01

Select Highlighted Source

You can navigate up and down in the list with the up and down arrow keys, and can select any entry by pressing the Select Highlighted Source key (or by double-clicking on the entry in the table with a mouse). The highlighted source becomes the Current Source and is prominently displayed at the bottom of the screen.

At any given time there is only one selected Source for the entire system; once a Source is selected, it becomes the Current Source and will be used by all applications that support Source Control.

For example, if no Source has yet been selected, the statement at the bottom of the screen would say

- Current Source
- None

If an N5182A connected via USB were the Current Source, the statement at the bottom of the screen might say:

- Current Source
- Keysight N5182A US00000258 at USB0::2931::7937::US00000258::0::INSTR

The SCPI command defined below allows the programmatic user to directly define the VISA address via a string parameter. The parameter is checked for proper syntax, the connection to the instrument is verified, and the source is added to the Available Source List if it verifies. If it does not verify or no source is found at that address, an error message is generated.

Normally the source selection activities should be performed only when the user changes the hardware connection configuration or activates/deactivates a source option license; shutdown and startup of the application will not cause source re-selection.

The Keysight IO Libraries Suite provides a “Keysight VISA Help” document that has a section that shows the proper syntax for valid VISA address strings, in the ViOpen function definition.

Key Path	Source, Select Source
Mode	SA
Remote Command	`:SYSTem:COMMunicate:SOURce[1]:ADDRess <address string>` `:SYSTem:COMMunicate:SOURce[1]:ADDRess?`
Example	Different examples for setting external source address :SYST:COMM:SOUR:ADDR “TCPIP0::MyHostName::INSTR” :SYST:COMM:SOUR:ADDR “TCPIP0::123.121.100.210::INSTR” :SYST:COMM:SOUR:ADDR “USB0::12212::32145::US1234567A::INSTR” :SYST:COMM:SOUR:ADDR “GPIB1::19::INSTR”
Notes	Empty string is allowed and means no source is defined or selected.
Remote Command Notes	The address string is the VISA address for external sources and “INTERNAL” for an internal source
Dependencies	Operation with a source requires a license. If the proper license is not installed, the SCPI command generates an error message, “Settings conflict;option not installed” If no supported source, or no source at all, is found at the specified address, the SCPI command generates an error message
Preset	The current source selection is unaffected by a Mode Preset and Source Preset but reverts to [None] on a Restore Input/Output Defaults. If an internal Tracking Generator is installed, then instead of None, the default selection will be INTERNAL.
State Saved	Selected Source is • Power On Persistent (survives power cycle) • Part of the Input/Output system, which means it is Loaded and Saved with state.
Readback	Two lines of readback give the type information and serial number of the current source on the Select Source key in the form [<source type>] [<serial number>]

	[None] shows in the type area and blank in the serial number area if a source has not been configured. [Internal TG] shows in type area and serial number in the serial number area if an internal Tracking Generator has been selected. For example: [MXG]/n, [US01020022]. This indicates an MXG of serial number US01020022.

Backwards Compatibility SCPI	`:SYSTem:COMMunicate:LAN:SOURce[:EXTernal]:IP <address string>`
	`:SYSTem:COMMunicate:LAN:SOURce[:EXTernal]:IP?`
	This command is provided for compatibility with PSA Option 215. The address string is reformatted for the X-Series. For example, if the customer sends
	:SYSTem:COMMunicate:LAN:SOURce:EXTernal:IP 146.208.172.111
	The analyzer turns this into
	:SYSTem:COMMunicate:SOURce:ADDRess "TCPIP0::146.208.172.111::INSTR"

Initial S/W Revision	A.06.01
Modified at S/W Revision	A.10.01

Source Preset

The Source Preset key forces all the settings in the analyzer's Source State to their preset condition.

The Source State is the set of Source settings that is maintained and remembered by the analyzer for use in the Tracking Source Mode. The Source State variables are controlled and set in the menus under the Source front panel key. These settings include:

- RF Output Off
- Amplitude = – 10 dBm
- Amplitude Step = Auto
- Power Sweep = 0 dB
- Amplitude Offset = 0 dB
- Source Sweep Reverse = Off
- Multiplier Numerator = 1
- Multiplier Denominator = 1
- Freq Offset = 0 Hz
- Point trigger is set to "Ext1"

The Source State is saved along with the state of the current Mode when you save a State, and is recalled when that Mode State is recalled.

When the analyzer first starts up, a Source Preset is performed. In the Input/Output menu, Restore Input/Output Defaults will also perform a Source Preset.

A Mode Preset, from modes that support the External Source, turns off the RF but does **not** perform a Source Preset. Similarly, Source Preset does **not** perform a Mode Preset.

Source Preset does **not** change the Source Mode nor the selection of which physical source is being used, nor does it release the current source (the source remains under the control of the analyzer) nor exit the Source menu.

"Source Mode" on page 1101

Key Path	Source
Mode	SA
Remote Command	`:SOURce:PRESet`
Example	:SOUR:PRES
Preset	Initiates a Source Preset
State Saved	No
Initial S/W Revision	A.06.01

Source Setting Query (Remote Command Only)

This query can be used to get certain settings from the Source when the Source Mode is set to Tracking. The returned values are all in ASCII.

Remote Command	`:SOURce:SETtings?`
Example	:SOUR:SET?
Notes	Returns a set of comma separated values as follows (no spaces): source max frequency,source min frequency,source frequency resolution,source max amplitude,source min amplitude,source amplitude resolution,source sweep max point,source start frequency,source stop frequency,source start amplitude,source stop amplitude
Initial SW Revision	A.10.01

SPAN X Scale

Activates the Span function and displays a menu of span functions.

Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

Span

Changes the displayed frequency range symmetrically about the center frequency. While adjusting the Span the Center Frequency is held constant, which means that both Start Frequency and Stop Frequency will change.

Span also sets the frequency entry mode to Center/Span. In Center/Span mode, the center frequency and span values are displayed below the graticule, and the default active function in the Frequency menu is Center Freq.

While discussing the Span function we make the distinction between “swept spans” and “zero span”. We use the term “swept spans” to mean spans other than zero; recognizing that, because of this terminology, the user can be in what we call a “swept span” even while performing an FFT “sweep”.

While in swept spans, setting the span to 0 Hz through SCPI or the front panel numeric key pad puts the analyzer into zero span. However, using the Step keys and the RPG in swept spans, the Span can only go as far down as 10 Hz and cannot be set to zero.

While in zero span, setting the Span to a non-zero value through SCPI or Front Panel puts the analyzer in swept spans.

If the Span is set to a value greater than the maximum allowable span of the instrument, an error message is generated indicating the data is out of range and was clipped to upper limit.

See SpanPresets

Key Path	SPAN X Scale
Remote Command	`[:SENSe]:FREQuency:SPAN <freq>` `[:SENSe]:FREQuency:SPAN?`
Example	FREQ:SPAN 2GHz sets the span to 2GHz FREQ:SPAN 0 Hz Sets the span to 0 Hz and puts the instrument in Zero Span
Dependencies	If the electrical attenuator is enabled, any attempt to set Span such that the Stop Frequency would be >3.6 GHz results in an error. If Source Mode is set to Tracking, and the Span is therefore limited by the limits of the source, a warning message is generated, “Data out of range;clipped to source max/min” if these limits are exceeded. Note that for an external source, these limits can be affected by the settings of Source Numerator, Source Denominator and Power Sweep. In analyzers with an RF Preselector, such as MXE, you cannot sweep across the band break at 3.6 GHz while the RF Preselector is on in Continuous sweep, as there is a mechanical switch which bypasses the RF Preselector above 3.6 GHz. See the Stop Frequency key description for details of

	this limitation.
Couplings	Span affects RBW, sweeptime, FFT & Sweep choice (including FFT Width, Phase Noise Optimization and ADC Dither auto couplings.) When operating in “swept span”: • Any value of the Center Frequency or Span that is within the frequency range of the analyzer is allowed when the value is being set through the front panel numeric key pad or the SCPI command. The other parameter is forced to a different value if needed, to keep the Start and the Stop Frequencies within the analyzer’s frequency range • When using the knob or the step up/down keys or the UP |DOWN keywords in SCPI, the value that is being changed i.e. the Center Frequency or Span, is limited so that the other parameter is not forced to a new value • The Span cannot be set to Zero by setting Start Frequency = Stop Frequency. The value of the last setting will be changed to maintain a minimum value of 10 Hz for the difference between start and stop frequencies.
Preset	Depends on instrument maximum frequency, mode, measurement, and selected input. See SpanPresets
State Saved	Saved in instrument state
Min	10 Hz unless entered directly, then 0 Hz is allowed, but nothing between 0 and 10 is ever allowed. In the Swept SA measurement, in Trace Zoom, Zero Span is not allowed, so the Span may not go below 10 Hz. In the Swept SA measurement, in Zone Span, Zero Span is not allowed in the top window, so the Span may not go below 10 Hz in the top window.
Max	Depends on instrument maximum frequency, mode, measurement, and selected input. See SpanPresets If the knob or step keys are being used, depends on the value of the other three interdependent parameters Center Frequency, Start Frequency, Stop Frequency Note that, if the Source Mode is set to Tracking, the effective instrument maximum Span may be limited by the source maximum frequency.
Default Unit	Hz
Status Bits/OPC dependencies	Overlapped if Signal Track is on (OPC shouldn’t return or clear until the zooming has completed for the new span)
Initial S/W Revision	Prior to A.02.00

Span Presets

The following table provides the Span Presets for the Spectrum Analyzer mode, and the Max Span, for the various frequency options:

Freq Option	Span after Mode Preset	Max Span (can't set higher than this)
503 (all but N9000A)	3.59 GHz	3.7 GHz
503	2.99 GHz	3.08 GHz

(N9000A)		
507 (all but N9000A)	6.99 GHz	7.1 GHz
507 (N9000A)	7.49 GHz	7.58 GHz
508 (all but N9038A)	8.39 GHz	8.5 GHz
508 (N9038A)	3.59 GHz	8.5 GHz
513	13.59 GHz	13.8 GHz
526 (all but N9000A and N9038A)	26.49 GHz	27.0 GHz
526 (N9038A)	3.59 GHz	27.0 GHz
526 (N9000A)	26.49 GHz	26.55 GHz
543	42.99 GHz	TBD
544	43.99 GHz	44.5 GHz
550	49.99 GHz	51 GHz

Input 2:

Model	Span after Mode Preset	Max Span (can't set higher than this)
N9000A opt C75	1.499 GHz	1.58 GHz
N9038A	1 GHz	1.000025 GHz

Note that if you are in External Mixing, the maximum Span will be equal to the Maximum Stop Frequency – Minimum Start Frequency for the currently selected mixer.

Zone Span

Allows the span of the zone markers to be changed without changing the center frequency. The zone markers are vertical lines marking the zone in the upper window. They determine the frequency range displayed in the lower window. As the zone markers are moved, the span of the lower window is changed but the lower window will not be updated to reflect the change unless it is selected as the active window.

The span limit of the lower window is the same as the span limit of the analyzer. The span for the lower window is not limited to the selected span of the upper window. However, if the frequency span of the lower window is at all outside of the span for the upper window, an orange arrow pointing left or right will be displayed at the left or right edge of the top window.

Key Path	SPAN X Scale, Zone
Remote Command	`[:SENSe]:FREQuency:ZSPan:SPAN <frequency>` `[:SENSe]:FREQuency:ZSPan:SPAN?`
Example	:FREQ:ZSP:SPAN 20 MHz
Notes	Min and Max values depend on the Hardware Options (5xx)
Dependencies	Only appears in the Zone Span View of the Swept SA measurement. If the SCPI command is sent in other Views, gives an error
Couplings	Span of lower window changes so that it is always the same as Zone Span, and vice-versa
Preset	On entry to the Zone Span View, the Zone Span is 10% of the span of the upper window. So if you do a Mode Preset and then immediately go into Zone Span, the Zone Span is 10% of the Span Preset value listed in the table under the Span key description.
State Saved	Saved in instrument state
Min	0 Hz
Max	Zone Span cannot go so high as to force the zone region outside the top window.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

Zoom Span

Allows the span of the zoom region to be changed without changing the zoom center.

The center frequency for the lower window is limited by the start and stop frequencies in the upper window. You cannot move the zoom region out of the upper window. Consequently, if the zoom region hits either the left or right edge of the upper window, the Zoom Span starts to shrink to keep the zoom region from going outside the upper window.

The Zoom Span value is displayed in the lower right corner of the zoom window (below the graticule) when the frequency entry mode is Center/Span (pressing Center Freq or Span sets the frequency entry mode to Center/Span). When the frequency entry mode is Start/Stop, Zoom Stop is displayed in this lower right annotation position (pressing Start Freq or Stop Freq sets the frequency entry mode to Start/Stop).

Key Path	SPAN X Scale, Zone
Remote Command	`[:SENSe]:FREQuency:TZOom:SPAN <frequency>` `[:SENSe]:FREQuency:TZOom:SPAN?`
Example	:FREQ:TZO:SPAN 20 MHz
Notes	As the Zoom Span increases, if the edge of the zoom region hits either edge of the graticule, then as the Zoom Span continues to increase, the Zoom Center will change to keep the zoom region from leaving the upper window.
Dependencies	Only appears in the Trace Zoom View of the Swept SA measurement. If the SCPI command is sent in other Views, gives an error.

Preset	On entry to Trace Zoom, Zoom Span is 10% of the span of the upper window. So if you do a Mode Preset and then immediately go into Trace Zoom, Zoom Span is 10% of the Span Preset value listed in the table under the Span key description.
State Saved	Saved in instrument state
Min	10 Hz
Max	The Zoom Span is constrained by the top window (analyzer) span. It cannot get so large that Zoom Start goes below the analyzer Start Freq, or so that Zoom Stop goes above the analyzer Stop Freq. Thus, the limit is 2*(Zoom Center – Start Freq) or 2*(Stop Freq-Zoom Center), whichever is smaller.
Default Unit	Hz
Status Bits/OPC dependencies	non-overlapped
Initial S/W Revision	A.07.01

Full Span

Changes the frequency span of the analyzer to the Preset frequency span of the analyzer and sets the Frequency entry mode to Center/Span.

The span is dependent on the currently selected Input (see the Section "Input/Output"). For example, when using external mixing, it changes the frequency to the Preset frequency range specified for the selected external mixing band.

Pressing this key while in zero span puts the analyzer back in swept span.

Key Path	SPAN X Scale
Remote Command	`[:SENSe]:FREQuency:SPAN:FULL`
Example	FREQ:SPAN:FULL Sets the span to full frequency range of the analyzer
Notes	n /a
Couplings	Turns off signal tracking (span zoom). It does NOT turn off the markers, nor the current active function.
Backwards Compatibility Notes	In the past, the Full Span function turned off all markers. In the X-Series this is not the case.
Initial S/W Revision	Prior to A.02.00

Zero Span

Changes the displayed frequency span to 0 Hz. The horizontal axis changes to time rather than frequency. The amplitude displayed is the input signal level at the current center frequency. This is a time-domain mode that changes several measurement functions and couplings. The instrument behavior is similar to an oscilloscope with a frequency selective detector installed in front of the oscilloscope. See Application Note 150 for more information on how to use zero span.

You can enter Zero Span in several ways:

- Press the Zero Span key in Span

- Set Span=0 Hz
- Press last Span if the last span was 0

You cannot go to Zero Span by setting start freq = stop freq, or rolling span down with the RPG, that will limit you to 10 Hz

You can go back to Swept Span by setting Span to a nonzero value or pressing Last Span, assuming the last span was not also zero span.

Pressing Zero Span places the analyzer in Center/Span frequency entry mode.

The following table summarizes the differences between Zero Span and Swept Spans:

Zero Span	Swept Spans
X axis is time	X axis is frequency
There is no auto-RBW selectionunless the EMC Standard is CISPR or MIL	RBW coupled to Span when RBW in auto
There is no auto sweep time	Sweep time coupled to RBW when sweep time in auto
Interval Power calculated in Mkr Function	Band Power calculated in Mkr Function
Can only define time limits when in zero span	Can only define frequency limits when in swept SA
Marker Count counts at the center frequency	Marker Count counts at the marker frequency
CF Step Size set to RBW value	CF Step autocouples to 10% of Span
Some "Marker ->" commands not available.	Other "Marker ->" commands not available
Freq entry mode always Center/Span	Freq entry mode can be Center/Span or Start/Stop
N dB points reports a time difference.	N dB points reports a frequency difference.

Key Path	SPAN X Scale
Example	FREQ:SPAN 0 Hz Sets the span to zero, switches to Zero Span Sending FREQ:SPAN 1 MHz while in Zero Span, switches to Swept span
Notes	Setting the Span to 0 Hz will change to Zero Span and setting the span to a non-zero value will select a swept span
Notes	n /a
Dependencies	Zero Span key is unavailable (grayed out) if any of the following is true: In the Swept SA measurement, in Trace Zoom In the Swept SA measurement, in Zone Span, in the top window
Couplings	Pressing Zero Span key (switching to Zero Span): • Turns off signal track function (span zoom). • Turns off the auto-coupling of RBW and sweep time.
Initial S/W Revision	Prior to A.02.00

Last Span

Changes the displayed frequency span to the previous span setting. If it is pressed immediately after Signal Track is turned off, then the span setting returns to the span that was in effect before Signal Track was turned on.

If this key is pressed while in a nonzero span, and the previous value of span was 0, it will put the analyzer back in Zero Span. And if it is pressed while in zero span, it will set the analyzer back to its last nonzero span.

Pressing Last Span places the analyzer in Center/Span frequency entry mode.

Key Path	SPAN X Scale
Remote Command	`[:SENSe]:FREQuency:SPAN:PREVious`
Example	FREQ:SPAN:PREV Sets the span to the previous value
Notes	n /a
Dependencies	If the electrical attenuator is enabled, any attempt to set Span such that the Stop Frequency would be >3.6 GHz results in an error.
Initial S/W Revision	Prior to A.02.00

Signal Track (Span Zoom)

When Marker 1 is placed on a signal and Signal Track is pressed, the marker remains on the signal while the analyzer retunes the center frequency to the marker frequency. The analyzer keeps the signal at the center of the display, as long as the amplitude of the signal does not change by more than +/–3 dB from one sweep to another. If Marker 1 is not in Normal or Delta, turning on Signal Track sets it to Normal, perform a peak search, and center the marker on the display.

See "More Information" on page 1115.

Key Path	SPAN X Scale
Remote Command	`:CALCulate:MARKer:TRCKing[:STATe] OFF|ON|0|1` `:CALCulate:MARKer:TRCKing[:STATe]?`
Example	CALC:MARK:TRCK ON Turns on Signal Track using Marker 1. CALC:MARK:TRCK?
Dependencies	Signal Track is associated with Marker 1. When marker 1 is turned off or set to Fixed, signal track is turned off as well. Signal Track is not available (grayed out) when Source Mode=Tracking. Signal Track is not available (grayed out) when Signal ID = on. Signal Track and Continuous Pk cannot be used with each other. If one is on, the other is grayed out. . Signal Track is grayed out if in Zero Span. But if Zero Span is entered while in Signal Track, Signal Track is turned off. Signal Track can only function properly if the trace Marker 1 is on is updating. Therefore if Signal Track is on and the trace Marker 1 is on is put into View, Signal Track is turned off and the Signal

	Track key grayed out. Whenever the trace Marker 1 is on is not updating, the Signal Track key is grayed out. Signal Track is only available in SA measurement . It should be grayed out in other Measurements in the Spectrum Analyzer mode.
Couplings	Signal Track can only function properly if the trace Marker 1 is on, is in Trace Update = Active. Therefore if the trace Marker 1 is on is in Update Off when Signal Track is turned on, it is changed to Update On. If the trace Marker 1 is on is set to Update Off while Signal Track is on, it turns off Signal Track.
Preset	OFF
State Saved	Saved in instrument state
Backwards Compatibility Notes	1. Signal Track is now in the Span menu. It was located in the Frequency menu in ESA and PSA, under its own hardkey in 859xA, under Marker Function (and called Marker Track) in 859xB/C/D/E. It was placed in Span in the X-Series because of the value that one of Signal Track's features, Auto Zoom, provides when changing span (see below). 2. In ESA and PSA the Span Zoom key (in the Span menu) turned on Signal Track in order to let the user enter a new span with Auto Zoom on; by putting Signal Track into the Span menu we achieve the same functionality more clearly. Hence Span Zoom is eliminated as a separate function. There never was a remote command for Span Zoom so there are no SCPI issues with this. 3. Signal Track now obeys the Excursion and Threshold criteria, allowing the user to control the search better; but this may cause low level signals that could previously be tracked to need the Excursion and Threshold adjusted. 4. Signal Track is now bound to only Marker 1, and cannot be enabled for any other marker. ESA/PSA allowed a subopcode to specify the marker to use. In X-Series, no subopcode is allowed and the marker is always assumed to be marker 1. 5. Signal Track now turns off when it finds an unstable signal. In the past it kept searching which caused inpredictable results.
Initial S/W Revision	Prior to A.02.00

More Information

If marker 1 is off when Signal Track is turned on, marker 1 is turned on in the center of the screen and a peak search is performed. If marker 1 is already on, it stays on and is used where it is. If it is Fixed, it is set to Normal.

If you move the marker during Signal Track, a Mkr-> CF is performed and the signal track function starts over.

If the signal is lost, an attempt will be made to find it again and continue tracking. If there are other signals on screen that are near the same amplitude, one of them may be found instead since the algorithm is seeking a signal with amplitude similar to the amplitude of the original signal.

Signals near 0 Hz cannot be tracked effectively as they cannot be distinguished from the LO feed-through, which is excluded by intent from the search algorithm.

As a speed optimization, the center frequency is only changed if it differs from the marker position by 1% or more of the span.

If the analyzer is in Single Sweep and Signal Track is turned on, then nothing happens until a sweep is actually initiated (i.e. by an INIT:IMM or Single key press, and a trigger). Once the sweep is initiated, the entire set of sweeps necessary to complete a pass through the signal track algorithm ensues before the analyzer returns *OPC true, returns results to a READ or MEASure, or returns to the idle state.

If the span is changed while in Signal Track, either by you or because moving the instrument to the signal's frequency results in Span Limiting (as described under the Frequency key), an "auto-zoom" algorithm is executed to get to the new span without losing the signal. In "auto zoom", the span is reduced in stages, with a sweep between each stage. You will see this zooming occur as each sweep is performed, and the new span is set.

When auto-zooming, the set of steps necessary to achieve the target span is to be considered a "measurement," thus the entire process executes even if the analyzer is in single sweep. *OPC will not return true until the process is complete nor will results be returned to a READ or MEASure command. Note further that if the analyzer is in a measurement such as averaging when this happens, the act of changing the span restarts averaging but the first average trace is the last trace of the auto zoom.

When you increase the span, we go directly to the new span. No zooming is required.

This function is intended to track signals with a frequency that is changing (drifting), and an amplitude that is not changing. It keeps tracking if you are in continuous-sweep mode. If in single-sweep mode, as described above, the analyzer only does one center frequency adjustment as necessary.

Sweep/Control

Accesses a menu that enables you to configure the Sweep and Control functions of the analyzer, such as Sweep Time and Gating.

Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

Sweep Time

Controls the time the analyzer takes to sweep the current frequency span when the Sweep Type is Swept, and displays the equivalent Sweep Time when the Sweep Type is FFT.

When Sweep Time is in Auto, the analyzer computes a sweep time which will give accurate measurements based on other settings of the analyzer, such as RBW and VBW.

NOTE

Significantly faster sweep times are available for the Swept SA measurement with Option FS1.

The Meas Uncal (measurement uncalibrated) warning is given in the Status Bar in the lower right corner of the screen when the manual sweep time entered is faster than the sweep time computed by the analyzer's sweep time equations, that is, the Auto Sweep Time. The analyzer's computed sweep time will give accurate measurements; if you sweep faster than this your measurements may be inaccurate. A Meas Uncal condition may be corrected by returning the Sweep Time to Auto; by entering a longer Sweep Time; or by choosing a wider RBW and/or VBW

On occasion other factors such as the Tracking Generator's maximum sweep rate, the YTF sweep rate (in high band) or the LO's capability (in low band) can cause a Meas Uncal condition. The most reliable way to correct it is to return the Sweep Time to Auto.

If the analyzer calculates that the Auto Sweep Time would be greater than 4000s (which is beyond its range), the warning message "Settings Alert;Sweep Rate Unavailable" is displayed. In this case increase the RBW or reduce the span.

If the anzlyzer's estimated sweep time in an FFT sweep is greater than 4000s, the warning message "Settings Alert;Span:RBW Ratio too big" is displayed. In this case reduce the span or increase the RBW and/or FFT Width.

When Sweep Type is FFT, you cannot control the sweep time, it is simply reported by the analyzer to give you an idea of how long the measurement is taking.

Note that although some overhead time is required by the analyzer to complete a sweep cycle, the sweep time reported when Sweep Type is Swept does not include the overhead time, just the time to sweep the LO over the current Span. When Sweep Type is FFT, however, the reported Sweep Time takes into account both the data acquisition time and the processing time, in order to report an equivalent Sweep Time for a meaningful comparison to the Swept case.

Because there is no "Auto Sweep Time" when in zero span, the Auto/Man line on this key disappears when in Zero Span. The Auto/Man line also disappears when in an FFT sweep. In this case the key is grayed out as shown below.

NOTE When using a Tracking Source (Source, Source Mode set to “Tracking”), the sweep time shown includes an estimate of the source’s settling time. This estimate may contain inaccuracies, particularly when software triggering is used for the source. This can result in the reported sweep time being shorter than the actual sweep time.

Key Path	Sweep/Control

Remote Command	`[:SENSe]:SWEep:TIME <time>`
	`[:SENSe]:SWEep:TIME?`
	`[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1`
	`[:SENSe]:SWEep:TIME:AUTO?`

Example	SWE:TIME 500 ms SWE:TIME:AUTO OFF
Notes	The values shown in this table reflect the “swept spans” conditions which are the default settings after a preset. See “Couplings” for values in the zero span domain.
Dependencies	The third line of the softkey (Auto/Man) disappears in Zero Span. The SCPI command SWEep:TIME:AUTO ON if sent in Zero Span generates an error message. Softkey grayed out and third line of the softkey (Auto/Man) disappears in FFT sweeps. Pressing the key or sending the SCPI for sweep time while the instrument is in FFT sweep generates a –221, “Settings Conflict;” error. F The SCPI command :SWEep:TIME:AUTO ON if sent in FFT sweeps generates an error. Grayed out while in Gate View, to avoid confusing those who want to set GATE VIEW Sweep Time. Key is grayed out in Measurements that do not support swept mode. Key is blanked in Modes that do not support swept mode. Set to Auto when Auto Couple is pressed or sent remotely
Couplings	Sweep Time is coupled primarily to Span and RBW. Center Frequency, VBW, and the number of sweep points also can have an effect. So changing these parameters may change the sweep time. The Sweep Time used upon entry to Zero Span is the same as the Sweep Time that was in effect before entering Zero Span. The Sweep Time can be changed while in Zero Span. Upon leaving Zero Span, the Auto/Man state of Sweep Time that existed before entering Zero Span is restored. If Sweep Time was in Auto before entering Zero Span, or if it is set to Auto while in zero span (which can happen via remote command or if Auto Couple is pressed) it returns to Auto and recouples when returning to non-zero spans. If Sweep Time was in Man before entering Zero Span, it returns to Man when returning to non-zero spans, and any changes to Sweep Time that were made while in Zero Span are retained in the non-zero span (except where constrained by minimum limits, which are different in and out of zero span).
Preset	The preset Sweep Time value is hardware dependent since Sweep Time presets to “Auto”.
State Saved	Saved in instrument state
Min	in zero span: 1 μs in swept spans: 1 ms in Stepped Tracking (as with option ESC): same as auto sweep time

	(in Swept Tracking, with Tracking Generator option T03 or T06, the minimum sweep time is 1 ms, but the Meas Uncal indicator is turned on for sweep times faster than 50 ms)
Max	in zero span: 6000 s in swept spans: 4000 s
Status Bits/OPC dependencies	Meas Uncal is Bit 0 in the STATus:QUEStionable:INTegrity:UNCalibrated register
Initial S/W Revision	Prior to A.02.00

Sweep Setup

Lets you set the sweep functions that control features such as sweep type and time.

Key Path	Sweep/Control
Dependencies	The whole Sweep Setup menu is grayed out in Zero Span, however, the settings in the menus under Sweep Setup can be changed remotely with no error indication. Grayed out in measurements that do not support swept mode. Blanked in modes that do not support swept mode
Initial S/W Revision	Prior to A.02.00

Sweep Time Rules

Allows the choice of three distinct sets of sweep time rules. These are the rules that are used to set the sweep time when Sweep Time is in Auto mode. Note that these rules only apply when in the Swept Sweep Type (either manually or automatically chosen) and not when in FFT sweeps.

See "More Information" on page 1120.

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:TIME:AUTO:RULes NORMal|ACCuracy|SRESponse` `[:SENSe]:SWEep:TIME:AUTO:RULes?`
Example	SWE:TIME:AUTO:RUL ACC
Dependencies	In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span), however its settings can be changed remotely with no error indication. Grayed out in FFT sweeps. Pressing the key while the instrument is in FFT sweep generates an advisory message. The SCPI is acted upon if sent, but has no effect other than to change the readout on the key, as long as the analyzer is in an FFT sweep.
Couplings	Set to Auto on Auto Couple
Preset	AUTO
State Saved	Saved in instrument state
Backwards	`:SWEep:TIME:AUTO:MODE SRESponse`

Compatibility SCPI	This legacy command is aliased to :SWEep:TIME:AUTO:RULes SRESponse
Backwards Compatibility SCPI	`:SWEep:TIME:AUTO:MODE SANalyzer` This legacy command is aliased to :SWEep:TIME:AUTO:RULes NORMal
Backwards Compatibility SCPI	`:SWEep:TIME:AUTO:MODE?` This legacy query is aliased to :SWEep:TIME:RULes?, so it will match for SRESponse but not for SANalyzer
Backwards Compatibility Notes	The old Auto Sweep Time command was the same [:SENSe]:SWEep:TIME:AUTO:RULes NORMal|ACCuracy so it still works although it now has a third parameter (SRESponse). The old Sweep Coupling command was [:SENSe]:SWEep:TIME:AUTO:MODE SRESponse|SANalyzer and it is aliased as below:
Initial S/W Revision	Prior to A.02.00

More Information

The first set of rules is called SA – Normal. Sweep Time Rules is set to SA-Normal on a Preset or Auto Couple. These rules give optimal sweep times at a lossof accuracy. Note that this means that in the Preset or Auto Coupled state, instrument amplitude accuracy specifications do not apply.

Setting Sweep Time Rules to SA-Accuracy will result in slower sweep times than SA-Normal, usually about three times as long, but with better amplitude accuracy for CW signals. The instrument absolute amplitude accuracy specifications only apply when Sweep Time is set to Auto, and Sweep Time Rules are set to SA-Accuracy. Additional amplitude errors which occur when Sweep Time Rules are set to SA-Normal are usually well under 0.1 dB, though this is not guaranteed. Because of the faster sweep times and still low errors, SA-Normal is the preferred setting of Sweep Time Rules.

The third set of sweep time rules is called Stimulus/Response and is automatically selected when an integrated source is turned on, such as a Tracking Generator or a synchronized external source. The sweep times for this set of rules are usually much faster for swept-response measurements. Stimulus-response auto-coupled sweep times are typically valid in stimulus-response measurements when the system's frequency span is less than 20 times the bandwidth of the device under test. You can select these rules manually (even if not making Stimulus-Response measurements) which will allow you to sweep faster before the "Meas Uncal" warning comes on, but you are then not protected from the over-sweep condition and may end up with uncalibrated results. However, it is commonplace in measuring non-CW signals such as noise to be able to get excellent measurement accuracy at sweep rates higher than those required for CW signal accuracy, so this is a valid measurement technique.

Auto

Sets the analyzer to automatically choose the Sweep Time Rules for the measurement.

Key Path	Sweep/Control, Sweep Setup, Sweep Time Rules
Remote Command	`[:SENSe]:SWEep:TIME:AUTO:RULes:AUTO[:STATe] ON|OFF|1|0` `[:SENSe]:SWEep:TIME:AUTO:RULes:AUTO[:STATe]?`

Example	:SWE:TIME:AUTO:RUL:AUTO ON
Couplings	Set on Preset or Auto Couple
Preset	ON
Initial S/W Revision	Prior to A.02.00

SA - Normal

Chooses Sweep Time Auto Rules for optimal speed and generally sufficient accuracy.

Key Path	Sweep/Control, Sweep Setup, Sweep Time Rules
Example	:SWE:TIME:AUTO:RUL NORM
Dependencies	Not available (grayed out) when Source Mode=Tracking.
Couplings	Automatically selected unless Source is on If directly selected, sets AUTO to Off
Readback	SA - Normal
Initial S/W Revision	Prior to A.02.00

SA - Accuracy

Chooses Sweep Time Auto Rules for specified absolute amplitude accuracy.

NOTE For specified accuracy, do not allow sweep time to fall below 20 ms when in SA - Accuracy

Key Path	Sweep/Control, Sweep Setup, Sweep Time Rules
Example	:SWE:TIME:AUTO:RUL ACC
Dependencies	Not available (grayed out) when Source Mode=Tracking.
Couplings	If directly selected, sets AUTO to Off
Readback	SA - Accuracy
Initial S/W Revision	Prior to A.02.00

Stimulus/Response

The Stimulus-Response setting for sweep time rules provides different sweep time settings, for the case where the analyzer is sweeping in concert with a source. These modified rules take two forms:

1. Sweeping along with a swept source, which allows faster sweeps than the normal case because the RBW and VBW filters do not directly interact with the Span. We call this “Swept Tracking”

2. Sweeping along with a stepped source, which usually slows the sweep down because it is necessary to wait for the stepped source and the analyzer to settle at each point. We call this “Stepped Tracking”

The analyzer chooses one of these methods based on what kind of a source is connected or installed; it picks Swept Tracking if there is no source in use.

As always, when the X-series analyzer is in Auto Sweep Time, the sweep time is estimated and displayed in the Sweep/Control menu as well as in the annotation at the bottom of the displayed measurement; of course, since this can be dependent on variables outside the analyzer's control, the actual sweep time may vary slightly from this estimate.

You can always choose a shorter sweep time to improve the measurement throughput, (with some potential unspecified accuracy reduction), but the Meas Uncal indicator will come on if the sweep time you set is less than the calculated Auto Sweep time. You can also select a longer sweep time, which can be useful (for example) for obtaining accurate insertion loss measurements on very narrowband filters. The number of measurement points can also be reduced to speed the measurement (at the expense of frequency resolution).

Key Path	Sweep/Control, Sweep Setup, Sweep Time Rules
Example	:SWE:TIME:AUTO:RUL SRES
Couplings	Automatically selected when the Source is on (Source Mode not set to OFF). If directly selected sets AUTO to Off
Readback	SR
Initial S/W Revision	Prior to A.02.00

Sweep Type

Chooses between the FFT and Sweep types of sweep.

Sweep Type refers to whether or not the instrument is in Swept or FFT analysis. When in Auto, the selection of sweep type is governed by two different sets of rules, depending on whether you want to optimize for dynamic range or for speed.

FFT "sweeps" should not be used when making EMI measurements; therefore, when a CISPR detector (Quasi Peak, EMI Average, RMS Average) is selected for any active trace (one for which Update is on), the FFT key in the Sweep Type menu is grayed out, and the Auto Rules only choose Swept. If Sweep Type is manually selected to be FFT, the CISPR detectors are all grayed out.

FFT sweeps will never be auto-selected when Screen Video, Log Video or Linear Video are the selected Analog Output.

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:TYPE FFT|SWEep` `[:SENSe]:SWEep:TYPE?`
Dependencies	In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span), however its settings can be changed remotely with no error indication. When Gate is on, Gate Method selection affects Sweep Type: **Method FFT&Sweep menu**

	FFT - Swept grayed out and rules choose FFT Video - FFT grayed out and rules choose Swept LO - FFT grayed out and rules choose Swept
Preset	AUTO

Backwards Compatibility SCPI	`[:SENSe]:SWEep:TYPE AUTO`
	sets sweep type Auto to On but the query will return either FFT or SWE depending on the auto setting.
	`[:SENSe]:SWEep:TYPE SWP`
	selects sweep type Swept but will return SWE on a query

Initial S/W Revision	Prior to A.02.00

Auto

When in Auto, the selection of sweep type is governed by two different sets of rules, depending on whether you want to optimize for dynamic range or for speed. These rules are chosen under the Sweep Type Rules key.

Key Path	Sweep/Control, Sweep Setup, Sweep Type
Remote Command	`[:SENSe]:SWEep:TYPE:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:TYPE:AUTO?`
Example	:SWE:TYPE:AUTO ON
Couplings	Pressing Auto Couple always sets Sweep Type to Auto. Swept is always chosen whenever any form of Signal ID is on, or the Source Mode is set to Tracking, or any EMI detector is selected, or the RF Preselector is ON.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Swept

Manually selects swept analysis, so it cannot change automatically to FFT.

Key Path	Sweep/Control, Sweep Setup, Sweep Type
Example	SWE:TYPE SWE
Dependencies	Grayed out while in Gated FFT (meaning Gate is ON and Gate Method is FFT). If this key is selected, the gate method Gated FFT is grayed out.
Couplings	This selection is chosen automatically if any of the CISPR detectors is chosen for any active trace, in which case the FFT Sweep Type selection is also grayed out.
State Saved	Saved in instrument state

Readback	Swept
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

FFT

Manually selects FFT analysis, so it cannot change automatically to Swept.

Key Path	Sweep/Control, Sweep Setup, Sweep Type
Example	SWE:TYPE FFT
Dependencies	When a CISPR detector (Quasi Peak, EMI Average, RMS Average) is selected for any active trace, the FFT key is grayed out. When the RF Preselector is on, the FFT key is grayed out. When Source Mode is set to Tracking, Manual FFT is grayed out. When Signal ID is on, Manual FFT is grayed out. Grayed out while in Gated LO (meaning Gate is ON and Gate Method is LO). Grayed out while in Gated Video (meaning Gate is ON and Gate Method is Video).
State Saved	Saved in instrument state
Readback	FFT
Initial S/W Revision	Prior to A.02.00

Sweep Type Rules

Selects which set of rules will be used for automatically choosing the Sweep Type when Sweep Type is in Auto.

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:TYPE:AUTO:RULes SPEed|DRANge` `[:SENSe]:SWEep:TYPE:AUTO:RULes?`
Dependencies	In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span), however its settings can be changed remotely with no error indication.
Preset	DRANge
State Saved	Saved in instrument state
Backwards Compatibility Notes	The legacy parameter DYNamicrange is unsupported
Initial S/W Revision	Prior to A.02.00

Auto

This selection is automatically chosen when Auto Couple is pressed. When in Auto, the Sweep Type Rules are set to Best Dynamic Range. It seems like a very simple Auto function but the use of this construct allows a consistent statement about what the Auto Couple key does.

Key Path	Sweep/Control, Sweep Setup, Sweep Type Rules
Remote Command	`[:SENSe]:SWEep:TYPE:AUTO:RULes:AUTO[:STATe] OFF|ON|0|1` `[:SENSe]:SWEep:TYPE:AUTO:RULes:AUTO[:STATe]?`
Example	:SWE:TYPE:AUTO:RUL:AUTO ON
Couplings	Pressing Auto Couple always sets Sweep Type Rules to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Best Dynamic Range

This selection tells the analyzer to choose between swept and FFT analysis with the primary goal of optimizing dynamic range. If the dynamic range is very close between swept and FFT, then it chooses the faster one. This auto selection also depends on RBW Type.

In determining the Swept or FFT setting, the auto rules use the following approach:

- If the RBW Filter Type is Gaussian use the RBW for the Normal Filter BW and if that RBW > 210 Hz, use swept; for RBW <= 210 Hz, use FFT
- If the RBW Filter Type is Flat Top, use the same algorithm but use 420 Hz instead of 210 Hz for the transition point between Swept and FFT
- If any of the CISPR detectors is chosen for any active trace, always use Swept.

Key Path	Sweep/Control, Sweep Setup, Sweep Type Rules
Example	SWE:TYPE:AUTO:RUL DRAN sets the auto rules to dynamic range.
Couplings	Directly selecting this setting sets AUTO to OFF.
Readback	Dynamic Range
Initial S/W Revision	Prior to A.02.00

Best Speed

This selection tells the analyzer to choose between FFT or swept analysis based on the fastest analyzer speed.

Key Path	Sweep/Control, Sweep Setup, Sweep Type Rules

Example	SWE:TYPE:AUTO:RUL SPE sets the rules for the auto mode to speed
Couplings	Directly selecting this setting sets AUTO to OFF.
Readback	Speed.
Initial S/W Revision	Prior to A.02.00

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE	This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1127

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set

	to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy “FFTs per Span” command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the “intended segment width” by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The “Span” used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

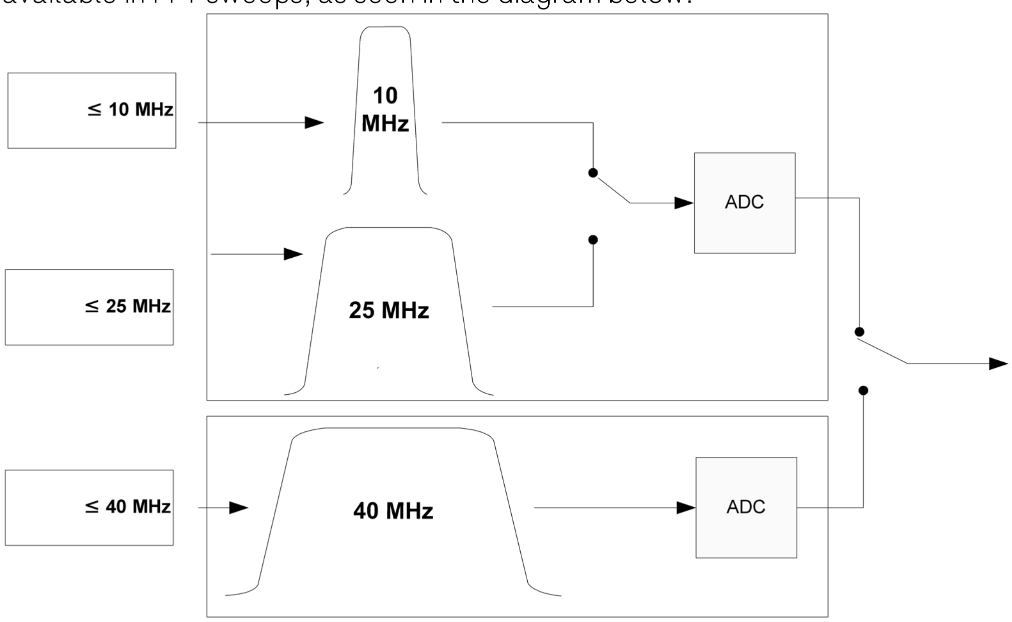
However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

Although narrowing the segment width can allow higher dynamic ranges some cases, this comes at the expense of losing some of the speed advantages of the FFT, because narrower segments require more acquisitions and proportionately more processing overhead.

However, the advantages of narrow segments can be significant. For example, in pulsed-RF measurements such as radar, it is often possible to make high dynamic range measurements with signal levels approaching the compression threshold of the analyzer in swept spans (well over 0 dBm), while resolving the spectral components to levels below the maximum IF drive level (about –8 dBm at the input mixer). But FFT processing experiences overloads at the maximum IF drive level even if the RBW is small enough that no single spectral component exceeds the maximum IF drive level. If you reduce the width of an FFT, an analog filter is placed before the ADC that is about 1.3 times as wide as the FFT segment width. This spreads out the pulsed RF in time and reduces the maximum signal level seen by the ADC. Therefore, the input attenuation can be reduced and the dynamic range increased without overloading the ADC.

Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE	This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1130

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.
Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>` `[:SENSe]:SWEep:FFT:SPAN:RATio?`

	This is the legacy “FFTs per Span” command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the “intended segment width” by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The “Span” used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

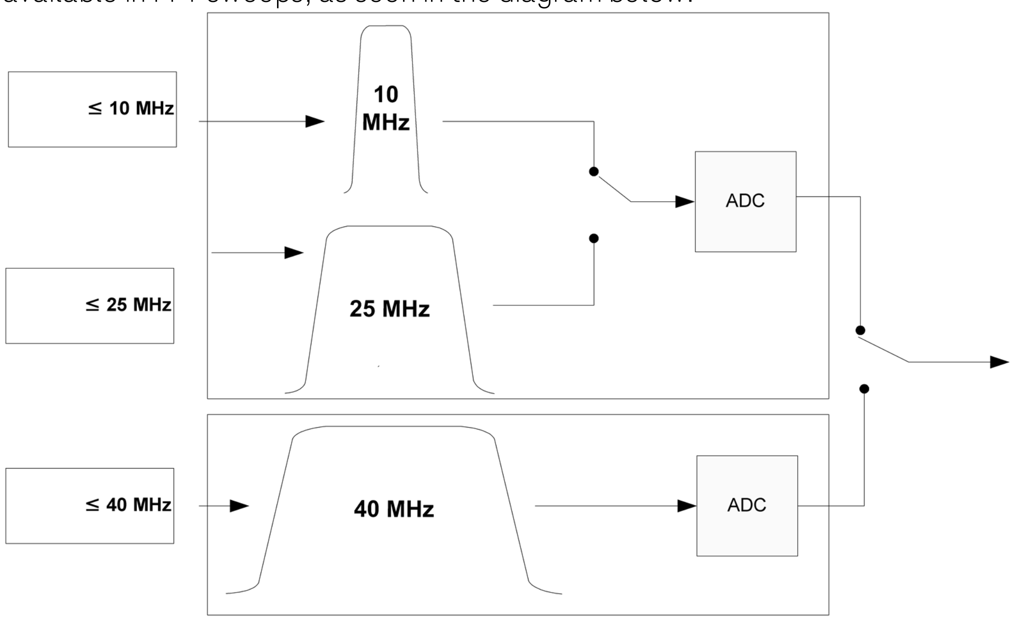
Although narrowing the segment width can allow higher dynamic ranges some cases, this comes at the expense of losing some of the speed advantages of the FFT, because narrower segments require more acquisitions and proportionately more processing overhead.

However, the advantages of narrow segments can be significant. For example, in pulsed-RF measurements such as radar, it is often possible to make high dynamic range measurements with signal levels approaching the compression threshold of the analyzer in swept spans (well over 0 dBm), while resolving the spectral components to levels below the maximum IF drive level (about –8 dBm at the input mixer). But FFT processing experiences overloads at the maximum IF drive level even if the RBW is small enough that no single spectral component exceeds the maximum IF drive level. If you reduce the width of an FFT, an analog filter is placed before the ADC that is about 1.3 times as wide as the FFT segment width.

This spreads out the pulsed RF in time and reduces the maximum signal level seen by the ADC. Therefore, the input attenuation can be reduced and the dynamic range increased without overloading the ADC.

Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE	This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1133

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy "FFTs per Span" command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the "intended segment width" by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The "Span" used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup

Remote Command	[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1 [:SENSe]:SWEep:FFT:WIDTh:AUTO?
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

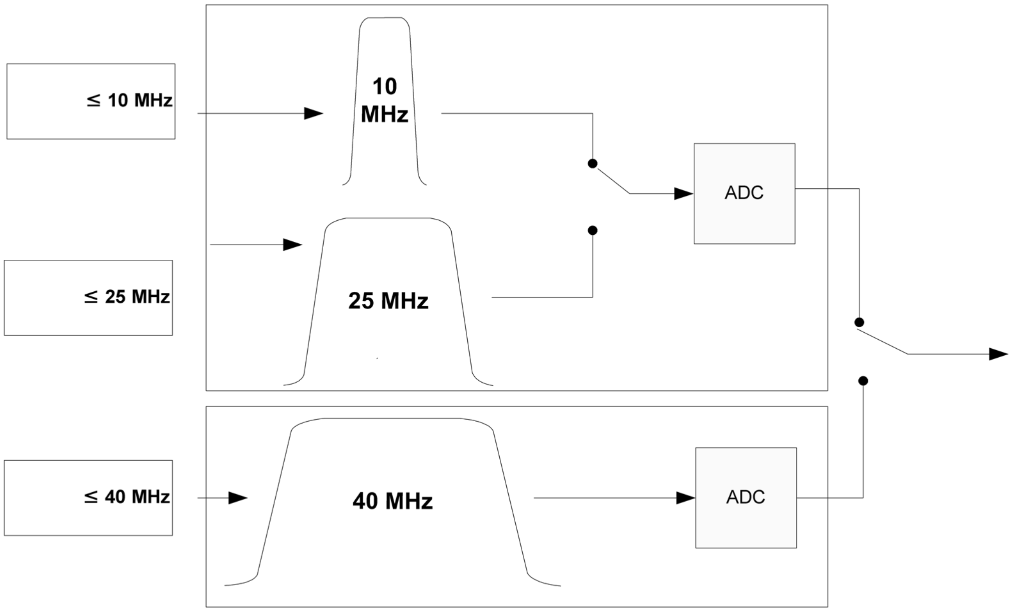
However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

Although narrowing the segment width can allow higher dynamic ranges some cases, this comes at the expense of losing some of the speed advantages of the FFT, because narrower segments require more acquisitions and proportionately more processing overhead.

However, the advantages of narrow segments can be significant. For example, in pulsed-RF measurements such as radar, it is often possible to make high dynamic range measurements with signal levels approaching the compression threshold of the analyzer in swept spans (well over 0 dBm), while resolving the spectral components to levels below the maximum IF drive level (about –8 dBm at the input mixer). But FFT processing experiences overloads at the maximum IF drive level even if the RBW is small enough that no single spectral component exceeds the maximum IF drive level. If you reduce the width of an FFT, an analog filter is placed before the ADC that is about 1.3 times as wide as the FFT segment width. This spreads out the pulsed RF in time and reduces the maximum signal level seen by the ADC. Therefore, the input attenuation can be reduced and the dynamic range increased without overloading the ADC.

Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1136

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the

	requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy "FFTs per Span" command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the "intended segment width" by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The "Span" used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

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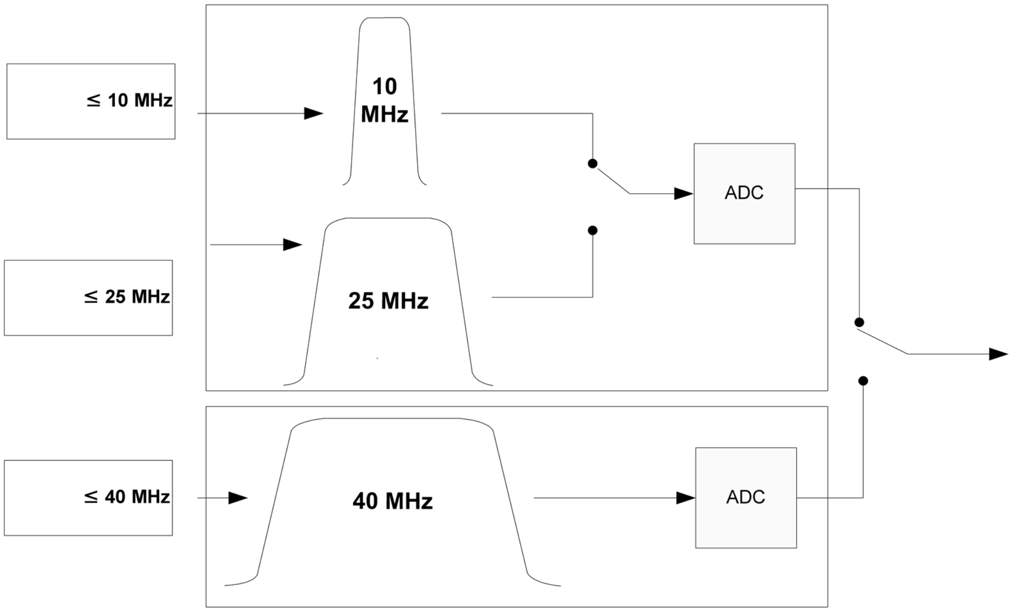
Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1139

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the

	requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy "FFTs per Span" command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the "intended segment width" by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The "Span" used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

Although narrowing the segment width can allow higher dynamic ranges some cases, this comes at the expense of losing some of the speed advantages of the FFT, because narrower segments require more acquisitions and proportionately more processing overhead.

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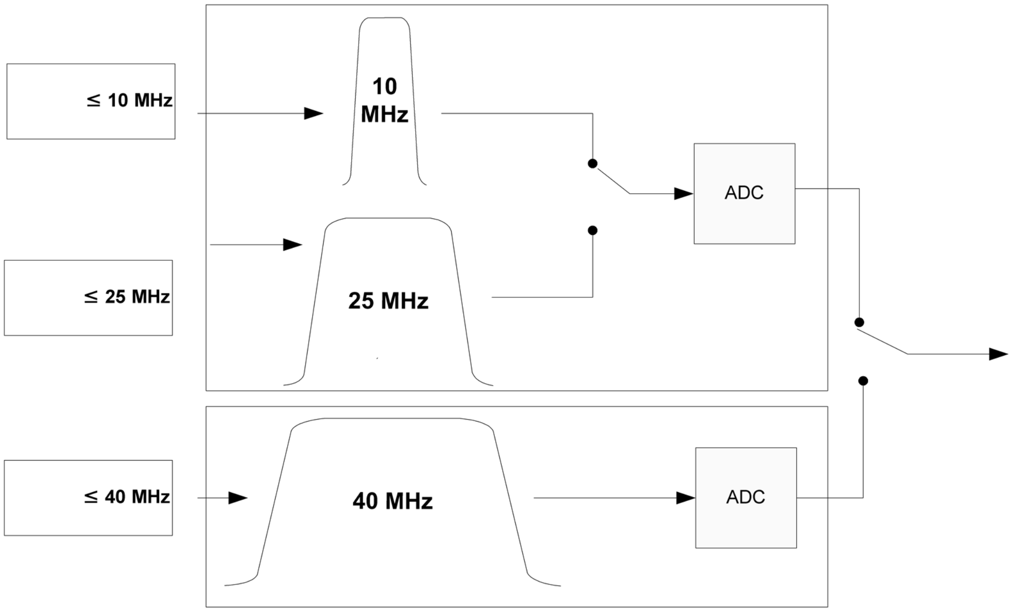
Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE	This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1142

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the

	requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy “FFTs per Span” command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the “intended segment width” by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The “Span” used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

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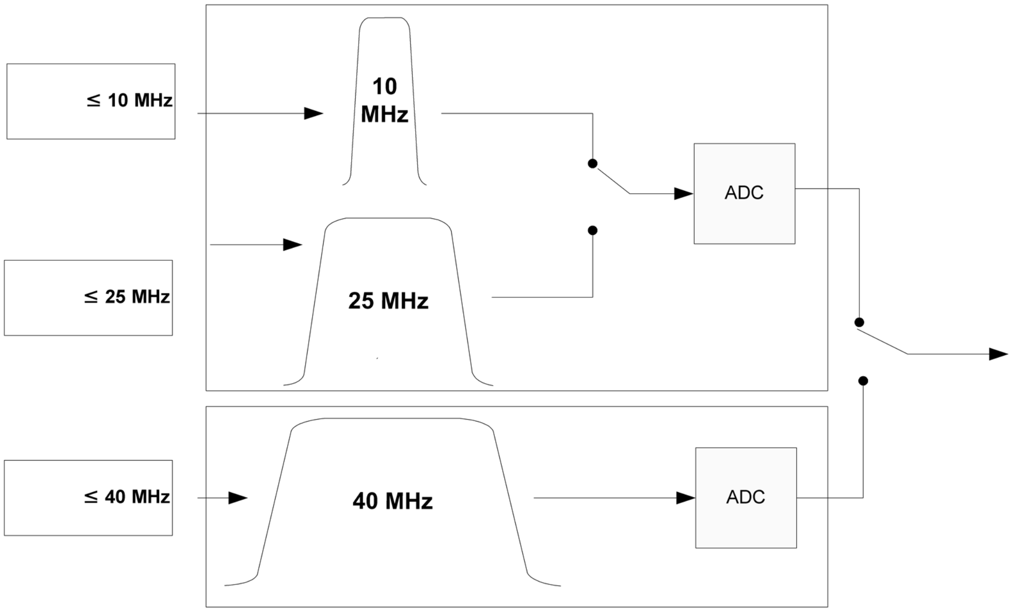
Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

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NOTE This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1145

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the

	requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy “FFTs per Span” command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the “intended segment width” by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The “Span” used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

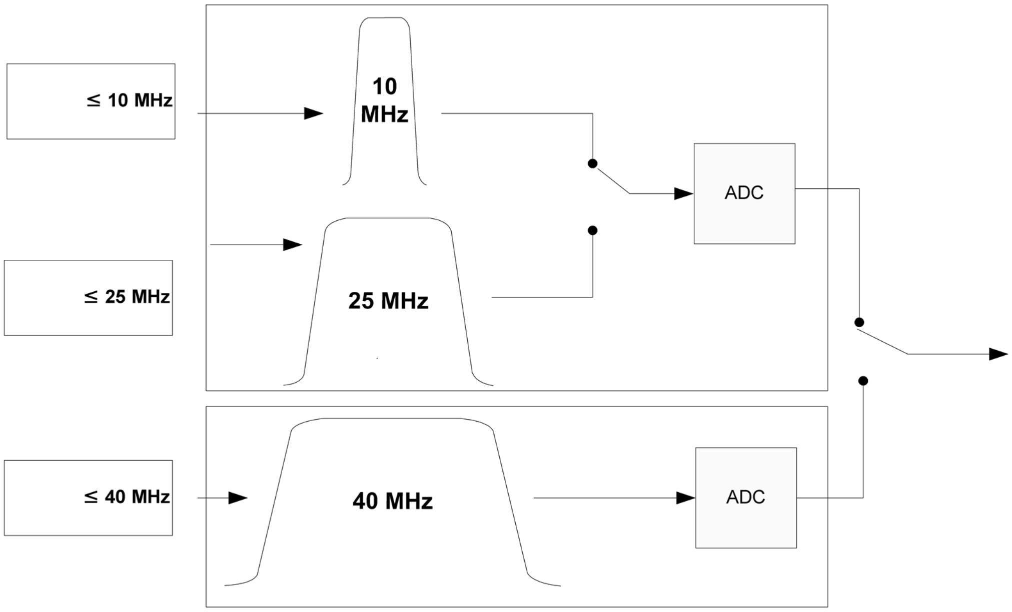
However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

Although narrowing the segment width can allow higher dynamic ranges some cases, this comes at the expense of losing some of the speed advantages of the FFT, because narrower segments require more acquisitions and proportionately more processing overhead.

However, the advantages of narrow segments can be significant. For example, in pulsed-RF measurements such as radar, it is often possible to make high dynamic range measurements with signal levels approaching the compression threshold of the analyzer in swept spans (well over 0 dBm), while resolving the spectral components to levels below the maximum IF drive level (about –8 dBm at the input mixer). But FFT processing experiences overloads at the maximum IF drive level even if the RBW is small enough that no single spectral component exceeds the maximum IF drive level. If you reduce the width of an FFT, an analog filter is placed before the ADC that is about 1.3 times as wide as the FFT segment width. This spreads out the pulsed RF in time and reduces the maximum signal level seen by the ADC. Therefore, the input attenuation can be reduced and the dynamic range increased without overloading the ADC.

Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE	This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1148

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the

	requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy "FFTs per Span" command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the "intended segment width" by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The "Span" used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

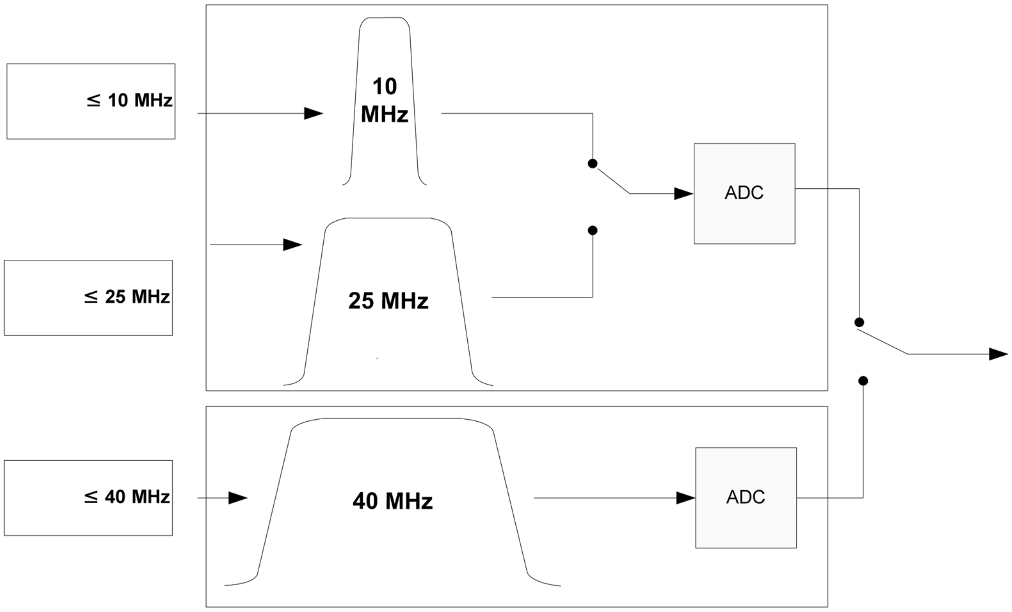
However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

Although narrowing the segment width can allow higher dynamic ranges some cases, this comes at the expense of losing some of the speed advantages of the FFT, because narrower segments require more acquisitions and proportionately more processing overhead.

However, the advantages of narrow segments can be significant. For example, in pulsed-RF measurements such as radar, it is often possible to make high dynamic range measurements with signal levels approaching the compression threshold of the analyzer in swept spans (well over 0 dBm), while resolving the spectral components to levels below the maximum IF drive level (about –8 dBm at the input mixer). But FFT processing experiences overloads at the maximum IF drive level even if the RBW is small enough that no single spectral component exceeds the maximum IF drive level. If you reduce the width of an FFT, an analog filter is placed before the ADC that is about 1.3 times as wide as the FFT segment width. This spreads out the pulsed RF in time and reduces the maximum signal level seen by the ADC. Therefore, the input attenuation can be reduced and the dynamic range increased without overloading the ADC.

Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE	This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1151

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the

	requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy “FFTs per Span” command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the “intended segment width” by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The “Span” used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

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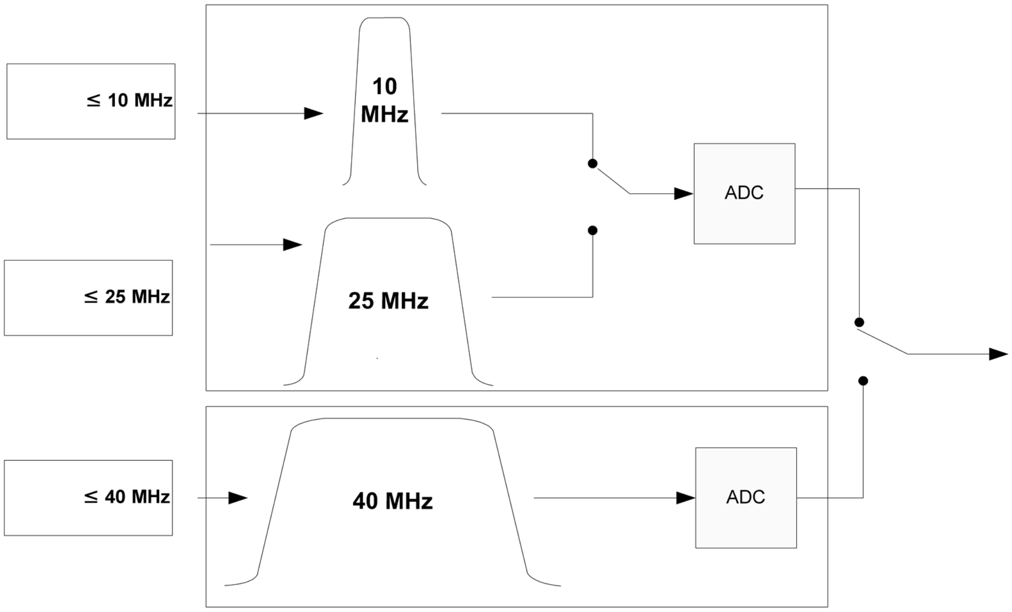
Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

FFT Width

This menudisplays and controls the width of the FFT's performed while in FFT mode. The "FFT width" is the range of frequencies being looked at by the FFT, sometimes referred to as the "chunk width" -- it is not the resolution bandwidth used when performing the FFT.

It is important to understand that this function does not directly set the FFT width, it sets the limit on the FFT Width. The actual FFT width used is determined by several other factors including the Span you have set. Usually the instrument picks the optimal FFT Width based on the current setup; but on occasion you may wish to limit the FFT Width to be narrower than that which the instrument would have set.

NOTE — This function does not allow you to widen the FFT Width beyond that which the instrument might have set; it only allows you to narrow it. You might do this to improve the dynamic range of the measurement or eliminate nearby spurs from your measurement.

Note that the FFT Width setting will have no effect unless in an FFT sweep.

See "More Information" on page 1154

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh <real>` `[:SENSe]:SWEep:FFT:WIDTh?`
Example	SWE:FFT:WIDT 167 kHz sets this function to "<167.4 kHz"
Notes	The parameter is in units of frequency. For values sent from SCPI, the analyzer chooses the smallest value that is at least as great as the

	requested value. Examples: Parameter 3.99 kHz is sent over SCPI. Analyzer chooses ≤4.01 kHz Parameter 4.02 kHz is sent over SCPI. Analyzer chooses ≤28.81 kHz Parameter 8 MHz is sent over SCPI. Analyzer chooses 10 MHz
Dependencies	In some models, the analog prefilters are not provided. In these models the FFT Width function is always in Auto. The FFT Width key is blanked in these models, and the SCPI commands are accepted without error but have no effect. In Zero Span, this key is irrelevant and cannot be accessed (because the whole Sweep Setup menu is grayed out in Zero Span). However, its settings can be changed remotely with no error indication.
Couplings	The FFT Width affects the ADC Dither function (see Meas Setup key) and the point at which the instrument switches from Swept to FFT acquisition.
Preset	The Preset is Auto, but Preset will also pick Best Dynamic Range and hence this function will be set to ~Maximum
State Saved	Saved in instrument state
Min	4.01 kHz
Max	The maximum available FFT width is dependent on the IF Bandwidth option. The maxim mum available width is: Option B10, 10 MHz; Option B25, 25 MHz, Option B40, 40 MHz.

Backwards Compatibility SCPI	`[:SENSe]:SWEep:FFT:SPAN:RATio <integer>`
	`[:SENSe]:SWEep:FFT:SPAN:RATio?`
	This is the legacy "FFTs per Span" command, because in the PSA, this is what you set rather than the FFT Width. The behavior of the analyzer when it receives this command is to compute the "intended segment width" by dividing the Span by the FFTs/Span parameter, then converting this intended width to an actual width by using the largest available FFT Width that is still less than the intended segment width. The "Span" used in this computation is whatever the Span is currently set to, whether a sweep has been taken at that Span or not.

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Sweep/Control, Sweep Setup
Remote Command	`[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1` `[:SENSe]:SWEep:FFT:WIDTh:AUTO?`
Example	:SWE:FFT:WIDT:AUTO ON
Couplings	Pressing Auto Couple always sets FFT Width to Auto.
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

More Information

An FFT measurement can only be performed over a limited span known as the “FFT segment”. Several segments may need to be combined to measure the entire span. For advanced FFT control in the X-Series, you have direct control over the segment width using the FFT Width control. Generally, in automatic operation, the X-Series sets the segment width to be as wide as possible, as this results in the fastest measurements.

However, in order to increase dynamic range, most X-series models provide a set of analog prefilters that precede the ADC. Unlike swept measurements, which pass the signal through a bandpass before the ADC, FFT measurements present the full signal bandwidth to the ADC, making them more susceptible to overload, and requiring a lower signal level. The prefilters act to alleviate this phenomenon - they allow the signal level at the ADC to be higher while still avoiding an ADC overload, by eliminating signal power outside the bandwidth of interest, which in turn improves dynamic range.

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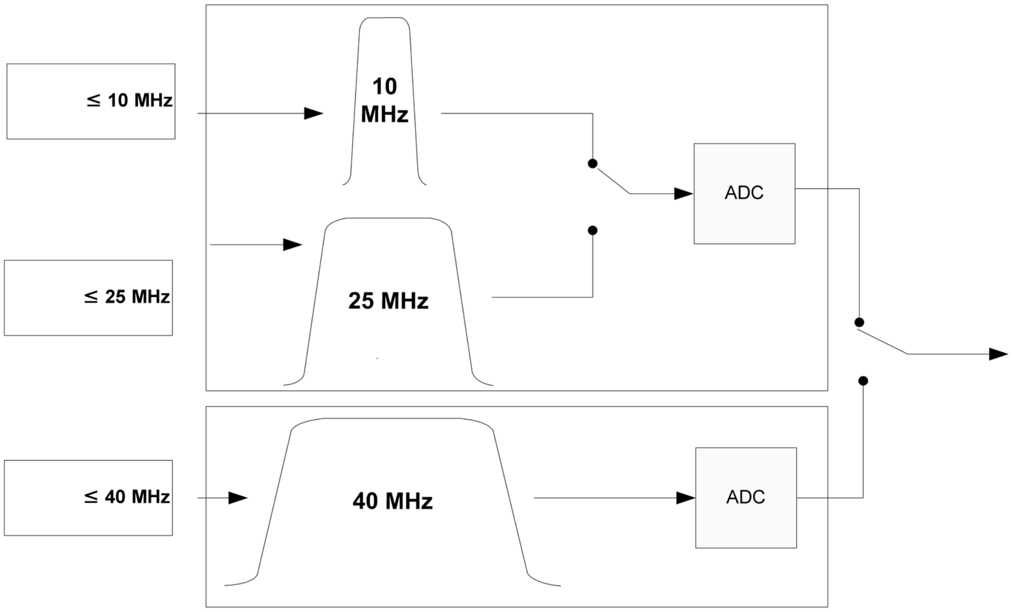
However, the advantages of narrow segments can be significant. For example, in pulsed-RF measurements such as radar, it is often possible to make high dynamic range measurements with signal levels approaching the compression threshold of the analyzer in swept spans (well over 0 dBm), while resolving the spectral components to levels below the maximum IF drive level (about –8 dBm at the input mixer). But FFT processing experiences overloads at the maximum IF drive level even if the RBW is small enough that no single spectral component exceeds the maximum IF drive level. If you reduce the width of an FFT, an analog filter is placed before the ADC that is about 1.3 times as wide as the FFT segment width. This spreads out the pulsed RF in time and reduces the maximum signal level seen by the ADC. Therefore, the input attenuation can be reduced and the dynamic range increased without overloading the ADC.

Further improvement in dynamic range is possible by changing the FFT IF Gain (in the Meas Setup menu of many measurements). If the segments are reduced in width, FFT IF Gain can be set to High, improving dynamic range.

Depending on what IF Bandwidth option you have ordered, there can be up to three different IF paths available in FFT sweeps, as seen in the diagram below:



The 10 MHz path is always used for Swept sweeps. It is always used for FFT sweeps as well, unless the user specifies ~25 MHz in which case the 25 MHz path will be used for FFT sweeps, or ~40 MHz, in which case the 40 MHz path will be used for FFT sweeps. Note that, although each of these keys picks the specified path, the analyzer may choose an FFT width less than the full IF width, in order to optimize speed, trading off acquisition time versus processing time.

Gate

Accesses a menu that enables you to control the gating function. The Gate functionality is used to view signals best viewed by qualifying them with other events.

Gate setup parameters are the same for all measurements – they do not change as you change measurements. Settings like these are called "Meas Global" and are unaffected by Meas Preset.

Note that Sweep Time autocoupling rules and annotation are changed by Gate being on.

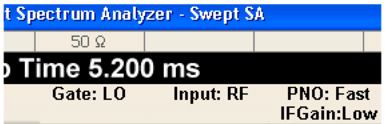
Key Path	Sweep/Control
Scope	Meas Global
Readback	The state and method of Gate, as [Off, LO] or [On, Video]. Note that for measurements that only support gated LO, the method is nonetheless read back, but always as LO.
Initial S/W Revision	Prior to A.02.00

Gate On/Off

Turns the gate function on and off.

When the Gate Function is on, the selected Gate Method is used along with the gate settings and the signal at the gate source to control the sweep and video system with the gate signal. Not all measurements allow every type of Gate Methods.

When Gate is on, the annunciation in the measurement bar reflects that it is on and what method is used, as seen in the following "Gate: LO" annunciator graphic.



Key Path	Sweep/Control, Gate
Remote Command	`[:SENSe]:SWEep:EGATe[:STATe] OFF|ON|0|1` `[:SENSe]:SWEep:EGATe[:STATe]?`
Example	SWE:EGAT ON SWE:EGAT?
Dependencies	The function is unavailable (grayed out) and Off when: • Gate Method is LO or Video and FFT Sweep Type is manually selected. • Gate Method is FFT and Swept Sweep Type is manually selected. • Marker Count is ON. The following are unavailable whenever Gate is on: • FFT under Sweep Type when Method=LO or Video or Swept under Sweep Type when Method=FFT • Marker Count While Gate is on, the Auto Rules for Sweep Type are modified so that the choice agrees with the Gate Method: i.e., FFT for Method = FFT and Swept for Method = LO or Video. The Gate softkey and all SCPI under the [:SENSe]:SWEep:EGATe SCPI node are grayed out when Source Mode is Tracking with an external source. This is because the Gate circuitry is used to sync the external source. If the Tracking Source is turned on, the Gate is turned off. When in the ACP measurement: • When Meas Method is RBW or FAST, this function is unavailable and the key is grayed out. • Whenever Gate is on, Meas Method, RBW or FAST is unavailable and keys for those are grayed out. • When Gate is on, Offset Res BW and Offset Video BW are ignored (if you set these values) and the measurement works as if all Offset Res BW and all Offset Video BW are coupled with the Res BW and the Video BW under the BW menu. When Gate is on, the Offset BW key in the Offset/Limit menu is grayed out.
Preset	Off
State Saved	Saved in instrument state
Range	On|Off
Backwards Compatibility SCPI	`[:SENSe]:SWEep:TIME:GATE[:STATe]`

	ESA compatibility
Backwards Compatibility Notes	In ESA, Trig Delay (On) and Gate (On) could not be active at the same time. This dependency does not exist in PSA or in X-Series.
Initial S/W Revision	Prior to A.02.00

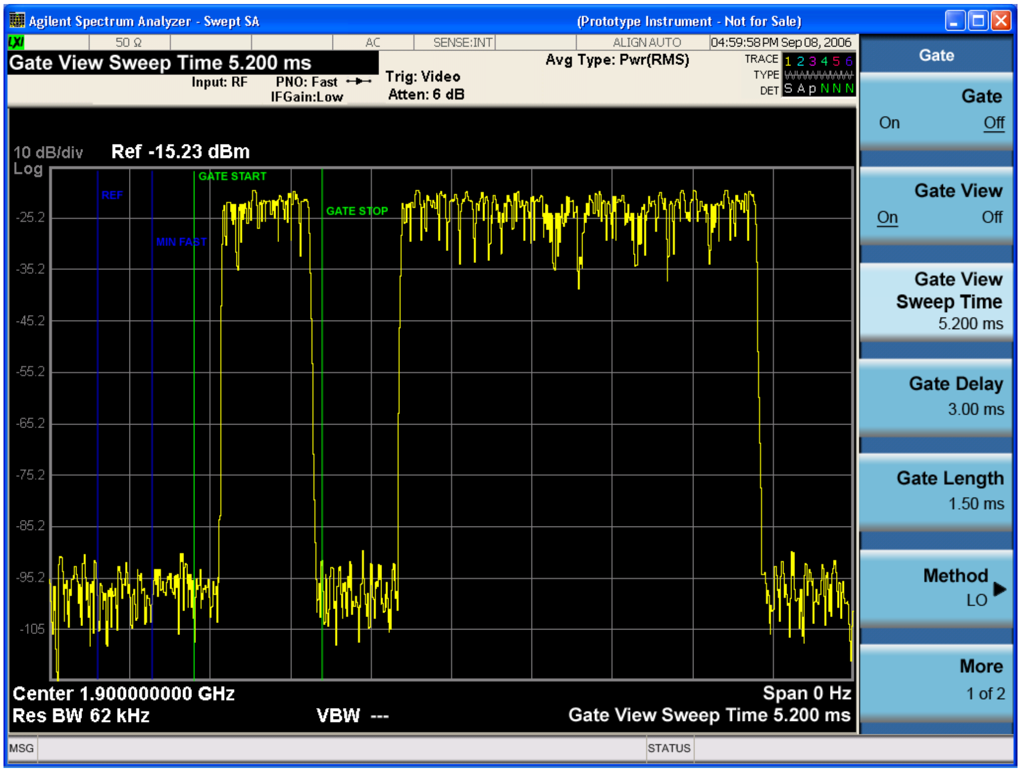
Gate View On/Off

Turning on Gate View in the Swept SA measurement provides a single-window gate view display..

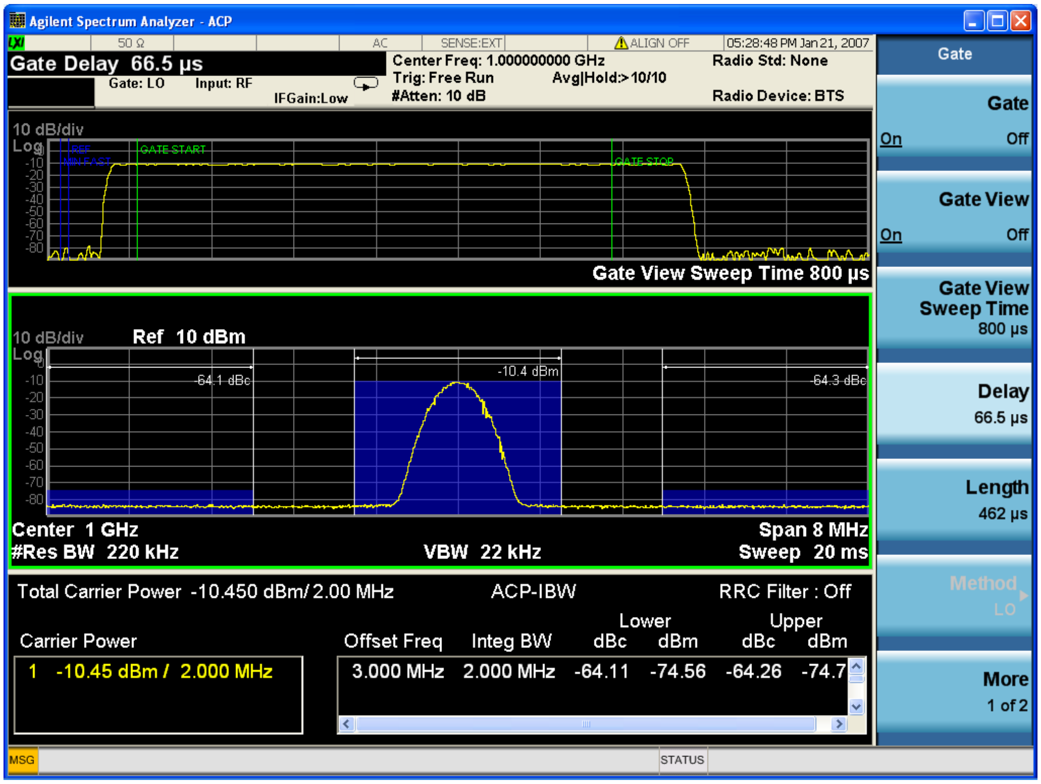
Turning on Gate View in other measurements shows the split-screen Gate View. In these measurements, when the Gate View is on, the regular view of the current measurement traces and results are reduced vertically to about 70% of the regular height. The Zero Span window, showing the positions of the Gate, is shown between the Measurement Bar and the reduced measurement window. By reducing the height of the measurement window, some of the annotation on the Data Display may not fit and is not shown.

Key Path	Sweep/Control, Gate
Remote Command	`[:SENSe]:SWEep:EGATe:VIEW ON|OFF|1|0` `[:SENSe]:SWEep:EGATe:VIEW?`
Example	SWE:EGAT:VIEW ON turns on the gate view.
Dependencies	In the Swept SA measurement: In Gate View, the regular Sweep Time key is grayed out . When pressed, the grayed out key puts up the informational message "Use Gate View Sweep Time in the Gate menu." In the other measurements: When you turn Gate View on, the lower window takes on the current state of the instrument. Upon leaving Gate View, the instrument takes on the state of the lower window. When you turn Gate View on, the upper window Sweep Time is set to the gate view sweep time.
Couplings	These couplings apply to the Swept SA measurement: • When Gate View is turned on, the instrument is set to Zero Span. • Gate View automatically turns off whenever a Span other than Zero is selected. • Gate View automatically turns off if you press the Last Span key while in Gate View, and the instrument returns to the Span it was in before entering Gate View (even if that is Zero Span). • When Gate View is turned on, the sweep time used is the gate view sweep time. This is set according to the rules in section "Gate View Setup " on page 1160 • When Gate View is turned off, Sweep Time is set to the normal Swept SA measurement sweep time. • If Gate View is on and Gate is off, then turning on Gate turns off Gate View.
Preset	OFF
State Saved	Saved in instrument state
Range	On|Off
Initial S/W Revision	Prior to A.02.00

A sample of the Gate View screen in the Swept SA measurement is shown in the following graphic :



A sample of the Gate View screen in other measurements is shown in the following graphic . This example is for the ACP measurement:



Turning Gate View off returns the analyzer to the Normal measurement view.

In the Swept SA, the normal measurement view is the single-window Swept SA view. When returning to this view, the Swept SA measurement returns to the Span it was in before entering **Gate View** (even if that is Zero Span).

The **Gate View** window is triggered from the Gate Source, with zero trigger delay. Also, when updating the **Gate View** window, the Gate itself must not operate. So it is internally shut off while the gate view window is being updated. For the Swept SA measurement, this means that the Gate is internally shut off whenever the gate view window is displayed. The measurement bar and softkeys continue to show the Trigger source for the main sweep window and give no indication that the Gate is shut off or that the Gate View window is triggered from the Gate Source.

When in **Gate View**, vertical lines are displayed in the Gate View window as follows:

- Green lines are displayed at the gate edges as follows: in Edge Gate, a line is shown for Delay and one for the end of the Gate period (defined by Length, even in FFT. In Level Gate a line is shown only for Delay. You can adjust the position of the green lines by adjusting the gate length and the gate delay. These lines update in the Gate View window as the active function changes, even if the window is not being updated. In Gated LO and Gated Video, these lines are positioned relative to the delay reference line (not relative to 0 time). In Gated FFT, their location is relative to the left edge of the screen.
- A blue line is displayed showing the delay reference, that is, the reference point for the Gate Delay within the Zero Span window. The blue line represents where (in time) the effective location of the gate start would be if the gate were programmed to zero delay.
- The second blue line is labeled "MIN FAST" as shown in the figure above because it represents the minimum Gate Delay for fast Gated LO operation. This line is only displayed in Gated LO. You cannot

scroll (knob) or decrement (down key) the Gate Delay to less than that represented by the position of this line, it can only be set below this position manually, although once there it can be moved freely with the knob while below the line.

- A yellow line in the Gated Video case only, is displayed at Blength, where Blength is the display point (bucket) length for the swept trace, which is given by the sweep time for that trace divided by number of Points – 1. So it is referenced to 0 time, not to the delay reference. This line is labeled NEXT PT (it is not shown in the figure above because the figure above is for Gated LO). The yellow line represents the edge of a display point (bucket). Normally in Gated Video, the bucket length must be selected so that it exceeds the off time of the burst. There is another way to use the analyzer in Gated Video measurements, and that is to set the bucket width much shorter than the off time of the burst. Then use the Max Hold trace function to fill in "missing" buckets more slowly. This allows you to see some of the patterns of the Gated Video results earlier, though seeing a completely filled-in spectrum later.

Gate View Setup

Accesses a menu that enables you to setup parameters relevant to the Gate View

Key Path	Sweep/Control, Gate
Scope	Meas Global
Initial S/W Revision	A.10.00

Gate View Sweep Time

Controls the sweep time in the Gate View window. To provide an optimal view of the gate signal, the analyzer initializes Gate View Sweep Time based on the current settings of Gate Delay and Gate Length.

Key Path	Sweep/Control, Gate, Gate View Setup
Remote Command	`[:SENSe]:SWEep:EGATe:TIME <time>` `[:SENSe]:SWEep:EGATe:TIME?`
Example	SWE:EGAT:TIME 500 ms
Dependencies	Gate View Sweep Time is initialized: • On Preset (after initializing delay and length). • Every time the Gate Method is set/changed. Additionally, in the Swept SA measurement, whenever you do a Preset, or leave Gate View, the analyzer remembers the Gate Delay and Gate Length settings. Then, when returning to Gate View, if the current Gate Delay and/or Gate Length do not match the remembered values Gate View Sweep Time is re-initialized. 1. Compute the location of the "gate stop" line, which you know is at time t = tmin + GateDelay + GateLength.
Preset	519.3 µs WiMAX OFDMA: 5 ms GSM/EDGE: 1 ms

State Saved	Saved in instrument state
Min	1 µs
Max	6000 s
Initial S/W Revision	Prior to A.02.00

Gate View Start Time

Controls the time at the left edge of the Gate View.

Key Path	Sweep/Control, Gate, Gate View Setup
Remote Command	`[:SENSe]:SWEep:EGATe:VIEW:STARt <time>` `[:SENSe]:SWEep:EGATe:VIEW:STARt?`
Example	SWE:EGAT:VIEW:STAR 10ms
Notes	Units of time are required or no units; otherwise an invalid suffix error message will be generated. See error –131.
Preset	0 ms
State Saved	Saved in instrument state
Min	0
Max	500 ms
Initial S/W Revision	A.10.00

Gate Delay

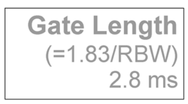
Controls the length of time from the time the gate condition goes True until the gate is turned on.

Key Path	Sweep/Control, Gate
Remote Command	`[:SENSe]:SWEep:EGATe:DELay <time>` `[:SENSe]:SWEep:EGATe:DELay?`
Example	SWE:EGAT:DELay 500ms SWE:EGAT:DELay?
Notes	Units of time are required or no units; otherwise an invalid suffix error message will be generated.
Preset	57.7 us WiMAX OFDMA: 71 us GSM/EDGE: 600 us
State Saved	Saved in instrument state
Min	0.0 us
Max	100 s
Backwards Compatibility SCPI	`[:SENSe]:SWEep:TIME:GATE:DELay` ESA compatibility

Initial S/W Revision	Prior to A.02.00

Gate Length

Controls the length of time that the gate is on after it opens.

Key Path	Sweep/Control, Gate
Remote Command	`[:SENSe]:SWEep:EGATe:LENGth <time>` `[:SENSe]:SWEep:EGATe:LENGth?`
Example	SWE:EGAT:LENG 1 SWE:EGAT:LENG?
Notes	Units of time are required or no units; otherwise an invalid suffix error message will be generated.
Dependencies	Grayed out when Gate Method is set to FFT in which case the label changes to that shown below.  vsd 39-1 The key is also grayed out if Gate Control = Level.
Preset	461.6 us WiMAX OFDMA: 50 us GSM/EDGE: 200 us
State Saved	Saved in instrument state
Min	100 ns
Max	5 s
Backwards Compatibility SCPI	`[:SENSe]:SWEep:TIME:GATE:LENGth` ESA compatibility
Initial S/W Revision	Prior to A.02.00

Method

This lets you choose one of the three different types of gating.

Not all types of gating are available for all measurements.

Key Path	Sweep/Control, Gate
Remote Command	`[:SENSe]:SWEep:EGATe:METHod LO|VIDeo|FFT` `[:SENSe]:SWEep:EGATe:METHod?`
Example	SWE:EGAT:METH FFT
Preset	LO
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

LO

When Gate is set to On, the LO sweeps whenever the gate conditions as specified in the Gate menu are satisfied by the signal at the Gate Source.

This form of gating is more sophisticated, and results in faster measurements. With Gated LO, the analyzer only sweeps while the gate conditions are satisfied. This means that a sweep could take place over several gate events. It would start when the gate signal goes true and stop when it goes false, and then continue when it goes true again. But since the LO is sweeping as long as the gate conditions are satisfied, the sweep typically finishes much more quickly than with Gated Video.

When in zero span, there is no actual sweep performed. But data is only taken while the gate conditions are satisfied. So even though there is no sweep, the gate settings will impact when data is acquired.

Key Path	Sweep/Control, Gate, Method
Dependencies	Key is unavailable when Gate is On and FFT Sweep Type manually selected. When selected, Sweep Type is forced to Swept and the FFT key in Sweep Type is grayed out.
Readback	LO
Initial S/W Revision	Prior to A.02.00

Video

When Gate is set to On, the video signal is allowed to pass through whenever the gate conditions as specified in the Gate menu are satisfied by the signal at the Gate Source.

This form of gating may be thought of as a simple switch, which connects the signal to the input of the spectrum analyzer. When the gate conditions are satisfied, the switch is closed, and when the gate conditions are not satisfied, the switch is open. So we only look at the signal while the gate conditions are satisfied.

With this type of gating, you usually set the analyzer to sweep very slowly. In fact, a general rule is to sweep slowly enough that the gate is guaranteed to be closed at least once per data measurement interval (bucket). Then if the peak detector is used, each bucket will represent the peak signal as it looks with the gate closed.

Key Path	Sweep/Control, Gate, Method
Dependencies	Key is unavailable when Gate is On and FFT Sweep Type manually selected. When selected, Sweep Type is forced to Swept and the FFT key in Sweep Type is grayed out
Readback	Video
Initial S/W Revision	Prior to A.02.00

FFT

When Gate is set to On, an FFT is performed whenever the gate conditions as specified in the Gate menu are satisfied by the signal at the Gate Source. This is an FFT measurement which begins when the gate conditions are satisfied. Since the time period of an FFT is approximately 1.83/RBW, you get a measurement that starts under predefined conditions and takes place over a predefined period. So, in essence, this is a gated measurement. You have limited control over the gate length but it works in FFT sweeps, which the other two methods do not.

Gated FFT cannot be done in zero span since the instrument is not sweeping. So in zero span the Gated LO method is used. Data is still only taken while the gate conditions are satisfied, so the gate settings do impact when data is acquired.

The Gate Length will be 1.83/RBW.

This is a convenient way to make a triggered FFT measurement under control of an external gating signal.

Key Path	Sweep/Control, Gate
Dependencies	Key is unavailable when Gate is On and Swept Sweep Type is manually selected. Key is unavailable when gate Control is set to Level. When selected, Sweep Type is forced to FFT and the Swept key in Sweep Type is grayed out Forces Gate Length to 1.83/RBW
Readback	FFT
Initial S/W Revision	Prior to A.02.00

Gate Source

The menus under the Gate Source key follow the same pattern as those under the Trigger key, with the exception that neither Free Run nor Video are available as Gate Source selections. Any changes to the settings in the setup menus under each Gate Source selection key (for example: Trigger Level) also affect the settings under the Trigger menu keys. Note that the selected Trigger Source does not have to match the Gate Source.

Key Path	Sweep/Control, Gate
Remote Command	`[:SENSe]:SWEep:EGATe:SOURce EXTernal1 | EXTernal2 | LINE | FRAMe | RFBurst` `[:SENSe]:SWEep:EGATe:SOURce?`
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a "Hardware missing; Not available for this model number" error.
Preset	EXTernal 1 GSM/EDGE: FRAMe
Backwards Compatibility Notes	In ESA, there is a single Gate input port. In PSA, the Gate Source may be taken from one of two specified input ports. In the X-Series, any Trigger Source can be a Gate Source.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Line

Pressing this key, when it is not selected, selects the line signal as the trigger. A new sweep/measurement will start synchronized with the next cycle of the line voltage. Pressing this key, when it is already selected, access the line trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR LINE Swept SA measurement TRIG:<meas>:SOUR LINE Measurements other than Swept SA
Dependencies	Line trigger is not available when operating from a "dc power source", for example, when the instrument is powered from batteries.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, Line
Remote Command	`:TRIGger[:SEQuence]:LINE:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:LINE:SLOPe?`
Example	TRIG:LINE:SLOP NEG
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

External 1

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 1 input connector on the rear panel.

Pressing this key, when it is already selected, accesses the external 1 trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR EXT1 Swept SA measurement TRIG:<meas>:SOUR EXT1 Measurements other than Swept SA
Dependencies	Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 1.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:LEVel <level>` `:TRIGger[:SEQuence]:EXTernal1:LEVel?`
Example	TRIG:EXT1:LEV 0.4 V
Couplings	This same level is used for the Ext1 trigger source in the Trigger menu, for the Ext1 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext1 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	–5 V
Max	5 V
Default Unit	V
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:EXTernal:LEVel` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:LEVel`
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:EXTernal1:SLOPe?`
Example	TRIG:EXT1:SLOP NEG
Couplings	This same slope is used in the Ext1 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:EXTernal:SLOPe` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:SLOPe`
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

External 2

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 2 input connector. The external trigger 2 input connector is on the rear panel.

Pressing this key, when it is already selected, accesses the external 2 trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR EXT2 Swept SA measurement TRIG:<meas>:SOUR EXT2 Measurements other than Swept SA
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a “Hardware missing; Not available for this model number” message. Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 2.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Trigger Level

Sets the value where the external 2 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 2
Remote Command	`:TRIGger[:SEQuence]:EXTernal2:LEVel` `:TRIGger[:SEQuence]:EXTernal2:LEVel?`
Example	TRIG:EXT2:LEV 1.1 V
Couplings	This same level is used for the Ext2 trigger source in the Trigger menu, for the Ext2 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext2 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	–5 V
Max	5 V
Default Unit	V
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal2:LEVel`
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, External 2
Remote Command	`:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:EXTernal2:SLOPe?`
Example	TRIG:EXT2:SLOP NEG
Couplings	This same slope is used in the Ext2 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal2:SLOPe`
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

RF Burst

Pressing this key, when it is not selected, selects the RF Burst as the trigger. A new sweep/measurement will start when an RF burst envelope signal is identified from the signal at the RF Input connector. Pressing this key, when it is already selected, accesses the RF Burst trigger setup menu.

In some models, a variety of burst trigger circuitry is available, resulting in various available burst trigger bandwidths. The analyzer automatically chooses the appropriate trigger path based on the hardware configuration and other settings of the analyzer.

Key Path	Trigger
Example	TRIG:SOUR RFB Swept SA measurement TRIG:<meas>:SOUR RFB Measurements other than Swept SA
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Backwards Compatibility Notes	The legacy command: :TRIGger[:SEQuence]:RFBurst:FSELectivity[:STATe] OFF|ON|0|1 is not supported in the X-Series, as the hardware to do Frequency Selective burst triggers does not exist in X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Absolute Trigger Level

Sets the absolute trigger level for the RF burst envelope.

When using the External Mixing path, the Absolute Trigger Level is uncalibrated because the factory default was set to accommodate the expected IF levels for the RF path.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>` `:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?`
Example	TRIG:RFB:LEV:ABS 10 dBm sets the trigger level of the RF burst envelope signal to the absolute level of 10 dBm
Notes	Sending this command does not switch the setting from relative to absolute; to switch it you need to send the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command, below.

	Amplitude Corrections are not taken into account by the Absolute Trigger Level. For example, if you have given yourself effective gain with an amplitude correction factor, the Absolute Trigger will not fire until you have set the trigger level that far below the displayed signal level, rather than simply to the displayed signal level. This is only true for Amplitude Corrections, not External Gain or Ref Level Offset functions. If mode is Bluetooth, the default value is –50 dBm.
Couplings	This same level is used for the RF Burst trigger source in the Trigger menu, for the RF Burst selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the RF Burst selection in the Gate Source menu
Preset	–20 dBm
State Saved	Saved in instrument state
Min	–200 dBm
Max	100 dBm
Default Unit	depends on the current selected Y-Axis unit
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:RFBurst:LEVel:ABSolute`
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Trigger, RF Burst
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE ABSolute|RELative` `:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE?`
Example	TRIG:RFB:LEV:TYPE REL sets the trigger level type of the RF burst trigger to Relative.
Preset	ABSolute
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Relative Trigger Level

Sets the relative trigger level for the RF burst envelope.

In some models, the relative burst trigger function is implemented in hardware. In other models, without the advanced triggering hardware required, the relative burst trigger function is implemented in software in some measurements, and is unavailable in other measurements.

When implemented in software, the relative RF Burst trigger function is implemented as follows:

1. The measurement starts with the absolute RF Burst trigger setting. If it cannot get a trigger with that level, auto trigger fires and the acquisition starts anyway. After the acquisition, the measurement searches for the peak in the acquired waveform and saves it.

2. Now, in the next cycle of the measurement, the measurement determines a new absolute RF Burst level based on the peak value from the first measurement and the Relative RF Burst Trigger Level (always 0 or negative dB) set by the user. The following formula is used:

   absolute RF Burst level = peak level of the previous acquisition + relative RF Burst level

3. If the new absolute RF Burst level differs from the previous by more than 0.5 dB, the new level is sent to the hardware; otherwise it is not updated (to avoid slowing down the acquisition)

Steps 2 and 3 repeat for subsequent measurements.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:RELative <rel_ampl>` `:TRIGger[:SEQuence]:RFBurst:LEVel:RELative?`
Example	TRIG:RFB:LEV:REL –10 dB sets the trigger level of the RF burst envelope signal to the relative level of –10 dB
Notes	Sending this command does not switch the setting from absolute to relative; to switch it you need to send the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command, above. The relative trigger level is not available in some measurements. In those measurements the RELative parameter, and the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command (above), will generate an error if sent.
Dependencies	This key is grayed out and Absolute Trigger Level selected if the required hardware is not present in your analyzer and the current measurement does not support Relative triggering.
Preset	–6 dB GSM: –25 dB
State Saved	Saved in instrument state
Min	–45 dB
Max	0 dB
Default Unit	dB or dBc
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:RFBurst:LEVel` This legacy command is aliased to :TRIGger[:SEQuence]:RFBurst:LEVel:RELative because the PSA had ONLY relative burst triggering
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Trigger Slope

It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, RF Burst
Remote Command	`:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative`

	:TRIGger[:SEQuence]:RFBurst:SLOPe?
Example	TRIG:RFB:SLOP NEG
Couplings	This same slope is used in the RF Burst selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:RFBurst:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Periodic Timer (Frame Trigger)

Pressing this key, when it is not selected, selects the internal periodic timer signal as the trigger. Triggering occurrences are set by the **Period** parameter, which is modified by the **Sync Source** and **Offset**. Pressing this key, when it is already selected, accesses the periodic timer trigger setup functions.

If you do not have a sync source selected (it is Off), then the internal timer will not be synchronized with any external timing events.

Key Path	Trigger
Example	TRIG:SOUR FRAM Swept SA measurement TRIG:<meas>:SOUR FRAM Measurements other than Swept SA
State Saved	Saved in instrument state
Readback	[Sync: <value of Sync Source>], for example, [Sync: External 1]
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

Periodic Timer Triggering:

This feature selects the internal periodic timer signal as the trigger. Trigger occurrences are set by the **Periodic Timer** parameter, which is modified by the **Sync Source** and **Offset**.

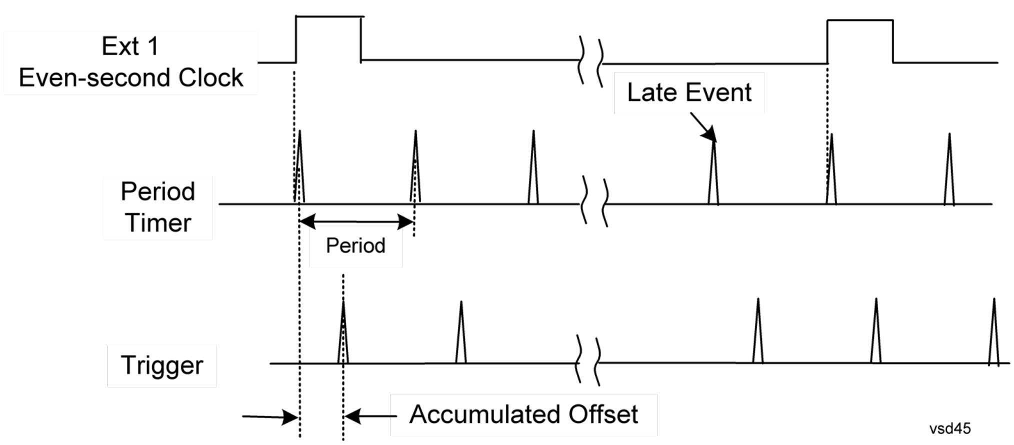
The figure below shows the action of the periodic timer trigger. Before reviewing the figure, we'll explain some uses for the periodic trigger.

A common application is measuring periodic burst RF signals for which a trigger signal is not easily available. For example, we might be measuring a TDMA radio which bursts every 20 ms. Let's assume that the 20 ms period is very consistent. Let's also assume that we do not have an external trigger source available that is synchronized with the period, and that the signal-to-noise ratio of the signal is not high enough to provide a clean RF burst trigger at all of the analysis frequencies. For example, we might want to measure spurious transmissions at an offset from the carrier that is larger than the bandwidth of the RF burst trigger. In this application, we can set the Periodic Timer to a 20.00 ms period and adjust the offset from that timer to position our trigger just where we want it. If we find that the 20.00 ms is not exactly right, we can adjust the period slightly to minimize the drift between the period timer and the signal to be measured.

A second way to use this feature would be to use **Sync Source** temporarily, instead of **Offset**. In this case, we might tune to the signal in a narrow span and use the RF Burst trigger to synchronize the periodic timer. Then we would turn the sync source off so that it would not mis-trigger. Mis-triggering can occur when we are tuned so far away from the RF burst trigger that it is no longer reliable.

A third example would be to synchronize to a signal that has a reference time element of much longer period than the period of interest. In some CDMA applications, it is useful to look at signals with a short periodicity, by synchronizing that periodicity to the "even-second clock" edge that happens every two seconds. Thus, we could connect the even-second clock trigger to Ext1 and use then Ext1 as the sync source for the periodic timer.

The figure below illustrates this third example. The top trace represents the even-second clock. It causes the periodic timer to synchronize with the leading edge shown. The analyzer trigger occurs at a time delayed by the accumulated offset from the period trigger event. The periodic timer continues to run, and triggers continue to occur, with a periodicity determined by the analyzer time base. The timer output (labeled "late event") will drift away from its ideal time due to imperfect matching between the time base of the signal being measured and the time base of the analyzer, and also because of imperfect setting of the period parameter. But the synchronization is restored on the next even-second clock event. ("Accumulated offset" is described in the in the **Offset** function section.)



Period

Sets the period of the internal periodic timer clock. For digital communications signals, this is usually set to the frame period of your current input signal. In the case that sync source is not set to OFF, and the external sync source rate is changed for some reason, the periodic timer is synchronized at the every external synchronization pulse by resetting the internal state of the timer circuit.

Key Path	Trigger, Periodic Timer

Remote Command	`:TRIGger[:SEQuence]:FRAMe:PERiod <time>` `:TRIGger[:SEQuence]:FRAMe:PERiod?`
Example	TRIG:FRAM:PER 100 ms
Dependencies	The invalid data indicator turns on when the period is changed, until the next sweep/measurement completes.
Couplings	The same period is used in the Gate Source selection of the period timer.
Preset	20 ms GSM: 4.615383
State Saved	Saved in instrument state
Min	100.000 ns
Max	559.0000 ms
Default Unit	S
Initial S/W Revision	Prior to A.02.00

Offset

Adjusts the accumulated offset between the periodic timer events and the trigger event. Adjusting the accumulated offset is different than setting an offset, and requires explanation.

The periodic timer is usually not synchronized with any external events, so the timing of its output events has no absolute meaning. Since the timing relative to external events (RF signals) is important, you need to be able to adjust (offset) it. However, you have no direct way to see when the periodic timer events occur. All that you can see is the trigger timing. When you want to adjust the trigger timing, you will be changing the internal offset between the periodic timer events and the trigger event. Because the absolute value of that internal offset is unknown, we will just call that the accumulated offset. Whenever the Offset parameter is changed, you are changing that accumulated offset. You can reset the displayed offset using Reset Offset Display. Changing the display does not change the value of the accumulated offset, and you can still make additional changes to accumulated offset.

To avoid ambiguity, we define that an increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.

Key Path	Trigger, Periodic Timer
Remote Command	`:TRIGger[:SEQuence]:FRAMe:OFFSet <time>` `:TRIGger[:SEQuence]:FRAMe:OFFSet?`
Example	TRIG:FRAM:OFFS 1.2 ms
Notes	The front panel interface (for example, the knob), and this command, adjust the accumulated offset, which is shown on the active function display. However, the actual amount sent to the hardware each time the offset is updated is the delta value, that is, the current accumulated offset value minus the previous accumulated offset value. Note that the accumulated offset value is essentially arbitrary; it represents the accumulated offset from the last time the offset was zeroed (with the Reset Offset Display key). Note that this command does not change the period of the trigger waveform. Note also that Offset is used only when the sync source is set to OFF, otherwise delay is used, see section "Trig Delay" on

	page 1359. An increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.
Notes	When the SCPI command is sent the value shown on the key (and the Active Function, if this happens to be the active function) is updated with the new value. However, the actual amount sent to the hardware is the delta value, that is, the current accumulated offset value minus the previous accumulated offset value. The SCPI query simply returns the value currently showing on the key.
Dependencies	The invalid data indicator turns on when the offset is changed, until the next sweep/measurement completes.
Couplings	The same offset is used in the Gate Source selection of the period timer.
Preset	0 s
State Saved	Saved in instrument state
Min	–10.000 s
Max	10.000 s
Default Unit	S
Initial S/W Revision	Prior to A.02.00

Reset Offset Display

Resets the value of the periodic trigger offset display setting to 0.0 seconds. The current displayed trigger location may include an offset value defined with the Offset key. Pressing this key redefines the currently displayed trigger location as the new trigger point that is 0.0 s offset. The Offset key can then be used to add offset relative to this new timing.

Key Path	Trigger, Periodic Timer
Remote Command	`:TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet`
Example	TRIG:FRAM:OFFS:DISP:RES
Initial S/W Revision	Prior to A.02.00

Sync Source

Selects a signal source for you to synchronize your periodic timer trigger to, otherwise you are triggering at some arbitrary location in the frame. Synchronization reduces the precision requirements on the setting of the period.

For convenience you may adjust the level and slope of the selected sync source in a conditional branch setup menu accessed from the Sync Source menu. Note that these settings match those in the **Trigger** and **Gate Source** menus; that is, each trigger source has only one value of level and slope, regardless of which menu it is accessed from.

Key Path	Trigger, Periodic Timer

Remote Command	:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal1 | EXTernal2 | RFBurst | OFF :TRIGger[:SEQuence]:FRAMe:SYNC?
Example	TRIG:FRAM:SYNC EXT2
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a "Hardware missing; Not available for this model number" message.
Preset	Off GSM/EDGE: RFBurst
State Saved	Saved in instrument state
Readback	The current setting is read back to this key and it is also Readback to the previous Periodic Timer trigger key.
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Off

Turns off the sync source for your periodic trigger. With the sync source off, the timing will drift unless the signal source frequency is locked to the analyzer frequency reference.

Key Path	Trigger, Periodic Timer, Sync Source
Example	TRIG:FRAM:SYNC OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

External 1

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 1 input connector on the rear panel.

Pressing this key, when it is already selected, accesses the external 1 trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR EXT1 Swept SA measurement TRIG:<meas>:SOUR EXT1 Measurements other than Swept SA
Dependencies	Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 1.
State Saved	Saved in instrument state
Status Bits/OPC	

dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:LEVel <level>` `:TRIGger[:SEQuence]:EXTernal1:LEVel?`
Example	TRIG:EXT1:LEV 0.4 V
Couplings	This same level is used for the Ext1 trigger source in the Trigger menu, for the Ext1 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext1 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	–5 V
Max	5 V
Default Unit	V
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:EXTernal:LEVel` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:LEVel`
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:EXTernal1:SLOPe?`
Example	TRIG:EXT1:SLOP NEG
Couplings	This same slope is used in the Ext1 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).

Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:EXTernal:SLOPe` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:SLOPe`
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

External 2

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 2 input connector. The external trigger 2 input connector is on the rear panel.

Pressing this key, when it is already selected, accesses the external 2 trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR EXT2 Swept SA measurement TRIG:<meas>:SOUR EXT2 Measurements other than Swept SA
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a “Hardware missing; Not available for this model number” message. Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 2.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Trigger Level

Sets the value where the external 2 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 2
Remote Command	`:TRIGger[:SEQuence]:EXTernal2:LEVel`

	:TRIGger[:SEQuence]:EXTernal2:LEVel?
Example	TRIG:EXT2:LEV 1.1 V
Couplings	This same level is used for the Ext2 trigger source in the Trigger menu, for the Ext2 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext2 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	–5 V
Max	5 V
Default Unit	V
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:EXTernal2:LEVel
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, External 2
Remote Command	:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative :TRIGger[:SEQuence]:EXTernal2:SLOPe?
Example	TRIG:EXT2:SLOP NEG
Couplings	This same slope is used in the Ext2 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:EXTernal2:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

RF Burst

Pressing this key, when it is not selected, selects the RF Burst as the trigger. A new sweep/measurement will start when an RF burst envelope signal is identified from the signal at the RF Input connector. Pressing this key, when it is already selected, accesses the RF Burst trigger setup menu.

In some models, a variety of burst trigger circuitry is available, resulting in various available burst trigger bandwidths. The analyzer automatically chooses the appropriate trigger path based on the hardware configuration and other settings of the analyzer.

Key Path	Trigger
Example	TRIG:SOUR RFB Swept SA measurement TRIG:<meas>:SOUR RFB Measurements other than Swept SA
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Backwards Compatibility Notes	The legacy command: :TRIGger[:SEQuence]:RFBurst:FSELectivity[:STATe] OFF|ON|0|1 is not supported in the X-Series, as the hardware to do Frequency Selective burst triggers does not exist in X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Absolute Trigger Level

Sets the absolute trigger level for the RF burst envelope.

When using the External Mixing path, the Absolute Trigger Level is uncalibrated because the factory default was set to accommodate the expected IF levels for the RF path.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>` `:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?`
Example	TRIG:RFB:LEV:ABS 10 dBm sets the trigger level of the RF burst envelope signal to the absolute level of 10 dBm
Notes	Sending this command does not switch the setting from relative to absolute; to switch it you need to send the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command, below. Amplitude Corrections are not taken into account by the Absolute Trigger Level. For example, if you have given yourself effective gain with an amplitude correction factor, the Absolute Trigger will not fire until you have set the trigger level that far below the displayed signal level, rather than simply to the displayed signal level. This is only true for Amplitude Corrections, not External Gain or Ref Level Offset functions. If mode is Bluetooth, the default value is –50 dBm.
Couplings	This same level is used for the RF Burst trigger source in the Trigger menu, for the RF Burst selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the RF Burst selection in the Gate Source menu

Preset	–20 dBm
State Saved	Saved in instrument state
Min	–200 dBm
Max	100 dBm
Default Unit	depends on the current selected Y-Axis unit
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:RFBurst:LEVel:ABSolute`
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Trigger, RF Burst
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE ABSolute|RELative` `:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE?`
Example	TRIG:RFB:LEV:TYPE REL sets the trigger level type of the RF burst trigger to Relative.
Preset	ABSolute
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Relative Trigger Level

Sets the relative trigger level for the RF burst envelope.

In some models, the relative burst trigger function is implemented in hardware. In other models, without the advanced triggering hardware required, the relative burst trigger function is implemented in software in some measurements, and is unavailable in other measurements.

When implemented in software, the relative RF Burst trigger function is implemented as follows:

1. The measurement starts with the absolute RF Burst trigger setting. If it cannot get a trigger with that level, auto trigger fires and the acquisition starts anyway. After the acquisition, the measurement searches for the peak in the acquired waveform and saves it.
2. Now, in the next cycle of the measurement, the measurement determines a new absolute RF Burst level based on the peak value from the first measurement and the Relative RF Burst Trigger Level (always 0 or negative dB) set by the user. The following formula is used:

   absolute RF Burst level = peak level of the previous acquisition + relative RF Burst level
3. If the new absolute RF Burst level differs from the previous by more than 0.5 dB, the new level is sent to the hardware; otherwise it is not updated (to avoid slowing down the acquisition)

Steps 2 and 3 repeat for subsequent measurements.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:RELative <rel_ampl>` `:TRIGger[:SEQuence]:RFBurst:LEVel:RELative?`
Example	TRIG:RFB:LEV:REL –10 dB sets the trigger level of the RF burst envelope signal to the relative level of –10 dB
Notes	Sending this command does not switch the setting from absolute to relative; to switch it you need to send the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command, above. The relative trigger level is not available in some measurements. In those measurements the RELative parameter, and the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command (above), will generate an error if sent.
Dependencies	This key is grayed out and Absolute Trigger Level selected if the required hardware is not present in your analyzer and the current measurement does not support Relative triggering.
Preset	–6 dB GSM: –25 dB
State Saved	Saved in instrument state
Min	–45 dB
Max	0 dB
Default Unit	dB or dBc
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:RFBurst:LEVel` This legacy command is aliased to :TRIGger[:SEQuence]:RFBurst:LEVel:RELative because the PSA had ONLY relative burst triggering
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Trigger Slope

It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, RF Burst
Remote Command	`:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:RFBurst:SLOPe?`
Example	TRIG:RFB:SLOP NEG
Couplings	This same slope is used in the RF Burst selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:RFBurst:SLOPe`

Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

TV

Pressing this key, when it is not selected, selects the TV input signal as the trigger. A new sweep/measurement will start synchronized with the next occurrence of the synchronizing pulse of the selected TV line number.

Pressing this key, when it is already selected, opens a menu of TV Trigger setup functions. The default active function in this menu is the TV line number on which you want to trigger.

The Frame and Field options enable you to determine how the fields of the TV picture signal will be affected by the trigger system. One complete TV image consists of one frame of 525 or 625 horizontal lines depending on the TV standard being used. Each frame is composed of two fields of interlacing lines, each consisting of 262 1/2 lines (or 312 1/2 lines). The fields are called Field One and Field Two. Field One is viewed as having 263 lines (or 313 lines) and Field Two is viewed as having 262 lines (or 312 lines).

For the 525 line NTSC video standard, we refer to TV lines as follows (these are the Field Modes):

Entire Frame, lines 1 to 525

Field One, lines 1 to 263

Field Two, lines 1 to 262 (note that this really refers to "actual" lines 264 to 525)

For the 625 line PAL and SECAM video standards, we refer to TV lines as follows:

Entire Frame, lines 1 to 625

Field One, lines 1 to 313

Field Two, lines 314 to 625

As the Field is changed, the appropriate value for Line is chosen to keep triggering on the same line as before, or if this is not possible, the corresponding line in the new Field. For example, suppose line 264 is selected while in the NTSC-M standard and the Entire Frame mode. This is the first line in Field Two. If Field Two is then selected, the Line number changes to Line 1, the same actual line in the TV signal. If Field One is then selected, the line number stays at 1, but now we are triggering in the first line in Field One. The only exception to this is if we are on the last line of Field One and change to Field Two. In this case, we go to the last line in Field Two.

Key Path	Trigger	
Example	TRIG:SOUR TV	Swept SA measurement
	TRIG:<meas>:SOUR TV	Measurements other than Swept SA
Dependencies	This key only appears in Modes which support TV Trigger, otherwise the key is blanked. If the SCPI command is sent while the key is blanked, an error is returned.	

Readback	This key displays the value read back from TV Line
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

TV Line

Selects the TV line number to trigger on. Line number range is dependent on the settings of the **Standard** and **Field** menus within the TV trigger setup functions. When the line number is incremented beyond the upper limit, the value will change to the lower limit and continue incrementing from there. When the line number is decremented below the lower limit, the value will change to the upper limit and continue decrementing from there.

Key Path	Trigger, TV
Remote Command	`:TRIGger[:SEQuence]:TV:LINE <integer>` `:TRIGger[:SEQuence]:TV:LINE?`
Example	TRIG:TV:LINE 20 TRIG:TV:LINE?
Notes	The range of the TV line number is dependent on the settings of the Standard and Field menus within the TV trigger setup functions.
Preset	17
State Saved	Saved in instrument state
Min	The minimum value is the minimum line, and rolls over to the maximum value. The minimum line number depends on which Field and standard are selected.
Max	The maximum value is the maximum line, and rolls over to the minimum value. The maximum line number depends on which Field and standard are selected.
Initial S/W Revision	Prior to A.02.00

Field

Accesses the menu to select the field.

Key Path	Trigger, TV
Remote Command	`:TRIGger[:SEQuence]:TV:FMODe ENTire|ODD|EVEN` `:TRIGger[:SEQuence]:TV:FMODe?`
Example	TRIG:TV:FMOD EVEN
Notes	ODD is Field 1 EVEN is Field 2

Dependencies	This command is available only when Option B7B (TV trigger) is installed.
Preset	ENTire
Readback	Displays the Readback value
Initial S/W Revision	Prior to A.02.00

Entire Frame

When you select Entire Frame it causes the selected line number to be viewed as an offset into the entire frame starting with line 1, the first line in Field One.

Key Path	Trigger, TV, Field
Example	TRIG:TV:FMOD ENT
Min	1, for all formats.
Max	525, for formats NTSC-M, NTSC-Japan, NTSC–4.43, PAL-M and PAL–60 625, for formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L.
Readback	Entire Frame
Initial S/W Revision	Prior to A.02.00

Field One

When you select Field One it causes the selected line number to be viewed as an offset into the first field starting with Line 1, the first line in Field One.

Key Path	Trigger, TV, Field
Example	TRIG:TV:FMOD ODD
Min	Field 1 (ODD) The minimum line is 1
Max	Field 1 (ODD) Maximum line is 263 for formats NTSC-M, NTSC-Japan, NTSC–4.43, PAL-M and PAL–60 Maximum line is 313 for formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L.
Readback	Field 1
Initial S/W Revision	Prior to A.02.00

Field Two

When you select Field Two it causes the selected line number to be viewed as an offset into the second field. If Line 1 is selected, it is the 264th line of the frame (NTSC-M, NTSC-Japan, NTSC–4.43, PAL-M, PAL–60) or the 314th line of the frame (PAL-B,D,G,H,I, PAL-N, PAL-N-Combin, SECAM-L).

Key Path	Trigger, TV, Field

Example	TRIG:TV:FMOD EVEN
Min	Field 2 (EVEN) The minimum line is 1
Max	Field 2 (EVEN) The maximum line 262 for formats NTSC-M, NTSC-Japan, NTSC–4.43, PAL-M and PAL–60 The maximum line is 312 for formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L
Readback	Field 2
Initial S/W Revision	Prior to A.02.00

Standard

Accesses the Standard menu keys which select from the following TV standards: NTSC-M, NTSC-Japan, NTSC–4.43, PAL-M, PAL-B,D,G,H,I , PAL-N, PAL-N-Combin, PAL–60, SECAM-L.

As the TV standard is changed, the current line value is clipped as necessary to keep it valid for the chosen standard and field mode. For example, line 600 is selected in Entire Frame mode in PAL-N; if NTSC-M is selected, the line number is clipped to 525. Or, if line 313 is selected in Field 1 mode in PAL-N and NTSC-M is selected, the line number is clipped to 263. Changing back to the PAL-N standard will leave the line number at 263.

Key Path	Trigger, TV
Remote Command	`:TRIGger[:SEQuence]:TV:STANdard MNTSc | JNTSc | NTSC443 | MPAL | BPAL | NPAL | CPAL | PAL60 | LSEC` `:TRIGger[:SEQuence]:TV:STANdard?`
Example	TRIG:TV:STAN MPAL TRIG:TV:STAN?
Preset	MNTS
State Saved	Saved in instrument state
Readback	Displays Readback value
Initial S/W Revision	Prior to A.02.00

NTSC-M

Sets the TV standard to NTSC-M.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN MNTS
Readback	NTSC-M
Initial S/W Revision	Prior to A.02.00

NTSC-Japan

Sets the TV standard to NTSC-Japan.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN JNTS
Readback	NTSC-Japan
Initial S/W Revision	Prior to A.02.00

NTSC–4.43

Sets the TV standard to NTSC–4.43.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN NTSC443
Readback	NTSC-Japan
Initial S/W Revision	Prior to A.02.00

PAL-M

Sets the TV standard to PAL-M.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN MPAL
Readback	PAL-M
Initial S/W Revision	Prior to A.02.00

PAL-N

Sets the TV standard to PAL-N.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN NPAL
Readback	PAL-N
Initial S/W Revision	Prior to A.02.00

PAL-N-Combin

Sets the TV standard to PAL-N-Combin.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN CPAL

Readback	PAL-N-C
Initial S/W Revision	Prior to A.02.00

PAL-B,D,G,H,I

Sets the TV standard to PAL-B,D,G,H,I

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN BPAL
Readback	PAL-B
Initial S/W Revision	Prior to A.02.00

PAL–60

Sets the TV standard to PAL–60.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN PAL60
Readback	PAL-N
Initial S/W Revision	Prior to A.02.00

SECAM-L

Sets the TV standard to SECAM-L.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN LSEC
Readback	SECAM-L
Initial S/W Revision	Prior to A.02.00

Control Edge/Level

Sets the method of controlling the gating function from the gating signal.

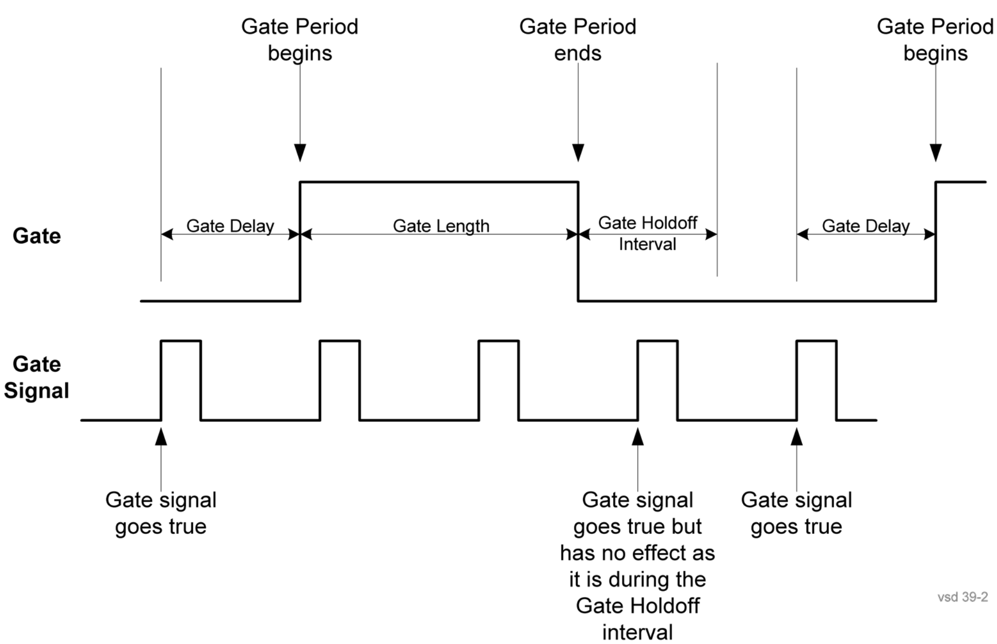
- Edge: In Edge triggering, the gate opens (after the Delay) on the selected edge (for example, positive) of the gate signal and closes on the alternate edge (for example, negative).
- Level: In Level triggering, the gate opens (after the Delay) when the gate signal has achieved a certain level and stays open as long as that level is maintained.

Key Path	Sweep/Control, Gate
Remote Command	`[:SENSe]:SWEep:EGATe:CONTrol EDGE|LEVel` `[:SENSe]:SWEep:EGATe:CONTrol?`
Example	SWE:EGAT:CONT EDGE
Dependencies	If the Gate Method is FFT the Control key is grayed out and Edge is selected. If the Gate Source is TV, Frame or Line, the Control key is grayed out and Edge is selected.
Preset	EDGE
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`[:SENSe]:SWEep:TIME:GATE:TYPE` ESA Compatibility
Initial S/W Revision	Prior to A.02.00

Gate Holdoff

Lets you increase or decrease the wait time after a gate event ends before the analyzer will respond to the next gate signal.

After any Gate event finishes, the analyzer must wait for the sweep system to settle before it can respond to another Gate signal. The analyzer calculates a "wait time," taking into account a number of factors, including RBW and Phase Noise Optimization settings. The goal is to achieve the same accuracy when gated as in ungated operation. The figure below illustrates this concept:



When Gate Holdoff is in Auto, the wait time calculated by the analyzer is used. When Gate Time is in Manual, the user may adjust the wait time, usually decreasing it in order to achieve greater speed, but at the risk of decreasing accuracy.

When the Method key is set to Video or FFT, the Gate Holdoff function has no effect.

In measurements that do not support Auto, the value shown when Auto is selected is “---“ and the manually set holdoff is returned to a query.

Key Path	Sweep/Control, Gate

Remote Command	`[:SENSe]:SWEep:EGATe:HOLDoff <time>`
	`[:SENSe]:SWEep:EGATe:HOLDoff?`
	`[:SENSe]:SWEep:EGATe:HOLDoff:AUTO OFF|ON|0|1`
	`[:SENSe]:SWEep:EGATe:HOLDoff:AUTO?`

Example	SWE:EGAT:HOLD 0.0002 SWE:EGAT:HOLD? SWE:EGAT:HOLD:AUTO ON SWE:EGAT:HOLD:AUTO?
Couplings	When Gate Holdoff is Auto, the Gate Holdoff key shows the value calculated by the analyzer for the wait time. Pressing the Gate Holdoff key while it is in Auto and not selected, causes the key to become selected and allows the user to adjust the value. If the value is adjusted, the setting changes to Man. Pressing the Gate Holdoff key, while it is in Auto and selected, does not change the value of Gate Holdoff, but causes the setting to change to Man. Now the user can adjust the value. Pressing the key while it is in Man and selected, cause the value to change back to Auto. Pressing the key while it is in Man and not selected, causes the key to become selected and allows the user to adjust the value. When Method is set to Video or FFT, the Gate Holdoff function has no effect.
Preset	Auto Auto/On
State Saved	Saved in instrument state
Min	1 µsec
Max	1 sec
Initial S/W Revision	Prior to A.02.00

Min Fast Position Query (Remote Command Only)

This command queries the position of the MIN FAST line, relative to the delay reference (REF) line. See section "Gate View On/Off" on page 1157. If this query is sent while not in gate view, the MinFast calculation is performed based on the current values of the appropriate parameters and the result is returned. Knowing this value lets you set an optimal gate delay value for the current measurement setup.

Remote Command	`[:SENSe]:SWEep:EGATe:MINFast?`
Example	SWE:EGAT:MIN?
Initial S/W Revision	Prior to A.02.00

Gate Preset (Remote Command Only)

Presets the time-gated spectrum analysis capability.

This command sets gate parameter values to the ESA preset values, as follows:

- Gate trigger type = edge
- Gate polarity = positive
- Gate delay = 1 us
- Gate length = 1 us

Remote Command	`[:SENSe]:SWEep:TIME:GATE:PRESet` ESA Compatibility
Initial S/W Revision	Prior to A.02.00

Gate Level (Remote Command Only)

Sets the gate input transition point level for the external TRIGGER inputs on the front and rear panel. This is a legacy command for PSA compatibility. It is simply an alias to the equivalent trigger level command.

Remote Command	`[:SENSe]:SWEep:EGATe:EXTernal[1]|2:LEVel <voltage>` `[:SENSe]:SWEep:EGATe:EXTernal[1]|2:LEVel?`
Notes	This command is simply an alias to :TRIGger[:SEQuence]:EXTernal[1]|2:LEVel For details refer
Initial S/W Revision	Prior to A.02.00

Gate Polarity (Remote Command Only)

Sets the polarity for the gate signal. This setup is now done using the gate trigger's slope setting.

- When Positive (Pos) is selected, a positive-going edge (Edge) or a high voltage (Level) will satisfy the gate condition, after the delay set with the Gate Delay key.
- When Negative (Neg) is selected, a negative-going edge (Edge) or a low voltage (Level) will satisfy the gate condition after the delay.

Remote Command	`[:SENSe]:SWEep:EGATe:POLarity NEGative|POSitive` `[:SENSe]:SWEep:EGATe:POLarity?`
Example	SWE:EGAT:POL NEG SWE:EGAT:POL?

Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`[:SENSe]:SWEep:TIME:GATE:POLarity` ESA compatibility
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:SWEep:TIME:GATE:LEVel HIGH|LOW`
	`[:SENSe]:SWEep:TIME:GATE:LEVel?`
	ESA compatibility

Preset	HIGH
Initial S/W Revision	Prior to A.02.00

Points

Sets the number of points taken per sweep, and displayed in the traces. The current value of points is displayed parenthetically, next to the sweep time in the lower-right corner of the display. Using more points provides greater resolution. Using fewer points compacts the data and decreases the time required to access a trace over the remote interface.

Increasing the number of points does not increase the sweep time; however, it can slightly impact the trace processing time and therefore the overall measurement speed. Decreasing the number of points does not decrease the sweep time, but it may speed up the measurement, depending on the other sweep settings (for example, in FFT sweeps). Fewer points will always speed up the I/O.

Due to minimum sweep rate limitations of the hardware, the minimum sweep time available to the user will increase above its normal value of 1 ms as the number of sweep points increases above 15001.

Changing the number of sweep points has several effects on the analyzer. The sweep time resolution will change. Trace data for all the traces will be cleared and, if Sweep is in Cont, a new trace taken. If any trace is in average or hold, the averaging starts over.

When in a split screen display each window may have its own value for points.

When sweep points is changed, an informational message is displayed, "Sweep points changed, all traces cleared."

Key Path	Sweep/Control
Remote Command	`[:SENSe]:SWEep:POINts <integer>` `[:SENSe]:SWEep:POINts?`
Example	SWE:POIN 5001 SWE:POIN?
Dependencies	• This function is not available when signal identification is set to On in External Mixing • Neither the knob nor the step keys can be used to change this value. If it is tried, a warning is

	given. • Clipped to 1001 whenever you are in the Spectrogram View in all models but MXE, clipped to 20001 whenever you are in the Spectrogram View in MXE • Grayed out in measurements that do not support swept. Forceful message –221.3200 • Blanked in modes that do not support Swept • Grayed out if Normalize is on; you can't change the number of sweep points with Normalize on, as it will erase the reference trace.
Couplings	• When Source Mode is set to Tracking, and Stepped Tracking is used (as with option ESC), 201 source steps are used to achieve optimal speed. The number of sweep points in the analyzer is then set to match the number of steps in the source. When Source Mode is set to Off, the previous number of points (the value that existed when Source Mode was Off previously) is restored, even if the user has changed the Points value while the Source Mode was set to Tracking. • Whenever the number of sweep points change: –All trace data is erased –Any traces with Update Off will also go to Display Off (like going from View to Blank in the older analyzers) –Sweep time is re-quantized –Any limit lines that are on will be updated –If averaging/hold is on, averaging/hold starts over
Preset	1001
State Saved	Saved in instrument state
Min	Normally the minimum is 1, but in Tracking Source Mode, the minimum value of Points is 101. If you go into Tracking Source Mode with fewer points than 101, it sets Points to 101.
Max	40001 when not in Tracking Source mode In Tracking Source mode: • in Stepped Tracking (e.g., External Source), 1601 or the maximum number of points supported by the source, whichever is less • in Swept Tracking (e.g., Tracking Generator), 10000
Backwards Compatibility Notes	1. In ESA and PSA, Sweep Points was adjustable with the knob and step keys. This caused the sweep time to increase whenever Points was adjusted (either up or down), due to excessive application of the quantization rules. In the X-Series the value of Sweep Points must be entered manually, which avoids this anomaly 2. In ESA the preset value of Sweep Points is 401, in PSA it is 601. In X-Series it is 1001.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.11.00

Zoom Points

In the Trace Zoom View of the Swept SA measurement, the Points key changes to Zoom Points whenever the focus (thick green border) is on the bottom window. Zoom Points controls how many points are displayed in the Zoom Window and hence indirectly controls the Zoom Span.

Key Path	Sweep/Control
Remote Command	`[:SENSe]:SWEep:TZOom:POINts <integer>` `[:SENSe]:SWEep:TZOom:POINts?`
Example	SWE:TZO:POIN 5001
Dependencies	Only appears in the Trace Zoom View of the Swept SA measurement. If the SCPI command is sent in other Views, generates an error.
Couplings	Zoom Points is coupled to Zoom Span and Sweep Points; if Zoom Span changes, Zoom Points changes but Sweep Points does not; if Sweep Points changes, Zoom Points changes but Zoom Span does not. Zoom Span is directly coupled to Zoom Points; if Zoom Points changes, Zoom Span changes but Sweep Points does not.
Preset	On entry to Trace Zoom, 10% of the number of points in the upper window.
State Saved	Saved in instrument state
Min	1
Max	Number of points in top window
Initial S/W Revision	A.07.01

Pause/Resume

Pauses a measurement after the current data acquisition is complete.

When Paused, the label on the key changes to Resume. Pressing Resume un-pauses the measurement. When you are Paused, pressing Restart, Single or Cont does a Resume.

Key Path	Sweep/Control
Remote Command	`:INITiate:PAUSe`
Dependencies	Grayed out in Measurements that do not support Pausing. Blanked in Modes that do not support Pausing.
Initial S/W Revision	Prior to A.02.00

Key Path	Sweep/Control
Remote Command	`:INITiate:RESume`
Dependencies	Grayed out in Measurements that do not support Pausing. Blanked in Modes that do not support Pausing.
Initial S/W Revision	Prior to A.02.00

Abort (Remote Command Only)

This command is used to stop the current measurement. It aborts the current measurement as quickly as possible, resets the sweep and trigger systems, and puts the measurement into an "idle" state. If the instrument is in the process of aligning when ABORt is sent, the alignment finishes before the abort function is performed. So ABORt does not abort an alignment.

If the instrument is set for Continuous measurement, this command sets up the measurement and initiates a new data measurement sequence. A new data acquisition (sweep) is taken once the trigger condition is met.

If the instrument is set for Single measurement, it remains in the "idle" state until an :INIT:IMM command is received.

Remote Command	`:ABORt`
Example	:ABOR
Notes	If :INITiate:CONTinuous is ON, then a new continuous measurement starts immediately, with sweep (data acquisition) occurring once the trigger condition has been met. If :INITiate:CONTinuous is OFF, then :INITiate:IMMediate is used to start a single measurement, with sweep (data acquisition) occurring once the trigger condition has been met.
Dependencies	For continuous measurement, ABORt is equivalent to the Restart key. Not all measurements support the ABORt command.
Status Bits/OPC dependencies	The STATus:OPERation register bits 0 through 8 are cleared. The STATus:QUEStionable register bit 9 (INTegrity sum) is cleared. Since all the bits that affect the OPC status are cleared by ABORt, a subsequent *OPC? query returns true ("1").
Initial S/W Revision	Prior to A.02.00

System

Opens a menu of keys that access various configuration menus and dialogs.

Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00

Show

Accesses a menu of choices that enable you to select the information window you want to view.

Key Path	System
Mode	All
Remote Command	`:SYSTem:SHOW OFF | ERRor | SYSTem | HARDware | LXI | HWSTatistics | ALIGnment | SOFTware | CAPPlication` `:SYSTem:SHOW?`
Example	:SYST:SHOW SYST
Notes	This command displays (or exits) the various System information screens.
Preset	OFF
State Saved	No
Range	OFF| ERRor | SYSTem | HARDware | LXI | HWSTatistics | ALIGNment | SOFTware|CAPPlication
Initial S/W Revision	Prior to A.02.00

Errors

There are two modes for the Errors selection, History and Status.

The list of errors displayed in the Errors screen does not automatically refresh. You must press the Refresh key or leave the screen and return to it to refresh it.

History brings up a screen displaying the event log in chronological order, with the newest event at the top. The history queue can hold up to 100 messages (if a message has a repeat count greater than 1 it only counts once against this number of 100). Note that this count bears no relation to the size of the SCPI queue. If the queue extends onto a second page, a scroll bar appears to allow scrolling with a mouse. Time is displayed to the second.

Status brings up a screen summarizing the status conditions currently in effect. Note that the time is displayed to the second.

The fields on the Errors display are:

Type (unlabeled) - Displays the icon identifying the event or condition as an error or warning.

ID - Displays the error number.

Message - Displays the message text.

Repeat (RPT) - This field shows the number of consecutive instances of the event, uninterrupted by other events. If an event occurs 5 times with no other intervening event, the value of repeat will be 5.

If the value of Repeat is 1 the field does not display. If the value of Repeat is >1, the time and date shown are those of the most recent occurrence. If the value of repeat reaches 999,999 it stops there.

Time - Shows the most recent time (including the date) at which the event occurred.

Key Path	System, Show
Mode	All
Remote Command	`:SYSTem:ERRor[:NEXT]?`
Example	:SYST:ERR?
Notes	The return string has the format: "<Error Number>,<Error>" Where <Error Number> and <Error> are those shown on the Show Errors screen
Backwards Compatibility Notes	In some legacy analyzers, the Repeat field shows the number of times the message has repeated since the last time the error queue was cleared. In the X-Series, the Repeat field shows the number of times the error has repeated since the last intervening error. So the count may very well be different than in the past even for identical signal conditions Unlike previous analyzers, in the X-Series all errors are reported through the Message or Status lines and are logged to the event queue. They never appear as text in the graticule area (as they sometimes do in previous analyzers) and they are never displayed in the settings panel at the top of the screen (as they sometimes do, by changing color, in previous analyzers). As a consequence of the above, the user can only see one status condition (the most recently generated) without looking at the queue. In the past, at least in the Spectrum Analyzer, multiple status conditions might display on the right side of the graticule. In general, there is no backwards compatibility specified or guaranteed between the error numbers in the X-Series and those of earlier products. Error, event, and status processing code in customers' software will probably need to be rewritten to work with X-Series. In the legacy analyzers, some conditions report as errors and others simply turn on status bits. Conditions that report as errors often report over and over as long as the condition exists. In the X-series, all conditions report as start and stop events. Consequently, software that repeatedly queries for a condition error until it stops reporting will have to be rewritten for the X-series.
Initial S/W Revision	Prior to A.02.00

Previous Page

See "Next Page" on page 1198.

Key Path	System, Show, Errors
Initial S/W Revision	Prior to A.02.00

Next Page

Next Page and Previous Page menu keys move you between pages of the log, if it fills more than one page. These keys are grayed out in some cases:

- If on the last page of the log, the Next Page key is grayed-out
- If on the first page of the log, the Previous Page key is grayed-out.
- If there is only one page, both keys are grayed out.

Key Path	System, Show, Errors
Initial S/W Revision	Prior to A.02.00

History

The History and Status keys select the Errors view. The Status key has a second line which shows a number in [square brackets]. This is the number of currently open status items.

Key Path	System, Show, Errors
Initial S/W Revision	Prior to A.02.00

History

The History and Status keys select the Errors view. The Status key has a second line which shows a number in [square brackets]. This is the number of currently open status items.

Key Path	System, Show, Errors
Initial S/W Revision	Prior to A.02.00

Verbose SCPI On/Off

When you turn Verbose SCPI on, additional information is returned when you send the :SYSTem:ERRor? query. The additional information consists of the characters that stimulated the error. This can aid you in debugging your test programs by indicating where in the parsing of a SCPI command the instrument encountered an invalid command or query.

Specifically, with Verbose SCPI on, the SYSTem:ERRor? query is expanded to show the SCPI data received, with the indicator <Err> at the point in the stream that the error occurred.

Verbose SCPI has no effect on the Show Errors screen or front panel Message Line; it only changes the response to the :SYST:ERR? query.

See the example below, where the invalid command “SENS:BOGUS” is sent:

Normal response to :SYST:ERR (using the Telnet window):

SCPI> SENS:BOGUS

SCPI> SYST:ERR?

–113,"Undefined header"

Now after turning on Verbose SCPI:

SCPI> SYST:BOGUS

SCPI> SYST:ERR?

–113,"Undefined header;SYST:BOGUS<Err>"

Key Path	System, Show, Errors
Mode	All
Remote Command	`:SYSTem:ERRor:VERBose OFF|ON|0|1` `:SYSTem:ERRor:VERBose?`
Example	:SYST:ERR:VERB ON
Preset	This is unaffected by Preset but is set to OFF on a “Restore System Defaults->Misc”
State Saved	No
Range	On | Off
Initial S/W Revision	Prior to A.02.00

Refresh

When pressed, refreshes the Show Errors display.

Key Path	System, Show, Errors
Initial S/W Revision	Prior to A.02.00

Clear Error Queue

This clears all errors in all error queues.

Note the following:

- Clear Error Queue does not affect the current status conditions.
- Mode Preset does not clear the error queue.
- Restore System Defaults will clear all error queues.
- *CLS only clears the queue if it is sent remotely and *RST does not affect any error queue.
- Switching modes does not affect any error queues.

Key Path	System, Show, Errors
Initial S/W Revision	Prior to A.02.00

Input Overload Enable (Remote Command Only)

Input Overload errors are reported using the Input Overload status bit (bit 12 in the Measurement Integrity status register). Input Overloads (for example, ADC Overload errors) can come and go with great frequency, generating many error events (for example, for signals just on the verge of overload), and so are not put into the SCPI error queue by default. Normally the status bit is the only way for detecting these errors remotely.

It is possible to enable Input Overload reporting to the SCPI queue, by issuing the :SYSTem:ERRor:OVERload ON command. To return to the default state, issue the :SYSTem:ERRor:OVERload OFF command. In either case, Input Overloads always set the status bit.

NOTE For versions of firmware before A.10.01, the Input Overload was only a Warning and so was never available in the SCPI queue, although it did set the status bit. For A.10.01 and later, the Input Overload is an error and can be enabled to the SCPI queue using this command.

Remote Command	`:SYSTem:ERRor:OVERload[:STATe] 0|1|OFF|ON`
Example	:SYST:ERR:OVER 1 Enable overload errors
Preset	Set to OFF by Restore Misc Defaults (no Overload errors go to SCPI)
State Saved	Saved in instrument state.
Initial S/W Revision	A.10.01

System

The System screen is formatted into three groupings: product descriptive information, options tied to the hardware, and software products:

```
<Product Name> <Product Description>
Product Number: N9020A
Serial Number: US46220924
Firmware Revision: A.01.01
Computer Name: <hostname>
Host ID: N9020A,US44220924

N9020A-503     Frequency Range to 3.6 GHz
N9020A-PFR     Precison Frequency Reference
N9020A-P03     Preamp 3.6 GHz

N9060A-2FP     Spectrum Analysis Measurement Suite   1.0.0.0
N9073A-1FP     WCDMA                                 1.0.0.0
N9073A-2FP     WCDMA with HSDPA                      1.0.0.0
```

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page menu key is grayed-out if the last page is information is presently displayed.

Key Path	System, Show
Mode	All
Example	SYST:SHOW SYST
Backwards Compatibility Notes	The hardware statistics that are displayed in the PSA Show System screen have been moved to a dedicated Show Hardware Statistics screen in the Service Menu.
Initial S/W Revision	Prior to A.02.00

System

The System screen is formatted into three groupings: product descriptive information, options tied to the hardware, and software products:

```
<Product Name> <Product Description>
Product Number: N9020A
Serial Number: US46220924
Firmware Revision: A.01.01
Computer Name: <hostname>
Host ID: N9020A,US44220924

N9020A-503     Frequency Range to 3.6 GHz
N9020A-PFR     Precison Frequency Reference
N9020A-P03     Preamp 3.6 GHz

N9060A-2FP     Spectrum Analysis Measurement Suite   1.0.0.0
N9073A-1FP     WCDMA                                 1.0.0.0
N9073A-2FP     WCDMA with HSDPA                      1.0.0.0
```

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page menu key is grayed-out if the last page is information is presently displayed.

Key Path	System, Show
Mode	All
Example	SYST:SHOW SYST
Backwards Compatibility Notes	The hardware statistics that are displayed in the PSA Show System screen have been moved to a dedicated Show Hardware Statistics screen in the Service Menu.
Initial S/W Revision	Prior to A.02.00

System

The System screen is formatted into three groupings: product descriptive information, options tied to the hardware, and software products:

```
<Product Name> <Product Description>
Product Number: N9020A
Serial Number: US46220924
Firmware Revision: A.01.01
Computer Name: <hostname>
Host ID: N9020A,US44220924

N9020A-503      Frequency Range to 3.6 GHz
N9020A-PFR      Precison Frequency Reference
N9020A-P03      Preamp 3.6 GHz

N9060A-2FP      Spectrum Analysis Measurement Suite   1.0.0.0
N9073A-1FP      WCDMA                                 1.0.0.0
N9073A-2FP      WCDMA with HSDPA                      1.0.0.0
```

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page menu key is grayed-out if the last page is information is presently displayed.

Key Path	System, Show
Mode	All
Example	SYST:SHOW SYST
Backwards Compatibility Notes	The hardware statistics that are displayed in the PSA Show System screen have been moved to a dedicated Show Hardware Statistics screen in the Service Menu.
Initial S/W Revision	Prior to A.02.00

Show System contents (Remote Command Only)

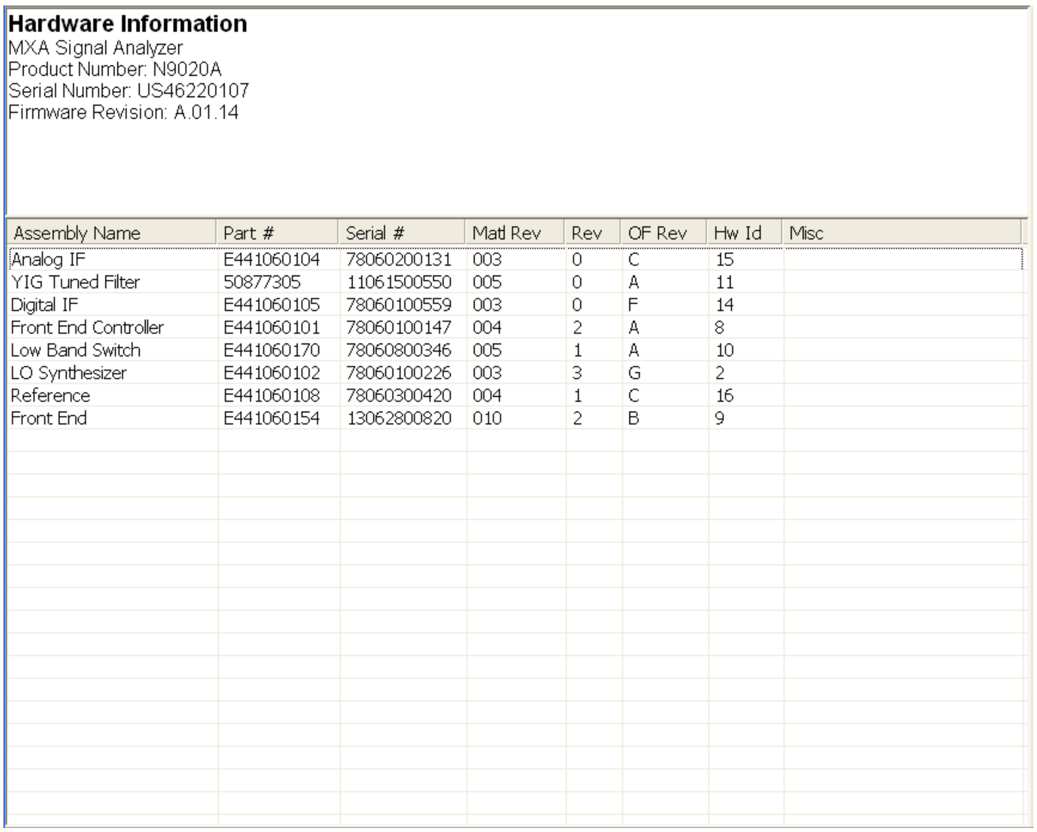
A remote command is available to obtain the contents of the Show System screen (the entire contents, not just the currently displayed page).

Remote Command	`:SYSTem:CONFigure[:SYSTem]?`
Example	:SYST:CONF?
Notes	The output is an IEEE Block format of the Show System contents. Each line is separated with a new-line character.
Initial S/W Revision	Prior to A.02.00

Hardware

The show hardware screen is used to view details of the installed hardware. This information can be used to determine versions of hardware assemblies and field programmable devices, in the advent of future upgrades or potential repair needs.

The screen is formatted into two groupings: product descriptive information and hardware information. The hardware information is listed in a table format:



Hardware Information
MXA Signal Analyzer
Product Number: N9020A
Serial Number: US46220107
Firmware Revision: A.01.14

Assembly Name	Part #	Serial #	Matl Rev	Rev	OF Rev	Hw Id	Misc
Analog IF	E441060104	78060200131	003	0	C	15	
YIG Tuned Filter	50877305	11061500550	005	0	A	11	
Digital IF	E441060105	78060100559	003	0	F	14	
Front End Controller	E441060101	78060100147	004	2	A	8	
Low Band Switch	E441060170	78060800346	005	1	A	10	
LO Synthesizer	E441060102	78060100226	003	3	G	2	
Reference	E441060108	78060300420	004	1	C	16	
Front End	E441060154	13062800820	010	2	B	9	

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page menu key is grayed-out if the last page is information is presently displayed.

Key Path	System, Show
Mode	All
Example	SYST:SHOW HARD
Initial S/W Revision	Prior to A.02.00

LXI

This key shows you the product number, serial number, firmware revision, computer name, IP address, Host ID, LXI Class, LXI Version, MAC Address, and the Auto-MDIX Capability.

Key Path	System, Show
Initial S/W Revision	Prior to A.02.00

Power On

Enables you to select how the instrument should power on. The options are: Mode and Input/Output Defaults, User Preset and Last State.

Key Path	System
Mode	All
Remote Command	`:SYSTem:PON:TYPE MODE|USER|LAST` `:SYSTem:PON:TYPE?`
Example	:SYST:PON:TYPE MODE
Preset	This is unaffected by a Preset but is set to Mode on a "Restore System Defaults->All"
State Saved	No
Backwards Compatibility SCPI	`:SYSTem:PON:TYPE PRESet` the "PRESet" parameter is supported for backward compatibility only and behaves the same as MODE.
Backwards Compatibility Notes	The Preset Type key in legacy analyzers has been removed, and the Power On toggle key has been replaced by this 1-of-N key in the System menu.
Initial S/W Revision	Prior to A.02.00

Mode and Input/Output Defaults

When the analyzer is powered on in Mode and Input/Output Defaults, it performs a Restore Mode Defaults to all modes in the instrument and also performs a Restore Input/Output Defaults.

Persistent parameters (such as Amplitude Correction tables or Limit tables) are not affected at power on, even though they are normally cleared by Restore Input/Output Defaults and/or Restore Mode Defaults.

Key Path	System, Power On
Mode	All
Example	SYST:PON:TYPE MODE
Readback Text	Defaults
Initial S/W Revision	Prior to A.02.00

User Preset

Sets Power On to User Preset. When the analyzer is powered on in User Preset, it will User Preset each mode and switch to the power-on mode. Power On User Preset will not affect any settings beyond what a normal User Preset affects.

NOTE An instrument could never power up for the first time in User Preset.

Key Path	System, Power On
Mode	All
Example	SYST:PON:TYPE USER
Readback Text	User Preset
Backwards Compatibility Notes	Power On User Preset will cause the instrument to power up in the power-on mode, not the last mode the instrument was in prior to shut down. Also, Power On User Preset will User Preset all modes. This does not exactly match legacy behavior.
Initial S/W Revision	Prior to A.02.00

Last State

Sets Power On to Last. When the analyzer is powered on, it will put all modes in the last state they were in prior to when the analyzer was put into Power Standby and it will wake up in the mode it was last in prior to powering off the instrument. The saving of the active mode prior to shutdown happens behind the scenes when a controlled shutdown is requested by using the front panel power Standby key or by using the remote command SYSTem:PDOWn. The non-active modes are saved as they are deactivated and recalled by Power On Last State.

NOTE An instrument can never power up for the first time in Last.

If line power to the analyzer is interrupted, for example by pulling the line cord plug or by switching off power to a test rack, Power On Last State may not work properly. For proper operation, Power On Last State depends on you shutting down the instrument using the Standby key or the SYSTem:PDOWn SCPI command. This will ensure the last state of each mode is saved and can be recalled during a power up.

Key Path	System, Power On
Mode	All
Example	SYST:PON:TYPE LAST
Notes	Power on Last State only works if you have done a controlled shutdown prior to powering on in Last. If a controlled shutdown is not done when in Power On Last State, the instrument will power up in the last active mode, but it may not power up in the active mode's last state. If an invalid mode state is detected, a Mode Preset will occur. To control the shutdown under remote control use the :SYSTem:PDOWn command.
Readback Text	Last State
Backwards Compatibility Notes	It is no longer possible to power-up the analyzer in the last mode the analyzer was running with that mode in the preset state. (ESA/PSA SYST:PRESET:TYPE MODE with SYST:PON:PRESET) You can power-on the analyzer in the last mode the instrument was running in its last state (SYST:PON:TYPE

	LAST), or you can specify the mode to power-up in its preset state (SYST:PON:MODE <mode>).
Initial S/W Revision	Prior to A.02.00

Power On Application

Accesses a menu that lists the available Modes and lets you select which Mode is to be the power-on application.

This application is used for Power On Type "Mode and Input/Output Defaults" and Restore System Defaults All.

Key Path	System, Power On
Mode	All
Remote Command	`:SYSTem:PON:MODE SA | BASIC | ADEMOD | NFIGURE | PNOISE | CDMA2K | TDSCDMA | VSA | VSA89601 | WCDMA | WIMAXOFDMA` `:SYSTem:PON:MODE?`
Example	SYST:PON:MODE SA
Notes	The list of possible modes (and remote parameters) to choose from is dependent on which modes are installed in the instrument.
Preset	This is unaffected by a Preset but is set on a "Restore System Defaults->All" to SA.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Configure Applications

The Configure Applications utility can be used to:

- select applications for preload
- determine how many applications can fit in memory at one time
- specify the order of the Modes in the Mode menu.

This utility consists of a window with instructions, a set of "Select Application" checkboxes, a "fuel bar" style memory gauge, and keys that help you set up your configuration.

For more information, see the following topics:

- "Preloading Applications" on page 1207
- "Access to Configure Applications utility" on page 1207
- "Virtual memory usage" on page 1207

Key Path	System, Power On
Example	:SYST:SHOW CAPP Displays the Config Applications screen
Initial S/W Revision	A.02.00

Preloading Applications

During runtime, if a Mode that is not preloaded is selected using the Mode menu or sending SCPI commands, there will be a pause while the Application is loaded. During this pause a message that says "Loading application, please wait ..." is displayed. Once loaded, the application stays loaded, so the next time you select it during a session, there is no delay.

Preloading enables you to "preload" at startup, to eliminate the runtime delay. Preloading an application will cause it to be loaded into the instrument's memory when the instrument program starts up. If you do this, the delay will increase the time it takes to start up the instrument program, but this may be preferable to having to wait the first time you select an application. Note that, once an application is loaded into memory, it cannot be unloaded without exiting and restarting the instrument program.

Note that there are more applications available for the X-Series than can fit into Windows Virtual Memory. By allowing you to choose which licensed applications to load at startup, the Configure Applications utility allows you to make optimal use of your memory.

Access to Configure Applications utility

A version of the utility runs the first time you power up the instrument after purchasing it. The utility automatically configures preloads so that as many licensed applications as possible are preloaded while keeping the total estimated virtual memory usage below the limit. This auto-configuration only takes place at the very first run, and after analyzer software upgrades.

You may, at any time, manually call up the Configure Applications utility by pressing System, Power On, Configure Applications, to find a configuration that works best for you, and then restart the instrument program.

The utility may also be called if, during operation of the instrument, you attempt to load more applications than can fit in memory at once.

Virtual memory usage

There are more applications available for the X-Series than can fit into memory at any one time, so the Configure Applications utility includes a memory tracker that serves two purposes:

1. It will not let you preload more applications than will fit into memory at once.

2. You can determine how many of your favorite applications can reside in memory at one time.

The utility provides a graphical representation of the amount of memory (note that the memory in question here is Virtual memory and is a limitation imposed by the operating system, not by the amount of physical memory you have in your instrument). You select applications to preload by checking the boxes on the left. Checked applications preload at startup. The colored fuel bar indicates the total memory required when all the checked applications are loaded (either preloaded or selected during runtime).

Here is what the fuel bar colors mean:

- RED: the applications you have selected cannot all fit into the instrument's memory. You must deselect applications until the fuel bar turns yellow.
- YELLOW: the applications you have selected can all fit into the instrument's memory, but there is less than 10% of the memory left, probably not enough to load any other applications, either via preload or by selecting a Mode while the instrument is running.
- GREEN: The indicator is green when <90% of the memory limit is consumed. This means the applications you have selected can all fit into the instrument's memory with room to spare. You will likely be able to load one or more other applications without running out of memory.

Select All

Marks all applications in the selection list. This allows you to enable all applications licensed on the instrument for pre-loading, or is a convenience for selecting all applications in one operation and then letting you deselect individual applications.

Key Path	System, Power On, Configure Applications
Initial S/W Revision	A.02.00

Deselect All

Clears the marks from all applications in the selection list, except the Power On application. The Power On application cannot be eliminated from the pre-load list.

Key Path	System, Power On, Configure Applications
Initial S/W Revision	A.02.00

Move Up

The application list is the order that applications appear in the Mode Menu. This key enables you to shift the selected application up in the list, thus moving the selected application earlier in the Mode Menu.

Key Path	System, Power On, Configure Applications
Initial S/W Revision	A.02.00

Move Down

The application list is the order that applications appear in the Mode Menu. This key enables you to shift the selected application down in the list, thus moving the selected application later in the Mode Menu.

Key Path	System, Power On, Configure Applications
Initial S/W Revision	A.02.00

Select/Deselect

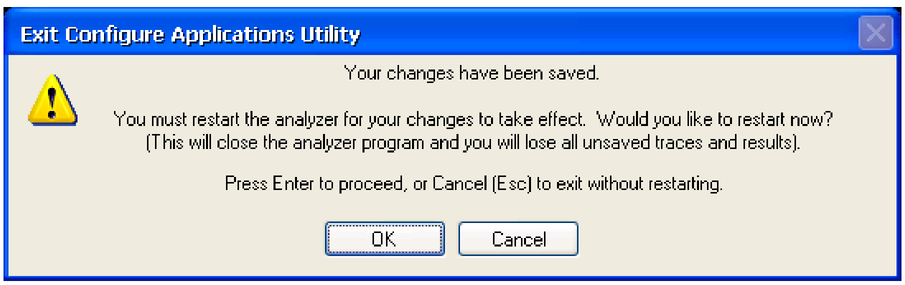
Toggles the currently highlighted application in the list.

Key Path	System, Power On, Configure Applications
Initial S/W Revision	A.02.00

Save Changes and Exit

Applies the configuration of the applications list. The marked applications will be pre-loaded in memory the next time the instrument application is started, and the order of the applications in the list will be the order of the applications in the Mode Menu.

After saving your changes, the analyzer asks you if you would like it to restart so that your changes can take effect (see dialog box, below). If you choose not to restart, the changes will not take affect until the next time you shut down and restart the analyzer.



Key Path	System, Power On, Configure Applications
Remote Command	`:SYSTem:PUP:PROCess`
Example	:SYST:PUP:PROC This is the SCPI command for restarting the analyzer. You must Wait after this command for the instrument application to restart
Notes	The softkey will be grayed-out when the virtual memory of the selected applications exceeds 100% of the limit.
Notes	You cannot use *WAI or *OPC? to synchronize operation after a restart. This command stops and restarts the instrument application, thus the SCPI operation is terminated and restarted. A remote program must use fixed wait time to resume sending commands to the instrument. The wait time will be dependent upon which applications are pre-loaded.
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.04.00

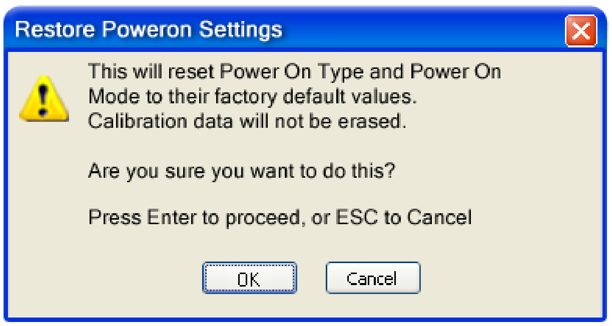
Exit Without Saving

Pressing this key will exit the Configure Applications utility without saving your changes.

Key Path	System, Power On, Configure Applications
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.04.00

Restore Power On Defaults

This selection causes the Power On Type and Power On Application settings to be a reset to their default values. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch. The Power On key, under the Restore System Defaults menu, causes the same action.



If you press any key other than OK or Enter, it is construed as a Cancel, because the only path that will actually cause the reset to be executed is through OK or Enter.

Key Path	System, Power On
Example	:SYST:DEF PON
Initial S/W Revision	Prior to A.02.00

Configure Applications - Remote Commands

The following topics provide details on using remote commands to configure the list of applications you want to load into the instrument memory, or to query the Virtual Memory utilization for your applications.

- "Configuration list (Remote Command Only)" on page 1211
- "Configuration Memory Available (Remote Command Only)" on page 1211
- "Configuration Memory Total (Remote Command Only)" on page 1211
- "Configuration Memory Used (Remote Command Only)" on page 1211
- "Configuration Application Memory (Remote Command Only)" on page 1212

Configuration list (Remote Command Only)

This remote command is used to set or query the list of applications to be loaded in-memory.

Remote Command	`:SYSTem:PON:APPLication:LLISt <string of INSTrument:SELect names>` `:SYSTem:PON:APPLication:LLISt?`
Example	:SYST:PON:APPL:LLIS "SA,BASIC,WCDMA"
Notes	Parameter <string of INSTrument:SELect names> uses the enum values of the :INSTrument:SELect command. The order of the <string of INSTrument:SELect names> is the order that the applications are loaded into memory, and the order that they appear in the Mode Menu. Error message –225 "Out of Memory" is reported when more applications are listed than can reside in Virtual Memory. When this occurs, the existing applications load list is unchanged.
Preset	Not affected by Preset
State Saved	Not saved in instrument state
Initial S/W Revision	A.02.00

Configuration Memory Available (Remote Command Only)

Queries the amount of Virtual Memory remaining.

Remote Command	`:SYSTem:PON:APPLication:VMEMory[:AVAilable]?`
Example	:SYST:PON:APPL:VMEM?
Preset	Not affected by Preset
Initial S/W Revision	A.02.00

Configuration Memory Total (Remote Command Only)

Queries the limit of Virtual Memory allowed for applications.

Remote Command	`:SYSTem:PON:APPLication:VMEMory:TOTal?`
Example	:SYST:PON:APPL:VMEM:TOT?
Preset	Not affected by Preset
Initial S/W Revision	A.02.00

Configuration Memory Used (Remote Command Only)

Queries the amount of Virtual Memory used by all measurement applications.

Remote Command	`:SYSTem:PON:APPLication:VMEMory:USED?`
Example	:SYST:PON:APPL:VMEM:USED?

Preset	Not affected by Preset
Initial S/W Revision	A.02.00

Configuration Application Memory (Remote Command Only)

Queries the amount of Virtual Memory consumed by a particular application.

Remote Command	`:SYSTem:PON:APPLication:VMEMory:USED:NAME? <INSTrument:SELect name>`
Example	:SYST:PON:APPL:VMEM:USED:NAME? CDMA2K
Notes	<INSTrument:SELect name> uses one of the enum values of the :INSTrument:SELect command. If the <INSTrument:SELect name> provided is invalid, the return value is 0 (zero).
Preset	Not affected by Preset
Initial S/W Revision	Prior to A.02.00

Alignments

The Alignments Menu controls and displays the automatic alignment of the instrument, and provides the ability to restore the default alignment values.

The current setting of the alignment system is displayed in the system Settings Panel along the top of the display, including a warning icon for conditions that may cause specifications to be impacted.

Key Path	System
Initial S/W Revision	Prior to A.02.00

Auto Align

Configures the method for which the automatic background alignment is run.

Automatic background alignments are run periodically between measurement acquisitions. The instrument's software determines when alignments are to be performed to maintain warranted operation. The recommended setting for Auto Align is Normal.

An Auto Align execution cannot be aborted with the Cancel (ESC) key. To interrupt an Auto Align execution, select Auto Align Off.

Key Path	System, Alignments
Mode	All
Remote Command	`:CALibration:AUTO ON|PARTial|OFF`

	:CALibration:AUTO?
Example	:CAL:AUTO ON
Notes	While Auto Align is executing, bit 0 of Status Operation register is set.
Couplings	Auto Align is set to Off if Restore Align Data is invoked.
Preset	This is unaffected by Preset but is set to ON upon a “Restore System Defaults->Align”.
State Saved	No
Status Bits/OPC dependencies	When Auto Align is executing, bit 0 in the Status Operational register is set.
Backwards Compatibility SCPI	:CALibration:AUTO ALERt Parameter ALERt is for backward compatibility only and is mapped to PARTial
Backwards Compatibility Notes	1. ESA SCPI for Auto Align is :CALibration:AUTO <Boolean>. The command for X-Series is an enumeration. Thus the parameters of “0” and “1” are not possible in X-Series. 2. Similarly, the ESA SCPI for :CALibration:AUTO? returned the Boolean value 1 or 0, in X-Series it is an Enumeration (string). Thus, queries by customer applications into numeric variables will result in an error 3. In PSA Auto Align OFF was not completely off, it is equivalent to PARTial in X-Series. In X-Series, OFF will be fully OFF. This means users of PSA SCPI who choose OFF may see degraded performance and should migrate their software to use PARTial.
Initial S/W Revision	Prior to A.02.00

Normal

Auto Align, Normal turns on the automatic alignment of all measurement systems. The Auto Align, Normal selection maintains the instrument in warranted operation across varying temperature and over time.

If the condition “Align Now, All required” is set, transition to Auto Align, Normal will perform the required alignments and clear the “Align Now, All required” condition and then continue with further alignments as required to maintain the instrument adequately aligned for warranted operation.

When Auto Align, Normal is selected the Auto Align Off time is set to zero.

When Auto Align, Normal is selected the Settings Panel indicates ALIGN AUTO.

Key Path	System, Alignments, Auto Align
Mode	All
Example	:CAL:AUTO ON
Notes	Alignment processing as a result of the transition to Normal will be executed sequentially. Thus, *OPC? or *WAI following CAL:AUTO ON will return when the alignment processing is complete. The presence of an external signal may interfere with the RF portion of the alignment. If so, the Error Condition message “Align skipped: 50 MHz interference” or “Align skipped: 4.8 GHz interference” is reported, and bit 11 is set in the Status Questionable Calibration register. After the interfering signal is removed, subsequent alignment of the RF will clear the condition, and clear bit 11 in the Status Questionable Calibration register.

Readback Text	Normal
Status Bits/OPC dependencies	An interfering user signal may prevent automatic alignment of the RF subsystem. If this occurs, the Error Condition message “Align skipped: 50 MHz interference” or “Align skipped: 4.8 GHz interference” is reported, the Status Questionable Calibration bit 11 is set, and the alignment proceeds. When a subsequent alignment of the RF subsystem succeeds, either by the next cycle of automatic alignment or from an Align Now, RF, the Error Condition and Status Questionable Calibration bit 11 are cleared.
Initial S/W Revision	Prior to A.02.00

Partial

Auto Align, Partial disables the full automatic alignment and the maintenance of warranted operation for the benefit of improved measurement throughput. Accuracy is retained for the Resolution Bandwidth filters and the IF Passband which is critical to FFT accuracy, demodulation, and many measurement applications. With Auto Align set to Partial, you are now responsible for maintaining warranted operation by updating the alignments when they expire. The Auto Align, Alert mechanism will notify you when alignments have expired. One solution to expired alignments is to perform the Align All, Now operation. Another is to return the Auto Align selection to Normal.

Auto Align, Partial is recommended for measurements where the throughput is so important that a few percent of improvement is more valued than an increase in the accuracy errors of a few tenths of a decibel. One good application of Auto Align, Partial would be an automated environment where the alignments can be called during overhead time when the device-under-test is exchanged.

When Auto Align, Partial is selected the elapsed time counter begins for Auto Align Off time.

When Auto Align, Partial is selected the Settings Panel indicates ALIGN PARTIAL with a warning icon. The warning icon is to inform the operator that they are responsible for maintaining the warranted operation of the instrument

Key Path	System, Alignments, Auto Align
Mode	All
Example	:CAL:AUTO PART
Notes	Auto Align Partial begins the elapsed time counter for Auto Align Off time.
Readback Text	Partial
Initial S/W Revision	Prior to A.02.00

Off

Auto Align, Off disables automatic alignment and the maintenance of warranted operation, for the benefit of maximum measurement throughput. With Auto Align set to Off, you are now responsible for maintaining warranted operation by updating the alignments when they expire. The Auto Align, Alert mechanism will notify you when alignments have expired. One solution to expired alignments is to perform the Align All, Now operation. Another is to return the Auto Align selection to Normal.

The Auto Align, Off setting is rarely the best choice, because Partial gives almost the same improvement in throughput while maintaining the warranted performance for a much longer time. The choice is intended for unusual circumstances such as the measurement of radar pulses where you might like the revisit time to be as consistent as possible.

When Auto Align, Off is selected the Auto Align Off time is initialized and the elapsed time counter begins.

When Auto Align, Off is selected the Settings Panel indicates ALIGN OFF with a warning icon. The warning icon is to inform the operator that they are responsible for maintaining the warranted operation of the instrument:

Key Path	System, Alignments, Auto Align
Mode	All
Example	:CAL:AUTO OFF
Notes	Auto Align Off begins the elapsed time counter for Auto Align Off time.
Couplings	Auto Align is set to Off if Restore Align Data is invoked.
Readback Text	Off
Initial S/W Revision	Prior to A.02.00

All but RF

Auto Align, All but RF, configures automatic alignment to include or exclude the RF subsystem. (Eliminating the automatic alignment of the RF subsystem prevents the input impedance from changing. The normal input impedance of 50 ohms can change to an open circuit when alignments are being used. Some devices under test do not behave acceptably under such circumstances, for example by showing instability.) When Auto Align, All but RF ON is selected, the operator is responsible for performing an Align Now, RF when RF-related alignments expire. The Auto Align, Alert mechanism will notify the operator to perform an Align Now, All when the combination of time and temperature variation is exceeded.

When Auto Align, All but RF ON is selected the Settings Panel indicates ALIGN AUTO/NO RF with a warning icon (warning icon is intended to inform the operator they are responsible for the maintaining the RF alignment of the instrument):

Key Path	System, Alignments, Auto Align
Mode	All
Remote Command	`:CALibration:AUTO:MODE ALL|NRF` `:CALibration:AUTO:MODE?`
Example	:CAL:AUTO:MODE NRF
Preset	This is unaffected by Preset but is set to ALL on a “Restore System Defaults->Align”.
State Saved	No
Readback Text	RF or NRF
Initial S/W Revision	Prior to A.02.00

Alert

The instrument will signal an Alert when conditions exist such that you will need to perform a full alignment (for example, Align Now, All). The Alert can be configured in one of four settings; Time & Temperature, 24 hours, 7 days, or None. A confirmation is required when a selection other than Time & Temperature is chosen. This prevents accidental deactivation of alerts.

With Auto Align set to Normal, the configuration of Alert is not relevant because the instrument's software maintains the instrument in warranted operation.

Key Path	System, Alignments, Auto Align
Mode	All
Remote Command	`:CALibration:AUTO:ALERt TTEMperature|DAY|WEEK|NONE` `:CALibration:AUTO:ALERt?`
Example	:CAL:AUTO:ALER TTEM
Notes	The alert that alignment is needed is the setting of bit 14 in the Status Questionable Calibration register.
Preset	This is unaffected by Preset but is set to TTEMperature on a "Restore System Defaults->Align".
State Saved	No
Status Bits/OPC dependencies	The alert is the Error Condition message "Align Now, All required" and bit 14 is set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

Time & Temperature

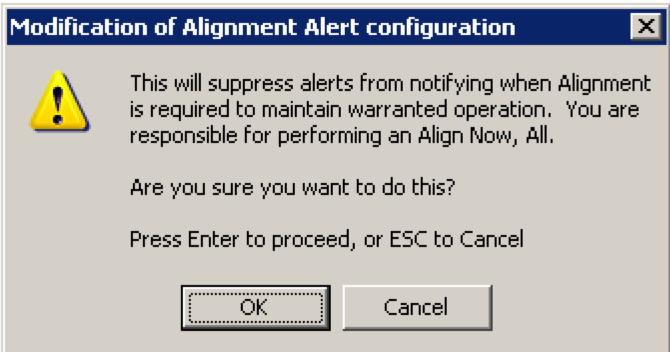
With Auto Align Alert set to Time & Temperature the instrument will signal an alert when alignments expire due to the combination of the passage of time and changes in temperature. The alert is the Error Condition message "Align Now, All required". If this choice for Alert is selected, the absence of an alert means that the analyzer alignment is sufficiently up-to-date to maintain warranted accuracy.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
Example	:CAL:AUTO:ALER TTEM
Readback Text	Time & Temp
Status Bits/OPC dependencies	Bit 14 is set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

24 hours

With Auto Align Alert set to 24 Hours the instrument will signal an alert after a time span of 24 hours since the last successful full alignment (for example, Align Now, All or completion of a full Auto Align). You may choose this selection in an environment where the temperature is stable on a daily basis at a small risk of accuracy errors in excess of the warranted specifications. The alert is the Error Condition message "Align Now, All required".

For front-panel operation , confirmation is required to transition into this setting of Alert. The confirmation dialog is:



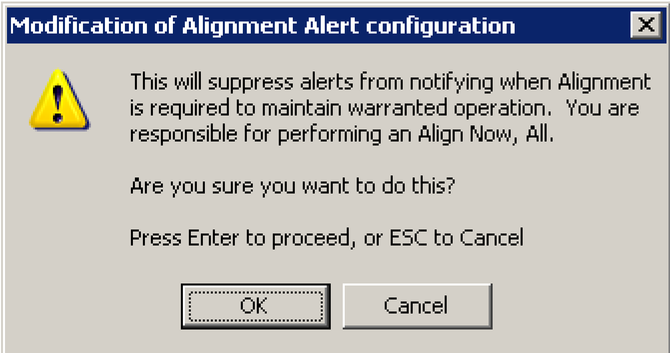
No confirmation is required when Alert is configured through a remote command.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
Example	:CAL:AUTO:ALER DAY
Readback Text	24 hours
Status Bits/OPC dependencies	Bit 14 is set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

7 days

With Auto Align Alert is set to 7 days the instrument will signal an alert after a time span of 168 hours since the last successful full alignment (for example, Align Now, All or completion of a full Auto Align). You may choose this selection in an environment where the temperature is stable on a weekly basis, at a modest risk of accuracy degradations in excess of warranted performance. The alert is the Error Condition message "Align Now, All required".

For front panel operation, confirmation is required for the customer to transition into this setting of Alert. The confirmation dialog is:



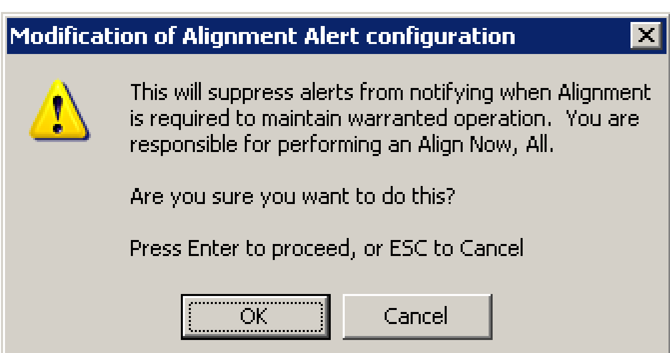
No confirmation is required when Alert is configured through a remote command.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
Example	:CAL:AUTO:ALER WEEK
Readback Text	7 days
Status Bits/OPC dependencies	Bit 14 is set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

None

With Auto Align Alert set to None the instrument will not signal an alert. This is provided for rare occasions where you are making a long measurement which cannot tolerate Auto Align interruptions, and must have the ability to capture a screen image at the end of the measurement without an alert posted to the display. Keysight does not recommends using this selection in any other circumstances, because of the risk of accuracy performance drifting well beyond expected levels without the operator being informed.

For front panel operation, confirmation is required to transition into this setting of Alert. The confirmation dialog is:



No confirmation is required when Alert is configured through a remote command.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
Example	:CAL:AUTO:ALER NONE
Initial S/W Revision	Prior to A.02.00

Execute Expired Alignments (Remote Command Only)

Alignments can be expired in the situation where Auto Align is in the state of Partial or Off. This feature runs the alignments that have expired. This is different than performing an Align All, Now operation, which performs an alignment of **all** subsystems, regardless of whether they are needed or not. Execute Expired Alignments performs alignments of only the individual subsystems that have become due.

Mode	All
Remote Command	`:CALibration:EXPired?`
Example	:CAL:EXP?
Notes	:CALibration:EXPired? returns 0 if successful :CALibration:EXPired? returns 1 if failed
Initial S/W Revision	Prior to A.02.00

Align Now

Accesses alignment processes that are immediate action operations. They perform complete operations and run until they are complete.

Key Path	System, Alignments
Initial S/W Revision	Prior to A.02.00

All

Immediately executes an alignment of all subsystems. The instrument stops any measurement currently underway, performs the alignment, then restarts the measurement from the beginning (similar to pressing the Restart key).

If an interfering user signal is present at the RF Input, the alignment is performed on all subsystems except the RF. After completion, the Error Condition message “Align skipped: 50 MHz interference” or “Align skipped: 4.8 GHz interference” is generated. In addition the Error Condition message “Align Now, RF required” is generated, and bits 11 and 12 are set in the Status Questionable Calibration register.

The query form of the remote commands (:CALibration[:ALL]? or *CAL?) invokes the alignment of all subsystems and returns a success or failure value. An interfering user signal is not grounds for failure; if the alignment was able to succeed on all portions but unable to align the RF because of an interfering signal, the resultant will be the success value.

Successful completion of Align Now, All will clear the “Align Now, All required” Error Condition, and clear bit 14 in the Status Questionable Calibration register. It will also begin the elapsed time counter for Last Align Now, All Time, and capture the Last Align Now, All Temperature.

If the Align RF subsystem succeeded in aligning (no interfering signal present), the elapsed time counter begins for Last Align Now, RF Time, and the temperature is captured for the Last Align Now, RF Temperature. In addition the Error Conditions “Align skipped: 50 MHz interference” and “Align skipped: 4.8 GHz interference” are cleared, the Error Condition “Align Now, RF required” is cleared, and bits 11 and 12 are cleared in the Status Questionable Calibration register

Align Now, All can be interrupted by pressing the Cancel (ESC) front-panel key or remotely with Device Clear followed by the :ABORt SCPI command. When this occurs the Error Condition message “Align Now, All required” is generated, and bit 14 is set in the Status Questionable Condition register. This is because new alignment data may be employed for an individual subsystem, but not a cohesive set of data for all subsystems.

In many cases, you might find it more convenient to change alignments to Normal, instead of executing Align Now, All. When the Auto Align process transitions to Normal, the analyzer will immediately start to update only the alignments that have expired, thus efficiently restoring the alignment process.

In models with the RF Preselector, such as the N9038A, the Align Now All alignment will immediately execute an alignment of all subsystems in the Spectrum Analyzer and partial subsystems of the RF Preselector. The additional alignments are the System Gain, Mechanical attenuator and Electronic attenuator alignments on the RF Preselector path. The purpose of these alignments is to improve the RF Preselector path amplitude variation compared to the bypass path.

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	`:CALibration[:ALL]` `:CALibration[:ALL]?`
Example	:CAL
Notes	:CALibration[:ALL]? returns 0 if successful :CALibration[:ALL]? returns 1 if failed :CALibration[:ALL]? is the same as *CAL? While Align Now, All is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. Successful completion will clear bit 14 in the Status Questionable Calibration register. An interfering user signal is not grounds for failure of Align Now, All. However, bits 11 and 12 are set in the Status Questionable Calibration register to indicate Align Now, RF is required. An interfering user supplied signal will result in the instrument requiring an Align Now, RF with the interfering signal removed.
Couplings	Initializes the time for the Last Align Now, All Time. Records the temperature for the Last Align Now, All Temperature. If Align RF component succeeded, initializes the time for the Last Align Now, RF Time.

	If Align RF component succeeded, records the temperature for the Last Align Now, RF Temperature.
Status Bits/OPC dependencies	Bits 11, 12, or 14 may be set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

Mode	All
Remote Command	`*CAL?`
Example	*CAL?
Notes	*CAL? returns 0 if successful *CAL? returns 1 if failed :CALibration[:ALL]? is the same as *CAL? See additional remarks described with :CALibration[:ALL]? Everything about :CALibration[:ALL]? is synonymous with *CAL? including all conditions, status register bits, and couplings
Initial S/W Revision	Prior to A.02.00

All but RF

Immediately executes an alignment of all subsystems except the RF subsystem. The instrument will stop any measurement currently underway, perform the alignment, and then restart the measurement from the beginning (similar to pressing the Restart key). This can be used to align portions of the instrument that are not impacted by an interfering user input signal.

This operation might be chosen instead of All if you do not want the device under test to experience a large change in input impedance, such as a temporary open circuit at the analyzer input.

The query form of the remote commands (:CALibration:NRF?) will invoke the alignment and return a success or failure value.

Successful completion of Align Now, All but RF will clear the “Align Now, All required” Error Condition, and clear bit 14 in the Status Questionable Calibration register. If “Align Now, All required” was in effect prior to executing the All but RF, the Error Condition message “Align Now, RF required” is generated and bit 12 in the Status Questionable Calibration register is set. It will also begin the elapsed time counter for Last Align Now, All Time, and capture the Last Align Now, All Temperature.

Align Now, All but RF can be interrupted by pressing the Cancel (ESC) front-panel key or remotely with Device Clear followed by the :ABORt SCPI command. When this occurs the Error Condition message “Align Now, All required” is generated, and bit 14 is set in the Status Questionable Condition register. This is because new alignment data may be used for an individual subsystem, but not a full new set of data for all subsystems.

In models with the RF Preselector, such as the N9038A, the “All but RF” alignment will execute an alignment of all subsystems except the RF subsystem of the Spectrum Analyzer, as well as the system gain of the RF Preselector.

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	`:CALibration:NRF` `:CALibration:NRF?`
Example	:CAL:NRF
Notes	:CALibration:NRF? returns 0 if successful :CALibration:NRF? returns 1 if failed While Align Now, All but RF is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. Successful completion will clear bit 14 in the Status Questionable Calibration register and set bit 12 if invoked with “Align Now, All required”.
Couplings	Initializes the time for the Last Align Now, All Time. Records the temperature for the Last Align Now, All Temperature.
Status Bits/OPC dependencies	Bits 12 or 14 may be set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

RF

Immediately executes an alignment of the RF subsystem. The instrument stops any measurement currently underway, performs the alignment, then restarts the measurement from the beginning (similar to pressing the Restart key).

This operation might be desirable if the alignments had been set to not include RF alignments, or if previous RF alignments could not complete because of interference which has since been removed.

If an interfering user signal is present at the RF Input, the alignment will terminate and generate the Error Condition message “Align skipped: 50 MHz interference” or “Align skipped: 4.8 GHz interference”, and Error Condition “Align Now, RF required”. In addition, bits 11 and 12 will be set in the Status Questionable Calibration register.

The query form of the remote commands (:CALibration:RF?) will invoke the alignment of the RF subsystem and return a success or failure value. An interfering user signal is grounds for failure.

Successful completion of Align Now, RF will begin the elapsed time counter for Last Align Now, RF Time, and capture the Last Align Now, RF Temperature.

Align Now, RF can be interrupted by pressing the Cancel (ESC) front-panel key or remotely with Device Clear followed by the :ABORt SCPI command. When this occurs, the Error Condition message “Align Now, RF required” is generated, and bit 12 is set in the Status Questionable Condition register. None of the new alignment data is used.

In models with the RF Preselector, such as the N9038A, the RF alignment will execute an alignment of the RF subsystem of the Spectrum Analyzer, as well as the RF subsystem on RF Preselector path.

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	`:CALibration:RF` `:CALibration:RF?`
Example	:CAL:RF
Notes	:CALibration:RF? returns 0 if successful :CALibration:RF? returns 1 if failed (including interfering user signal) While Align Now, RF is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. Successful completion clears the Error Conditions “Align skipped: 50 MHz interference” and “Align skipped: 4800 MHz interference” and the Error Conditions “Align RF failed” and “Align Now, RF required”, and clears bits 3, 11, and 12 in the Status Questionable Calibration register. A failure encountered during alignment will generate the Error Condition message “Align RF failed” and set bit 3 in the Status Questionable Calibration register. An interfering user signal will result in bits 11 and 12 to be set in the Status Questionable Calibration register to indicate Align Now, RF is required. An interfering user supplied signal will result in the instrument requiring an Align Now, RF with the interfering signal removed.
Couplings	Initializes the time for the Last Align Now, RF Time. Records the temperature for the Last Align Now, RF Temperature.
Status Bits/OPC dependencies	Bits 11, 12, or 14 may be set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

External Mixer

Immediately executes an alignment of the External Mixer that is plugged into the USB port. The instrument stops any measurement currently underway, performs the alignment, then restarts the measurement from the beginning (similar to pressing the Restart key). As this alignment calibrates the LO power to the mixer, this is considered an LO alignment; and failure is classified as an LO alignment failure.

The query form of the remote commands (:CALibration:EMIXer?) will invoke the alignment of the External Mixer and return a success or failure value.

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	`:CALibration:EMIXer` `:CALibration:EMIXer?`

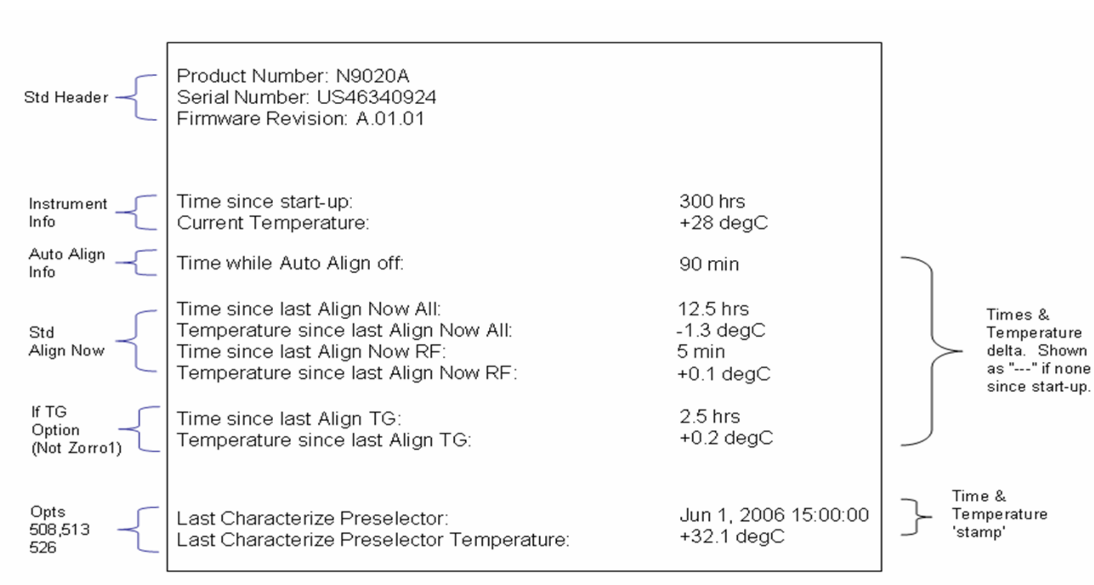
Example	:CAL:EMIX
Notes	:CAL:EMIX? returns 0 if successful :CAL:EMIX? returns 1 if failed While Align Now, Ext Mix is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. A failure encountered during alignment will generate the Error Condition message “Align LO failed” and set bit 5 in the Status Questionable Calibration register. Successful completion will clear the “Align LO failed” message and bit 5 in the Status Questionable Calibration register.
Dependencies	This key does not appear unless option EXM is present and is grayed-out unless a USB mixer is plugged in to the USB.
Status Bits/OPC dependencies	Bit3 may be set in the Status Questionable Calibration Extended Failure register.
Initial S/W Revision	A.08.00

Show Alignment Statistics

Shows alignment information you can use to ensure that the instrument is operating in a specific manner. The Show Alignment Statistics screen is where you can view time and temperature information.

Values which are displayed are only updated when the Show Alignment Statistics screen is invoked, they are not updated while the Show Alignment Statistics screen is being displayed. The remote commands that access this information obtain current values.

An example of the Show Alignment Statistics screen would be similar to:



A successful Align Now, RF will set the Last Align RF temperature to the current temperature, and reset the Last Align RF time. A successful Align Now, All or Align Now, All but RF will set the Last Align Now All temperature to the current temperature, and reset the Last Align Now All time. A successful Align Now, All will also reset the Last Align RF items if the RF portion of the Align Now succeeded.

Key Path	System, Alignments
Mode	All
Notes	The values displayed on the screen are only updated upon entry to the screen and not updated while the screen is being displayed.
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:SYSTem:PON:TIME?`
Example	:SYST:PON:TIME?
Notes	Value is the time since the most recent start-up in seconds.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:CURRent?`
Example	:CAL:TEMP:CURR?
Notes	Value is in degrees Centigrade. Value is invalid if using default alignment data (Align Now, All required)
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TIME:LALL?`
Example	:CAL:TIME:LALL?
Notes	Value is the elapsed time, in seconds, since the last successful Align Now, All or Align Now, All but RF was executed.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:LALL?`
Example	:CAL:TEMP:LALL?
Notes	Value is in degrees Centigrade at which the last successful Align Now, All or Align Now, All but RF was executed.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TIME:LRF?`
Example	:CAL:TIME:LRF?
Notes	Value is the elapsed time, in seconds, since the last successful Align Now, RF was executed, either individually or as a component of Align Now, All.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:LRF?`
Example	:CAL:TEMP:LRF?
Notes	Value is in degrees Centigrade at which the last successful Align Now, RF was executed, either individually or as a component of Align Now, All.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TIME:SOURce:LALL?`
Example	:CAL:TIME:SOUR:LALL?
Notes	Value is the date and time of the last successful Align Now, Source was performed on the instrument.
State Saved	No
Initial S/W Revision	A.05.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:SOURce: LALL?`
Example	:CAL:TEMP:SOUR:LALL?
Notes	Value is in degrees Centigrade at which the last successful Align Now, Sourcewas performed on the instrument.
State Saved	No
Initial S/W Revision	A.05.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TIME:LPReselector?`
Example	:CAL:TIME:LPR?
Notes	Value is the date and time the last successful Characterize Preselector was executed. The date is separated from the time by a space character. Returns “” if no Characterize Preselector has ever been performed on the instrument.
Dependencies	In models that do not include preselectors, this command is not enabled and any attempt to set or query will yield an error.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:LPReselector?`
Example	:CAL:TEMP:LPR?
Notes	Value is in degrees Centigrade at which the last successful Characterize Preselector was executed.
Dependencies	In models that do not include preselectors, this command is not enabled and any attempt to set or query will yield an error.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:AUTO:TIME:OFF?`
Example	:CAL:AUTO:TIME:OFF?
Notes	Value is the elapsed time, in seconds, since Auto Align has been set to Off or Off with Alert. The value

	is 0 if Auto Align is ALL or NORF.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TIME:RFPSelector:LCONducted?`
Example	:CAL:TIME:RFPS:LCON?
State Saved	No
Restriction and Notes	Values are the date and time the last successful Align Now, 20 Hz – 30 MHz was executed. The date is separated from the time by a semi-colon character.

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:RFPSelector:LCONducted?`
Example	:CAL:TEMP:RFPS:LCON?
State Saved	No
Restriction and Notes	Value is in degrees Centigrade at which the last successful Align Now, 20 Hz – 30 MHz was executed.

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TIME:RFPSelector:LRADiated?`
Example	:CAL:TIME:RFPS:LRAD?
State Saved	No
Restriction and Notes	Value is the date and time the last successful Align Now, 30 MHz – 3.6 GHz was executed. The date is separated from the time by a semi-colon character.

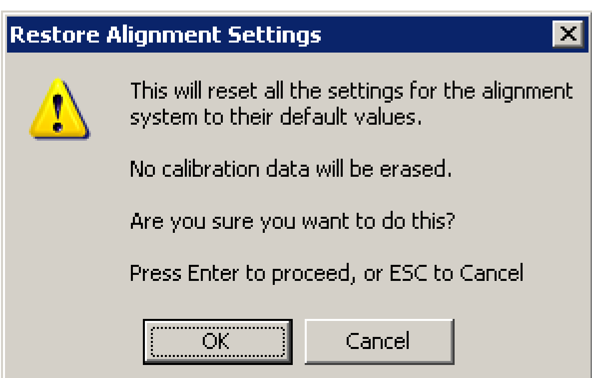
Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:RFPSelector:LRADiated?`
Example	:CAL:TEMP:RFPS:LRAD?
State Saved	No
Restriction and Notes	Value is in degrees Centigrade at which the last successful Align Now, 30 MHz – 3.6 GHz was executed.

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:RFPSelector:SCHeduler:TIME:NEXT?` This query returns data using the following format "YYYY/MM/DD; HH:MM:SS"
Example	:CAL:RFPS:SCH:TIME:NEXT?
State Saved	No
Restriction and Notes	The next run time will be updated based on the start date/time and recurrence set by the users. "date" is representation of the date the task will run in the form of "YYYY/MM/DD" where: -YYYY is the four digit representation of year. (for example, 2009) -MM is the two digit representation of month. (for example, 01 to 12) -DD is the two digit representation of the day. (for example, 01 to 28, 29, 30 or 31 depending on the month and year) "time" is a representation of the time of day the task will run in the form of "HH:MM:SS" where: -HH is the two digit representation of the hour in 24 hour format -MM is the two digit representation of minute -SS is the two digit representation of seconds For model N9038A only.

Restore Align Defaults

Initializes the alignment user interface settings, not alignment data, to the factory default values. Align Now, All must be executed if the value of the Timebase DAC results in a change.

For front panel operation, you are prompted to confirm action before setting the alignment parameters to factory defaults:



The parameters affected are:

Parameter	Setting
Timebase DAC	Calibrated
Timebase DAC setting	Calibrated value

Auto Align State	Normal (if the instrument is not operating with default alignment data, Off otherwise)
Auto Align All but RF	Off
Auto Align Alert	Time & Temperature

Key Path	System, Alignments
Mode	All
Example	:SYST:DEF ALIG
Notes	Alignment processing that results as the transition to Auto Alignment Normal will be executed sequentially; thus *OPC? or *WAI will wait until the alignment processing is complete.
Initial S/W Revision	Prior to A.02.00

Backup or Restore Align Data...

Opens the utility for backing-up or restoring the alignment data.

Alignment data for the instrument resides on the hard drive in a database. Keysight uses high quality hard drives; however it is highly recommended the alignment data be backed-up to storage outside of the instrument. Additionally, for customers who use multiple CPU Assemblies or multiple disk drives, the alignment that pertains to the instrument must be transferred to the resident hard drive after a CPU or hard drive is replaced. This utility facilitates backing-up and restoring the alignment data.

NOTE This utility allows the operator to navigate to any location of the Windows file system. It is intended that the operator use a USB memory device or Mapped Network Drive to back up the alignment data to storage outside of the instrument.

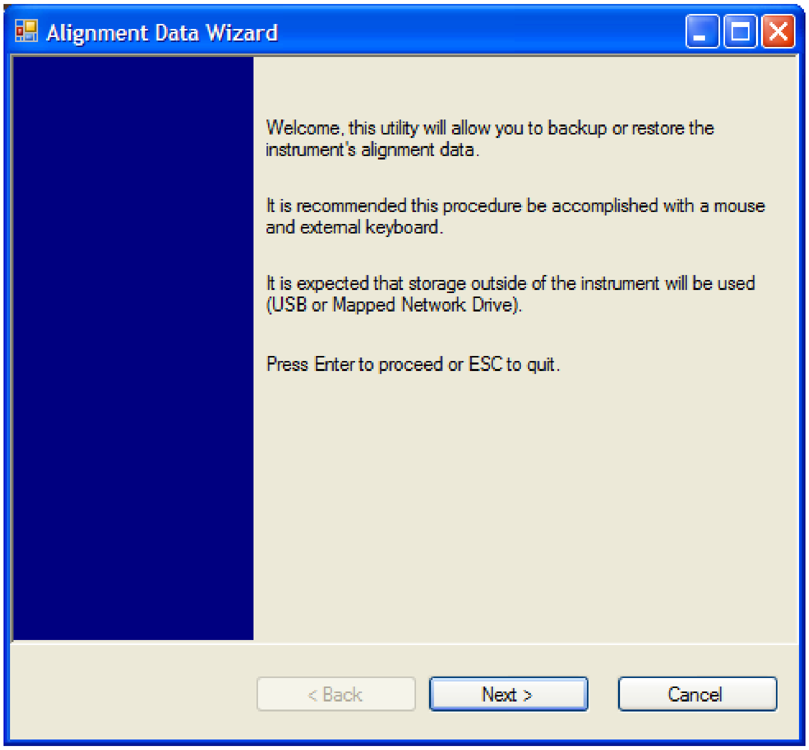
Key Path	System, Alignments
Initial S/W Revision	A.02.00

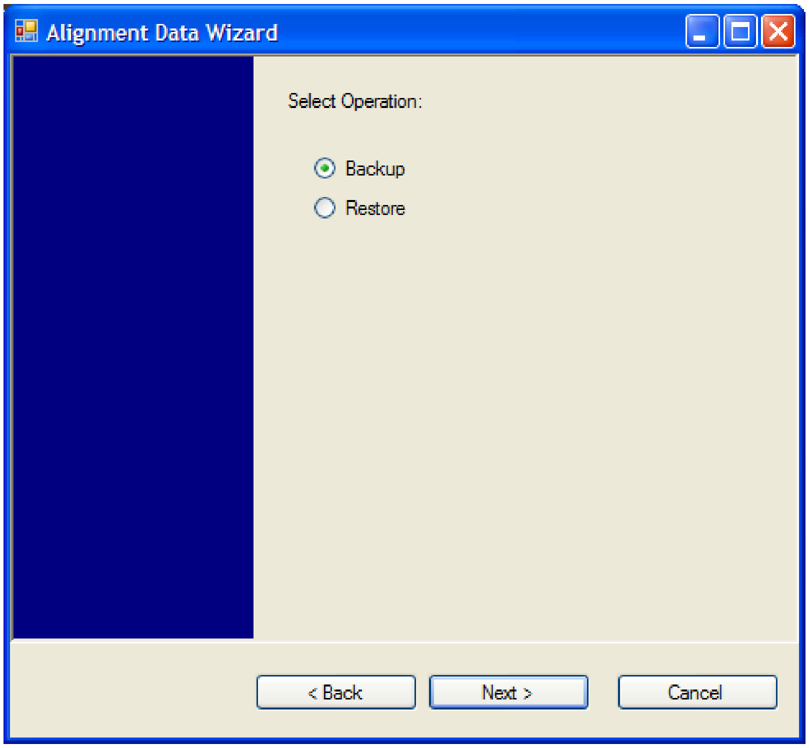
Key Path	System, Alignments
Mode	All
Remote Command	`:CALibration:DATA:DEFault`
Example	:CAL:DATA:DEF
Couplings	Sets Auto Align to Off. Sets bit 14 in the Status Questionable Calibration register. The Error Condition message “Align Now, All required” is generated.
Initial S/W Revision	Prior to A.02.00

Alignment Data Wizard

The Backup or Restore Alignment Data wizard guides you through the operation of backing-up or restoring alignment data.

The following dialog boxes may be used without a mouse or external keyboard, if you use the default file names.

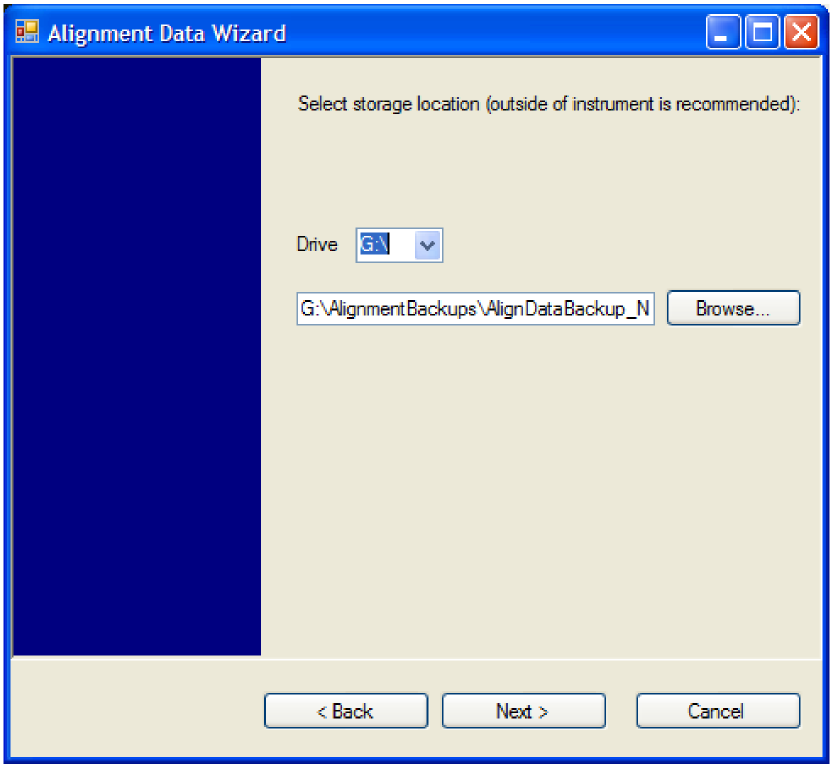




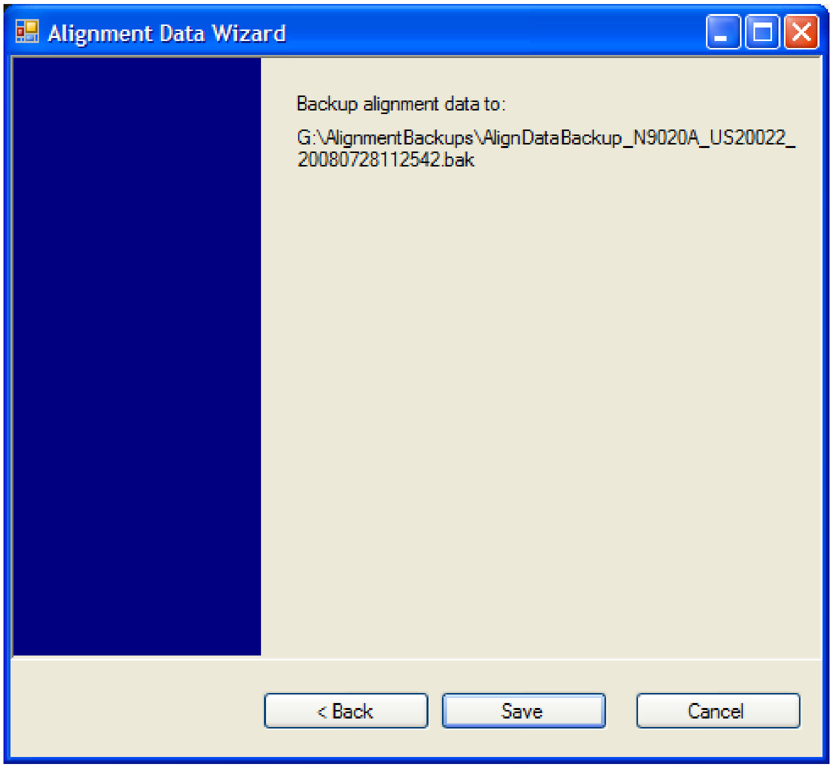
The backup screen indicates the approximate amount of space required to contain the backup file.

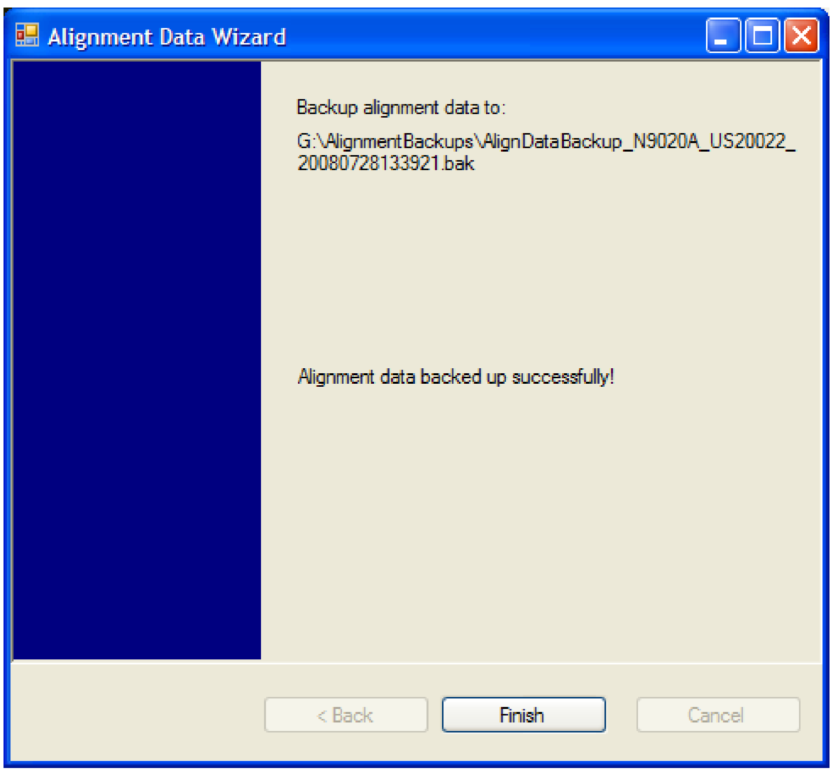
The default file name is AlignDataBackup_<model number>_<serial number>_<date in YYYYMMDDHHMMSS>.bak.

For the N9030A, the default backup location is the internal F: drive, which is a solid-state memory device located internally on the instrument.



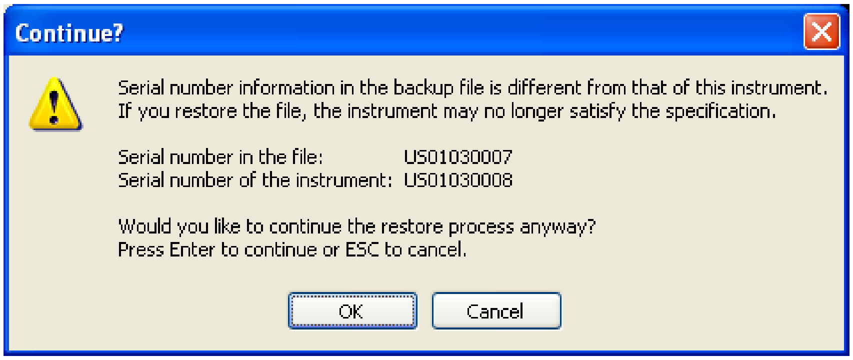
Changing the drive letter also modifies the path displayed in the dialog below. When this step is first loaded, the drive drop-down menu is populated with connected drives, which provide the user with write access. If there are many unreachable network drives connected to the instrument, this step can take a few seconds. If a USB drive is present, it will be selected by default. The path defaults to the AlignmentBackups folder, and a filename is automatically created in the form of AlignDataBackup_ <model>_<serial number>_<date><time>. When the Next > button is pressed, you will be prompted to create a new folder if the chosen path does not yet exist.



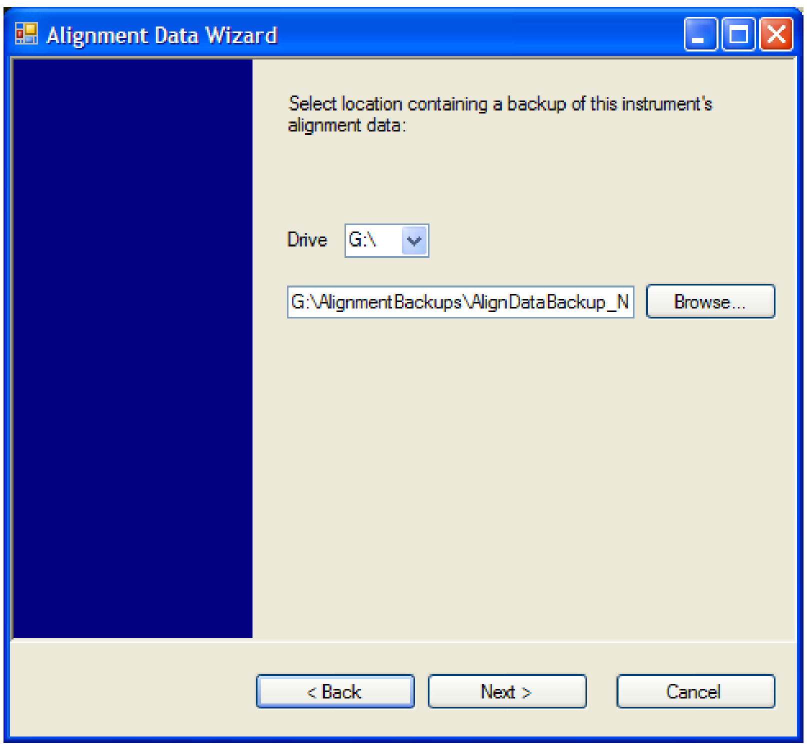


The restore operation checks the validity of the restore file using the database's built-in file validation. If the restore file is corrupt, the existing alignment data will remain in use.

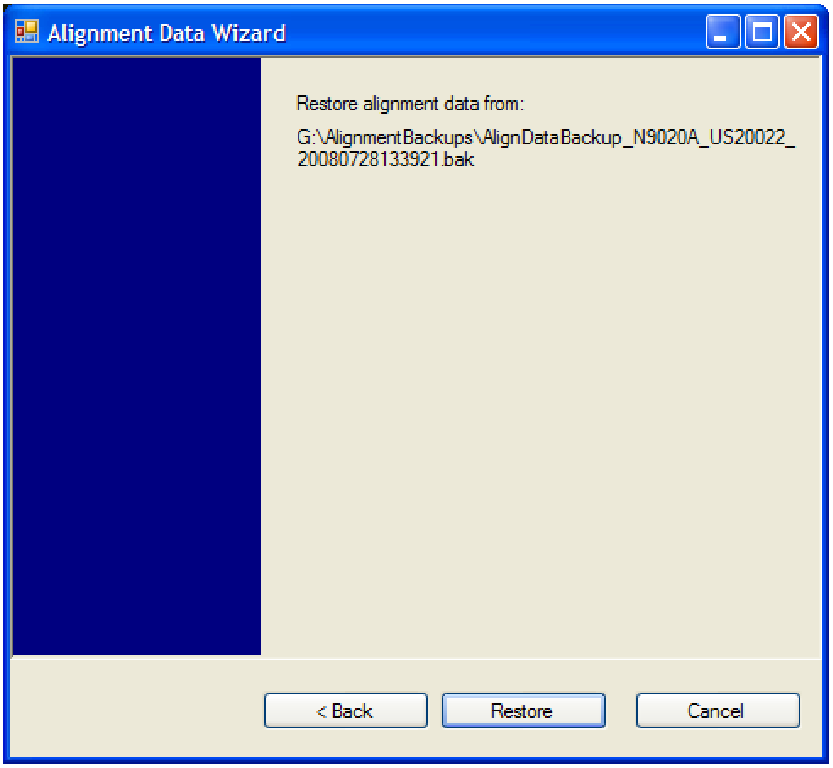
If the serial number information in the backup file being restored is different from that of the instrument, the following message appears (the serial numbers shown are examples):

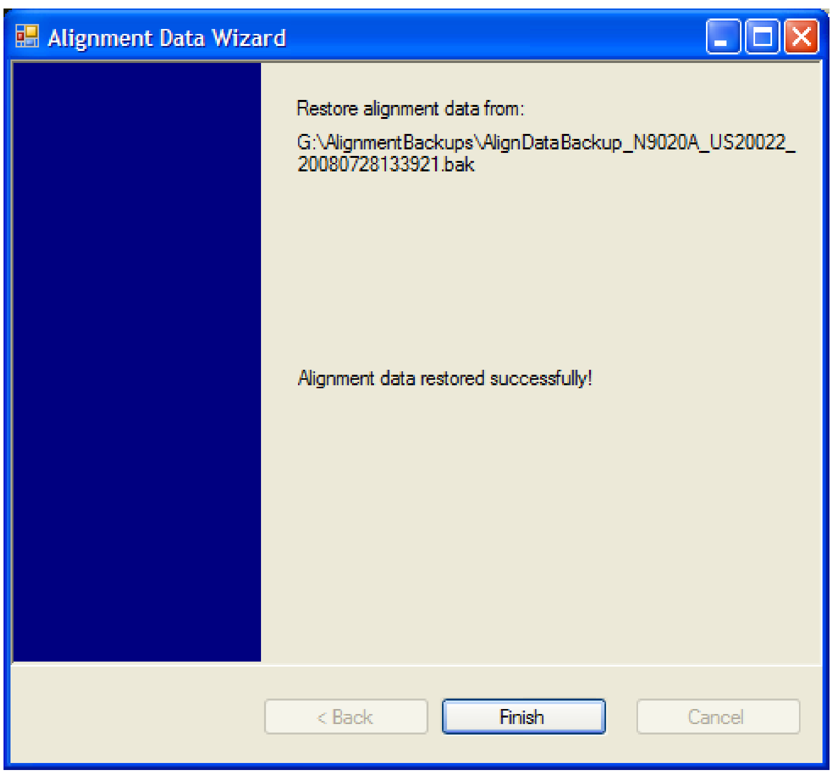


For N9030A, the default restore location is the internal F: drive, which is a solid-state memory device located internally on the instrument. The default restore file is the most recent file that matches the default backup file name format: AlignDataBackup_N9030A_<serial number>_<date>.bak



Changing the drive letter also modifies the path displayed in the box below. When this step is first loaded, the drive drop-down menu is populated with connected drives, which provide you with read access. The path defaults to the AlignBackups folder. The most recent *.bak file in the folder will also be selected by default.





Perform Backup (Remote Command Only)

Invokes an alignment data backup operation to the specified folder.

NOTE It is recommended that the specified backup folder should be external to the instrument (for example, a USB or Mapped Network Drive).

Remote Command	:CALibration:DATA:BACKup <filename>
Example	:CAL:DATA:BACK "F:\AlignDataBackup_N9020A_US00000001_2008140100.bak"
Initial S/W Revision	A.02.00

Perform Restore (Remote Command Only)

Invokes an alignment data restore operation from the specified file.

Remote Command	:CALibration:DATA:RESTore <filename>
Example	:CAL:DATA:REST "F:\ AlignDataBackup_N9020A_US00000001_2008140100.bak "
Initial S/W Revision	A.02.00

Advanced

Accesses alignment processes that are immediate action operations that perform operations that run until complete. Advanced alignments are performed on an irregular basis, or require additional operator interaction

Key Path	System, Alignments
Initial S/W Revision	Prior to A.02.00

Characterize Preselector

The Preselector tuning curve drifts over temperature and time. Recognize that the Amplitude, Presel Center function adjusts the preselector for accurate amplitude measurements at an individual frequency. Characterize Preselector improves the amplitude accuracy by ensuring the Preselector is approximately centered at all frequencies without the use of the Amplitude, Presel Center function. Characterize Preselector can be useful in situations where absolute amplitude accuracy is not of utmost importance, and the throughput savings or convenience of not performing a Presel Center is desired. Presel Center is required prior to any measurement for best (and warranted) amplitude accuracy.

Keysight recommends that the Characterize Preselector operation be performed yearly as part of any calibration, but performing this operation every three months can be worthwhile.

Characterize Preselector immediately executes a characterization of the Preselector, which is a YIG-tuned filter (YTF). The instrument stops any measurement currently underway, performs the characterization, then restarts the measurement from the beginning (similar to pressing the Restart key).

The query form of the remote commands (:CALibration:YTF?) will invoke the alignment of the YTF subsystem and return a success or failure value.

A failure encountered during alignment will generate the Error Condition message “Characterize Preselector failure” and set bit 3 in the STATus:QUEStionable:CALibration:EXTended:FAILure status register. Successful completion of Characterize Preselector will clear this Condition. It will also begin the elapsed time counter for Last Characterize Preselector Time, and capture the Last Characterize Preselector Temperature.

The last Characterize Preselector Time and Temperature survives across the power cycle as this operation is performed infrequently.

NOTE The Characterize Preselector function can be interrupted by pressing the Cancel (ESC) front-panel key or remotely with Device Clear followed by the :ABORt SCPI command. None of the new characterization data is then used. However, since the old characterization data is purged at the beginning of the characterization, you now have an uncharacterized preselector. You should re-execute this function and allow it to finish before making any further preselected measurements.

Key Path	System, Alignments, Advanced
Mode	All
Remote Command	`:CALibration:YTF` `:CALibration:YTF?`
Example	:CAL:YTF
Notes	:CALibration:YTF? returns 0 if successful :CALibration:YTF? returns 1 if failed (including interfering user signal) While Advanced, Characterize Preselector is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. Successful completion will clear bit 9 in the Status Questionable Calibration register. A failure encountered during alignment will generate the Error Condition message “Characterize Preselector failed” and set bit 9 in the Status Questionable Calibration register. For Options that support frequencies > 3.6 GHz only.
Dependencies	This key does not appear in models that do not contain preselectors. In these models the SCPI command is accepted without error but no action is taken.
Couplings	Initializes the time for the Last Characterize Preselector Time. Records the temperature for the Last Characterize Preselector Temperature.
Initial S/W Revision	Prior to A.02.00

Timebase DAC

Allows control of the internal 10 MHz reference oscillator timebase. This may be used to adjust for minor frequency alignment between the signal and the internal frequency reference. This adjustment has no effect if the instrument is operating with an External Frequency Reference.

If the value of the Timebase DAC changes (by switching to Calibrated from User with User set to a different value, or in User with a new value entered) an alignment may be necessary. The alignment system will take appropriate action; which will either invoke an alignment or cause an Alert.

Key Path	System, Alignments
Mode	All
Remote Command	`:CALibration:FREQuency:REFerence:MODE CALibrated|USER` `:CALibration:FREQuency:REFerence:MODE?`
Example	:CAL:FREQ:REF:MODE CAL
Notes	If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due. If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due.
Preset	This is unaffected by Preset but is set to CALibrated on a “Restore System Defaults->Align”.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Calibrated

Sets the Timebase DAC to the value established during factory or field calibration. The value displayed on the menu key is the calibrated value.

Key Path	System, Alignments, Timebase DAC
Mode	All
Example	:CAL:FREQ:REF:MODE CAL
Readback Text	[xxx] < where xxx is the calibrated value
Initial S/W Revision	Prior to A.02.00

User

Allows setting the Timebase DAC to a value other than the value established during the factory or field calibration. The value displayed on the menu key is the calibrated value.

Key Path	System, Alignments, Timebase DAC
Mode	All
Example	:CAL:FREQ:REF:MODE USER
Readback Text	xxx < where xxx is the Timebase DAC setting
Initial S/W Revision	Prior to A.02.00

Key Path	System, Alignments, Timebase DAC
Mode	All
Remote Command	:CALibration:FREQuency:REFerence:FINE <integer> :CALibration:FREQuency:REFerence:FINE?
Example	:CAL:FREQ:REF:FINE 8191
Notes	If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due.
Couplings	Setting :CAL:FREQ:REF:FINE sets :CAL:FREQ:REF:MODE USER
Preset	This is unaffected by Preset but is set to the factory setting on a "Restore System Defaults->Align".
State Saved	No
Min	0
Max	16383
Backwards Compatibility SCPI	:CALibration:FREQuency:REFerence:COARse ESA hardware contained two DAC controls for the Timebase. In X-Series the command :CALibration:FREQuency:REFerence:FINE is the method for adjusting the timebase. The :COARse command is provided as an alias to :FINE.
Initial S/W Revision	Prior to A.02.00

Remote Command	:CALibration:FREQuency:REFerence:COARse <integer> :CALibration:FREQuency:REFerence:COARse?
Example	:CAL:FREQ:REF:COAR 8191
Notes	This is an alias for CAL:FREQ:REF:FINE any change to COARse is reflected in FINE and vice-versa. See CAL:FREQ:REF:FINE for description of functionality.
Couplings	Setting :CAL:FREQ:REF:COAR sets :CAL:FREQ:REF:MODE USER
Initial S/W Revision	Prior to A.02.00

I/O Config

Activates a menu for identifying and changing the I/O configuration for remote control.

Key Path	System
Initial S/W Revision	Prior to A.02.00

GPIB

Activates a menu for configuring the GPIB I/O port.

Key Path	System, I/O Config
Initial S/W Revision	A.02.00

GPIB Address

Select the GPIB remote address.

Key Path	System, I/O Config, GPIB
Mode	All
Remote Command	`:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess <integer>` `:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess?`
Example	:SYST:COMM:GPIB:ADDR 17
Notes	Changing the Address on the GPIB port requires all further communication to use the new address.
Preset	This is unaffected by Preset but is set to 18 on a “Restore System Defaults->Misc”
State Saved	No
Range	0 to 30
Min	0
Max	30
Initial S/W Revision	Prior to A.02.00

GPIB Controller

Sets the GPIB port into controller or device mode. In the normal state, GPIB controller is disabled, which allows the analyzer to be controlled by a remote computer. When GPIB Controller is enabled, the instrument can run software applications that use the instrument's computer as a GPIB controller; controlling devices connected to the instrument's GPIB port.

NOTE When GPIB Controller is enabled, the analyzer application itself cannot be controlled over GPIB. In this case it can easily be controlled via LAN or USB. The GPIB port cannot be a controller and device at the same time. Only one controller can be active on the GPIB bus at any given time. If the analyzer is the controller, an external PC cannot be a controller.

To control the instrument from the software that is performing GPIB controller operation, you can use an internal TCP/IP connection to the analyzer application. Use the address TCPIP0:localhost:inst0:INSTR to send SCPI commands to the analyzer application.

Key Path	System, I/O Config, GPIB
Mode	All
Scope	Mode Global
Remote Command	`:SYSTem:COMMunicate:GPIB[1][:SELF]:CONTroller[:ENABle] ON | OFF | 0 | 1` `:SYSTem:COMMunicate:GPIB[1][:SELF]:CONTroller[:ENABle]?`
Example	:SYST:COMM:GPIB:CONT ON Will set GPIB port to Controller
Notes	When the instrument becomes the Controller bit 0 in the Standard Event Status Register is set (and when the instrument relinquishes Controller capability bit 0 is cleared in the Standard Event Status Register).

Preset	This is unaffected by Preset but is set to OFF on a “Restore System Defaults->Misc”
State Saved	No
Range	Disabled|Enabled
Initial S/W Revision	A.02.00

Disabled

Disables the GPIB Controller capability, this is the default (or normal) setting.

Key Path	System, I/O Config, GPIB, GPIB Controller	
Example	:SYST:COMM:GPIB:CONT OFF	Will set GPIB port to Device
Initial S/W Revision	A.02.00	

Enabled

Enables the GPIB Controller capability.

Key Path	System, I/O Config, GPIB, GPIB Controller	
Example	:SYST:COMM:GPIB:CONT ON	Will set GPIB port to Controller
Initial S/W Revision	A.02.00	

SCPI LAN

Activates a menu for identifying and changing the SCPI over a LAN configuration. There are a number of different ways to send SCPI remote commands to the instrument over LAN. It can be a problem to have multiple users simultaneously accessing the instrument over the LAN. These keys limit that somewhat by disabling the telnet, socket, and/or SICL capability.

Key Path	System, I/O Config
Initial S/W Revision	Prior to A.02.00

SCPI Telnet

Turns the SCPI LAN telnet capability On or Off allowing you to limit SCPI access over LAN through telnet.

Key Path	System, I/O Config, SCPI LAN
Mode	All
Remote Command	`:SYSTem:COMMunicate:LAN:SCPI:TELNet:ENABle OFF|ON|0|1` `:SYSTem:COMMunicate:LAN:SCPI:TELNet:ENABle?`
Example	:SYST:COMM:LAN:SCPI:TELN:ENAB OFF

Preset	This is unaffected by Preset but is set to ON with a “Restore System Defaults->Misc”
State Saved	No
Range	On | Off
Initial S/W Revision	Prior to A.02.00

SCPI Socket

Turns the capability of establishing Socket LAN sessions On or Off. This allows you to limit SCPI access over LAN through socket sessions.

Key Path	System, I/O Config, SCPI LAN
Mode	All
Remote Command	`:SYSTem:COMMunicate:LAN:SCPI:SOCKet:ENABle OFF|ON|0|1` `:SYSTem:COMMunicate:LAN:SCPI:SOCKet:ENABle?`
Example	:SYST:COMM:LAN:SCPI:SOCK:ENAB OFF
Preset	This is unaffected by a Preset but is set to ON with a “Restore System Defaults->Misc”
State Saved	No
Range	On | Off
Initial S/W Revision	Prior to A.02.00

SICL Server

Turns the SICL server capability On or Off, enabling you to limit SCPI access over LAN through the SICL server. (SICL IEEE 488.2 protocol.)

Parameter	Description	Setting
Maximum Connections	The maximum number of connections that can be accessed simultaneously	5
Instrument Name	The name (same as the remote SICL address) of your analyzer	inst0
Instrument Logical Unit	The unique integer assigned to your analyzer when using SICL LAN	8
Emulated GPIB Name	The name (same as the remote SICL address) of the device used when communicating with your analyzer	gpib7
Emulated GPIB Logical Unit	The unique integer assigned to your device when it is being controlled using SICL LAN	8
Emulated GPIB Address	The emulated GPIB address assigned to your transmitter tester when it is a SICL server (the same as your GPIB address)	18

Key Path	System, I/O Config, SCPI LAN
Mode	All
Remote Command	`:SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle OFF|ON|0|1` `:SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle?`
Example	:SYST:COMM:LAN:SCPI:SICL:ENAB OFF
Preset	This is unaffected by Preset, but is set to ON with a “Restore System Defaults->Misc”
State Saved	No
Range	On | Off
Initial S/W Revision	Prior to A.02.00

HiSLIP Server

Turns the HiSLIP server capability On or Off, enabling you to limit SCPI access over LAN through the HiSLIP server.

HiSLIP stands for High Speed LAN Instrument Protocol and is part of the IVI−6.1 specification.

Here is an example of a VISA connection string used to connect to the HiSLIP Server on an X-Series Spectrum Analyzer:

TCPIP0::a-n9030a−93016::hislip0::INSTR

In the example above, hislip0 is the HiSLIP device name that VISA users must include in their HiSLIP VISA Address strings. Your HiSLIP device name may be different depending on your VISA settings.

Key Path	System, I/O Config, SCPI LAN
Mode	All
Remote Command	`:SYSTem:COMMunicate:LAN:SCPI:HISLip:ENABle OFF|ON|0|1` `:SYSTem:COMMunicate:LAN:SCPI:HISLip:ENABle?`
Example	:SYST:COMM:LAN:SCPI:HISL:ENAB OFF
Preset	This is unaffected by Preset, but is set to ON with a “Restore System Defaults->Misc”
State Saved	No
Range	On | Off
Initial S/W Revision	A.11.00

SCPI Socket Control Port (Remote Command Only)

Returns the TCP/IP port number of the control socket associated with the SCPI socket session. This query enables you to obtain the unique port number to open when a device clear is to be sent to the instrument. Every time a connection is made to the SCPI socket, the instrument creates a peer control socket. The port number for this socket is random, so you must use this command to obtain the port number of the control socket. To force a device clear on this socket, open the port and send the string “DCL ” to the instrument.

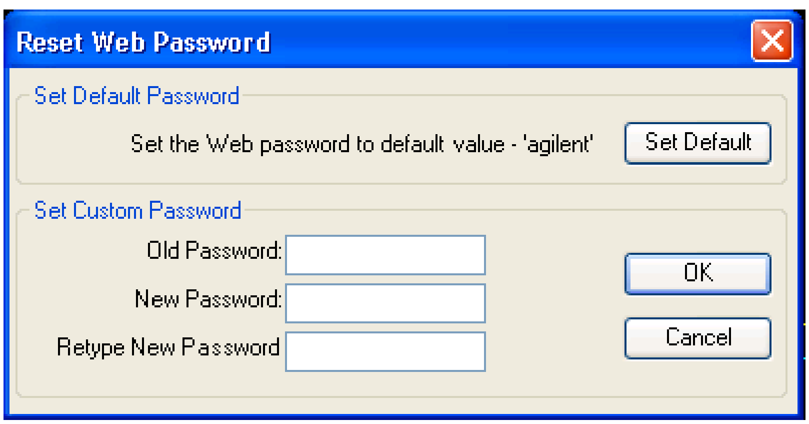
If this SCPI command is sent to a non-SCPI Socket interface, then 0 is returned.

Mode	All
Remote Command	`:SYSTem:COMMunicate:LAN:SCPI:SOCKet:CONTrol?`
Example	:SYST:COMM:LAN:SCPI:SOCK:CONT?
Preset	This is unaffected by Preset or Restore System Defaults, Misc.
State Saved	No
Range	0 to 65534
Min	0
Max	65534
Initial S/W Revision	Prior to A.02.00

Reset Web Password

The embedded web server contains certain capability which are password protected; modifying the LAN configuration of the instrument, and access to web pages that can change the settings of the instrument. The default password from the factory is ‘agilent’ (without the quotes). The control provided here is the means to set the web password as the user desires, or to reset the password to the factory default.

Selecting Reset web password brings up a control for resetting the password as the user desires, or to the factory default. A keyboard is required to change the password from the factory default of ‘agilent’ or to set a new password that contains alphabetic characters. The control is:



If this control is entered without an external keyboard or mouse connected, you can cancel the control by pressing the Cancel (ESC) front-panel key.

Key Path	System, I/O Config
Mode	All
Initial S/W Revision	Prior to A.02.00

LXI

Opens a menu that allows you to access the various LXI configuration properties.

Key Path	System, I/O Config
Initial S/W Revision	Prior to A.02.00

LAN Reset

Resets the LAN connection.

Key Path	System, I/O Config, LXI
Initial S/W Revision	Prior to A.02.00

System IDN Response

This key allows you to specify a response to the *IDN? query, or to return the analyzer to the Factory response if you have changed it.

To choose the factory-set response, press the Factory key.

To specify your own response, press the User key, and enter your desired response.

Key Path	System, I/O Config
Mode	All
Remote Command	`:SYSTem:IDN <string>` `:SYSTem:IDN?`
Notes	• This affects the response given in all Modes of the Analyzer, unless the current Mode has also specified a custom response, in which case the current Mode's custom IDN response takes precedence over the System's, but only while that Mode is the current Mode.. • It survives shutdown and restart of the software and therefore survives a power cycle • Null string as parameter restores the Factory setting
Preset	This is unaffected by Preset but is set to the original factory setting on a "Restore System Defaults->Misc"
State Saved	No
Initial S/W Revision	A.06.00

Factory

This key selects the factory setting, for example:

"Keysight Technologies,N9020A,MY00012345,A.05.01"

where the fields are manufacturer, model number, serial number, firmware revision.

Key Path	System, I/O Config, IDN Response

Example	:SYST:IDN "" null string, restores the factory setting
Initial S/W Revision	A.06.0

User

This key allows you to specify your own response to the *IDN? query. You may enter your desired response with the Alpha Editor or a plugin PC keyboard.

When you press this key, the active function becomes the current User string with the cursor at the end. This makes it easy to edit the existing string.

If you enter a null string (for example, by clearing the User String while editing and then pressing Done) the analyzer automatically reverts to the Factory setting.

Key Path	System, I/O Config, IDN Response
Example	:SYST:IDN “XYZ Corp, Model 12, 012345, A.01.01” user specified response
Initial S/W Revision	A.06.00

Query USB Connection (Remote Command Only)

Enables you to determine the speed of the USB connection.

Mode	All
Remote Command	`:SYSTem:COMMunicate:USB:CONNection?`
Example	:SYST:COMM:USB:CONN?
Notes	• NONE – Indicates no USB connection has been made. • LSPeed – Indicates a USB low speed connection (1.5 Mbps). This is reserved for future use. The T+M488 protocol is not supported on low speed connections. • HSPeed – Indicates that a USB high speed connection (480 Mbps) has been negotiated. • FSPeed – Indicates that a USB full speed connection (12 Mbps) has been negotiated.
State Saved	No
Range	NONE|LSPeed|HSPeed|FSPeed
Initial S/W Revision	Prior to A.02.00

USB Connection Status (Remote Command Only)

Enables you to determine the current status of the USB connection.

Mode	All
Remote Command	`:SYSTem:COMMunicate:USB:STATus?`
Example	:SYST:COMM:USB:STAT?

Notes	• SUSPended – Indicates that the USB bus is currently in its suspended state. The bus is in the suspended state when:
	  • The bus is not connected to any controller,
	  • The controller is currently powered off,
	  • The controller has explicitly placed the USB device into the suspended state.
	When in the suspended state, no USB packets are received, including start of frame packets.
	• ACTive – Indicates that the USB device is in the active state. When the device is in the active state, it is receiving periodic start of frames but it is not necessarily receiving or transmitting data.

State Saved	No
Range	SUSPended|ACTive
Initial S/W Revision	Prior to A.02.00

USB Packet Count (Remote Command Only)

Enables you to determine the number of packets received and transmitted on the USB bus.

Mode	All
Remote Command	`:SYSTem:COMMunicate:USB:PACKets?`
Example	:SYST:COMM:USB:PACK?
Notes	Two integers are returned: • The first is the number of packets received since application invocation • The second is the number of packets transmitted since application invocation. If no packets have been received or transmitted the response is 0,0. The packet count is initialized to 0,0 when the instrument application is started.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Restore Defaults

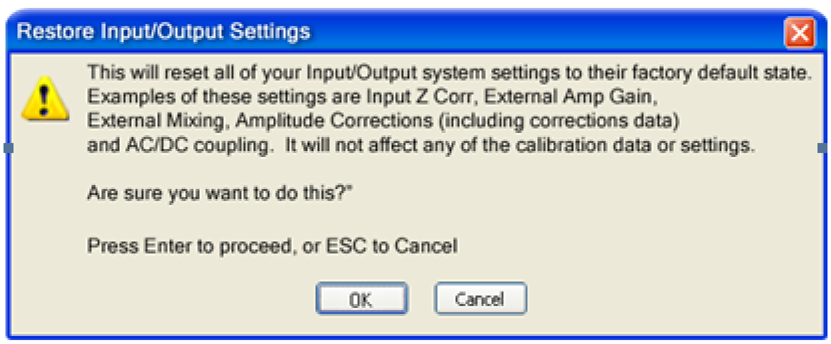
Provides incremental initialization of the system setting groups along with supporting a comprehensive reset of the entire instrument back to a factory default state. The menu selections are the groups of system settings and when one is selected, that particular group of system settings is reset back to their default values.

Key Path	System
Mode	All
Remote Command	`:SYSTem:DEFault [ALL]|ALIGn|INPut|MISC|MODes|PON`
Example	SYST:DEF
State Saved	No
Initial S/W Revision	Prior to A.02.00

Restore Input/Output Defaults

Causes the group of settings and data associated with Input/Output front-panel key to be a reset to their default values. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch. .

Confirmation is required to restore the Input/Output setting. The confirmation dialog is:

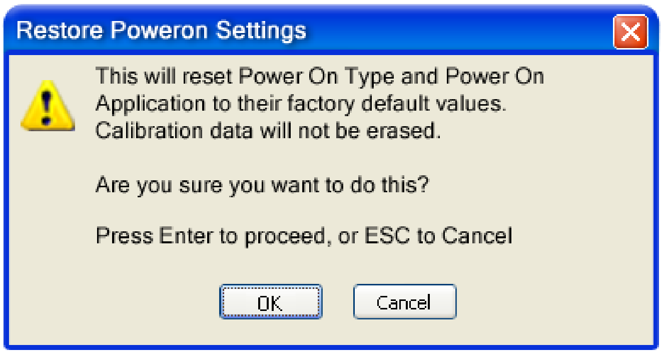


Key Path	System, Restore System Defaults
Example	:SYST:DEF INP
Initial S/W Revision	Prior to A.02.00

Restore Power On Defaults

This selection causes the Power On settings to be a reset to their default value. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch. The Power On settings and their default values are Power On Type reset to Mode and Input/Output Defaults and Power On Application reset to whatever the factory set as its default value.

Confirmation is required to restore the factory default values. The confirmation dialog is:



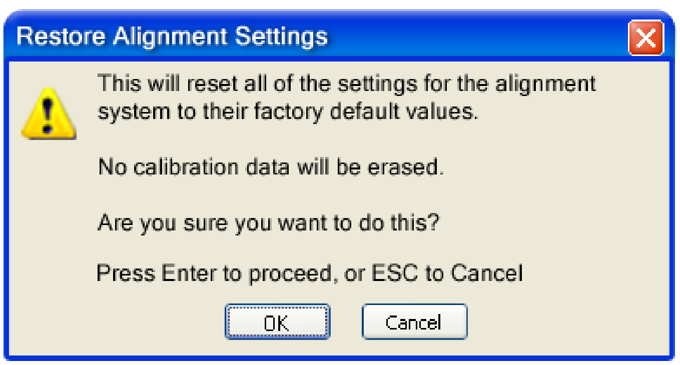
Key Path	System, Restore System Defaults
Example	:SYST:DEF PON
Initial S/W Revision	Prior to A.02.00

Restore Align Defaults

This selection causes the Alignment system settings to be a reset to their default values. This does not affect any Alignment data stored in the system. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch.

After performing this function, it may impact the auto-alignment time of the instrument until a new alignment baseline has been established.

Confirmation is required to restore the factory default values. The confirmation dialog is:



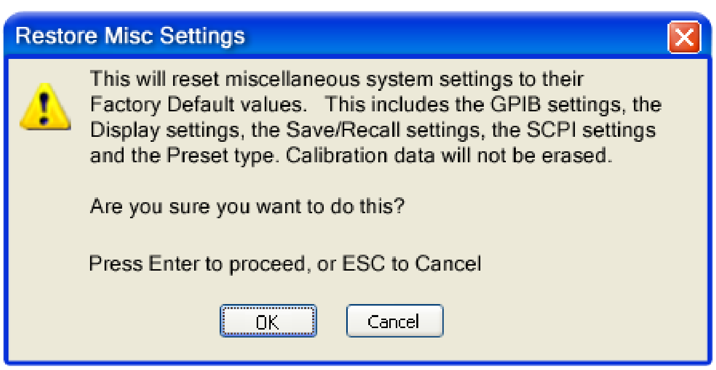
Key Path	System, Restore System Defaults
Example	:SYST:DEF ALIG
Initial S/W Revision	Prior to A.02.00

Restore Misc Defaults

This selection causes miscellaneous system settings to be reset to their default values. With this reset, you lose the GPIB address and it is reset to 18, so this should be used with caution. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch. This miscellaneous group contains the rest of the settings that have not been part of the other Restore System Defaults groups. The following table is a complete list of settings associated with this group:

Miscellaneous Setting	Default Value
Verbose SCPI	Off
GPIB Address	18
Auto File Name Number	000
Save Type	State
State Save To	Register 1
Screen Save To	SCREEN000.png
DISP:ENABle	ON
Full Screen	Off
SCPI Telnet	ON
SCPI Socket	ON
SICL Server	ON
Display Intensity	100
Display Backlight	ON
Display Theme	TDColor
System Annotation	ON
The SYST:PRES:TYPE	MODE

Confirmation is required to restore the factory default values. The confirmation dialog is:

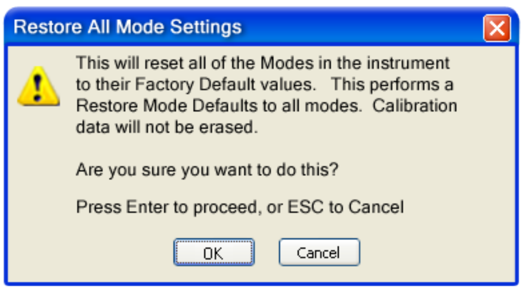


Key Path	System, Restore System Defaults
Example	:SYST:DEF MISC
Initial S/W Revision	Prior to A.02.00

Restore Mode Defaults (All Modes)

This selection resets all of the modes in the instrument back to their default state just as a Restore Mode Defaults does and it switches the instrument to the power-on mode and causes the default measurement for the power-on mode to be active. This level of Restore System Defaults does not affect any system settings, but it does affect the state of all modes and does cause a mode switch unless the instrument was already in the power-on mode.

Confirmation is required to restore the factory default values. The confirmation dialog is:



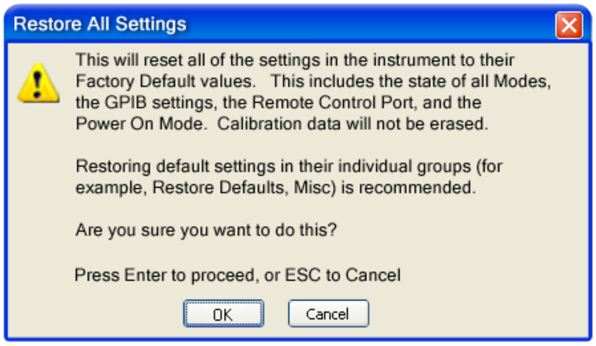
.

Key Path	System, Restore System Defaults
Example	:SYST:DEF MOD
Couplings	An All Mode will cause the currently running measurement to be aborted, mode switch to the power-on mode and activate the default measurement for the power-on mode.. It gets the mode to a consistent state with all of the default couplings set.
Initial S/W Revision	Prior to A.02.00

All

This performs a comprehensive reset of ALL analyzer settings to their factory default values. It resets all of the system setting groups, causes a Restore Mode Defaults for all modes in the instrument, and switches back to the power-on mode. It does not affect the User Preset file or any user saved files.

Confirmation is required to restore the factory default values. The confirmation dialog is:



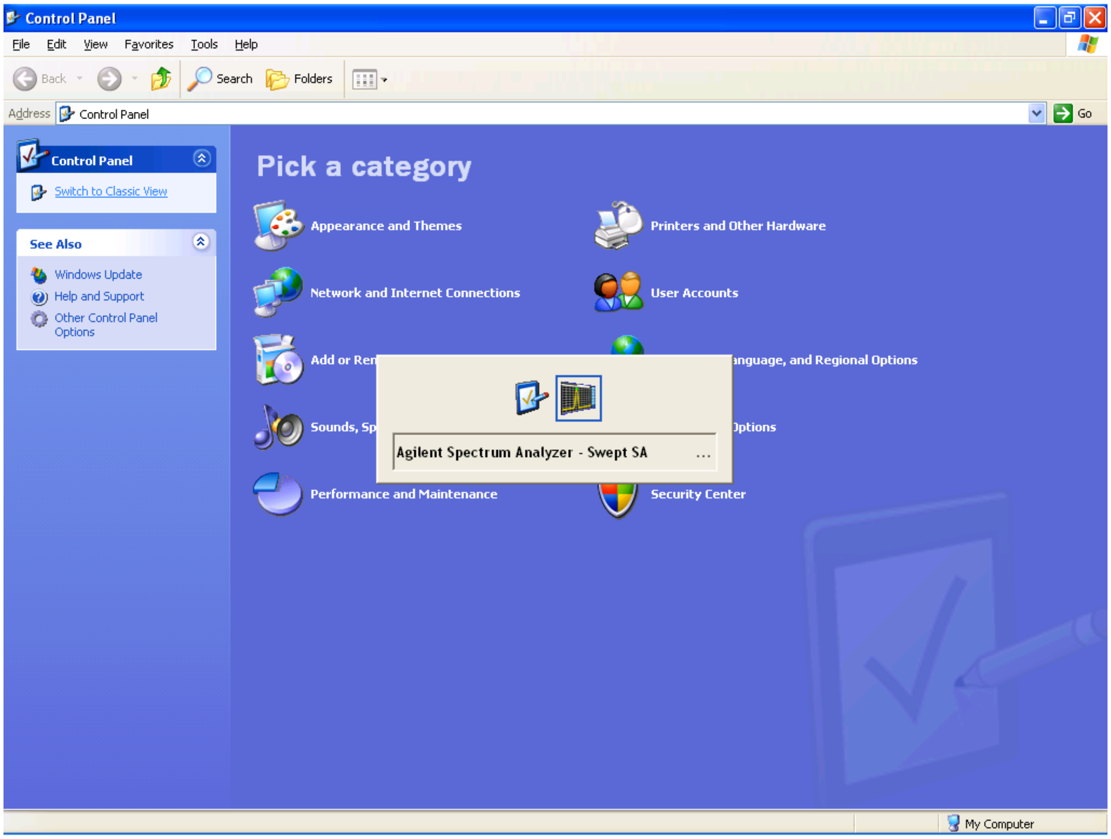
Key Path	System, Restore System Defaults
Example	:SYST:DEF ALL
Couplings	An All will cause the currently running measurement to be aborted and get all modes to a consistent state, so it is unnecessary to couple any settings.
Initial S/W Revision	Prior to A.02.00

Control Panel...

Opens the Windows Control Panel. The Control Panel is used to configure certain elements of Windows that are not configured through the hardkey/softkey System menus.

The Control Panel is a separate Windows application, so to return to the analyzer once you are in the Control Panel, you may either:

Exit the Control Panel by clicking on the red X in the upper right hand corner, with a mouse



Or use Alt-Tab: press and hold the Alt 

key and press and release the Tab key until the Analyzer logo is showing in the window in the center of the screen, as above, then release the Alt key.

Key Path	System
Notes	No remote command for this key.
Initial S/W Revision	Prior to A.02.00

Licensing...

Opens the license explorer.

For Help on this key, select Help in the menu bar at the top of the license explorer window.

Key Path	System
Notes	No equivalent remote command for this key.
Backwards Compatibility Notes	In ESA the SCPI command for displaying the Show Licenses screen is: :SYSTem:CONFigure:LKEY:STATe OFF|ON|0|1 :SYSTem:CONFigure:LKEY:STATe? There are no equivalent SCPI commands in the X-Series for displaying the License Explorer.
Initial S/W Revision	Prior to A.02.00

Remote Command	`:SYSTem:LKEY <"OptionInfo">, <"LicenseInfo">`
Example	SYST:LKEY "N9073A-1FP", "027253AD27F83CDA5673A9BA5F427FDA5E4F25AEB1017638211AC9F60D9C639FE539735909C551DE0A91"
Notes	The <"OptionInfo"> contains the feature and the version. You must specify the feature but can omit the version. If you omit the version, the system regards it as the latest one, since the system knows which version is supported for each feature. The <"LicenseInfo"> contains the signature, the expiration date, and serial number for transport if transportable. You must specify the signature, but you can omit the other information. If you omit the expiration date, the system regards it as permanent. If you omit the serial number, the system regards it as non-transportable. As a result, this supports reverse compatibility.
Initial S/W Revision	Prior to A.02.00

Remote Command	`:SYSTem:LKEY:DELete <"OptionInfo">,<"LicenseInfo">`
Example	SYST:LKEY:DEL 'N9073A-1FP", "027253AD27F83CDA5673A9BA5F427FDA5E4F25AEB1017638211AC9F60D9C639FE539735909C551DE0A91"
Notes	The <"OptionInfo"> contains the feature and the version. You must specify the feature but can omit the version. If you omit the version, the system regards it as the latest one, if more than one version is installed. The <"LicenseInfo"> contains the signature, the expiration date, and whether or not be transportable. You must specify the signature, but you can omit the other information. If you omit the expiration date, the system regards it as permanent. If you omit the transportability, the system regards it as non-transportable. As a result, this supports reverse compatibility.
Initial S/W Revision	Prior to A.02.00

Remote Command	`:SYSTem:LKEY:LIST?`
Notes	Return Value: An <arbitrary block data> of all the installed instrument licenses. The format of each license is as follows. <Feature>,<Version>,<Signature>,<Expiration Date>,<Serial Number for Transport> Return Value Example: #3136 N9073A-1FP,1.000,B043920A51CA N9060A-2FP,1.000,4D1D1164BE64 N9020A-508,1.000,389BC042F920

	N9073A-1F1,1.000,5D71E9BA814C,13-aug-2005 <arbitrary block data> is: #NMMM<data> Where: N is the number of digits that describes the number of MMM characters. For example if the data was 55 bytes, N would be 2. MMM would be the ASCII representation of the number of bytes. In the previous example, N would be 55. <data> ASCII contents of the data
Initial S/W Revision	Prior to A.02.00

Remote Command	`:SYSTem:LKEY? <"OptionInfo">`
Example	SYST:LKEY? "N9073A-1FP"
Notes	The <"OptionInfo"> contains the feature and the version. You must specify the feature but can omit the version. If you omit the version, the system regards it as the latest one. Return Value: <"LicenseInfo"> if the license is valid, null otherwise. <"LicenseInfo"> contains the signature, the expiration date, and serial number if transportable. Return Value Example: "B043920A51CA"
Initial S/W Revision	Prior to A.02.00

Remote Command	`:SYSTem:HID?`
Notes	Return value is the host ID as a string
Initial S/W Revision	Prior to A.02.00

Security

Accesses capabilities for operating the instrument in a security controlled environment.

Key Path	System
Initial S/W Revision	A.04.00

USB

The Windows operating system can be configured to disable write access to the USB ports for users who are in a secure environment where transferring data from the instrument is prohibited. This user interface is a convenient way for the customer to disable write access to USB.

Key Path	System, Security
Mode	All
Scope	Mode Global
Remote Command	`:SYSTem:SECurity:USB:WPRotect[:ENABle] ON|OFF|0|1` `:SYSTem:SECurity:USB:WPRotect[:ENABle]?`
Example	:SYST:SEC:USB:WPR ON Will set USB ports to Read-only
Notes	When the USB ports are in Read-only mode then no data can be stored to USB, including the internal USB memory used for a back-up location for the calibration data.
Dependencies	This key is grayed-out unless the current user has administrator privileges.
Preset	This is unaffected by Preset or any Restore System Defaults. A Keysight Recovery will set the USB to write protect OFF
State Saved	No
Range	Read-Write|Read only
Initial S/W Revision	A.04.00

Read-Write

Selection for allowing full read-write access to the USB ports.

Key Path	System, Security, USB
Example	:SYST:SEC:USB:WPR OFF Will set USB ports to Read-Write
Initial S/W Revision	A.04.00

Read only

Selection for disabling write access to the USB ports.

Key Path	System, Security, USB
Example	:SYST:SEC:USB:WPR ON Will set USB ports to Read only
Initial S/W Revision	A.04.00

Diagnostics

The Diagnostics key in the System menu gives you access to basic diagnostic capabilities of the instrument.

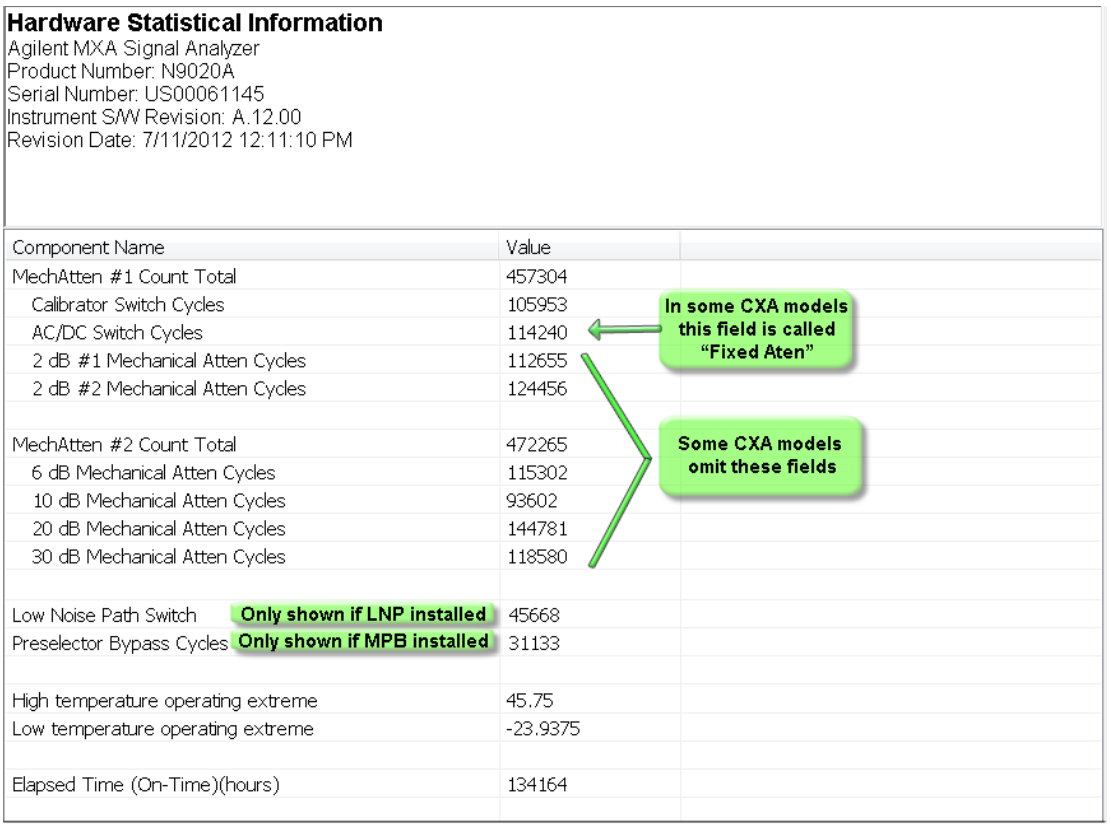
Key Path	System
Initial S/W Revision	Prior to A.02.00

Show Hardware Statistics

Provides a display of various hardware statistics. The statistics include the following:

- Mechanical relay cycles
- High and Low temperature extremes
- Elapsed time that the instrument has been powered-on (odometer)

The display should appear listing the statistics, product number, serial number, and firmware revision.



Hardware Statistical Information
Agilent MXA Signal Analyzer
Product Number: N9020A
Serial Number: US00061145
Instrument S/W Revision: A.12.00
Revision Date: 7/11/2012 12:11:10 PM

Component Name	Value
MechAtten #1 Count Total	457304
Calibrator Switch Cycles	105953
AC/DC Switch Cycles	114240
2 dB #1 Mechanical Atten Cycles	112655
2 dB #2 Mechanical Atten Cycles	124456
MechAtten #2 Count Total	472265
6 dB Mechanical Atten Cycles	115302
10 dB Mechanical Atten Cycles	93602
20 dB Mechanical Atten Cycles	144781
30 dB Mechanical Atten Cycles	118580
Low Noise Path Switch	45668
Preselector Bypass Cycles	31133
High temperature operating extreme	45.75
Low temperature operating extreme	-23.9375
Elapsed Time (On-Time)(hours)	134164

The CXA models in which the AC/DC Switch field is called Fixed Atten and which omit the mech atten fields are the N9000A–503/507 models.

The data will be updated only when the Show Hardware Statistics menu key is pressed, it will not be updated while the screen is displayed.

The tabular data should be directly printable.

Key Path	System, Diagnostics
Mode	All
Notes	The values displayed on the screen are only updated upon entry to the screen and not updated while the screen is being displayed.
Initial S/W Revision	Prior to A.02.00

SCPI for Show Hardware Statistics (Remote Commands Only)

Each of the hardware statistic items can be queried via SCPI, using the following queries:

- "Query the Mechanical Relay Cycle Count" on page 1259
- "Query the Operating Temperature Extremes" on page 1259
- "Query the Elapsed Time since First Power-On" on page 1260

Query the Mechanical Relay Cycle Count

Returns the count of mechanical relay cycles.

For N9038A, there are additional 2 Mechanical Relays, which are <N9038A Input2>, <N9038A Bypass>.

Remote Command	`:SYSTem:MRELay:COUNt?`
Example	:SYST:MREL:COUN?
Notes	Query Only The return value is a comma-separated list of the individual counts for each mechanical relay. The position of the relays in the list is: "<Cal Signal>,<AC/DC>,<2dB #1 Atten>,<2dB #2 Atten>,<6dB Atten>,<10dB Atten>,<20dB Atten>,<30dB Atten>,<Fixed Atten>,<Low Noise Path Switch>,<Presel Bypass>,<N9038A Input2>,<N9038A Bypass>" Items in the list not pertaining to your particular hardware configuration return with the value –999.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.08.00

Query the Operating Temperature Extremes

Returns the low (or high) operating temperature extreme value. The value survives a power-cycle and is the temperature extreme encountered since the value was reset by the factory or service center.

Mode	All
Remote Command	`:SYSTem:TEMPerature:LEXTreme?`
Example	:SYST:TEMP:LEXT?
Notes	Value (in degrees Celsius) at which the lowest operating temperature has been recorded since first power-up.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Mode	All

Remote Command	`:SYSTem:TEMPerature:HEXTreme?`
Example	:SYST:TEMP:HEXT?
Notes	Value (in degrees Celsius) at which the highest operating temperature has been recorded since first power-up.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Query the Elapsed Time since First Power-On

Returns the elapsed on-time in minutes since first power-on.

Remote Command	`:SYSTem:PON:ETIMe?`
Example	:SYST:PON:ETIM?
Notes	Query Only
Initial S/W Revision	Prior to A.02.00

Service

Accesses capabilities performed in the factory or under instructions from repair procedures. This menu key is only visible when the logged-in user is “advanceduser” or “saservice”. The first access to the Service Menu after invoking the instrument application will require an authentication Service Code.

Key Path	System
Initial S/W Revision	Prior to A.02.00

Internet Explorer...

This key launches Microsoft Internet Explorer. A mouse and external keyboard are highly desired for using Internet Explorer. When Internet Explorer is running, close Internet Explorer to return focus to the Instrument Application (or use Alt-Tab).

Key Path	System
Mode	All
Notes	No equivalent remote command for this key.
Initial S/W Revision	A.05.01

System Remote Commands (Remote Commands Only)

The commands in this section have no front-panel key equivalent.

"System Powerdown (Remote Command Only)" on page 1261

"List installed Options (Remote Command Only)" on page 1261

"Lock the Front-panel keys (Remote Command Only)" on page 1261

"List SCPI Commands (Remote Command Only)" on page 1262

"SCPI Version Query (Remote Command Only)" on page 1262

"Date (Remote Command Only)" on page 1262

"Time (Remote Command Only)" on page 1263

Initial S/W Revision	Prior to A.02.00

System Powerdown (Remote Command Only)

Remote Command	`SYSTem:PDOWn [NORMal|FORCe]`
Notes	Shuts down the instrument in the normal way (NORMal) or forced way (FORCe). In case there is another application with modified data pending for saving, the application prompt the user. The system waits until the user responds in the normal mode. It will go off after 20 seconds of wait in the force mode and all data will be lost.

List installed Options (Remote Command Only)

Lists the installed options that pertain to the instrument (signal analyzer). .

Mode	All
Remote Command	`:SYSTem:OPTions?`
Example	:SYST:OPT?
Notes	The return string is a comma separated list of the installed options. For example: “503,P03,PFR” :SYSTem:OPTions? and *OPT? are the same.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Lock the Front-panel keys (Remote Command Only)

Disables the instrument keyboard to prevent local input when the instrument is controlled remotely. Annunciation showing a “K” for ‘Klock” (keyboard lock) alerts the local user that the keyboard is locked. Klock is similar to the GPIB Local Lockout function; namely that no front-panel keys are active with the exception of the Power Standby key. (The instrument is allowed to be turned-off if Klock is ON.) The Klock command is used in remote control situations where Local Lockout cannot be used.

Although primary intent of Klock is to lock-out the front panel, it will lock-out externally connected keyboards through USB. Klock has no effect on externally connected pointing devices (mice).

The front panel 'Local' key (Cancel/Esc) has no effect if Klock is ON.

Mode	All
Remote Command	`:SYSTem:KLOCk OFF|ON|0|1` `:SYSTem:KLOCk?`
Example	:SYST:KLOC ON
Notes	Keyboard lock remains in effect until turned-off or the instrument is power-cycled
Preset	Initialized to OFF at startup, unaffected by Preset
State Saved	No
Initial S/W Revision	Prior to A.02.00

List SCPI Commands (Remote Command Only)

Outputs a list of the valid SCPI commands for the currently selected Mode.

Remote Command	`:SYSTem:HELP:HEADers?`
Example	:SYST:HELP:HEAD?
Notes	The output is an IEEE Block format with each command separated with the New-Line character (hex 0x0A)
Initial S/W Revision	Prior to A.02.00

SCPI Version Query (Remote Command Only)

Returns the SCPI version number with which the instrument complies. The SCPI industry standard changes regularly. This command indicates the version used when the instrument SCPI commands were defined.

Remote Command	`:SYSTem:VERSion?`
Example	:SYST:VERS?
Initial S/W Revision	Prior to A.02.00

Date (Remote Command Only)

The recommended access to the Date, Time, and Time zone of the instrument is through the Windows native control (Control Panel or accessing the Task Bar). You may also access this information remotely, as shown in this command and Time (below).

Sets or queries the date in the instrument.

Mode	All
Remote Command	`:SYSTem:DATE "<year>,<month>,<day>"` `:SYSTem:DATE?`
Example	:SYST:DATE "2006,05,26"
Notes	<year> is the four digit representation of year. (for example, 2006) <month> is the two digit representation of year. (for example. 01 to 12) <day> is the two digit representation of day. (for example, 01 to 28, 29, 30, or 31) depending on the month and year Unless the current account has Power User or Adminstrator privileges, an error will be generated by this command and no action will be taken.
Initial S/W Revision	Prior to A.02.00

Time (Remote Command Only)

Sets or queries the time in the instrument.

Mode	All
Remote Command	`:SYSTem:TIME "<hour>,<minute>,<second>"` `:SYSTem:TIME?`
Example	:SYST:TIME "13,05,26"
Notes	<hour> is the two digit representation of the hour in 24 hour format <minute> is the two digit representation of minute <second> is the two digit representation of second Unless the current account has Power User or Adminstrator privileges, an error will be generated by this command and no action will be taken.
Initial S/W Revision	Prior to A.02.00

Trace/Detector

The Trace/Detector menu lets you control the acquisition, display, storage, detection and manipulation of trace data for the six available traces. The first page of this menu contains a selection of the trace type (Clear Write, Trace Average, Max Hold, Min Hold) for the selected trace. Those choices are described here.

A trace is a series of data points, each having an x and a y value. The x value is frequency (or time, in zero span) and the y value is amplitude. Each data point is referred to as a trace point. In any given trace, trace point 0 is the first point, and trace point (sweep_points – 1) is the last. For example, in a 1001 point trace, the first point is 0 and the last is 1000. Another term sometimes used to describe traces is bucket. A bucket is the frequency span of a trace point, equal to the point spacing. For swept analysis, the y value in each bucket is measured while the analyzer is sweeping across the bucket. How it is measured depends on which detector is selected.

For more information see:

"Trace Update Indicator" on page 1266
"Trace Annunciator Panel" on page 1266
"Trace Annotation" on page 1267
"Trace Mode Backwards Compatibility" on page 1266

Key Path	Front-panel key
Remote Command	`:TRACe[1]|2|...6:TYPE WRITe|AVERage|MAXHold|MINHold` `:TRACe[1]|2|...6:TYPE?`
Notes	WRITe = Clear Write AVERage = Trace Average MAXHold = Maximum Hold MINHold = Minimum Hold
Couplings	,Sending a trace command does not cause the specified trace to become selected. Selecting a trace type (pressing any of the four keys or sending a TRAC:TYPE command) puts Update in On and Display in On, even if that trace type was already selected.
Preset	Write. During normal operation of the instrument (that is, other than at powerup), after a mode preset is performed, all active traces are cleared. This is so their domains and initial x values will match the current X Axis of the analyzer. Inactive traces are not cleared after a preset, so a trace which is in Update=On before a preset, and in Update=Off after the preset, will still have the data that it had before the preset.
State Saved	The type of each trace is saved in instrument state
Initial S/W Revision	Prior to A.02.00

Remote Command	`:TRACe[1]|2|...6:MODE WRITe|MAXHold|MINHold|VIEW|BLANk` `:TRACe[1]|2|...6:MODE?`

Notes	The legacy TRACe:MODE command is retained for backwards compatibility. In conjunction with the legacy :AVErage command, it works as follows: • :AVErage ON|OFF sets/clears a variable which we will call average for the sake of this discussion. This variable is maintained by the analyzer solely for backwards compatibility. See the [:SENSe]:AVERage[:STATe] command description below. • :TRACe:MODEWRITe sets :TRACe:TYPE WRITe (Clear Write) unless average is true, in which case it sets it to :TRACe:TYPE AVErage. It also sets :TRACe:UPDate ON, :TRACe:DISPlay ON, for the selected trace. • :TRACe:MODE MAXHold sets:TRACe:TYPE MAXHold (Max Hold). It also sets:TRACe:UPDate ON, :TRACe:DISPlay ON, for the selected trace. • :TRACe:MODE MINHold sets :TRACe:TYPE MINHold (Min Hold). It also sets:TRACe:UPDate ON, :TRACe:DISPlay ON, for the selected trace. • :TRACe:MODE VIEW sets :TRACe:UPDate OFF, :TRACe:DISPlay ON, for the selected trace • :TRACe:MODE BLANk sets :TRACe:UPDate OFF, :TRACe:DISPlay OFF, for the selected trace The query will return the same value as a :TRACe:TYPE? Query, meaning that if you set :TRACe:MODE:VIEW or :TRACe:MODE:BLANk, the query response will not be what you sent.
Preset	WRITe
State Saved	The trace mode is an alias only
Backwards Compatibility Notes	The legacy command :TRACe[n]:MODE was formerly used to set the type or “writing mode” of the trace. At that time, View and Blank were writing modes. The new TRACe:TYPE command should be used in the future, but TRACe:MODE is retained to afford backwards compatibility.
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:AVERage[:STATe] ON|OFF|1|0` `[:SENSe]:AVERage[:STATe]?`
Preset	OFF
State Saved	The state of Average is saved in Instrument State for ghosting purposes
Backwards Compatibility Notes	Previous to the X-Series, Averaging (also sometimes known as trace averaging) was global to all traces, that is, it was either on or off for all active traces. The legacy command [:SENSe]:AVERage [:STATe] ON | OFF | 1 | 0 was used to turn averaging on and off. In the X-Series, Averaging is turned on and off on a per-trace basis, so it can be on for one trace and off for another. For backwards compatibility, the old global Average State variable is retained solely as a legacy variable, turned on and off and queried by the legacy command [:SENSe]:AVERage[:STATe] OFF|ON|0|1. When Average is turned on, any trace in Clear Write will get put into Average. While Average is on, any trace put into Clear Write by the old TRAC:MODE command will instead get put into Average. When Average is turned off, any trace in Average will get put into Clear Write.
Initial S/W Revision	Prior to A.02.00

Trace Mode Backwards Compatibility

In earlier analyzers, the Trace Modes were Clear/Write, Max Hold, Min Hold, View and Blank. Averaging was global to all traces and was controlled under the BW/Avg menu.

In the X-Series, trace averaging can be done on a per-trace basis. The Trace Modes (now called Types) are Clear/Write, Trace Average, Max Hold and Min Hold. View and Blank are set separately under the View/Blank key.

While this gives the user more flexibility it also gives rise to potential backwards compatibility problems. To mitigate these, the old Trace Mode command has been retained and a new command, Trace Type, has been added. What were formerly called trace modes are now called trace types. The :TRACe:MODE command is retained for backwards compatibility and the :TRACe:TYPE, :TRACe:UPDate and :TRACe:DISPlay commands introduced for ongoing use. The old Trace Modes are selected using TRAC:MODE, whose parameters are mapped into calls to TRACe:TYPE, TRACe:UPDate and TRACe:DISPlay, and the old global Averaging command [:SENSe]:AVERage[:STATe] is provided for backwards compatibility. See these individual command descriptions for details.

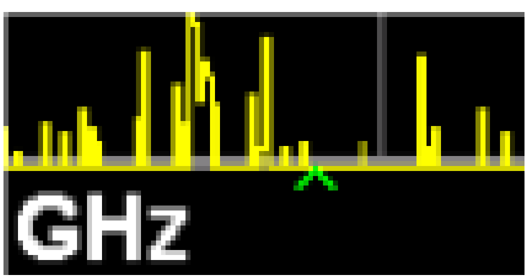
Trace Update Indicator

Trace updates can take one of two forms:

1. The trace is updated in a single operation that affects all of the points in the trace at once. This happens, for example, in the case of very fast (< 200 ms) sweeps, single-chunk FFT’s, and the initial math operation after a math function is set for a trace.

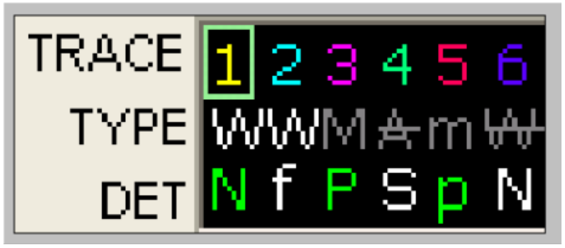
2. The trace is updated in a series of discrete steps, with measurement data being gathered between each step. This will be the case for slow sweeps, multi-chunk FFT’s, etc.

In the first case, no update indicator is required. In the second case, however, a visual indicator exists on the trace where the new data is being written, a green “caret” or ^ symbol, which moves across the bottom of the graticule showing the current trace point.



Trace Annunciator Panel

The trace annunciator panel appears on the right hand side of the Meas Bar. Here is an explanation of the fields in this panel:



On the line labeled “TRACE”, each trace number is shown, in the trace color. A green box is drawn around the currently selected trace

Below each trace number, on the line labeled “TYPE”, is a letter signifying the trace type for that trace number, where

W=Clear Write
A=Trace Average
M=Max Hold
m=Min Hold

If the letter is white it means the trace is being updated (Update = On); if the letter is dimmed , it means the trace is not being updated (Update = Off). A strikethrough (e.g., W) indicates that the trace is blanked (Display = Off). Note that it is possible for a trace to be updating and blanked, which is useful if the trace is a trace math component.

The third line, labeled “DET”, shows the detector type for each trace, or, if trace math is on for that trace, it shows an “f” (for “math function”). It is not always possible to have a unique detector for each trace, but the analyzer hardware provides the maximum flexibility of detector selection in order to maintain the highest accuracy. .The letters used for this readout are:

N=Normal
A=Average
P=peak
p=negative peak
S=Sample
Q=Quasi Peak
E=EMI Average
R=RMS Average
f=math function

If the DET letter is green it means the detector is in Auto; if it is white it means the detector has been manually selected.

Trace Annotation

When Trace Annotation (see View/Display menu) is On, each non-blanked trace is labeled on the trace with the detector used to take it, unless a trace math function is on for that trace, in which case it is labeled with the math function.

The detector labels are:

NORM =Normal

PEAK =Peak

SAMP =Sample

NPEAK =Negative Peak

RMS =Average detector with Power Average (RMS)

LG AVG =Average detector with Log-Pwr Average

VAVG =Average detector with Voltage Average

QPEAK =Quasi Peak

EMI AVG =EMI Average

RMS AVG =RMS Average

The trace math labels are:

PDIF =Power Difference

PSUM =Power Sum

LOFF =Log Offset

LDIF =Log Difference

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

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Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

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Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

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Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Clear Write

In Clear Write type each trace update replaces the old data in the trace with new data. Pressing the Clear Write key for the selected trace, or sending the TRAC:TYPE WRIT command for the specified trace, sets the trace type to Clear Write and causes the trace to be cleared, even if you are already in Clear Write. Then a new sweep is initiated.

Because pressing Clear Write stops the current sweep and initiates a new one, Trace Average, Max Hold and Min Hold data may be interrupted in mid-sweep, and may not accurately reflect the displayed count. Therefore, when Clear Write is pressed for one trace, Trace Average, Max Hold and Min Hold must restart for all traces.

When in Clear Write, if a measurement-related instrument setting is changed, a new sweep is initiated but the trace is not cleared.

Key Path	Trace/Detector
Example	TRAC:TYPE WRIT
Notes	See “"Trace/Detector" on page 1264”.
Dependencies	When Signal ID is on, this key is grayed out for Traces 2–6 in Image Supress mode and for Traces 3–6 in Image Shift Mode.
Couplings	Whenever you press Clear Write or send the equivalent SCPI command, Update is set to On and Display is set to On. Automatic detector selection and the VBW:RBW ratio auto rules both depend on the trace type

	selections
Preset	After a Preset, any trace that is in Clear Write is cleared (all trace points set to mintracevalue).
State Saved	The type for each trace is saved in Instrument State
Backwards Compatibility Notes	Previous to the X-Series, pressing Clear Write while already in Clear Write (or doing so remotely) had no effect. Now it will clear the trace and restart the sweep
Initial S/W Revision	Prior to A.02.00

Trace Average

In Trace Average type the analyzer maintains and displays an average trace, which represents the cumulative average on a point-by-point basis of the new trace data and previous averaged trace data. Details of the averaging calculations may be found under "Average/Hold Number" on page 794 and "Average Type" on page 795 in the Meas Setup Section.

See "Trace Averaging: More Information" on page 1271.

Key Path	Trace/Detector
Example	TRAC2:TYPE AVER
Notes	See "Trace/Detector" on page 1264.
Dependencies	When Signal ID is on, this key is grayed out for Traces 2–6 in Image Supress mode and for Traces 3–6 in Image Shift Mode.
Couplings	Affected by Average Type and Average/Hold Number Whenever you press Trace Average or send the equivalent SCPI command, Update is set to On and Display is set to On. Automatic detector selection and the VBW:RBW ratio auto rules both depend on the trace type selections.
Preset	After a Preset, any trace that is in Trace Average is cleared (all trace points set to mintracevalue).
State Saved	The type for each trace is saved in instrument state
Initial S/W Revision	Prior to A.02.00

Trace Averaging: More Information

Pressing the Trace Average key (for the selected trace), or sending the TRAC:TYPE AVER command (for the specified trace), sets the trace type to Trace Average and causes the average to be restarted.

When in Trace Average, if a measurement-related instrument setting is changed, the average restarts and a new sweep is initiated but the trace is not cleared.

Restarting the average means:

- The average/hold count k is set to 1, so that the next time the average trace is displayed it simply represents one trace of new data
- A new sweep is initiated.

- Once the new sweep starts, the trace is overwritten with current trace data as the first trace of the new average

Remember that restarting averaging also restarts Max Hold and Min Hold, as there is only one count for Trace Average and Hold.

Max Hold

In Max Hold type the analyzer maintains and displays a max hold trace, which represents the maximum data value on a point-by-point basis of the new trace data and previous trace data.

Pressing the Max Hold key for the selected trace, or sending the :TRAC:TYPE MAXH command for the specified trace, sets the trace type to Max Hold, causes the trace to be cleared, and causes the Max Hold sequence to be (re)started, even if you are already in Max Hold.

When in Max Hold, if a measurement-related instrument setting is changed, the Max Hold sequence restarts and a new sweep is initiated but the trace is not cleared.

Restarting the Max Hold sequence means:

- The average/hold count k is set to 1, so that the next time the max hold trace is displayed it simply represents one trace of new data
- A new sweep is initiated.

Remember that restarting Max Hold also restarts averaging and Min Hold, as there is only one count for Trace Average and Hold.

Key Path	Trace/Detector
Example	TRAC4:TYPE MAXH
Notes	See “"Trace/Detector" on page 1264”.
Dependencies	When Signal ID is on, this key is grayed out for Traces 2–6 in Image Supress mode and for Traces 3–6 in Image Shift Mode. When the Average/Hold switch in the Mode Setup, Legacy Compatibility menu is in the “Legacy” position, the following is true for traces in Max Hold: –They pay no attention to the Average/Hold number; “Single” for Max Hold causes one sweep only, so going to Single stops after the current sweep, and going to Cont starts you going again without clearing the accumulated result –They don’t clear the Max Hold on a Restart or Single or INIT:IMM (changing a measurement parameter like frequency or bandwidth etc would still restart the max hold).
Couplings	Affected by Average Type and Average/Hold Number Whenever you press Max Hold or send the equivalent SCPI command, Update is set to On and Display is set to On. Automatic detector selection and the VBW:RBW ratio auto rules both depend on the trace type selections.
Preset	After a Preset, any trace that is in Max Hold is cleared (all trace points set to mintracevalue).
State Saved	The type for each trace is saved in instrument state
Backwards Compatibility Notes	In the X-Series, unlike earlier analyzers, Max Hold and Min Hold now obey the Average Number and counts up to a terminal value as Average always has.

	As the Average/Hold Number now affects Min Hold and Max Hold, the things that restart Averaging (eg, the Restart key) now also restart Min Hold and Max Hold. As a result of these changes, users who used to restart averaging while retaining a running Max Hold will find that they need to rewrite their code, because the Max Hold will restart when the Average does. Also, previous to the X-Series, –pressing Max Hold while already in Max Hold (or doing so remotely) had no effect. Now it will clear the trace and restart the sweep and the Max Hold sequence.. –changing the vertical scale (Log/Lin or dB/div) of the display restarted Max Hold and Min Hold. This is no longer the case in the X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.11.00

Min Hold

In Min Hold type the analyzer maintains and displays a min hold trace, which represents the minimum data value on a point-point basis of the new trace data and previous trace data. Details of the count limiting behavior may be found under "Average/Hold Number" on page 794 in the Meas Setup Section.

Pressing the Min Hold key for the selected trace, or sending the TRAC:TYPE MINH command for the specified trace, sets the trace type to Min Hold, causes the trace to be cleared, and causes the Min Hold sequence to be (re)started, even if you are already in Min Hold.

When in Min Hold, if a measurement-related instrument setting is changed, the Min Hold sequence restarts and a new sweep is initiated but the trace is not cleared.

Restarting the Min Hold sequence means:

- The average/hold count k is set to 1, so that the next time the min hold trace is displayed it simply represents one trace of new data
- A new sweep is initiated.

Remember that restarting Min Hold also restarts Max Hold and averaging, as there is only one count for Trace Average and Hold.

Key Path	Trace/Detector
Example	TRAC3:TYPE MINH
Notes	See “"Trace/Detector" on page 1264 ”.
Dependencies	When Signal ID is on, this key is grayed out for Traces 2–6 in Image Supress mode and for Traces 3–6 in Image Shift Mode. When the Average/Hold switch in the Mode Setup, Legacy Compatibility menu is in the “Legacy” position, the following is true for traces in Min Hold: –They pay no attention to the Average/Hold number; “Single” for Min Hold causes one sweep only, so going to Single stops after the current sweep, and going to Cont starts you going again without clearing the accumulated result –They don’t clear the Min Hold on a Restart or Single or INIT:IMM (changing a measurement

	parameter like frequency or bandwidth etc would still restart the min hold).
Couplings	Affected by Average Type and Average/Hold Number. Whenever you press Min Hold or send the equivalent SCPI command, Update is set to On and Display is set to On. Automatic detector selection and the VBW:RBW ratio auto rules both depend on the trace type selections.
Preset	After a Preset, any trace that is in Min Hold is cleared (all trace points set to maxtracevalue).
State Saved	The type for each trace is saved in instrument state
Backwards Compatibility Notes	In the X-Series, unlike earlier analyzers, Max Hold and Min Hold now obey the Average Number and counts up to a terminal value as Average always has. As the Average/Hold Number now affects Min Hold and Max Hold, the things that restart Averaging (eg, the Restart key) now also restart Min Hold and Max Hold. As a result of these changes, users who used to restart averaging while retaining a running Min Hold will find that they need to rewrite their code, because the Min Hold will restart when the Average does. Also, previous to the X-Series, –pressing Min Hold while already in Min Hold (or doing so remotely) had no effect. Now it will clear the trace and restart the sweep and the Min Hold sequence. –changing the vertical scale (Log/Lin or dB/div) of the display restarted Max Hold and Min Hold. This is no longer the case in the X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.11.00

View/Blank

This key lets you set the state of the two trace variables, Update and Display. The four choices available in this 1-of-N menu are:

- Trace On: Update and Display both On
- View: Update Off and Display On
- Blank: Update Off and Display Off
- Background: Update On, Display Off (this allows a trace to be blanked and continue to update “in the background”, which was not possible in the past)

A trace with Display Off is indicated by a strikethrough thru the type letter in the trace annotation panel in the Measurement bar. A trace with Update Off is indicated by dimming the type letter in the trace annotation panel in the Measurement bar. So in the example below, Traces 3, 4, 5 and 6 have Update Off and Traces 4 and 6 have Display Off.

See "Trace Update State On/Off" on page 1275.

See "Trace Display State On/Off" on page 1276.

See "More Information" on page 1276.

Key Path	Trace/Detector
Notes	The four states of this 1-of-N actually set two variables, Update and Display, to their four possible combinations: • Trace On: Update and Display both On • View: Update Off and Display On • Blank: Update Off and Display Off • Background: Update On, Display Off See tables below for detail on the SCPI to control these two variables.
Dependencies	When Signal ID is on, this key is grayed out.
Couplings	Selecting a trace type (Clear Write, Trace Average, Max Hold, Min Hold) for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that trace type was already selected. Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts the trace in Trace On (Update On and Display On), even if that detector was already selected. Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that math mode was already selected. Loading a trace from a file puts that trace in View regardless of the state it was in when it was saved; as does being the target of a Copy or a participant in an Exchange.
Initial S/W Revision	Prior to A.02.00

Trace Update State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:UPDate[:STATe] ON|OFF|0|1` `:TRACe[1]|2|...6:UPDate[:STATe]?`
Example	TRAC2:UPD 0 Makes trace 2 inactive (stops updating)
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards	`:TRACe:MODE VIEW`

Compatibility SCPI	sets :TRACe:UPDate OFF, :TRACe:DISPlay ON, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE VIEW command will yield its new equivalent, which is Update=Off, Display=On
Initial S/W Revision	Prior to A.02.00

Trace Display State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:DISPlay[:STATe] ON|OFF|0|1` `:TRACe[1]|2|...6:DISPlay[:STATe]?`
Example	TRAC2:DISP,1 Makes trace 2 visible TRAC3:DISP,0 Blanks trace 3
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRACe:MODE BLANk` sets :TRACe:UPDate OFF, :TRACe:DISPlay OFF, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE BLANk command will yield its new equivalent, which is Update=Off, Display=Off
Initial S/W Revision	Prior to A.02.00

More Information

When a trace becomes inactive, the following things happen:

- Any update from the SENSe system (detectors) immediately stops (does not wait for end of sweep)
- the trace is displayed at half intensity (as long as it stays inactive)

Inactive traces display across the entire X Axis of the instrument. Their horizontal placement does not change even if X Axis settings subsequently are changed, although Y-axis settings will affect the vertical placement of data.

In most cases, inactive traces are static and unchanging; however, there are cases when an inactive trace will update, specifically:

- if data is written to that trace from remote
- if trace data is loaded from mass storage
- if the trace is the target of a Copy or participant in an Exchange
- if the trace is cleared using the Clear Trace function (below)

When a trace becomes active (Update=On), the trace is cleared, the average count is reset, and a new sweep is initiated.

Traces which are blanked (Display=off) do not display nor appear on printouts but are otherwise unaffected. They may be queried and markers may be placed on them.

Note that the action of putting a trace in Display=Off and/or Update=Off does not restart the sweep and does not restart Averaging or Hold functions for any traces.

Note also that whenever you set Update to On for any trace,Display is set to On for that trace.

View/Blank

This key lets you set the state of the two trace variables, Update and Display. The four choices available in this 1-of-N menu are:

- Trace On: Update and Display both On
- View: Update Off and Display On
- Blank: Update Off and Display Off
- Background: Update On, Display Off (this allows a trace to be blanked and continue to update “in the background”, which was not possible in the past)

A trace with Display Off is indicated by a strikethrough thru the type letter in the trace annotation panel in the Measurement bar. A trace with Update Off is indicated by dimming the type letter in the trace annotation panel in the Measurement bar. So in the example below, Traces 3, 4, 5 and 6 have Update Off and Traces 4 and 6 have Display Off.

See "Trace Update State On/Off" on page 1278.

See "Trace Display State On/Off" on page 1278.

See "More Information" on page 1279.

Key Path	Trace/Detector
Notes	The four states of this 1-of-N actually set two variables, Update and Display, to their four possible combinations: • Trace On: Update and Display both On • View: Update Off and Display On • Blank: Update Off and Display Off • Background: Update On, Display Off See tables below for detail on the SCPI to control these two variables.
Dependencies	When Signal ID is on, this key is grayed out.

Couplings	Selecting a trace type (Clear Write, Trace Average, Max Hold, Min Hold) for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that trace type was already selected. Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts the trace in Trace On (Update On and Display On), even if that detector was already selected. Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that math mode was already selected. Loading a trace from a file puts that trace in View regardless of the state it was in when it was saved; as does being the target of a Copy or a participant in an Exchange.
Initial S/W Revision	Prior to A.02.00

Trace Update State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:UPDate[:STATe] ON|OFF|0|1` `:TRACe[1]|2|...6:UPDate[:STATe]?`
Example	TRAC2:UPD 0 Makes trace 2 inactive (stops updating)
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRACe:MODE VIEW` sets :TRACe:UPDate OFF, :TRACe:DISPlay ON, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE VIEW command will yield its new equivalent, which is Update=Off, Display=On
Initial S/W Revision	Prior to A.02.00

Trace Display State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:DISPlay[:STATe] ON|OFF|0|1` `:TRACe[1]|2|...6:DISPlay[:STATe]?`
Example	TRAC2:DISP,1 Makes trace 2 visible TRAC3:DISP,0 Blanks trace 3
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRACe:MODE BLANk`

	sets :TRACe:UPDate OFF, :TRACe:DISPlay OFF, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE BLANk command will yield its new equivalent, which is Update=Off, Display=Off
Initial S/W Revision	Prior to A.02.00

More Information

When a trace becomes inactive, the following things happen:

- Any update from the SENSe system (detectors) immediately stops (does not wait for end of sweep)
- the trace is displayed at half intensity (as long as it stays inactive)

Inactive traces display across the entire X Axis of the instrument. Their horizontal placement does not change even if X Axis settings subsequently are changed, although Y-axis settings will affect the vertical placement of data.

In most cases, inactive traces are static and unchanging; however, there are cases when an inactive trace will update, specifically:

- if data is written to that trace from remote
- if trace data is loaded from mass storage
- if the trace is the target of a Copy or participant in an Exchange
- if the trace is cleared using the Clear Trace function (below)

When a trace becomes active (Update=On), the trace is cleared, the average count is reset, and a new sweep is initiated.

Traces which are blanked (Display=off) do not display nor appear on printouts but are otherwise unaffected. They may be queried and markers may be placed on them.

Note that the action of putting a trace in Display=Off and/or Update=Off does not restart the sweep and does not restart Averaging or Hold functions for any traces.

Note also that whenever you set Update to On for any trace,Display is set to On for that trace.

View/Blank

This key lets you set the state of the two trace variables, Update and Display. The four choices available in this 1-of-N menu are:

- Trace On: Update and Display both On
- View: Update Off and Display On
- Blank: Update Off and Display Off
- Background: Update On, Display Off (this allows a trace to be blanked and continue to update “in the background”, which was not possible in the past)

A trace with Display Off is indicated by a strikethrough thru the type letter in the trace annotation panel in the Measurement bar. A trace with Update Off is indicated by dimming the type letter in the trace annotation panel in the Measurement bar. So in the example below, Traces 3, 4, 5 and 6 have Update Off and Traces 4 and 6 have Display Off.

See "Trace Update State On/Off" on page 1280.

See "Trace Display State On/Off" on page 1281.

See "More Information" on page 1281.

Key Path	Trace/Detector
Notes	The four states of this 1-of-N actually set two variables, Update and Display, to their four possible combinations: • Trace On: Update and Display both On • View: Update Off and Display On • Blank: Update Off and Display Off • Background: Update On, Display Off See tables below for detail on the SCPI to control these two variables.
Dependencies	When Signal ID is on, this key is grayed out.
Couplings	Selecting a trace type (Clear Write, Trace Average, Max Hold, Min Hold) for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that trace type was already selected. Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts the trace in Trace On (Update On and Display On), even if that detector was already selected. Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that math mode was already selected. Loading a trace from a file puts that trace in View regardless of the state it was in when it was saved; as does being the target of a Copy or a participant in an Exchange.
Initial S/W Revision	Prior to A.02.00

Trace Update State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:UPDate[:STATe] ON|OFF|0|1` `:TRACe[1]|2|...6:UPDate[:STATe]?`
Example	TRAC2:UPD 0 Makes trace 2 inactive (stops updating)

Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRACe:MODE VIEW` sets :TRACe:UPDate OFF, :TRACe:DISPlay ON, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE VIEW command will yield its new equivalent, which is Update=Off, Display=On
Initial S/W Revision	Prior to A.02.00

Trace Display State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:DISPlay[:STATe] ON|OFF|0|1` `:TRACe[1]|2|...6:DISPlay[:STATe]?`
Example	TRAC2:DISP,1 Makes trace 2 visible TRAC3:DISP,0 Blanks trace 3
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRACe:MODE BLANk` sets :TRACe:UPDate OFF, :TRACe:DISPlay OFF, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE BLANk command will yield its new equivalent, which is Update=Off, Display=Off
Initial S/W Revision	Prior to A.02.00

More Information

When a trace becomes inactive, the following things happen:

- Any update from the SENSe system (detectors) immediately stops (does not wait for end of sweep)
- the trace is displayed at half intensity (as long as it stays inactive)

Inactive traces display across the entire X Axis of the instrument. Their horizontal placement does not change even if X Axis settings subsequently are changed, although Y-axis settings will affect the vertical placement of data.

In most cases, inactive traces are static and unchanging; however, there are cases when an inactive trace will update, specifically:

- if data is written to that trace from remote
- if trace data is loaded from mass storage

- if the trace is the target of a Copy or participant in an Exchange
- if the trace is cleared using the Clear Trace function (below)

When a trace becomes active (Update=On), the trace is cleared, the average count is reset, and a new sweep is initiated.

Traces which are blanked (Display=off) do not display nor appear on printouts but are otherwise unaffected. They may be queried and markers may be placed on them.

Note that the action of putting a trace in Display=Off and/or Update=Off does not restart the sweep and does not restart Averaging or Hold functions for any traces.

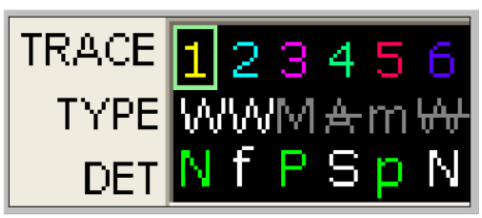
Note also that whenever you set Update to On for any trace,Display is set to On for that trace.

View/Blank

This key lets you set the state of the two trace variables, Update and Display. The four choices available in this 1-of-N menu are:

- Trace On: Update and Display both On
- View: Update Off and Display On
- Blank: Update Off and Display Off
- Background: Update On, Display Off (this allows a trace to be blanked and continue to update “in the background”, which was not possible in the past)

A trace with Display Off is indicated by a strikethrough thru the type letter in the trace annotation panel in the Measurement bar. A trace with Update Off is indicated by dimming the type letter in the trace annotation panel in the Measurement bar. So in the example below, Traces 3, 4, 5 and 6 have Update Off and Traces 4 and 6 have Display Off.



See "Trace Update State On/Off" on page 1283.

See "Trace Display State On/Off" on page 1283.

See "More Information" on page 1284.

Key Path	Trace/Detector
Notes	The four states of this 1-of-N actually set two variables, Update and Display, to their four possible combinations: • Trace On: Update and Display both On • View: Update Off and Display On • Blank: Update Off and Display Off • Background: Update On, Display Off

	See tables below for detail on the SCPI to control these two variables.
Dependencies	When Signal ID is on, this key is grayed out.
Couplings	Selecting a trace type (Clear Write, Trace Average, Max Hold, Min Hold) for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that trace type was already selected. Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts the trace in Trace On (Update On and Display On), even if that detector was already selected. Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that math mode was already selected. Loading a trace from a file puts that trace in View regardless of the state it was in when it was saved; as does being the target of a Copy or a participant in an Exchange.
Initial S/W Revision	Prior to A.02.00

Trace Update State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:UPDate[:STATe] ON|OFF|0|1` `:TRACe[1]|2|...6:UPDate[:STATe]?`
Example	TRAC2:UPD 0 Makes trace 2 inactive (stops updating)
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRACe:MODE VIEW` sets :TRACe:UPDate OFF, :TRACe:DISPlay ON, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE VIEW command will yield its new equivalent, which is Update=Off, Display=On
Initial S/W Revision	Prior to A.02.00

Trace Display State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:DISPlay[:STATe] ON|OFF|0|1` `:TRACe[1]|2|...6:DISPlay[:STATe]?`
Example	TRAC2:DISP,1 Makes trace 2 visible TRAC3:DISP,0 Blanks trace 3
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)

State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRACe:MODE BLANk sets :TRACe:UPDate OFF, :TRACe:DISPlay OFF, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE BLANk command will yield its new equivalent, which is Update=Off, Display=Off
Initial S/W Revision	Prior to A.02.00

More Information

When a trace becomes inactive, the following things happen:

- Any update from the SENSe system (detectors) immediately stops (does not wait for end of sweep)
- the trace is displayed at half intensity (as long as it stays inactive)

Inactive traces display across the entire X Axis of the instrument. Their horizontal placement does not change even if X Axis settings subsequently are changed, although Y-axis settings will affect the vertical placement of data.

In most cases, inactive traces are static and unchanging; however, there are cases when an inactive trace will update, specifically:

- if data is written to that trace from remote
- if trace data is loaded from mass storage
- if the trace is the target of a Copy or participant in an Exchange
- if the trace is cleared using the Clear Trace function (below)

When a trace becomes active (Update=On), the trace is cleared, the average count is reset, and a new sweep is initiated.

Traces which are blanked (Display=off) do not display nor appear on printouts but are otherwise unaffected. They may be queried and markers may be placed on them.

Note that the action of putting a trace in Display=Off and/or Update=Off does not restart the sweep and does not restart Averaging or Hold functions for any traces.

Note also that whenever you set Update to On for any trace,Display is set to On for that trace.

View/Blank

This key lets you set the state of the two trace variables, Update and Display. The four choices available in this 1-of-N menu are:

- Trace On: Update and Display both On
- View: Update Off and Display On
- Blank: Update Off and Display Off

- Background: Update On, Display Off (this allows a trace to be blanked and continue to update “in the background”, which was not possible in the past)

A trace with Display Off is indicated by a strikethrough thru the type letter in the trace annotation panel in the Measurement bar. A trace with Update Off is indicated by dimming the type letter in the trace annotation panel in the Measurement bar. So in the example below, Traces 3, 4, 5 and 6 have Update Off and Traces 4 and 6 have Display Off.

See "Trace Update State On/Off" on page 1285.

See "Trace Display State On/Off" on page 1286.

See "More Information" on page 1286.

Key Path	Trace/Detector
Notes	The four states of this 1-of-N actually set two variables, Update and Display, to their four possible combinations: • Trace On: Update and Display both On • View: Update Off and Display On • Blank: Update Off and Display Off • Background: Update On, Display Off See tables below for detail on the SCPI to control these two variables.
Dependencies	When Signal ID is on, this key is grayed out.
Couplings	Selecting a trace type (Clear Write, Trace Average, Max Hold, Min Hold) for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that trace type was already selected. Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts the trace in Trace On (Update On and Display On), even if that detector was already selected. Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that math mode was already selected. Loading a trace from a file puts that trace in View regardless of the state it was in when it was saved; as does being the target of a Copy or a participant in an Exchange.
Initial S/W Revision	Prior to A.02.00

Trace Update State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...6:UPDate[:STATe] ON|OFF|0|1`

	:TRACe[1]|2|...6:UPDate[:STATe]?
Example	TRAC2:UPD 0 Makes trace 2 inactive (stops updating)
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRACe:MODE VIEW sets :TRACe:UPDate OFF, :TRACe:DISPlay ON, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE VIEW command will yield its new equivalent, which is Update=Off, Display=On
Initial S/W Revision	Prior to A.02.00

Trace Display State On/Off

Key Path	Trace/Detector
Remote Command	:TRACe[1]|2|...6:DISPlay[:STATe] ON|OFF|0|1 :TRACe[1]|2|...6:DISPlay[:STATe]?
Example	TRAC2:DISP,1 Makes trace 2 visible TRAC3:DISP,0 Blanks trace 3
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRACe:MODE BLANk sets :TRACe:UPDate OFF, :TRACe:DISPlay OFF, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE BLANk command will yield its new equivalent, which is Update=Off, Display=Off
Initial S/W Revision	Prior to A.02.00

More Information

When a trace becomes inactive, the following things happen:

- Any update from the SENSe system (detectors) immediately stops (does not wait for end of sweep)
- the trace is displayed at half intensity (as long as it stays inactive)

Inactive traces display across the entire X Axis of the instrument. Their horizontal placement does not change even if X Axis settings subsequently are changed, although Y-axis settings will affect the vertical placement of data.

In most cases, inactive traces are static and unchanging; however, there are cases when an inactive trace will update, specifically:

- if data is written to that trace from remote
- if trace data is loaded from mass storage
- if the trace is the target of a Copy or participant in an Exchange
- if the trace is cleared using the Clear Trace function (below)

When a trace becomes active (Update=On), the trace is cleared, the average count is reset, and a new sweep is initiated.

Traces which are blanked (Display=off) do not display nor appear on printouts but are otherwise unaffected. They may be queried and markers may be placed on them.

Note that the action of putting a trace in Display=Off and/or Update=Off does not restart the sweep and does not restart Averaging or Hold functions for any traces.

Note also that whenever you set Update to On for any trace,Display is set to On for that trace.

Detector

Selects a detector. The detector selected is then applied to the selected trace.

For the SCPI UI, two commands are provided. One is a legacy command, which affects all traces. There is also a command which is new for the X-Series, which uses a subopcode to specify to which trace the specified detector is to be applied.

The three detectors on the second page of the Detector menu, Quasi Peak, EMI Average, and RMS Average, are referred to collectively as the “CISPR detectors” because their behaviors are specified by the CISPR 16–1–1 specification.

The analyzer can typically provide 3 different detectors simultaneously. Occasionally the analyzer can only provide 2 simultaneous detectors, typically when the Average detector is selected. When one of the CISPR detectors is selected, it is only possible to have that one detector so all active traces change to that detector. It is never possible to have more than 3 simultaneous detectors.

See "More Information" on page 1290

Key Path	Trace/Detector
Remote Command	`[:SENSe]:DETector:TRACe[1] | 2 | ...6 AVERage | NEGative | NORMal | POSitive | SAMPle | QPEak | EAVerage | RAVerage` `[:SENSe]:DETector:TRACe[1]|2|...6?`
Example	DET:TRAC AVER -- Sets trace 1’s detector to average DET:TRAC1 AVER -- Sets trace 1’s detector to average DET:TRAC2 SAMP -- Sets trace 2’s detector to sample
Notes	When a detector selection is made, the menu returns to the previous menu. Selecting any CISPR detector on any active trace sets the EMI Standard to CISPR.
Notes	The query returns a name that corresponds to the detector type as shown below, and indicates the setting for Trace 1. String ReturnedDefinition

	NORM =Normal AVER =Average / RMS POS =Positive peak SAMP =Sample NEG =Negative peak QPE =Quasi Peak EAV =EMI Average RAV =RMS Average
Dependencies	When Tune & Listen is turned on, or Demod Audio is the selected Analog Output: • all active traces are forced to use the same detector. • CISPR detectors (QPD, EMI Avg, RMS Avg) are unavailable CISPR detectors are grayed out when you have manually selected FFT sweep. Conversely, if any CISPR detector is selected on an active trace, the auto rules for sweep type will never select FFT, and manual FFT selection will be grayed out. When Signal ID is on, the Detector key is grayed out for Traces 2–6 in Image Supress mode and for Traces 3–6 in Image Shift Mode. If the grayed out key is pressed, an advisory message is generated. If the equivalent SCPI command is sent, this same message is generated as part of a "–221, Settings conflict" warning. It is never possible to have more than 3 simultaneous detectors, and sometimes fewer than three. If the analyzer has to enforce this limit a message is generated, "Detector n changed due to physical constraints" where "n" is the detector number.
Couplings	The auto detector rules depend upon marker type, averaging state and type, trace state writing mode, and trace active state. _Auto_Rules_(couplings) If the Avg Type is in Auto, and any of the CISPR detectors is selected on any active trace, the Voltage Averaging type is auto-selected. In Tracking Source mode, if a stepped source is used (for example, an external source using option ESC), the best detector is Average, as this gives optimal sensitivity. Therefore, when operating a source in Tracking Source mode, Auto selection is Average. All other detector selections are allowed, but in most cases the user will want to stick with the Auto selection, which gives optimal sensitivity.
Preset	Preset returns all traces to "auto", which will result in Normal (Rosenfell) detection for all traces.
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

Remote Command	`[:SENSe]:DETector[:FUNCtion] NORMal | AVERage | POSitive | SAMPle | NEGative | QPEak | EAVerage | EPOSitive | MPOSitive | RMS` `[:SENSe]:DETector[:FUNCtion]?`
Example	DET AVER Sets detector to average for all traces DET:FUNC? Returns trace 1's detector setting

Notes	This is a SCPI only legacy command to preserve the classic functionality wherein all traces are affected when a detector is selected (in the X-Series, the detector is set on a per-trace basis). The query returns a name that corresponds to the detector type as shown below, and indicates the setting for Trace 1. The RMS selection sets the detector type to AVERage and the Average Type to RMS. Therefore if RMS has been selected, the query will return the “AVER” string. The EPOS selection sets the detector type to Peak and the EMI Standard to CISPR. A query will then return POS The MPOS selection sets the detector type to Peak and the EMI Standard to MIL Impulse. A query will then return POS The RAV parameter is not included in the command because this is not a legacy detector; nonetheless, if it happens to be the detector on Trace 1 then RAV will be returned. String ReturnedDefinition NORM =Normal AVER =Average / RMS POS =Positive peak SAMP =Sample NEG =Negative peak QPE =Quasi Peak EAV =EMI Average RA =RMS Average
Preset	NORMal
State Saved	Saved in instrument state
Backwards Compatibility Notes	1. In ESA and E7400, selecting QPD or EMI Average sets the Amplitude Scale Type to Linear and performs an auto-ranging function resulting in the Reference Level being adjusted such that the highest level of the trace is near (but below) the Reference Level. Subsequent selection of Peak, Negative Peak, Sample, or Average (the 'non-EMI Detectors') will return the Reference Level and Amplitude Scale Type to their pre-EMI Detector values. The X-Series does not perform this scale and reference level change because the digital IF makes it unnecessary.. 2. The commands which select the CISPR detectors are not generally compatible with pre-PSA instruments, because the CISPR detectors are now part of the overall detector set, rather than a separate set. However, the basic behavior of coupling the resolution bandwidth to the selected detector is similar to the behavior of previous EMI analyzers, like the E4400B series. 3. In the past, selecting Auto Couple All did not change the selected CISPR detector. Now, since the CISPR detectors are part of the full set of detectors, pressing Auto Couple All will switch from the selected CISPR detector to an auto coupled detector according to the Auto Detector rules in the Detector, Auto key description below. 4. The following ESA/E7400 detector commands are no longer accepted: [:SENSe]:DETector[:FUNCtion]:EMI QPD|AVERage|OFF[:SENSe]:POWer:QPGain[:STATe] [:SENSe]:ARDT
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

More Information

The available detectors are:

- The Sample detector indicates the instantaneous level of the signal at the center of the bucket represented by each display point.
- The Normal detector determines the peak of CW-like signals, and it yields alternating maximums and minimums of noise-like signals. This is also referred to as Rosenfell detection.
- The Average detector determines the average of the signal within the bucket. The averaging method depends upon Average Type selection (voltage, power or log scales).
- The Peak detector determines the maximum of the signal within the bucket.
- The Negative Peak detector determines the minimum of the signal within the bucket.
- The Quasi-Peak detector is a fast-rise, slow-fall detector used in making CISPR compliant EMI measurements.
- The EMI-Average detector provides a standard means to “smooth” the signal while still providing compliance to CISPR pulse response standards. It displays the average value of the amplitude envelope, rather than the average value of sample-detected amplitude, and uses an advanced algorithm to realize a lowpass filter that conforms to the latest CISPR standard.
- The RMS Average detector is a frequency dependent RMS or Averaging filter, used in making CISPR compliant EMI measurements, which performs one averaging process (in the VBW hardware) on the "power" (a.k.a. RMS) scale, and another process on the voltage scale using a "meter movement simulator". This filter conforms to the 2007 revision of the CISPR 16–1–1 standard.

Because they may not find a spectral component's true peak, neither average nor sample detectors measure amplitudes of CW signals as accurately as peak or normal, but they do measure noise without the biases of peak detection.

When the Detector choice is Auto, the detector selected depends on marker functions, trace functions, average type, and the trace averaging function.

When you manually select a detector (instead of selecting Auto), that detector is used regardless of other analyzer settings.

Multiple Detectors

The analyzer always provides the requested detector on the specified trace. Depending on the detectors requested the analyzer can provide up to three different detectors simultaneously within the constraints of its digital processing algorithms. Some detectors utilize more resources; the Quasi-Peak detector, for example, utilizes most of the digital IF’s resources, and the hardware in some analyzers is incapable of providing another detector when Quasi-Peak is on. If the limit of system resources is exceeded, detectors on some existing traces may be forced to change. When this happens, they change to match the detector just requested, and a message is generated: “Detector <X> changed due to physical constraints”, where X might contain multiple values.

Example: User has traces 1, 2, and 3 with Peak, Average, and Negative Peak. User specifies QPD for trace 1. Traces 2 and 3 also change to QPD and we generate the message “Detector 2,3 changed due to physical constraints”. Now all three traces have the QPD.

Auto

This sets the detector for the currently selected trace to Auto. (For SCPI, the trace number is specified as a subopcode.) This will immediately apply the auto rules to determine a new detector value.

Key Path	Trace/Detector, Detector
Remote Command	`[:SENSe]:DETector:TRACe[1]|2|...6:AUTO ON	OFF	1	0` `[:SENSe]:DETector:TRACe[1]|2|...6:AUTO?`
Example	DET:TRACE2:AUTO ON Sets trace 2 detection to automatic.
Dependencies	The auto detector rules depend upon marker type, averaging state and type, trace state writing mode, and trace active state. _Auto_Rules_(couplings) When operating a source in Tracking Source mode, Auto selection is the Average detector. All other detector selections are allowed, but in most cases you will want to stick with Average, which gives optimal sensitivity.
Couplings	Selecting AUTO, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace.
Preset	Auto (On) for all detectors.
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Remote Command	`[:SENSe]:DETector:AUTO ON	OFF	1	0` `[:SENSe]:DETector:AUTO?`
Example	DET:AUTO ON
Notes	SCPI only. Turns AUTO on or off for ALL detectors. This is a legacy command to preserve the classic functionality wherein all traces are affected when a detector is addressed
Notes	The query returns the Auto state of Trace 1.
Initial S/W Revision	Prior to A.02.00

Normal

This sets the detector for the current selected trace to Normal (Rosenfell).

When the signal is CW-like, it displays the peak-detected level in the interval (bucket) being displayed. If the signal is noise-like (within a bucket the signal both rose and fell), it alternates displaying the max/min values. That is, an even bucket shows the peak (maximum) within a two-bucket wide interval centered on the even bucket. And an odd bucket will show the negative peak (minimum) within a two-bucket wide interval. For example, for an even bucket the two-bucket wide interval is a combination of one-half bucket to the left of the even bucket, the even bucket itself, and one-half bucket to the right of the even bucket, so the peak found will be displayed in the correct relative location on screen. The odd buckets are similar.

Key Path	Trace/Detector, Detector
Example	DET:TRAC3 NORM Sets the detector to normal for trace 3.

Dependencies	Selecting any detector (even the currently selected detector) for a given trace turns Update and Display on for that trace. Normal detector is grayed out when the X scale is Log.
Couplings	Selecting a specific detector type turns "Auto" to false for this trace (manual). Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and Display On for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior. Selecting a detector, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace.
Initial S/W Revision	Prior to A.02.00

Average (Log/RMS/V)

For each bucket (interval) in the trace, Average detection displays the average of the amplitude within the bucket using one of the following averaging methods:

- Log power (also known as video)
- Power (also known as RMS)
- Voltage envelope

To explicitly set the averaging method, use the Meas Setup, Average Type key. When you are using average detection with the Power method is equivalent to what is sometimes referred to as "RMS detection". The detailed information about the different types of averaging is found in Average Type in the Meas Setup key menu.

Key Path	Trace/Detector, Detector
Example	DET:TRAC3 AVER Sets the detector to average for trace 3.
Notes	For the specific case of a customer wanting RMS detection, they need to set the averaging type to RMS, and also select average detection for the trace: AVER:TYPE RMS DET:TRAC AVER
Dependencies	Selecting any detector (even the currently selected detector) for a given trace turns Update and Display on for that trace.
Couplings	Selecting a specific detector type turns "Auto" to false for this trace (manual). Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and Display On for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior. Selecting a detector, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace. The VBW filter is not used for this detector, so varying the VBW will have no effect for any traces for which this detector is selected (other than to slow down the sweep, because of the coupling to Sweep Time of VBW). If any traces are active for which VBW does not apply (traces with Average, EMI Average, RMS Average or Quasi Peak detectors), then an * displays after the VBW annotation on the front panel.

	Use of the Average detector affects the VBW setting because of its effect on the VBW/RBW coupling. See the BW section under the key “"Video BW " on page 590”.
Initial S/W Revision	Prior to A.02.00

Peak

For each bucket (interval) in the trace, Peak detection displays the highest amplitude within the bucket.

Peak detection is used for CW measurements and some pulsed-RF measurements. For FFT analysis, the highest amplitude across the frequency width of a bucket is displayed, even if that peak amplitude falls between samples of the spectrum computed in the FFT process.

Key Path	Trace/Detector, Detector
Example	DET:TRAC2 POS Sets the detector to peak for trace 2.
Couplings	Selecting a specific detector type turns “Auto” to false for this trace (manual). Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and DisplayOn for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior. Selecting a detector, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace.
Initial S/W Revision	Prior to A.02.00

Sample

The sample detector displays the instantaneous level of the signal at the center of the bucket (interval) represented by each trace point.

Sample detection is good for displaying noise or noise-like signals.

Sample detection is not the best for making amplitude measurements of CW-like signals for two reasons. First, the peak response to a signal can occur between samples. So unless the Span to RBW ratio is lower than usual, then the highest sample can be well below the peak signal amplitude. Second, for the high sweep rates normally used, the peak response of the RBW filters is up to –0.5 dB. This sweeping error is compensated when using the peak and normal detectors by changing the overall gain. But the gain is not changed when in the sample detector, because doing so would cause errors in the response to noise. Instead, the auto-couple rules for sweep time are modified to give slower sweeps.

Key Path	Trace/Detector, Detector
Example	DET:TRAC SAMP Selects the Sample detector for trace 1.
Couplings	Selecting a specific detector type turns “Auto” to false for this trace (manual). Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and DisplayOn for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior.

	Selecting a detector, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace.
Initial S/W Revision	Prior to A.02.00

Negative Peak

For each bucket (interval) in the trace, Negative Peak detection displays the lowest sample within the bucket. Negative peak detection is similar to peak detection, but selects the minimum video signal.

Key Path	Trace/Detector, Detector
Example	DET:TRAC2 NEG Selects the negative peak detector for trace 2.
Couplings	Selecting a specific detector type turns “Auto” to false for this trace (manual). Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and DisplayOn for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior. Selecting a detector, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace.
Initial S/W Revision	Prior to A.02.00

Quasi Peak

Only appears with the N6141A or W6141A application or Option EMC installed and licensed.

This is a fast-rise, slow-fall detector used in making CISPR compliant EMI measurements and defined by CISPR Publication 16–1–1. Quasi-peak detection displays a weighted, sample-detected amplitude using specific, charge, discharge, and meter time constants derived from the legacy behaviors of analog detectors and meters. It is used for EMI measurements to provide a specific and consistent response to EMI-like signals.

Note that CISPR standard operation is to perform the averaging associated with quasi peak detection on the voltage scale. You can manually set the Average Type to Log-Power or Power, but the results will no longer be CISPR compliant.

See "More Information" on page 1295.

Key Path	Trace/Detector, Detector
Example	DET:TRAC3 QPE Selects the quasi-peak detector for trace 3.
Dependencies	Unavailable in manual FFT sweep. Unavailable when Tune & Listen is turned on, or Demod Audio is the selected Analog Output:
Couplings	If the user selects this detector on any active trace, the EMI Standard will be set to CISPR. If any inactive trace with this detector selected goes active, the EMI Standard is set to CISPR. If the Avg Type is in Auto, and this detector is selected on any active trace, the Voltage Averaging type is auto-selected. The VBW filter is not used for this detector, so varying the VBW will have no effect for any traces for

	which this detector is selected (other than to slow down the sweep, because of the coupling to Sweep Time of VBW). If any traces are active for which VBW does not apply (traces with Average, EMI Average, RMS Average or Quasi Peak detectors), then an * displays after the VBW annotation on the front panel. Selecting a specific detector type turns the “"Auto " on page 1291” (to false for this trace (manual). Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and DisplayOn for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior. Selecting a detector, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace.
Initial S/W Revision	A.02.00

More Information

In the past, Quasi Peak and EMI Average measurements were often made on a linear display scale because those detectors only worked properly with signals on a linear (voltage) scale. The X-series analyzers are capable of making Quasi Peak and EMI Average detected measurements correctly on a log scale, due to the digital IF. This latter capability means that the user can observe detected EMI levels on a log scale, allowing a large visible dynamic range.

Also in the past, EMI analysis equipment would need to perform a ranging operation to set the reference level when one of these detectors was turned on, but the X-series analyzers do not - because of its digital IF, there is no need to set the reference level (range) to improve the accuracy nor to allow visibility of the detected level.

EMI Average

Only appears with the N6141A or W6141A application or Option EMC installed and licensed.

The EMI Average detector in Keysight’s X-Series analyzers is so called to distinguish it from the Average detector, although EMI users typically refer to it simply as the “Average detector”. The intent of this detector is to provide a standard means to “smooth” the signal while still providing compliance to CISPR pulse response standards.

Unlike the regular Average detector, which averages on a bucket-by-bucket basis using either a power, log-power or voltage scale (a bucket is the same as a trace point), the EMI Average detector displays the average value, on the voltage scale, of the overall amplitude envelope, independent of the trace bucket width. It is defined for EMI measurements by the CISPR 16–1–1 standard and, in the X-series, uses a sophisticated algorithm to implement a lowpass filter that conforms to the latest CISPR standard.

Note that CISPR standard operation is to perform the envelope averaging on the voltage scale. You can manually set the Average Type to Log-Power or Power, but the results will no longer be CISPR compliant.

Key Path	Trace/Detector, Detector
Example	DET:TRAC3 EAV Selects the EMI average detector for trace 3.
Dependencies	Unavailable in manual FFT sweep.

	Unavailable when Tune & Listen is turned on, or Demod Audio is the selected Analog Output:
Couplings	If the user selects this detector on any active trace, the EMI Standard will be set to CISPR. If any inactive trace with this detector selected goes active, the EMI Standard is set to CISPR. If the Avg Type is in Auto, and this detector is selected on any active trace, the Voltage Averaging type is auto-selected. The VBW filter is not used for this detector, so varying the VBW will have no effect for any traces for which this detector is selected (other than to slow down the sweep, because of the coupling to Sweep Time of VBW). If any traces are active for which VBW does not apply (traces with Average, EMI Average, RMS Average or Quasi Peak detectors), then an * displays after the VBW annotation on the front panel. Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and DisplayOn for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior. Selecting a detector, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace.
Initial S/W Revision	A.02.00

RMS Average

Only appears with the N6141A or W6141A application or Option EMC installed and licensed.

This key selects the RMS Average detector, a frequency dependent RMS/Averaging filter, used in making CISPR compliant EMI measurements. This filter conforms to the 2007 revision of the CISPR 16–1–1 standard.

This detector does one averaging process (in the VBW hardware) on the "power" (a.k.a. RMS) scale and another process on the voltage scale using a "meter movement simulator" similar to the one used in the QPD filter.

Note that the user can manually set the Average Type to Log-Power or Power, but the results will no longer be CISPR compliant.

Key Path	Trace/Detector, Detector
Example	DET:TRAC3 RAV Selects the RMS Average detector for trace 3.
Notes	This key / command is grayed out when you have manually selected FFT sweep.
Dependencies	Unavailable in manual FFT sweep. Unavailable when Tune & Listen is turned on, or Demod Audio is the selected Analog Output:
Couplings	Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and DisplayOn for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior.
Couplings	If the user selects this detector on any active trace, the EMI Standard will be set to CISPR. If any inactive trace with this detector selected goes active, the EMI Standard is set to CISPR. If the Avg Type is in Auto, and this detector is selected on any active trace, the Voltage Averaging type is auto-selected. The VBW filter is not used for this detector, so varying the VBW will have no effect for any traces for

	which this detector is selected (other than to slow down the sweep, because of the coupling to Sweep Time of VBW). If any traces are active for which VBW does not apply (traces with Average, EMI Average, RMS Average or Quasi Peak detectors), then an * displays after the VBW annotation on the front panel. Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts Update On and DisplayOn for that trace, even if that detector was already selected. Note that the legacy command [:SENS]:DET[:FUNC] does NOT exhibit this behavior. Selecting a detector, whether by pressing the softkey or sending the equivalent SCPI command, will turn trace math to Off for the selected/specified trace.
Initial S/W Revision	A.02.00

Preset Detectors

The keys in this menu provide a quick way of setting a number of traces to convenient common detector settings. It is important to point out that these are not toggles or 'modes', and do not keep any detectors in a particular configuration. The effect is identical to just setting the traces' detectors individually. These are simply one-time settings that are quicker than making many individual changes.

Key Path	Trace/Detector, Detector
Dependencies	When Signal ID is on, this key is grayed out.
Preset	No interaction with preset
State Saved	Not saved in instrument state
Initial S/W Revision	Prior to A.02.00

All Traces Auto

This is designed to quickly return the selected set of detectors to the "preset" state, which is auto-selected.

Key Path	Trace/Detector, Detector, Preset Detectors
Couplings	Sets all traces' Detector Auto to true.
Initial S/W Revision	Prior to A.02.00

Peak / Average / NPeak

This is a setting for making a measurement of the average power and the signal envelope.

Key Path	Trace/Detector, Detector, Preset Detectors
Couplings	Trace 1: Set to peak detection, and Clear-Write. Trace 2: Set to average detection, and Clear-Write.

	Trace 3: Set to negative peak detection, and Clear-Write.
Initial S/W Revision	Prior to A.02.00

Peak / Sample / NPeak

This is a setting for making a measurement that displays a power sample and the signal envelope.

Key Path	Trace/Detector, Detector, Preset Detectors
Couplings	Trace 1: Set to peak detection, and Clear-Write. Trace 2: Set to sample detection, and Clear-Write. Trace 3: Set to negative peak detection, and Clear-Write.
Initial S/W Revision	Prior to A.02.00

Clear Trace

Clears the selected trace (from the front panel) or the specified trace (from SCPI). Does not affect the state of any function or variable in the instrument. Loads mintracevalue into all of the points in the selected trace, unless the trace is in Min Hold in which case it loads maxtracevalue. It does this even if Update=Off.

Key Path	Trace/Detector
Remote Command	`:TRACe:CLEar TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6`
Example	TRAC:CLE TRACE1 Clears trace 1
Initial S/W Revision	Prior to A.02.00

Clear All Traces

Clears all traces. Does not affect the state of any function or variable in the instrument. Loads mintracevalue into all of the points all traces, except traces in Min Hold in which case it loads maxtracevalue. Does so even if Update=Off.

Key Path	Trace/Detector

Remote Command	`:TRACe:CLEar:ALL`
	`:TRACe:PRESet:ALL`
	When Signal ID is on, this key is grayed out.

Example	TRAC:CLE:ALL Clears all traces
Initial S/W Revision	Prior to A.02.00

Preset All Traces

Turns on Trace 1 and blanks all other traces. Useful when you have many traces on and you want to go back to having only Trace 1 on the display. Does not affect the trace type, detector or any other aspect of the trace system.

Key Path	Trace/Detector
Remote Command	`:TRACe:PRESet:ALL` When Signal ID is on, this key is grayed out.
Example	TRAC:PRES:ALL
Initial S/W Revision	A.08.01

Math

This menu lets you turn on trace math functions. Trace math functions perform mathematical operations between traces and, in some cases, user-specified offsets. When in a trace math function, the indicated function is performed during the sweep with the math function used in place of a detector. The trace operands for the math function are set using the Trace Operands key.

See "Math: More Information" on page 1300.

Key Path	Trace/Detector
Remote Command	`:CALCulate:MATH TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6, PDIFference | PSUM | LOFFset | LDIFference | OFF, TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6, TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6, <real>,<real>` `:CALCulate:MATH? TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6`
Notes	The lower level menu, which contains an embedded 1-of-N, does not auto-return when a selection is made.
Notes	The Trace Math Function command has 6 main set of parameters: - Set 1 defines the “result trace”: TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6 -Set 2 defines the “function”: PDIFference|PSUM|LOFFset|LDIFference|OFF - Set 3 is a “trace operand” (1): TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6 - Set 4 is a “trace operand” (2): TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6 - Set 5 defines the “Log Offset” (in dB). - Set 6 defines the “Log Difference Reference” (in dBm). Note that the trace math mode is an enumeration; that is, when a math function is set for a trace it turns off any math function that is on for that trace and sets the new math function. The parameters sent in the command are reflected in the values in the softkey menu. There is no default for any parameter; all 6 parameters must be sent to satisfy the parser. Failure to specify a

	parameter will result in a missing parameter message. Note that for some of the math modes some of the parameters are not relevant. For those modes, the parameters are ignored, and sending “,,” is sufficient for those parameters. The query returns the math mode, the operand traces, the offset and the reference for the specified trace, all separated by commas. The return value of irrelevant parameters is undefined; empty fields (“,,”) would be desirable. Remote command examples are included in each section below.
Dependencies	Trace Math is not available if Normalize is on. Trace Math is not available if Signal ID is on. None of the trace operands can be the destination trace. If any of the three trace math commands is sent with a destination trace number matching one of the operands a warning is generated and the function does not turn on.
Couplings	Whenever a math function is turned on for a trace, that trace is set to Display=On and Update=On.
Preset	OFF, TRACE5, TRACE6, 0, 0 | OFF, TRACE6, TRACE1, 0, 0 | OFF, TRACE1, TRACE2, 0, 0 | OFF, TRACE2, TRACE3, 0, 0 | OFF, TRACE3, TRACE4, 0, 0 | OFF, TRACE4, TRACE5, 0, 0
State Saved	The trace math function for each trace is saved in instrument state.
Status Bits/OPC dependencies	*OPC can be used to detect the completion of a sweep, which will also correspond to the completion of the math operation, since all math takes place during the sweep
Backwards Compatibility Notes	The legacy TRACE:MATH:ADD and TRACE:MATH:SUBTract commands have been eliminated.
Initial S/W Revision	Prior to A.02.00

Math: More Information

IMPORTANT: to generate a trace math result, you must take a sweep. The trace math engine, described below, operates in concert with the sweep engine in the analyzer. Until a sweep has been taken, even if the constituent traces are not in Update mode, no result is generated. Note that certain events can affect the trace in ways that affects all points at once. This can happen in any number of ways, including:

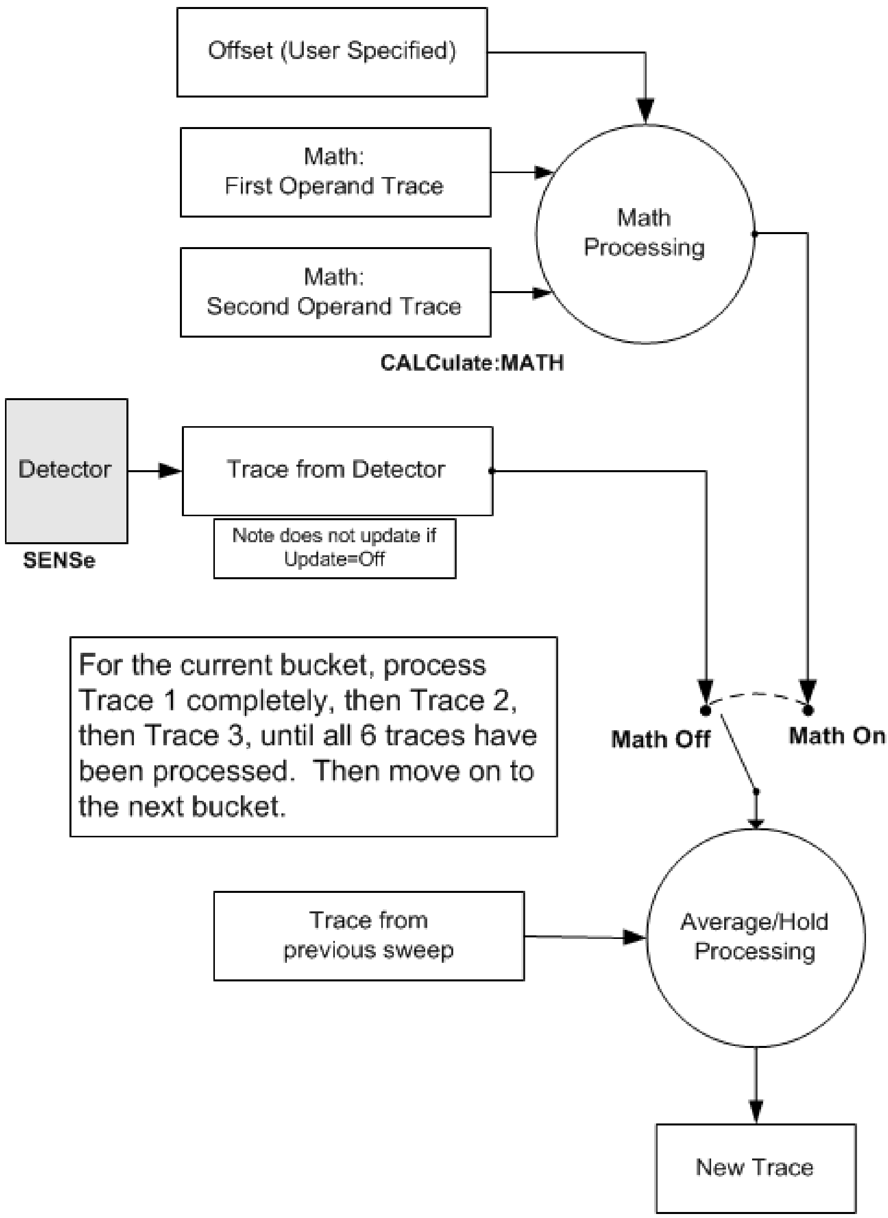
- A trace clear taking place
- A trace being loaded from the file system
- Trace data being sent in from the remote interface
- A copy or exchange of trace data

You should try to avoid these occurrences during a sweep, as they will tend to invalidate the math result being accumulated.

How trace math is processed:

Whenever a trace math function is turned on, or the parameters and/or operands of an existing trace math function are changed, the destination trace is cleared. After the trace is cleared, all x-axis values in the trace, and the domain of the trace, are set to match the X Axis settings of the first trace operand. When this is complete, a new sweep is initiated.

The process of acquiring data, processing it using the math and average/hold functions, and presenting it to the user as trace data, consists of several functional blocks, as shown below:



NOTE ABOUT OFFSETS: When either External Gain or Ref Level Offset is on, an offset is applied to the trace operands, and when Trace Math is on this offset is applied before any math processing is performed. Since the operands have already been offset the result trace should NOT be offset. Therefore when any Trace Math operation is performed, the sum of (External Gain - Ref Level Offset) is added to the result before it is stored in the result trace.

For each active trace, the current trace point is processed for Trace 1, then Trace 2, then Trace 3, etc. Trace data is taken from either the detector for that trace, or from the mathematical result of up to two other traces and an offset, depending on whether trace math is on or not. The resultant data is then fed to the Average/Hold processing block, where (if the trace type is Average, Max Hold, or Min Hold) it is processed with previous trace data. The new trace data resulting from this process is then available for display, storage or remote output.

When the processing is complete for Trace 1, Trace 2 is processed, and so on until all six traces have been processed. This allows a downstream trace to use as one of its math components a fully processed upstream trace. In other words, if math is on for Trace 4, and its operand traces are Trace 2 and Trace 3, all detector, math, average and hold processing for traces 2 and 3 is complete before the math is performed for trace 4. When the current trace point is completed for all traces, the analyzer moves on to the next trace point.

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.

Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Select Trace

Determines which trace the type control keys will affect. When you select a trace, it makes that trace the current trace, so it displays on top of all of the other traces.

Key Path	Trace/Detector
Dependencies	Traces 1 and 2 cannot be selected (grayed out) when Image Shift is On.
Preset	Trace 1
State Saved	The number of the selected trace is saved in Instrument State
Initial S/W Revision	Prior to A.02.00

Power Diff (Op1-Op2)

Calculates a power difference between the First Trace operand and the Second Trace operand and puts the result in the destination trace.

During the sweep, the following formula is executed for each point in the trace operands, and the corresponding point is generated for the destination trace:

DestinationTrace = 10 log(10(1/10)(FirstTrace) – 10(1/10)(SecondTrace))

The values of the trace points are assumed to be in a decibel scale, as they are internally stored.

If a point in FirstTrace is equal to maxtracevalue, the resultant point is also maxtracevalue.

Otherwise, if the result of the subtraction is less than or equal to 0, the resultant point is mintracevalue.

Key Path	Trace/Detector, Math
Example	:CALC:MATH TRACE1,PDIF,TRACE4,TRACE5,, Sets Trace 1 to Power Diff trace math function, and sets the First Trace operand (for Trace 1) to Trace 4 and the Second Trace operand (for Trace 1) to Trace 5.
Couplings	Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in View (Update On and Display On), even if that math mode was already selected.
Initial S/W Revision	Prior to A.02.00

Power Sum (Op1+Op2)

Calculates a power sum between the First Trace operand and the Second Trace operand and puts the result in the destination trace.

During the sweep, the following formula is executed for each point in the trace operands, and the corresponding point is generated for the destination trace.:

DestinationTrace = 10 log(10(1/10)(FirstTrace) + 10(1/10)(SecondTrace))

The values of the trace points are assumed to be in a decibel scale, as they are internally stored.

If a point in either trace operand is equal to maxtracevalue, the resultant point is also maxtracevalue.

Key Path	Trace/Detector, Math
Example	:CALC:MATH TRACE1,PSUM,TRACE4,TRACE5,, Sets Trace 1 to Power Sum trace math function and sets the First Trace operand (for Trace 1) to Trace 4 and the Second Trace operand (for Trace 1) to Trace 5.
Couplings	Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in View (Update On and Display On), even if that math mode was already selected.
Initial S/W Revision	Prior to A.02.00

Log Offset (Op1 + Offset)

Calculates a log offset from the First Trace operand and puts the result in the destination trace. This is like the B-DL function in some older analyzers. The offset is entered as the active function. Each destination trace has its own offset.

During the sweep, the following formula is executed for each point in the trace operand, and the corresponding point is generated for the destination trace.:

DestinationTrace = FirstTrace + Offset

The values of the trace points are assumed to be in dBm (as they are internally stored) and the offset is in dB.

If a point in the trace operand is equal to maxtracevalue, the resultant point is also maxtracevalue.

If a point in the trace operand is equal to mintracevalue, the resultant point is also mintracevalue.

Example: If offset is 25 dB, then our destination trace will be higher than the operand trace by 25 dB.

Note that the Second Trace operand is not used for this function.

Key Path	Trace/Detector, Math
Example	:CALC:MATH TRACE1,LOFF,TRACE4,,–6.00, Sets Trace 1 to Log Offset trace math function, sets the First Trace operand (for Trace 1) to Trace 4, leaves the Second Trace operand (for Trace 1) unchanged (it is irrelevant for this function) and sets the Log Offset (for Trace 1) to –6 dB.
Couplings	Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in View (Update On and Display On), even if that math mode was already selected.
State Saved	The Log Offset value for each trace is saved in Instrument State
Min	–100 dB
Max	100 dB
Initial S/W Revision	Prior to A.02.00

Log Diff (Op1-Op2+Ref)

Offsets the difference between the First Trace operand and the Second Trace operand by a reference and puts the result in the destination trace. This is like the A-B+DL function in some older analyzers. The reference is entered as the active function. Each destination trace has its own reference.

During the sweep, the following formula is executed for each point in the trace operands, and the corresponding point is generated for the destination trace:

DestinationTrace = (FirstTrace - SecondTrace) + Reference

The values of the operand trace points are assumed to be in decibel units (as they are internally stored) and the reference is in dBm so the result is in dBm.

Example: If the first operand trace 1 is at 5 dBm, the second operand trace 2 is at –5 dBm, and the reference is –25 dBm, then the destination trace will be –15 dBm.

Example: If the first operand trace1 is at 60 dBuV, the second operand trace 2 is at 50 dBuV, and the reference is 35 dBuV, then the destination trace will be 45 dBuV.

See "More Information" on page 1306.

Key Path	Trace/Detector, Math
Example	:CALC:MATH TRACE1, LDIF, TRACE4, TRACE5, , -6.00 Sets Trace 1 to Log Diff trace math function, sets the First Trace operand (for Trace 1) to Trace 4, sets the Second Trace operand (for Trace 1) to Trace 5, and sets the Log Difference reference for Trace 1 to -6 dBm.
Couplings	Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in View (Update On and Display On), even if that math mode was already selected.
State Saved	The Log Difference reference value for each trace is saved in instrument state
Min	Same as reference level
Max	Same as reference level
Default Unit	depends on the current selected Y axis unit
Initial S/W Revision	Prior to A.02.00

More Information

If a point in FirstTrace is equal to maxtracevalue, the resultant point is also maxtracevalue.

If a point in FirstTrace is equal to mintracevalue, the resultant point is also mintracevalue.

If neither of the above is true for a given point, then:

- If that point in SecondTrace is equal to maxtracevalue, the resultant point is mintracevalue.
- If that point in SecondTrace is equal to mintracevalue, the resultant point is maxtracevalue.

Off

Turns off Trace Math.

Key Path	Trace/Detector, Math
Example	CALC:MATH TRACE1 OFF Turns off trace math for trace 1.
Notes	See Trace “Math”.
State Saved	The current trace math function is saved in Instrument State
Readback	Off
Initial S/W Revision	Prior to A.02.00

Trace Operands

Selects the trace operand(s) to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math
Notes	The operands of the trace math commands specify the trace operands. Since the operands are common to all math functions for a given trace, the most recently sent math function command sets the operands for each trace and are reflected on the trace operand keys.
Dependencies	The destination trace cannot be an operand.
Readback line	In square brackets, the First Trace operand, new line, and the second trace operand, as: [Op1=Trace 1, Op2=Trace2] where Trace 1 is operand 1 and Trace 2 is operand 2.
Initial S/W Revision	Prior to A.02.00

Operand 1

Selects the first trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The First Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 2 (wraps at 1). For example, for Trace 1, the First Trace presets to Trace 5; for Trace 6, it presets to Trace 4.
State Saved	The First Trace operand for each trace is stored in instrument state.
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 1

Selects the first trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands

Dependencies	The First Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 2 (wraps at 1). For example, for Trace 1, the First Trace presets to Trace 5; for Trace 6, it presets to Trace 4.
State Saved	The First Trace operand for each trace is stored in instrument state.
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 1

Selects the first trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The First Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 2 (wraps at 1). For example, for Trace 1, the First Trace presets to Trace 5; for Trace 6, it presets to Trace 4.
State Saved	The First Trace operand for each trace is stored in instrument state.
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 1

Selects the first trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The First Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 2 (wraps at 1). For example, for Trace 1, the First Trace presets to Trace 5; for Trace 6, it presets to Trace 4.
State Saved	The First Trace operand for each trace is stored in instrument state.
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 1

Selects the first trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The First Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.

Preset	Trace number – 2 (wraps at 1). For example, for Trace 1, the First Trace presets to Trace 5; for Trace 6, it presets to Trace 4.
State Saved	The First Trace operand for each trace is stored in instrument state.
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 1

Selects the first trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The First Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 2 (wraps at 1). For example, for Trace 1, the First Trace presets to Trace 5; for Trace 6, it presets to Trace 4.
State Saved	The First Trace operand for each trace is stored in instrument state.
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 1

Selects the first trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The First Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 2 (wraps at 1). For example, for Trace 1, the First Trace presets to Trace 5; for Trace 6, it presets to Trace 4.
State Saved	The First Trace operand for each trace is stored in instrument state.
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 2

Selects the second trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The Second Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 1 (wraps at 1). For example, for Trace 1, the Second Trace presets to Trace 6; for Trace 6, it presets to Trace 5.

State Saved	The Second Trace operand for each trace is stored in instrument state
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 2

Selects the second trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The Second Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 1 (wraps at 1). For example, for Trace 1, the Second Trace presets to Trace 6; for Trace 6, it presets to Trace 5.
State Saved	The Second Trace operand for each trace is stored in instrument state
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 2

Selects the second trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The Second Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 1 (wraps at 1). For example, for Trace 1, the Second Trace presets to Trace 6; for Trace 6, it presets to Trace 5.
State Saved	The Second Trace operand for each trace is stored in instrument state
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 2

Selects the second trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The Second Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 1 (wraps at 1). For example, for Trace 1, the Second Trace presets to Trace 6; for Trace 6, it presets to Trace 5.
State Saved	The Second Trace operand for each trace is stored in instrument state

Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 2

Selects the second trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The Second Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 1 (wraps at 1). For example, for Trace 1, the Second Trace presets to Trace 6; for Trace 6, it presets to Trace 5.
State Saved	The Second Trace operand for each trace is stored in instrument state
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 2

Selects the second trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The Second Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 1 (wraps at 1). For example, for Trace 1, the Second Trace presets to Trace 6; for Trace 6, it presets to Trace 5.
State Saved	The Second Trace operand for each trace is stored in instrument state
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Operand 2

Selects the second trace operand to be used for the trace math functions for the destination trace.

Key Path	Trace/Detector, Math, Trace Operands
Dependencies	The Second Trace cannot be the same as the destination trace. The destination trace number is gray on the key, and the underline skips that number when selecting the trace.
Preset	Trace number – 1 (wraps at 1). For example, for Trace 1, the Second Trace presets to Trace 6; for Trace 6, it presets to Trace 5.
State Saved	The Second Trace operand for each trace is stored in instrument state
Readback	Trace <trace number>
Initial S/W Revision	Prior to A.02.00

Copy/Exchange

This menu lets you copy any trace to any other trace, or exchange any trace with any other trace. The action is performed once, it is not an “every sweep” type of thing.

The X-Axis settings and domain of a trace go with it when it is copied or exchanged.

Key Path	Trace/Detector
Remote Command	`:TRACe:COPY TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6, TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6` `:TRACe:COPY?`
Example	TRAC:COPY TRACE1, TRACE3 Copies Trace 1 to Trace 3 and puts Trace 3 in Update=Off, Display=On
Notes	The TRACe:COPY command is of the form: :TRACe:COPY <source_trace>,<dest_trace>
Notes	In the case of a Copy, the destination trace is put in Update=Off, Display=On after the copy. In the case of an Exchange, both traces are put into Update=Off, Display=On after the exchange.
Dependencies	When Signal ID is on, this key is grayed out.
Preset	TRACE1, TRACE2
Backwards Compatibility Notes	The copy and exchange operations menu in ESA and PSA is replaced with the more general purpose Copy/Exchange menu. The remote commands are unaffected, as they were already general. The 2-DL->2 function in ESA and PSA (which was really a trace math function) has been eliminated, because its use case was very rare.. It actually subtracted the dB-equivalent of the dBm-expressed display line, regardless of the y axis unit. For example, if DL = +21.99 dBmV, it subtracted –25.00 dB (i.e. add +25.00 dB) to trace 2. New, more useful functions are provided in the new Trace, Math menu
Initial S/W Revision	Prior to A.02.00

Remote Command	`:TRACe:EXCHange TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6, TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6` `:TRACe:EXCHange?`
Example	TRAC:EXCH TRACE1, TRACE2 Exchanges Trace 1 and Trace 2 and puts both traces in Update=Off, Display=On.
Notes	The TRACe:EXCHange command is of the form::TRACe:EXCHange <trace_1>,<trace_2>
Preset	TRACE1, TRACE2
Backwards Compatibility Notes	The copy and exchange operations menu in ESA and PSA is replaced with the more general purpose Copy/Exchange menu. The remote commands are unaffected, as they were already general.
Initial S/W Revision	Prior to A.02.00

From Trace

Selects the trace to be copied to or exchanged with the To Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	1
Initial S/W Revision	Prior to A.02.00

From Trace

Selects the trace to be copied to or exchanged with the To Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	1
Initial S/W Revision	Prior to A.02.00

From Trace

Selects the trace to be copied to or exchanged with the To Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	1
Initial S/W Revision	Prior to A.02.00

From Trace

Selects the trace to be copied to or exchanged with the To Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	1
Initial S/W Revision	Prior to A.02.00

From Trace

Selects the trace to be copied to or exchanged with the To Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.

Preset	1
Initial S/W Revision	Prior to A.02.00

From Trace

Selects the trace to be copied to or exchanged with the To Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	1
Initial S/W Revision	Prior to A.02.00

From Trace

Selects the trace to be copied to or exchanged with the To Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	1
Initial S/W Revision	Prior to A.02.00

To Trace

Selects the trace to be copied from or exchanged with the From Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	2
Initial S/W Revision	Prior to A.02.00

To Trace

Selects the trace to be copied from or exchanged with the From Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	2
Initial S/W Revision	Prior to A.02.00

To Trace

Selects the trace to be copied from or exchanged with the From Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	2
Initial S/W Revision	Prior to A.02.00

To Trace

Selects the trace to be copied from or exchanged with the From Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	2
Initial S/W Revision	Prior to A.02.00

To Trace

Selects the trace to be copied from or exchanged with the From Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	2
Initial S/W Revision	Prior to A.02.00

To Trace

Selects the trace to be copied from or exchanged with the From Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	2
Initial S/W Revision	Prior to A.02.00

To Trace

Selects the trace to be copied from or exchanged with the From Trace

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Preset	2
Initial S/W Revision	Prior to A.02.00

Copy Now

Executes the Copy operation and puts the destination trace in Update=Off, Display=On.

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Initial S/W Revision	Prior to A.02.00

Exchange Now

Executes the Exchange operation and puts both traces in Update=Off, Display=On.

Key Path	Trace/Detector, Copy/Exchange
Notes	See “Copy/Exchange”.
Initial S/W Revision	Prior to A.02.00

Normalize

Displays menu keys that let you normalize trace data.

Key Path	Trace/Detector
Dependencies	When Signal ID is on, this key is grayed out.
Readback	[On] or [Off]
Initial S/W Revision	Prior to A.02.00

Normalize On/Off

Normalize (On) activates the normalize function. On each sweep, the normalized trace (Trace 3) is subtracted from Trace 1 and the result is added to the normalized reference level. This arithmetic assumes all values are in decibel units, so we are actually taking a ratio.

See "More Information" on page 1317.

See "Normalize Block Diagram" on page 1318.

Key Path	Trace/Detector, Normalize
Remote Command	`:CALCulate:NTData[:STATe] OFF|ON|0|1` `:CALCulate:NTData[:STATe]?`
Example	CALC:NTD ON CALC:NTD?
Dependencies	• If Normalize (On) is pressed before Store Ref (1→ 3), an error message is generated. Normalize remains off in this case. • Normalize is not available (grayed out) if any Trace Math function is on.
Couplings	When Normalize is turned on, Trace 1 is placed in Clear/Write with Update = On and Display = On.
Preset	OFF
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

More Information

The normalize function is most useful for applying correction data to a trace while making a stimulus-response measurement with a tracking generator (or synchronized source). For example, connect the cables and a through line, in place of the device to be measured, between the tracking generator and the analyzer input. Notice that the frequency response is not perfectly flat, showing the response of the cables, as well as the flatness of both the tracking generator and the analyzer. Now press Store Ref (1→ 3), Normalize On. Notice that the displayed trace is now flat, or normalized. The position of the normalized trace can now be moved to a different position on the display by changing the normalized reference position. This may be useful if the device to be tested has positive gain, such as an amplifier. Now replace the through line with the device under test, and an accurate measurement of the gain or loss can be made.

The normalize function can also be use to perform a scalar reflection measurement (return loss). In this case a directional coupler or bridge is used to extract the reflected signal. In the simplest reflection measurement a Short is placed at the end of the cable and the result is stored to trace 3 (as before). When Normalize is turned on, the result is the calibrated return loss in dB. For a more accurate calibration, an Open and Short can be used. To do the Open/Short calibration, the Open/Short key at the bottom of the Normalize menu is pressed. This will initiate a guided calibration procedure which captures the reference trace. This is then stored to Trace 3, as before. When Normalize is turned on the corrected return loss is displayed.

Measurement Details

First the following calculation is performed:

Trace 1 = (Trace 1D – Normalized Trace)

Where:

Trace 1D is the measured value of trace 1, as it comes from the SENSe subsystem.

Normalized Trace is Trace 3, in which you have previously stored a reference trace

All values are in decibel units.

This Trace 1 contains the values that will be returned from a trace query, or if the marker is placed on the trace.

For example, let's say bucket 1 on Trace 1 is at 0 dBm, and bucket 1 on Trace 3 is at 10 dBm. The resultant bucket is at 0 dBm – 10 dBm = –10 dB (just like with a delta marker).

You are also given the ability to define what (dB) value to use for Ref Level, and to define where on the screen the Ref Lvl line will appear using Normalized Reference Position. This flexibility in displaying the result allows a wide range of devices, including amplifiers, to be tested using Normalize.

In the example above, bucket 1 has the value of –10 dB. Let us assume you have set Norm Ref Lvl to 5 dB. Thus bucket 1 will display 1.5 divisions below the Reference Level line (assuming 10 dB per division).

The Reference Level line is normally the top line of the graticule. If Norm Ref Posn is set to 10, this is the case. If it is set to 9, it is the next line down. If it is set to 5, it is the middle line of the graticule. If set to 0 it is the bottom line.

So in the example above, if Norm Ref Posn is set to 9, then bucket 1 will display 2.5 divisions below the top line of the graticule.

None of the manipulations of Norm Ref Posn and Norm Ref Lvl affect the data in the trace.

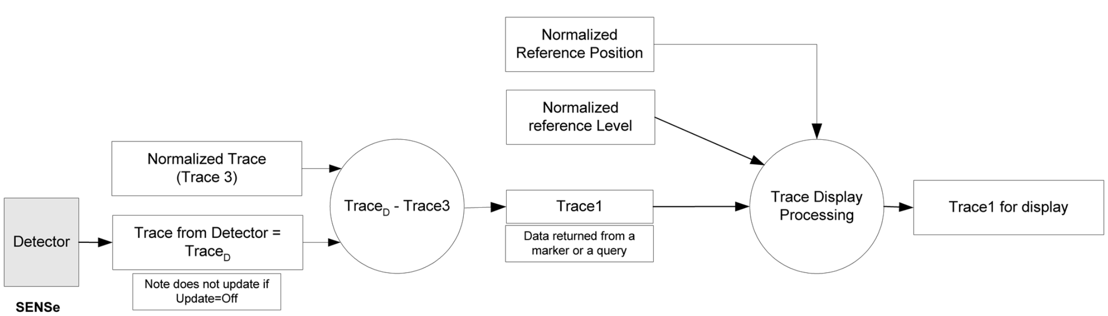
As Normalize displays a ratio between two traces (a difference, in dB) the Y-Axis Unit while in Normalize is dB in Log Amplitude and dimensionless in Linear. The Y Axis Unit chosen in the Y Axis Unit menu is unaffected by Normalize. When you leave Normalize the Y Axis Unit returns to the value set in the Y Axis Unit menu. While in Normalize, all amplitude functions, such as Marker Y and the values in other traces, should be always in db unit, and so should the returned trace query results. In other words, both trace query result and marker Y become independent of the Y Axis Unit chosen in the Y Axis Unit menu when normalize is on.

(In Linear, the equivalent calculation is performed but it yields a dimensionless ratio, so the normalized ref level will be unitless, presetting to 1, just as in Log it presets to 0 dB).

Y Axis annotation is blanked while in Normalize. Any other traces on the display are plotted in dB, where the dB value used is equivalent to the dBm value of the trace. For example, if bucket 1 in trace 2 is at –40 dBm, that bucket is plotted at –40 dB. All traces use Norm Ref Lvl and Norm Ref Posn for positioning on the display. When Normalize exits, the normal Ref Lvl is restored. This normal Ref Level is unaffected by Normalize.

Normalize Block Diagram

A block diagram showing how Normalize works is presented below:



Store Ref (1 -> 3)

Copies trace 1 into trace 3. Store Ref (1→ 3) must be pressed before pressing Normalize (On). Note that this puts Trace 3 in Update=Off (not updating) and Display=On (visible).

Key Path	Trace/Detector, Normalize
Notes	There is no remote command for this function, however the trace copy command can be used for this purpose.
Dependencies	If Normalize (On) is pressed before Store Ref (1→ 3), an error message is generated. Normalize remains off in this case.
Initial S/W Revision	Prior to A.02.00

Show Ref Trace (Trace 3)

Views or blanks the reference trace on the display. The reference trace is trace 3, so this is the same as setting Trace 3’s “Display” attribute.

Key Path	Trace/Detector, Normalize
Example	TRAC3:DISP 1 Shows the reference trace.
Notes	Use the TRAC3:DISP command to show or blank the reference trace Trace 3 is always the reference trace by definition.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Norm Ref Lvl

Sets the level (in dB) of the normalized reference.

Key Path	Trace/Detector, Normalize
Remote Command	`:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:NRLevel <rel_ampl>` `:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:NRLevel?`
Example	DISP:WIND:TRAC:Y:NRL .10 dB DISP:WIND:TRAC:Y:NRL?
Preset	0 dB
State Saved	Saved in instrument state.
Min	–327.6 dB
Max	327.6 dB
Initial S/W Revision	Prior to A.02.00

Open/Short Cal

Performs a guided open/short calibration, while providing step-by-step instructions to the user. This is the most accurate way to make the return loss measurement on the X-series analyzers. You are directed through a 1-Port coaxial open calibration, and a 1-Port coaxial short calibration. The result can then be saved to Trace 3. It is used to perform calibrated scalar reflection measurements (return loss), using the Normalize function.

Key Path	Trace/Detector, Normalize
Mode	SA
Notes	Does not auto return
Dependencies	Key is grayed out unless Source Mode is Tracking, and control returns to the Normalize menu.
Initial S/W Revision	A.06.01

Open/Short Guided Cal

On pressing the Open/Short Cal softkey in the Normalize menu, the Open Calibration Form is displayed. The form shows a diagrammatic representation of how to connect the external source to the spectrum analyzer to perform the calibration. When the Continue button is pressed, the Open calibration sweep is taken and stored in internal memory, for use later in this cal process. If the Cancel button is pressed, the Open/Short Cal is cancelled and the Normalize menu is returned.

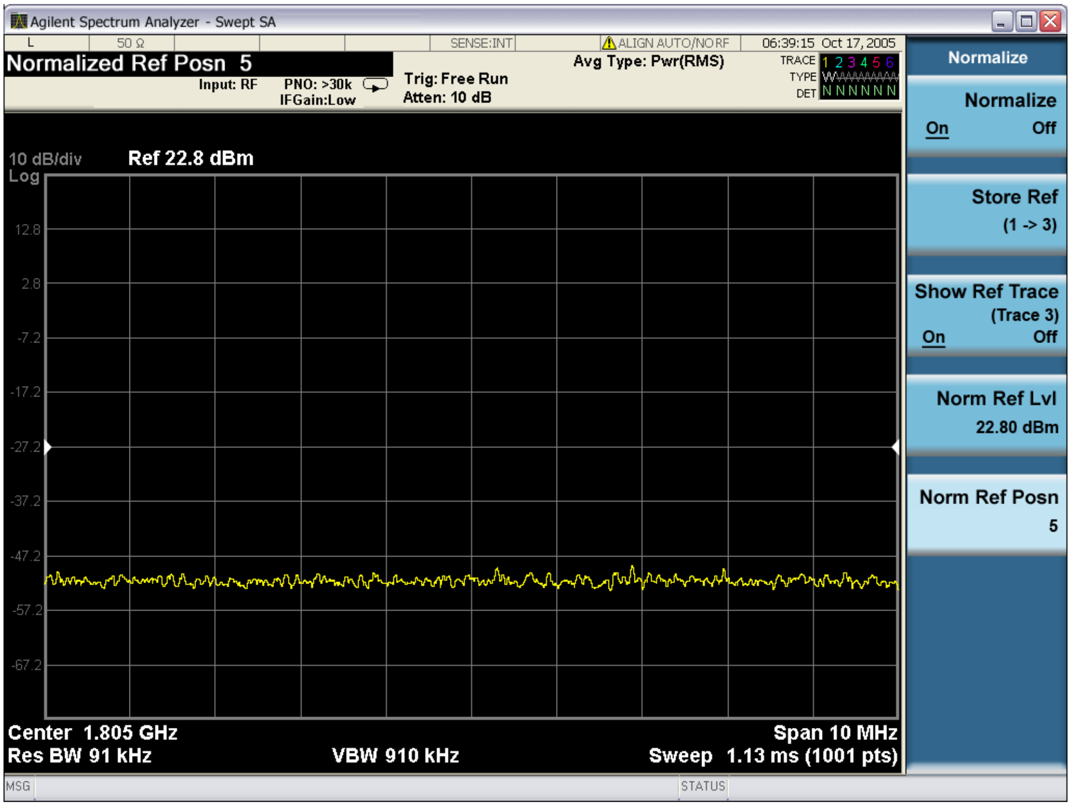
On completion of the Open Calibration, the Short Calibration Form is displayed. This form shows a diagrammatic representation of how to connect the external source to the spectrum analyzer to perform the Short calibration. When the Continue button is pressed, the Short calibration sweep is taken and stored in internal memory, for use later in this cal process. If the Cancel button is pressed, the Open/Short Cal is cancelled and the Normalize menu is returned.

On completion of the Short Calibration, the Open and Short calibration measurements are averaged (power). The picture with prompt is taken off the screen and a menu with “Done Cal” and “Cancel” is displayed. When you press “Done Cal” the resulting trace is stored to Trace 3. If the Cancel button is pressed, the Open/Short Cal is cancelled and the Normalize menu is returned.

The Open Short calibration is applied by taking the average of the Open and the Short trace. The average is a linear average point-by-point. You can further configure averaging on the traces (Open, Short, and final measurement). In this case, the value of the averaged Open and Short trace are linear averaged (by performing a point-by-point average of the two traces). Both the Open and the Short terminations should have approximately unity reflection. Taking the average gives the best estimate of a perfect reflector for a scalar return loss measurement. You should store the result in reference trace 3, for later application with the Normalize function.

Norm Ref Posn

Offsets the displayed trace without affecting the instrument gain or attenuation settings. This allows the displayed trace to be moved without decreasing measurement accuracy. The normalized reference position is indicated with a right arrow on the left side of the display and a left arrow on the right side of the display, just inside the graticule. See picture below:



Key Path	Trace/Detector, Normalize
Remote Command	`:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:NRPosition <integer>` `:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:NRPosition?`
Example	DISP:WIND:TRAC:Y:NRP 5 DISP:WIND:TRAC:Y:NRP?
Notes	The top and bottom graticule lines correspond to 10 and 0, respectively.
Preset	10
State Saved	Saved in instrument state.
Min	0
Max	10
Initial S/W Revision	Prior to A.2.00

Send/Query Trace Data (Remote Command Only)

This command allows trace data to be sent to the instrument or queried from the instrument. The response to the query is a list of the amplitude points that comprise the requested trace in the current Y Axis Unit of the instrument. The X Axis Unit is that of the destination trace (for send) or the source trace (for query).

See "Query Trace Data" on page 1322.

See "More Information" on page 1322.

Remote Command	`:TRACe[:DATA] TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6, <data>`
Notes	The TRACe[:DATA] command is of the form: :TRACe:DATA <trace>,<data> where <trace> can be one of the following parameters: TRACE1,TRACE2,TRACE3,TRACE4,TRACE5,TRACE6 and where <data> can be - ASCII data, which consists of a string of values separated by comma or - REAL or INTeger sent as a definite length block, with a header describing the data to follow.
Couplings	Sweep points affect the amount of data. The FORMat:DATA command describes the different types of data formats that can be used with trace data (see "Format Data: Numeric Data (Remote Command Only)" on page 174). Use the FORMat:BORDer command to set the byte order (see "Format Data: Byte Order (Remote Command Only)" on page 175).
Initial S/W Revision	Prior to A.02.00

Query Trace Data

Remote Command	`:TRACe[:DATA]? TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6`
Example	TRAC TRACE1, –1, –2, –3, –4, –5 Sends five points to Trace 1. Assuming that FORMat:DATA is set to ASCII, Y Axis Unit is set to dBm, and sweep points is set to 5, sending this command results in Trace 1 consisting of the five points –1 dBm, –2 dBm, –3 dBm, –4 dBm, and –5 dBm. TRAC? TRACE2 Queries the instrument for the contents of trace 2.
Backwards Compatibility SCPI	In the X-Series, the legacy RAWTRACE,LLINE1,LLINE2 parameters for trace data query are no longer available.
Initial S/W Revision	Prior to A.02.00

More Information

The format and byte-ordering of the sent or received data depend on the settings controlled by the FORMat:DATA and FORMat:BORDer commands. ASCII data consists of a string of comma separated values. REAL or INTeger data is sent as a definite length block, with a header describing the data to follow.

For example, a four point trace might look like this if in ASCII (FORMat:DATA ASCIi):

–5.87350E+01, –5.89110E+01, –5.87205E+01, –5.12345E+01<NL><END>

and like this if in INTeger with 4 bytes per point (FORMat:DATA INT,32):

#216<16 bytes of data><NL><END>

where the 2 in the #216 means “2 digits of numeric data to follow”, and the 16 is the 2 digits and means “16 binary bytes to follow” (this is the definite length block format).

Note that the data is terminated with <NL><END>. (For GPIB this is newline, or linefeed, followed by EOI set true. For LAN, this is newline only.)

The data format set by FORMat:DATA and FORMat:BORDer is used both for sending data to the instrument and receiving data from the instrument.

When sending data to the instrument, the data block must contain exactly the number of points currently specified in Sweep, Points or an error message will be generated and there will be no change to the target trace.

No units terminator (for example, dB or V) is used when sending data; the data is taken as being in the current Y Axis Unit of the analyzer.

When a trace is sent to the instrument, it immediately overwrites all of the data in the target trace. Consequently the trace should be inactive in order to achieve predictable results. If you send trace data while a trace is active, and particularly if a sweep or an Average or Max/Min Hold sequence is already in progress, you may end up with a trace that combines the data you sent with measurement data. Similarly, when querying trace data, it is best if the instrument is not sweeping during the query.

Therefore, it is generally advisable to be in Single Sweep, or have the trace in View, when sending trace data to the instrument or querying trace data from the instrument.

Smooth Trace Data (Remote Command Only)

NOTE Included for ESA compatibility. Not recommended for new designs. Use the command CALCulate:DATA:COMPress instead.

Smoothes the trace according to the number of points specified in :TRACe:MATH:SMOoth:POINts. There is no equivalent front panel function.

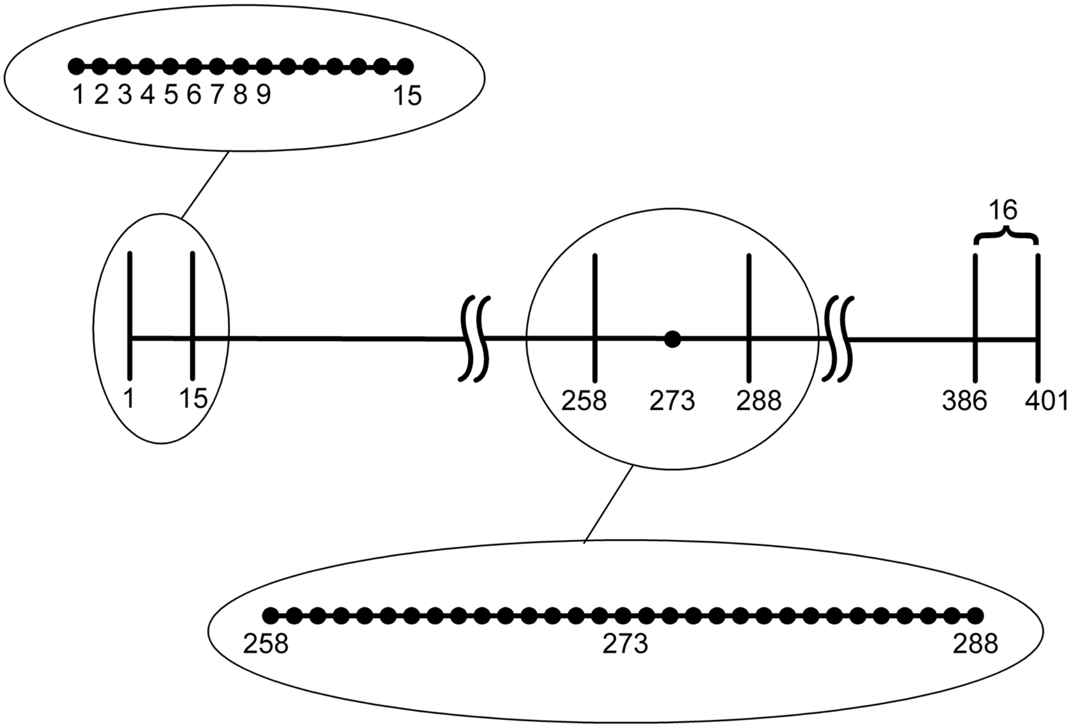
The purpose of this function is to perform a spatial video averaging, as compared to the temporal version supplied by the video-average command [:SENSe]:AVERage:TYPE VIDeo. The functions of TRACe:MATH:SMOoth <trace> and [:SENSe]:AVERage:TYPE VIDeo|POWer are not interchangeable.

Remote Command	`:TRACe:MATH:SMOoth TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6`
Initial S/W Revision	Prior to A.02.00

Each point value is replaced with the average of the values of the selected number of points, with half of those points located on each side of any particular point (when possible). Refer to Figure 14–1 below. This figure illustrates a 401 point trace with a smoothing number of 31. Think of the trace points as “buckets” of data. To smooth (arbitrary) point 273, the analyzer averages buckets 258 through 288 and applies that value to point 273.

Increasing the number of points increases smoothing at the cost of decreasing resolution.

The amount of smoothing decreases at the end points. Because :TRACe:MATH:SMOoth <trace> averages values that occur before and after the data point in time, display irregularities can be caused at the start and stop frequencies. To avoid possible irregularities (signal distortion) at the ends of the trace, use small values for the smooth parameter.



Refer to the figure above for a discussion of this end-point smoothing phenomena. With 31 smoothing points and a 401 point trace, point 16 will be the first point to have full 31-bucket smoothing. Likewise, point 386 will be the last point with full 31-bucket smoothing. Under the conditions stated, points 2 through 15 will be smoothed as follows: Point 2 is derived from averaging buckets 1 through 3. Point 3 is derived from averaging buckets 1 through 5, Point 4 is derived from averaging buckets 1 through 7, and so forth until point 16 is reached. The quantity of buckets used for the smoothing running average increases at the rate of 2 buckets per point, from point 1 to point ([smoothing number+1]/2), at which time the full number of smoothing points is utilized. The same characteristic occurs at the completion of the trace, beginning at point 386, beyond which the number of averaging buckets begins to decrease until point 401 is reached.

By replacing the value of each point in a trace with the average of the values of a number of points centered about that point, any rapid variations in noise or signals are smoothed into more gradual variations. It thereby performs a function similar to reducing the video bandwidth without the corresponding changes in sweep time; as such, frequency resolution is decreased. Also, signal peaks are reduced with large smoothing values. This can cause the amplitude to appear to be less than its actual value.

Number of Points for Smoothing (Remote Command Only)

NOTE	Included for ESA compatibility. Not recommended for new designs. (Will not be supported in future designs.) Use the CALCulate:DATA:COMPress command instead.

Specifies the number of points that will be smoothed. Increasing the number of points increases smoothing at the cost of decreasing resolution. If the number of points is an even number, then the number of points is increased by one. If the number of points is larger than the number of sweep points, then the number of sweep points is used, unless the number of sweep points is even, in which case the number of points will be the sweep points minus one. The number of points smoothed is always an odd number.

Remote Command	`:TRACe:MATH:SMOoth:POINts <integer>` `:TRACe:MATH:SMOoth:POINts?`
Example	TRAC:MATH:SMO:POIN 501
Notes	Only odd values allowed; if <integer> even, add 1 unless <integer> = number of sweep points, in which case subtract 1 Used with the TRACe:MATH:SMOoth command.
Preset	11
Min	3
Max	Number of sweep points
Initial S/W Revision	Prior to A.02.00

Mean Trace Data (Remote Command Only)

NOTE Included for ESA compatibility. Not recommended for new designs. Use the CALCulate:DATA:COMPress command instead.

Returns the mean of the amplitudes of the trace amplitude elements in measurement units.

Remote Command	`:TRACe:MATH:MEAN? TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6`
Example	TRAC:MATH:MEAN? TRACE2
Initial S/W Revision	Prior to A.02.00

Display Trace Time Query (Remote Command Only)

Can be used to determine the time that the current trace in the spectrogram started.

Remote Command	`:TRACe:DISPlay:VIEW:SPECtrogram:TIME?`
Example	:TRAC:DISP:VIEW:SPEC:TIME? Returns the start time of the Display Trace relative to the start time of the “live” trace (Spectrogram Trace 1)
Dependencies	Only available in the Spectrogram View of the Swept SA measurement. If the command is sent in any other View, an error is generated.
Initial S/W Revision	A.07.01

Trigger

Accesses a menu of keys to control the selection of the trigger source and the setup of each of the trigger sources. The analyzer is designed to allow triggering from a number of different sources, for example, Free Run, Video, External, RF Burst, and so forth.

The TRIG:SOURCe command (below) will specify the trigger source for the currently selected input (RF or I/Q). If you change inputs, the new input remembers the trigger source it was last programmed to for the current measurement, and uses that trigger source. You can directly set the trigger source for each input using the TRIGger:RF:SOURce and TRIGger:IQ:SOURce commands (later in this section). When in External Mixing, the analyzer uses the RF trigger source.

Note the inclusion of the <measurement> parameter in the command below. Because each measurement remembers its own Trigger Source, the command must be qualified with the measurement name. Note that for the Swept SA measurement this is not the case; for backwards compatibility, no <measurement> parameter is used when setting the Trigger Source for the Swept SA measurement.

See "Trigger Source Presets" on page 1327

See "RF Trigger Source" on page 1330

See "I/Q Trigger Source" on page 1331

See "More Information" on page 1332

Key Path	Front-panel key

Remote Command	`:TRIGger:<measurement>[:SEQuence]:SOURce EXTernal1 | EXTernal2 | IMMediate | LINE | FRAMe | RFBurst | VIDeo | IF | ALARm | LAN | IQMag | IDEMod | QDEMod | IINPut | QINPut | AIQMag | TV`
	`:TRIGger:<measurement>[:SEQuence]:SOURce?`
	where <measurement> is the measurement for which you wish to set the Source (blank for the Swept SA measurement)

Example	TRIG:ACP:SOUR EXT1 Selects the external 1 trigger input for the ACP measurement and the selected input TRIG:SOUR VID Selects video triggering for the Swept SA (SANalyzer) measurement in the Spectrum Analyzer mode. For SAN, do not use the <measurement> keyword. Only send this form in the Spectrum Analyzer mode or you will get an Undefined Header error
Notes	Not all measurements have all the trigger sources available to them. Check the trigger source documentation for your specific measurement to see what sources are available. Not all trigger sources are available for each input. See the "RF Trigger Source" on page 1330 and "I/Q Trigger Source" on page 1331 commands for detailed information on which trigger sources are available for each input. Other trigger-related commands are found in the INITiate and ABORt SCPI command subsystems. *OPC should be used after requesting data. This will hold off any subsequent changes to the selected trigger source, until after the sweep is completed and the data is returned. Available ranges and presets can vary from mode to mode.
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and

	the EXTernal2 parameter will generate a “Hardware missing; Not available for this model number” message.
Preset	See table below
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:SOURce EXTernal` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	`[:SENSe]:<measurement>:TRIGger:SOURce` This backwards compatibility alias command is provided for ESA/PSA compatibility This backwards compatibility command does not apply to the Swept SA measurement, for that just use :TRIGger:SOURCe This backwards compatibility command does not apply to the monitor spectrum, log plot and spot frequency measurements
Backwards Compatibility SCPI	`[:SENSe]:<measurement>:TRIGger:SOURce IF` In earlier instruments, the parameter IF was used by apps for the video trigger, so using the IF parameter selects VIDeo triggering. Sending IF in the command causes VID to be returned to a query.
Backwards Compatibility SCPI	`[:SENSe]:ACPR:TRIGger:SOURce` This backwards Compatibility SCPI command is provided to support the same functionality as [:SENSe]:ACPr:TRIGger:SOURce (PSA W-CDMA, PSA cdma2000 and PSA 1xEVDO) due to the fact that the ACPr node conflicts with the ACPower node.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Trigger Source Presets

Here are the Trigger Source Presets for the various measurements:

Meas	Mode	Preset for RF	Preset for IQ	Notes
Swept SA	SA	IMM	IQ not supported	
CHP	SA, WCDMA, C2K, WIMAX OFDMA, 1xEVDO, DVB-T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR	IMM	IQ not supported	
OBW	SA, WCDMA, C2K, WIMAX OFDMA,	1xEVDO: EXT1 others: IMM	IQ not supported	For 1xEVDO mode, the trigger source is coupled with the gate state, as well as the gate

	TD-SCDMA, 1xEVDO, LTE, LTETDD, CMMB, ISDB-T, MSR			source. When the trigger source changes to RFBurst, External1 or External2, the gate state is set to on, and the gate source is set identically with the trigger source. When the trigger source changes to IMMediate, VIDeo, LINE, FRAMe or IF, the gate state is set to off.
CCDF	SA, WCDMA, C2K, WIMAXOFDMA, TD-SCDMA, 1xEV-DO, DVB-T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR	WIMAXOFDMA: RFBurst LTETDD: BTS: External 1 MS: Periodic Timer TD-SCDMA and 1xEV-DO: BTS: External 1 MS: RFBurst SA, WCDMA, C2K, LTE, CMMB, ISDB-T, DVB-T/H, DTMB, Digital Cable TV, MSR: IMMediate	TD-SCDMA and 1xEV-DO: BTS: External 1 MS: IQMag LTETDD: BTS: External 1 MS: Periodic Timer Others: IMM	For TD-SCDMA: Trigger source is coupled with radio device. When radio device changes to BTS, trigger source will be changed to EXTernal1. When radio device changes to MS, trigger source will be set as RFBurst for RF or IQ Mag for BBIQ. When TriggerSource is RFBurst or IQ Mag, Measure Interval is grayed out.
ACP	SA, WCDMA, C2K, WIMAX OFDMA, TD-SCDMA, 1xEVDO, DVB-T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR	IMM	IQ not supported	
Tx Power	SA, GSM, TD-SCDMA	SA, GSM: RFBurst TD-SCDMA: EXTernal	IMM	TD-SCDMA doesn't support the Line and Periodic Timer parameters. When the mode is TD-SCDMA, if the Radio Device is switched to BTS, the value will be changed to External 1 and if the Radio device is switched to MS, the value will be changed to RFBurst
SPUR	SA, WCDMA, C2K, WIMAX OFDMA, TD-SCDMA,1xEV-DO, DVB-T/H, LTE, LTETDD, MSR	IMM	IQ not supported	
SEM	SA, WCDMA, C2K, WIMAX OFDMA, TD-SCDMA, 1xEVDO, DVB-T/H, DTMB, LTE,	1xEVDO(BTS): EXTernal1 All others: IMMediate	IQ not supported	

	LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR			
CDP	WCDMA	IMM	IMM	
RHO	WCDMA	IMM	IMM	
PCON	WCDMA	IMM	IMM	
QPSK	WCDMA, C2K, 1xEVDO	All except CDMA1xEVDO: IMMediate CDMA1xEVDO: EXT1	IMM	
MON	All except SA and BASIC	IMM	IQ not supported	
WAV		LTETDD: BTS: External 1 MS: Periodic Timer GSM/EDGE: RFBurst All others: IMMediate	LTETDD: BTS: External 1 MS: Periodic Timer GSM/EDGE: IQMag All others: IMMMediate	
PVT	WIMAXOFDMA	RFB	IMM	
EVM	WIMAXOFDMA, DVB-T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV	All but CMMB: IMM CMMB: Periodic Timer	All but CMMB: IMM CMMB: External 1	LTE, LTETDD supports Free Run, Video and External 1 only.
SPEC	BASIC	IMM	IMM	
LOG Plot	PN	IMM	IQ not supported	
Spot Freq	PN	IMM	IQ not supported	
GMSK PVT	EDGE/GSM	RFB	IMM	
GMSK PFER	EDGE/GSM	RFB	IQMag	
GMSK ORFS	EDGE/GSM	RF Burst	IQ not supported	
EDGE PVT	EDGE/GSM	RFB	IMM	
EDGE EVM	EDGE/GSM	RFB	IQMag	
EDGE ORFS	EDGE/GSM	Periodic Timer	IQ not supported	
Combined WCDMA	WCDMA	IMM	IQ not supported	

Combined GSM	EDGE/GSM	RFB	IQ not supported
List Power Step	WCDMA, EDGE/GSM	IMM	IQ not supported
Transmit On/Off Power	LTETDD	LTETDD: BTS: External 1 MS: Periodic Timer	LTETDD: BTS: External 1 MS: Periodic Timer
Transmit Analysis	BLUETOOTH	RFB	IQ not supported
Adjacent Channel Power	BLUETOOTH	IMM	IQ not supported
LE In-band Emissions	BLUETOOTH	IMM	IQ not supported
EDR In-band Spurious Emissions	BLUETOOTH	Periodic Timer	IQ not supported
Conformance EVM	LTE, LTETDD, MSR	IMM	IMM

RF Trigger Source

The RF Trigger Source command selects the trigger to be used for the specified measurement when RF is the selected input. The RF trigger source can be queried and changed even while another input is selected, but it is inactive until RF becomes the selected input.

Note the inclusion of the <measurement> parameter in the command below. Because each measurement remembers its own Trigger Source, the command must be qualified with the measurement name. Note that for the Swept SA measurement this is not the case; for backwards compatibility, no <measurement> parameter is used when setting the Trigger Source for the Swept SA measurement.

Remote Command	`:TRIGger:<measurement>[:SEQuence]:RF:SOURce EXTernal1 | EXTernal2 | IMMediate | LINE | FRAMe | RFBurst | VIDeo | IF | ALARm | LAN | TV` `:TRIGger:<measurement>[:SEQuence]:RF:SOURce?`
Example	TRIG:ACP:RF:SOUR EXT1 Selects the external 1 trigger input for the ACP measurement and the RF input TRIG:RF:SOUR VID Selects video triggering for the SANalyzer measurement and the RF input. For SAN, do not use the <measurement> keyword.
Notes	Not all measurements have all the trigger sources available to them. Check the trigger source documentation for your specific measurement to see what sources are available. Not all trigger sources are available for each input. For the RF Trigger Source, the following trigger sources are available:

	–IMMediate - free run triggering –VIDeo - triggers on the video signal level –LINE - triggers on the power line signal –EXTernal1 (or EXTernal) - triggers on an externally connected trigger source marked "Trigger 1 In" on the rear panel –EXTernal2 - triggers on an externally connected trigger source marked "Trigger 2 In" on the front panel. In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a "Hardware missing; Not available for this model number" message –RFBurst - triggers on the bursted frame –FRAMe - triggers on the periodic timer –IF (video) - same as video, for backwards compatibility only *OPC should be used after requesting data. This will hold off any subsequent changes to the selected trigger source, until after the sweep is completed and the data is returned. Available ranges, and presets can vary from mode to mode.
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

I/Q Trigger Source

This command selects the trigger to be used for the specified measurement when I/Q (which requires option BBA) is the selected input. The I/Q trigger source can be queried and changed even while another input is selected, but it is inactive until I/Q becomes the selected input.

Remote Command	`:TRIGger:<measurement>[:SEQuence]:IQ:SOURce EXTernal1 | EXTernal2 | IMMediate | IQMag | IDEMod | QDEMod | IINPut | QINPut | AIQMag` `:TRIGger:<measurement>[:SEQuence]:IQ:SOURce?`
Example	TRIG:WAVeform:SOUR IQM Selects I/Q magnitude triggering for the IQ Waveform measurement and the I/Q input
Notes	Not all measurements have all the trigger sources available to them. Check the trigger source documentation for your specific measurement to see what sources are available. Not all trigger sources are available for each input. For the I/Q Trigger Source, the following trigger sources are available: –IMMediate - free run triggering –EXTernal1 (or EXTernal) - triggers on an externally connected trigger source on the rear panel –EXTernal2 - triggers on an externally connected trigger source on the front panel –IQMag - triggers on the magnitude of the I/Q signal –IDEMod - triggers on the I/Q signal's demodulated I voltage –QDEMod - triggers on the I/Q signal's demodulated Q voltage

	–IINPut - triggers on the I channel's ADC voltage –QINPut - triggers on the Q channel's ADC voltage –AIQMag - triggers on the magnitude of the auxiliary receiver channel I/Q signal *OPC should be used after requesting data. This will hold off any subsequent changes to the selected trigger source, until after the sweep is completed and the data is returned. Available ranges, and from mode to mode presets can vary
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

More Information

The trigger menus let you select the trigger source and trigger settings for a sweep or measurement. In triggered operation (basically, any trigger source other than Free Run), the analyzer will begin a sweep or measurement only with the selected trigger conditions are met, generally when your trigger source signal meets the specified trigger level and polarity requirements. (In FFT measurements, the trigger controls when the data acquisition begins for FFT conversion.)

For each of the trigger sources, you may define a set of operational parameters or settings which will be applied when that source is selected as the current trigger source. Examples of these settings are Trigger Level, Trigger Delay, and Trigger Slope. You may apply different settings for each source; so, for example, you could have a Trigger Level of 1v for External 1 trigger and –10 dBm for Video trigger.

Once you have established the settings for a given trigger source, they generally will remain unchanged for that trigger source as you go from measurement to measurement within a Mode (although the settings do change as you go from Mode to Mode). Furthermore, the trigger settings within a Mode are the same for the **Trigger** menu, the **Gate Source** menu, and the **Sync Source** menu that is part of the **Periodic Timer Trigger Setup** menu. That is, if **Ext1** trigger level is set to 1v in the **Trigger** menu, it will appear as 1v in both the **Gate Source** and the **Sync Source** menus. For these reasons the trigger settings commands are not qualified with the measurement name, the way the trigger source commands are.

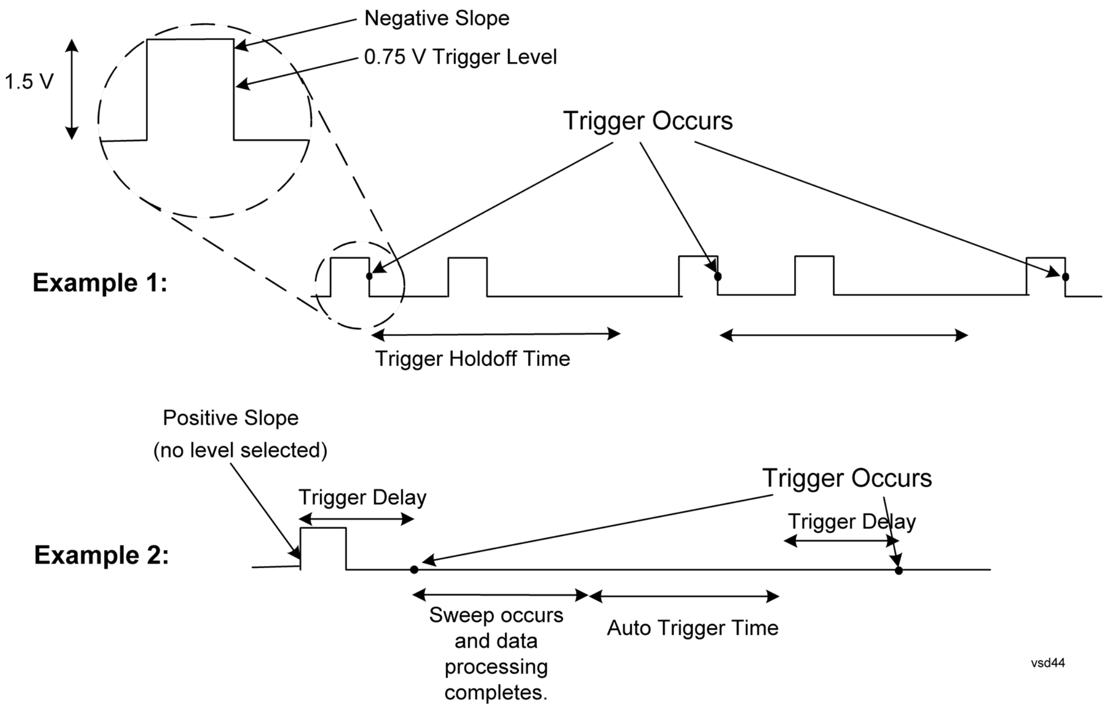
The settings setup menu can be accessed by pressing the key for the current trigger source a second time. For example, one press of Video selects the Video trigger as the source. The Video key becomes highlighted and the hollow arrow on the key turns black. Now a second press of the key takes you into the Video Trigger Setup menu.

Trigger Setup Parameters:

The following examples show trigger setup parameters using an external trigger source.

Example 1 illustrates the trigger conditions with negative slope and no trigger occurs during trigger Holdoff time.

Example 2 illustrates the trigger conditions with positive slope, trigger delay, and auto trigger time.



Free Run

Pressing this key, when it is not selected, selects free-run triggering. Free run triggering occurs immediately after the sweep/measurement is initiated.

Key Path	Trigger	
Example	TRIG:SOUR IMM	Swept SA measurement
	TRIG:<meas>:SOUR IMM	Measurements other than Swept SA
State Saved	Saved in instrument state	
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.	
Initial S/W Revision	Prior to A.02.00	

Video (IF Envelope)

Pressing this key, when it is not selected, selects the video signal as the trigger. The Video trigger condition is met when the video signal (the filtered and detected version of the input signal, including both RBW and VBW filtering) crosses the video trigger level.

NOTE When the detector selected for all active traces is the average detector, the video signal for triggering does not include any VBW filtering.

The video trigger level is shown as a labeled line on the display. The line is displayed as long as video is the selected trigger source.

Pressing this key, when it is already selected, accesses the video trigger setup functions.

Key Path	Trigger
Example	TRIG:SOUR VID Swept SA measurement TRIG:<meas>:SOUR VID Measurements other than Swept SA
Notes	Log Plot and Spot Frequency measurements do not support Video Trigger
Dependencies	Video trigger is allowed in average detector mode.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Backwards Compatibility Notes	In the past, the Average detector was not available when Video triggering was on, and consequently, functions that set the detector to average (such as Marker Noise or Band/Intvl Power) were not available when the video trigger was on. Similarly, Video triggering was not available when the detector was Average. In the X-Series, these restrictions are removed.
Initial S/W Revision	Prior to A.02.00

Trigger Level

Sets a level for the video signal trigger. When the video signal crosses this level, with the chosen slope, the trigger occurs. This level is displayed with a horizontal line only if **Video** is the selected trigger source.

Key Path	Trigger, Video
Remote Command	`:TRIGger[:SEQuence]:VIDeo:LEVel <ampl>` `:TRIGger[:SEQuence]:VIDeo:LEVel?`
Example	TRIG:VID:LEV –40 dBm
Notes	When sweep type = FFT, the video trigger uses the amplitude envelope in a bandwidth wider than the FFT width as a trigger source. This might often be useful, but does not have the same relationship between the displayed trace and the trigger level as in swept triggering. Amplitude Corrections are not taken into account by the Video Trig Level. For example, if you have given yourself effective gain with an amplitude correction factor, the Video Trigger will not fire until you have dropped the trigger line that far below the displayed signal level, rather than simply dropping it down to the displayed signal level. Note that other corrections, specifically External Gain and Ref Level Offset, modify the actual trace data as it is taken and therefore ARE taken into account by Trig Level.

Couplings	This same level is used for the Video trigger source in the Trigger menu and for the Video selection in the Gate Source menu.
Preset	Set the Video Trigger Level –25 dBm on Preset. When the Video Trigger Level becomes the active function, if the value is off screen, set it to either the top or bottom of screen, depending on which direction off screen it was.
State Saved	Saved in instrument state
Min	–170 dBm
Max	+30 dBm
Default Unit	Depends on the current selected Y axis unit
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:IF:LEVel` `:TRIGger[:SEQuence]:IF:LEVel?`
Backwards Compatibility Notes	This alias is provided for backward compatibility with VSA/PSA comms apps.
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, Video
Remote Command	`:TRIGger[:SEQuence]:VIDeo:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:VIDeo:SLOPe?`
Example	TRIG:VID:SLOP NEG
Preset	POSitive
State Saved	Saved in instrument state

Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:IF:SLOPe NEGative|POSitive`
	`:TRIGger[:SEQuence]:IF:SLOPe?`
	For backward compatibility with VSA/PSA comms apps

Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Remote Command	`:TRIGger[:SEQuence]:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:SLOPe?`
Example	TRIG:SLOP NEG
Preset	POSitive

State Saved	Saved in instrument state
Backwards Compatibility Notes	In ESA/PSA, the Trigger Slope was global to all triggers. In the X-Series, the slope can be set individually for each Trigger Source. For backward compatibility, the global SLOPe command updates all instances of trigger slope (VID, LINE, EXT1, EXT2, TV, RFB). The query returns the trigger slope setting of the currently selected trigger source.
Initial S/W Revision	Prior to A.02.00

Trig Delay

Controls a time delay during that the analyzer will wait to begin a sweep after meeting the trigger criteria. You can use negative delay to pre-trigger the instrument in the time domain or FFT, but not in swept spans.

Key Path	Trigger, Video

Remote Command	`:TRIGger[:SEQuence]:VIDeo:DELay <time>`
	`:TRIGger[:SEQuence]:VIDeo:DELay?`
	`:TRIGger[:SEQuence]:VIDeo:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:VIDeo:DELay:STATe?`

Example	TRIG:VID:DEL:STAT ON TRIG:VID:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1 us
State Saved	Saved in instrument state
Min	–150 ms
Max	+500 ms
Default Unit	s
Backwards Compatibility Notes	! For backward compatibility with VSA/PSA comms apps :TRIGger[:SEQuence]:IF:DELay :TRIGger[:SEQuence]:DELay The legacy :TRIGger[:SEQuence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Remote Command	`:TRIGger[:SEQuence]:DELay <time>`
	`:TRIGger[:SEQuence]:DELay?`
	`:TRIGger[:SEQuence]:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:DELay:STATe?`

Example	TRIG:DEL 1 ms
Preset	1 us
State Saved	Saved in instrument state
Backwards Compatibility Notes	In ESA/PSA, the Trigger Delay was global to all triggers. In the X-Series, the delay can be set individually for each Trigger Source. For backward compatibility, the global DELay command updates all instances of trigger slope (VID, LINE, EXT1, EXT2) except TV and RFBurst. The query returns the trigger delay setting of the currently selected trigger source.
Initial S/W Revision	Prior to A.02.00

Remote Command	`:TRIGger[:SEQuence]:OFFSet <time>`
	`:TRIGger[:SEQuence]:OFFSet?`
	`:TRIGger[:SEQuence]:OFFSet:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:OFFSet:STATe?`

Example	TRIG:OFFS ON TRIG:OFFS –100 ms
Notes	These are ESA commands for trigger offset that allowed you to use a positive or negative delay when in zero span and in a Res BW >= 1 kHz. For ESA compatibility, X-series analyzers keep track of this offset and adds it to the Trigger Delay for VIDeo, LINE, EXTernal1 or EXTernal2 whenever the value is sent to the hardware, if in Zero Span and RBW >= 1 kHz.
Preset	Off, 0 s
State Saved	Saved in instrument state
Min	–11 s
Max	+11 s
Initial S/W Revision	Prior to A.02.00

Line

Pressing this key, when it is not selected, selects the line signal as the trigger. A new sweep/measurement will start synchronized with the next cycle of the line voltage. Pressing this key, when it is already selected, access the line trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR LINE Swept SA measurement TRIG:<meas>:SOUR LINE Measurements other than Swept SA
Dependencies	Line trigger is not available when operating from a "dc power source", for example, when the instrument is powered from batteries.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or

	Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, Line
Remote Command	`:TRIGger[:SEQuence]:LINE:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:LINE:SLOPe?`
Example	TRIG:LINE:SLOP NEG
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Trig Delay

Controls a time delay during which the analyzer will wait to begin a sweep after meeting the trigger criteria. You can use negative delay to pre-trigger the instrument in time domain or FFT, but not in swept spans.

Key Path	Trigger, Line

Remote Command	`:TRIGger[:SEQuence]:LINE:DELay <time>`
	`:TRIGger[:SEQuence]:LINE:DELay?`
	`:TRIGger[:SEQuence]:LINE:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:LINE:DELay:STATe?`

Example	TRIG:LINE:DEL:STAT ON TRIG:LINE:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us
State Saved	Saved in instrument state

Min	–150 ms
Max	500 ms
Default Unit	S
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers. The legacy :TRIGger[:SEQuence]:OFFSet command is supported for the VIDeo, LINE, EXT1, and EXT2 triggers.
Initial S/W Revision	Prior to A.02.00

External 1

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 1 input connector on the rear panel.

Pressing this key, when it is already selected, accesses the external 1 trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR EXT1 Swept SA measurement TRIG:<meas>:SOUR EXT1 Measurements other than Swept SA
Dependencies	Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 1.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:LEVel <level>` `:TRIGger[:SEQuence]:EXTernal1:LEVel?`
Example	TRIG:EXT1:LEV 0.4 V
Couplings	This same level is used for the Ext1 trigger source in the Trigger menu, for the Ext1 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext1 selection in the Gate Source menu.

Preset	1.2 V
State Saved	Saved in instrument state
Min	–5 V
Max	5 V
Default Unit	V
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:EXTernal:LEVel` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:LEVel`
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:EXTernal1:SLOPe?`
Example	TRIG:EXT1:SLOP NEG
Couplings	This same slope is used in the Ext1 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:EXTernal:SLOPe` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:SLOPe`
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Trig Delay

Controls a time delay during which the analyzer will wait to begin a sweep after meeting the trigger criteria. You can use negative delay to pre-trigger the instrument in time domain or FFT, but not in swept spans.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:DELay <time>`

	:TRIGger[:SEQuence]:EXTernal1:DELay? :TRIGger[:SEQuence]:EXTernal1:DELay:STATe OFF|ON|0|1 :TRIGger[:SEQuence]:EXTernal1:DELay:STATe?
Example	TRIG:EXT1:DEL:STAT ON TRIG:EXT1:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us
State Saved	Saved in instrument state
Min	–150 ms
Max	+500 ms
Default Unit	s
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:EXTernal:DELay For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers. The legacy :TRIGger[:SEQuence]:OFFSet command is supported for the VIDeo, LINE, EXT1, and EXT2 triggers.
Initial S/W Revision	Prior to A.02.00

External 2

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 2 input connector. The external trigger 2 input connector is on the rear panel.

Pressing this key, when it is already selected, accesses the external 2 trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR EXT2 Swept SA measurement TRIG:<meas>:SOUR EXT2 Measurements other than Swept SA
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a “Hardware missing; Not available for this model number” message. Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 2.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	

	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Trigger Level

Sets the value where the external 2 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 2
Remote Command	`:TRIGger[:SEQuence]:EXTernal2:LEVel` `:TRIGger[:SEQuence]:EXTernal2:LEVel?`
Example	TRIG:EXT2:LEV 1.1 V
Couplings	This same level is used for the Ext2 trigger source in the Trigger menu, for the Ext2 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext2 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	–5 V
Max	5 V
Default Unit	V
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal2:LEVel`
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, External 2
Remote Command	`:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:EXTernal2:SLOPe?`
Example	TRIG:EXT2:SLOP NEG
Couplings	This same slope is used in the Ext2 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive

State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:EXTernal2:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Trig Delay

Controls a time delay during which the analyzer will wait to begin a sweep after meeting the trigger criteria. You can use negative delay to pre-trigger the instrument in time domain or FFT, but not in swept spans.

Key Path	Trigger, External 2
Remote Command	:TRIGger[:SEQuence]:EXTernal2:DELay <time> :TRIGger[:SEQuence]:EXTernal2:DELay? :TRIGger[:SEQuence]:EXTernal2:DELay:STATe OFF|ON|0|1 :TRIGger[:SEQuence]:EXTernal2:DELay:STATe?
Example	TRIG:EXT2:DEL:STAT ON TRIG:EXT2:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us
State Saved	Saved in instrument state
Min	–150 ms
Max	500 ms
Default Unit	s
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers. The legacy :TRIGger[:SEQuence]:OFFSet command is supported for the VIDeo, LINE, EXT1, and EXT2 triggers.
Initial S/W Revision	Prior to A.02.00

RF Burst

Pressing this key, when it is not selected, selects the RF Burst as the trigger. A new sweep/measurement will start when an RF burst envelope signal is identified from the signal at the RF Input connector. Pressing this key, when it is already selected, accesses the RF Burst trigger setup menu.

In some models, a variety of burst trigger circuitry is available, resulting in various available burst trigger bandwidths. The analyzer automatically chooses the appropriate trigger path based on the hardware configuration and other settings of the analyzer.

Key Path	Trigger
Example	TRIG:SOUR RFB Swept SA measurement TRIG:<meas>:SOUR RFB Measurements other than Swept SA
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Backwards Compatibility Notes	The legacy command: :TRIGger[:SEQuence]:RFBurst:FSELectivity[:STATe] OFF|ON|0|1 is not supported in the X-Series, as the hardware to do Frequency Selective burst triggers does not exist in X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Absolute Trigger Level

Sets the absolute trigger level for the RF burst envelope.

When using the External Mixing path, the Absolute Trigger Level is uncalibrated because the factory default was set to accommodate the expected IF levels for the RF path.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>` `:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?`
Example	TRIG:RFB:LEV:ABS 10 dBm sets the trigger level of the RF burst envelope signal to the absolute level of 10 dBm
Notes	Sending this command does not switch the setting from relative to absolute; to switch it you need to send the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command, below. Amplitude Corrections are not taken into account by the Absolute Trigger Level. For example, if you have given yourself effective gain with an amplitude correction factor, the Absolute Trigger will not fire until you have set the trigger level that far below the displayed signal level, rather than simply to the displayed signal level. This is only true for Amplitude Corrections, not External Gain or Ref Level Offset functions.

	If mode is Bluetooth, the default value is –50 dBm.
Couplings	This same level is used for the RF Burst trigger source in the Trigger menu, for the RF Burst selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the RF Burst selection in the Gate Source menu
Preset	–20 dBm
State Saved	Saved in instrument state
Min	–200 dBm
Max	100 dBm
Default Unit	depends on the current selected Y-Axis unit
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:RFBurst:LEVel:ABSolute`
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Trigger, RF Burst
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE ABSolute|RELative` `:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE?`
Example	TRIG:RFB:LEV:TYPE REL sets the trigger level type of the RF burst trigger to Relative.
Preset	ABSolute
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Relative Trigger Level

Sets the relative trigger level for the RF burst envelope.

In some models, the relative burst trigger function is implemented in hardware. In other models, without the advanced triggering hardware required, the relative burst trigger function is implemented in software in some measurements, and is unavailable in other measurements.

When implemented in software, the relative RF Burst trigger function is implemented as follows:

1. The measurement starts with the absolute RF Burst trigger setting. If it cannot get a trigger with that level, auto trigger fires and the acquisition starts anyway. After the acquisition, the measurement searches for the peak in the acquired waveform and saves it.

2. Now, in the next cycle of the measurement, the measurement determines a new absolute RF Burst level based on the peak value from the first measurement and the Relative RF Burst Trigger Level (always 0 or negative dB) set by the user. The following formula is used:

   absolute RF Burst level = peak level of the previous acquisition + relative RF Burst level

3. If the new absolute RF Burst level differs from the previous by more than 0.5 dB, the new level is sent to the hardware; otherwise it is not updated (to avoid slowing down the acquisition)

Steps 2 and 3 repeat for subsequent measurements.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:RELative <rel_ampl>` `:TRIGger[:SEQuence]:RFBurst:LEVel:RELative?`
Example	TRIG:RFB:LEV:REL –10 dB sets the trigger level of the RF burst envelope signal to the relative level of –10 dB
Notes	Sending this command does not switch the setting from absolute to relative; to switch it you need to send the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command, above. The relative trigger level is not available in some measurements. In those measurements the RELative parameter, and the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command (above), will generate an error if sent.
Dependencies	This key is grayed out and Absolute Trigger Level selected if the required hardware is not present in your analyzer and the current measurement does not support Relative triggering.
Preset	–6 dB GSM: –25 dB
State Saved	Saved in instrument state
Min	–45 dB
Max	0 dB
Default Unit	dB or dBc
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:RFBurst:LEVel` This legacy command is aliased to :TRIGger[:SEQuence]:RFBurst:LEVel:RELative because the PSA had ONLY relative burst triggering
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Trigger Slope

It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, RF Burst
Remote Command	`:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:RFBurst:SLOPe?`
Example	TRIG:RFB:SLOP NEG
Couplings	This same slope is used in the RF Burst selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).

Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:RFBurst:SLOPe`
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Trig Delay

Controls a time delay during which the analyzer will wait to begin a sweep after meeting the trigger criteria. You can use negative delay to pre-trigger the instrument in time domain or FFT, but not in swept spans.

Key Path	Trigger, RF Burst

Remote Command	`:TRIGger[:SEQuence]:RFBurst:DELay <time>`
	`:TRIGger[:SEQuence]:RFBurst:DELay?`
	`:TRIGger[:SEQuence]:RFBurst:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:RFBurst:DELay:STATe?`

Example	TRIG:RFB:DEL:STAT ON TRIG:RFB:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us
State Saved	Saved in instrument state
Min	–150 ms
Max	500 ms
Default Unit	s
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Periodic Timer (Frame Trigger)

Pressing this key, when it is not selected, selects the internal periodic timer signal as the trigger. Triggering occurrences are set by the Period parameter, which is modified by the Sync Source and Offset. Pressing this key, when it is already selected, accesses the periodic timer trigger setup functions.

If you do not have a sync source selected (it is Off), then the internal timer will not be synchronized with any external timing events.

Key Path	Trigger
Example	TRIG:SOUR FRAM Swept SA measurement TRIG:<meas>:SOUR FRAM Measurements other than Swept SA
State Saved	Saved in instrument state
Readback	[Sync: <value of Sync Source>], for example, [Sync: External 1]
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

Periodic Timer Triggering:

This feature selects the internal periodic timer signal as the trigger. Trigger occurrences are set by the **Periodic Timer** parameter, which is modified by the **Sync Source** and **Offset**.

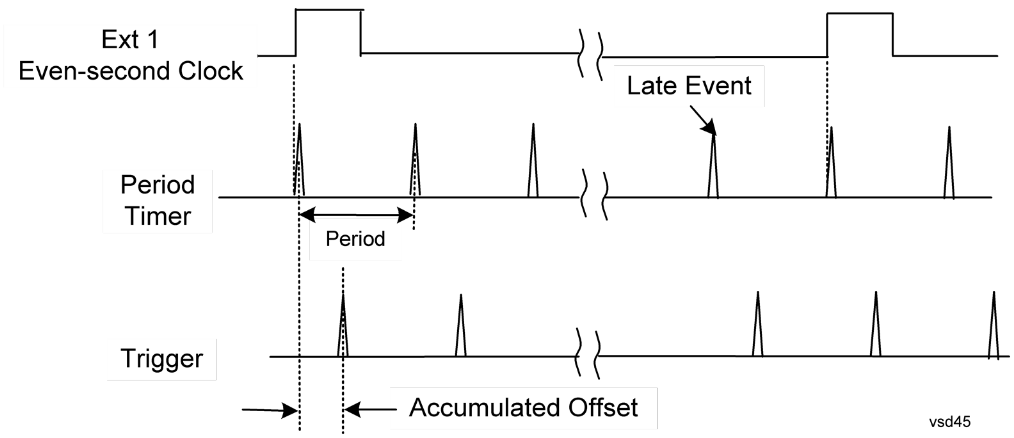
The figure below shows the action of the periodic timer trigger. Before reviewing the figure, we'll explain some uses for the periodic trigger.

A common application is measuring periodic burst RF signals for which a trigger signal is not easily available. For example, we might be measuring a TDMA radio which bursts every 20 ms. Let's assume that the 20 ms period is very consistent. Let's also assume that we do not have an external trigger source available that is synchronized with the period, and that the signal-to-noise ratio of the signal is not high enough to provide a clean RF burst trigger at all of the analysis frequencies. For example, we might want to measure spurious transmissions at an offset from the carrier that is larger than the bandwidth of the RF burst trigger. In this application, we can set the Periodic Timer to a 20.00 ms period and adjust the offset from that timer to position our trigger just where we want it. If we find that the 20.00 ms is not exactly right, we can adjust the period slightly to minimize the drift between the period timer and the signal to be measured.

A second way to use this feature would be to use **Sync Source** temporarily, instead of **Offset**. In this case, we might tune to the signal in a narrow span and use the RF Burst trigger to synchronize the periodic timer. Then we would turn the sync source off so that it would not mis-trigger. Mis-triggering can occur when we are tuned so far away from the RF burst trigger that it is no longer reliable.

A third example would be to synchronize to a signal that has a reference time element of much longer period than the period of interest. In some CDMA applications, it is useful to look at signals with a short periodicity, by synchronizing that periodicity to the "even-second clock" edge that happens every two seconds. Thus, we could connect the even-second clock trigger to Ext1 and use then Ext1 as the sync source for the periodic timer.

The figure below illustrates this third example. The top trace represents the even-second clock. It causes the periodic timer to synchronize with the leading edge shown. The analyzer trigger occurs at a time delayed by the accumulated offset from the period trigger event. The periodic timer continues to run, and triggers continue to occur, with a periodicity determined by the analyzer time base. The timer output (labeled "late event") will drift away from its ideal time due to imperfect matching between the time base of the signal being measured and the time base of the analyzer, and also because of imperfect setting of the period parameter. But the synchronization is restored on the next even-second clock event. ("Accumulated offset" is described in the in the **Offset** function section.)



Period

Sets the period of the internal periodic timer clock. For digital communications signals, this is usually set to the frame period of your current input signal. In the case that sync source is not set to OFF, and the external sync source rate is changed for some reason, the periodic timer is synchronized at the every external synchronization pulse by resetting the internal state of the timer circuit.

Key Path	Trigger, Periodic Timer
Remote Command	`:TRIGger[:SEQuence]:FRAMe:PERiod <time>` `:TRIGger[:SEQuence]:FRAMe:PERiod?`
Example	TRIG:FRAM:PER 100 ms
Dependencies	The invalid data indicator turns on when the period is changed, until the next sweep/measurement completes.
Couplings	The same period is used in the Gate Source selection of the period timer.
Preset	20 ms GSM: 4.615383
State Saved	Saved in instrument state
Min	100.000 ns
Max	559.0000 ms
Default Unit	S
Initial S/W Revision	Prior to A.02.00

Offset

Adjusts the accumulated offset between the periodic timer events and the trigger event. Adjusting the accumulated offset is different than setting an offset, and requires explanation.

The periodic timer is usually not synchronized with any external events, so the timing of its output events has no absolute meaning. Since the timing relative to external events (RF signals) is important, you need to be able to adjust (offset) it. However, you have no direct way to see when the periodic timer events occur. All that you can see is the trigger timing. When you want to adjust the trigger timing, you will be changing the internal offset between the periodic timer events and the trigger event. Because the absolute value of that internal offset is unknown, we will just call that the accumulated offset. Whenever the Offset parameter is changed, you are changing that accumulated offset. You can reset the displayed offset using Reset Offset Display. Changing the display does not change the value of the accumulated offset, and you can still make additional changes to accumulated offset.

To avoid ambiguity, we define that an increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.

Key Path	Trigger, Periodic Timer
Remote Command	`:TRIGger[:SEQuence]:FRAMe:OFFSet <time>` `:TRIGger[:SEQuence]:FRAMe:OFFSet?`
Example	TRIG:FRAM:OFFS 1.2 ms
Notes	The front panel interface (for example, the knob), and this command, adjust the accumulated offset, which is shown on the active function display. However, the actual amount sent to the hardware each time the offset is updated is the delta value, that is, the current accumulated offset value minus the previous accumulated offset value. Note that the accumulated offset value is essentially arbitrary; it represents the accumulated offset from the last time the offset was zeroed (with the Reset Offset Display key). Note that this command does not change the period of the trigger waveform. Note also that Offset is used only when the sync source is set to OFF, otherwise delay is used, see section "Trig Delay" on page 1359. An increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.
Notes	When the SCPI command is sent the value shown on the key (and the Active Function, if this happens to be the active function) is updated with the new value. However, the actual amount sent to the hardware is the delta value, that is, the current accumulated offset value minus the previous accumulated offset value. The SCPI query simply returns the value currently showing on the key.
Dependencies	The invalid data indicator turns on when the offset is changed, until the next sweep/measurement completes.
Couplings	The same offset is used in the Gate Source selection of the period timer.
Preset	0 s
State Saved	Saved in instrument state
Min	–10.000 s
Max	10.000 s
Default Unit	S
Initial S/W Revision	Prior to A.02.00

Offset Adjust (Remote Command Only)

This remote command does not work at all like the related front panel keys. This command lets you advance the phase of the frame trigger by the amount you specify.

It does not change the period of the trigger waveform. If the command is sent multiple times, it advances the phase of the frame trigger an additional amount each time it is sent. Negative numbers are permitted.

Remote Command	`:TRIGger[:SEQuence]:FRAMe:ADJust <time>`
Example	TRIG:FRAM:ADJ 1.2 ms
Notes	Note also that Offset is used only when the sync source is set to OFF, otherwise delay is used (see section "Trig Delay" on page 1359 An increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.
Notes	The front panel interface (for example, the knob) and the :TRIG:FRAM:OFFS command adjust the accumulated offset, which is shown on the active function display. However, the actual amount sent to the hardware is the delta value, that is, the current offset value minus the previous offset value. When the SCPI command is sent, the value shown on the key (and the Active Function, if this happens to be the active function) is updated by increasing it (or decreasing it if the value sent is negative) by the amount specified in the SCPI command. This is a "command only" SCPI command, with no query.
Dependencies	The invalid data indicator turns on when the offset is changed, until the next sweep/measurement completes.
Couplings	The same offset is used in the Gate Source selection of the period timer.
Preset	0 s
State Saved	Saved in instrument state
Min	–10.000 s
Max	10.000 s
Default Unit	S
Initial S/W Revision	Prior to A.02.00

Reset Offset Display

Resets the value of the periodic trigger offset display setting to 0.0 seconds. The current displayed trigger location may include an offset value defined with the Offset key. Pressing this key redefines the currently displayed trigger location as the new trigger point that is 0.0 s offset. The Offset key can then be used to add offset relative to this new timing.

Key Path	Trigger, Periodic Timer
Remote Command	`:TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet`
Example	TRIG:FRAM:OFFS:DISP:RES
Initial S/W Revision	Prior to A.02.00

Sync Source

Selects a signal source for you to synchronize your periodic timer trigger to, otherwise you are triggering at some arbitrary location in the frame. Synchronization reduces the precision requirements on the setting of the period.

For convenience you may adjust the level and slope of the selected sync source in a conditional branch setup menu accessed from the Sync Source menu. Note that these settings match those in the **Trigger** and **Gate Source** menus; that is, each trigger source has only one value of level and slope, regardless of which menu it is accessed from.

Key Path	Trigger, Periodic Timer
Remote Command	`:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal1 | EXTernal2 | RFBurst | OFF` `:TRIGger[:SEQuence]:FRAMe:SYNC?`
Example	TRIG:FRAM:SYNC EXT2
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a "Hardware missing; Not available for this model number" message.
Preset	Off GSM/EDGE: RFBurst
State Saved	Saved in instrument state
Readback	The current setting is read back to this key and it is also Readback to the previous Periodic Timer trigger key.
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Off

Turns off the sync source for your periodic trigger. With the sync source off, the timing will drift unless the signal source frequency is locked to the analyzer frequency reference.

Key Path	Trigger, Periodic Timer, Sync Source
Example	TRIG:FRAM:SYNC OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

External 1

Pressing this key, when it is not selected, selects the external input port that you will use for the periodic trigger synchronization. Pressing this key, when it is already selected, accesses the external 1 sync source setup menu.

Key Path	Trigger, Periodic Timer, Sync Source
Example	TRIG:FRAM:SYNC EXT
Couplings	Same as External 1 trigger source.
Readback	External 1
Initial S/W Revision	Prior to A.02.00

Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:LEVel <level>` `:TRIGger[:SEQuence]:EXTernal1:LEVel?`
Example	TRIG:EXT1:LEV 0.4 V
Couplings	This same level is used for the Ext1 trigger source in the Trigger menu, for the Ext1 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext1 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	–5 V
Max	5 V
Default Unit	V
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:EXTernal:LEVel` For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:LEVel`
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, External 1
Remote Command	`:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:EXTernal1:SLOPe?`
Example	TRIG:EXT1:SLOP NEG
Couplings	This same slope is used in the Ext1 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).

Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:EXTernal:SLOPe For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:EXTernal1:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

External 2

Pressing this key, when it is not selected, selects the external input port that you will use for the periodic frame trigger synchronization.

Pressing this key, when it is already selected, accesses the external 2 sync source setup menu.

Key Path	Trigger, Periodic Timer, Sync Source
Example	TRIG:FRAM:SYNC EXT2
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a "Hardware missing; Not available for this model number" message.
Couplings	Same as External 2 trigger source.
Readback	External 2
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

Trigger Level

Sets the value where the external 2 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 2
Remote Command	:TRIGger[:SEQuence]:EXTernal2:LEVel :TRIGger[:SEQuence]:EXTernal2:LEVel?
Example	TRIG:EXT2:LEV 1.1 V
Couplings	This same level is used for the Ext2 trigger source in the Trigger menu, for the Ext2 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext2 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state

Min	–5 V
Max	5 V
Default Unit	V
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:EXTernal2:LEVel
Initial S/W Revision	Prior to A.02.00

Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, External 2
Remote Command	:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative :TRIGger[:SEQuence]:EXTernal2:SLOPe?
Example	TRIG:EXT2:SLOP NEG
Couplings	This same slope is used in the Ext2 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:EXTernal2:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

RF Burst

Pressing this key, when it is not selected, selects the RF Burst as the trigger. A new sweep/measurement will start when an RF burst envelope signal is identified from the signal at the RF Input connector. Pressing this key, when it is already selected, accesses the RF Burst trigger setup menu.

In some models, a variety of burst trigger circuitry is available, resulting in various available burst trigger bandwidths. The analyzer automatically chooses the appropriate trigger path based on the hardware configuration and other settings of the analyzer.

Key Path	Trigger	
Example	TRIG:SOUR RFB	Swept SA measurement
	TRIG:<meas>:SOUR RFB	Measurements other than Swept SA
State Saved	Saved in instrument state	

Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Backwards Compatibility Notes	The legacy command: :TRIGger[:SEQuence]:RFBurst:FSELectivity[:STATe] OFF|ON|0|1 is not supported in the X-Series, as the hardware to do Frequency Selective burst triggers does not exist in X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Absolute Trigger Level

Sets the absolute trigger level for the RF burst envelope.

When using the External Mixing path, the Absolute Trigger Level is uncalibrated because the factory default was set to accommodate the expected IF levels for the RF path.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>` `:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?`
Example	TRIG:RFB:LEV:ABS 10 dBm sets the trigger level of the RF burst envelope signal to the absolute level of 10 dBm
Notes	Sending this command does not switch the setting from relative to absolute; to switch it you need to send the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command, below. Amplitude Corrections are not taken into account by the Absolute Trigger Level. For example, if you have given yourself effective gain with an amplitude correction factor, the Absolute Trigger will not fire until you have set the trigger level that far below the displayed signal level, rather than simply to the displayed signal level. This is only true for Amplitude Corrections, not External Gain or Ref Level Offset functions. If mode is Bluetooth, the default value is –50 dBm.
Couplings	This same level is used for the RF Burst trigger source in the Trigger menu, for the RF Burst selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the RF Burst selection in the Gate Source menu
Preset	–20 dBm
State Saved	Saved in instrument state
Min	–200 dBm
Max	100 dBm

Default Unit	depends on the current selected Y-Axis unit
Backwards Compatibility SCPI	`:TRIGger[:SEQuence]:FRAMe:RFBurst:LEVel:ABSolute`
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Key Path	Trigger, RF Burst
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE ABSolute|RELative` `:TRIGger[:SEQuence]:RFBurst:LEVel:TYPE?`
Example	TRIG:RFB:LEV:TYPE REL sets the trigger level type of the RF burst trigger to Relative.
Preset	ABSolute
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Relative Trigger Level

Sets the relative trigger level for the RF burst envelope.

In some models, the relative burst trigger function is implemented in hardware. In other models, without the advanced triggering hardware required, the relative burst trigger function is implemented in software in some measurements, and is unavailable in other measurements.

When implemented in software, the relative RF Burst trigger function is implemented as follows:

1. The measurement starts with the absolute RF Burst trigger setting. If it cannot get a trigger with that level, auto trigger fires and the acquisition starts anyway. After the acquisition, the measurement searches for the peak in the acquired waveform and saves it.
2. Now, in the next cycle of the measurement, the measurement determines a new absolute RF Burst level based on the peak value from the first measurement and the Relative RF Burst Trigger Level (always 0 or negative dB) set by the user. The following formula is used:

   absolute RF Burst level = peak level of the previous acquisition + relative RF Burst level
3. If the new absolute RF Burst level differs from the previous by more than 0.5 dB, the new level is sent to the hardware; otherwise it is not updated (to avoid slowing down the acquisition)

Steps 2 and 3 repeat for subsequent measurements.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:RELative <rel_ampl>`

	:TRIGger[:SEQuence]:RFBurst:LEVel:RELative?
Example	TRIG:RFB:LEV:REL –10 dB sets the trigger level of the RF burst envelope signal to the relative level of –10 dB
Notes	Sending this command does not switch the setting from absolute to relative; to switch it you need to send the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command, above. The relative trigger level is not available in some measurements. In those measurements the RELative parameter, and the :TRIGger[:SEQuence]:RFBurst:LEVel:TYPE command (above), will generate an error if sent.
Dependencies	This key is grayed out and Absolute Trigger Level selected if the required hardware is not present in your analyzer and the current measurement does not support Relative triggering.
Preset	–6 dB GSM: –25 dB
State Saved	Saved in instrument state
Min	–45 dB
Max	0 dB
Default Unit	dB or dBc
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:RFBurst:LEVel This legacy command is aliased to :TRIGger[:SEQuence]:RFBurst:LEVel:RELative because the PSA had ONLY relative burst triggering
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

Trigger Slope

It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, RF Burst
Remote Command	:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative :TRIGger[:SEQuence]:RFBurst:SLOPe?
Example	TRIG:RFB:SLOP NEG
Couplings	This same slope is used in the RF Burst selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRIGger[:SEQuence]:FRAMe:RFBurst:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEQuence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

Trig Delay

This setting delays the measurement timing relative to the Periodic Timer.

Key Path	Trigger, Periodic Timer

Remote Command	`:TRIGger[:SEQuence]:FRAMe:DELay <time>`
	`:TRIGger[:SEQuence]:FRAMe:DELay?`
	`:TRIGger[:SEQuence]:FRAMe:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:FRAMe:DELay:STATe?`

Notes	Note that delay is used when the sync source is not set to OFF. If the sync source is set to OFF, offset is used.
Preset	Off, 1.000 us
State Saved	Saved in instrument state
Min	–150 ms
Max	+500 ms
Default Unit	s
Initial S/W Revision	Prior to A.02.00

TV

Pressing this key, when it is not selected, selects the TV input signal as the trigger. A new sweep/measurement will start synchronized with the next occurrence of the synchronizing pulse of the selected TV line number.

Pressing this key, when it is already selected, opens a menu of TV Trigger setup functions. The default active function in this menu is the TV line number on which you want to trigger.

The Frame and Field options enable you to determine how the fields of the TV picture signal will be affected by the trigger system. One complete TV image consists of one frame of 525 or 625 horizontal lines depending on the TV standard being used. Each frame is composed of two fields of interlacing lines, each consisting of 262 1/2 lines (or 312 1/2 lines). The fields are called Field One and Field Two. Field One is viewed as having 263 lines (or 313 lines) and Field Two is viewed as having 262 lines (or 312 lines).

For the 525 line NTSC video standard, we refer to TV lines as follows (these are the Field Modes):

Entire Frame, lines 1 to 525

Field One, lines 1 to 263

Field Two, lines 1 to 262 (note that this really refers to "actual" lines 264 to 525)

For the 625 line PAL and SECAM video standards, we refer to TV lines as follows:

Entire Frame, lines 1 to 625

Field One, lines 1 to 313

Field Two, lines 314 to 625

As the Field is changed, the appropriate value for Line is chosen to keep triggering on the same line as before, or if this is not possible, the corresponding line in the new Field. For example, suppose line 264 is selected while in the NTSC-M standard and the Entire Frame mode. This is the first line in Field Two. If Field Two is then selected, the Line number changes to Line 1, the same actual line in the TV signal. If Field One is then selected, the line number stays at 1, but now we are triggering in the first line in Field One. The only exception to this is if we are on the last line of Field One and change to Field Two. In this case, we go to the last line in Field Two.

Key Path	Trigger
Example	TRIG:SOUR TV Swept SA measurement TRIG:<meas>:SOUR TV Measurements other than Swept SA
Dependencies	This key only appears in Modes which support TV Trigger, otherwise the key is blanked. If the SCPI command is sent while the key is blanked, an error is returned.
Readback	This key displays the value read back from TV Line
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

TV Line

Selects the TV line number to trigger on. Line number range is dependent on the settings of the **Standard** and **Field** menus within the TV trigger setup functions. When the line number is incremented beyond the upper limit, the value will change to the lower limit and continue incrementing from there. When the line number is decremented below the lower limit, the value will change to the upper limit and continue decrementing from there.

Key Path	Trigger, TV
Remote Command	`:TRIGger[:SEQuence]:TV:LINE <integer>` `:TRIGger[:SEQuence]:TV:LINE?`
Example	TRIG:TV:LINE 20 TRIG:TV:LINE?
Notes	The range of the TV line number is dependent on the settings of the Standard and Field menus within the TV trigger setup functions.
Preset	17
State Saved	Saved in instrument state
Min	The minimum value is the minimum line, and rolls over to the maximum value. The minimum line number depends on which Field and standard are selected.
Max	The maximum value is the maximum line, and rolls over to the minimum value. The maximum line

	number depends on which Field and standard are selected.
Initial S/W Revision	Prior to A.02.00

Field

Accesses the menu to select the field.

Key Path	Trigger, TV
Remote Command	`:TRIGger[:SEQuence]:TV:FMODe ENTire|ODD|EVEN` `:TRIGger[:SEQuence]:TV:FMODe?`
Example	TRIG:TV:FMOD EVEN
Notes	ODD is Field 1 EVEN is Field 2
Dependencies	This command is available only when Option B7B (TV trigger) is installed.
Preset	ENTire
Readback	Displays the Readback value
Initial S/W Revision	Prior to A.02.00

Entire Frame

When you select Entire Frame it causes the selected line number to be viewed as an offset into the entire frame starting with line 1, the first line in Field One.

Key Path	Trigger, TV, Field
Example	TRIG:TV:FMOD ENT
Min	1, for all formats.
Max	525, for formats NTSC-M, NTSC-Japan, NTSC-4.43, PAL-M and PAL-60 625, for formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L.
Readback	Entire Frame
Initial S/W Revision	Prior to A.02.00

Field One

When you select Field One it causes the selected line number to be viewed as an offset into the first field starting with Line 1, the first line in Field One.

Key Path	Trigger, TV, Field
Example	TRIG:TV:FMOD ODD
Min	Field 1 (ODD)

	The minimum line is 1
Max	Field 1 (ODD) Maximum line is 263 for formats NTSC-M, NTSC-Japan, NTSC–4.43, PAL-M and PAL–60 Maximum line is 313 for formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L.
Readback	Field 1
Initial S/W Revision	Prior to A.02.00

Field Two

When you select Field Two it causes the selected line number to be viewed as an offset into the second field. If Line 1 is selected, it is the 264th line of the frame (NTSC-M, NTSC-Japan, NTSC–4.43, PAL-M, PAL–60) or the 314th line of the frame (PAL-B,D,G,H,I, PAL-N, PAL-N-Combin, SECAM-L).

Key Path	Trigger, TV, Field
Example	TRIG:TV:FMOD EVEN
Min	Field 2 (EVEN) The minimum line is 1
Max	Field 2 (EVEN) The maximum line 262 for formats NTSC-M, NTSC-Japan, NTSC–4.43, PAL-M and PAL–60 The maximum line is 312 for formats PAL-B, D, G, H, I, PAL-N, PAL-N Combin, and SECAM-L
Readback	Field 2
Initial S/W Revision	Prior to A.02.00

Standard

Accesses the Standard menu keys which select from the following TV standards: **NTSC-M**, **NTSC-Japan**, **NTSC–4.43**, **PAL-M**, **PAL-B,D,G,H,I** , **PAL-N**, **PAL-N-Combin**, **PAL–60**, **SECAM-L**.

As the TV standard is changed, the current line value is clipped as necessary to keep it valid for the chosen standard and field mode. For example, line 600 is selected in Entire Frame mode in PAL-N; if NTSC-M is selected, the line number is clipped to 525. Or, if line 313 is selected in Field 1 mode in PAL-N and NTSC-M is selected, the line number is clipped to 263. Changing back to the PAL-N standard will leave the line number at 263.

Key Path	Trigger, TV
Remote Command	`:TRIGger[:SEQuence]:TV:STANdard MNTSc | JNTSc | NTSC443 | MPAL | BPAL | NPAL | CPAL | PAL60 | LSEC` `:TRIGger[:SEQuence]:TV:STANdard?`
Example	TRIG:TV:STAN MPAL TRIG:TV:STAN?
Preset	MNTS

State Saved	Saved in instrument state
Readback	Displays Readback value
Initial S/W Revision	Prior to A.02.00

NTSC-M

Sets the TV standard to NTSC-M.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN MNTS
Readback	NTSC-M
Initial S/W Revision	Prior to A.02.00

NTSC-Japan

Sets the TV standard to NTSC-Japan.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN JNTS
Readback	NTSC-Japan
Initial S/W Revision	Prior to A.02.00

NTSC–4.43

Sets the TV standard to NTSC–4.43.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN NTSC443
Readback	NTSC-Japan
Initial S/W Revision	Prior to A.02.00

PAL-M

Sets the TV standard to PAL-M.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN MPAL
Readback	PAL-M
Initial S/W Revision	Prior to A.02.00

PAL-N

Sets the TV standard to PAL-N.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN NPAL
Readback	PAL-N
Initial S/W Revision	Prior to A.02.00

PAL-N-Combin

Sets the TV standard to PAL-N-Combin.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN CPAL
Readback	PAL-N-C
Initial S/W Revision	Prior to A.02.00

PAL-B,D,G,H,I

Sets the TV standard to PAL-B,D,G,H,I

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN BPAL
Readback	PAL-B
Initial S/W Revision	Prior to A.02.00

PAL–60

Sets the TV standard to PAL–60.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN PAL60
Readback	PAL-N
Initial S/W Revision	Prior to A.02.00

SECAM-L

Sets the TV standard to SECAM-L.

Key Path	Trigger, TV, Standard
Example	TRIG:TV:STAN LSEC
Readback	SECAM-L
Initial S/W Revision	Prior to A.02.00

Auto/Holdoff

Opens up a menu that lets you adjust Auto Trigger and Trigger Holdoff parameters

Key Path	Trigger
Readback line	Displays a summary of the Auto Trig and Holdoff settings, in square brackets First line: Auto Off or Auto On Second Line: "Hldf" followed by: • If Holdoff is Off, readback Off • If Holdoff On and Type = Normal, readback value • If Holdoff On and Type = Above, readback value followed by AL • If Holdoff On and Type = Below, readback value followed by BL • If Holdoff Type selection is not supported by the current measurement, Holdoff Type is always Normal
Initial S/W Revision	A.02.00

Auto Trig

Sets the time that the analyzer will wait for the trigger conditions to be met. If they are not met after that much time, then the analyzer is triggered anyway.

Key Path	Trigger, Auto/Holdoff

Remote Command	`:TRIGger[:SEQuence]:ATRigger <time>`
	`:TRIGger[:SEQuence]:ATRigger?`
	`:TRIGger[:SEQuence]:ATRigger:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:ATRigger:STATe?`

Example	TRIG:ATR:STAT ON TRIG:ATR 100 ms
Notes	The "time that the analyzer will wait" starts when the analyzer is ready for a trigger, which may be hundreds of ms after the data acquisition for a sweep is done. The "time" ends when the trigger condition is satisfied, not when the delay ends.
Preset	Off, 100 ms
State Saved	Saved in instrument state
Min	1 ms

Max	100 s
Default Unit	s
Initial S/W Revision	Prior to A.02.00

Trig Holdoff

Sets the holdoff time between triggers. When the trigger condition is satisfied, the trigger occurs, the delay begins, and the holdoff time begins. New trigger conditions will be ignored until the holdoff time expires. For a free-running trigger, the holdoff value is the minimum time between triggers.

Key Path	Trigger, Auto/Holdoff

Remote Command	`:TRIGger[:SEQuence]:HOLDoff <time>`
	`:TRIGger[:SEQuence]:HOLDoff?`
	`:TRIGger[:SEQuence]:HOLDoff:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:HOLDoff:STATe?`

Example	TRIG:HOLD:STAT ON TRIG:HOLD 100 ms
Dependencies	Unavailable if the selected Input is BBIQ. If this is the case, the key is grayed out if it is pressed the informational message “Feature not supported for this Input” is displayed. If the SCPI command is sent, the error “Settings conflict; Feature not supported for this Input” is generated.
Preset	Off, 100 ms
State Saved	Saved in instrument state
Min	0 s
Max	0.5 s
Default Unit	s
Initial S/W Revision	Prior to A.02.00

User Preset

Accesses a menu that gives you the following three choices:

- User Preset – recalls a state previously saved using the Save User Preset function.
- User Preset All Modes – presets all of the modes in the analyzer
- Save User Preset– saves the current state for the current mode

Key Path	Front-panel key
Backwards Compatibility Notes	User Preset is actually loading a state, and in legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly it was possible to do a User Preset without affecting the trace data, limit lines or correction data. In the X-Series, “state” always includes all of this data; so whenever state is loaded, or User Preset is executed, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users. On ESA and PSA, User Preset affected the entire instrument’s state. In the X-Series, User Preset only recalls the state for the active mode. There is a User Preset file for each mode. User Preset can never cause a mode switch as it can in legacy analyzers. If you want to recall all modes to their user preset file state, you will need to do a User Preset after mode switching into each mode. User Preset recalls mode state which can now include data like traces; whereas on ESA and PSA, User Preset did not affect data.
Initial S/W Revision	Prior to A.02.00

User Preset

User Preset sets the state of the currently active mode back to the state that was previously saved for this mode using the Save User Preset menu key or the SCPI command, SYST:PRES:USER:SAV. It not only recalls the Mode Preset settings, but it also recalls all of the mode persistent settings, and the Input/Output system setting that existed at the time Save User Preset was executed.

If a Save User Preset has not been done at any time, User Preset recalls the default user preset file for the currently active mode. The default user preset files are created if, at power-on, a mode detects there is no user preset file. There will never be a scenario when there is no user preset file to restore. For each mode, the default user preset state is the same state that would be saved if a Save User Preset is performed in each mode right after doing a Restore Mode Default and after a Restore Input/Output Defaults.

The User Preset function does the following:

- Aborts the currently running measurement.
- Sets the mode State to the values defined by Save User Preset.
- Makes the saved measurement for the currently running mode the active measurement.
- Brings up the saved menu for the power-on mode.
- Clears the input and output buffers.

- Sets the Status Byte to 0.

Key Path	User Preset
Remote Command	`:SYSTem:PRESet:USER`
Example	:SYST:PRES:USER:SAVE:SYST:PRES:USER
Notes	:SYST:PRES:USER:SAVE is used to save the current state as the user preset state. Clears all pending OPC bits. The Status Byte is set to 0. Pressing the User Preset front-panel key while already in the User Preset menu will cause the User Preset to get executed
Couplings	A user preset will cause the currently running measurement to be aborted and cause the saved measurement to be active. Recalling a User Preset file has the same issues that recalling a Save State file has. Some settings may need to be limited and therefore re-coupled, since the capabilities of the mode may have changes when the User Preset file was last saved.
Initial S/W Revision	Prior to A.02.00

User Preset All Modes

Recalls all of the User Preset files for each mode, switches to the power-on mode, and activates the saved measurement from the power-on mode User Preset file.

NOTE When the instrument is secured, all of the user preset files are converted back to their default user preset files.

The User Preset function does the following:

- Aborts the currently running measurement.
- Switches the Mode to the power-on mode.
- Restores the User Preset files for each mode.
- Makes the saved measurement for the power-on mode the active measurement.
- Brings up the saved menu for the power-on mode.
- Clears the input and output buffers.
- Sets the Status Byte to 0.

Key Path	User Preset
Remote Command	`:SYSTem:PRESet:USER:ALL`
Example	:SYST:PRES:USER:SAVE:SYST:PRES:USER:ALL
Notes	Clears all pending OPC bits. The Status Byte is set to 0. :SYST:PRES:USER:SAVE is used to save the current state as the user preset state.
Couplings	A user preset will cause the currently running measurement to be aborted, cause a mode switch to the power-on mode, and cause the saved measurement to be active in the power-on mode.

	Recalling a User Preset file has the same issues that recalling a Save State file has. Some settings may need to be limited and therefore re-coupled, since the capabilities of the mode may have changes when the User Preset file was last saved.
Initial S/W Revision	Prior to A.02.00

Save User Preset

Saves the currently active mode and its State. You can recall this User Preset file by pressing the User Preset menu key or sending the SYST:PRES:USER remote command. This same state is also saved by the Save State function.

Key Path	User Preset
Remote Command	`:SYSTem:PRESet:USER:SAVE`
Example	:SYST:PRES:USER:SAVE
Notes	:SYST:PRES:SAVE creates the same file as if the user requested a *SAV or a MMEM: STOR:STAT, except User Preset Save does not allow the user to specify the filename or the location of the file.
Initial S/W Revision	Prior to A.02.00

View/Display

The View/Display key opens the Display Menu (common to most measurements) and the View menu for the current measurement.

Some measurements have simple View menus, or even no View menu, others provide many different Views.

Views are different ways of looking at data, usually different ways of looking at the same data, often when the data represents a time record that is being digitally processed with an FFT and/or other digital signal processing algorithms.

Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

View

The Swept SA measurement has four views, the Normal or “classic” SA view, and the Spectrogram, Trace Zoom, and Zone Span views, which let you look at the trace data in different ways.

The Spectrogram, Trace Zoom and Zone Span Views are two-window Views. When in one of these Views, you can switch back to the Normal View by pressing the Multi Window toggle key, and switch back to the previous two-window View by pressing the Multi Window key again. When in the two-window views, you can use the Next Window key or the :DISPlay:WINDow[:SELect] <number> command to switch windows (Window 1 is the top window and Window 2 is the bottom window).

Multi Window Next Window

NOTE The “previous view” is set to Zone Span on a Restore Mode Defaults. So after a Restore Mode Defaults, pressing the Multi Window key always takes you to Zone Span.

The View Menu (Normal, Spectrogram, Trace Zoom and Zone Span keys) is only available when Option EDP is licensed. When Option EDP is not licensed, the View menu does not display at all.

Whenever the View changes, the default menu is Frequency.

Key Path	View/Display
Remote Command	`:DISPlay:VIEW[:SELect] NORMal|TZOom|SPECtrogram|ZSPan` `:DISPlay:VIEW[:SELect]?`
Example	:DISP:VIEW ZSP sets the zone span view
Dependencies	All views except NORMal require option EDP to be licensed. If the SCPI is sent to select any other View and EDP is not licensed, an error is generated.
Preset	NORMal
State Saved	Saved in instrument state.
Initial S/W Revision	A.07.01

Display

The Display menu is common to most measurements, and is used for configuring items on the display. Some Display menu settings apply to all the measurements in a mode, and some only to the current measurement. Those under the System Display Settings key apply to all measurements in all modes.

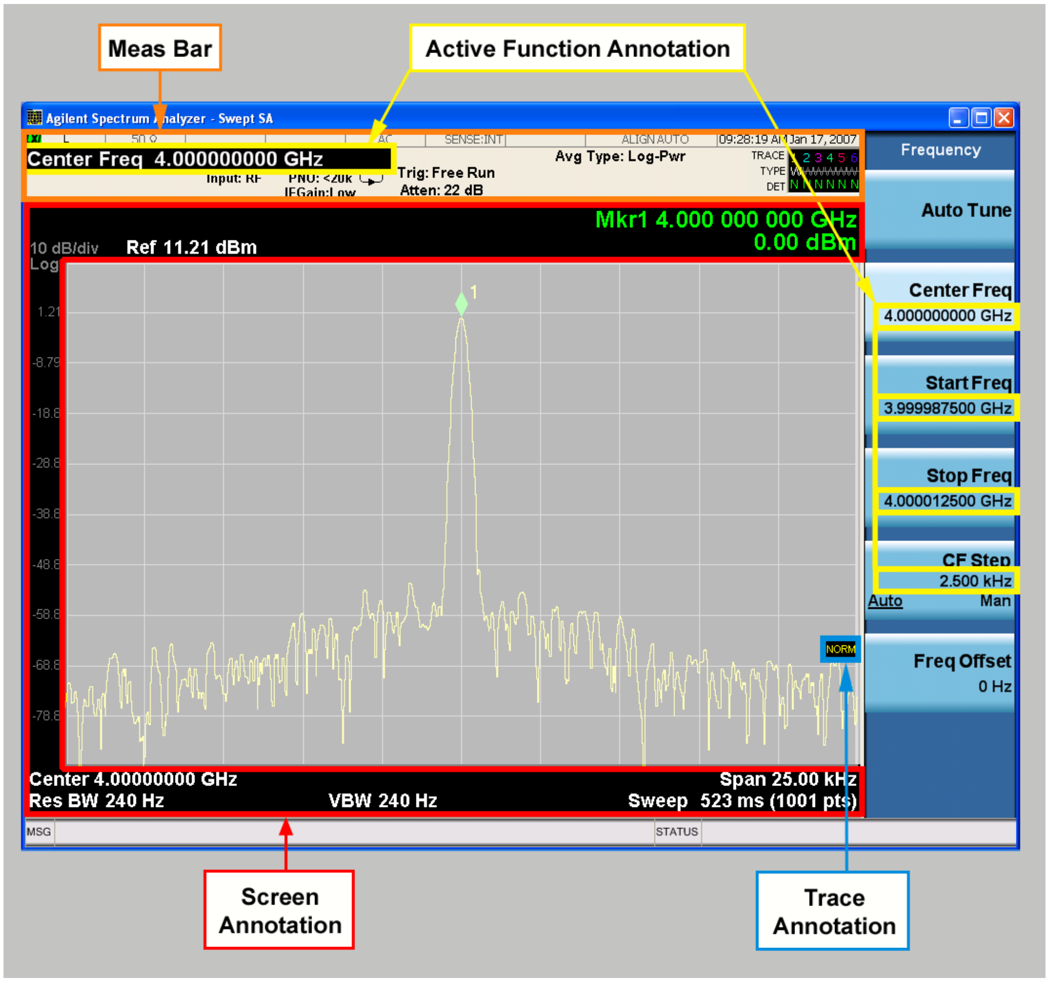
Key Path	Display
Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

1. Meas Bar: This is the measurement bar at the top of the screen. It does not include the settings panel or the Active Function. Turning off the Meas Bar turns off the settings panel and the Active Function. When the Meas Bar is off, the graticule area expands to fill the area formerly occupied by the Meas Bar.
2. Screen Annotation: this is the annotation and annunciation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) This does NOT include the marker number or the N dB result. When off, the graticule expands to fill the entire graticule area.
3. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).
4. Active Function annotation: this is the active function display in the meas bar, and all of the active function values displayed on softkeys.

See the figure below. Each type of annotation can be turned on and off individually.



Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

Meas Bar On/Off

This function turns the Measurement Bar on and off, including the settings panel. When off, the graticule area expands to fill the area formerly occupied by the Measurement Bar.

Key Path	View/Display, Display, Annotation
Remote Command	`:DISPlay:ANNotation:MBAR[:STATe] OFF|ON|0|1` `:DISPlay:ANNotation:MBAR[:STATe]?`
Example	DISP:ANN:MBAR OFF
Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On

	This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Screen

This controls the display of the annunciation and annotation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) and the y-axis annotation. This does NOT include marker annotation (or the N dB result). When off, the graticule expands to fill the entire graticule area, leaving only the 1.5% gap above the graticule as described in the Trace/Detector chapter.

Key Path	View/Display, Display, Annotation
Remote Command	`:DISPlay:ANNotation:SCReen[:STATe] OFF|ON|0|1` `:DISPlay:ANNotation:SCReen[:STATe]?`
Example	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Trace

Turns on and off the labels on the traces, showing their detector (or their math mode) as described in the Trace/Detector section.

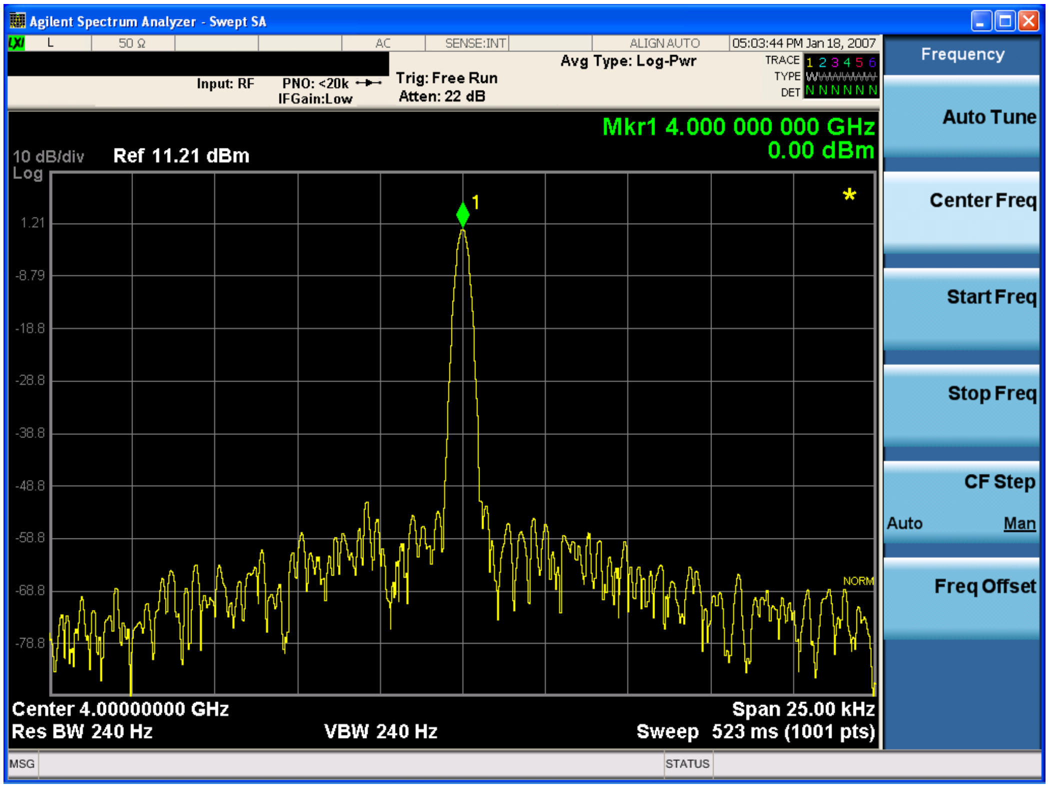
If trace math is being performed with a trace, then the trace math annotation will replace the detector annotation.

Key Path	View/Display, Display, Annotation
Remote Command	`:DISPlay:ANNotation:TRACe[:STATe] ON|OFF|1|0` `:DISPlay:ANNotation:TRACe[:STATe]?`
Example	DISP:ANN:TRAC OFF
Preset	Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Active Function Values On/Off

Turns on and off the active function display in the Meas Bar, and all of the active function values displayed on the softkeys.

Note that all of the softkeys that have active functions have these numeric values blanked when this function is on. This is a security feature..



Key Path	View/Display, Display, Annotation
Remote Command	`:DISPlay:ACTivefunc[:STATe] ON|OFF|1|0` `:DISPlay:ACTivefunc[:STATe]?`
Example	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Title

Displays menu keys that enable you to change or clear a title on your display.

Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

Change Title

Writes a title into the "measurement name" field in the banner, for example, "Swept SA".

Press Change Title to enter a new title through the alpha editor. Press Enter or Return to complete the entry. Press ESC to cancel the entry and preserve your existing title.

The display title will replace the measurement name. It remains for this measurement until you press Change Title again, or you recall a state, or a Preset is performed. A title can also be cleared by pressing Title, Clear Title.

NOTE Notice the inclusion of the <measurement> parameter in the command below. Because each measurement remembers the Display Title, the command must be qualified with the measurement name. For the Swept SA measurement this is not the case; no <measurement> parameter is used when changing the Display Title for the Swept SA measurement.

Key Path	View/Display, Display, Title
Mode	All
Remote Command	`:DISPlay:<measurement>:ANNotation:TITLe:DATA <string>` `:DISPlay:<measurement>:ANNotation:TITLe:DATA?`
Example	DISP:ANN:TITL:DATA "This Is My Title" This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer <measurement> name is not used. DISP:ACP:ANN:TITL:DATA "This Is My Title" This example is for Measurements other than Swept SA. Both set the title to: This Is My Title
Notes	Pressing this key cancels any active function. When a title is edited the previous title remains intact (it is not cleared) and the cursor goes at the end so that characters can be added or BKSP can be used to go back over previous characters.
Preset	No title (measurement name instead)
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Clear Title

Clears a title from the front-panel display. Once cleared, the title cannot be retrieved. After the title is cleared, the current Measurement Name replaces it in the title bar.

Key Path	View/Display, Display, Title
Example	The following commands clear the title and restore the measurement's original title: DISP:ANN:TITL:DATA "" This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer <measurement> name is not used. DISP:ACP:ANN:TITL:DATA "" This example is for ACP; in measurements other than Swept SA the measurement name is required.

Notes	Uses the :DISPlay:<measurement>:ANNotation:TITLe:DATA <string> command with an empty string (in the Swept SA, the <measurement> is omitted).
Preset	Performed on Preset.
Initial S/W Revision	Prior to A.02.00

Graticule

Pressing Graticule turns the display graticule On or Off. It also turns the graticule y-axis annotation on and off.

Key Path	View/Display, Display
Remote Command	`:DISPlay:WINDow[1]:TRACe:GRATicule:GRID[:STATe] OFF|ON|0|1` `:DISPlay:WINDow[1]:TRACe:GRATicule:GRID[:STATe]?`
Example	DISP:WIND:TRAC:GRAT:GRID OFF
Notes	The graticule is the set of horizontal and vertical lines that make up the grid/divisions for the x-axis and y-axis.
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Display Line

Activates an adjustable horizontal line that is used as a visual reference line. The line's vertical position corresponds to its amplitude value. The value of the display line (for example, "–20.3 dBm") appears above the line itself on the right side of the display in the appropriate font.

The display line can be adjusted using the step keys, knob, or numeric keypad. The unit of the Display Line is determined by the **Y axis unit** setting under **Amplitude**. If more than one window has a display line, the display line of the selected window is controlled.

If the display line is off the screen, it shows as a line at the top/bottom of the screen with an arrow pointing up or down. As with all such lines (Pk Thresh, Trigger Level, etc.) it is drawn on top of all traces.

The display line is unaffected by Auto Couple.

Key Path	View/Display, Display

Remote Command	`:DISPlay:WINDow[1]:TRACe:Y:DLINe <ampl>`
	`:DISPlay:WINDow[1]:TRACe:Y:DLINe?`
	`:DISPlay:WINDow[1]:TRACe:Y:DLINe:STATe OFF|ON|0|1`
	`:DISPlay:WINDow[1]:TRACe:Y:DLINe:STATe?`

Example	DISP:WIND:TRAC:Y:DLIN:STAT ON DISP:WIND:TRAC:Y:DLIN:STAT –32 dBm

Preset	Set the Display Line to Off and –25 dBm on Preset. When the Display Line goes from Off to On, if it is off screen, set it to either the top or bottom of screen, depending on which direction off screen it was. The Display Line's value does not change when it is turned off.
State Saved	Saved in instrument state.
Min	–∞ (minus infinity) in current units
Max	+∞ (plus infinity) in current units
Default Unit	Depends on the current selected Y axis unit
Initial S/W Revision	Prior to A.02.00

System Display Settings

These settings are "Mode Global" – they affect all modes and measurements and are reset only by Restore Misc Defaults or Restore System Defaults under System.

Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

Annotation Local Settings

This is a Mode Global override of the meas local annotation settings. When it is All Off, it forces ScreenAnnotation, Meas Bar, Trace, and Active Function Values settings to be OFF for all measurements in all modes. This provides the security based "annotation off" function of previous analyzers; hence it uses the legacy SCPI command.

When it is All Off, the Screen, Meas Bar, Trace, and Active Function Values keys under the Display, Annotation menu are grayed out and forced to Off. When Local Settings is selected, you are able to set the local annotation settings on a measurement by measurement basis.

Key Path	View/Display, Display, System Display Settings
Remote Command	`:DISPlay:WINDow[1]:ANNotation[:ALL] OFF|ON|0|1` `:DISPlay:WINDow[1]:ANNotation[:ALL]?`
Example	:DISP:WIND:ANN OFF
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	The WINDow parameter and optional subopcode is included for backwards compatibility but ignored – all windows are equally affected.
Initial S/W Revision	Prior to A.02.00

Annotation Local Settings

This is a Mode Global override of the meas local annotation settings. When it is All Off, it forces ScreenAnnotation, Meas Bar, Trace, and Active Function Values settings to be OFF for all measurements in all modes. This provides the security based "annotation off" function of previous analyzers; hence it uses the legacy SCPI command.

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Key Path	View/Display, Display, System Display Settings
Remote Command	`:DISPlay:WINDow[1]:ANNotation[:ALL] OFF|ON|0|1` `:DISPlay:WINDow[1]:ANNotation[:ALL]?`
Example	:DISP:WIND:ANN OFF
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	The WINDow parameter and optional subopcode is included for backwards compatibility but ignored – all windows are equally affected.
Initial S/W Revision	Prior to A.02.00

Annotation Local Settings

This is a Mode Global override of the meas local annotation settings. When it is All Off, it forces ScreenAnnotation, Meas Bar, Trace, and Active Function Values settings to be OFF for all measurements in all modes. This provides the security based "annotation off" function of previous analyzers; hence it uses the legacy SCPI command.

When it is All Off, the Screen, Meas Bar, Trace, and Active Function Values keys under the Display, Annotation menu are grayed out and forced to Off. When Local Settings is selected, you are able to set the local annotation settings on a measurement by measurement basis.

Key Path	View/Display, Display, System Display Settings
Remote Command	`:DISPlay:WINDow[1]:ANNotation[:ALL] OFF|ON|0|1` `:DISPlay:WINDow[1]:ANNotation[:ALL]?`
Example	:DISP:WIND:ANN OFF
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	The WINDow parameter and optional subopcode is included for backwards compatibility but ignored – all windows are equally affected.
Initial S/W Revision	Prior to A.02.00

Theme

This key allows you to change the Display theme. This is similar to the Themes selection under Page Setup and Save Screen Image. The four themes are detailed below.

Key Path	View/Display, Display, System Display Settings
Remote Command	`:DISPlay:THEMe TDColor|TDMonochrome|FCOLor|FMONochrome` `:DISPlay:THEMe?`
Example	DISP:THEM TDM sets the display theme to 3D Monochrome.
Notes	TDColor – 3D is the standard color theme with filling and shading TDMonochrome – is similar to 3D color, but only black is used FCOLor – flat color is intended for inkjet printers to conserve ink. It uses a white background instead of black. FMONochrome – is like flat color, but only black is used
Preset	TDColor (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM TDC
Readback	3D Color
Initial S/W Revision	Prior to A.02.00

3D Monochrome

Selects a format that is like 3D color but shades of gray are used instead of colors.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM TDM
Readback	3D Mono
Initial S/W Revision	Prior to A.02.00

Flat Color

Selects a format that is best when the screen is to be printed on an ink printer.

Key Path	Save, Screen Image, Themes

Example	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
Initial S/W Revision	Prior to A.02.00

Flat Monochrome

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

Backlight

Accesses the display backlight on/off keys. This setting may interact with settings under the Windows "Power" menu.

When the backlight is off, pressing ESC, TAB, SPACE, ENTER, UP, DOWN, LEFT, RIGHT, DEL, BKSP, CTRL, or ALT turns the backlight on without affecting the application. Pressing any other key will turn backlight on and could potentially perform the action as well.

Key Path	View/Display, Display, System Display Settings
Remote Command	`:DISPlay:BACKlight ON|OFF` `:DISPlay:BACKlight?`
Preset	ON (Set by Restore Misc Defaults)
Initial S/W Revision	Prior to A.02.00

On

Turns the display backlight on.

Key Path	View/Display, Display, System Display Settings, Backlight
Example	DISP:BACK ON
Readback	On
Initial S/W Revision	Prior to A.02.00

Off

Turns the display backlight off.

Key Path	View/Display, Display, System Display Settings, Backlight
Example	DISP:BACK OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

Backlight Intensity

An active function used to set the backlight intensity. It goes from 0 to 100 where 100 is full on and 0 is off. This value is independent of the values set under the Backlight on/off key.

Key Path	View/Display, Display, System Display Settings
Remote Command	`:DISPlay:BACKlight:INTensity <integer>` `:DISPlay:BACKlight:INTensity?`
Example	DISP:BACK:INT 50
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

Normal

Single window view of the frequency domain or zero span. This is the classic SA view. This is also the View into which the analyzer switches whenever you do anything that causes the frequency limits to change, for example:

- If you switch inputs (for example, if you switch from the RF Input to External Mixing)
- If, while in External Mixing, you edit the Harmonic Table
- If, while in External Mixing, the Mixer Preset changes (for example, if you change from A-band to V-band etc)

.Key Path	View/Display
Example	:DISP:VIEW NORM
Initial S/W Revision	A.07.01

Spectrogram

The Spectrogram View allows a quick look at a history of 300 traces. In the Spectrogram View, the display opens up a second window (the "spectrogram window"), in which trace history is displayed, below the main Swept SA display window (the "trace window"). Each horizontal line in the spectrogram display represents one historical trace. The data streams upwards from newest to oldest; the latest trace displays on the bottom and the oldest trace on the top.

Note that whenever you save state while in Spectrogram, and then recall the state, Spectrogram comes back with all the settings just as they were when you saved the state, but not including the Spectrogram data itself. If you want to save the Spectrogram data, you can Export it using Meas Results, and import it into a PC, although you cannot load it back into the analyzer.

See "More Information" on page 1382.

Key Path	View/Display
Example	DISP:VIEW SPEC
Dependencies	Because Spectrogram is a split-screen View, no other split screen views are available in Spectrogram. These include Peak Table, Marker Table, and the Limit and Ampcor editors. The keys that access these functions are grayed out while in Spectrogram.
Initial S/W Revision	A.07.01

More Information

In the Spectrogram View, the spectrogram window shows a history of the last 300 traces, and the trace window shows the trace indicated by the Display Trace function in the View/Display menu. The Display Trace key determines which of the traces in the spectrogram (lower) window is currently being viewed in the trace (top) window. A white line across the spectrogram window shows the current position of the Display Trace. On entry to the Spectrogram view, Display Trace has a value of 0; which means it is set to the “live” trace.

The “live” trace does not appear in the Spectrogram window; Display Trace 1 is the bottommost trace in the spectrogram window. Every time a sweep completes, the data from Display Trace 0 is put into Display Trace 1, and all the other traces “roll up.” Once the trace data has been written into the spectrogram, it is immutable.

Although all 6 traces can be used in the trace window, it is the data from the “live” Trace 1 that goes into Display Trace 0 and then into the spectrogram window. Thus, the spectrogram represents the history of Trace 1; traces 2–6, although available, are not written into the spectrogram. As you change the value of Display Trace, you see the historical data only in Trace 1; Traces 2–6 still represent live data.

The display can only hold 300 traces. The oldest trace is Display Trace 300, and it is always the topmost trace in the bottom window. (If the Spectrogram window has not yet filled with 300 traces, the oldest trace is the highest numbered trace that has data in it). The value of Display Trace is annunciated in the upper left hand corner of the bottom window, along with the start time of that trace.

Any variable change that restarts a sweep will clear out the spectrogram and start it over, unless you are in the idle state (single sweep or waiting for a trigger), in which case it will be cleared out when you start sweeping again. The Restart key will clear out all spectrogram traces and start over. The spectrogram display is also cleared on exit from the Spectrogram View, so every time you enter the Spectrogram View, the spectrogram window is empty.

The colors in the Spectrogram represent signal amplitude. The key to these colors is displayed next to the Y Axis in the upper window. By changing the Y Axis parameters you can change the scaling; that is, by changing the Ref Level or Scale/Div, the colors will get remapped to new Amplitude values. Note that this will not restart the Spectrogram unless the Attenuation changes.

As this is swept spectrum analysis, each horizontal line in the spectrogram represents a single trace, and the vertical axis represents time. The user might thus expect each line to slope upwards from left to right to more correctly represent the point in time at which each point in the trace was taken. However, the lines are horizontal, so the display represents each trace as representing a single time, which is in fact its start time. If this distinction is important to you, you should use FFT sweeps (with an FFT Width greater than your span, of course) to ensure that each trace point in a line better represents the same moment in time.

If Display Trace=0, the data for Trace 1 is written into the trace as the data is acquired, just as in Normal View. So you will see the data as it is acquired; for a slow sweep, for example, you will see the trace fill as the points are taken. For any other value of Display Trace, Trace 1 will appear static, as it represents an historical trace. As the traces roll up, the value of Display Trace does not change, so you will see a different trace in Trace 1 every time the live trace finishes. To freeze the spectrogram, put Trace 1 into View, or put the analyzer into Single sweep (note that unless the Average/Hold Number=1, putting the analyzer into Single will not freeze the Spectrogram until the number of traces specified by the Average/Hold Number have been taken).

When returning to the Normal View from the Spectrogram View, Trace 1 will hold whatever data was in Display Trace 0 on exit.

Note that since the spectrogram is intended to give a view of spectral behavior versus time, the Periodic Trigger, which generates triggers at known intervals, will give the most predictable and consistent starting times for the traces. Other triggers, like Free Run or External Triggers, may give non-linear or less predictable times. Similarly, turning Auto Align off will improve the regularity of the trace starting times.

While in Spectrogram View, all functions and settings work as normal, except as noted below.

- The Single key behaves differently than it does in Normal View. In the Spectrogram View, the Single key causes a specified number of traces to be read into the spectrogram from Trace 1, after which the acquisition stops. The number of traces to be read into the spectrogram is controlled with the "Average/Hold Number" key in the Meas Setup menu. For example, if you set the "Average/Hold Number" to 5, then every time you press Single, it will take 5 sweeps and put the 5 traces one by one into the Spectrogram; then it will stop sweeping. Note that you can set the "Average/Hold Number" to 1 to capture a single trace into the Spectrogram when the Single key is pressed, making the behavior similar to that of the Normal View

- In the Spectrogram View, Sweep Points are limited to a maximum of 1001 due to memory concerns. On entry to this View, if the number of points is greater than 1001, it is forced to 1001; therefore if the user had a larger number of points on entry to Spectrogram, all the traces from the Normal View will be cleared out.

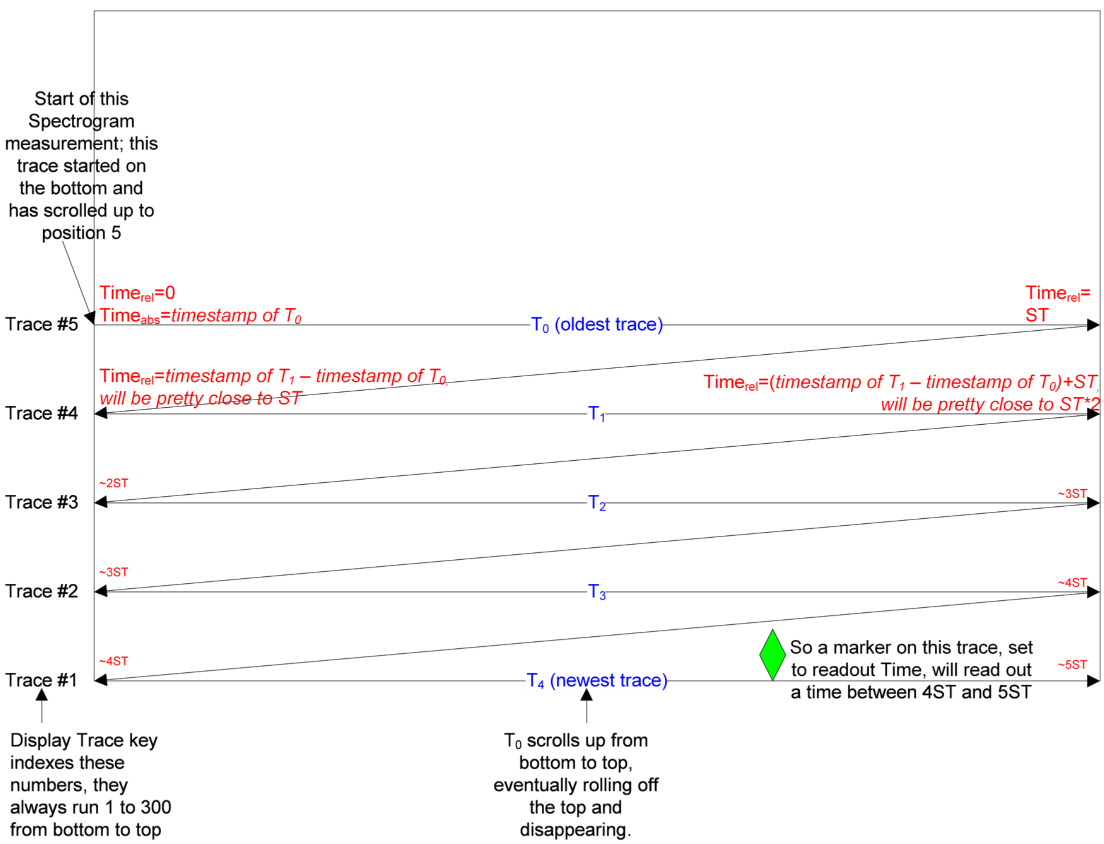
- In the Spectrogram View, if Trace 1 is saved, exported or queried, the data that gets saved or returned is the data from the Display Trace in the spectrogram. All SCPI trace saves or queries for the other 5 traces return their data normally.

- Copy Trace is available in Spectrogram. If Trace 1 is the "from" trace, Copy Trace will copy the Display Trace to any other trace; remember that the Display Trace is one of up to 300 historical versions of Trace 1. So if the Display Trace is 150, then the 150th version of Trace 1 will get copied to the destination trace. Since the historical trace data is immutable, copying a trace to Trace 1 is not possible. The same is true for Exchange Trace; Trace 1 is not available to exchange

- Selecting or moving a marker which is turned on but not on the current Display Trace will NOT move the marker to the current Display Trace; it will select it, and/or move it, but it will stay on the Trace it is currently on.
- Turning on a marker which is turned off will turn it on in the center of the current Display Trace.
- When a Peak Search is performed, if the selected marker is turned on but is not on the current Display Trace, it is first moved to the center of the current Display Trace before performing the search.
- If Couple Markers is On, then moving a marker to a new Display Trace will cause all the coupled markers to move by the same number of traces.

Representation of Time

In the Spectrogram view, zero time is the point where the first trace started, meaning that each subsequent trace point is at a positive time that represents when that point was gathered, relative to the start point. Each trace is time stamped as it starts, and this time is remembered for each trace. As successive traces appear their start times get successively larger, relative to the start time of the oldest trace. If a marker is placed on the live trace and its readout is set to Time, the time of this marker will increment by about the sweep time for every new sweep. See the diagram below for a graphical representation of how this will appear to the user:



Each trace point has a time value; the value of the start time of the trace is accurately time stamped, but each point within the trace is the start value plus the proportion of sweep time represented by that position in the trace. This means the time value of the points within a trace will not be as accurate as the start point, which is actually the case even in the Normal View, when you use a Time readout for Markers in the frequency domain. This problem is particularly acute with the Sweep Type set to FFT, since the calculated nominal FFT sweep time estimate can be off by a large percentage. Therefore, in FFT sweeps, to prevent overlaps of time on traces, and to make the Sweep Type of FFT consistent with Swept, the end time for each trace is calculated to yield a continuous functional Z axis time value for each position on the trace. Since any inaccuracies within each trace are therefore reconciled with the start of the next sweep, the user may consider the time values along a trace to be accurate enough for the purpose of making delta time measurements between traces.

The :TRACe:DISPlay:VIEW:SPECtrogram:TIME? Command can be used to determine the time that the current trace in the spectrogram started.

Markers

In the Spectrogram View, you can put Markers on any trace in the spectrogram window. To put a Marker on a particular trace in the spectrogram window, set the Display Trace to the trace upon which you want the marker, then position the marker as desired on Trace 1 in the trace window. When you turn a Marker on, or do any kind of Peak Search, if the Marker is a Trace 1 Marker, it will appears on the current Display Trace. Then when you move the Display Trace to other traces in the Spectrogram Window, the Marker will stay on the spectrogram trace it is on.

Markers are displayed in the Spectrogram Window as little crosses, with one bar sitting on the trace in question and the other bar perpendicular to it. The selected marker’s cross is green; the others are white.

Example: Set Display Trace to spectrogram trace number 125. Turn on Marker 1. Marker 1 appears on Trace 1, which is spectrogram trace number 125. A green diamond appears on trace 1 in the trace window, and a little cross appears on spectrogram trace number 125 in the spectrogram window. Now set Display Trace to 200. The trace window now shows spectrogram trace number 200; Marker 1 disappears out of that window because it is still on spectrogram trace number 125. You can still see the little cross sitting on spectrogram trace number 125 in the spectrogram window.

The selected marker displays in the upper right corner of the top window display, as always. If a delta marker is referenced to a marker on another Spectrogram Trace, then when the Marker X-Axis Scale is time, you will see the delta which represents the Y-axis delta between the two markers, as always; but in this case the X-axis delta now includes the time between the two traces.

When you leave the Spectrogram View, all Trace 1 Markers that were not on Display Trace 0 are turned OFF.

Trace Zoom

In the Trace Zoom view, the screen is split into two windows. The top window is a normal spectrum analyzer window, and the bottom window (“Zoom Window”) shows a “zoomed” representation of the traces in the top window. The data in both windows is identical, but the bottom window typically shows fewer data points, spread across the whole display, which allows you to see the data in those points more clearly, particularly when the trace data in the top window is very dense (sweep points much greater than 1000).

The zoom region is indicated by a blue shading over the whole region. In the top window, this indicates which subset of the data is zoomed in the bottom window. The entire Zoom Window is shaded, to indicate that it represents the zoom region. You can set the span of the Zoom Window using the Zoom Span key (in the Span menu) and you can set the Center Frequency of the Zoom Window using the Zoom Center key (in the Frequency menu).

It is important to emphasize that the data and state in the two windows are **identical**. The Zoom Window is simply a close-up view of a region of the top window's traces. Therefore all traces and markers are the same in both windows; and any state changes you make affect both windows.

You set the number of sweep points shown in the Zoom Window separately from the top window. Changing the number of points in the top window does not change the Zoom Span; hence the number of points in the bottom window will change by the same proportion as the change in the top window. Conversely, changing the number of points in the bottom window **will** change the Zoom Span and does **not** change the number of points in the top window, because the more points you show in the bottom window, the greater is the percentage of the top window which you are showing in the bottom.

Two functions in Trace Zoom depend on which window is selected (the selected window has a thick green border around it). When the Zoom Window (bottom window) is selected, the Points key in the Sweep/Control menu changes to Zoom Points and adjusts the number of points in the bottom window. Also, for all Peak Search functions, if the bottom window is selected the search function will operate ONLY within that window. This allows you to perform a Peak Search over a specified, limited frequency range, while still viewing the larger frequency range in the top window.

NOTE

If you have just switched to the Zoom Window via SCPI (using the :DISP:WIND function) you should wait at least one second before performing a Peak Search, to ensure that SCPI will direct the Peak Search command to the correct window.

Note that in Trace Zoom, the Span cannot go below 10 Hz. The Zero Span key is grayed out in Trace Zoom, and the Last Span key will do nothing if the last span was zero span. If, on entry to Trace Zoom, the Span is 0 Hz, the Span will revert to the last nonzero span.

Key Path	View/Display
Example	DISP:VIEW TZO
Dependencies	Because Trace Zoom is a split-screen View, no other split screen views are available in Trace Zoom. These include Peak Table, Marker Table, and the Limit and Ampcor editors. The keys that access these functions are grayed out while in Spectrogram.
Initial S/W Revision	A.07.01

Transition Rules

When you enter the Trace Zoom view, the top window of Trace Zoom takes on all of the traces, markers and settings that were present in the Normal View. The Zoom Center is the same as the analyzer Center Frequency, and the Zoom Span is 10 % of the analyzer Span. When you leave the Trace Zoom View, the top window traces and settings carry over to the next view.

When you enter the Trace Zoom view, the focus is always in the zoom window. To change the focus (switch between windows), press the Next Window key located below the display. The window which has the focus is distinguished by a green border.

Zone Span

In the Zone Span view, the screen is split into two windows. The top window is a normal spectrum analyzer window, and the bottom window (“Zone Window”) shows a window whose span represents a region (zone) within the top window. The data in the two windows represents two completely separate sweeps; each window sweeps **only** when the focus (thick green border) is on that window. It is important to understand that the data in the window without the focus remains unchanged until the focus is moved to that window.

In the top window, the zone region is indicated by a light orange shading and solid orange boundary lines. The Zone Window is not shaded orange; this emphasizes the fact that, unlike Trace Zoom, the data in the Zone Window does not match the top window but is from a separate sweep. You can set the span of the Zone Window using the Zone Span key (in the Span menu) and you can set the Center Frequency of the Zoom Window using the Zone Center key (in the Frequency menu).

Note that in Zone Span, the Span of the top window cannot go below 10 Hz. The Zero Span key is grayed out when the top window is active. The Last Span key will do nothing if the last span was zero span. If, on entry to Zone Span, the Span is 0 Hz, the Span will revert to the last nonzero span. Also, if the Span of the top window is between 10 Hz and 100 Hz on transition, the Zone Span will initialize to 10 Hz, not 10% of Span.

Key Path	View/Display
Example	DISP:VIEW ZSP
Example	Zone Span is a View in the X-Series, whereas in the ESA it was under the Span menu. There were no remote commands associated with Zone Span in the past so there are no code compatibility issues.
Dependencies	Because Zone Span is a split-screen View, no other split screen views are available in Zone Span. These include Peak Table, Marker Table, and the Limit and Ampcor editors. The keys that access these functions are grayed out while in Spectrogram. Also in the Zone Span View, Signal Track is not allowed and is grayed out
Initial S/W Revision	A.07.01

More Information

In Zone Span, the window with the focus (the selected window) is the window which updates. You can tell which window is selected because the selected window has a thick green border around it. When you enter the Zone Span view, the focus is always in the Zone Window, so it is the window which is updating. To change the focus (switch between windows), press the Next Window key located below the display. Single and Continuous settings apply, so if the analyzer is in Single, no sweep actually happens until it is initiated or you go to Continuous.

NOTE

The selected window is the window to which virtually all key presses and SCPI commands are directed. Most key functions like Center Frequency, Ref Level, etc, apply only to the selected window. Similarly, any traces which are exported or queried while in Zone Span will return the data from the currently active window. Because of this dependency, it is important to allow the SCPI system to synchronize after switching windows. Therefore, if you have just switched windows via SCPI (using the :DISP:WIND function) you should wait at least one second before sending any window-dependent command, to ensure that SCPI will direct the command to the correct window.

Transition Rules

When you enter the Zone Span view, the top window of Zone Span takes on all of the traces, markers and settings that were present in the Normal View. The Zone Center is the same as the analyzer Center Frequency, and the Zone Span is 10 % of the analyzer Span.

When you leave the Zone Span View, the current window traces and settings carry over to the next view. The traces from the other window will all now be gone. To mitigate this fact, we note that whenever you save state while in Zone Span, and then recall the state, Zone Span comes back just as it was when you saved the state, including all trace data and settings for both windows (of course, any traces that were updating when you did the save will load in an updating state, so their data will be erased after the first sweep). So if the data in both windows is important to preserve, make sure you put the traces in View and save the state before you exit.

Display Trace

You can specify which spectrogram trace to display in the trace window by using the Display Trace function. This function determines which of the 300 traces stored in the Spectrogram is currently being viewed in the trace window. Display Trace 0 shows the “live” trace. See the description of Spectrogram in the View menu for more detail on Display Trace.

This key only appears in the Spectrogram View. If the SCPI command is sent to any other View, it is accepted without error but you won’t see the result until you go back to the Spectrogram View.

Key Path	Trace
Scope	Meas Local
Measurement	Swept SA
Remote Command	`:TRACe:DISPlay:VIEW:SPECtrogram:POSition <integer>` `:TRACe:DISPlay:VIEW:SPECtrogram:POSition?`
Example	:TRAC:DISP:VIEW:SPEC:POS 146
Preset	Unaffected by Mode Preset, but set to 0 by Restore Mode Defaults. The value is remembered when you go in and out of Spectrogram View.
State Saved	Saved in Instrument State
Min	0
Max	300
Default Unit	Enter
Initial S/W Revision	A.07.01

Full Screen

When Full Screen is pressed the measurement window expands horizontally over the entire instrument display. The screen graticule area expands to fill the available display area.

It turns off the display of the softkey labels, however the menus and active functions still work. (Though it would obviously be very hard to navigate without the key labels displayed.) Pressing Full Screen again while Full Screen is in effect cancels Full Screen.

Note that the banner and status lines are unaffected. You can get even more screen area for your data display by turning off the Meas Bar (in the Display menu) which also turns off the settings panel.

Full Screen is a Meas Global function. Therefore it is cancelled by the Preset key.

Key Path	Display
Remote Command	`:DISPlay:FSCReen[:STATe] OFF|ON|0|1` `:DISPlay:FSCReen[:STATe]?`
Preset	Unaffected by Preset but set to Off by Restore Misc Defaults or shutdown and restart
State Saved	Not saved in instrument state.
Backwards Compatibility SCPI	`:DISPlay:MENU[:STATe] OFF|ON|0|1` This emulates ESA full screen functionality, which is the same as the FSCReen command in PSA except that the sense of on/off is reversed (that is, OFF means the menus are OFF, so Fullscreen is ON) and the default is ON (meaning Fullscreen is OFF).
Backwards Compatibility Notes	In ESA/PSA, Full Screen was turned on with a softkey, so pressing any other key turned Full Screen off. In the X-Series, because a hardkey is provided to turn this function on and off, pressing any other key no longer turns off Full Screen
Initial S/W Revision	Prior to A.02.00

Display Enable (Remote Command Only)

Turns the display on/off, including the display drive circuitry. The backlight stays lit so you can tell that the instrument is on. The display enable setting is mode global. The reasons for turning the display off are three:

- To increase speed as much as possible by freeing the instrument from having to update the display
- To reduce emissions from the display, drive circuitry

For security purposes

If you have turned off the display:

- and you are in local operation, the display can be turned back on by pressing any key or by sending the SYSTem:DEFaults MISC command or the DISPlay:ENABle ON (neither *RST nor SYSTem:PRESet enable the display.)
- and you are in remote operation, the display can be turned back on by pressing the Local or Esc keys or by sending the SYSTem:DEFaults MISC command or the DISPlay:ENABle ON (neither *RST nor SYSTem:PRESet enable the display.)
- and you are using either the SYSTem:KLOCk command or GPIB local lockout, then no front-panel key press will turn the display back on. You must turn it back on remotely.

Remote Command	`:DISPlay:ENABle OFF|ON|0|1`

	`:DISPlay:ENABle?`
Example	DISP:ENAB OFF
Couplings	DISP:ENAB OFF turns Backlight OFF and DISP:ENAB ON turns Backlight ON. However, settings of Backlight do not change the state of DISP:ENAB
Preset	On Set by SYST:DEF MISC, but Not affected by *RST or SYSTem:PRESet.
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	SYST:PRES no longer turns on DISPlay:ENABle as it did in legacy analyzers
Initial S/W Revision	Prior to A.02.00