

# Keysight X-Series Signal Analyzer

This manual provides documentation for the following X-Series Analyzers:

PXA Signal Analyzer N9030A  
MXA Signal Analyzer N9020A  
EXA Signal Analyzer N9010A  
CXA Signal Analyzer N9000A  
MXE EMI Receiver N9038A

N9068A & W9068A  
Phase Noise  
Measurement  
Application User's  
& Programmer's  
Reference

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## 1 About the Analyzer

The X-Series signal analyzer measures and monitors complex RF and microwave signals. Analog baseband analysis is available on MXA. The analyzer integrates traditional spectrum measurements with advanced vector signal analysis to optimize speed, accuracy, and dynamic range. The analyzer has 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 analyzer is ideal for both R&D and manufacturing engineers working on cellular, emerging wireless communications, general purpose, aerospace and defense applications.

## 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 Spectrum/Signal Analyzer measurement applications and upgrade kits, visit the following internet URL.

[www.keysight.com/find/sa\\_upgrades](http://www.keysight.com/find/sa_upgrades)

### 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 analyzer.

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:\Program 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:

[www.keysight.com/find/pxa\\_software](http://www.keysight.com/find/pxa_software)

[www.keysight.com/find/mxa\\_software](http://www.keysight.com/find/mxa_software)

[www.keysight.com/find/exa\\_software](http://www.keysight.com/find/exa_software)

[www.keysight.com/find/cxa\\_software](http://www.keysight.com/find/cxa_software)

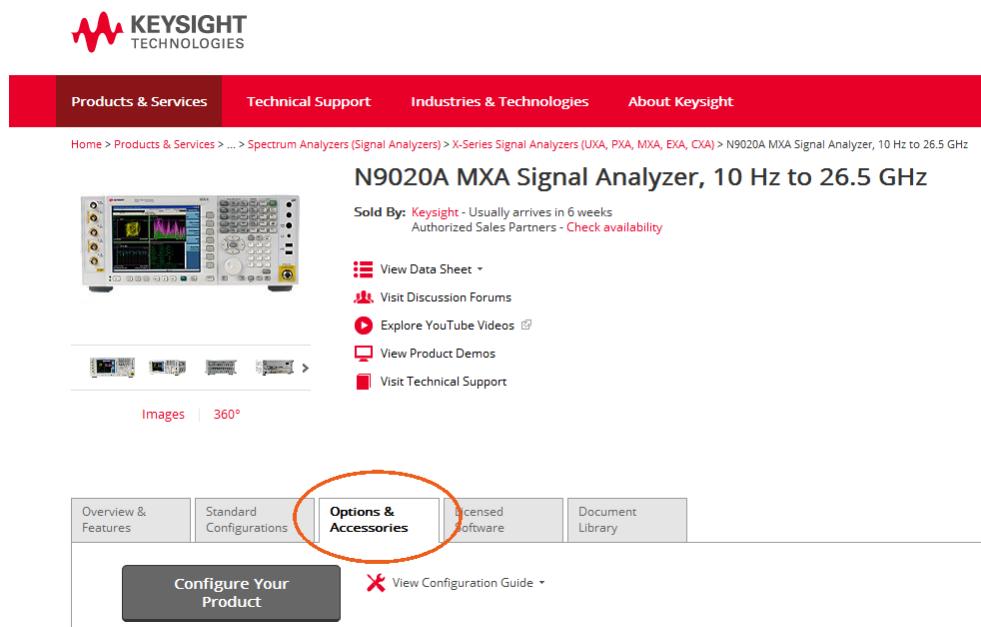
[www.keysight.com/find/mxe\\_software](http://www.keysight.com/find/mxe_software)

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.keysight.com/find/cxa](http://www.keysight.com/find/cxa)  
[www.keysight.com/find/exa](http://www.keysight.com/find/exa)  
[www.keysight.com/find/mxa](http://www.keysight.com/find/mxa)  
[www.keysight.com/find/pxa](http://www.keysight.com/find/pxa)  
[www.keysight.com/find/mxe](http://www.keysight.com/find/mxe)
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.



The screenshot shows the product page for the N9020A MXA Signal Analyzer. The 'Options & Accessories' tab is highlighted with an orange circle. Other tabs include 'Overview & Features', 'Standard Configurations', 'Licensed Software', and 'Document Library'. A 'Configure Your Product' button is at the bottom left, and a 'View Configuration Guide' link is at the bottom right.

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

## Front-Panel Features

The instrument's Front-panel features are fully detailed in the section "Front-Panel Features" (under the chapter "Front and Rear Panel Features") of the document:

[Getting Started Guide](#)

If you are viewing this information as a Help file in the instrument, then you can click on the link above to open the PDF document.

## Display Annotations

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

[Getting Started Guide](#)

If you are viewing this information as a Help file in the instrument, then you can click on the link above to open the PDF document.

## Rear-Panel Features

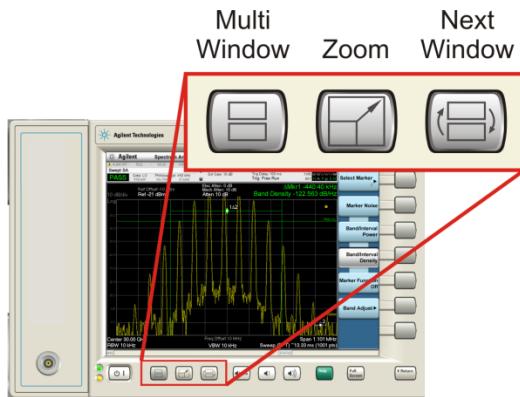
The instrument's Rear-panel features are fully detailed in the section "Rear-Panel Features" (under the chapter "Front and Rear Panel Features") of the document:

[Getting Started Guide](#)

If you are viewing this information as a Help file in the instrument, then you can click on the link above to open the PDF document.

## Window Control Keys

The instrument provides three front-panel keys for controlling windows. They are Multi Window, Zoom, and Next Window. These are all “immediate action” keys.



Multi-Window



The **Multi Window** front-panel key will toggle you back and forth between the Normal View and the last Multi Window View (Zone Span, Trace Zoom or Spectrogram) that you were in, when using the Swept SA measurement of the Spectrum Analyzer Mode. It remembers which View you were in through a Preset. This “previous view” is set to Zone Span on a Restore Mode Defaults.

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

## Zoom

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 will get 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

---

<b>Example</b>	:DISP:WIND:FORM:ZOOM sets zoomed :DISP:WIND:FORM:TILE sets un-zoomed
Preset	TILE
Initial S/W Revision	Prior to A.02.00

---

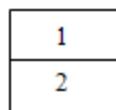
## Next Window

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 follows. 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**

## RTSA measurements:

Only two windows are available in the Spectrogram view under the Spectrum measurement and up to three windows are available in the Power vs. Time measurement, depending on the view set up.

---

<b>Remote Command</b>	:DISPlay:WINDOW[:SElect] <number> :DISPlay:WINDOW[:SElect]?
<b>Example</b>	: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 Mode state.

**NOTE**

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

## 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
<b>Remote Command</b>	: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.
<b>Backwards Compatibility SCPI</b>	: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.

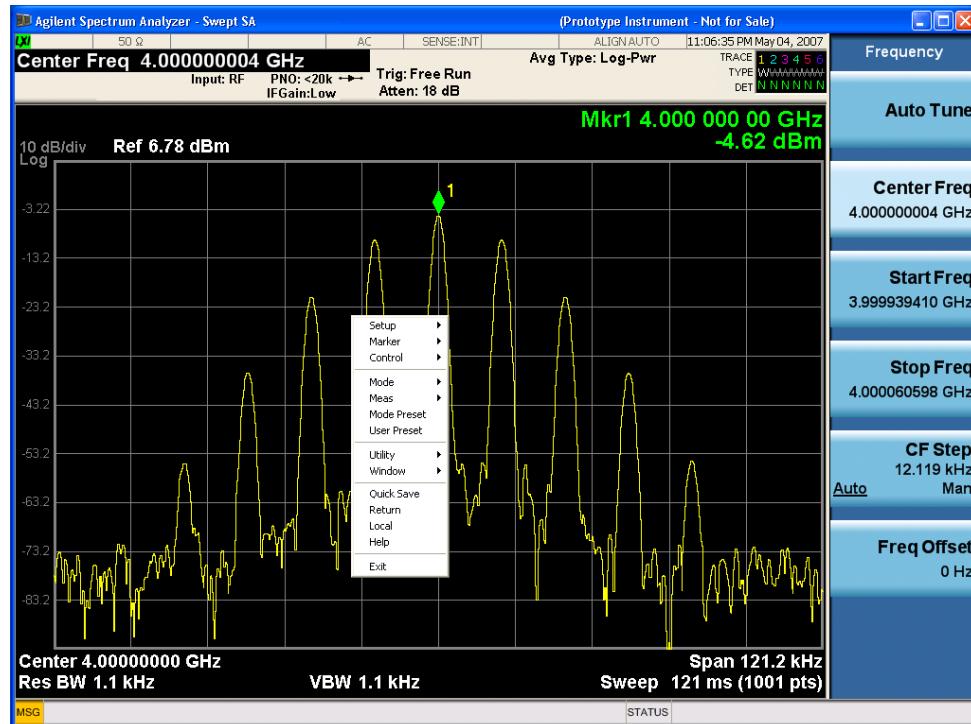
<b>Remote Command</b>	:DISPlay:ENABLE OFF ON 0 1 :DISPlay:ENABLE?
<b>Example</b>	DISP:ENAB OFF
Couplings	DISP:ENAB OFF turns Backlight OFF and DISP:ENAB ON turns Backlight ON. However, settings of Backlight do not change the state of DISP:ENAB
Preset	On Set by SYST:DEF MISC, but Not affected by *RST or SYSTem:PRESet.
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	SYST:PRE no longer turns on DISPlay:ENABLE as it did in legacy analyzers
Initial S/W Revision	Prior to A.02.00

## Mouse and Keyboard Control

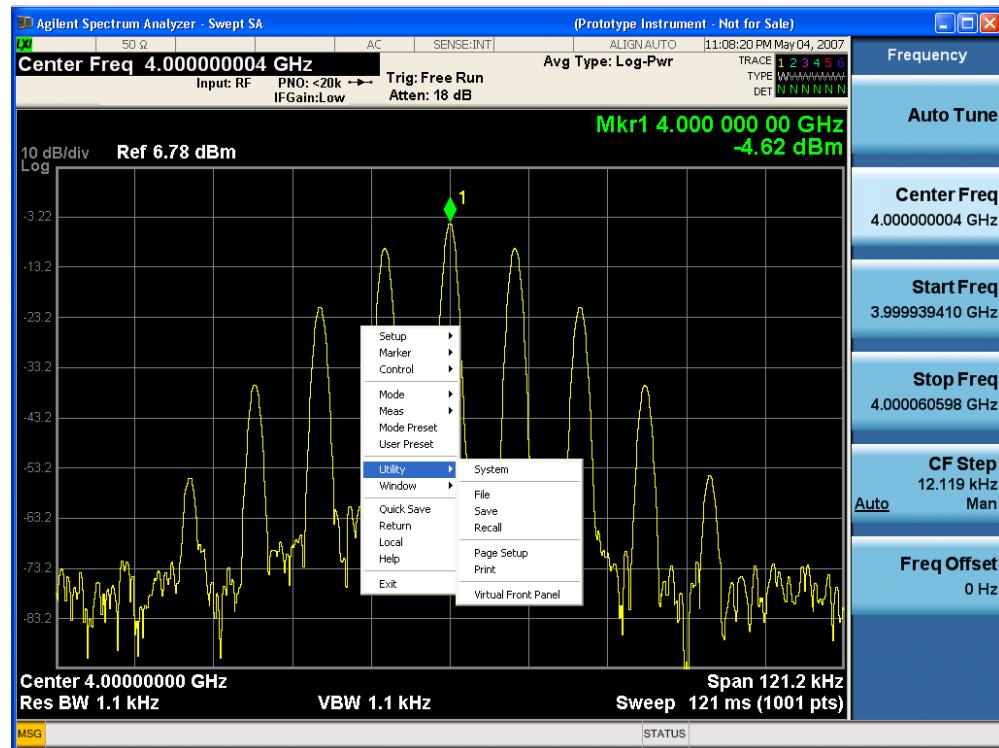
If you do not have access to the instrument front-panel, there are several ways that a mouse and PC Keyboard can give you access to functions normally accessed using the front-panel keys.

### Right-Click

If you plug in a mouse and right-click on the analyzer screen, a menu will appear as below:

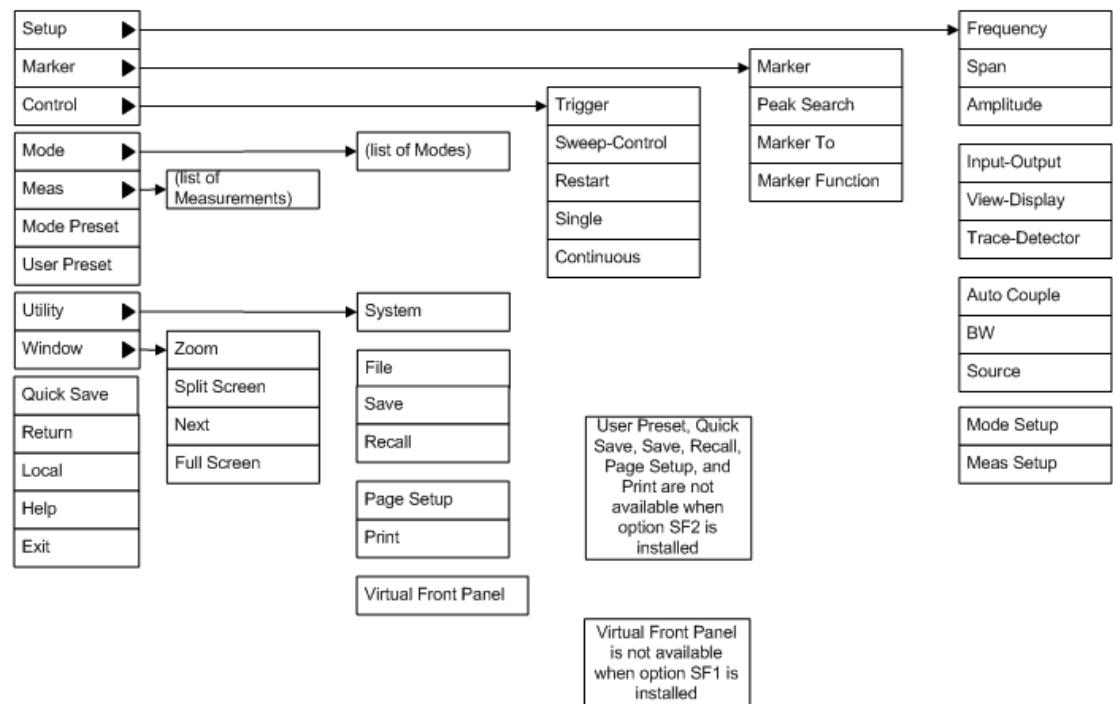


Placing the mouse on one of the rows marked with a right arrow symbol will cause that row to expand, as for example below where the mouse is hovered over the "Utility" row:



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 through Remote Desktop.

The array of keys thus available is shown below:



## PC Keyboard

If you have a PC keyboard plugged in (or via Remote Desktop), certain key codes on the PC keyboard map to front-panel keys on the GPSA front panel. These key codes are shown 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

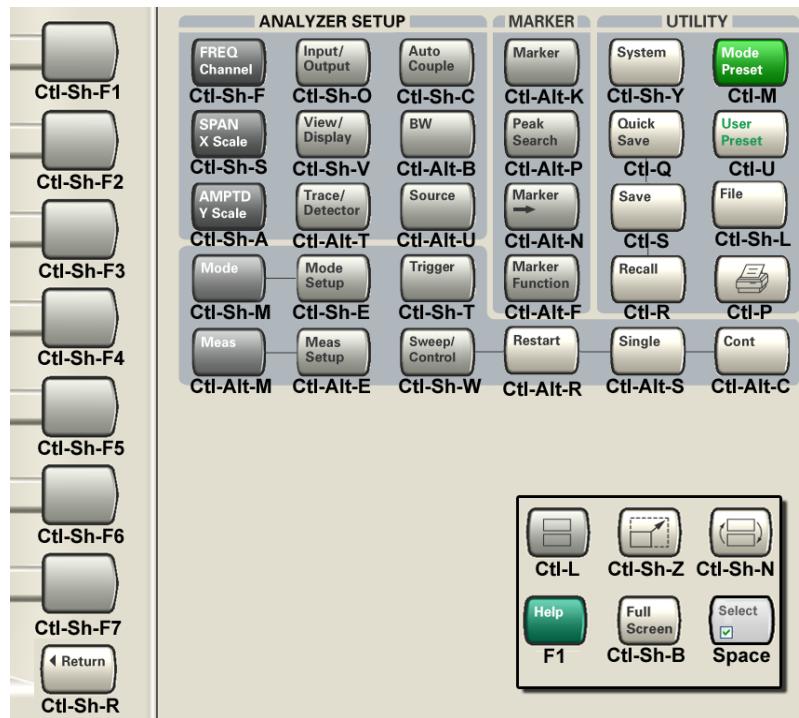
<b>Front-panel key</b>	<b>Key code</b>
Split Screen	CTRL+L
Full Screen	CTRL+SHIFT+B
Return	CTRL+SHIFT+R
Mute	Mute
Inc Audio	Volume Up
Dec Audio	Volume Down
Help	F1
Control	CTRL
Alt	ALT
Enter	Return
Cancel	Esc
Del	Delete
Backspace	Backspace
Select	Space
Up Arrow	Up
Down Arrow	Down
Left Arrow	Left
Right 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

# 1 About the Analyzer

## Mouse and Keyboard Control

Front-panel key	Key code
9	9
0	0

This is a pictorial view of the table:



## 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:

[www.keysight.com/find/security](http://www.keysight.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.

## 2 About the Phase Noise Measurement Application

This section provides information on using the Phase Noise Measurement Application in your instrument.

## What Does the Phase Noise Application Do?

This measurement application can be used to make single-sideband phase noise measurements. The following phase noise measurements can be made:

- "Monitor Spectrum Measurement" on page 425
- "Log Plot Measurement" on page 759
- "Spot Frequency Measurement" on page 613
- "Waveform Measurement" on page 923

The instrument makes these measurements automatically, using common measurement methods. The detailed results displayed by the measurements enable you to analyze phase noise performance of a system or Device Under Test (DUT). You may alter the measurement parameters for specialized analysis.

## 3 Programming the Analyzer

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

- "What Programming Information is Available?" on page 61
- "List of SCPI Commands" on page 62
- "STATus Subsystem " on page 84
- "IEEE 488.2 Common Commands" on page 131

### 3 Programming the Analyzer

#### What Programming Information is Available?

## What Programming Information is Available?

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.keysight.com/find/mxa\\_manuals](http://www.keysight.com/find/mxa_manuals).

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

Resource	Description
X-Series Programmer's Guide	<p>Provides general SCPI programming information on the following topics:</p> <ul style="list-style-type: none"><li>- Programming the X-Series Applications</li><li>- Programming fundamentals</li><li>- Programming examples</li></ul> <p>Note that SCPI command descriptions for measurement applications are <b>not</b> in this manual, but are included in the User's and Programmer's Reference manuals and the embedded help.</p>
User's and Programmer's Reference manuals	<p>Describes all front-panel keys and softkeys, including SCPI commands for a measurement application. Note that:</p> <ul style="list-style-type: none"><li>- Each measurement application has its own User's and Programmer's Reference.</li><li>- 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).</li></ul>
Embedded Help in your instrument	<p>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.</p>
X-Series Getting Started Guide	<p>Provides valuable sections related to programming including:</p> <ul style="list-style-type: none"><li>- Licensing New Measurement Application Software - After Initial Purchase</li><li>- Configuring instrument LAN Hostname, IP Address, and Gateway Address</li><li>- Using the controller to connect to the instrument remotely</li><li>- Using the Embedded Web Server Telnet connection to communicate SCPI</li></ul> <p>This printed document is shipped with the instrument.</p>
Keysight Application Notes	<p>Printable PDF versions of pertinent application notes.</p>
Keysight VISA User's Guide	<p>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.</p>

## List of SCPI Commands

\*

\*CAL?  
\*CLS  
\*ESE  
\*ESE?  
\*ESR?  
\*IDN?  
\*OPC  
\*OPC?  
\*OPT?  
\*RCL  
\*RST  
\*SAV  
\*SRE  
\*SRE?  
\*STB?  
\*TRG  
\*TST?  
\*WAI

A

ABORT

C

CALCulate:CLIMits:FAIL?  
CALCulate:DATA<n>:COMPress?  
CALCulate:DATA[n]?  
CALCulate:DATA[1]|2|...|6:PEAKs?  
CALCulate:DATA[1]|2|...|6:PEAKs?  
CALCulate:FPOWer:POWer[1,2,...,999]?  
CALCulate:FPOWer:POWer[1,2,...,999]:CONFigure  
CALCulate:FPOWer:POWer[1,2,...,999]:DEFine  
CALCulate:FPOWer:POWer[1,2,...,999]:DEFine?  
CALCulate:FPOWer:POWer[1,2,...,999]:FETCh?  
CALCulate:FPOWer:POWer[1,2,...,999]:INITiate  
CALCulate:FPOWer:POWer[1,2,...,999]:READ?  
CALCulate:FPOWer:POWer[1,2,...,999]:READ2?  
CALCulate:FPOWer:POWer[1,2,...,999]:READ1?  
CALCulate:FPOWer:POWer[1,2,...,999]:RESET  
CALCulate:LPLot:DECade:TABLE[:STATe]  
CALCulate:LPLot:DECade:TABLE[:STATe]?  
CALCulate:LPLot:MARKer:AOFF  
CALCulate:LPLot:MARKer[1]|2|...|12:BAND:LEFT  
CALCulate:LPLot:MARKer[1]|2|...|12:BAND:LEFT?  
CALCulate:LPLot:MARKer[1]|2|...|12:BAND:RIGHT

```
CALCulate:LPLot:MARKer[1]|2|...|12:BAND:RIGHT?
CALCulate:LPLot:MARKer[1]|2|...|12:BAND:SPAN
CALCulate:LPLot:MARKer[1]|2|...|12:BAND:SPAN?
CALCulate:LPLot:MARKer:COUPle[:STATe]
CALCulate:LPLot:MARKer:COUPle[:STATe]?
CALCulate:LPLot:MARKer[1]|2|...|12:FUNCTION
CALCulate:LPLot:MARKer[1]|2|...|12:FUNCTION?
CALCulate:LPLot:MARKer[1]|2|...|12:MODE
CALCulate:LPLot:MARKer[1]|2|...|12:MODE?
CALCulate:LPLot:MARKer[1]|2|...|12:REFERENCE
CALCulate:LPLot:MARKer[1]|2|...|12:REFERENCE?
CALCulate:LPLot:MARKer[1]|2|...|12:RMSNoise:MODE
CALCulate:LPLot:MARKer[1]|2|...|12:RMSNoise:MODE?
CALCulate:LPLot:MARKer[1]|2|...|12:SPURious:MAXimum:LEFT
CALCulate:LPLot:MARKer[1]|2|...|12:SPURious:MAXimum:NEXT
CALCulate:LPLot:MARKer[1]|2|...|12:SPURious:MAXimum[:PEAK]
CALCulate:LPLot:MARKer[1]|2|...|12:SPURious:MAXimum:RIGHT
CALCulate:LPLot:MARKer:TABLE[:STATe]
CALCulate:LPLot:MARKer:TABLE[:STATe]?
CALCulate:LPLot:MARKer[1]|2|...|12:TRACe
CALCulate:LPLot:MARKer[1]|2|...|12:TRACe?
CALCulate:LPLot:MARKer[1]|2|...|12:X
CALCulate:LPLot:MARKer[1]|2|...|12:X?
CALCulate:LPLot:MARKer[1]|2|...|12:X:POSITION
CALCulate:LPLot:MARKer[1]|2|...|12:X:POSITION?
CALCulate:LPLot:MARKer[1]|2|...|12:Y?
CALCulate:LPLot:SPURious:TABLE[:STATe]
CALCulate:LPLot:SPURious:TABLE[:STATe]?
CALCulate:LPLot:TRACe:COMPARE?
CALCulate:LPLot:TRACe:COPY12
CALCulate:LPLot:TRACe:COPY13
CALCulate:LPLot:TRACe:COPY23
CALCulate:LPLot:TRACe:COPY31
CALCulate:LPLot:TRACe:COPY32
CALCulate:LPLot:TRACe:COPY21
CALCulate:LPLot:TRACe3:MODE
CALCulate:LPLot:TRACe2:MODE
CALCulate:LPLot:TRACe1:MODE
CALCulate:LPLot:TRACe:SWAP13
CALCulate:LPLot:TRACe:SWAP21
CALCulate:LPLot:TRACe:SWAP23
CALCulate:LPLot:TRACe:SWAP31
CALCulate:LPLot:TRACe:SWAP32
CALCulate:LPLot:TRACe:SWAP12
CALCulate:MONitor:MARKer:AOFF
CALCulate:MONitor:MARKer:COUPle[:STATe]
CALCulate:MONitor:MARKer:COUPle[:STATe]?
CALCulate:MONitor:MARKer[1]|2|...|12:FUNCTION
CALCulate:MONitor:MARKer[1]|2|...|12:FUNCTION?
CALCulate:MONitor:MARKer[1]|2|...|12:FUNCTION:BAND:LEFT
CALCulate:MONitor:MARKer[1]|2|...|12:FUNCTION:BAND:LEFT?
CALCulate:MONitor:MARKer[1]|2|...|12:FUNCTION:BAND:RIGHT
CALCulate:MONitor:MARKer[1]|2|...|12:FUNCTION:BAND:RIGHT?
```

CALCulate:MONitor:MARKer[1] 2|...|12:FUNCTION:BAND:SPAN  
CALCulate:MONitor:MARKer[1] 2|...|12:FUNCTION:BAND:SPAN?  
CALCulate:MONitor:MARKer[1] 2|...|12:FUNCTION:RESult?  
CALCulate:MONitor:MARKer[1] 2|...|12:MAXimum  
CALCulate:MONitor:MARKer[1] 2|...|12:MODE  
CALCulate:MONitor:MARKer[1] 2|...|12:MODE?  
CALCulate:MONitor:MARKer[1] 2|...|12:REFERENCE  
CALCulate:MONitor:MARKer[1] 2|...|12:REFERENCE?  
CALCulate:MONitor:MARKer[1] 2|...|12:TRACe  
CALCulate:MONitor:MARKer[1] 2|...|12:TRACe?  
CALCulate:MONitor:MARKer[1] 2|...|12:X  
CALCulate:MONitor:MARKer[1] 2|...|12:X?  
CALCulate:MONitor:MARKer[1] 2|...|12:X:POSITION  
CALCulate:MONitor:MARKer[1] 2|...|12:X:POSITION?  
CALCulate:MONitor:MARKer[1] 2|...|12:Y?  
CALCulate:WAVEform:MARKer:AOFF  
CALCulate:WAVEform:MARKer:COUPLE[:STATE]  
CALCulate:WAVEform:MARKer:COUPLE[:STATE]?  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION?  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION:BAND:LEFT  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION:BAND:LEFT?  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION:BAND:RIGHT  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION:BAND:RIGHT?  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION:BAND:SPAN  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION:BAND:SPAN?  
CALCulate:WAVEform:MARKer[1] 2|...|12:FUNCTION:RESult?  
CALCulate:WAVEform:MARKer[1] 2|...|12:MAXimum  
CALCulate:WAVEform:MARKer[1] 2|...|12:MAXimum:NEXT  
CALCulate:WAVEform:MARKer[1] 2|...|12:MINimum  
CALCulate:WAVEform:MARKer[1] 2|...|12:MODE  
CALCulate:WAVEform:MARKer[1] 2|...|12:MODE?  
CALCulate:WAVEform:MARKer[1] 2|...|12:REFERENCE  
CALCulate:WAVEform:MARKer[1] 2|...|12:REFERENCE?  
CALCulate:WAVEform:MARKer[1] 2|...|12:STATE  
CALCulate:WAVEform:MARKer[1] 2|...|12:STATE?  
CALCulate:WAVEform:MARKer[1] 2|...|12:TRACe  
CALCulate:WAVEform:MARKer[1] 2|...|12:TRACe?  
CALCulate:WAVEform:MARKer[1] 2|...|12:X  
CALCulate:WAVEform:MARKer[1] 2|...|12:X?  
CALCulate:WAVEform:MARKer[1] 2|...|12:X:POSITION  
CALCulate:WAVEform:MARKer[1] 2|...|12:X:POSITION?  
CALCulate:WAVEform:MARKer[1] 2|...|4:X:SPAN  
CALCulate:WAVEform:MARKer[1] 2|...|12:Y?  
CALibration[:ALL]  
CALibration[:ALL]?  
CALibration[:ALL]:NPENDING  
CALibration:AUTO  
CALibration:AUTO  
CALibration:AUTO?  
CALibration:AUTO:ALERT  
CALibration:AUTO:ALERT?  
CALibration:AUTO:MODE

```
CALibration:AUTO:MODE?
CALibration:AUTO:TIME:OFF?
CALibration:DATA:BACKup
CALibration:DATA:DEFault
CALibration:DATA:RESTore
CALibration:EMIXer
CALibration:EMIXer?
CALibration:EXPired?
CALibration:FREQuency:REFerence:COARse
CALibration:FREQuency:REFerence:COARse
CALibration:FREQuency:REFerence:COARse?
CALibration:FREQuency:REFerence:FINE
CALibration:FREQuency:REFerence:FINE?
CALibration:FREQuency:REFerence:MODE
CALibration:FREQuency:REFerence:MODE?
CALibration:IQ:FLATness:I
CALibration:IQ:FLATness:IBAR
CALibration:IQ:FLATness:I|IBAR|Q|QBAR:TIME?
CALibration:IQ:FLATness:Q
CALibration:IQ:FLATness:QBAR
CALibration:IQ:ISOLation
CALibration:IQ:ISOLation:TIME?
CALibration:IQ:PROBe:I
CALibration:IQ:PROBe:IBar
CALibration:IQ:PROBe:I|IBAR|Q|QBAR:TIME?
CALibration:IQ:PROBe:I|Q:CLEar
CALibration:IQ:PROBe:Q
CALibration:IQ:PROBe:QBar
CALibration:NFLoor
CALibration:NFLoor?
CALibration:NRF
CALibration:NRF?
CALibration:NRF:NPENDING
CALibration:REFERENCE:CLOCK?
CALibration:REFERENCE:CLOCK:END?
CALibration:REFERENCE:CLOCK:INITialize?
CALibration:RF
CALibration:RF?
CALibration:RF:NPENDING
CALibration:RFPSelector:ALERT
CALibration:RFPSelector:ALERT?
CALibration:RFPSelector:CONDUCTed
CALibration:RFPSelector:CONDUCTed?
CALibration:RFPSelector:FULL
CALibration:RFPSelector:FULL?
CALibration:RFPSelector:RADiated
CALibration:RFPSelector:RADiated?
CALibration:RFPSelector:SCHEDuler:RECurrence
CALibration:RFPSelector:SCHEDuler:RECurrence?
CALibration:RFPSelector:SCHEDuler:RECurrence:DAY
CALibration:RFPSelector:SCHEDuler:RECurrence:DAY?
CALibration:RFPSelector:SCHEDuler:RECurrence:WEEK
CALibration:RFPSelector:SCHEDuler:RECurrence:WEEK?
```

CALibration:RFPSelector:SCHeduler:STATE  
CALibration:RFPSelector:SCHeduler:STATE?  
CALibration:RFPSelector:SCHeduler:TASK  
CALibration:RFPSelector:SCHeduler:TASK?  
CALibration:RFPSelector:SCHeduler:TIME:NEXT?  
CALibration:RFPSelector:SCHeduler:TIME:START  
CALibration:RFPSelector:SCHeduler:TIME:START?  
CALibration:SOURce:STATE?  
CALibration:SOURce:STATE?  
CALibration:TEMPerature:CURREnt?  
CALibration:TEMPerature:LALL?  
CALibration:TEMPerature:LPRe selector?  
CALibration:TEMPerature:LRF?  
CALibration:TEMPerature:NFLoor?  
CALibration:TEMPerature:RFPSelector:LCONDucted?  
CALibration:TEMPerature:RFPSelector:LRADIated?  
CALibration:TIME:ELAPsed:NFLoor?  
CALibration:TIME:LALL?  
CALibration:TIME:LPRe selector?  
CALibration:TIME:LRF?  
CALibration:TIME:NFLoor?  
CALibration:TIME:REFerence:CLOCK?  
CALibration:TIME:RFPSelector:LCONDucted?  
CALibration:TIME:RFPSelector:LRADIated?  
CALibration:YTF  
CALibration:YTF?  
CALibration:YTF:NPENding  
CONF  
CONFigure?  
CONFigure:LPLot  
CONFigure:LPLot  
CONFigure:LPLot:NDFault  
CONFigure:MONitor  
CONFigure:MONitor  
CONFigure:MONitor:NDFault  
CONFigure:SFRe quency  
CONFigure:SFRe quency  
CONFigure:SFRe quency:NDFault  
CONFigure:WAVeform  
CONFigure:WAVeform  
CONFigure:WAVeform:NDFault  
COUPle

## D

DISPlay:<measurement>:ANN otation:TITLe:DATA  
DISPlay:<measurement>:ANN otation:TITLe:DATA?  
DISPlay:ACTivefunc[:STATE]  
DISPlay:ACTivefunc[:STATE]?  
DISPlay:ANN otation:MBAR[:STATE]  
DISPlay:ANN otation:MBAR[:STATE]?  
DISPlay:ANN otation:SCReen[:STATE]

```
DISPlay:ANNotation:SCReen[:STATe]?
DISPlay:BACKlight
DISPlay:BACKlight?
DISPlay:BACKlight:INTensity
DISPlay:BACKlight:INTensity?
DISPlay:ENABLE
DISPlay:ENABLE?
DISPlay:FSCReen[:STATe]
DISPlay:FSCReen[:STATe]?
DISPlay:LPlot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision
DISPlay:LPlot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
DISPlay:LPlot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel
DISPlay:LPlot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?
DISPlay:LPlot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION
DISPlay:LPlot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION?
DISPlay:MENU[:STATe]
DISPlay:MONitor:VIEW:NSELect
DISPlay:MONitor:VIEW:NSELect?
DISPlay:MONitor:VIEW[:SELECT]
DISPlay:MONitor:VIEW[:SELECT]?
DISPlay:MONitor:VIEW:WINDOW:TRACe[1]|2|3:CLEar
DISPlay:MONitor:VIEW:WINDOW:TRACe:CLEar:ALL
DISPlay:MONitor:VIEW:WINDOW:TRACe[1]|2|3:TYPE
DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:COUPLE
DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:COUPLE?
DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision
DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel
DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?
DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION
DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION?
DISPlay:SFRrequency:VIEW:WINDOW[1]|2:TRACe:Y[:SCALE]:COUPLE
DISPlay:SFRrequency:VIEW:WINDOW[1]|2:TRACe:Y[:SCALE]:COUPLE?
DISPlay:SFRrequency:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision
DISPlay:SFRocurrency:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
DISPlay:SFRocurrency:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel
DISPlay:SFRocurrency:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel
DISPlay:SFRocurrency:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?
DISPlay:SFRocurrency:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:COUPLE
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:COUPLE?
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:PDIVision
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:PDIVision?
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel?
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel?
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:RPOSITION
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:RPOSITION?
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:Y[:SCALE]:COUPLE
DISPlay:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:Y[:SCALE]:COUPLE?
DISPlay:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision
DISPlay:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision
DISPlay:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
DISPlay:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
```

DISPlay:WAveform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel  
DISPlay:WAveform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel  
DISPlay:WAveform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?  
DISPlay:WAveform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?  
DISPlay:WAveform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION  
DISPlay:WAveform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION  
DISPlay:WAveform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION?  
DISPlay:WAveform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION?  
DISPlay:WINDOW[1]:ANNotation[:ALL]  
DISPlay:WINDOW[1]:ANNotation[:ALL]?  
DISPlay:WINDOW:FORMAT:TILE  
DISPlay:WINDOW:FORMAT:ZOOM  
DISPlay:WINDOW[:SElect]  
DISPlay:WINDOW[:SElect]?  
DISPlay:WINDOW[1]:TRACe:GRATICULE:GRID[:STATE]  
DISPlay:WINDOW[1]:TRACe:GRATICULE:GRID[:STATE]?

## F

FETCh:LPlot[n]?  
FETCh:MONitor[n]?  
FETCh:SFRrequency[n]?  
FETCh:WAveform[n]?  
FORMAT:BORDer  
FORMAT:BORDer?  
FORMAT[:TRACe][:DATA]  
FORMAT[:TRACe][:DATA]?

## G

GLOBal:DEFault  
GLOBal:FREQuency:CENTER[:STATE]  
GLOBal:FREQuency:CENTER[:STATE]?

## H

HCOPy:ABORT  
HCOPy[:IMMEDIATE]  
HCOPy:SDUMP:DATA?

## I

INITiate:CONTinuous  
INITiate:CONTinuous?  
INITiate[:IMMEDIATE]  
INITiate:LPlot  
INITiate:MONitor  
INITiate:PAUSE  
INITiate:REStart

```
INITiate:RESume
INITiate:SFRrequency
INITiate:WAVEform
INPUT<1|2>:PRESelection[:STATE]
INPUT<1|2>:PRESelection[:STATE]?
INPUT<1|2>:TYPE
INPUT<1|2>:TYPE?
INPUT:COUPLing
INPUT:COUPLing?
INPUT:COUPLing:I|Q
INPUT:COUPLing:I|Q?
INPUT:IMPedance:IQ
INPUT:IMPedance:IQ?
INPUT:IMPedance:REFerence
INPUT:IMPedance:REFerence?
INPUT[1]:IQ:BALanced[:STATE]
INPUT[1]:IQ:BALanced[:STATE]?
INPUT:IQ[:I]:DIFFerential
INPUT:IQ[:I]:DIFFerential?
INPUT[1]:IQ[:I]:IMPedance
INPUT[1]:IQ[:I]:IMPedance?
INPUT:IQ:MIRRored
INPUT:IQ:MIRRored?
INPUT:IQ:Q:DIFFerential
INPUT:IQ:Q:DIFFerential?
INPUT[1]:IQ:Q:IMPedance
INPUT[1]:IQ:Q:IMPedance?
INPUT[1]:IQ:TYPE
INPUT[1]:IQ:TYPE?
INPUT:MIXer
INPUT:MIXer?
INPUT:OFFSet:I|Q
INPUT:OFFSet:I|Q?
INST:NSEL
INST:NSEL
INSTrument:CATalog?
INSTrument:CONFigure:<mode>:<meas>
INSTrument:COUPLE:DEFault
INSTrument:COUPLE:FREQuency:CENTER
INSTrument:COUPLE:FREQuency:CENTER?
INSTrument:NSELect
INSTrument:NSELect?
INSTrument[:SELect]
INSTrument[:SELect]
INSTrument[:SELect]
INSTrument[:SELect]
INSTrument[:SELect]
INSTrument[:SELect]?
INST:SEL
INST:SEL
INST:SEL
INST:SEL
```

L

LXI:IDENTify[:STATE]  
LXI:IDENTify[:STATE]?

M

MEASure:LPLot[n]?  
MEASure:MONitor[n]?  
MEASure:SFRrequency[n]?  
MEASure:WAveform[n]?  
MMEMory:CATalog?  
MMEMory:CDIRectory  
MMEMory:CDIRectory?  
MMEMory:COPY  
MMEMory:COPY:DEVice  
MMEMory:DATA  
MMEMory:DATA?  
MMEMory:DElete  
MMEMory:LOAD:CORRection  
MMEMory:LOAD:CORrection  
MMEMory:LOAD:STATE  
MMEMory:LOAD:STATE  
MMEMory:MDIRectomy  
MMEMory:MOVE  
MMEMory:RDIRectomy  
MMEMory:REGister:STATe:LABel  
MMEMory:REGister:STATe:LABel?  
MMEMory:RMEDIA:LABel  
MMEMory:RMEDIA:LABel?  
MMEMory:RMEDIA:LIST?  
MMEMory:RMEDIA:SIZE?  
MMEMory:RMEDIA:WProtect?  
MMEMory:STORe:CORRection  
MMEMory:STORe:CORrection  
MMEMory:STORe:RESULTS:MTABle|PTABle|SPECrogram  
MMEMory:STORe:SCreen  
MMEMory:STORe:SCreen:THEMe  
MMEMory:STORe:SCreen:THEMe?  
MMEMory:STORe:STATe  
MMEMory:STORe:STATe

O

OUTPut:ANALog  
OUTPut:ANALog?  
OUTPut:ANALog:AUTO  
OUTPut:ANALog:AUTO?  
OUTPut:AUX  
OUTPut:AUX?

```
OUTPut:AUX:AIF
OUTPut:AUX:AIF?
OUTPut:DBUS[1][:STATe]
OUTPut:DBUS[1][:STATe]?
OUTPut:IQ:OUTPut
OUTPut:IQ:OUTPut?
```

R

```
READ:LPLot[n]?
READ:MONitor[n]?
READ:SFRequency[n]?
READ:WAVeform[n]?
```

S

```
[ :SENSe]:<measurement>:TRIGger:SOURce
[ :SENSe]:<measurement>:TRIGger:SOURce
[ :SENSe]:ACPR:TRIGger:SOURce
[ :SENSe]:CARRier:THreshold:MINimum
[ :SENSe]:CARRier:THreshold:MINimum?
[ :SENSe]:CORRection:BTS[:RF]:GAIN
[ :SENSe]:CORRection:BTS[:RF]:GAIN?
[ :SENSe]:CORRection:BTS[:RF]:LOSS
[ :SENSe]:CORRection:BTS[:RF]:LOSS?
[ :SENSe]:CORRection:CSET:ALL:DElete
[ :SENSe]:CORRection:CSET:ALL[:STATe]
[ :SENSe]:CORRection:CSET:ALL[:STATe]?
[ :SENSe]:CORRection:CSET[1]:ANTenna[:UNIT]
[ :SENSe]:CORRection:CSET[1]:ANTenna[:UNIT]?
[ :SENSe]:CORRection:CSET[1]|2|...|8:COMMENT
[ :SENSe]:CORRection:CSET[1]|2|...|8:COMMENT?
[ :SENSe]:CORRection:CSET[1]|2|...|6:DElete
[ :SENSe]:CORRection:CSET[1]|2|...|8:DESCription
[ :SENSe]:CORRection:CSET[1]|2|...|8:DESCription?
[ :SENSe]:CORRection:CSET[1]|2|...|8[:STATe]
[ :SENSe]:CORRection:CSET[1]|2|...|8[:STATe]?
[ :SENSe]:CORRection:CSET[1]|2|...|8:X:SPACing
[ :SENSe]:CORRection:CSET[1]|2|...|8:X:SPACing?
[ :SENSe]:CORRection:IMPedance[:INPUT][:MAGNitude]
[ :SENSe]:CORRection:IMPedance[:INPUT][:MAGNitude]?
[ :SENSe]:CORRection:IQ:I:GAIN
[ :SENSe]:CORRection:IQ:I:GAIN?
[ :SENSe]:CORRection:IQ:I|Q:ATTenuation
[ :SENSe]:CORRection:IQ:I|Q:ATTenuation?
[ :SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio
[ :SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio?
[ :SENSe]:CORRection:IQ[:I]:SKEW
[ :SENSe]:CORRection:IQ[:I]:SKEW?
[ :SENSe]:CORRection:IQ:Q:GAIN
[ :SENSe]:CORRection:IQ:Q:GAIN?
```

```
[ :SENSe] :CORRection:IQ:Q:GAIN:COUPLE
[ :SENSe] :CORRection:IQ:Q:GAIN:COUPLE?
[ :SENSe] :CORRection:IQ:Q:SKEW
[ :SENSe] :CORRection:IQ:Q:SKEW?
[ :SENSe] :CORRection:MS[:RF]:GAIN
[ :SENSe] :CORRection:MS[:RF]:GAIN?
[ :SENSe] :CORRection:MS[:RF]:LOSS
[ :SENSe] :CORRection:MS[:RF]:LOSS?
[ :SENSe] :CORRection:NOISe:FLOor
[ :SENSe] :CORRection:NOISe:FLOor?
[ :SENSe] :CORRection:NOISe:FLOor:ADaptive
[ :SENSe] :CORRection:NOISe:FLOor:ADaptive?
[ :SENSe] :CORRection:OFFSet[:MAGNitude]
[ :SENSe] :CORRection:SA[:RF]:GAIN
[ :SENSe] :CORRection:SA[:RF]:GAIN?
[ :SENSe] :FEED
[ :SENSe] :FEED
[ :SENSe] :FEED
[ :SENSe] :FEED?
[ :SENSe] :FEED?
[ :SENSe] :FEED:AREFerence
[ :SENSe] :FEED:AREFerence?
[ :SENSe] :FEED:IQ:TYPE
[ :SENSe] :FEED:IQ:TYPE?
[ :SENSe] :FEED:RF:PORT[:INPut]
[ :SENSe] :FEED:RF:PORT[:INPut]?
[ :SENSe] :FREQuency:CARRier
[ :SENSe] :FREQuency:CARRier?
[ :SENSe] :FREQuency:CARRier:SEARCH
[ :SENSe] :FREQuency:CARRier:TRACK:ACCuracy
[ :SENSe] :FREQuency:CARRier:TRACK:ACCuracy?
[ :SENSe] :FREQuency:CARRier:TRACK:SPAN
[ :SENSe] :FREQuency:CARRier:TRACK:SPAN?
[ :SENSe] :FREQuency:CARRier:TRACK:SPAN:AUTO
[ :SENSe] :FREQuency:CARRier:TRACK:SPAN:AUTO?
[ :SENSe] :FREQuency:CARRier:TRACK[:STATE]
[ :SENSe] :FREQuency:CARRier:TRACK[:STATE]?
[ :SENSe] :LPLot:AMRejection
[ :SENSe] :LPLot:AMRejection?
[ :SENSe] :LPLot:AMRejection:OFFSet
[ :SENSe] :LPLot:AMRejection:OFFSet?
[ :SENSe] :LPLot:AVERage:COUNT
[ :SENSe] :LPLot:AVERage:COUNT?
[ :SENSe] :LPLot:AVERage[:STATe]
[ :SENSe] :LPLot:AVERage[:STATe]?
[ :SENSe] :LPLot:AVERage:TCONTrol
[ :SENSe] :LPLot:AVERage:TCONTrol?
[ :SENSe] :LPLot:CANCellation:DELTa
[ :SENSe] :LPLot:CANCellation:DELTa?
[ :SENSe] :LPLot:CANCellation[:STATe]
[ :SENSe] :LPLot:CANCellation[:STATe]?
[ :SENSe] :LPLot:CANCellation:TRACe
[ :SENSe] :LPLot:CANCellation:TRACe?
```

```
[ :SENSe]:LPPlot:DETector[:FUNCTION]?
[ :SENSe]:LPPlot:FILTering
[ :SENSe]:LPPlot:FILTering:LITTle
[ :SENSe]:LPPlot:FILTering:MAXimum
[ :SENSe]:LPPlot:FILTering:MEDIUM
[ :SENSe]:LPPlot:FILTering:NONE
[ :SENSe]:LPPlot:FREQuency:OFFSet:START
[ :SENSe]:LPPlot:FREQuency:OFFSet:START?
[ :SENSe]:LPPlot:FREQuency:OFFSet:STOP
[ :SENSe]:LPPlot:FREQuency:OFFSet:STOP?
[ :SENSe]:LPPlot:METHod
[ :SENSe]:LPPlot:METHod?
[ :SENSe]:LPPlot:ODRive
[ :SENSe]:LPPlot:ODRive?
[ :SENSe]:LPPlot:ATTenuation:ZERO
[ :SENSe]:LPPlot:ATTenuation:ZERO?
[ :SENSe]:LPPlot:SMooth
[ :SENSe]:LPPlot:SMooth?
[ :SENSe]:MIXer:BAND
[ :SENSe]:MIXer:BAND?
[ :SENSe]:MIXer:BIAS
[ :SENSe]:MIXer:BIAS?
[ :SENSe]:MIXer:BIAS:STATE
[ :SENSe]:MIXer:BIAS:STATE?
[ :SENSe]:MIXer:CIFLoss
[ :SENSe]:MIXer:CIFLoss?
[ :SENSe]:MIXer:HARMonic
[ :SENSe]:MIXer:HARMonic?
[ :SENSe]:MIXer:LODoubler
[ :SENSe]:MIXer:LODoubler?
[ :SENSe]:MIXer:TTYPe
[ :SENSe]:MIXer:TTYPe?
[ :SENSe]:MONitor:AVERage:COUNT
[ :SENSe]:MONitor:AVERage:COUNT?
[ :SENSe]:MONitor:AVERage[:STATe]
[ :SENSe]:MONitor:AVERage[:STATe]?
[ :SENSe]:MONitor:AVERage:TCONTrol
[ :SENSe]:MONitor:AVERage:TCONTrol?
[ :SENSe]:MONitor:BANDwidth[:RESolution]
[ :SENSe]:MONitor:BANDwidth[:RESolution]?
[ :SENSe]:MONitor:BANDwidth[:RESolution]:AUTO
[ :SENSe]:MONitor:BANDwidth[:RESolution]:AUTO?
[ :SENSe]:MONitor:BANDwidth:VIDeo
[ :SENSe]:MONitor:BANDwidth:VIDeo?
[ :SENSe]:MONitor:BANDwidth:VIDeo:VIDEO
[ :SENSe]:MONitor:BANDwidth:VIDeo:VIDEO?
[ :SENSe]:MONitor:BANDwidth:VIDeo:RATio
[ :SENSe]:MONitor:BANDwidth:VIDeo:RATio?
[ :SENSe]:MONitor:BANDwidth:VIDeo:RATio:VIDEO
[ :SENSe]:MONitor:BANDwidth:VIDeo:RATio:VIDEO?
[ :SENSe]:MONitor:BWIDth[:RESolution]
[ :SENSe]:MONitor:BWIDth:VIDeo
[ :SENSe]:MONitor:BWIDth:VIDeo:RATio
```

```
[ :SENSe] :MONitor:DETector:AUTO
[ :SENSe] :MONitor:DETector:AUTO?
[ :SENSe] :MONitor:DETector[:FUNCTION]
[ :SENSe] :MONitor:DETector:TRACe
[ :SENSe] :MONitor:DETector:TRACe?
[ :SENSe] :MONitor:FREQuency:SPAN
[ :SENSe] :MONitor:FREQuency:SPAN?
[ :SENSe] :MONitor:FREQuency:SPAN:BANDwidth[:RESolution]:RATio
[ :SENSe] :MONitor:FREQuency:SPAN:BANDwidth[:RESolution]:RATio?
[ :SENSe] :MONitor:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO
[ :SENSe] :MONitor:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO?
[ :SENSe] :MONitor:FREQuency:SPAN:BWIDth[:RESolution]:RATio
[ :SENSe] :MONitor:FREQuency:SPAN:FULL
[ :SENSe] :MONitor:FREQuency:SPAN:PREVIOUS
[ :SENSe] :MONitor:SWEep:POINTs
[ :SENSe] :MONitor:SWEep:POINTs?
[ :SENSe] :MONitor:SWEep:TIME
[ :SENSe] :MONitor:SWEep:TIME?
[ :SENSe] :MONitor:SWEep:TIME:AUTO
[ :SENSe] :MONitor:SWEep:TIME:AUTO?
[ :SENSe] :POWer:CARRier:MINimum
[ :SENSe] :POWer:IQ[:I]:RANGE[:UPPer]
[ :SENSe] :POWer:IQ[:I]:RANGE[:UPPer]?
[ :SENSe] :POWer:IQ:Q:RANGE[:UPPer]
[ :SENSe] :POWer:IQ:Q:RANGE[:UPPer]?
[ :SENSe] :POWer:IQ:RANGE:AUTO
[ :SENSe] :POWer:IQ:RANGE:AUTO?
[ :SENSe] :POWer[:RF]:ATTenuation
[ :SENSe] :POWer[:RF]:ATTenuation?
[ :SENSe] :POWer[:RF]:ATTenuation:AUTO
[ :SENSe] :POWer[:RF]:ATTenuation:AUTO?
[ :SENSe] :POWer[:RF]:ATTenuation:STEP[:INCRement]
[ :SENSe] :POWer[:RF]:ATTenuation:STEP[:INCRement]?
[ :SENSe] :POWer[:RF]:EATTenuation
[ :SENSe] :POWer[:RF]:EATTenuation?
[ :SENSe] :POWer[:RF]:EATTenuation:STATe
[ :SENSe] :POWer[:RF]:EATTenuation:STATe?
[ :SENSe] :POWer[:RF]:GAIN:BAND
[ :SENSe] :POWer[:RF]:GAIN:BAND?
[ :SENSe] :POWer[:RF]:GAIN[:STATe]
[ :SENSe] :POWer[:RF]:GAIN[:STATe]?
[ :SENSe] :POWer[:RF]:MMW:PADJust
[ :SENSe] :POWer[:RF]:MW:PADJust
[ :SENSe] :POWer[:RF]:MW:PATH
[ :SENSe] :POWer[:RF]:MW:PATH?
[ :SENSe] :POWer[:RF]:MW:PRESelector[:STATe]
[ :SENSe] :POWer[:RF]:MW:PRESelector[:STATe]?
[ :SENSe] :POWer[:RF]:PADJust
[ :SENSe] :POWer[:RF]:PADJust?
[ :SENSe] :POWer[:RF]:PADJust:PRESelector
[ :SENSe] :POWer[:RF]:PADJust:PRESelector?
[ :SENSe] :POWer[:RF]:PCENTER
[ :SENSe] :POWer[:RF]:RANGE:AUTO
```

```
[ :SENSe]:POWer[:RF]:RANGE:AUTO?
[ :SENSe]:POWer[:RF]:RANGE:OPTimize
[ :SENSe]:POWer[:RF]:RANGE:OPTimize:ATTenuation
[ :SENSe]:POWer[:RF]:RANGE:OPTimize:ATTenuation?
[ :SENSe]:POWer[:RF]:RFPSelector[:STATe]
[ :SENSe]:POWer[:RF]:RFPSelector[:STATe]?
[ :SENSe]:ROSCillator:BANDwidth
[ :SENSe]:ROSCillator:BANDwidth?
[ :SENSe]:ROSCillator:COUPling
[ :SENSe]:ROSCillator:COUPling?
[ :SENSe]:ROSCillator:EXTerнал:FREQuency
[ :SENSe]:ROSCillator:EXTerernal:FREQuency?
[ :SENSe]:ROSCillator:EXTerinal:FREQuency:DEFault
[ :SENSe]:ROSCillator:SOURce
[ :SENSe]:ROSCillator:SOURce?
[ :SENSe]:ROSCillator:SOURce:TYPE
[ :SENSe]:ROSCillator:SOURce:TYPE?
[ :SENSe]:SFReQuency:AVERage:COUNT
[ :SENSe]:SFReQuency:AVERage:COUNT?
[ :SENSe]:SFReQuency:AVERage[:STATe]
[ :SENSe]:SFReQuency:AVERage[:STATe]?
[ :SENSe]:SFReQuency:AVERage:TCONTrol
[ :SENSe]:SFReQuency:AVERage:TCONTrol?
[ :SENSe]:SFReQuency:BANDwidth[:RESolution]?
[ :SENSe]:SFReQuency:BANDwidth[:RESolution]:AUTO?
[ :SENSe]:SFReQuency:BANDwidth:VIDeo?
[ :SENSe]:SFReQuency:BANDwidth:VIDeo:AUTO?
[ :SENSe]:SFReQuency:BANDwidth:VIDeo:RATio
[ :SENSe]:SFReQuency:BANDwidth:VIDeo:RATio?
[ :SENSe]:SFReQuency:BANDwidth:VIDeo:RATio:AUTO
[ :SENSe]:SFReQuency:BANDwidth:VIDeo:RATio:AUTO?
[ :SENSe]:SFReQuency:BWIDth[:RESolution]?
[ :SENSe]:SFReQuency:BWIDth:VIDeo?
[ :SENSe]:SFReQuency:BWIDth:VIDeo:RATio
[ :SENSe]:SFReQuency:DETector[:FUNCTION]?
[ :SENSe]:SFReQuency:METHod
[ :SENSe]:SFReQuency:METHod?
[ :SENSe]:SFReQuency:SOFFset
[ :SENSe]:SFReQuency:SOFFset?
[ :SENSe]:SFReQuency:SOFFset:BANDwidth[:RESolution]:RATio
[ :SENSe]:SFReQuency:SOFFset:BANDwidth[:RESolution]:RATio?
[ :SENSe]:SFReQuency:SOFFset:BWIDth[:RESolution]:RATio
[ :SENSe]:SFReQuency:SWEep:TIME
[ :SENSe]:SFReQuency:SWEep:TIME?
[ :SENSe]:SFReQuency:SWEep:TIME:AUTO
[ :SENSe]:SFReQuency:SWEep:TIME:AUTO?
[ :SENSe]:SIDentify[:STATe]
[ :SENSe]:SIDentify[:STATe]?
[ :SENSe]:SWEep:EGATE:CONTrol
[ :SENSe]:SWEep:EGATE:CONTrol?
[ :SENSe]:SWEep:EGATE:DELAY
[ :SENSe]:SWEep:EGATE:DELAY?
[ :SENSe]:SWEep:EGATE:DELAY:COMPensation:TYPE
```

```
[ :SENSe] :SWEep:EGATE:DELay:COMPensation:TYPE?
[ :SENSe] :SWEep:EGATE:EXTERNal[1]|2:LEVel
[ :SENSe] :SWEep:EGATE:EXTERNal[1]|2:LEVel?
[ :SENSe] :SWEep:EGATE:HOLDoff
[ :SENSe] :SWEep:EGATE:HOLDoff?
[ :SENSe] :SWEep:EGATE:HOLDoff:AUTO
[ :SENSe] :SWEep:EGATE:HOLDoff:AUTO?
[ :SENSe] :SWEep:EGATE:LENGth
[ :SENSe] :SWEep:EGATE:LENGth?
[ :SENSe] :SWEep:EGATE:MINFast?
[ :SENSe] :SWEep:EGATE:POLarity
[ :SENSe] :SWEep:EGATE:POLarity?
[ :SENSe] :SWEep:EGATE:SOURce
[ :SENSe] :SWEep:EGATE:SOURce?
[ :SENSe] :SWEep:EGATE[:STATe]
[ :SENSe] :SWEep:EGATE[:STATe]?
[ :SENSe] :SWEep:EGATE:TIME
[ :SENSe] :SWEep:EGATE:TIME?
[ :SENSe] :SWEep:EGATE:VIEW
[ :SENSe] :SWEep:EGATE:VIEW?
[ :SENSe] :SWEep:EGATE:VIEW:START
[ :SENSe] :SWEep:EGATE:VIEW:START?
[ :SENSe] :SWEep:TIME:GATE:LEVel
[ :SENSe] :SWEep:TIME:GATE:LEVel?
[ :SENSe] :VOLTage:IQ[:I]:RANGE[:UPPer]
[ :SENSe] :VOLTage:IQ[:I]:RANGE[:UPPer]?
[ :SENSe] :VOLTage:IQ:Q:RANGE[:UPPer]
[ :SENSe] :VOLTage:IQ:Q:RANGE[:UPPer]?
[ :SENSe] :VOLTage:IQ:RANGE:AUTO
[ :SENSe] :VOLTage:IQ:RANGE:AUTO?
[ :SENSe] :VOLTage|POWer:IQ:MIRRored
[ :SENSe] :VOLTage|POWer:IQ:MIRRored?
[ :SENSe] :WAVEform:ADC:DITHer:AUTO[:STATe]
[ :SENSe] :WAVEform:ADC:DITHer:AUTO[:STATe]?
[ :SENSe] :WAVEform:ADC:DITHer[:STATe]
[ :SENSe] :WAVEform:ADC:DITHer[:STATe]?
[ :SENSe] :WAVEform:AVERage:COUNT
[ :SENSe] :WAVEform:AVERage:COUNT?
[ :SENSe] :WAVEform:AVERage[:STATe]
[ :SENSe] :WAVEform:AVERage[:STATe]?
[ :SENSe] :WAVEform:AVERage:TACount
[ :SENSe] :WAVEform:AVERage:TACount?
[ :SENSe] :WAVEform:AVERage:TACount:AUTO
[ :SENSe] :WAVEform:AVERage:TACount:AUTO?
[ :SENSe] :WAVEform:AVERage:TCONTROL
[ :SENSe] :WAVEform:AVERage:TCONTROL?
[ :SENSe] :WAVEform:AVERage:TYPE
[ :SENSe] :WAVEform:AVERage:TYPE?
[ :SENSe] :WAVEform:BANDwidth|BWIDth[:RESolution]:TYPE
[ :SENSe] :WAVEform:BANDwidth[:RESolution]
[ :SENSe] :WAVEform:BANDwidth:SHAPE
[ :SENSe] :WAVEform:BWIDth[:RESolution]
[ :SENSe] :WAVEform:BWIDth:SHAPE
```

```
[ :SENSe]:WAVEform:DIF:BANDwidth
[ :SENSe]:WAVEform:DIF:BANDwidth?
[ :SENSe]:WAVEform:DIF:FILTter:ALPHA
[ :SENSe]:WAVEform:DIF:FILTter:ALPHA?
[ :SENSe]:WAVEform:DIF:FILTter:BANDwidth
[ :SENSe]:WAVEform:DIF:FILTter:BANDwidth?
[ :SENSe]:WAVEform:DIF:FILTter:BANDwidth:AUTO
[ :SENSe]:WAVEform:DIF:FILTter:BANDwidth:AUTO?
[ :SENSe]:WAVEform:DIF:FILTter:TYPE
[ :SENSe]:WAVEform:DIF:FILTter:TYPE?
[ :SENSe]:WAVEform:DIF:FILTter:TYPE?
[ :SENSe]:WAVEform:DIF:FILTter:TYPE?
[ :SENSe]:WAVEform:FREQuency:SYNThesis:AUTO[:STATe]
[ :SENSe]:WAVEform:FREQuency:SYNThesis:AUTO[:STATe]?
[ :SENSe]:WAVEform:FREQuency:SYNThesis[:STATe]
[ :SENSe]:WAVEform:FREQuency:SYNThesis[:STATe]?
[ :SENSe]:WAVEform:IF:GAIN:AUTO[:STATe]
[ :SENSe]:WAVEform:IF:GAIN:AUTO[:STATe]?
[ :SENSe]:WAVEform:IF:GAIN:OFFSet
[ :SENSe]:WAVEform:IF:GAIN:OFFSet?
[ :SENSe]:WAVEform:IF:GAIN[:STATe]
[ :SENSe]:WAVEform:IF:GAIN[:STATe]?
[ :SENSe]:WAVEform:PDIther
[ :SENSe]:WAVEform:SRATe
[ :SENSe]:WAVEform:SRATe?
[ :SENSe]:WAVEform:SWEep:TIME
[ :SENSe]:WAVEform:SWEep:TIME?
[ :SENSe]:WAVEform:WBIF:ADC:DITHer
[ :SENSe]:WAVEform:WBIF:FILTter:ALPHA
[ :SENSe]:WAVEform:WBIF:FILTter:BANDwidth
[ :SENSe]:WAVEform:WBIF:FILTter:BANDwidth?
[ :SENSe]:WAVEform:WBIF:FILTter[:TYPE]
[ :SENSe]:WAVEform:WBIF:FILTter[:TYPE]?
STATus:OPERation:CONDITION?
STATus:OPERation:ENABLE
STATus:OPERation:ENABLE?
STATus:OPERation[:EVENT]?
STATus:OPERation:INSTRument:CONDITION?
STATus:OPERation:INSTRument:ENABLE
STATus:OPERation:INSTRument:ENABLE?
STATus:OPERation:INSTRument[:EVENT]?
STATus:OPERation:INSTRument:NTRansition
STATus:OPERation:INSTRument:NTRansition?
STATus:OPERation:INSTRument:PTRansition
STATus:OPERation:INSTRument:PTRansition?
STATus:OPERation:NTRansition
STATus:OPERation:NTRansition?
STATus:OPERation:PTRansition
STATus:OPERation:PTRansition?
STATus:PRESet
STATus:QUEstionable:CALibration:CONDITION?
STATus:QUEstionable:CALibration:ENABLE
STATus:QUEstionable:CALibration:ENABLE?
```

```
STATus:QUEStionable:CALibration[:EVENT]?
STATus:QUEStionable:CALibration:EXTended:FAILure:CONDITION?
STATus:QUEStionable:CALibration:EXTended:FAILure:ENABLE
STATus:QUEStionable:CALibration:EXTended:FAILure:ENABLE?
STATus:QUEStionable:CALibration:EXTended:FAILure[:EVENT]?
STATus:QUEStionable:CALibration:EXTended:FAILure:NTRansition
STATus:QUEStionable:CALibration:EXTended:FAILure:NTRansition?
STATus:QUEStionable:CALibration:EXTended:FAILure:PTRansition
STATus:QUEStionable:CALibration:EXTended:FAILure:PTRansition?
STATus:QUEStionable:CALibration:EXTended:NEEDed:CONDITION?
STATus:QUEStionable:CALibration:EXTended:NEEDed:ENABLE
STATus:QUEStionable:CALibration:EXTended:NEEDed:ENABLE?
STATus:QUEStionable:CALibration:EXTended:NEEDed[:EVENT]?
STATus:QUEStionable:CALibration:EXTended:NEEDed:NTRansition
STATus:QUEStionable:CALibration:EXTended:NEEDed:NTRansition?
STATus:QUEStionable:CALibration:EXTended:NEEDed:PTRansition
STATus:QUEStionable:CALibration:EXTended:NEEDed:PTRansition?
STATus:QUEStionable:CALibration:NTRansition
STATus:QUEStionable:CALibration:NTRansition?
STATus:QUEStionable:CALibration:PTRansition
STATus:QUEStionable:CALibration:PTRansition?
STATus:QUEStionable:CALibration:SKIPped:CONDITION?
STATus:QUEStionable:CALibration:SKIPped:ENABLE
STATus:QUEStionable:CALibration:SKIPped:ENABLE?
STATus:QUEStionable:CALibration:SKIPped[:EVENT]?
STATus:QUEStionable:CALibration:SKIPped:NTRansition
STATus:QUEStionable:CALibration:SKIPped:NTRansition?
STATus:QUEStionable:CALibration:SKIPped:PTRansition
STATus:QUEStionable:CALibration:SKIPped:PTRansition?
STATus:QUEStionable:CONDITION?
STATus:QUEStionable:ENABLE
STATus:QUEStionable:ENABLE?
STATus:QUEStionable[:EVENT]?
STATus:QUEStionable:FREQuency:CONDITION?
STATus:QUEStionable:FREQuency:ENABLE
STATus:QUEStionable:FREQuency:ENABLE?
STATus:QUEStionable:FREQuency[:EVENT]?
STATus:QUEStionable:FREQuency:NTRansition
STATus:QUEStionable:FREQuency:NTRansition?
STATus:QUEStionable:FREQuency:PTRansition
STATus:QUEStionable:FREQuency:PTRansition?
STATus:QUEStionable:INTegrity:CONDITION?
STATus:QUEStionable:INTegrity:ENABLE
STATus:QUEStionable:INTegrity:ENABLE?
STATus:QUEStionable:INTegrity[:EVENT]?
STATus:QUEStionable:INTegrity:NTRansition
STATus:QUEStionable:INTegrity:NTRansition?
STATus:QUEStionable:INTegrity:PTRansition
STATus:QUEStionable:INTegrity:PTRansition?
STATus:QUEStionable:INTegrity:SIGNal:CONDITION?
STATus:QUEStionable:INTegrity:SIGNal:ENABLE
STATus:QUEStionable:INTegrity:SIGNal:ENABLE?
STATus:QUEStionable:INTegrity:SIGNal[:EVENT]?
```

```
STATus:QUEStionable:INTegrity:SIGNal:NTRansition
STATus:QUEStionable:INTegrity:SIGNal:NTRansition?
STATus:QUEStionable:INTegrity:SIGNal:PTRansition
STATus:QUEStionable:INTegrity:SIGNal:PTRansition?
STATus:QUEStionable:INTegrity:UNCalibrated:CONDITION?
STATus:QUEStionable:INTegrity:UNCalibrated:ENABLE
STATus:QUEStionable:INTegrity:UNCalibrated:ENABLE?
STATus:QUEStionable:INTegrity:UNCalibrated[:EVENT]?
STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition
STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition?
STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition
STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition?
STATus:QUEStionable:NTRansition
STATus:QUEStionable:NTRansition?
STATus:QUEStionable:POWer:CONDITION?
STATus:QUEStionable:POWer:ENABLE
STATus:QUEStionable:POWer:ENABLE?
STATus:QUEStionable:POWer[:EVENT]?
STATus:QUEStionable:POWer:NTRansition
STATus:QUEStionable:POWer:NTRansition?
STATus:QUEStionable:POWer:PTRansition
STATus:QUEStionable:POWer:PTRansition?>
STATus:QUEStionable:PTRansition
STATus:QUEStionable:PTRansition?
STATus:QUEStionable:TEMPerature:CONDITION?
STATus:QUEStionable:TEMPerature:ENABLE
STATus:QUEStionable:TEMPerature:ENABLE?
STATus:QUEStionable:TEMPerature[:EVENT]?
STATus:QUEStionable:TEMPerature:NTRansition
STATus:QUEStionable:TEMPerature:NTRansition?
STATus:QUEStionable:TEMPerature:PTRansition
STATus:QUEStionable:TEMPerature:PTRansition?
SYSTem:APPLication:CATalog[:NAME]?
SYSTem:APPLication:CATalog[:NAME]:COUNT?
SYSTem:APPLication:CATalog:OPTION?
SYSTem:APPLication:CATalog:REVision?
SYSTem:APPLication[:CURRENT][:NAME]?
SYSTem:APPLication[:CURRENT]:OPTION?
SYSTem:APPLication[:CURRENT]:REVision?
SYSTem:COMMUnicatE:GPIB[1][:SELF]:ADDReSS
SYSTem:COMMUnicatE:GPIB[1][:SELF]:ADDReSS?
SYSTem:COMMUnicatE:GPIB[1][:SELF]:CONTroller[:ENABLE]
SYSTem:COMMUnicatE:GPIB[1][:SELF]:CONTroller[:ENABLE]?
SYSTem:COMMUnicatE:LAN:SCPI:HISlip:ENABLE
SYSTem:COMMUnicatE:LAN:SCPI:HISlip:ENABLE?
SYSTem:COMMUnicatE:LAN:SCPI:SICL:ENABLE
SYSTem:COMMUnicatE:LAN:SCPI:SICL:ENABLE?
SYSTem:COMMUnicatE:LAN:SCPI:SOCKet:CONTrol?
SYSTem:COMMUnicatE:LAN:SCPI:SOCKet:ENABLE
SYSTem:COMMUnicatE:LAN:SCPI:SOCKet:ENABLE?
SYSTem:COMMUnicatE:LAN:SCPI:TELNet:ENABLE
SYSTem:COMMUnicatE:LAN:SCPI:TELNet:ENABLE?
SYSTem:COMMUnicatE:TCPip:CONTrol?
```

SYSTem:COMMunicate:USB:CONNnection?  
SYSTem:COMMunicate:USB:PACKets?  
SYSTem:COMMunicate:USB:STATus?  
SYSTem:CONFigure[:SYSTem]?  
SYSTem:CSYStem?  
SYSTem:DATE  
SYSTem:DATE?  
SYSTem:DEFault  
SYSTem:DISPlay:LANGuage  
SYSTem:DISPlay:LANGuage?  
SYSTem:ERROR[:NEXT]?  
SYSTem:ERROR:OVERload[:STATE]  
SYSTem:ERROR:PUP?  
SYSTem:ERROR:VERBose  
SYSTem:ERROR:VERBose?  
SYSTem:HELP:HEADers?  
SYSTem:HID?  
SYSTem:IDN  
SYSTem:IDN?  
SYSTem:IDN:CONFigure  
SYSTem:IDN:CONFigure?  
SYSTem:KLOCK  
SYSTem:KLOCK?  
SYSTem:LKEY  
SYSTem:LKEY?  
SYSTem:LKEY:DElete  
SYSTem:LKEY:LIST?  
SYSTem:LOCK:NAME?  
SYSTem:LOCK:OWNer?  
SYSTem:LOCK:RELEASE  
SYSTem:LOCK:REQuest?  
SYSTem:LOFF  
SYSTem:METRics:FPANel?  
SYSTem:METRics:SCPI?  
SYSTem:METRics:STIMe?  
SYSTem:MRELay:COUNT?  
SYSTem:OPTIONS?  
SYSTem:PDOWn  
SYSTem:PERSONa:DEFault  
SYSTem:PERSONa:DEFault?  
SYSTem:PERSONa:MANufacturer  
SYSTem:PERSONa:MANufacturer?  
SYSTem:PERSONa:MANufacturer:DEFault  
SYSTem:PERSONa:MANufacturer:DEFault?  
SYSTem:PERSONa:MODel  
SYSTem:PERSONa:MODel?  
SYSTem:PERSONa:MODel:DEFault  
SYSTem:PERSONa:MODel:DEFault?  
SYSTem:PON:APPLication:LLIst  
SYSTem:PON:APPLication:LLIst?  
SYSTem:PON:APPLication:VMEMory[:AVAvailble]?  
SYSTem:PON:APPLication:VMEMory:TOTal?  
SYSTem:PON:APPLication:VMEMory:USED?

```
SYSTem:PON:APPLication:VMEMemory:USED:NAME?
SYSTem:PON:ETIMe?
SYSTem:PON:MODE
SYSTem:PON:MODE?
SYSTem:PON:TIME?
SYSTem:PON:TYPE
SYSTem:PON:TYPE?
SYSTem:PRESet
SYSTem:PRESet:USER
SYSTem:PRESet:USER:ALL
SYSTem:PRESet:USER:SAVE
SYSTem:PRINT:THEMe
SYSTem:PRINT:THEMe?
SYSTem:PUP:PROCess
SYSTem:SECurity:USB:WPRotect[:ENABLE]
SYSTem:SECurity:USB:WPRotect[:ENABLE]?
SYSTem:SET
SYSTem:SET?
SYSTem:SHOW
SYSTem:SHOW?
SYSTem:TEMPerature:HEXTreme?
SYSTem:TEMPerature:LEXTreme?
SYSTem:TIME
SYSTem:TIME?
SYSTem:VERSion?
```

## T

```
TRACe:LPlot:COPY
TRACe:LPlot:EXChange
TRACe[1]|2|3:LPlot:TYPE
TRACe[1]|2|3:LPlot:TYPE?
TRACe:MONitor:CLEar
TRACe:MONitor:CLEar:ALL
TRACe[1]|2|3:MONitor:DISPLAY[:STATE]
TRACe[1]|2|3:MONitor:DISPLAY[:STATE]?
TRACe[1]|2|3:MONitor:TYPE
TRACe[1]|2|3:MONitor:TYPE?
TRACe[1]|2|3:MONitor:UPDate[:STATE]
TRACe[1]|2|3:MONitor:UPDate[:STATE]?
TRIGger:<measurement>[:SEQUence]:IQ:SOURce
TRIGger:<measurement>[:SEQUence]:IQ:SOURce?
TRIGger:<measurement>[:SEQUence]:RF:SOURce
TRIGger:<measurement>[:SEQUence]:RF:SOURce?
TRIGger:<measurement>[:SEQUence]:SOURce
TRIGger:<measurement>[:SEQUence]:SOURce?
TRIGger[:SEQUence]:ATRigger
TRIGger[:SEQUence]:ATRigger?
TRIGger[:SEQUence]:ATRigger:STATE
TRIGger[:SEQUence]:ATRigger:STATE?
TRIGger[:SEQUence]:DELay
```

TRIGger[ :SEQUence]:DELay?  
TRIGger[ :SEQUence]:DELay:STATE  
TRIGger[ :SEQUence]:DELay:STATE?  
TRIGger[ :SEQUence]:EXTernal:DELay  
TRIGger[ :SEQUence]:EXTernal2:DELay  
TRIGger[ :SEQUence]:EXTernal1:DELay  
TRIGger[ :SEQUence]:EXTernal1:DELay?  
TRIGger[ :SEQUence]:EXTernal2:DELay?  
TRIGger[ :SEQUence]:EXTernal2:DELay:STATE  
TRIGger[ :SEQUence]:EXTernal1:DELay:STATE  
TRIGger[ :SEQUence]:EXTernal1:DELay:STATE?  
TRIGger[ :SEQUence]:EXTernal2:DELay:STATE?  
TRIGger[ :SEQUence]:EXTernal2:LEVel  
TRIGger[ :SEQUence]:EXTernal1:LEVel  
TRIGger[ :SEQUence]:EXTernal:LEVel  
TRIGger[ :SEQUence]:EXTernal2:LEVel?  
TRIGger[ :SEQUence]:EXTernal1:LEVel?  
TRIGger[ :SEQUence]:EXTernal2:SLOPe  
TRIGger[ :SEQUence]:EXTernal:SLOPe  
TRIGger[ :SEQUence]:EXTernal1:SLOPe  
TRIGger[ :SEQUence]:EXTernal2:SLOPe?  
TRIGger[ :SEQUence]:EXTernal1:SLOPe?  
TRIGger[ :SEQUence]:FRAMe:ADJust  
TRIGger[ :SEQUence]:FRAMe:DELay  
TRIGger[ :SEQUence]:FRAMe:DELay?  
TRIGger[ :SEQUence]:FRAMe:DELay:STATE  
TRIGger[ :SEQUence]:FRAMe:DELay:STATE?  
TRIGger[ :SEQUence]:FRAMe:EXTernal1:LEVel  
TRIGger[ :SEQUence]:FRAMe:EXTernal2:LEVel  
TRIGger[ :SEQUence]:FRAMe:EXTernal1:SLOPe  
TRIGger[ :SEQUence]:FRAMe:EXTernal2:SLOPe  
TRIGger[ :SEQUence]:FRAMe:OFFSet  
TRIGger[ :SEQUence]:FRAMe:OFFSet?  
TRIGger[ :SEQUence]:FRAMe:OFFSet:DISPlay:RESet  
TRIGger[ :SEQUence]:FRAMe:PERiod  
TRIGger[ :SEQUence]:FRAMe:PERiod?  
TRIGger[ :SEQUence]:FRAMe:RFBurst:LEVel:ABSolute  
TRIGger[ :SEQUence]:FRAMe:RFBurst:SLOPe  
TRIGger[ :SEQUence]:FRAMe:SYNC  
TRIGger[ :SEQUence]:FRAMe:SYNC  
TRIGger[ :SEQUence]:FRAMe:SYNC?  
TRIGger[ :SEQUence]:FRAMe:SYNC:HOLDoff  
TRIGger[ :SEQUence]:FRAMe:SYNC:HOLDoff?  
TRIGger[ :SEQUence]:FRAMe:SYNC:HOLDoff:STATE  
TRIGger[ :SEQUence]:FRAMe:SYNC:HOLDoff:STATE?  
TRIGger[ :SEQUence]:HOLDoff  
TRIGger[ :SEQUence]:HOLDoff?  
TRIGger[ :SEQUence]:HOLDoff:STATE  
TRIGger[ :SEQUence]:HOLDoff:STATE?  
TRIGger[ :SEQUence]:HOLDoff:TYPE  
TRIGger[ :SEQUence]:HOLDoff:TYPE?  
TRIGger[ :SEQUence]:IF:LEVel  
TRIGger[ :SEQUence]:IF:LEVel?

```
TRIGger[:SEQUence]:IF:SLOPe
TRIGger[:SEQUence]:IF:SLOPe?
TRIGger[:SEQUence]:LINE:DELay
TRIGger[:SEQUence]:LINE:DELay?
TRIGger[:SEQUence]:LINE:DELay:STATe
TRIGger[:SEQUence]:LINE:DELay:STATe?
TRIGger[:SEQUence]:LINE:SLOPe
TRIGger[:SEQUence]:LINE:SLOPe?
TRIGger[:SEQUence]:OFFSet
TRIGger[:SEQUence]:OFFSet?
TRIGger[:SEQUence]:OFFSet:STATe
TRIGger[:SEQUence]:OFFSet:STATe?
TRIGger[:SEQUence]:RFBurst:DELay
TRIGger[:SEQUence]:RFBurst:DELay?
TRIGger[:SEQUence]:RFBurst:DELay:STATe
TRIGger[:SEQUence]:RFBurst:DELay:STATe?
TRIGger[:SEQUence]:RFBurst:LEVel
TRIGger[:SEQUence]:RFBurst:LEVel:ABSolute
TRIGger[:SEQUence]:RFBurst:LEVel:ABSolute?
TRIGger[:SEQUence]:RFBurst:LEVel:RELative
TRIGger[:SEQUence]:RFBurst:LEVel:RELative?
TRIGger[:SEQUence]:RFBurst:LEVel:TYPE
TRIGger[:SEQUence]:RFBurst:LEVel:TYPE?
TRIGger[:SEQUence]:RFBurst:SLOPe
TRIGger[:SEQUence]:RFBurst:SLOPe?
TRIGger[:SEQUence]:SLOPe
TRIGger[:SEQUence]:SLOPe?
TRIGger[:SEQUence]:SOURCe
TRIGger[:SEQUence]:VIDeo:DELay
TRIGger[:SEQUence]:VIDeo:DELay?
TRIGger[:SEQUence]:VIDeo:DELay:STATe
TRIGger[:SEQUence]:VIDeo:DELay:STATe?
TRIGger[:SEQUence]:VIDeo:LEVel
TRIGger[:SEQUence]:VIDeo:LEVel?
TRIGger[:SEQUence]:VIDeo:SLOPe
TRIGger[:SEQUence]:VIDeo:SLOPe?
TRIGger[:SEQUence]:XRELative
TRIGger[:SEQUence]:XRELative?
TRIGger|TRIGger1|TRIGger2[:SEQUence]:OUTPUT
TRIGger|TRIGger1|TRIGger2[:SEQUence]:OUTPUT?
TRIGger|TRIGger1|TRIGger2[:SEQUence]:OUTPUT:POLarity
TRIGger|TRIGger1|TRIGger2[:SEQUence]:OUTPUT:POLarity?
```

W

Where

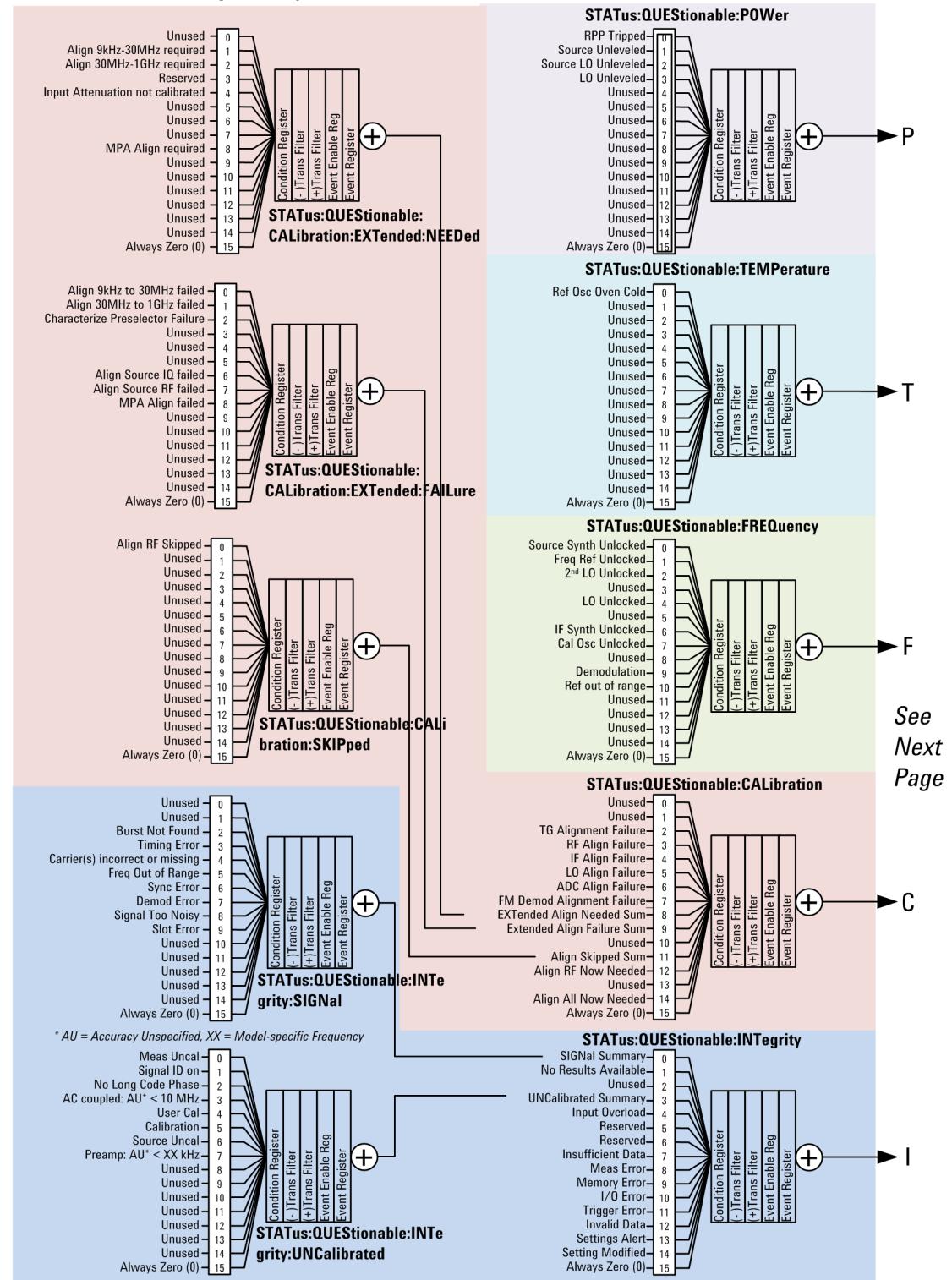
## STATus Subsystem

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

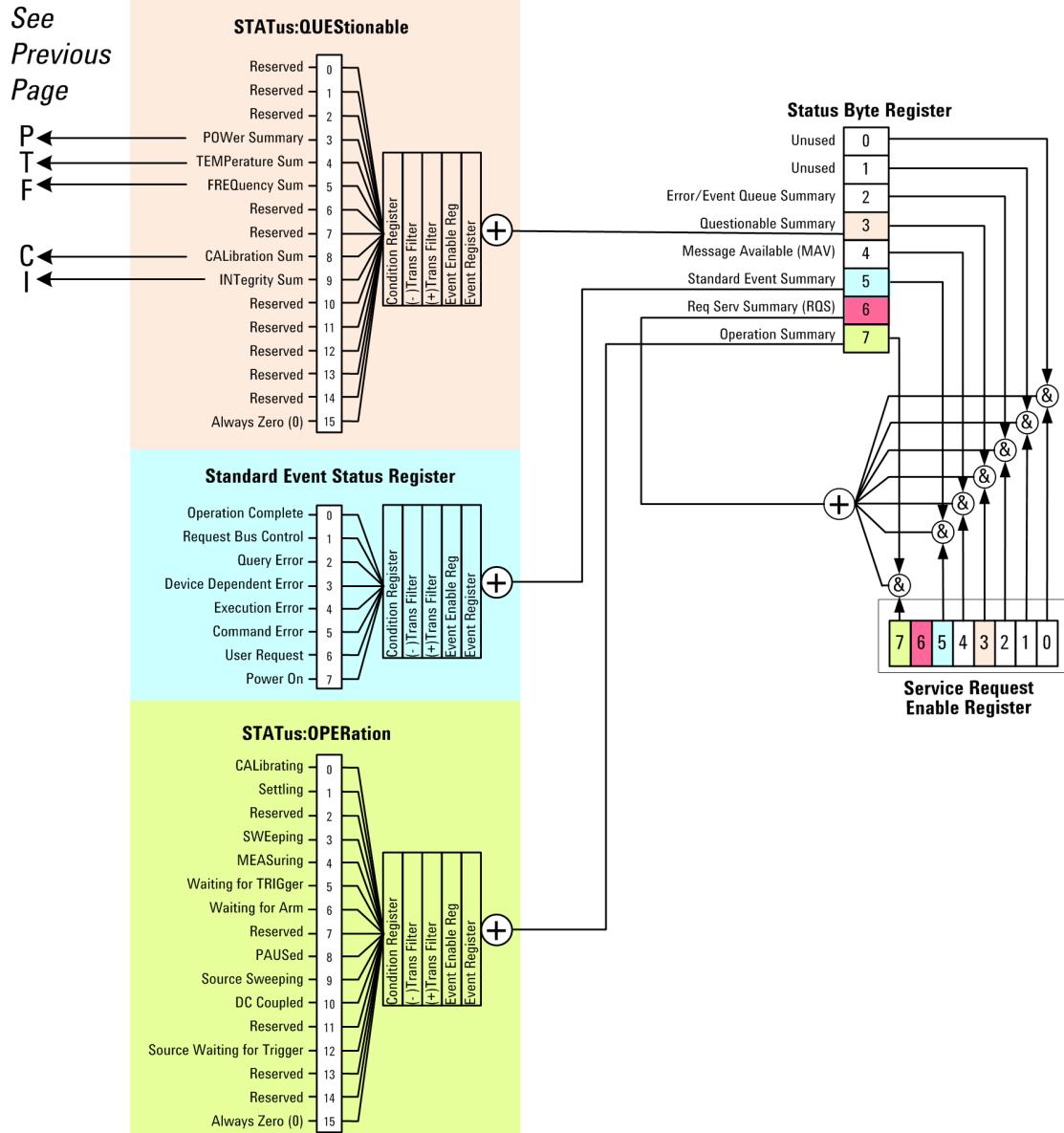
For readability, the diagram is split into two sections:

- "X-Series Status Register System (1)" on page 85
- "X-Series Status Register System (2)" on page 86

### 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—It 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—It 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—It 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 in Figure at the beginning of this section.

The STATUs:OPERation register set has no summarized inputs. The inputs to the STATUs:OPERation:CONDition register indicate 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 are available in the IEEE commands section at the beginning of the language reference. Individual status registers can be set and queried using the commands in the STATUs subsystem of the language reference.

- \*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

	Decimal Value															
Bit Number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1
STATus:OPERation:ENABLE <num> STATus:OPERation:ENABLE?																

### Standard Operation Event Enable Register

ck730a

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 the STAT:QUES:INT:PTR 0 and the 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.

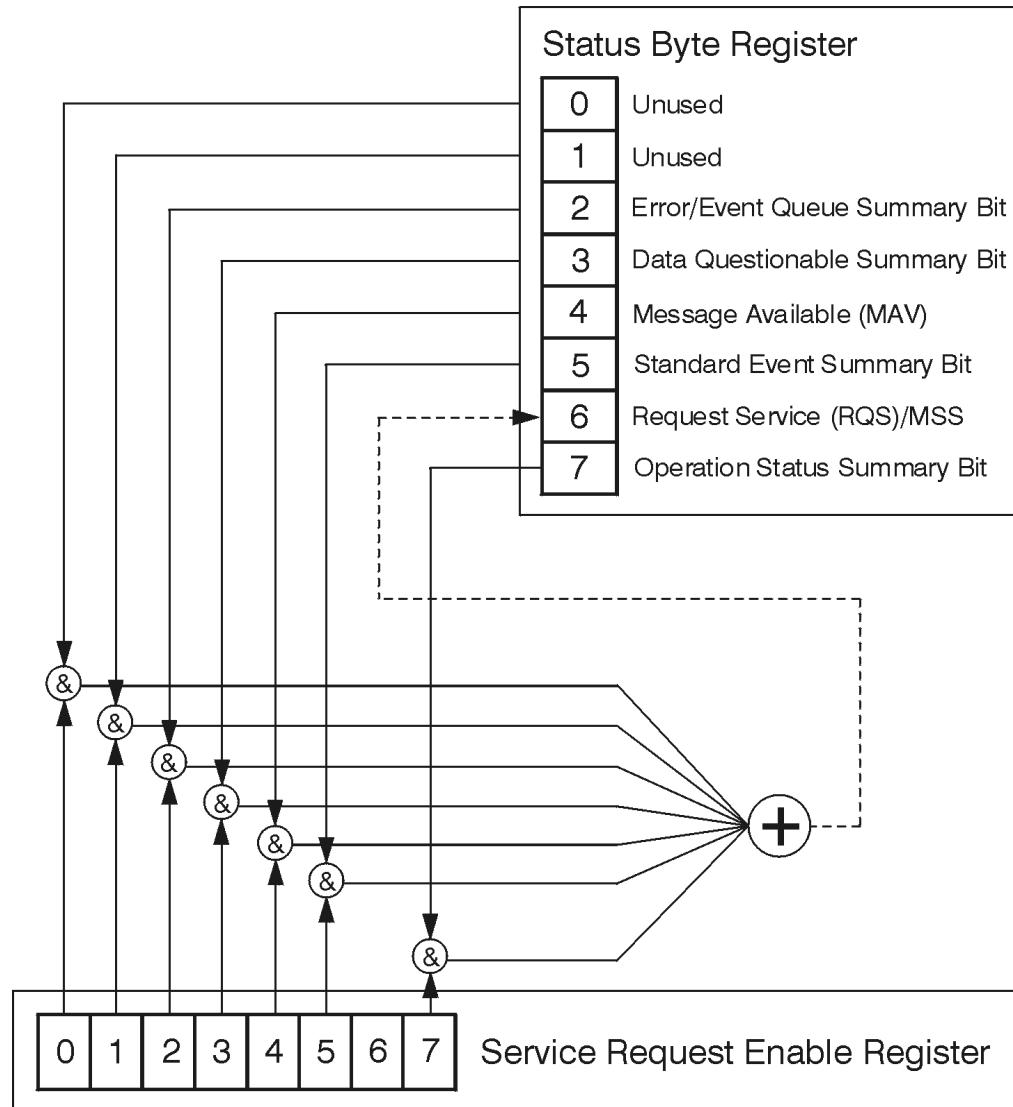
If the status register is configured to SRQ on end-of-measurement and the measurement is in continuous mode, then restarting a measurement (INIT command) can cause the measuring bit to pulse low. This causes an SRQ when you have not actually reached the "end-of-measurement" condition. To avoid this:

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

### Status Register System

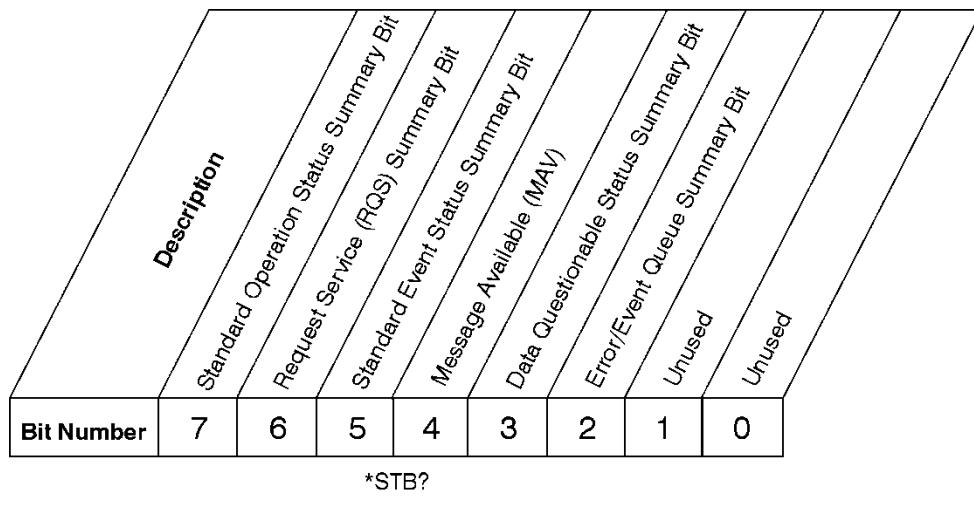
The hardware status registers are combined to form the instrument status system. Specific status bits are assigned to monitor various aspects of the instrument operation and status. See the diagram of the status system above for information about the bit assignments and status register interconnections.

### The Status Byte Register



ck776a

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 IEEE 488.2 standards, section 11.



**Status Byte Register**

ck725a

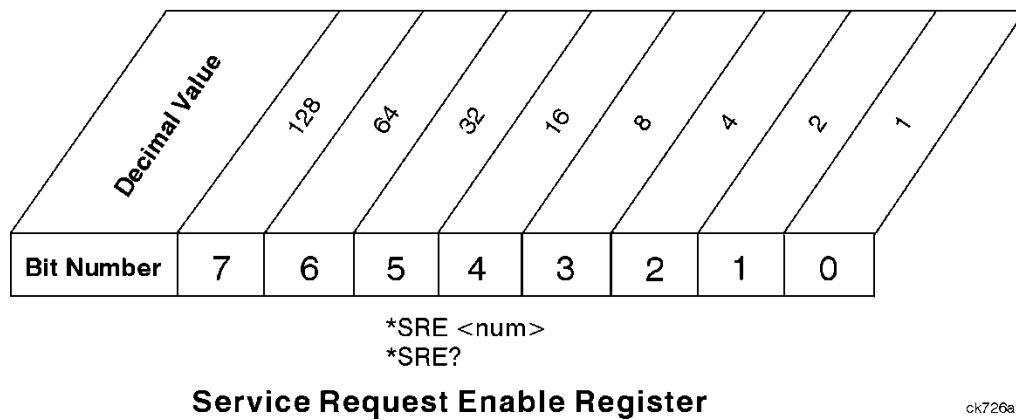
Bit	Description
0,	These bits are always set to 0.
1	
2	A 1 in this bit position indicates that the SCPI error queue is not empty which means that it contains at least one error message.
3	A 1 in this bit position indicates that the data questionable summary bit has been set. The data questionable event 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.

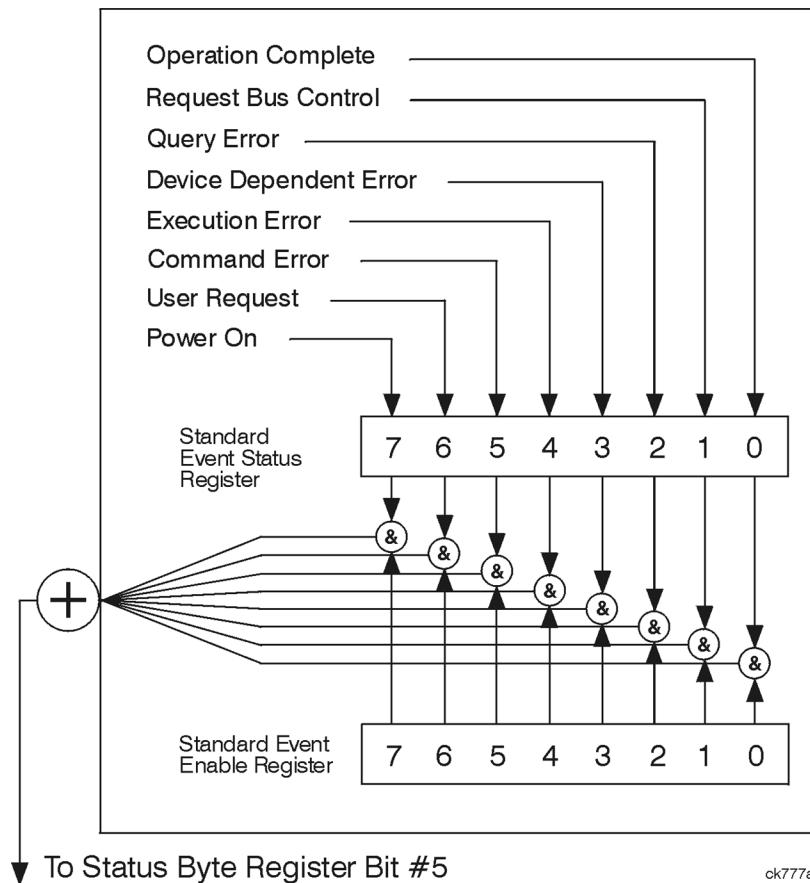
Send the \*SRE <integer> command where <integer> is the sum of the decimal values of the bits you want to enable plus the decimal value of bit 6. For example, assume that you want to enable bit 7 so that whenever the standard operation status register summary bit is set to 1 it will trigger a service 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 command \*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).



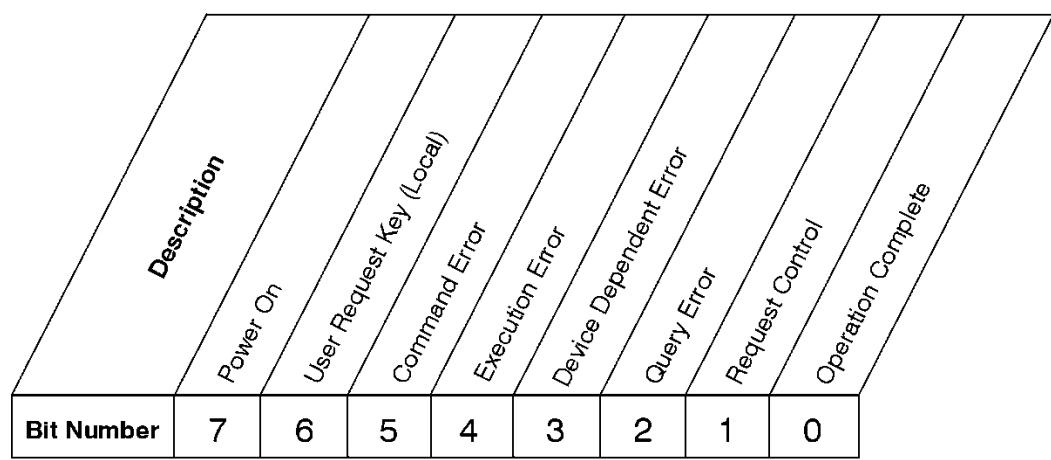
ck726a

### Standard Event Status Register



ck777a

The standard event status register contains the following bits:



**Standard Event Status Register**

ck777a

Bit	Description
0	A 1 in this bit position indicates that all pending operations were

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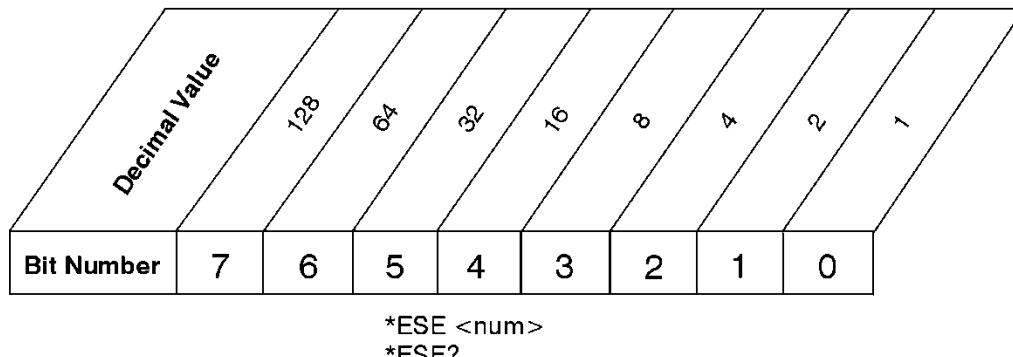
completed following execution of the \*OPC command.

- 
- 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 the command \*ESR?. The response will be the decimal sum of the bits which 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 command \*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).



## Standard Event Status Enable Register

ck728a

### Operation and Questionable Status Registers

The operation and questionable status registers are registers that monitor the overall instrument condition. They are accessed with the STATus:OPERation and STATus:QUEStionable commands in the STATus command subsystem. See the figure at the beginning of this chapter.

#### 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 the \*OPC? command located in the IEEE Common Commands section.

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 MEASURE 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 unleveld 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. (i.e. 0 to 32767 is equivalent to #H0 to #H7FFF. It is also equal to all ones, 1111111111111111) See the SCPI Basics information about using bit patterns for variable parameters.

### Operation Register

- ["Operation Condition Query" on page 99](#)
- ["Operation Enable" on page 100](#)
- ["Operation Event Query" on page 100](#)
- ["Operation Negative Transition" on page 101](#)
- ["Operation Positive Transition" on page 101](#)

### 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
<b>Remote Command</b>	<code>:STATus:OPERation:CONDITION?</code>
<b>Example</b>	<code>STAT:OPER:COND?</code>
Preset	0
Status Bits/OPC dependencies	Sequential command

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Initial S/W Revision	Prior to A.02.00
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## 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
<b>Remote Command</b>	:STATus:OPERation:ENABLE <integer> :STATus:OPERation:ENABLE?
<b>Example</b>	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

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## 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
<b>Remote Command</b>	:STATus:OPERation[:EVENT]?
<b>Example</b>	STAT:OPER?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

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## 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
<b>Remote Command</b>	:STATus:OPERation:NTRansition <integer> :STATus:OPERation:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:OPERation:PTRansition <integer> :STATus:OPERation:PTRansition?
<b>Example</b>	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

## Operation Instrument Register

- "Operation Instrument Condition" on page 102
- "Operation Instrument Event Enable " on page 102
- "Operation Instrument Event Query " on page 102

- "Operation Instrument Negative Transition " on page 103
- "Operation Instrument Positive Transition" on page 103
- "Preset the Status Byte " on page 104

### Operation Instrument Condition

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

**NOTE**

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

Mode	All
<b>Remote Command</b>	:STATus:OPERation:INSTRument:CONDition?
<b>Example</b>	STAT:OPER:INST:COND?
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	x.16.10

### Operation Instrument Event Enable

This command determines which bits in the Operation Instrument Event Register will propagate to setting the Instrument Summary bit (bit 11) in the Operation Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

Mode	All
<b>Remote Command</b>	:STATus:OPERation:INSTRument:ENABLE <integer> :STATus:OPERation:INSTRument:ENABLE?
<b>Example</b>	STAT:OPER:INST:ENAB 1 can be used to propagate Instrument Locked bit (bit 0) of Operation Instrument Event Register.
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	x.16.10

### Operation Instrument Event Query

This query returns the decimal value of the sum of the bits in the Operation Instrument 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
<b>Remote Command</b>	:STATus:OPERation:INSTRument[:EVENT]?
<b>Example</b>	STAT:OPER:INST?
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	x.16.10

### Operation Instrument Negative Transition

This command determines which bits in the Operation Instrument Condition register will set the corresponding bit in the Operation Instrument 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
<b>Remote Command</b>	:STATus:OPERation:INSTRument:NTRansition <integer> :STATus:OPERation:INSTRument:NTRansition?
<b>Example</b>	STAT:OPER:INST:NTR 1 to set event register when SCPI Lock is released.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	x.16.10

### Operation Instrument Positive Transition

This command determines which bits in the Operation Instrument Condition register will set the corresponding bit in the Operation Instrument 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
<b>Remote Command</b>	:STATus:OPERation:INSTRument:PTRansition <integer> :STATus:OPERation:INSTRument:PTRansition?
<b>Example</b>	STAT:OPER:INST:PTR 1 to set event register when SCPI Lock is required.
Preset	32767
Min	0

Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	x.16.10

### Preset the Status Byte

Sets bits in most of the enable and transition registers to their default state. It presets all the Transition Filters, Enable Registers, and the Error/Event Queue Enable. It has no effect on Event Registers, Error/Event QUEue, IEEE 488.2 ESE, and SRE Registers as described in IEEE Standard 488.2–1992, IEEE Standard Codes, Formats, Protocols, and Common Commands for Use with ANSI/IEEE Std 488.1–1987. New York, NY, 1992.

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

### Questionable Register

- "Questionable Condition" on page 104
- "Questionable Enable" on page 105
- "Questionable Event Query" on page 105
- "Questionable Negative Transition" on page 106
- "Questionable Positive Transition" on page 106

#### 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
<b>Remote Command</b>	:STATus:QUESTIONable:CONDITION?
<b>Example</b>	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
<b>Remote Command</b>	:STATUs:QUESTIONable:ENABLE <integer> :STATUs:QUESTIONable:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATUs:QUESTIONable[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:NTRansition <integer> :STATus:QUEStionable:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:PTRansition <integer> :STATus:QUEStionable:PTRansition?
<b>Example</b>	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

- "Questionable Calibration Condition" on page 107

- "Questionable Calibration Enable" on page 107
- "Questionable Calibration Event Query" on page 108
- "Questionable Calibration Negative Transition" on page 108
- "Questionable Calibration Positive Transition" on page 108

### 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
<b>Remote Command</b>	:STATUs:QUESTIONable:CALibration:CONDITION?
<b>Example</b>	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
<b>Remote Command</b>	:STATUs:QUESTIONable:CALibration:ENABLE <integer> :STATUs:QUESTIONable:CALibration:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:NTRansition <integer> :STATus:QUESTIONable:CALibration:NTRansition?
<b>Example</b>	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
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<b>Remote Command</b>	<code>:STATUs:QUESTIONable:CALibration:PTRansition &lt;integer&gt;</code> <code>:STATUs:QUESTIONable:CALibration:PTRansition?</code>
<b>Example</b>	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

- "Questionable Calibration Skipped Condition" on page 109
- "Questionable Calibration Skipped Enable" on page 109
- "Questionable Calibration Skipped Event Query" on page 110
- "Questionable Calibration Skipped Negative Transition" on page 110
- "Questionable Calibration Skipped Positive Transition" on page 111

### Questionable Calibration Skipped Condition

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

<b>NOTE</b>	The data in this register is continuously updated and reflects the current conditions.
Mode	All
<b>Remote Command</b>	<code>:STATUs:QUESTIONable:CALibration:SKIPPed:CONDition?</code>
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:SKIPPed:ENABLE <integer> :STATus:QUESTIONable:CALibration:SKIPPed:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:SKIPPed[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:SKIPPed:NTRansition <integer> :STATus:QUESTIONable:CALibration:SKIPPed:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	:STATUs:QUEStionable:CALibration:SKIPPed:PTRansition <integer> :STATUs:QUEStionable:CALibration:SKIPPed:PTRansition?
<b>Example</b>	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

- "Questionable Calibration Extended Failure Condition " on page 111
- "Questionable Calibration Extended Failure Enable " on page 112
- "Questionable Calibration Extended Failure Event Query " on page 112
- "Questionable Calibration Extended Failure Negative Transition " on page 113
- "Questionable Calibration Extended Failure Positive Transition " on page 113

### 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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:EXTended:FAILure:CONDition?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:EXTended:FAILure:ENABLE <integer> :STATus:QUESTIONable:CALibration:EXTended:FAILure:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:EXTended:FAILure[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:EXTended:FAILure:NTRansition <integer> :STATus:QUESTIONable:CALibration:EXTended:FAILure:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:EXTended:FAILure:PTRansition <integer> :STATus:QUESTIONable:CALibration:EXTended:FAILure:PTRansition?
<b>Example</b>	STAT:QUES:CAL:EXT:FAIL:PTR 1 EMI conducted align failure is required.
Preset	32767
Min	0
Max	32767
Status Bits/OPC	Sequential command

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dependencies

Initial S/W Revision Prior to A.02.00

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### Questionable Calibration Extended Needed Register

- "Questionable Calibration Extended Needed Condition" on page 114
- "Questionable Calibration Extended Needed Enable" on page 114
- "Questionable Calibration Extended Needed Event Query" on page 115
- "Questionable Calibration Extended Needed Negative Transition" on page 115
- "Questionable Calibration Extended Needed Positive Transition" on page 116

### 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.

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Mode All

**Remote Command** :STATus:QUEStionable:CALibration:EXTended:NEEDed:COND?

**Example** STAT:QUES:CAL:EXT:NEED:COND?

Preset 0

Status Bits/OPC  
dependencies Sequential command

Initial S/W Revision Prior to A.02.00

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### 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.

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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

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

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### 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.

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

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### 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.

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Mode	All
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:EXTended:NEEDed:NTRansition <integer> :STATus:QUESTIONable:CALibration:EXTended:NEEDed:NTRansition?
<b>Example</b>	STAT:QUES:CAL:EXT:NTR 2 Align EMI conducted is not required.
Preset	0
Min	0
Max	32767
Status Bits/OPC	Sequential command

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dependencies

Initial S/W Revision Prior to A.02.00

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### 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
<b>Remote Command</b>	:STATus:QUEStionable:CALibration:EXTended:NEEDed:PTRansition <integer> :STATus:QUEStionable:CALibration:EXTended:NEEDed:PTRansition?
<b>Example</b>	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

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### Questionable Frequency Register

- "Questionable Frequency Condition " on page 116
- "Questionable Frequency Enable " on page 117
- "Questionable Frequency Event Query " on page 117
- "Questionable Frequency Negative Transition " on page 118
- "Questionable Frequency Positive Transition " on page 118

#### 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
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<b>Remote Command</b>	:STATus:QUEStionable:FREQuency:COND?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:FREQuency:ENABLE <integer> :STATus:QUEStionable:FREQuency:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:FREQuency[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:FREQuency:NTRansition <integer> :STATus:QUESTIONable:FREQuency:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:FREQuency:PTRansition <integer> :STATus:QUESTIONable:FREQuency:PTRansition?
<b>Example</b>	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

- "Questionable Integrity Condition " on page 119

- "Questionable Integrity Enable " on page 119
- "Questionable Integrity Event Query " on page 120
- "Questionable Integrity Negative Transition " on page 120
- "Questionable Integrity Positive Transition " on page 120

### 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
<b>Remote Command</b>	:STATUs:QUEStionable:INTegrity:COND?
<b>Example</b>	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
<b>Remote Command</b>	:STATUs:QUEStionable:INTegrity:ENABLE <integer> :STATUs:QUEStionable:INTegrity:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:INTegrity[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:INTegrity:NTRansition <integer> :STATus:QUEStionable:INTegrity:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	<code>:STATus:QUEStionable:INTEGRity:PTRansition &lt;integer&gt;</code> <code>:STATus:QUEStionable:INTEGRity:PTRansition?</code>
<b>Example</b>	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

- "Questionable Integrity Signal Condition" on page 121
- "Questionable Integrity Signal Enable" on page 121
- "Questionable Integrity Signal Event Query" on page 122
- "Questionable Integrity Signal Negative Transition" on page 122
- "Questionable Integrity Signal Positive Transition" on page 123

#### 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
<b>Remote Command</b>	<code>:STATus:QUEStionable:INTEGRity:SIGNal:COND?</code>
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:INTEGRity:SIGNal:ENABLE <integer> :STATus:QUESTIONable:INTEGRity:SIGNal:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:INTEGRity:SIGNal[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:INTEGRity:SIGNal:NTRansition <integer> :STATus:QUESTIONable:INTEGRity:SIGNal:NTRansition?

<b>Example</b>	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
<b>Remote Command</b>	:STATUs:QUESTIONable:INTEGRity:SIGNAl:PTRansition <integer> :STATUs:QUESTIONable:INTEGRity:SIGNAl:PTRansition?
<b>Example</b>	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

- "Questionable Integrity Uncalibrated Condition " on page 123
- "Questionable Integrity Uncalibrated Enable " on page 124
- "Questionable Integrity Uncalibrated Event Query " on page 124
- "Questionable Integrity Uncalibrated Negative Transition " on page 125
- "Questionable Integrity Uncalibrated Positive Transition " on page 125

### 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
<b>Remote Command</b>	:STATus:QUEStionable:INTEGRity:UNCalibrated:CONDition?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:INTEGRity:UNCalibrated:ENABLE :STATus:QUEStionable:INTEGRity:UNCalibrated:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:INTEGRity:UNCalibrated[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATUs:QUESTIONable:INTEGRity:UNCALibrated:NTRansition <integer> :STATUs:QUESTIONable:INTEGRity:UNCALibrated:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	:STATUs:QUESTIONable:INTEGRity:UNCALibrated:PTRansition <integer> :STATUs:QUESTIONable:INTEGRity:UNCALibrated:PTRansition?
<b>Example</b>	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	Sequential command

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dependencies

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Initial S/W Revision	Prior to A.02.00
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## Questionable Power Register

- "Questionable Power Condition " on page 126
- "Questionable Power Enable " on page 126
- "Questionable Power Event Query " on page 127
- "Questionable Power Negative Transition " on page 127
- "Questionable Power Positive Transition " on page 128

### 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.

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Mode	All
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<b>Remote Command</b>	:STATus:QUESTIONable:POWer:CONDITION?
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<b>Example</b>	STAT:QUES:POW:COND?
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Preset	0
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Status Bits/OPC dependencies	Sequential command
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Initial S/W Revision	Prior to A.02.00
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## 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.

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Mode	All
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<b>Remote Command</b>	:STATus:QUESTIONable:POWer:ENABLE <integer>
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	:STATus:QUESTIONable:POWer:ENABLE?
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<b>Example</b>	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.
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Preset	32767
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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
<b>Remote Command</b>	:STATus:QUEStionable:POWeR[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:POWeR:NTRansition <integer> :STATus:QUEStionable:POWeR:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:POWer:PTRansition <integer> :STATus:QUESTIONable:POWer:PTRansition?>
<b>Example</b>	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

- "Questionable Temperature Condition" on page 128
- "Questionable Temperature Enable" on page 129
- "Questionable Temperature Event Query" on page 129
- "Questionable Temperature Negative Transition" on page 129
- "Questionable Temperature Positive Transition" on page 130

## 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
<b>Remote Command</b>	:STATus:QUESTIONable:TEMPerature:CONDITION?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:TEMPerature:ENABLE <integer> :STATus:QUESTIONable:TEMPerature:ENABLE?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUESTIONable:TEMPerature[:EVENT]?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:TEMPerature:NTRansition <integer> :STATus:QUEStionable:TEMPerature:NTRansition?
<b>Example</b>	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
<b>Remote Command</b>	:STATus:QUEStionable:TEMPerature:PTRansition <integer> :STATus:QUEStionable:TEMPerature:PTRansition?
<b>Example</b>	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

## 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 descriptions, some of these commands correspond directly to instrument front-panel key functionality, while others are available only as remote commands.

Command	Description
*CAL?	Align Now "All" on page 315
*CLS	"Clear Status" on page 134
*ESE	"Standard Event Status Enable" on page 134
*ESE?	
*ESR?	"Standard Event Status Register Query" on page 135
*IDN?	"Identification Query" on page 135
*OPC	"Operation Complete" on page 135
*OPC?	
*OPT?	"Query Instrument Options" on page 136
*RCL	"Recall Instrument State" on page 137
*RST	"*RST (Remote Command Only)" on page 137
*SAV	"Save Instrument State" on page 138
*SRE	"Service Request Enable" on page 138
*SRE?	
*STB?	"Status Byte Query" on page 138
*TRG	"Trigger" on page 139
*TST?	"Self Test Query" on page 139
*WAI	"Wait-to-Continue" on page 139

### All

(In MXE the key label is “All (plus RF Presel 20 Hz – 3.6 GHz)”) Immediately executes an alignment of all subsystems.

In MXE, the Align Now All is followed by additionally aligning the RF Preselector section, so in MXE, the key label contains the parenthetical note “(plus RF Presel 20 Hz – 3.6 GHz)”. 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.

In the MXE, successful completion will also clear the “Align 20 Hz to 30 MHz required” Error Condition, the “Align 30 MHz to 3.6 GHz required” Error Condition, and the “Align 20 Hz to 3.6 GHz required” Error Condition, and clear bits 1 and bit 2 and clear the bit 1 in the Status Questionable Calibration Extended Needed register.

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.

Key Path	System, Alignments, Align Now
Mode	All
<b>Remote Command</b>	:CALibration[:ALL] :CALibration[:ALL]?
<b>Example</b>	: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.

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	<p>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.</p> <p>An interfering user supplied signal will result in the instrument requiring an Align Now, RF with the interfering signal removed.</p>
Couplings	<p>Initializes the time for the Last Align Now, All Time.</p> <p>Records the temperature for the Last Align Now, All Temperature.</p> <p>If Align RF component succeeded, initializes the time for the Last Align Now, RF Time.</p> <p>If Align RF component succeeded, records the temperature for the Last Align Now, RF Temperature.</p>
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

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

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Mode	All
<b>Remote Command</b>	<b>:CALibration[:ALL]:NPENDING</b>
<b>Example</b>	<b>CAL:NPEN</b>
Notes	<p>:CALibration[:ALL]:NPENDING is the same as :CALibration[:ALL] including all conditions, status register bits, except this scpi command does not BLOCK the scpi session, so the user should use status register bits to query if the calibration is successfully completed or not.</p> <p>Typical usage is:</p> <ol style="list-style-type: none"> <li>1) :CALibration:ALL:NPENDING (Start a calibration)</li> <li>2) :STATus:OPERation:CONDITION? (Check if the calibration is completed or not, If bit 0 is set, then the system is doing calibration, the user should repeat this scpi query until the bit is cleared )</li> <li>3):STATus:QUESTIONable:CALibration:CONDITION? (Check if there are any errors/failures in previous calibration procedure)</li> </ol>
Initial S/W Revision	X.14.20

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## 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.

<b>Key Path</b>	No equivalent key. Related key System, Show Errors, Clear Error Queue
<b>Remote Command</b>	<b>*CLS</b>
<b>Example</b>	*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.

<b>Key Path</b>	No equivalent key. Related key System, Show Errors, Clear Error Queue
<b>Remote Command</b>	<b>*ESE &lt;integer&gt;</b> <b>*ESE?</b>
<b>Example</b>	*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.

<b>Remote Command</b>	*ESR?
<b>Example</b>	*ESR? Returns a 1 if there is either a query or command error, otherwise it returns a zero.
Notes	For related commands, see the <b>STATUs</b> 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.
<b>Remote Command</b>	*IDN?
<b>Example</b>	*IDN? Returns instrument identification information, such as: Keysight Technologies, N9020A, US01020004, A.01.02
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	x.14.50

## 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.

<b>Remote Command</b>	*OPC *OPC?
<b>Example</b>	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	<ol style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>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):           <ul style="list-style-type: none"> <li>Calibrating: monitored by PSA, ESA, VSA (E4406A)</li> <li>Sweeping: monitored by PSA, ESA, VSA (E4406A)</li> <li>Waiting for Trigger: monitored by PSA, ESA, VSA (E4406A)</li> <li>Measuring: monitored by PSA and ESA (but not in all Modes).</li> <li>Paused: monitored by VSA (E4406A).</li> <li>Printing: monitored by VSA (E4406A).</li> <li>Mass memory busy: monitored by VSA (E4406A).</li> </ul> </li> </ol>
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.

<b>Remote Command</b>	*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.

<b>Remote Command</b>	*RCL <register #>
<b>Example</b>	*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.

<b>Remote Command</b>	*RST
<b>Example</b>	*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.

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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.

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Initial S/W Revision	Prior to A.02.00
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## Save Instrument State

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

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<b>Remote Command</b>	*SAV <register #>
<b>Example</b>	*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

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## 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.

---

<b>Remote Command</b>	*SRE <integer> *SRE?
<b>Example</b>	*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

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## Status Byte Query

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

---

<b>Remote Command</b>	*STB?
<b>Example</b>	*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

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	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

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## 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.
<b>Remote Command</b>	*TRG
<b>Example</b>	*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

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## 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.

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

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## 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.

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<b>Remote Command</b>	*WAI
<b>Example</b>	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 that the *OPC command was issued from.
Initial S/W Revision	Prior to A.02.00

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## 4 Input/Output Functions

## 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 143](#)

The Input Port selection is the first menu under the **Input/Output** key:

Key Path	Front-panel key
<b>Remote Command</b>	<code>[ :SENSe]:FEED RF AIQ EMIXer</code> <code>[ :SENSe]:FEED?</code>
<b>Example</b>	<code>:FEED RF</code> <code>:FEED?</code>
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
<b>Backwards Compatibility SCPI</b>	<code>[ :SENSe]:FEED AREference</code>  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:AREF50, 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? will NOT return "AREF" but instead the currently selected input.
<b>Backwards Compatibility SCPI</b>	<code>[ :SENSe]:FEED IQ IONLY QONLY</code> <code>[ :SENSe]:FEED?</code>

---

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? will always return AIQ whatever the type of legacy parameters IQ | IONLY | QONLY has been used.

Backwards Compatibility Notes	<p>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.</p> <p>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-&gt;Restore System Defaults-&gt; In/Out Config key or through the System -&gt;Restore System Defaults -&gt; All key (and corresponding SCPI).</p> <p>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.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

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<b>Remote Command</b>	:INPut:MIXer EXTernal INTernal :INPut:MIXer?
<b>Example</b>	INP:MIX INT INP:MIX?
Notes	<p>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).</p> <p>For compatibility, the INPut:MIXer EXTernal INTernal legacy command is mapped as follows:</p> <ol style="list-style-type: none"> <li>1. When INPut:MIXer EXTernal is received, SENSe:FEED EMIXer is executed.</li> <li>2. When INPut:MIXer INTernal is received, SENSe:FEED RF is executed.</li> <li>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</li> </ol>
Preset	INT
Backwards Compatibility Notes	<p>PSA supports the following SCPI Command :</p> <p>:INPut:MIXer:TYPE PRESelected UNPRselect :INPut:MIXer:TYPE?</p> <p>PXA does not support the :INPut:MIXer:TYPE command.</p>
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
<b>Example</b>	[:SENSe]:FEED RF
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Input to automatically switch to the RF Input. If the RF Calibrator is on, it is turned off. Subsequently disconnecting the USB Preamp from USB does not change the Input selection nor restore the previous selection.
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
Modified at S/W Revision	A.14.00

### 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	<b>Input/Output, RF Input</b>
<b>Remote Command</b>	<code>[ :SENSe]:CORRection:IMPedance[:INPut][:MAGNitude] 50 75</code> <code>[ :SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]?</code>
<b>Example</b>	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. You 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. You 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 $\Omega$ or 75 $\Omega$ . 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-	100 kHz	n/a

X-Series Model	Lowest Freq for meeting specs when AC coupled	Lowest Freq for meeting specs when DC coupled
503/507		
N9000A-C75 Input 2	1 MHz	n/a
N9000A- 513/526	10 MHz	9 kHz
M9290A	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 :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

## RF Input Port

Specifies the RF input port used. The RF Input Port key only appears on units with multiple inputs, and lets you switch between the two inputs.

Switching from the RF input port to one of the RFIO ports, on units that have them, changes the receiver performance of the instrument.

Key Path	<b>Input/Output, RF Input</b>
<b>Remote Command</b>	<code>[ :SENSe ] :FEED :RF :PORT [ :INPut ] RFIN   RFIN2   RFIO1   RFIO2   RFIO3   RFIO4   RFHD   RFFD</code> <code>[ :SENSe ] :FEED :RF :PORT [ :INPut ] ?</code>
Example	<code>:FEED:RF:PORT RFIN</code>
Dependencies	<p>This key only appears in models that support multiple inputs. If the SCPI command is sent with unsupported parameters in any other model, an error is generated, -221.1900, "Settings conflict;option not installed"</p> <p>When any input is selected in a measurement that does not support it, the "No result; Meas invalid with this input" error condition occurs, and the measurement returns invalid data when queried.</p> <p>RFHD and RFFD are only available on M9420A, option "HDX" is required to enable RFHD port and option "FDX" is required to enable RFFD port.</p>
Preset	This is unaffected by Mode Preset but is set to RF on a "Restore Input/Output Defaults" or "Restore System Defaults -> All"
State Saved	Saved in instrument state
Readback	The current RF Input Port selected is read back to this key
<b>Backwards Compatibility SCPI</b>	<code>INPut&lt;1 2&gt; :TYPE INPUT1   INPUT2</code> <code>INPut&lt;1 2&gt; :TYPE ?</code>  Included for R&S ESU compatibility. In the MXE, the INPUT1 parameter is aliased to RFIN and the INPUT2 parameter is aliased to RFIN2
Initial S/W Revision	A.05.01
Modified at S/W Revision	A.14.00

## RF Input

Specifies using the main RF port for the current measurement

Key Path	<b>Input/Output, RF Input, RF Input Port</b>
Example	<code>:FEED:RF:PORT RFIN</code>
ReadBack	RF Input
Initial S/W Revision	A.05.01
Modified at S/W Revision	A.14.00

## RF Input 2

Specifies using the second RF port, if supported, for the current measurement.

See "[More Information](#)" on page 147

Key Path	<b>Input/Output, RF Input, RF Input Port</b>
Example	:FEED:RF:PORT RFIN2
Couplings	<p>When switching from Input 1 to Input 2:</p> <ul style="list-style-type: none"> <li>- If the Stop Freq is above the Max Freq, it is set to the Max Freq, otherwise it does not change.</li> <li>- If the Start Freq is above (Max Freq – Min Span), it is set to (Max Freq – Min Span), otherwise it does not change.</li> </ul> <p>When switching from Input 2 to Input 1, neither the Start Freq nor the Stop Freq change.</p> <p>For the Swept SA measurement, Min Span is 10 Hz. This may vary from measurement to measurement.</p>
ReadBack	RF Input 2
Initial S/W Revision	A.05.01

## More Information

In models with two inputs, the second input usually has a different maximum frequency than the first input. For your convenience, the actual “Max Freq” value is allowed to go slightly higher than the nominal Max Freq for the second input, just as is the case with the first input.

Model	Nominal Input 2 Max Freq	Absolute Input 2 Max Freq	Transition rule for switching from Input 1 to Input 2
N9038A	1 GHz	1.000025 GHz	<ul style="list-style-type: none"> <li>- If the Stop Freq is above 1.000025 GHz, it is set to 1.000025 GHz, otherwise it does not change.</li> <li>- If the Start Freq is above 1.000024990 Hz, Start Freq is set to 1.000024990 Hz and Span to 10 Hz, otherwise nothing changes.</li> </ul>
N9000A with option C75	1.5 GHz	1.58 GHz	<ul style="list-style-type: none"> <li>- If the Stop Freq is above 1.58 GHz, it is set to 1.58 GHz, otherwise it does not change.</li> <li>- If the Start Freq is above 1.579999990 GHz, Start Freq is set to 1.579999990 GHz and Span to 10 Hz, otherwise nothing changes</li> </ul>

## RFHD

Specifies using the RFIO HD (half-duplex) port for the current measurement

Key Path	Input/Output, RF Input, RF Input Port
Example	:FEED:RF:PORT RFHD
Dependencies	RFIO HD port is exclusive for RF Input and RF Output. If HD Port is chosen as RF Output port, pressing this key or sending SCPI to set it, an error message is generated : “-221, Settings conflict;RF Input cannot be set to RFIO HD when RF Output is RFIO HD”. Option “HDX” is required to enable RFHD port.
ReadBack	RFHD
Initial S/W Revision	A.16.00

## RFFD

Specifies using the RFIO FD (full duplex) port for the current measurement

Key Path	Input/Output, RF Input, RF Input Port
Example	:FEED:RF:PORT RFFD
Dependencies	Option “FDX” is required to enable RFFD port.
ReadBack	RFFD
Initial S/W Revision	A.16.00

## RF Preselector

In models that support the RF Preselector, such as MXE (N9038A), this key allows you to turn the preselector on and off.

### NOTE

When using the RF Preselector, if your measurement starts below 3.6 GHz and finishes above 3.6 GHz, the preselector bypass switch will have to switch in and out for every measurement. When this is the case, you will hear a clicking sound from the instrument and a warning message will be displayed: “Settings Alert:Mechanical switch cycling”. You are advised to avoid such setups as much as possible, to minimize switch wear. Pressing Mode Preset will reset the Stop Freq to 3.6 GHz and get you out of this state, or you can manually set the Stop Freq to be below 3.6 GHz.

Key Path	Input/Output, RF Input
Mode	All
Remote Command	[ :SENSe]:POWeR[:RF]:RFPreSelector[:STATe] 1 0 ON OFF [ :SENSe]:POWeR[:RF]:RFPreSelector[:STATe]?
Example	:POW:RFPS 1
Example	:INP:PRES:STAT ON

---

Notes	[:SENSe]:POWer[:RF]:RFPSelector[:STATe] 1 ON. Sets to full compliance measurement. [:SENSe]:POWer[:RF]:RFPSelector[:STATe] 0 OFF. Sets to pre-compliance measurement.
Dependencies	The RF Preselector is not available in all measurements. The key is grayed out in measurements that do not support it, unless you are in a Mode in which no measurements support it, in that case the key does not appear at all. If the preselector is unavailable it is forced to Off. Attempting to turn it on or off in measurements that do not support it generates an error message: -221.3200, Settings conflict; Feature not supported for this measurement. The RF Preselector is not available when FFT Sweep Type is manually selected. Attempting to turn it on or off when this is the case generates an error message: “-221, Settings conflict; RF Presel unavailable when Sweep Type=Manual FFT”. This key only appears in Modes that support the RF Preselector, in other Modes, setting or querying the SCPI will generate an error. This key only appears in models that support the RF Preselector, in other models, setting or querying the SCPI will generate an error.
Preset	It is set to Off when the selected mode is SA. If the selected mode is EMI Receiver, then it will be set to On.
<b>Backwards Compatibility SCPI</b>	<b>INPut&lt;1 2&gt;:PRESelection[:STATe]</b> ON OFF <b>INPut&lt;1 2&gt;:PRESelection[:STATe]?</b> Included for R&S ESU compatibility
Initial S/W Revision	A.05.01

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## External Mixer

This key allows you to choose an External Mixer through which to apply signal input to the analyzer. When chosen, the LO/IF port becomes the input to the analyzer.

External Mixing requires option EXM. The External Mixer key will not appear unless option EXM is installed. The presence of the LO/IF connector alone does not indicate that you have Option EXM licensed. To verify that option EXM is installed, press **System, Show, System**.

When External Mixer is selected, the **Center Freq** key controls the setting of the Center Freq in external mixing, which is separate from the settings of Center Freq for the RF Input or BBIQ. Each input retains its unique settings for Center Freq. A unique SCPI command is provided solely for the external mixing Center Freq (see the **Center Freq** key description), which only affects the External Mixer CF, although sending the generic Center Freq command while External Mixer is selected also controls the External Mixer CF.

See "More Information" on page 150

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Key Path	Input/Output
<b>Example</b>	:FEED EMIX
Notes	Not all measurements support the use of the External Mixer input. When External Mixer is

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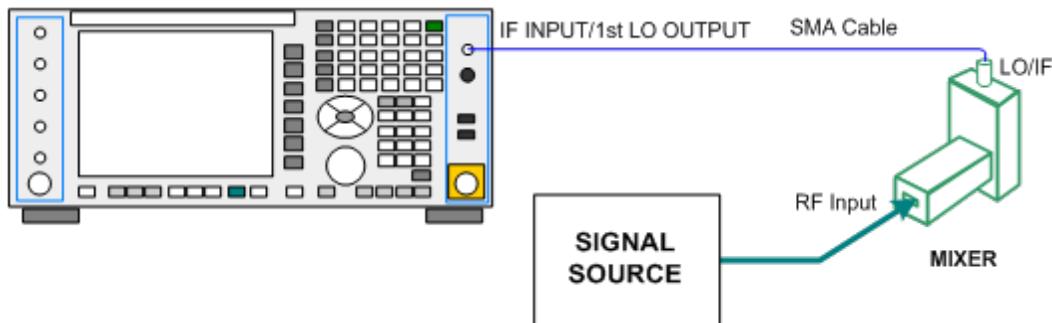
---

selected in a measurement that does not support it, the "No result; Meas invalid with Ext Mixing" error condition occurs.

Dependencies	Unless option EXM is present, the External Mixer key is blanked, and all SCPI commands associated with menus accessed by this key return an error  Manual FFT mode is available with external mixing, but not with Signal ID.
Preset	All settings under this key are returned to their default state when <b>Restore Input/Output Defaults</b> is pressed.
State Saved	All settings under this key, and all Frequency settings, are remembered when you go out of External Mixer, so that when <b>External Mixer</b> is chosen again, all the external mixer functions will retain their previous settings, with the exception of Signal ID which is set to OFF (Signal ID is also set to Off unless External Mixer is the selected Input).
Readback Text	The readback text on this key shows the currently selected mixer, in square brackets.
Backwards Compatibility Notes	Unlike PSA, all external mixer settings including Center Frequency are retained when you go in and out of External Mixing. Also, Preset does not take you out of External Mixing (Restore Input/Output Defaults does).
Initial S/W Revision	A.08.01

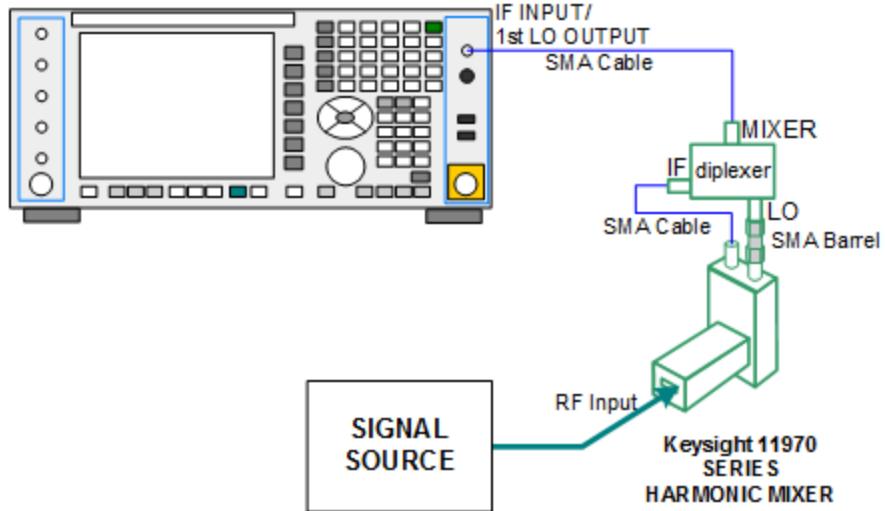
## More Information

X-series analyzers have a combined LO Out/IF In connection, whereas earlier analyzers used separate ports for the LO Out and the IF in. Internal diplexers in the analyzer and the mixer simplify the connection for the user – only a single SMA cable is required.



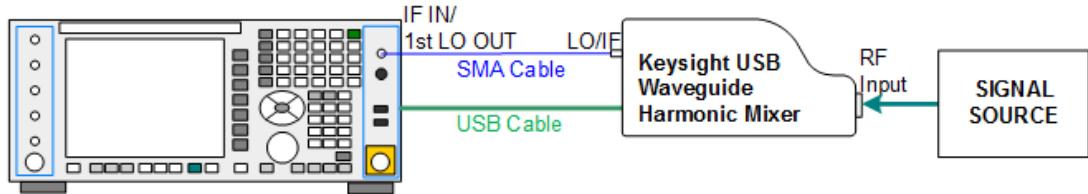
Legacy Keysight and some third party mixers have separate LO In and IF out connections. This requires you to use an external diplexer to connect these mixers. A diplexer can easily be purchased for this purpose (for example, Diplexer Model # DPL.26 or # DPL.313B from OML Inc., Morgan Hill CA)

The connection diagram for such a legacy mixer is:



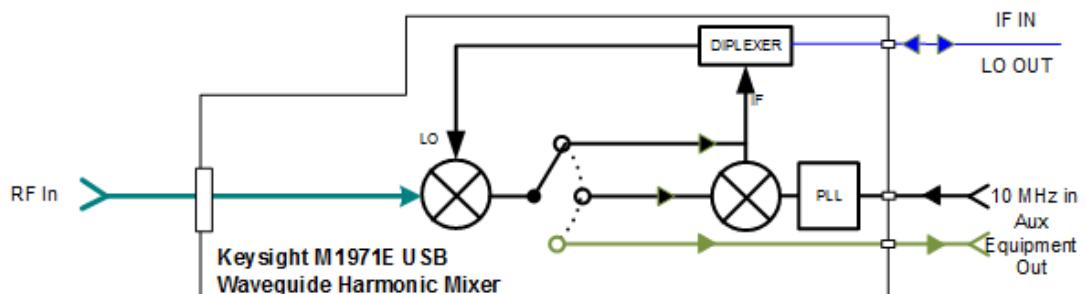
In addition, External Mixing in the X-Series supports the new Keysight M1970 series of Harmonic Mixers, which provide a USB connection for download of calibration data and additional control.

The connection diagram for one of the Keysight USB mixers is:



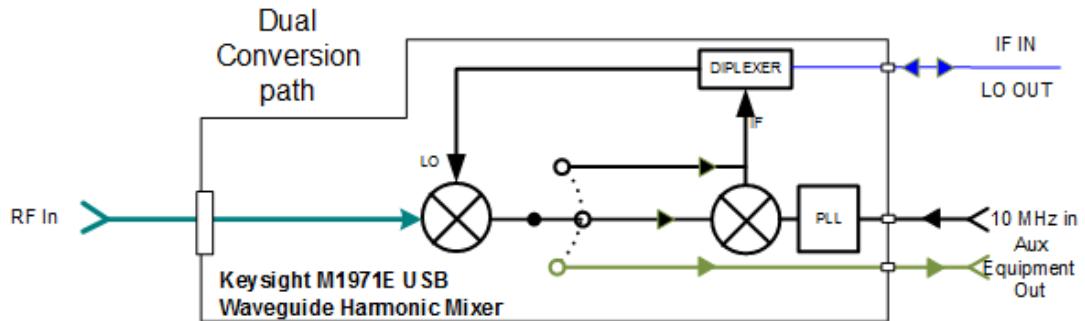
Also available in the M197x series are the M1971 series USB Mixers, which provide additional inputs and outputs for special functionality as described below. These mixers have multiple signal paths which allow them to function in three different states:

- Normal, in which the mixer functions as a classic external mixer with a single conversion:

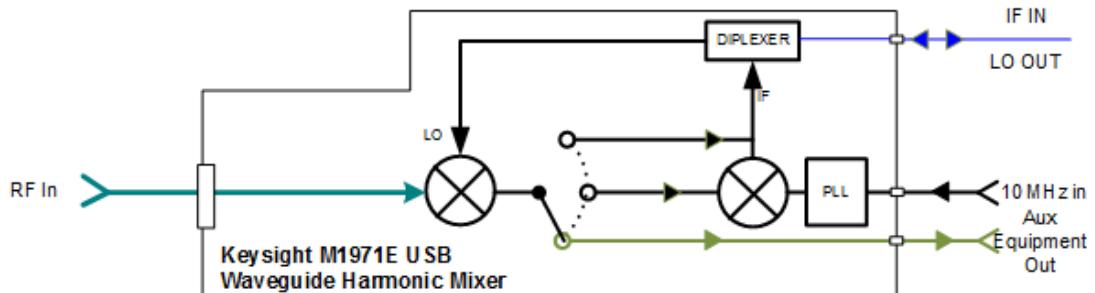


- Dual Conversion, which gives you a wider image-free range. In Dual Conversion, the first conversion is to a higher IF frequency and you provide a

10 MHz signal to which an internal PLL is locked, to effect a second downconversion:



- Aux Equipment, wherein the first mixer output drives an output connector on the mixer and the analyzer is out of the circuit:



External Mixing is only supported in certain Modes and Measurements in the X-Series, as shown in the table below:

Mode	Measurements	Sig ID (Image Suppress only)
Spectrum Analyzer	Swept SA	Y*
	TOI	Y
	Harmonics	N
	Spurious Emissions	Y
	Channel Power	Y
	Occupied BW	Y
	ACP	Y
	Spectrum Emissions Mask	Y
	CCDF	N

Mode	Measurements	Sig ID (Image Suppress only)
	Burst Power	N
	List Sweep	N
Phase Noise	Monitor Spectrum	Y
	Log Plot	Y
	Spot Frequency	N
	Waveform	N
I/Q Analyzer	Complex Spectrum	N
	Waveform	N
Vector Signal Analyzer	Vector Analysis	N
	Analog Demod	N
	Digital Demod	N

\*the Swept SA measurement also supports Image Shift

### Ext Mix Setup

This menu lets you select the mixer type, and lets you configure your mixer (if necessary). While in this menu, and any of its submenus, the External Mixer Setup screen appears, showing you the current settings for the selected mixer. These settings may be dependent on which IF path is currently in use, whether a + or – harmonic is currently selected, etc.

To apply any amplitude correction factors needed to correct mixer flatness, you enter values into one of the Correction tables (under Input/Output, Corrections). The correction conversion loss values can be extracted from data supplied with the mixer or from manual measurements you make to determine the conversion loss. Note that the correction applied by the Correction tables is global to the analyzer; therefore you should make sure to turn off the External Mixer corrections when you are not using the External Mixer input.

#### NOTE

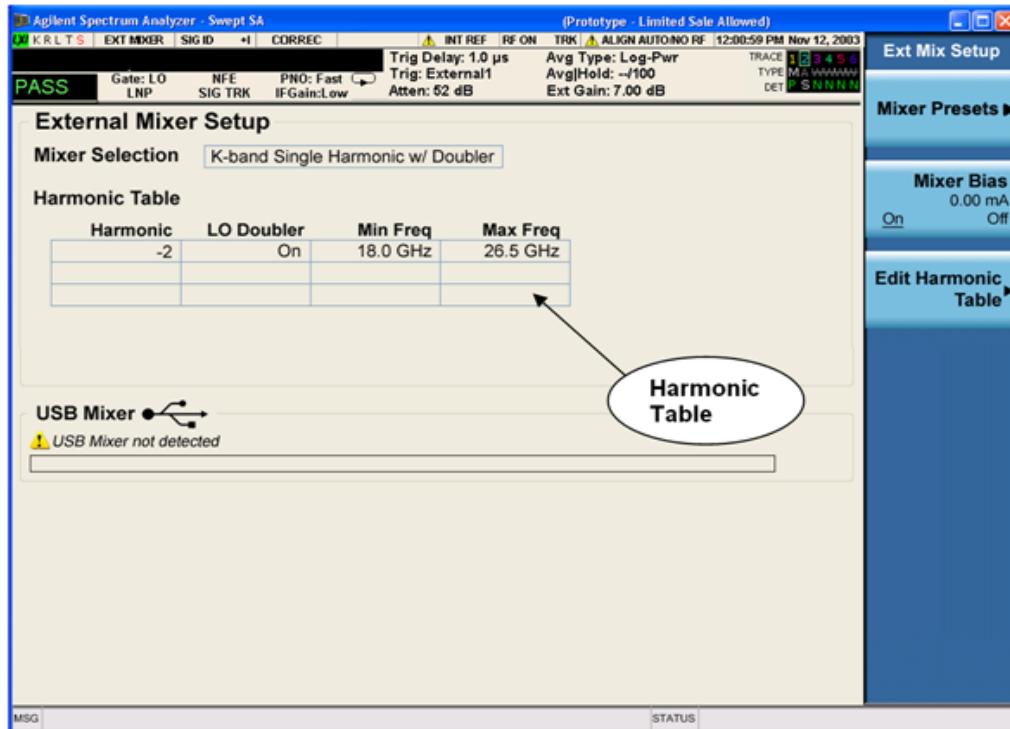
The Keysight USB Mixers automatically give their flatness data to the analyzer, and the correction is applied internally. No correction needs to be entered by the user, and the correction does not appear in the user-accessible Corrections tables. The user is free to enter additional corrections into the Correction tables under Input/Output, Corrections.

Key Path	Input/Output, External Mixer
State Saved	All settings in the Mixer Setup are part of the Input/Output system, and hence are saved whenever State is saved.

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Readback Text	The readback line on this key shows the currently selected mixer, in square brackets.
Initial S/W Revision	A.08.01
Modified at S/W Revision	A.08.50

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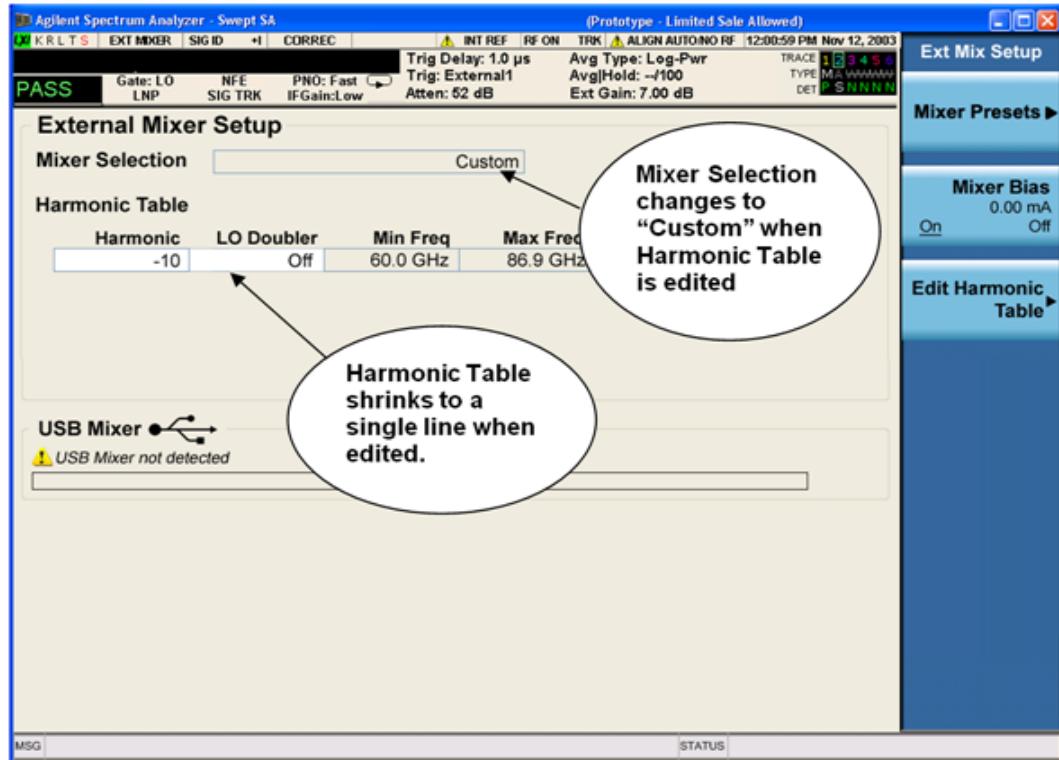
The External Mixer Setup screen looks like this

The current Mixer selection (the current or most recently connected USB Mixer, or the most recent Mixer Preset, or “Custom” if the user has modified the setup) reads out at the top of this screen.

The Harmonic Table currently being used reads out below the Mixer Selection. It shows each range being used for the current mixer. Note that a band may be made up of up to 3 ranges. Each range represents a choice of mixer harmonic and doubler state. When you select a Mixer Preset, it sets the analyzer Start and Stop frequency to the values shown in the Harmonic Table; Start Freq is set to the Min Freq for the bottom range, and Stop Freq is set to the Max Freq for the top range. In many cases you can exceed these nominal values; the absolute maximum and minimum frequency for each preset are shown in the tables that accompany the key descriptions for the Mixer Presets.

**NOTE**

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.



You may customize the Harmonic Table, but when you do this the analyzer goes into “single harmonic” mode. You may enter the harmonic number and whether to use the doubler or not, but now range switching is not supported, so you can only have one harmonic.

When you edit the Harmonic Table, the Mixer Selection changes to “Custom.” To change it back you must go back into the Mixer Presets menu and select a Preset.

When you edit the Harmonic Table, the nominal Min Freq and Max Freq that are available will usually be different than the Preset you were using; and the absolute frequency limits will change as well. This may result in a change to your Start and/or Stop Freq, if the current values fall outside the new range, requiring you to retune your Center Freq to get your signal back in the center.

The analyzer supports the Keysight M1970 Series Harmonic Mixers with USB connection. While in External Mixing, if one of these mixers is plugged in to a USB port, it is automatically detected and displayed in the “USB Mixer” area of the setup screen, including its model number and serial number.

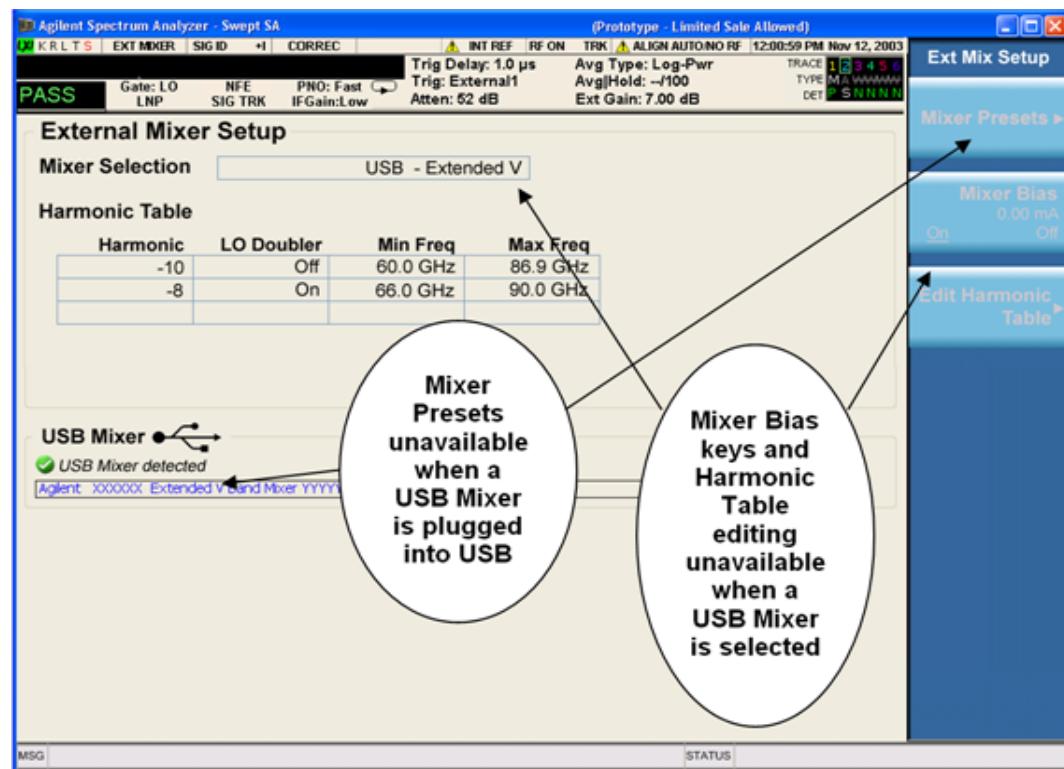
The analyzer assumes that if you plug a mixer into the USB, that is the mixer you want to use. Therefore:

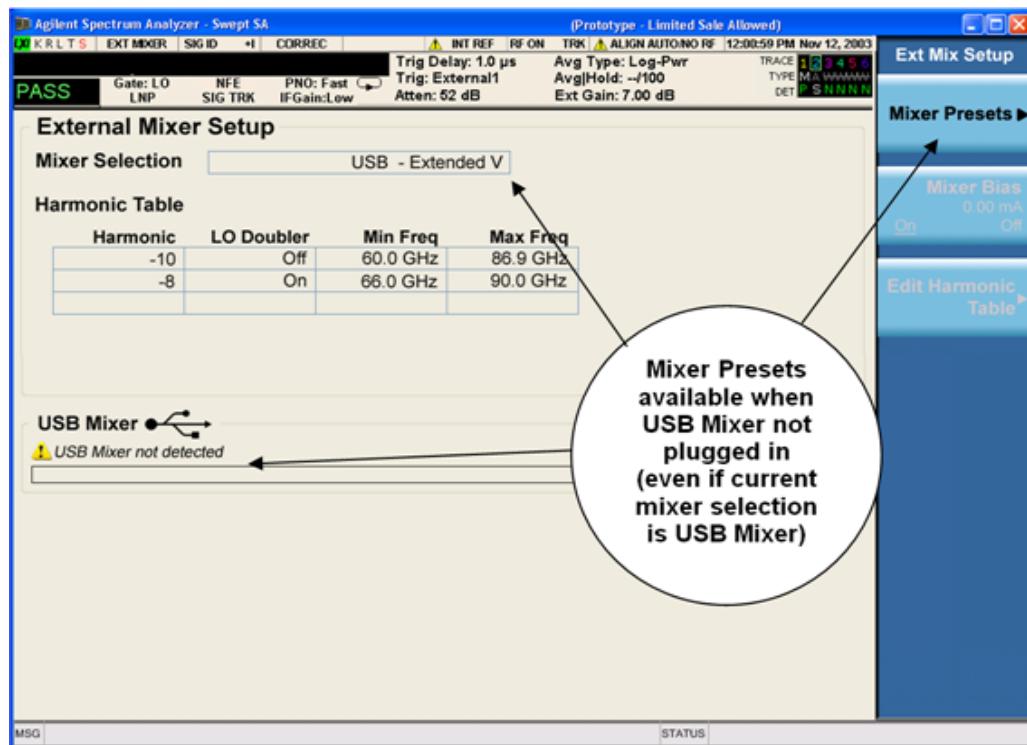
1. If a USB mixer is connected to the USB port, the Mixer Presets menu is grayed out, as none of the presets make sense with a USB Mixer connected. Note that once the analyzer has acquired the USB Mixer, the mixer selection will remain if it is subsequently unplugged from the USB, allowing you to plug it back in with

no change to your settings. However, once you unplug it, the Mixer Presets key will stop being grayed out, allowing you to preset to a different mixer.

2. When **Restore Input/Output Defaults** is performed, if an Keysight USB Mixer is plugged into the analyzer's USB port, the Mixer Selection remains unchanged.
3. When recalling an instrument state, if an Keysight USB Mixer is plugged into the analyzer's USB port, and the Mixer Selection in the recalled state is for a USB Mixer that does not match the mixer currently plugged in, you will have to unplug your mixer and then plug it back in to get the analyzer to recognize your mixer.

As long as the selection in Ext Mixer Setup shows one of the USB mixers, both the **Mixer Bias** and **Edit Harmonic Table** keys will be grayed out.





Only one USB Mixer is supported at a time. To switch to a different USB Mixer, disconnect the one that is no longer being used prior to connecting a new one.

The Mixer Selection displayed and softkey readback for the Keysight M1970 series mixers is:

Mixer Model	Mixer Selection display on Setup Screen	Readback on softkeys
Keysight M1970E: Option 001: 60 to 90 GHz Waveguide Harmonic Mixer	USB - M1970E-001 E-Band	USB Mixer E-Band
Keysight M1971E: Option 001: 60 to 90 GHz Waveguide Harmonic Mixer	USB - M1971E-001 E-Band	USB Mixer E-Band
Keysight M1971E: Option 003: 55 to 90 GHz Waveguide Harmonic Mixer	USB - M1971E-003 Extended E-Band	USB Mixer Extended E
Keysight M1971V: Option 001: 50 to 75 GHz Waveguide Harmonic Mixer	USB - M1971E-001 V-Band	USB Mixer V-Band
Keysight M1971W: Option 001: 75 to 110 GHz Waveguide Harmonic Mixer	USB - M1971E-001 W-Band	USB Mixer W-Band

Mixer Model	Mixer Selection display on Setup Screen	Readback on softkeys
Keysight M1970V Option 001: 50 to 75 GHz Waveguide Harmonic Mixer	USB - M1970V-001 V-Band	USB Mixer V-Band
Keysight M1970V Option 002: 50 to 80 GHz Waveguide Harmonic Mixer	USB - M1970V-002 Extended V-Band	USB Mixer Extended V
Keysight M1970W Option 001: 75 to 110 GHz Waveguide Harmonic Mixer	USB - M1970W-001 W-Band	USB Mixer W-Band

The Keysight USB mixer essentially acts as a “remote front end” and is fully calibrated over the specified frequency range, without requiring any user interaction. This is particularly useful at high mm-wave frequencies, where cable loss is typically quite large, and it is desirable to bring the front end right up to the device under test, rather than bringing the mm-wave signal to the analyzer using a lossy and uncalibrated cable or waveguide connection.

Connecting the mixer to the USB port on the analyzer switches you to External Mixing, aborts the current measurement, and initiates an alignment of the mixer. A popup message, “USB Mixer connected” appears on the display. When a USB mixer and the LO/IF cable are connected the alignment is performed. When the alignment begins, an “Aligning” popup replaces the previous message on the display. When the alignment completes, the current measurement restarts.

### Mixer Presets

This menu lets you preset the mixer setup for the particular type of mixer that you are using.

These presets are divided into four groups:

- one for Keysight legacy mixers,
- three for general purpose mixers:
  - presets that use a single harmonic and no doubling
  - presets that use a single harmonic but double the LO
  - presets that use multiple harmonics

Note that the IF/LO port provides a 3.8-14 GHz LO in two bands: 3.8-8.7 (LO fundamental), and 8.6-14 GHz (doubled LO).

In most cases, once you have executed the preset, you will not need to adjust any further settings.

Key Path	Input/Output, External Mixer, Ext Mix Setup																						
<b>Remote Command</b>	<pre>[ :SENSe]:MIXer:BAND A   Q   U   V   W   NA   ND   NE   NF   NG   NJ   NK   NQ   NU   NV   NW   NY   NEXT   DD   DF   DG   DJ   DK   DQ   DV   DW   DY   DEXT   MA   ME   MU   MCOAX   USB  [ :SENSe]:MIXer:BAND?</pre>																						
<b>Example</b>	<pre>:MIX:BAND A :MIX:BAND?</pre>																						
Notes	<p>A Q U V W select Keysight 11970 mixer presets  NA ND NE NF NG NJ NK NQ NU NV NW NY NEXT select single harmonic, non-doubled LO presets  DD DF DG DJ DK DQ DV DW DY DEXT select single harmonic, doubled LO presets  MA ME MU MCOAX select multiple harmonic presets  All of these presets are detailed in their respective key descriptions  The query form of this command returns the most recent preset, UNLESS the harmonic table has been edited after the preset was executed. If the harmonic table has been edited it returns CUSTOM  The command USB will refresh the USB mixer connection and automatically detect the mixer band. The query form of this command returns the following if an Keysight USB Mixer is plugged into the analyzer's USB port:</p> <ul style="list-style-type: none"> <li>USBE Keysight E-Band USB Mixer</li> <li>USBV Keysight V-Band USB Mixer</li> <li>USBVEXT Keysight Extended V-Band USB Mixer</li> <li>USBWKeysight W-Band USB Mixer</li> </ul> <p>Note that the parameters CUSTOM, USBV, USBVEXT, and USBW are query responses only, and cannot be sent TO the analyzer.</p> <p>The following cross-reference matches the mixer band designators used by Keysight to the EIA waveguide designations:</p> <table> <tbody> <tr><td>EIA</td><td>Keysight Freq Range</td></tr> <tr><td>WR-28</td><td>A26.5 - 40 GHz</td></tr> <tr><td>WR-22</td><td>Q33 - 50 GHz</td></tr> <tr><td>WR-19</td><td>U40 - 60 GHz</td></tr> <tr><td>WR-15</td><td>V50 - 75 GHz</td></tr> <tr><td>WR-12</td><td>E60 - 90 GHz</td></tr> <tr><td>WR-10</td><td>W75 - 110 GHz</td></tr> <tr><td>WR-8</td><td>F90 - 140 GHz</td></tr> <tr><td>WR-6</td><td>D110 - 170 GHz</td></tr> <tr><td>WR-5</td><td>G140 - 220 GHz</td></tr> <tr><td>WR-3</td><td>J220 - 325 GHz</td></tr> </tbody> </table>	EIA	Keysight Freq Range	WR-28	A26.5 - 40 GHz	WR-22	Q33 - 50 GHz	WR-19	U40 - 60 GHz	WR-15	V50 - 75 GHz	WR-12	E60 - 90 GHz	WR-10	W75 - 110 GHz	WR-8	F90 - 140 GHz	WR-6	D110 - 170 GHz	WR-5	G140 - 220 GHz	WR-3	J220 - 325 GHz
EIA	Keysight Freq Range																						
WR-28	A26.5 - 40 GHz																						
WR-22	Q33 - 50 GHz																						
WR-19	U40 - 60 GHz																						
WR-15	V50 - 75 GHz																						
WR-12	E60 - 90 GHz																						
WR-10	W75 - 110 GHz																						
WR-8	F90 - 140 GHz																						
WR-6	D110 - 170 GHz																						
WR-5	G140 - 220 GHz																						
WR-3	J220 - 325 GHz																						
Preset	<p>When <b>Restore Input/Output Defaults</b> is performed, an "A" mixer preset is also issued (11970A band), unless an Keysight USB Mixer is plugged into the analyzer's USB port, in which case the Mixer Selection remains unchanged.</p> <p>When using Keysight USB Mixers, if a Restore All Defaults (SCPI command SYSTem:DEFault) has been perform, either remove and reinsert the USB cable or press the Refresh USB Mixer Connection softkey.</p>																						

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Backwards Compatibility Notes	The [:SENSe]:MIXer:BAND command was used in PSA and ESA to select the mixer band. In the X-Series, only the legacy parameters A, Q, U, V, and W are honored, and they preset the analyzer to match the corresponding Keysight 11970 legacy mixer. Parameters D, E, F, G ,J , K, Y, which were accepted in ESA and PSA, return an error if sent. If you are using a mixer in one of these bands, you should study the tables of presets and choose the appropriate preset to match your application. Also the USER parameter is no longer accepted, as the control model for mixer customization is very different in the X-Series.
Initial S/W Revision	A.08.01
Modified at S/W Revision	A.14.00

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## Keysight 11970

This menu allows you to preset for one of the models in the Keysight 11970 series.

Because the X-Series has an LO range of 3.8 - 14 GHz, and older analyzers had an LO range of 3.0 - 6.8 GHz, the harmonic numbers used in the X-Series may differ from those used on older analyzers for the same mixers. Additionally, some of the 11970 mixers cannot be operated over their full range with the X-Series without switching harmonics. Consequently, you will find that some of the bands (A-Band, for example) are broken into two ranges for use with the X-Series.

See "[More Information](#)" on page 161

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Key Path	Input/Output, External Mixer, Ext Mix Setup, Mixer Presets
<b>Example</b>	MIX:BAND A
Initial S/W Revision	A.08.01

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## More Information

Below are the 11970A presets. The 11970U and the 11970W use a single harmonic. The other three switch harmonics mid-band. Both harmonic ranges are shown in the table. None of these mixers use LO doubling.

The 11970 K-band mixer and the 11974 preselected mixer series are not supported.

Preset	Readout in setup screen	Readback on softkeys	Range	Harm #	RF start	RF stop	RF center
A- band	Keysight 11970A	Keysight 11970A	1 2	-6 -8	26.5 30.35	30.45 40	28.475 35.175
Q- band	Keysight 11970Q	Keysight 11970Q	1 2	-8 -10	33 39.8	40.8 50	36.9 44.9
U- band	Keysight 11970U	Keysight 11970U	..	-10	40	60	50
V- band	Keysight 11970V	Keysight 11970V	1 2	-12 -14	50 53	66 75	58 64
W- band	Keysight 11970W	Keysight 11970W	..	-18	75	110	92.5

### Single Harmonic

These presets choose a setup that uses a single harmonic and no doubling for the LO.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Mixer Presets
<b>Example</b>	MIX:BAND NA
Initial S/W Revision	A.08.01

These are the presets for single harmonic operation with no doubler:

Mixer	Readout in setup screen	Readback on softkeys	Harm #	RF start	RF stop	RF center
K-band	K-band Single Harmonic, no doubler	Sngl harm LOx1 K-band	-4	18	26.5	22.25
A-band	A-band Single Harmonic, no doubler	Sngl harm LOx1 A-band	-6	26.5	40	33.25

Mixer	Readout in setup screen	Readback on softkeys	Harm #	RF start	RF stop	RF center
D-band	D-band Single Harmonic, no doubler	Sngl harm LOx1 D-band	-20	110	170	140
E-band	E-band Single Harmonic, no doubler	Sngl harm LOx1 E-band	-12	60	90	75
F-band	F-band Single Harmonic, no doubler	Sngl harm LOx1 F-band	-18	90	140	115
Q-band	Q-band Single Harmonic, no doubler	Sngl harm LOx1 Q-band	-6	33	50	41.5
U-band	U-band Single Harmonic, no doubler	Sngl harm LOx1 U-band	-8	40	60	50
V-band	V-band Single Harmonic, no doubler	Sngl harm LOx1 V-band	-10	50	75	62.5
W-band	W-band Single Harmonic, no doubler	Sngl harm LOx1 W-band	-14	75	110	92.5
G-band	G-band Single Harmonic, no doubler	Sngl harm LOx1 G-band	-26	140	220	180
Y-band	Y-band Single Harmonic, no doubler	Sngl harm LOx1 Y-band	-30	170	260	215
J -band	J-band Single Harmonic, no doubler	Sngl harm LOx1 J-band	-38	220	325	272.5
Extended	Extended Single Harmonic, no doubler	Sngl harm LOx1 Extended	-40	155	345	250

### Single Harmonic w/doubler

These presets choose a setup that uses a single harmonic and doubling for the LO.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Mixer Presets
<b>Example</b>	MIX:BAND DW
Initial S/W Revision	A.08.01

These are the presets for single harmonic operation with LO doubling:

Mixer	Readout in setup screen	Readback on softkeys	Harm #	RF start	RF stop	RF center
D-band	D-band Single Harmonic w/doubler	Sngl harm LOx2 K-band	-14	110	170	140
F-band	F-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-10	90	140	115
G-band	G-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-16	140	220	180
J-band	J-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-24	220	325	272.5
K-band	K-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-2	18	26.5	22.25
Q-band	Q-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-4	33	50	41.5
V-band	V-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-6	50	75	62.5
W-band	W-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-8	75	110	92.5

Mixer	Readout in setup screen	Readback on softkeys	Harm #	RF start	RF stop	RF center
Y-band	Y-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-20	170	260	215
Extended	Extended Single Harmonic w/doubler	Sngl harm LOx2 A-band	-28	245	390	317.5

## Multiple Harmonics

These presets choose a setup that uses multiple harmonics and may or may not use doubling for the LO.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Mixer Presets
Example	MIX:BAND MA
Initial S/W Revision	A.08.01

These are the presets for multiple harmonic operation:

Mixer	Readout in setup screen	Readback on softkeys	Rang e	Har m #	Dbl r?	RF star t	RF sto p	RF Cent er
A-band	A-band Multiple Harmonic	Multi harm A-band	1 2	-4 -4	N Y	26. 33. 1	34. 40	30.3 36.55
E-band	E-band Multiple Harmonic	Multi harm E-band	1 2	-6 -8	Y	60 65	83 90	71.5 77.5
U-band	U-band Multiple Harmonic	Multi harm U-band	1 2	-6 -6	N Y	40 49. 5	51. 60	45.75 54.75
Coaxial	Coaxial Multiple Harmonic	Multi harm Coaxial	1 2 3	-4 -4 -6	N Y Y	26. 32. 50	34 55 70	30.25 43.75 60

## Edit Harmonic Table

This menu lets you directly configure the Harmonic number and LO Doubler state of your mixer by editing the Harmonic Table. The Harmonic Table can be configured:

- as a single row (meaning only one harmonic number is used and the LO Doubler is either on or off),
- as two rows where the harmonic number switches between the first row and the second, or
- as two rows where the LO Doubler state switches between the first row and the second

When you press the **Edit Harmonic Table** key, a dialog appears on the display informing you that when you edit the Harmonic Table you will go into Custom mixer mode, and that to undo your changes you must go to the Mixer Presets menu and choose the preset appropriate for your mixer. You may cancel out of this dialog and not enter the Edit Harmonic Table menu. If you choose to enter the menu, the Mixer Selection changes to “Custom”.

In Custom mode, your maximum start and stop frequencies are strictly set by the LO range and the harmonic number you have chosen. The undoubled LO range is approximately 3.8 - 8.7 GHz, and (for LO's that support doubling) the doubled range is approximately 8.0 – 14.0 GHz. That range times the harmonic you have selected will determine your tuning range. If your frequency is currently outside that range when you edit the Harmonic Table, your frequency will be changed to fall at the edge of the range. To change it back you must go into the Mixer Presets menu and select a Preset.

Whenever you are in the **Edit Harmonic Table** menu, the editable fields in the table have a white background, indicating that they can be edited. These fields vary depending on the Table Type.

Table Type	Fields you can edit
Single Row	Harmonic and LO Doubler cells
Harmonic Switching	Harmonic and LO Doubler cells (only the first row)
Doubler Switching	Harmonics cell (only the first row)

Note that you cannot add or delete rows from the table; you can only modify the rows that are already there.

Key Path	Input/Output, External Mixer, Ext Mix Setup
Initial S/W Revision	A.08.01
Modified at S/W Revision	A.09.491

## Table Type

This parameter determines which type of configuration you want the Custom Mixer to be. You can choose Single Row, Harmonic Switching, or Doubler Switching. See detail under each of these keys.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Edit Harmonic Table
<b>Remote Command</b>	[ :SENSe]:MIXer:TTYPE SINGLE HARMonic DOUBLer [ :SENSe]:MIXer:TTYPE?
<b>Example</b>	:MIX:TTYP SING
Couplings	When you change the Table Type, the Mixer Selection changes to "Custom"
Preset	Depends on the current Mixer Preset. This is unaffected by Mode Preset, but on a "Restore Input/Output Defaults" the Mixer is preset to 11970A, for which the Table Type is Harmonic Switching
State Saved	Saved in instrument state
Initial S/W Revision	A.09.491

## Single Row

In the Single Row type, the External Mixer always stays in the same Harmonic Number and the LO Doubler is either on or off and does not change state during a sweep. You may change the Harmonic Number and you may change the state of the Doubler.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Edit Harmonic Table, Table Type
<b>Example</b>	:MIX:TTYP SING
State Saved	Saved in instrument state
Initial S/W Revision	A.09.491

## Harmonic Switching

In the Harmonic Switching type, the External Mixer switches the Harmonic Number in the middle of the sweep. The Lo Doubler may be on or off but it is the same for both Harmonic Numbers. You can set the initial Harmonic Number, and when it switches it decrements by two when the harmonic is negative and increments by two when the harmonic is positive. For example, if you set the initial number to -6, when it switches it will go to -8. If you set the harmonic number to 8 when it switches it will go to 10.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Edit Harmonic Table, Table Type
<b>Example</b>	:MIX:TTYP HARM
State Saved	Saved in instrument state
Initial S/W Revision	A.09.491

## Doubler Switching

In the Doubler Switching type, the External Mixer switches the doubler from Off to On in the middle of the sweep. You can set the Harmonic Number but it stays the same for the Doubler Off state as for the Doubler On state. The LO Doubler key is grayed out in this table type.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Edit Harmonic Table, Table Type
<b>Example</b>	:MIX:TTYP DOUB
State Saved	Saved in instrument state
Initial S/W Revision	A.09.491

## Harmonic

This lets you enter the Harmonic value with its associated sign (mixing mode).

The harmonic number is a signed integer, where the sign has the meaning of choosing between positive and negative mixing products. Desired mixing products occur at an IF frequency which equals the difference between the RF frequency (fRF) and the LO frequency (NfLO). When this difference is positive, we can say fIF = fRF – NfLO. When this difference is negative, we can say fIF = NfLO – fRF. Thus, a negative harmonic means the analyzer will be tuned such that the harmonic of the LO is higher than the indicated frequency by the frequency of the first IF. A positive harmonic means the analyzer will be tuned such that the harmonic of the LO is lower than the indicated frequency by the frequency of the first IF.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Edit Harmonic Table
<b>Remote Command</b>	[ <b>:SENSe</b> ]: <b>MIXer</b> : <b>HARMonic</b> <integer> [ <b>:SENSe</b> ]: <b>MIXer</b> : <b>HARMonic?</b>
<b>Example</b>	:MIX:HARM -28 :MIX:HARM?
Notes	The query returns the harmonic value of the first row of the harmonic table.
Couplings	When you set a value for the Harmonic via SCPI, the Mixer Selection changes to "Custom"
Preset	This is unaffected by Mode Preset, but on a "Restore Input/Output Defaults" editing is turned off, the Harmonic Table returns to normal, and the Mixer is preset to 11970A, which has -6 in the first row of its Harmonic Table
State Saved	Saved in instrument state
Min	-400
Max	400
Initial S/W Revision	A.08.01
Modified at S/W Revision	A.09.491

## LO Doubler

This lets you enter the LO Doubler setting. The LO Doubler setting controls the choice of the LO doubler state for LO's that support doubled operation.

In LO's that support doubling, the fundamental band is approximately 3.8 – 8.7 GHz, and the doubled band is approximately 8.0 – 14 GHz. The higher LO frequency can result in a lower mixer harmonic and reduced mixer conversion loss.

Key Path	Input/Output, External Mixer, Ext Mix Setup, Edit Harmonic Table
<b>Remote Command</b>	[ :SENSe]:MIXer:LODoubler ON OFF 0 1 [ :SENSe]:MIXer:LODoubler?
<b>Example</b>	:MIX:LOD 0 :MIX:LOD?
Notes	The query returns the doubler value of the first row of the harmonic table.
Dependencies	This key is grayed out and set to Off when Table Type is set to Doubler Switching.
Couplings	When you set a value for the doubler setting via SCPI, the Mixer Selection changes to "Custom"
Preset	This is unaffected by Mode Preset, but on a "Restore Input/Output Defaults" editing is turned off, the Harmonic Table returns to normal, and the Mixer is preset to 11970A, which has the doubler Off in the first row of its Harmonic Table
State Saved	Saved in instrument state
Initial S/W Revision	A.08.01
Modified at S/W Revision	A.09.491

## Refresh USB Mixer Connection

This operation re-reads the USB devices and refreshes connection to Keysight USB mixers. This operation is the same as physically removing and reinserting the mixer's USB connection.

Key Path	Input/Output, External Mixer, Ext Mix Setup
<b>Example</b>	:MIX:BAND USB
Notes	When using Keysight USB Mixers, if a Restore All Defaults (SCPI command SYSTem:DEFault) has been performed, either remove and reinsert the USB cable or press the Refresh USB Mixer Connection softkey.
Initial S/W Revision	A.14.00

## Mixer Bias

Adjusts an internal bias source for use with external mixers. The bias signal is present on the center conductor of the IF input connector on the front panel. The

shunt current range is from -10 mA to 10 mA and it can be set whether Mixer Bias state is On or Off, but it will only be applied if it is On.

The bias remains as set if the user switches to another input (e.g., the RF Input).

Key Path	Input/Output, External Mixer, Ext Mix Setup
<b>Remote Command</b>	<pre>[ :SENSe]:MIXer:BIAS &lt;real&gt; [ :SENSe]:MIXer:BIAS? [ :SENSe]:MIXer:BIAS:STATe OFF ON 0 1 [ :SENSe]:MIXer:BIAS:STATe?</pre>
<b>Example</b>	<pre>:MIX:BIAS 0 :MIX:BIAS? MIX:BIAS:STAT 0 MIX:BIAS:STAT?</pre>
Preset	This is unaffected by Preset but is set to OFF and 0 on a "Restore Input/Output Defaults"
State Saved	Saved in instrument state
Min	-10 mA
Max	10 mA
Initial S/W Revision	A.08.01

### Signal ID On/Off

Activates or deactivates an algorithm that aids with the identification of multiple responses

Toggles the Signal ID (signal identification) function On or Off. This function lets you identify multiple responses of a single input signal that are generated when using un-preselected external mixers. The use of mixers without pre-selecting filters offers the advantage of improved receiver sensitivity because of the absence of the filter insertion loss, but results in multiple responses due to images and undesired harmonic mixing products.

While in Signal ID, basic spectrum analyzer functions work normally (for example, you can change Span normally), but some functions are disabled (for example, some traces are unavailable).

There are two forms of Signal ID, Image Suppress and Image Shift. Choose the one most appropriate for your application. For Image Shift, an LO-shifted and an unshifted trace are taken in Trace 1 and Trace 2 and displayed together. Any peaks that are not the same in both traces are images. For Image Suppress, image cancellation is performed in the background using two hidden traces, and the result displayed in Trace 1, which shows only the valid signals.

Key Path	Input/Output, External Mixer
<b>Remote Command</b>	<pre>[ :SENSe]:SIDentify[:STATe] OFF ON 0 1 [ :SENSe]:SIDentify[:STATe]?</pre>

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<b>Example</b>	:SID 0 :SID?
Notes	Signal ID uses data from two successive sweeps. Therefore, if the analyzer is in single sweep mode, two sweep triggers are used to generate the data needed for signal identification.
Dependencies	<p>Signal ID is not available in some measurements. If the Signal ID key does not appear or is grayed out while in your measurement, then it is not available.</p> <p>Because Signal ID uses data from two successive sweeps, several trace and sweep functions are grayed out in Signal ID. See the documentation for your measurement for details on which trace keys are grayed out.</p> <p>Signal ID is not available with Signal Track so Signal ID will be grayed out if in Signal Track.</p> <p>Signal ID will be turned off when External Mixer is turned off. Signal ID cannot be turned on when using internal mixing.</p> <p>Rules for auto coupling of the Sweep and FFT keys are changed with Signal ID on. For both the dynamic range case and the speed case, swept is chosen whenever any form of Signal ID is on. If Manual FFT is selected, the Signal ID key is grayed out.</p> <p>Whenever Signal ID is on, a warning message will be generated</p> <p>If Signal ID is selected in a measurement that does not support it, a warning message is generated</p>
Couplings	The Auto Rules for detector selection select Normal for all active traces when Signal ID is turned on.
Preset	This is unaffected by Preset but is set to OFF on a "Restore Input/Output Defaults"
Initial S/W Revision	A.08.01

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## Cable IF Loss

The loss at the IF in the IF/LO cable can be compensated for with this function, by entering the loss in dB for your cable.

The cable loss will depend on the IF frequency. The IF frequency varies depending on which IF path your measurement is using. For best accuracy, characterize your cable's loss for the IF frequency or frequencies you will be using.

IF Frequencies:

10 MHz path: 322.5 MHz

25 MHz path: 322.5 MHz

40 MHz path: 250 MHz

140 MHz path: 300 MHz

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Key Path	Input/Output, External Mixer
Key Path	Input/Output, External Mixer, Calibrate Mixer
<b>Remote Command</b>	<pre>[ :SENSe]:MIXer:CIFLoss &lt;rel_ampl&gt; [:SENSe]:MIXer:CIFLoss?</pre>

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<b>Example</b>	:MIX:CIFL 0.23 DB :MIX:CIFL?
Preset	0.26 dB
State Saved	Saved in instrument state
Min	-100
Max	100
Initial S/W Revision	A.08.01

## I/Q

This feature is not available unless the "Baseband I/Q (Option BBA)" on page 171 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, LTE, LTETDD, LTEAFDD, LTEATDD, DCTV, DTMB (CTTB), DVB-T/H with T2, CMMB, ISDBT, WCDMA, VXA, CDMA1XEV, WLAN
<b>Example</b>	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  $50\ \Omega$  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  $1\ M\Omega$  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.

4. The following commands are supported:

```
:CALibration:IQ:FLATness
:INPut:IMPedance:IQ U50|B50|U1M|B1M
:INPut:IMPedance:REference <integer>
```

5. The [:SENSe]:FEED RF|IQ||IONLy|QONLy|AREFerence||IFALign command supports all parameters except IFALign. The FEED? query will return only RF|AIQ|AREF.

6. 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.

<b>Key Path</b>	<b>Input/Output, I/Q</b>
<b>Remote Command</b>	<b>[ :SENSe]:FEED:IQ:TYPE IQ IONLY QONLY</b> <b>[ :SENSe]:FEED:IQ:TYPE?</b>
<b>Example</b>	Set the input to be both the I and Q channels, combined as $I + j * Q$ . FEED:IQ:TYPE IQ
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
Readback Text	I+jQ   I Only   Q Only
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	<b>:INPut[1]:IQ:TYPE IQ I Q</b> <b>:INPut[1]:IQ:TYPE?</b>
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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Remote Command</b>	<code>:INPut:IQ[:I]:DIFFerential OFF ON 0 1</code> <code>:INPut:IQ[:I]:DIFFerential?</code>
<b>Example</b>	Put the I channel in Differential Input mode  <code>INP:IQ:DIFF ON</code>
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

<b>Remote Command</b>	<code>:INPut[1]:IQ:BALanced[:STATe] OFF ON 0 1</code> <code>:INPut[1]:IQ:BALanced[:STATe]?</code>
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

## 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	<b>Input/Output, I/Q, I Setup</b>
<b>Remote Command</b>	<b>:INPut[1]:IQ[:I]:IMPedance LOW HIGH :INPut[1]:IQ[:I]:IMPedance?</b>
<b>Example</b>	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	<b>Input/Output, I/Q, I Setup</b>
<b>Remote Command</b>	<b>[ :SENSe]:CORRection:IQ[:I]:SKEW &lt;seconds&gt; [:SENSe]:CORRection:IQ[:I]:SKEW?</b>
<b>Example</b>	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 188.](#)

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

This is an alternate form of the SCPI that allows input as a power instead of a ratio.

<b>Remote Command</b>	<code>[ :SENSe]:CORRection:IQ:I Q:ATTenuation &lt;rel_ampl&gt;</code> <code>[ :SENSe]:CORRection:IQ:I Q:ATTenuation?</code>
<b>Example</b>	Set the attenuation for the current I probe type to 100.00:1. <code>CORR:IQ:I:ATT 20 dB</code>
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 232](#).

<b>Key Path</b>	<b>Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling</b>
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
<b>Remote Command</b>	<b>:CALibration:IQ:PROBe:I Q:CLEAR</b>
<b>Example</b>	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.

<b>Remote Command</b>	<b>:INPut:IMPedance:IQ U50 B50 U1M B1M</b> <b>:INPut:IMPedance:IQ?</b>
<b>Example</b>	: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 = $50\Omega$ B50: Differential Input = On, Input Z = $50\Omega$ U1M: Differential Input = Off, Input Z = $1 M\Omega$ B1M: Differential Input = On, Input Z = $1 M\Omega$ This command is for backwards compatibility. It combines the Input Z ( $50\Omega$ or $1 M\Omega$ ) 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	<b>Input/Output, I/Q</b>
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	<b>Input/Output, I/Q, Q Setup</b>
<b>Remote Command</b>	:INPut:IQ:MIRRored OFF ON 0 1 :INPut:IQ:MIRRored?
<b>Example</b>	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	<b>Input/Output, I/Q, Q Setup</b>
<b>Remote Command</b>	:INPut:IQ:Q:DIFFerential OFF ON 0 1 :INPut:IQ:Q:DIFFerential?

<b>Example</b>	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	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

## 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
<b>Remote Command</b>	:INPut[1]:IQ:Q:IMPedance LOW HIGH  :INPut[1]:IQ:Q:IMPedance?
<b>Example</b>	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

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	key is disabled when Q Same as I is On.
Preset	LOW
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	50 Ω   1 MΩ
Initial S/W Revision	Prior to A.02.00

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### 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.

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Key Path	Input/Output, I/Q, Q Setup
<b>Remote Command</b>	[ :SENSe]:CORRection:IQ:Q:SKEW <seconds> [ :SENSe]:CORRection:IQ:Q:SKEW?
<b>Example</b>	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

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### Q Probe

Accesses the probe setup parameters for the Q channel. See "[I/Q Probe Setup](#)" on page 188.

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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

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## 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
<b>Remote Command</b>	[ :SENSe]:CORRection:IQ:I Q:ATTenuation:RATio <real> [ :SENSe]:CORRection:IQ:I Q:ATTenuation:RATio?
<b>Example</b>	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

This is an alternate form of the SCPI that allows input as a power instead of a ratio.

<b>Remote Command</b>	[ :SENSe]:CORRection:IQ:I Q:ATTenuation <rel_ampl> [ :SENSe]:CORRection:IQ:I Q:ATTenuation?
<b>Example</b>	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 232.

Key Path	<b>Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling</b>
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	<b>Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe</b>
<b>Remote Command</b>	<b>:CALibration:IQ:PROBe:I Q:CLEar</b>
<b>Example</b>	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 177).

Key Path	<b>Input/Output, I/Q</b>
<b>Remote Command</b>	<b>:INPut:IMPedance:REFerence &lt;integer&gt;</b> <b>:INPut:IMPedance:REFerence?</b>
<b>Example</b>	Set the I/Q reference impedance to 50 Ω

	INP:IMP:REF 50
Preset	50 $\Omega$
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 $\Omega$ to 1 M $\Omega$
Min	1 $\Omega$
Max	1 M $\Omega$
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

## 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 an 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 "[I/Q Guided Calibration](#) on page 232").

## 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?

---

<b>Example</b>	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

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This is an alternate form of the SCPI that allows input as a power instead of a ratio.

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<b>Remote Command</b>	[ :SENSe]:CORRection:IQ:I Q:ATTenuation <rel_ampl>  [ :SENSe]:CORRection:IQ:I Q:ATTenuation?
<b>Example</b>	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

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## 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.

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<b>Key Path</b>	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
<b>Remote Command</b>	:INPut:OFFSet:I Q <voltage>  :INPut:OFFSet:I Q?
<b>Example</b>	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
<b>Remote Command</b>	:INPut:COUPling:I Q DC LFR1 LFR2 :INPut:COUPling:I Q?
<b>Example</b>	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
<b>Example</b>	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	<b>Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling</b>
<b>Example</b>	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	<b>Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling</b>
<b>Example</b>	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 232](#).

Key Path	<b>Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling</b>
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
<b>Remote Command</b>	:CALibration:IQ:PROBe:I Q:CLEar
<b>Example</b>	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

## RF Calibrator

Lets you choose a calibrator signal to look at or turns the calibrator "off".

Key Path	Input/Output
<b>Remote Command</b>	[ :SENSe]:FEED:AREFerence REF50 REF4800 OFF [:SENSe]:FEED:AREFerence?
<b>Example</b>	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 <b>4.8 GHz</b> 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

<b>Remote Command</b>	:CALibration:SOURce:STATE OFF ON 0 1
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	<b>:CALibration:SOURce:STATE?</b>
Notes	<p>For ESA backwards compatibility.</p> <p>In the ESA the calibrator was a separate output which you connected to the input and switched on with this command.</p> <p>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.</p> <p>When CALibration:SOURce:STATe? is received, 1 will be returned if any of the references is selected and 0 if the Calibrator is "Off"</p>
Preset	OFF
Initial S/W Revision	Prior to A.02.00

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### 50 MHz

Selects the 50 MHz internal reference as the input signal.

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Key Path	<b>Input/Output, RF Calibrator</b>
<b>Example</b>	:FEED:AREF REF50
Readback	50 MHz
Initial S/W Revision	Prior to A.02.00

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### 4.8 GHz

Selects the 4.8 GHz internal reference as the input signal.

---

Key Path	<b>Input/Output, RF Calibrator</b>
<b>Example</b>	: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 <b>4.8 GHz</b> 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

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### Off

Switches the input back to the selected input (RF or I/Q)

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Key Path	<b>Input/Output, RF Calibrator</b>
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<b>Example</b>	: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.

["More Information" on page 195](#)

Key Path	Input/Output, External Gain
<b>Remote Command</b>	<code>[ :SENSe]:CORRection:SA[:RF]:GAIN &lt;rel_ampl&gt;</code> <code>[ :SENSe]:CORRection:SA[:RF]:GAIN?</code>
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	<code>[ :SENSe]:CORRection:OFFSet[:MAGNitude]</code> 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
Modified at S/W Revision	A.14.00

## More Information

The U7227A USB Preamplifier is an accessory for the X-Series Signal Analyzer that provides gain externally, and whose gain settings are automatically loaded into the analyzer over USB whenever it is connected to one of the analyzer's USB ports.

While the USB Preamplifier is plugged into one of the analyzer's USB ports, the analyzer will consider it to be in the signal path of the RF Input and will apply the calibration data from the USB Preamp to measurements taken at the RF Input (on 2

input boxes, it will be considered to be in the signal path of RF Input 1; it is not supported for RF Input 2).

The USB Preamplifier contains its own cal data. This includes a noise trace suitable for use with NFE, for those models which support NFE. The act of connecting the Preamp to USB will cause the cal data to be downloaded from the preamp. When this happens an informational message is provided saying "Cal data loaded from USB Preamp". The analyzer will then automatically apply the calibration factors loaded from the Preamp in any measurement that supports the USB Preamp.

The External Preamp Gain setting may still be used, even though it is not required for the USB Preamp (since the USB Preamp supplies its own gain data to the analyzer which is applied automatically). Connecting the USB Preamp does not change the External Preamp Gain setting, however unless you have another gain or attenuation element in the signal path, the appropriate setting for External Preamp Gain is 0 dB.

Overload detection and reporting will apply when the USB preamplifier is connected to USB. The USB Preamplifier has its own overload detector which reports overloads to the instrument over USB. This generates an error condition, "Input Overload;USB Preamp."

If, while the USB Preamp is connected to USB, a measurement is selected that does not support the USB preamplifier, the "No result; Meas invalid with Preamp" error condition is generated.

## MS

Sets an external gain/attenuation value for MS (Mobile Station) tests.

Key Path	Input/Output, External Gain
<b>Remote Command</b>	<pre>[ :SENSe]:CORRection:MS[:RF]:GAIN &lt;rel_ampl&gt; [ :SENSe]:CORRection:MS[:RF]:GAIN?</pre>
<b>Example</b>	<p>CORR:MS:GAIN 10 sets the Ext Gain value to 10 dB</p> <p>CORR:MS:GAIN -10 sets the Ext Gain value to -10 dB (that is, a loss of 10 dB.)</p>
Notes	Does not auto return.
Dependencies	<p>The reference level limits are determined in part by the External Gain, Max Mixer Level, RF Attenuation</p> <p>This key is grayed out in modes that do not support MS.</p>
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

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<b>Remote Command</b>	<code>[ :SENSe]:CORRection:MS[:RF]:LOSS &lt;rel_ampl&gt;</code> <code>[ :SENSe]:CORRection:MS[:RF]:LOSS?</code>
<b>Example</b>	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

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## BTS

Sets an external attenuation value for BTS (Base Transceiver Station) tests.

---

Key Path	Input/Output, External Gain
<b>Remote Command</b>	<code>[ :SENSe]:CORRection:BTS[:RF]:GAIN &lt;rel_ampl&gt;</code> <code>[ :SENSe]:CORRection:BTS[:RF]:GAIN?</code>
<b>Example</b>	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 Attenuation. 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

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<b>Remote Command</b>	<code>[ :SENSe]:CORRection:BTS[:RF]:LOSS &lt;rel_ampl&gt;</code> <code>[ :SENSe]:CORRection:BTS[:RF]:LOSS?</code>
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<b>Example</b>	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 the I channel input. However, when Q Gain in I+jQ is set to Same as I Gain, this value is applied to both I and Q channel inputs.

Key Path	Input/Output, External Gain
<b>Remote Command</b>	[ :SENSe] :CORRection:IQ:I:GAIN <rel_ampl> [ :SENSe] :CORRection:IQ:I:GAIN?
<b>Example</b>	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
Dependencies	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 the Q channel input.

Key Path	Input/Output, External Gain
<b>Remote Command</b>	[ :SENSe]:CORRection:IQ:Q:GAIN <rel_ampl> [ :SENSe]:CORRection:IQ:Q:GAIN?
<b>Example</b>	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
Dependencies	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, <1 Ext Gain> dB
Initial S/W Revision	Prior to A.02.00

### Q Gain in I+jQ

When Same as I Gain is selected, I Ext Gain value is applied to both I and Q channel input if the Input Path is I+jQ. When Independent is selected, I and Q Ext Gain values are applied to I and Q channel input independently.

Key Path	Input/Output, External Gain
<b>Remote Command</b>	[ :SENSe]:CORRection:IQ:Q:GAIN:COUPle ON OFF 0 1 [ :SENSe]:CORRection:IQ:Q:GAIN:COUPle?
<b>Example</b>	CORR:IQ:Q:GAIN:COUP ON CORR:IQ:Q:GAIN:COUP?
Preset	ON
State Saved	Saved in instrument state.
Range	Same as I Gain Independent
Initial S/W Revision	14.50

### 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
<b>Example</b>	: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 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, I/Q Analyzer, Phase Noise, VXA, RTSA, EMI Receiver, DVB-T/H, DTMB, DVB-T/H, DTMB, W-CDMA, LTE & LTE-Adv FDD, LTE & LTE-Adv TDD, Sequence Analyzer, BTooth, WLAN
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

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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
Modified at S/W Revision	x.14.50

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### 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, I/Q Analyzer, Phase Noise, VXA, RTSA, EMI Receiver, DVB-T/H, DTMB, DVB-T/H, DTMB, W-CDMA, LTE & LTE-Adv FDD, LTE & LTE-Adv TDD, Sequence Analyzer, BTooth
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 Correction 7 Correction 8
Initial S/W Revision	A.02.00
Modified at S/W Revision	x.14.50

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### Correction On/Off

Turning the Selected Correction from the OFF state to the ON state allows the values in it to be applied to the data. This state transition 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
<b>Remote Command</b>	[ :SENSe]:CORRection:CSET[1] 2 ... 8[:STATe] ON OFF 1 0 [ :SENSe]:CORRection:CSET[1] 2 ... 8[:STATe]?
<b>Example</b>	SENS:CORR:CSET1 ON
Dependencies	Changing this from the OFF state to the ON state 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.

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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 <a href="#">Restore Input/Output Defaults</a>
State Saved	Saved in instrument state.
Backwards Compatibility Notes	Unlike legacy analyzers, Preset does not turn Corrections off (Restore Input/Output Defaults does).
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.14.00

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## Properties

Accesses a menu that lets you set the properties of the selected correction.

Key Path	<a href="#">Input/Output, Corrections</a>
Initial S/W Revision	A.02.00

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## 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	<a href="#">Input/Output, Corrections</a>
Mode	SA, I/Q Analyzer, Phase Noise, VXA, RTSA, EMI Receiver, DVB-T/H, DTMB, DVB-T/H, DTMB, W-CDMA, LTE & LTE-Adv FDD, LTE & LTE-Adv TDD, Sequence Analyzer, BTooth
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by <a href="#">Restore Input/Output Defaults</a>
Readback	Correction 1 Correction 2 Correction 3 Correction 4 Correction 5 Correction 6 Correction 7 Correction 8
Initial S/W Revision	A.02.00
Modified at S/W Revision	x.14.50

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## 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 dB $\mu$ V, 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 specified or 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, I/Q Analyzer, Phase Noise, VXA, RTSA, EMI Receiver, DVB-T/H, DTMB, DVB-T/H, DTMB, W-CDMA, LTE & LTE-Adv FDD, LTE & LTE-Adv TDD, Sequence Analyzer, BTooth
<b>Remote Command</b>	<code>[ :SENSe]:CORRection:CSET[1]:ANTenna[:UNIT] GAUSS   PTES1a   UVM   UAM   UA   NOConversion</code> <code>[ :SENSe]:CORRection:CSET[1]:ANTenna[:UNIT]?</code>
<b>Example</b>	<code>CORR:CSET:ANT GAUS</code>
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
Modified at S/W Revision	x.14.50

### 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
<b>Example</b>	<code>:CORR:CSET:ANT NOC</code>
Readback	"None"
Initial S/W Revision	A.02.00

### dB $\mu$ V/m

Sets the antenna unit to dB $\mu$ V/m. If this correction is turned on, and Apply Corrections is on, the Y Axis Unit will then be forced to dB $\mu$ V/m and all other Y Axis Unit selections will be grayed out.

Key Path	Input/Output, Corrections, Properties, Antenna Unit
<b>Example</b>	:CORR:CSET:ANT UVM
Readback	"dB $\mu$ V/m"
Initial S/W Revision	A.02.00

### **dB $\mu$ A/m**

Sets the antenna unit to dB $\mu$ A/m. If this correction is turned on, and Apply Corrections is on, the Y Axis Unit will then be forced to dB $\mu$ A/m and all other Y Axis Unit selections will be grayed out.

Key Path	Input/Output, Corrections, Properties, Antenna Unit
<b>Example</b>	:CORR:CSET:ANT UVA
Readback	"dB $\mu$ A/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
<b>Example</b>	: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
<b>Example</b>	:CORR:CSET:ANT GAUS
Readback	"dBG"
Initial S/W Revision	A.02.00

## 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 205

Key Path	Input/Output, Corrections, Properties
<b>Remote Command</b>	[ :SENSe]:CORRection:CSET[1] 2 ... 8:X:SPACing LINear   LOGarithmic [ :SENSe]:CORRection:CSET[1] 2 ... 8:X:SPACing?
<b>Example</b>	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
Modified at S/W Revision	A.14.00

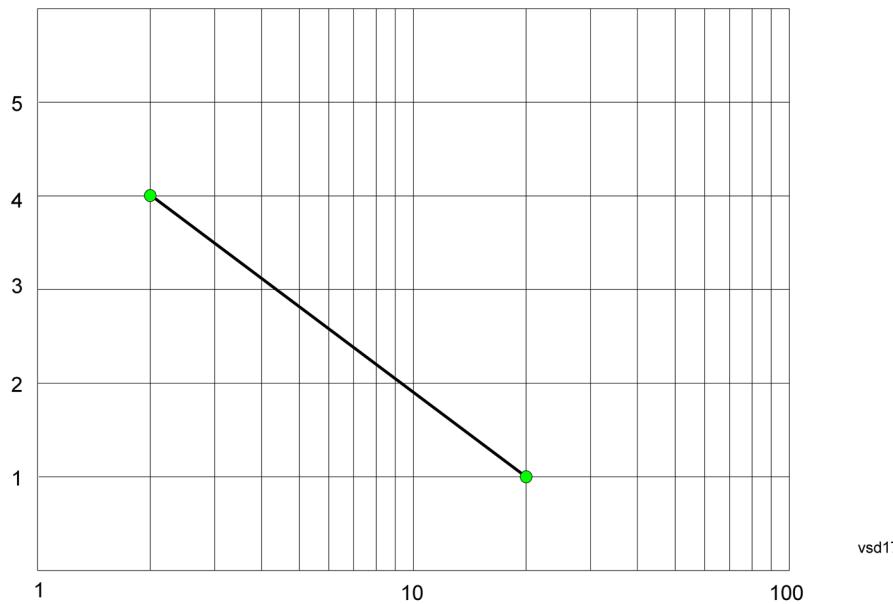
## Interpolation

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.

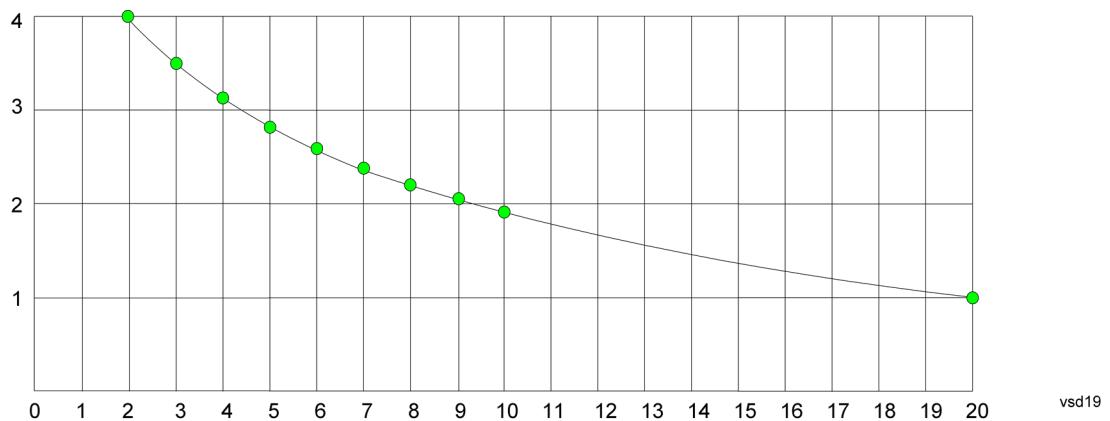
To effect this correction, the goal, for any particular start and stop frequency, is to build a correction trace, whose number of points matches the current Sweep Points setting of the instrument, which will be used to apply corrections on a bucket by bucket basis to the data traces.

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.

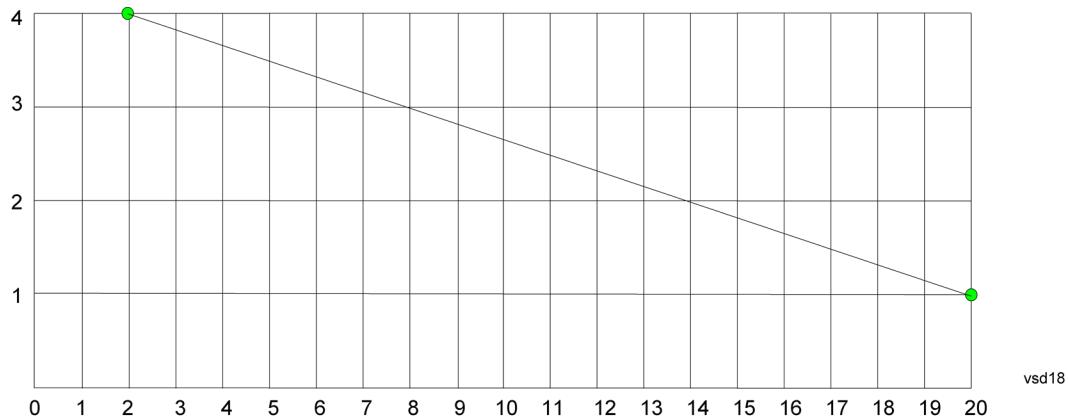
If we interpolate on a log scale, we assume that the line between the two points is a straight line on the log scale. For example, let's say the two points are (2,4) and (20,1). A straight line between them on a log scale looks like:



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
<b>Remote Command</b>	[ :SENSe]:CORRection:CSET[1] 2 ... 8:DESCription "text" [ :SENSe]:CORRection:CSET[1] 2 ... 8:DESCription?
<b>Example</b>	: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 <b>Restore Input/Output Defaults</b>
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.14.00

### 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
<b>Remote Command</b>	[ :SENSe]:CORRection:CSET[1] 2 ... 8:COMMENT "text" [ :SENSe]:CORRection:CSET[1] 2 ... 8:COMMENT?
<b>Example</b>	: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 <b>Restore Input/Output Defaults</b>
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.14.00

### 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.

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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.

When editing a correction, the editor remembers which correction and which element in the correction array you were editing, and returns you to that correction and that element when you return to the editor after leaving it.

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Key Path	Input/Output, Corrections
Initial S/W Revision	A.02.00

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## Navigate

Lets you move through the table to edit the desired point.

Key Path	<b>Input/Output, Corrections, Edit</b>
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	<b>Input/Output, Corrections, Edit</b>
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	<b>Input/Output, Corrections, Edit</b>
Notes	There is no value readback on the key.
Min	-1000 dB
Max	1000 dB
Initial S/W Revision	A.02.00

### Insert Point Below

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	<b>Input/Output, Corrections, Edit</b>
Initial S/W Revision	A.02.00

### Delete Point

Deletes the currently-selected point, whether or not that point is being edited, and selects the Navigate functionality. The point following the currently-selected point (or the point preceding if there is none) will be selected.

Key Path	Input/Output, Corrections, Edit
Initial S/W Revision	A.02.00

### Scale X Axis

Matches the X Axis to the selected Correction, as well as possible. Sets the Start and Stop Frequency to contain the minimum and maximum Frequency of the selected Correction. 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. If in zero-span, or there is no data in the Ampcor table, or the frequency range represented by the table is zero, 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	Input/Output, Corrections, 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 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
<b>Remote Command</b>	[ :SENSe]:CORRection:CSET[1] 2 ... 6:DELete
<b>Example</b>	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 201) are used.

Key Path	Input/Output, Corrections
<b>Remote Command</b>	[ :SENSe] :CORRection:CSET:ALL[:STATe] ON OFF 1 0 [ :SENSe] :CORRection:CSET:ALL[:STATe]?
<b>Example</b>	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
<b>Remote Command</b>	[ :SENSe] :CORRection:CSET:ALL:DELete
<b>Example</b>	CORR:CSET:ALL:DEL
Initial S/W Revision	A.02.00

### Freq Ref In

Specifies the frequency reference as being the internal reference at the rear panel input labeled EXT REF IN, a 1 pulse per second signal at the EXT REF IN input,, external reference or sensing the presence of a signal at the EXT REF IN input.

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.

When the frequency reference is set to Pulse, the instrument expects a 1 pulse per second signal at the EXT REF IN input. The instrument uses this signal to adjust the frequency of the internal reference.

If Sense is selected, the instrument checks whether a signal is present at the external reference connector. If it senses a signal within 5 ppm of the External Ref Freq (as set on the **External Ref Freq** softkey), it will automatically switch to the external reference. If it senses a 1 pulse per second signal, it enters Pulse mode,

wherein the signal is used to adjust the internal reference. When no signal is present, it automatically switches to the internal reference. No message is generated as the reference switches between pulse, 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 1 in the Questionable Frequency register will be true and a condition error message is generated. When lock is regained, Status bit 1 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.

On the M9420A module, there is no internal frequency reference. To work correctly, a 100MHz external frequency reference signal is needed to connect to the front panel of the module. The default Freq Ref In setting is "External" and it cannot be set to any other types.

Key Path	Input/Output
<b>Remote Command</b>	<code>[SENSe]:ROSCillator:SOURce:TYPE INTernal   EXTernal   SENSe   PULSe</code> <code>[SENSe]:ROSCillator:SOURce:TYPE?</code>
Dependencies	The PULSe parameter, and support of the 1 pps signal at the EXT REF IN input, are not available in firmware prior to A.13.00. They are also not available in some model numbers. If not available, the Pulse key will be blank, and sending the PULSe parameter via SCPI will generate an error.  On the M9420A, only the EXTernal choice is available.
Preset	This is unaffected by Mode Preset but is set to the Preset value 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 1 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
Modified at S/W Revision	A.14.00

<b>Remote Command</b>	<code>[SENSe]:ROSCillator:SOURce?</code>
Notes	<p>The query [SENSe]:ROSCillator:SOURce? returns the current switch setting. This means:</p> <ul style="list-style-type: none"> <li>7. If it was set to SENSe but there is no external reference nor 1pps signal so the instrument is actually using the internal reference, then this query returns INTernal and not SENSe.</li> <li>8. If it was set to SENSe and there is an external reference present, the query returns</li> </ul>

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EXternal and not SENSe.

9. If it was set to SENSe and there is a 1 pps signal present, the query returns PULSe and not SENSe.
10. If it was set to EXTernal, then the query returns "EXTernal"
11. If it was set to INTernal, then the query returns "INTernal".
12. If it was set to PULSe, then the query returns "PULSe"

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Backwards Compatibility Notes	<p>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.</p> <p>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.</p> <p>Thus the query form of this command is 100% backwards compatible with both instruments.</p>
Initial S/W Revision	Prior to A.02.00

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**Remote Command**      [:SENSe]:ROSCillator:SOURce INTERNAL|EXTernal

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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

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### Sense

If Sense is selected, the instrument checks whether a signal is present at the external reference connector. If it senses a signal within 5 ppm of the External Ref Freq (as set on the **External Ref Freq** softkey), it will use this signal as an External Reference. If it senses a 1 pulse per second signal, it will use this signal to adjust the internal reference by adjusting the User setting of the Timebase DAC. When no signal is present, it automatically switches to the internal reference.

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Key Path	Input/Output, Freq Ref In
<b>Example</b>	:ROSC:SOUR:TYPE SENS
Couplings	If set to SENSe and the analyzer senses a 1 pulse per second signal, it sets the System, Alignments, Timebase DAC setting to "User". This setting survives Preset and Power Cycle but is set to "Calibrated" on a System, Restore Defaults, Align or a System, Restore Defaults, All
Readback	Sense
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

---

## Internal

The internal reference is used. A 1 pps signal at the EXT REF IN port, or a signal there between 1 and 50 MHz, will cause a warning triangle to appear in the settings panel next to the word "INTERNAL", but will otherwise be ignored.

Key Path	Input/Output, Freq Ref In
<b>Example</b>	:ROSC:SOUR:TYPE INT
Readback	Internal
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## External

The external reference is used.

Key Path	Input/Output, Freq Ref In
<b>Example</b>	: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
<b>Remote Command</b>	[ :SENSe]:ROSCillator:EXTernal:FREQuency <freq> [ :SENSe]:ROSCillator:EXTernal:FREQuency?
<b>Example</b>	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.
Dependencies	Still available with Internal or Pulse selected, to allow setup for when External is in use. However,

---

	the setting has no effect if the Internal Reference is in use (Freq Ref In set to Internal, Pulse, or SENSE:INT or SENSE:PULSE).
Preset	This is unaffected by a Mode Preset or an "Input/Output Preset" or "Restore Defaults, Input/Output" but is set to 10 MHz on a "Restore Defaults, Misc" or "Restore Defaults, All" or by pressing the "Default External Ref Freq" button.
Min	CXA: 10 MHz EXA: 10 MHz MXA: 1 MHz PXA: 1 MHz M9420A: 100 MHz N8973B, N8974B, N8975B, or N8976B: 10 MHz M9420A: 100 MHz
Max	CXA: 10 MHz EXA: 10 MHz EXA with option R13: 20 MHz MXA: 50 MHz PXA: 50 MHz N8973B, N8974B, N8975B, or N8976B: 10 MHz M9420A: 100 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

---

### Default External Ref Freq

This button restores the External Ref Freq to its default of 10 MHz.

When you set an External Ref Freq value with the Ext Ref Freq control, that Frequency is persistent; is not affected by Mode Preset or Input/Output Preset, and survives shutdown and power cycle. This control allows you to reset the External Ref Freq to its default value.

**NOTE**

The persistence of the External Ref Freq is a new behavior as of firmware version A.18.00, necessitating the addition of this control. In versions before A.18.00, the frequency reset on a power cycle/restart. Thus you may need to use this command to retain backwards compatibility.

---

Key Path	Input/Output, Freq Ref Input
Remote Command	[ :SENSe]:ROSCillator:EXTernal:FREQuency:DEFault
Example	ROSC:EXT:FREQ:DEF resets the external ref frequency

---

Notes	This is command only, there is no query
Dependencies	Grayed out if the Ext Ref Freq is already set to the default
Initial S/W Revision	A.18.00

### 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  $-134 \text{ dBc/Hz}$  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  $-120 \text{ dBc/Hz}$  at 10 Hz offset.

Key Path	Input/Output, Freq Ref In
Scope	Mode Global
<b>Remote Command</b>	<code>[ :SENSe]:ROSCillator:BANDwidth WIDE NARRow</code> <code>[ :SENSe]:ROSCillator:BANDwidth?</code>
<b>Example</b>	<code>ROSC:BAND WIDE</code>
Dependencies	Still available with Internal or Pulse selected, to allow setup for when External is in use. However, the setting has no effect if the Internal Reference is in use (Freq Ref In set to Internal, Pulse, or SENSE:INT or SENSE:PULSE). 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
Modified at S/W Revision	A.14.00

### 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.

**External reference problem.**  
**Data acquisition suspended.**  
**To resume data acquisition, fix the problem and press the Restart key**  
**OR**  
**Press the following keys:**

**Input/Output, More 1 of 2, Freq Ref In,**  
**External Ref Coupling, Normal**  
**OR**  
**Input/Output, More 1 of 2,**  
**Freq Ref In, Internal**

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	<b>Input/Output, Freq Ref In</b>
Mode	All
<b>Remote Command</b>	<b>[ :SENSe]:ROSCillator:COUPLing NORMAL NACQuisition</b> <b>[ :SENSe]:ROSCillator:COUPLing?</b>
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	<b>Input/Output</b>
Backwards	In ESA there was not a user interface to enable the Video Output (Analog Output), Trigger Output,

---

Compatibility Notes	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

Select the type of output signal that will be output from the Trig 1 Out, or Trig 2 Out connectors.

---

Key Path	Input/Output, Output Config
<b>Remote Command</b>	:TRIGger TRIGger1 TRIGger2[:SEQUence]:OUTPUT HSWP   MEASuring   MAIN   GATE   GTRigger   OEVen   SPoint   SSWeep   SSETtled   S1Marker   S2Marker   S3Marker   S4Marker   OFF :TRIGger TRIGger1 TRIGger2[:SEQUence]:OUTPUT?
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger TRIGger1 TRIGger2[:SEQUence]:OUTPUT:POLarity POSitive   NEGative :TRIGger TRIGger1 TRIGger2[:SEQUence]:OUTPUT:POLarity?
<b>Example</b>	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	<b>Input/Output, Output Config, Trig 1/2 Output</b>
<b>Example</b>	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	<b>Input/Output, Output Config, Trig 1/2 Output</b>
<b>Example</b>	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	<b>Input/Output, Output Config, Trig 1/2 Output</b>
<b>Example</b>	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	<b>Input/Output, Output Config, Trig 1/2 Output</b>
----------	---

---

<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	TRIG1:OUTP GATE
Readback	Gate
Initial S/W Revision	Prior to A.02.00

### Source Point Trigger

Selects the gate signal to be output to the Trig 1 Out, or Trig 2 Out, connector for use as the Point Trigger when operating an external source in Tracking mode. When Ext Trigger 1 is selected as the Point Trigger under Source, the Source Point Trigger under Trig1 Out automatically gets selected. Similarly, when Ext Trigger 2 is selected as the Point Trigger under Source, the Source Point Trigger key under Trig 2 Out automatically gets selected

Key Path	Input/Output, Output Config, Trig 1/2 Output
<b>Example</b>	TRIG1:OUTP SPO
Readback	Source Point
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	<b>Input/Output, Output Config, Trig 1/2 Output</b>
<b>Example</b>	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 222

Key Path	<b>Input/Output, Output Config</b>
<b>Remote Command</b>	:OUTPUT:ANALOG OFF SVIDEO LOGVIDEO LINVIDEO DAUDIO :OUTPUT:ANALOG?
Example	OUTP:ANAL SVIDEo ! causes the analog output type to be Screen Video
Preset	This is unaffected by Preset but is set to DAUDIO on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Preset	OFF
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
<b>Remote Command</b>	<b>OUTPut:ANALog:AUTO OFF ON 0 1</b> <b>OUTPut:ANALog:AUTO?</b>
<b>Example</b>	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	<b>Input/Output, Output Config, Analog Out</b>
Example	OUTP:ANAL SVID
Dependencies	<p>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.</p> <p>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.</p> <p>The output holds at its last value during an alignment and during a marker count. After a sweep:</p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- If no new sweep is to follow (as in Single sweep mode), the output remains live, and continues to show the pre-detector data</li> </ul> <p>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.</p>
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 " <a href="#">Backwards Compatibility</a> :" on page 224, 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	<p>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.</p> <p>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.</p> <p>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).</p> <p>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.</p>
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	<b>Input/Output, Output Config, Analog Out</b>
Example	OUTP:ANAL LINV
Dependencies	<p>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.</p> <p>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.</p> <p>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).</p> <p>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.</p>
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	<b>Input/Output, Output Config, Analog Out</b>
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
<b>Remote Command</b>	:OUTPUT:DBUS[1][:STATE] ON OFF 1 0 :OUTPUT:DBUS[1][:STATE]?
<b>Example</b>	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

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Modified at S/W	A.04.00
Revision	

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### 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
<b>Remote Command</b>	:OUTPut:IQ:OUTPUT IQ1 IQ250 OFF :OUTPut:IQ:OUTPUT?
<b>Example</b>	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

---

### 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	<b>Input/Output, Output Config, I/Q Cal Out</b>
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	<b>Input/Output, Output Config</b>
<b>Remote Command</b>	: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	<b>Input/Output, Output Config, Aux IF Out</b>
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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	<b>Input/Output, Output Config, Aux IF Out</b>
Scope	Mode Global
<b>Remote Command</b>	:OUTPut:AUX:AIF <value> :OUTPut:AUX:AIF?
<b>Example</b>	: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	<b>Input/Output, Output Config, Aux IF Out</b>
<b>Example</b>	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 will interactively step you through the required steps, displaying diagrams to help with the connections. The steps will 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.

#### Next

Perform the I/Q Isolation calibration.

Key Path	Input/Output, I/Q, I/Q Cable Calibration
<b>Remote Command</b>	:CALibration:IQ:ISOLation
<b>Example</b>	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 will 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 will be displayed (see " <a href="#">Exit Confirmation</a> " on page 244 ).
Initial S/W Revision	Prior to A.02.00

## 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.

<b>Remote Command</b>	:CALibration:IQ:ISOLation:TIME?
<b>Example</b>	: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

## 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.

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Key Path	Input/Output, I/Q
Initial S/W Revision	Prior to A.02.00

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## I Port

The I port calibration is performed with the front panel's I port connected via a short BNC cable to the Cal Out port. The guided calibration will show a diagram of the required connections.

## Back

Return to the prior step in the calibration procedure.

---

Key Path	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
Initial S/W Revision	Prior to A.02.00

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## Next

Perform the I port calibration.

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Key Path	Input/Output, I/Q, I/Q Cable Calibrate...
<b>Remote Command</b>	:CALibration:IQ:FLATness:I
<b>Example</b>	CAL:IQ:FLAT:I
Notes	The recommended procedure is to use the same BNC cable to calibrate all I/Q ports. All I/Q ports should be calibrated sequentially during the procedure.  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.
Notes	The I port must be connected to the Cal Out port before issuing the SCPI command.
State Saved	No.
Initial S/W Revision	Prior to A.02.00

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## Exit

Exit 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 Calibrate...
Notes	Using the Exit button will 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

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is to redo the calibration step.

When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see "[Exit Confirmation](#)" on page 244).

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Initial S/W Revision	Prior to A.02.00
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## I-bar Port

The I-bar port calibration is performed with the front panel's I-bar port connected via a short BNC cable to the Cal Out port. The guided calibration will show a diagram of the required connections.

### Back

Return to the prior step in the calibration procedure.

---

Key Path	<b>Input/Output, I/Q, I/Q Cable Calibration</b>
Notes	Using the Back button will not restore the calibration data to a prior state. Once a port is calibrated the data is stored immediately and the only way to change it is to redo the calibration step. The Back button allows the user to go back to a prior step to redo that calibration step.
Initial S/W Revision	Prior to A.02.00

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### Next

Perform the I-bar port calibration.

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Key Path	<b>Input/Output, I/Q, I/Q Cable Calibrate...</b>
<b>Remote Command</b>	:CALibration:IQ:FLATness:IBAR
<b>Example</b>	CAL:IQ:FLAT:IBAR
Notes	The recommended procedure is to use the same BNC cable to calibrate all I/Q ports. All I/Q ports should be calibrated sequentially during the procedure.  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.
Notes	The I-bar port must be connected to the Cal Out port before issuing the SCPI command.
State Saved	No
Initial S/W Revision	Prior to A.02.00

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### Exit

Exit the calibration procedure. All ports calibrated before pressing Exit will use the newly acquired calibration data.

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Key Path	<b>Input/Output, I/Q, I/Q Cable Calibrate...</b>
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Notes	Using the Exit button will 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 will be displayed (see " <a href="#">Exit Confirmation</a> " on page 244 ).
Initial S/W Revision	Prior to A.02.00

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## Q Port

The Q port calibration is performed with the front panel's Q port connected via a short BNC cable to the Cal Out port. The guided calibration will show a diagram of the required connections.

### Back

Return to the prior step in the calibration procedure.

---

Key Path	<a href="#">Input/Output, I/Q, I/Q Cable Calibrate...</a>
Notes	Using the Back button will not restore the calibration data to a prior state. Once a port is calibrated the data is stored immediately and the only way to change it is to redo the calibration step. The Back button allows the user to go back to a prior step to redo that calibration step.
Initial S/W Revision	Prior to A.02.00

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## Next

Perform the Q port calibration.

---

Key Path	<a href="#">Input/Output, I/Q, I/Q Cable Calibrate...</a>
<b>Remote Command</b>	:CALibration:IQ:FLATness:Q
<b>Example</b>	CAL:IQ:FLAT:Q
Notes	The recommended procedure is to use the same BNC cable to calibrate all I/Q ports. All I/Q ports should be calibrated sequentially during the procedure.  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.
Notes	The Q port must be connected to the Cal Out port before issuing the SCPI command.
State Saved	No
Initial S/W Revision	Prior to A.02.00

---

## Exit

Exit the calibration procedure. All ports calibrated before pressing Exit will use the newly acquired calibration data.

---

Key Path	<b>Input/Output, I/Q, I/Q Cable Calibrate...</b>
Notes	<p>Using the Exit button will 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.</p> <p>When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see "<a href="#">Exit Confirmation</a>" on page 244 ).</p>
Initial S/W Revision	Prior to A.02.00

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### Q-bar Port

The Q-bar port calibration is performed with the front panel's Q-bar port connected via a short BNC cable to the Cal Out port. The guided calibration will show a diagram of the required connections.

#### Back

Return to the prior step in the calibration procedure.

---

Key Path	<b>Input/Output, I/Q, I/Q Cable Calibrate...</b>
Notes	<p>Using the Back button will not restore the calibration data to a prior state. Once a port is calibrated the data is stored immediately and the only way to change it is to redo the calibration step. The Back button allows the user to go back to a prior step to redo that calibration step.</p>
Initial S/W Revision	Prior to A.02.00

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#### Next

Perform the Q-bar port calibration.

---

Key Path	<b>Input/Output, I/Q, I/Q Cable Calibrate...</b>
<b>Remote Command</b>	:CALibration:IQ:FLATness:QBAR
<b>Example</b>	CAL:IQ:FLAT:QBAR
Notes	<p>The recommended procedure is to use the same BNC cable to calibrate all I/Q ports. All I/Q ports should be calibrated sequentially during the procedure.</p> <p>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.</p>
Notes	The Q-bar port must be connected to the Cal Out port before issuing the SCPI command.
State Saved	No
Initial S/W Revision	Prior to A.02.00

---

#### Exit

Exit 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 Calibrate...
Notes	<p>Using the Exit button will 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.</p> <p>When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see "<a href="#">Exit Confirmation</a>" on page 244 ).</p>
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.

<b>Remote Command</b>	:CALibration:IQ:FLATness:I IBAR Q QBAR:TIME?
<b>Example</b>	: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

The I/Q probe calibration creates correction data for one of the front panel I/Q channels. When the probe has EEPROM identification, the data is unique to that specific probe. When the probe does not have EEPROM identification, the data will be used for all probes of the same type. The data is also unique to the channel, so calibration data for the I channel will not be used for the Q channel and vice versa.

The guided calibration (front panel only) will show connection diagrams and guide the user through the I/Q Isolation Calibration and through 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 a user presses "Exit" to exit the calibration process, the data for the port 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 probe. 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 softkeys 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. The user 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.

For Active probes or when Differential is Off, only the main port is calibrated, otherwise both the main and complementary ports are calibrated.

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:PROB: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 relevant port will be displayed. For passive probes with Differential On, any calibration that is more than a day older than the most recent calibration will be displayed with the color amber.

## I Port

The I port calibration is performed with the probe body attached to the front panel's I port and the probe tip connected via an adapter to the Cal Out port. The guided calibration will show a diagram of the required connections.

### Show Adapter

Show a connection diagram and instructions for the probe and adapter. See "[Show Adapter Screen](#)" on page 244.

Key Path	<b>Input/Output, I/Q, I Setup, I Probe, Calibrate</b>
Notes	Either a passive or an active probe adapter diagram will be shown, depending on the type of probe attached.
Initial S/W Revision	Prior to A.02.00

### Back

Return to the prior step in the calibration procedure.

Key Path	<b>Input/Output, I/Q, Q Setup, Q Probe, Calibrate</b>
Initial S/W Revision	Prior to A.02.00

### Next

Perform the I port calibration.

<b>Key Path</b>	Input/Output, I/Q, I Setup, I Probe, Calibrate
<b>Remote Command</b>	:CALibration:IQ:PROBe:I
<b>Example</b>	CAL:IQ:PROB:I
Notes	<p>The I port must be connected to the Cal Out port before issuing the SCPI command.</p> <p>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.</p>
State Saved	No
Initial S/W Revision	Prior to A.02.00

### Exit

Exit the calibration procedure. All ports calibrated before pressing Exit will use the newly acquired calibration data.

<b>Key Path</b>	Input/Output, I/Q, I Setup, I Probe, Calibrate
Notes	<p>Using the Exit button will 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.</p> <p>When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see "<a href="#">Exit Confirmation</a>" on page 244).</p>
Initial S/W Revision	Prior to A.02.00

### I-bar Port

The I-bar port calibration is performed with the probe body attached to the front panel's I-bar port and the probe tip connected via an adapter to the Cal Out port. The I-bar probe calibration is only available for passive probes with Differential On. The guided calibration will show a diagram of the required connections.

### Show Adapter

Show a connection diagram and instructions for the probe and adapter. See "[Show Adapter Screen](#)" on page 244.

<b>Key Path</b>	Input/Output, I/Q, I Setup, I Probe, Calibrate
Notes	Either a passive or an active probe adapter diagram will be shown, depending on the type of probe attached.
Initial S/W Revision	Prior to A.02.00

### Back

Return to the prior step in the calibration procedure.

<b>Key Path</b>	<b>Input/Output, I/Q, I Setup, I Probe, Calibrate</b>
<b>Notes</b>	Using the Back button will not restore the calibration data to a prior state. Once a port is calibrated the data is stored immediately and the only way to change it is to redo the calibration step. The Back button allows the user to go back to a prior step to redo that calibration step.
<b>Initial S/W Revision</b>	Prior to A.02.00

## Next

Perform the I-bar port calibration.

<b>Key Path</b>	<b>Input/Output, I/Q, I Setup, I Probe, Calibrate</b>
<b>Remote Command</b>	<b>:CALibration:IQ:PROBe:IBar</b>
<b>Example</b>	CAL:IQ:PROB:IB
<b>Notes</b>	The I-bar 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.
<b>State Saved</b>	No
<b>Initial S/W Revision</b>	Prior to A.02.00

## Exit

Exit the calibration procedure. All ports calibrated before pressing Exit will use the newly acquired calibration data.

<b>Key Path</b>	<b>Input/Output, I/Q, I Setup, I Probe, Calibrate</b>
<b>Notes</b>	Using the Exit button will 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 will be displayed (see " <a href="#">Exit Confirmation</a> " on page 244 ).
<b>Initial S/W Revision</b>	Prior to A.02.00

## Q Port

The Q port calibration is performed with the probe body attached to the front panel's Q port and the probe tip connected via an adapter to the Cal Out port. The guided calibration will show a diagram of the required connections.

### Show Adapter

Show a connection diagram and instructions for the probe and adapter. See "[Show Adapter Screen](#)" on page 244.

---

Key Path	<b>Input/Output, I/Q, Q Setup, Q Probe, Calibrate</b>
Notes	Either a passive or an active probe adapter diagram will be shown, depending on the type of probe attached.
Initial S/W Revision	Prior to A.02.00

---

## Back

Return to the prior step in the calibration procedure.

---

Key Path	<b>Input/Output, I/Q, Q Setup, Q Probe, Calibrate</b>
Initial S/W Revision	Prior to A.02.00

---

## Next

Perform the Q port calibration.

---

Key Path	<b>Input/Output, I/Q, Q Setup, Q Probe, Calibrate</b>
<b>Remote Command</b>	:CALibration:IQ:PROBe:Q
<b>Example</b>	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

---

## Exit

Exit the calibration procedure. All ports calibrated before pressing Exit will use the newly acquired calibration data.

---

Key Path	<b>Input/Output, I/Q, Q Setup, Q Probe, Calibrate</b>
Notes	Using the Exit button will 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 redo the calibration step. When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see " <a href="#">Exit Confirmation</a> " on page 244 ).
Initial S/W Revision	Prior to A.02.00

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## Q-bar Port

The Q-bar port calibration is performed with the probe body attached to the front panel's Q-bar port and the probe tip connected via an adapter to the Cal Out port. The Q-bar probe calibration is only available for passive probes with Differential On. The guided calibration will show a diagram of the required connections.

### Show Adapter

Show a connection diagram and instructions for the probe and adapter. See "[Show Adapter Screen](#)" on page 244.

Key Path	<a href="#">Input/Output, I/Q, Q Setup, Q Probe, Calibrate</a>
Notes	Either a passive or an active probe adapter diagram will be shown, depending on the type of probe attached.
Initial S/W Revision	Prior to A.02.00

## Back

Return to the prior step in the calibration procedure.

Key Path	<a href="#">Input/Output, I/Q, Q Setup, Q Probe, Calibrate</a>
Notes	Using the Back button will not restore the calibration data to a prior state. Once a port is calibrated the data is stored immediately and the only way to change it is to redo the calibration step. The Back button allows the user to go back to a prior step to redo that calibration step.
Initial S/W Revision	Prior to A.02.00

## Next

Perform the Q-bar port calibration.

Key Path	<a href="#">Input/Output, I/Q, Q Setup, Q Probe, Calibrate</a>
<b>Remote Command</b>	:CALibration:IQ:PROBe:QBar
<b>Example</b>	CAL:IQ:PROB:QB
Notes	The Q-bar 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

## Exit

Exit the calibration procedure. All ports calibrated before pressing Exit will use the newly acquired calibration data.

Key Path	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
Notes	<p>Using the Exit button will 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.</p> <p>When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see "<a href="#">Exit Confirmation</a>" on page 244 ).</p>
Initial S/W Revision	Prior to A.02.00

## Show Adapter Screen

When one of the Probe Calibration Show Adapter buttons is pressed, a diagram of the probe with its adapter will be shown. Depending on the type of probe attached, either the Passive Probe Adapter or the Active Probe Adapter diagram will be shown.

## 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.

<b>Remote Command</b>	:CALibration:IQ:PROBe:I IBAR Q QBAR:TIME?
<b>Example</b>	: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 will be 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

## 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 will appear to confirm that the user really wants to exit. A "Yes" answer will exit the calibration procedure, leaving potentially inconsistent calibration data in place. A "No" answer will return to the calibration procedure.

## 5 Mode Functions

## 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 be different between modes. The information displayed in Help is about 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.

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For more information on Modes, preloading Modes, and memory requirements for Modes,

see "More Information" on page 248

Key Path	Front-panel key
<b>Remote Command</b>	:INSTRument[:SElect] SA   RTSA   SEQAN   EMI   BASIC   WCDMA   EDGEGSM   WIMAXOFDMA   VSA   PNOISE   NFIGure   ADEM0D   BTooth   TDSCDMA   CDMA2K   CDMA1XEV   LTE   LTETDD   LTEAFDD   LTEATDD   MSR   DVB   DTMB   DCTV   ISDBT   CMMB   WLAN   CWLAN   CWIMAXOFDM   WIMAXFIXED   IDEN   RLC   SCPILC   VSA89601 :INSTRument[:SElect]?
<b>Example</b>	: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. A list of the valid mode choices is returned with the INST:CAT? Query.
Preset	This is unaffected by a Preset but is set on a "Restore System Defaults->All" to: For N9038A: EMI For N8973B, N8974B, N8975B, or N8976B: NFIG For all other models: SA
State Saved	Saved in instrument state
<b>Backwards Compatibility SCPI</b>	:INSTRument[:SElect] GSM provided for backwards compatibility. Mapped to EDGEGSM.
<b>Backwards Compatibility SCPI</b>	:INSTRument[:SElect] SANalyzer provided for ESU compatibility. When this command is received, the analyzer aliases it to the following: INST:SEL SCPILC

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	This results in the analyzer being placed in SCPI Language Compatibility Mode, in order to emulate the ESU Spectrum Analyzer Mode.
<b>Backwards Compatibility SCPI</b>	<p><b>:INSTRument[:SELect] RECeiver</b> provided for ESU compatibility. When this command is received, the analyzer aliases it to the following:</p> <p><b>:INST:SEL EMI</b> <b>:CONF FSC</b></p>
	This results in the analyzer 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

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Modified at S/W Revision	A.13.00
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Control Type	SCPI only
<b>Remote Command</b>	<p><b>:INSTRument:CONFigure:&lt;mode&gt;:&lt;meas&gt;</b> Where &lt;mode&gt; is a valid parameter for the INST:SEL command and &lt;meas&gt; is a valid parameter for the CONF command in the Mode specified by &lt;mode&gt;</p>
<b>Example</b>	<p><b>:INST:CONF:SA:SAN</b> selects the Spectrum Analyzer mode and the Swept SA measurement <b>:INST:CONF:WCDMA:RHO</b> selects the WCDMA mode and the Mod Accuracy measurement</p>
Notes	The available parameters for <mode> are dependent upon installed and licensed applications resident in the instrument. The available parameters for <meas> are dependent on the <mode> parameter and the valid measurements available for that mode, which can depend on model numbers and installed options. In general this command will execute more quickly than sending the equivalent separate INST:SEL and :CONF commands.
Initial S/W Revision	A.17.50

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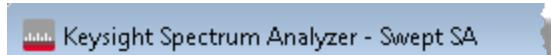
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<b>Example</b>	<b>:INST 'SA'</b>
Notes	<p><b>NOTE</b> The query is not a quoted string. It is an enumeration as indicated in the Instrument Select table above.</p> <p>The command must be sequential: i.e. continued parsing of commands cannot proceed until the instrument select is complete and the resultant SCPI trees are available.</p>
<b>Backwards Compatibility SCPI</b>	<b>:INSTRument[:SELect] 'SA'   'PNOISE'   'EDGE'   'GSM'   'BASIC'</b>
Initial S/W Revision	Prior to A.02.00

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## 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:



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 applications Mode key or sending that applications :INST:SEL command over SCPI), there will be a pause while the Application is loaded. During this pause a message box that says “Loading application, please wait...” is displayed.

Each application (Mode) that runs in the X-Series signal analyzers consumes virtual memory. The various applications consume varying amounts of virtual memory, and as more applications run, the memory consumption increases. Once an application is run, some of its memory remains allocated even when it is not running, and is not released until the analyzer program (xSA.exe) is shut 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 and menu will appear that gives you 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. Bring up the Configure Applications utility in order to reconfigure the preloaded apps 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.

In each case except 4, this will cause the analyzer software to close, and you will lose all unsaved traces and results.

If you attempt to load a mode via SCPI that will exceed 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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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 and PXA 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

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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	INST:SEL ADEM0D INST:NSEL 234
Initial S/W Revision	Prior to A.02.00

## Real Time Spectrum Analyzer

The Real Time Spectrum Analyzer (RTSA) mode provides real-time signal analysis, very high probability-of-intercept for intermittent signals with appropriate triggers.

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
<b>Example</b>	INST:SEL RTSA or INST:NSEL 2
Initial S/W Revision	A.13.00

## 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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	INST:SEL LTETDD INST:NSEL 105
Initial S/W Revision	A.03.00

## LTE-Advanced FDD

As LTE-Advanced FDD and LTE modes are converged into one single application, the single softkey under Mode menu is designed to select the converged mode. The display mode of the LTE and LTE-Advanced FDD are distinguished by the licenses.

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
<b>Example</b>	INST:SEL LTEAFDD INST:NSEL 107
Notes	When the N9080A/80B-1FP exists, the display mode name is LTE. When the N9080A/80B-1FP and N9080B-2FP all exist, the display mode name is LTE FDD & LTE-A FDD.
<b>Backwards Compatibility SCPI</b>	INST:SEL LTE INST:NSEL 102
Initial S/W Revision	A.14.00
Modified at S/W Revision	A.14.50

## LTE-Advanced TDD

As LTE-Advanced TDD and LTE TDD modes are converged into one single application, the single softkey under Mode menu is designed to select the converged mode. The display mode of the LTE TDD and LTE-Advanced TDD are distinguished by the licenses.

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
<b>Example</b>	INST:SEL LTETDD INST:NSEL 108
Notes	When the N9082A/82B-1FP exists, the display mode name is LTE TDD.

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When the N9082A/82B-1FP and N9082B-2FP all exist, the display mode name is LTE TDD & LTE-A TDD.	
<b>Backwards Compatibility SCPI</b>	INST:SEL LTETDD INST:NSEL 105
Initial S/W Revision	A.14.00
Modified at S/W Revision	A.14.50

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## 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.

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Key Path	Mode
<b>Example</b>	INST:SEL DVB INST:NSEL 235
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.07.00

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## 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.

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Key Path	Mode
<b>Example</b>	INST:SEL DTMB INST:NSEL 236
Initial S/W Revision	A.02.00

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## 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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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.**

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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.

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Key Path	Mode
<b>Example</b>	INST:SEL RLC Or INST:NSEL 266
Initial S/W Revision	Prior to A.02.00

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## 89601 VSA

Selecting the 89601 VSA mode will start the 89600 VSA software. 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 R&D engineers. Even for proprietary and non-standard signals in SATCOM or MILCOM applications, you can make signal quality measurements with customized IQ constellation. Reach deeper into signals, gather more data on signal problems, and gain greater insight.

- Over 35 general-purpose analog and digital demodulators ranging from 2FSK to 4096QAM
- Flexible and custom IQ and OFDM signal analysis for single carrier
- Standards specific modulation analysis including:
  - Cellular: GSM/EDGE, cdma2000, W-CDMA, TD-SCDMA, LTE (FDD/TDD),
  - LTE-Advanced and more
  - Wireless networking: 802.11a/b/g, 802.11n, 802.ac, 802.16 WiMAX (fixed/mobile), WiSUN (MR-FSK PHY)
  - 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
- 20 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.keysight.com/find/89600vsa](http://www.keysight.com/find/89600vsa)

To learn more about how to use the 89600 VSA running in the X-Series, after the 89600 VSA software is running, open the 89600 VSA Help and open the "About Keysight X-Series Signal Analyzer with 89600 VSA Software" help topic.

Key Path	Mode
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	INST:SEL DCTV 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
<b>Example</b>	INST:SEL MSR INST:NSEL 106
Initial S/W Revision	A.09.491

## 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
<b>Example</b>	INST:SEL WLAN INST:NSEL 217
Initial S/W Revision	A.09.491

## 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 267 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
Real Time Spectrum Analyzer	2	RTSA
Sequence Analyzer	123	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	ADEMOM
Bluetooth	228	BTooth
TD-SCDMA with HSPA/8PSK	211	TDSCDMA

<b>Mode</b>	<b>Mode Number</b>	<b>Mode Parameter</b>
cdma2000	10	CDMA2K
1xEV-DO	15	CDMA1XEV
LTE	102	LTE
LTE TDD	105	LTETDD
LTE-Advanced FDD	107	LTEAFDD
LTE-Advanced TDD	108	LTEATDD
MSR	106	MSR
DVB-T/H with T2	235	DVB
DTMB (CTTB)	236	DTMB
Digital Cable TV	238	DCTV
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
Electronic Toll Collection	61	ETC

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<b>Remote Command</b>	:INSTRument:NSELect <integer> :INSTRument:NSELect?
<b>Example</b>	: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

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## 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.

<b>Remote Command</b>	:INSTRument:CATalog?
<b>Example</b>	: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,D MODULATION,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 264](#)

["Current Application Revision" on page 265](#)

["Current Application Options" on page 265](#)

### Current Application Model

Returns a string that is the Model Number of the currently selected application (mode).

<b>Remote Command</b>	:SYSTem:APPLication[:CURREnt][:NAME]?
<b>Example</b>	: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).

<b>Remote Command</b>	:SYST:APPLication[:CURRent]:REVision?
<b>Example</b>	: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).

<b>Remote Command</b>	:SYST:APPLication[:CURRent]:OPTION?
<b>Example</b>	: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 266

"Application Catalog Model Numbers" on page 266

"Application Catalog Revision" on page 266

"Application Catalog Options" on page 267

### Application Catalog Number of Entries

Returns the number of installed and licensed applications (Modes).

---

**Remote Command** :SYST: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

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### Application Catalog Model Numbers

Returns a list of Model Numbers for the installed and licensed applications (Modes).

---

**Remote Command** :SYST: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

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### Application Catalog Revision

Returns the Revision of the provided Model Number.

---

**Remote Command** :SYST: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

<b>Remote Command</b>	:SYST:APPLICATION:CATALOG:OPTION? <model>
<b>Example</b>	: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 :SYST: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 section contains an alphabetical list of Modes available in the X-Series, along with a brief description of each Mode.

Note that with the exception of the 89601 VSA, only licensed applications appear in the Mode menu. The 89601 will always appear, because its licensing is handled differently.

### 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
<b>Example</b>	INST:SEL CDMA1XEV INST:NSEL 15
Initial S/W Revision	Prior to 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
<b>Example</b>	INST:SEL WIMAXOFDMA INST:NSEL 75
Initial S/W Revision	Prior to 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
<b>Example</b>	INST:SEL WIMAXFIXED INST:NSEL 104
Initial S/W Revision	A.02.00

### 89601 VSA

Selecting the 89601 VSA mode will start the 89600 VSA software. 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 R&D engineers. Even for proprietary and non-standard signals in SATCOM or MILCOM applications, you can make signal quality measurements with customized IQ constellation. Reach deeper into signals, gather more data on signal problems, and gain greater insight.

- Over 35 general-purpose analog and digital demodulators ranging from 2FSK to 4096QAM
- Flexible and custom IQ and OFDM signal analysis for single carrier
- Standards specific modulation analysis including:
  - Cellular: GSM/EDGE, cdma2000, W-CDMA, TD-SCDMA, LTE (FDD/TDD),

- LTE-Advanced and more
- Wireless networking: 802.11a/b/g, 802.11n, 802.ac, 802.16 WiMAX (fixed/mobile), WiSUN (MR-FSK PHY)
- 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
- 20 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.keysight.com/find/89600vsa](http://www.keysight.com/find/89600vsa)

To learn more about how to use the 89600 VSA running in the X-Series, after the 89600 VSA software is running, open the 89600 VSA Help and open the "About Keysight X-Series Signal Analyzer with 89600 VSA Software" help topic.

Key Path	Mode
<b>Example</b>	INST:SEL VSA89601 INST:NSEL 101
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
<b>Example</b>	INST:SEL ADEM0D INST:NSEL 234
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
<b>Example</b>	INST:SEL BT INST:NSEL 228
Initial S/W Revision	A.06.01

## 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
<b>Example</b>	INST:SEL CDMA2K INST:NSEL 10
Initial S/W Revision	Prior to A.02.00

## 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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	INST:SEL CWIMAXOFDM INST:NSEL 81
Initial S/W Revision	A.02.00

### 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
<b>Example</b>	INST:SEL DCTV INST:NSEL 238
Initial 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
<b>Example</b>	INST:SEL DTMB INST:NSEL 236
Initial S/W Revision	A.02.00

### 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
<b>Example</b>	INST:SEL DVB INST:NSEL 235
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.07.00

### 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
<b>Example</b>	INST:SEL EMI INST:NSEL 141
Initial S/W Revision	A.07.01

## 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
<b>Example</b>	INST:SEL EDGEGSM INST:NSEL 13
Initial S/W Revision	Prior to A.02.00
Modified at 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
<b>Example</b>	INST:SEL IDEN INST:NSEL 103
Initial S/W Revision	A.02.00

## 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
<b>Example</b>	INST:SEL BASIC

	INST:NSEL 8
Initial S/W Revision	Prior to 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
<b>Example</b>	INST:SEL ISDBT INST:NSEL 239
Initial S/W Revision	A.03.00

## 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
<b>Example</b>	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
<b>Example</b>	INST:SEL LTETDD INST:NSEL 105
Initial S/W Revision	A.03.00

## 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
<b>Example</b>	INST:SEL MSR INST:NSEL 106
Initial S/W Revision	A.09.491

## 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
<b>Example</b>	INST:SEL NFIGURE INST:NSEL 219
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
<b>Example</b>	INST:SEL PNOISE or INST:NSEL 14
Initial S/W Revision	Prior to 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
<b>Example</b>	INST:SEL RLC Or INST:NSEL 266
Initial S/W Revision	Prior to A.02.00

## 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
<b>Example</b>	INST:SEL SCPILC Or INST:NSEL 270
Initial S/W Revision	A.06.00

## 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
<b>Example</b>	INST:SEL SA INST:NSEL 1
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
<b>Example</b>	INST:SEL TDSCDMA INST:NSEL 211
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 and PXA 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

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
<b>Example</b>	INST:SEL VSA INST:NSEL 100
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
<b>Example</b>	INST:SEL WCDMA INST:NSEL 9
Initial S/W Revision	Prior to A.02.00

### 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
<b>Example</b>	INST:SEL WLAN INST:NSEL 217
Initial S/W Revision	A.09.491

### 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
<b>Remote Command</b>	:INSTrument:COUPle:FREQuency:CENTER ALL NONE :INSTrument:COUPle:FREQuency:CENTER?
<b>Example</b>	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

<b>Remote Command</b>	:GLOBa1:FREQuency:CENTER[:STATe] 1 0 ON OFF :GLOBa1: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
<b>Remote Command</b>	:INSTRUMENT:COUPLE:DEFault
<b>Example</b>	INST:COUP:DEF
<b>Backwards Compatibility SCPI</b>	:GLOBal:DEFault
Initial S/W Revision	Prior to A.02.00

## Mode Setup

The Mode Setup menu contains setup functions that are global across the entire Mode. These functions are independent of which measurement is currently running – they are global to all measurements in the mode, or "Meas Global." The Mode Setup functions are not the only Meas Global functions in the analyzer; for example, the Trigger Setup functions are Meas Global, and there are even Mode Global functions (that is, the same for all Modes) in the Input/Output menu, but the fact that they are all Meas Global is a distinguishing characteristic of the Mode Setup functions.

The Mode Setup menu also contains the **Restore Mode Defaults** key. Most Meas Global functions are restored to their preset values by **Mode Preset**, however some variables are more persistent and are not preset until the **Restore Mode Defaults** key is pressed.

There are also a few Meas Global variables (for example, Global Center Frequency) that can be switched to be Mode Global, that is, the same for all modes. The keys under the Global Settings key control whether these variables are Mode Global or not.

In the Spectrum Analyzer mode, the Mode Setup functions include which radio standard and/or EMC standard is in use and how it is configured. A set of CISPR EMC presets is available as well.

The EMC keys require either the N6141A or W6141A application or Option EMC to be installed and licensed.

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

### Minimum Carrier Level

Specifies the minimum carrier level which is used by the carrier search algorithm.

Key Path	Mode Setup
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	[SENSe]:CARRier:THReShold:MINImum <amptd> [SENSe]:CARRier:THReShold:MINImum?
<b>Example</b>	CARR:THR:MIN -60dBm CARR:THR:MIN?
Preset	-50 dBm
State Saved	Saved in instrument state.
Min	-200 dBm
Max	30 dBm
<b>Backwards Compatibility SCPI</b>	[SENSe]:POWer:CARRier:MINImum

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Initial S/W Revision	A.16.00
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## Noise Reduction

Noise Reduction accesses a menu for configuring the noise compensation of the instrument. This menu only appears in models that support Noise Reduction.

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Key Path	Mode Setup
Initial S/W Revision	A.04.00

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## Noise Floor Extension

Allows you to turn on the **Noise Floor Extension** function in either of two states, Full or Adaptive.

In Full NFE, the expected noise power of the analyzer (derived from a factory calibration) is subtracted from the trace data. This will usually reduce the apparent noise level by about 10 dB in low band, and 8 dB in high band ( $\sim 3.6$  GHz).

In Adaptive NFE, there is not the same dramatic visual impact on the noise floor as there is in Full NFE. Adaptive NFE controls the amount of correction that is applied based on other analyzer settings like RBW, averaging and sweep time. Adaptive NFE controls the degree of potential improvement in the noise floor to give more improvement for those analyzer settings that can make good use of the potential improvement, such as settings that provide more averaging. The result is that when not much averaging is being performed, the signal displays more like the NFE-off case; and when lots of averaging is being performed, the signal displays more like the full-NFE case.

Adaptive NFE is recommended for general-purpose use. For fully ATE (automatic test equipment) applications, where the distraction of a person using the instrument is not a risk, Full NFE is recommended.

NFE works with any RBW, VBW, detector, any setting of Average Type, any amount of trace averaging, and any signal type. It is ineffective when the trace is not smoothed (smoothing processes include narrow VBWs, trace averaging, and long sweep times with the detector set to Average or Peak). It works best with extreme amounts of smoothing, and with the average detector, with the Average Type set to Power.

In those cases where the cancellation is ineffective, it nonetheless has no undesirable side-effects. There is no significant speed impact to having **Noise Floor Extension** on.

The best accuracy is achieved when substantial smoothing occurs in each point before trace averaging. Thus, when using the average detector, results are better with long sweep times and fewer trace averages. When using the sample detector, the VBW filter should be set narrow with less trace averaging, instead of a wide VBW filter with more trace averaging.

**NOTE**

Noise Floor Extensions has no effect unless the RF Input is selected, therefore it does nothing when External Mixing is selected.

With the introduction of Adaptive NFE, in firmware version A.18.00, the default state of NFE is now Adaptive. Before the introduction of Adaptive NFE, NFE was Off by default.

With the introduction of Adaptive NFE, the menu control is changed from On|Off to Full|Adaptive|Off. For SCPI Backwards Compatibility, the existing SCPI command to turn NFE on and off is retained, and a new command is added to set the state to turn Adaptive On and Off, as follows:

- [:SENSe]:CORRection:NOISE:FLOor ON|OFF|1|0 is retained, default changed to ON
- [:SENSe]:CORRection:NOISE:FLOor:ADAPtive ON|OFF|1|0 is added, default=ON, OFF=Full

See "More Information" on page 284

<b>Key Path</b>	Mode Setup, Noise Reduction
Scope	Meas Global
<b>Remote Command</b>	[:SENSe]:CORRection:NOISE:FLOor ON OFF 1 0 [:SENSe]:CORRection:NOISE:FLOor?
<b>Example</b>	CORR:NOIS:FLO ON
Dependencies	This key only appears in instruments with the NFE or NF2 license installed. In all others, the key does not appear, however the SCPI command will be accepted without error (but will have no effect).
Couplings	When NFE is enabled in any mode manually, a prompt will be displayed reminding you to perform the Characterize Noise Floor operation if it is needed. If NFE is enabled through SCPI and a Characterize Noise Floor operation is needed, an error will be entered in the system error queue.
Preset	Unaffected by Mode Preset. Turned ON at startup and by Restore Mode Defaults. This is a change, in S/W versions prior to A.18.00, this function was turned OFF at startup and by Restore Mode Defaults
State Saved	No
Initial S/W Revision	A.04.00
Modified at S/W Revision	A.18.00

<b>Key Path</b>	Meas Setup, Advanced
Scope	Meas Global
<b>Remote Command</b>	[:SENSe]:CORRection:NOISE:FLOor:ADAPtive ON OFF 1 0 [:SENSe]:CORRection:NOISE:FLOor:ADAPtive?
<b>Example</b>	CORR:NOIS:FLO ON First turn NFE on CORR:NOIS:FLO:ADAP ON Then set it to Adaptive

Dependencies	This control only appears in instruments with the NFE or NF2 license installed. In all others, the control does not appear, however the SCPI command will be accepted without error (but will have no effect).
Couplings	Sending CORR:NOIS:FLO ON turns NFE Adaptive OFF for backwards compatibility. So to turn Adaptive on, you must issue the commands in the proper order, as shown in the example above
Preset	Not affected by Mode Preset, but set to ON at startup and by Restore Mode Defaults
State Saved	No
Initial S/W Revision	A.18.00

## More Information

The analyzer is characterized in the factory (or during a field calibration) with a model of the noise, referred to the input mixer, versus frequency in each band and path combination. Bands are 0 (low band) and 1 through 4 (high band) in a 26.5 GHz instrument, for example. Paths include normal paths, preamp paths, the electronic attenuator, etc.

In most band/path combinations, the noise can be well characterized based on just two parameters and the analyzer frequency response before compensation for frequency-dependent losses.

After the noise density at the input mixer is estimated, the effects of the input attenuator, RBW, detector, etc. are computed to get the estimated input-port-referred noise level.

In the simplest case, the measured power (signal plus analyzer noise) in each display point (bucket) is compensated by subtracting the estimated noise power, leaving just the signal power. This is the operation when the detector is Average and the Average Type is set to Power.

In other cases, operation is often not quite as good but still highly effective. With peak detection, the noise floor is estimated based on the RBW and the duration of the bucket using the same equations used in the noise marker function. The voltage of the noise is subtracted from the voltage of the observed signal-plus-noise measurement to compute the estimated signal voltage. The peak detector is one example of processing that varies with detector to give good estimates of the signal level without the analyzer noise.

For best operation, the average detector and the power scale are recommended, as already stated. Peak detection for pulsed-RF can still give excellent effectiveness. FFT analysis does not work well, and does not do NFE well, with pulsed-RF signals, so this combination is not recommended. Negative peak detection is not very useful, either. Sample detection works well, but is never better than the average detector because it doesn't smooth as well. The Normal detector is a combination of peak and negative peak behaviors, and works about as well as these.

For best operation, extreme smoothing is desirable, as already stated. Using narrow VBWs works well, but using very long bucket durations and the average detector works best. Reducing the number of trace points will make the buckets longer.

For best operation, the power scale (Average Type = Power) is optimum. When making CW measurements in the presence of noise without NFE, averaging on the decibel scale has the advantage of reducing the effect of noise. When using NFE, the NFE does an even better job than using the log scale ever could. Using NFE with the log scale is not synergistic, though; NFE with the power scale works a little better than NFE with log averaging type.

The results from NFE with internal preamp can often be lower than the theoretical noise in a signal source at room temperature, a noise density of -174 dBm/Hz. This is expected and useful behavior, because NFE is designed to report the amount of input signal that is in excess of the thermal noise, not the amount that includes the thermal noise. This can be a useful behavior because thermal noise often interferes with what you want to measure, instead of being part of what you want to measure. Note that NFE is not adequately accurate to always be able to read below kTB.

On instruments with the NF2 license installed, the calibrated Noise Floor used by Noise Floor Extensions should be refreshed periodically. Keysight recommends that the **Characterize Noise Floor** operation be performed after the first 500 hours of operation, and once every calendar year. The key to perform this is located in the **System, Alignments, Advanced** menu. If you have not done this yourself at the recommended interval, then when you turn on Noise Floor Extensions, the analyzer will prompt you to do so with a dialog that says:

“This action will take several minutes to perform. Please disconnect all cables from the RF input and press Enter to proceed. Press ESC to cancel, or Postpone to postpone for a week.”

If you Cancel, you will be prompted again the next time you turn NFE on. If you postpone, you will be prompted again after a week passes and you then turn NFE on.

## Restore Mode Defaults

Resets the state for the currently active mode by resetting the mode persistent settings to their factory default values, clearing mode data and by performing a Mode Preset

See [Restore Mode Defaults](#) under “Preset” in the System Functions section, for more information.

Key Path	Mode setup
<hr/>	
	<h3>Global Settings</h3>
	Opens a menu that allows you to switch certain Meas Global parameters to a Mode Global state.  See <a href="#">"Global Settings" on page 278</a> for more information.

## 6 System Functions

## File

Opens a menu that enables you to access various standard and custom Windows functions. Press any other front-panel key to exit

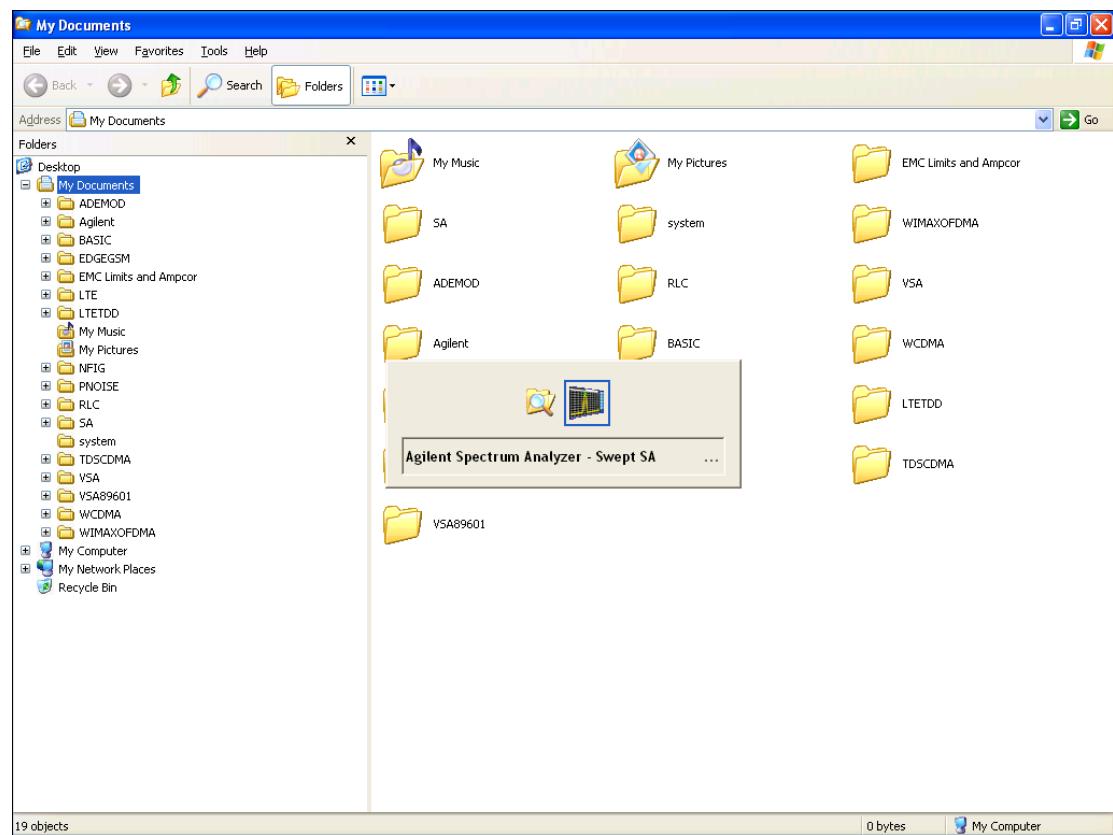
Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

### File Explorer

Opens the standard Windows File Explorer. The File Explorer opens in 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 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.

The ability to access File Explorer is not available if Option SF1 is installed.

Key Path	File
Initial S/W Revision	Prior to A.02.00

### Print

The Print key opens a Print dialog for configured printing (for example, to the printer of your choice). Refer to your Microsoft Windows Operating System manual for more information.

### Maximize/Restore Down

These keys allow the Instrument Application to be maximized and then restored to its prior state. Only one of the two keys is visible at a time. When not already maximized the Maximize Application key is visible, and when maximized, the Restore Down Application key is visible and replaces the Maximize Application key.

#### Maximize

This key allows you to Maximize the Instrument Application, which causes the analyzer display to fill the screen. Once the application is maximized, this key is replaced by the Restore Down key.

Key Path	File
Mode	All
Notes	No equivalent remote command for this key.
State Saved	No
Initial S/W Revision	A.05.01

#### 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

### Page Setup

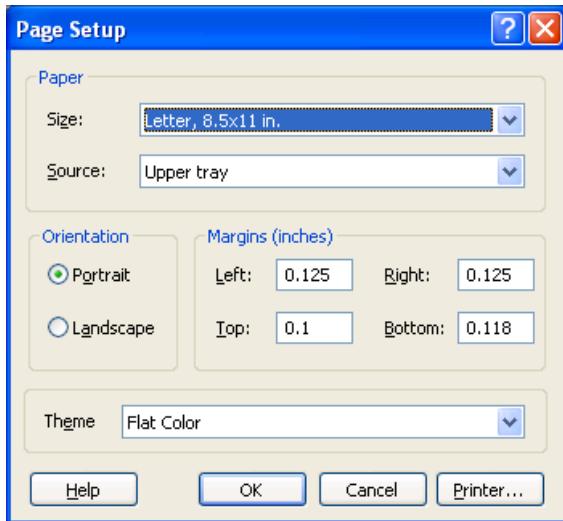
The Page Setup key brings up a Windows Page Setup dialog that allows you to control aspects of the pages sent to the printer when the PRINT hardkey is pressed.

---

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
<b>Remote Command</b>	:SYST:PRIN:THEM TDColor TDMonochrome FCOLor FMONochrome :SYST:PRIN:THEM?
<b>Example</b>	:SYST:PRIN:THEM FCOL
Setup	:SYST: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
<b>Remote Command</b>	:HCOPy[:IMMEDIATE]
Initial S/W Revision	Prior to A.02.00

---

Key Path	SCPI command only
<b>Remote Command</b>	: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.

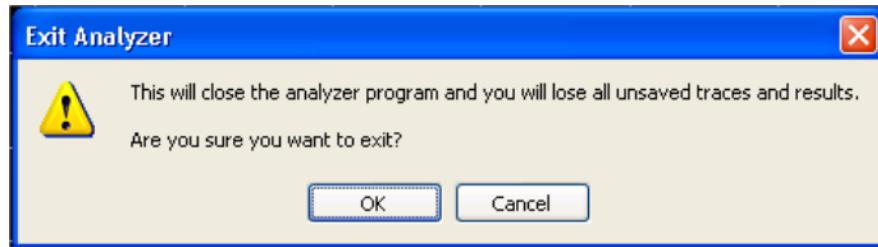
---

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 will close. No further SCPI commands can be sent. Use with caution!
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
<b>Remote Command</b>	:HCOPy[:IMMediate]
Initial S/W Revision	Prior to A.02.00

Key Path	SCPI command only
<b>Remote Command</b>	:HCOPy:ABORT
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
<b>Remote Command</b>	:SYST:SHOW OFF   ERRor   SYSTEM   HARDware   LXI   HWStatistics   ALIGNment   SOFTware   CAPplication :SYST:SHOW?
<b>Example</b>	: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
<b>Remote Command</b>	:SYST:ERRor[:NEXT]?
<b>Example</b>	:SYST:ERR?
Notes	<p>The return string has the format:          “&lt;Error Number&gt;,&lt;Error&gt;”</p> <p>Where &lt;Error Number&gt; and &lt;Error&gt; are those shown on the Show Errors screen</p>
Backwards Compatibility Notes	<p>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</p> <p>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).</p> <p>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.</p> <p>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.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

### Previous Page

See "["Next Page" on page 294.](#)

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 that 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

## Status

See "History" on page 295.

## 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	<b>System, Show, Errors</b>
Mode	All
<b>Remote Command</b>	<b>:SYSTem:ERRor:VERBose OFF ON 0 1</b> <b>:SYSTem:ERRor:VERBose?</b>
<b>Example</b>	<b>:SYST:ERR:VERB ON</b>
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	<b>System, Show, Errors</b>
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	<b>System, Show, Errors</b>
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.

Key Path	SCPI only
<b>Remote Command</b>	:SYSTem:ERRor:OVERload[:STATe] 0 1 OFF ON
<b>Example</b>	: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

### Power Up (Remote Command Only)

This serves to show the errors encountered during the application boot-up, such as: mismatch FW-FPGA, missing Calibration data, missing hardware and construction errors.

<b>Remote Command</b>	:SYSTem:ERRor:PUP?
Notes	If no error occurs, the return value will be: "No Power Up Errors." Return Value: <list of error strings> <List of error strings> is an <IEEE488 Block> format. Return Value Example: "Power up errors, see details in Windows Event Log" "Unmatched FPGA Version(s), See details in Windows Event Log"
Initial S/W Revision	E.14.30

## 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     Precision 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 of information is presently displayed.

Key Path	<b>System, Show</b>
Mode	All
<b>Example</b>	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).

<b>Remote Command</b>	:SYSTem:CONFigure[:SYSTem]?
<b>Example</b>	: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

### Computer System description (Remote Command Only)

A remote command is available to obtain the Computer System description. The Computer System is the operating system and patch level as reported by operating system.

<b>Remote Command</b>	:SYST:CSYST?
<b>Example</b>	:SYST:CSYS?
Notes	The return value is the Computer System name and service pack level.
Initial S/W Revision	Prior to A.12.00

## 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:

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 of information is presently displayed.

Key Path	System, Show
Mode	All
<b>Example</b>	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	<b>System, Show</b>
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	<b>System</b>
Mode	All
<b>Remote Command</b>	:SYST: PON: TYPE MODE   USER   LAST :SYST: PON: TYPE?
<b>Example</b>	: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
<b>Backwards Compatibility SCPI</b>	:SYST: PON: TYPE PRESet the “PRESet” parameter is supported for backward compatibility only and behaves the same as MODE.
Backwards Compatibility Notes	The <b>Preset Type</b> key in legacy analyzers has been removed, and the <b>Power On</b> toggle key has been replaced by this 1-of-N key in the <b>System</b> 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	<b>System, Power On</b>
Mode	All
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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

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(SYST:PON:MODE <mode>).

Initial S/W Revision	Prior to A.02.00
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### 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
<b>Remote Command</b>	:SYST:PON:MODE <mode> where <mode> is the identical list from the :INSTRument[:SElect] command :SYST:PON:MODE?
<b>Example</b>	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: For N9038A: EMI For N8973B, N8974B, N8975B, or N8976B: NFIG For all other models: SA
State Saved	No
Initial S/W Revision	Prior to A.02.00

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### 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 303](#)

["Access to Configure Applications utility" on page 303](#)

"Virtual memory usage" on page 303

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 analyzer's memory when the analyzer program starts up. If you do this, the delay will increase the time it takes to start up the analyzer 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 analyzer 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 analyzer after purchasing it from Keysight. 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 analyzer program.

The utility may also be called if, during operation of the analyzer, 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 analyzer). 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 analyzer's memory. You must deselect applications until the fuel bar turns yellow.

YELLOW: the applications you have selected can all fit into the analyzer'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 analyzer 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 analyzer'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

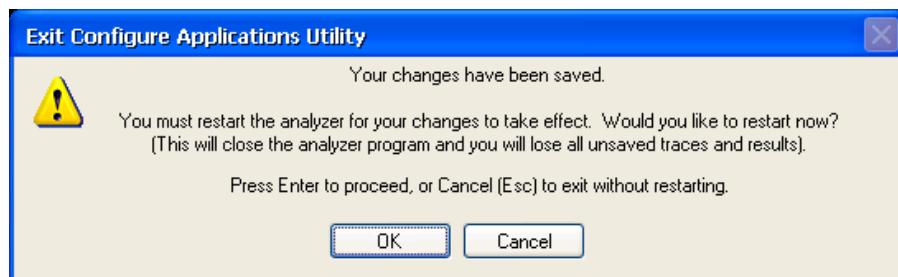
Toggles the currently highlighted application in the list.

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	:SYST: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

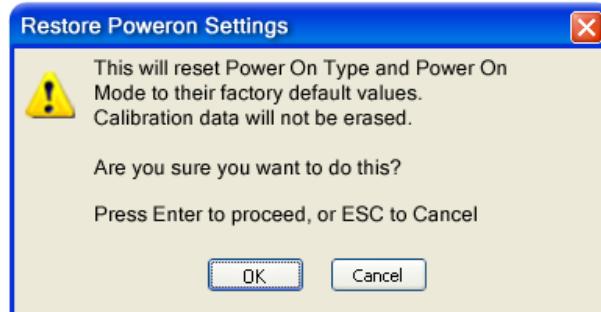
## Exit Without Saving

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
<b>Example</b>	:SYST:DEF PON
Initial S/W Revision	Prior to A.02.00

## Configure Applications - Instrument boot-up

At start-up of the analyzer program a dialog box similar to the one under the **System, Power On, Configure Applications** key will be displayed allowing you to choose which licensed applications are to be loaded. This dialog will only be displayed if the memory required to pre-load all of the licensed applications exceeds the Virtual Memory available.

## Configure Applications - Windows desktop

The Configure Applications Utility may be run from the Windows Desktop. The utility



is launched by double-clicking the icon on the desktop, which brings-up a dialog box similar to the one under the **System, Power On, Configure Applications**

key, allowing you to choose which licensed applications are to be loaded when the analyzer program starts up. This dialog box has mouse buttons on it that do the job the softkeys normally do in the **System, Power On, Configure Applications** menu.

### 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 query the Virtual Memory utilization for your applications.

- "Configuration list (Remote Command Only)" on page 307
- "Configuration Memory Available (Remote Command Only)" on page 307
- "Configuration Memory Total (Remote Command Only)" on page 307
- "Configuration Memory Used (Remote Command Only)" on page 308
- "Configuration Application Memory (Remote Command Only)" on page 308

#### Configuration list (Remote Command Only)

This remote command is used to set or query the list of applications to be loaded in-memory.

<b>Remote Command</b>	:SYSTem:PON:APPLICATION:LLIST <string of INSTRument:SElect names> :SYSTem:PON:APPLICATION:LLIST?
<b>Example</b>	:SYST:PON:APPL:LLIS "SA,BASIC,WCDMA"
Notes	<string of INSTRument:SElect names> are from the enums of the :INSTRument:SElect command. The order of the <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)

This remote command is used to query the amount of Virtual Memory remaining.

<b>Remote Command</b>	:SYSTem:PON:APPLICATION:VMEMory[:AVAvailble]?
<b>Example</b>	:SYST:PON:APPL:VMEM?
Preset	Not affected by Preset
Initial S/W Revision	A.02.00

#### Configuration Memory Total (Remote Command Only)

This remote command is used to query the limit of Virtual Memory allowed for applications.

---

<b>Remote Command</b>	:SYST:POA:APPL:VMEM:TOT?
<b>Example</b>	:SYST:POA:APPL:VMEM:TOT?
Preset	Not affected by Preset
Initial S/W Revision	A.02.00

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### Configuration Memory Used (Remote Command Only)

This remote command is a query of the amount of Virtual Memory used by all measurement applications.

---

<b>Remote Command</b>	:SYST:POA:APPL:VMEM:USED?
<b>Example</b>	:SYST:POA:APPL:VMEM:USED?
Preset	Not affected by Preset
Initial S/W Revision	A.02.00

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### Configuration Application Memory (Remote Command Only)

This remote command is used to query the amount of Virtual Memory a particular application consumes.

---

<b>Remote Command</b>	:SYST:POA:APPL:VMEM:USED:NAME? <INSTRUMENT:SELect name>
<b>Example</b>	:SYST:POA:APPL:VMEM:USED:NAME? CDMA2K
Notes	<INSTRUMENT:SELect name> is from the enums of the :INSTRUMENT:SELect command Value returned will be 0 (zero) if the name provided is invalid.
Preset	Not affected by Preset
Initial S/W Revision	Prior to A.02.00

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## 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.




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<b>Key Path</b>	System
Initial S/W Revision	Prior to A.02.00

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### 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
<b>Remote Command</b>	:CALibration:AUTO ON LIGHT PARTial OFF :CALibration:AUTO?
<b>Example</b>	: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.
<b>Backwards Compatibility SCPI</b>	:CALibration:AUTO ALERT Parameter ALERT is for backward compatibility only and is mapped to PARTial
Backwards Compatibility Notes	<ol style="list-style-type: none"> <li>1. ESA SCPI for Auto Align is :CALibration:AUTO &lt;Boolean&gt;. The command for X-Series is an enumeration. Thus the parameters of “0” and “1” are not possible in X-Series.</li> <li>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</li> <li>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.</li> </ol>
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
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Mode	All
<b>Example</b>	:CAL:AUTO ON
Notes	<p>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.</p> <p>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.</p>
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	<b>System, Alignments, Auto Align</b>
Mode	All
<b>Example</b>	: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
<b>Example</b>	: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):

<b>Key Path</b>	System, Alignments, Auto Align
Mode	All
<b>Remote Command</b>	:CALibration:AUTO:MODE ALL NRF :CALibration:AUTO:MODE?
<b>Example</b>	: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.

<b>Key Path</b>	System, Alignments, Auto Align
Mode	All
<b>Remote Command</b>	:CALibration:AUTO:ALERT TTEMperature DAY WEEK NONE :CALibration:AUTO:ALERT?
<b>Example</b>	: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.

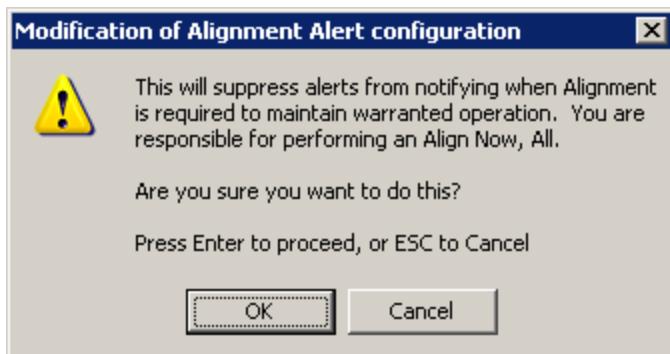
<b>Key Path</b>	System, Alignments, Auto Align, Alert
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Mode	All
<b>Example</b>	:CAL:AUTO:ALER TTEM
Readback Text	Time & Temp
Status Bits/OPC dependencies	Bit 14 is set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

### 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.

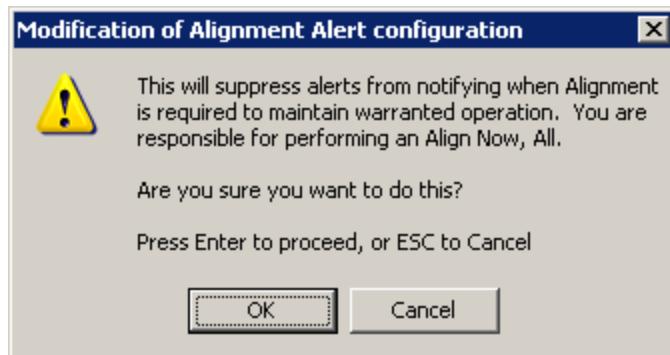
Key Path	System, Alignments, Auto Align, Alert
Mode	All
<b>Example</b>	:CAL:AUTO:ALER DAY
Readback Text	24 hours
Status Bits/OPC dependencies	Bit 14 is set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

### 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:



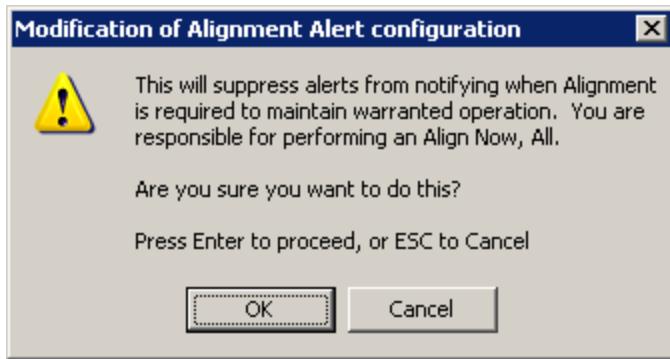
No confirmation is required when Alert is configured through a remote command.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
<b>Example</b>	: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 recommend 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
<b>Example</b>	: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. Align All, Now performs an alignment of all subsystems regardless of whether they are needed or not, with Execute Expired Alignments, only the individual subsystems that have become due are aligned.

Mode	All
<b>Remote Command</b>	:CALibration:EXPired?
<b>Example</b>	: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

(In MXE the key label is “All (plus RF Presel 20 Hz – 3.6 GHz)”) Immediately executes an alignment of all subsystems.

In MXE, the Align Now All is followed by additionally aligning the RF Preselector section, so in MXE, the key label contains the parenthetical note “(plus RF Presel 20

Hz – 3.6 GHz)". 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.

In the MXE, successful completion will also clear the "Align 20 Hz to 30 MHz required" Error Condition, the "Align 30 MHz to 3.6 GHz required" Error Condition, and the "Align 20 Hz to 3.6 GHz required" Error Condition, and clear bits 1 and bit 2 and clear the bit 1 in the Status Questionable Calibration Extended Needed register.

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.

Key Path	System, Alignments, Align Now
Mode	All
<b>Remote Command</b>	:CALibration[:ALL] :CALibration[:ALL]?
<b>Example</b>	:CAL

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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

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Mode	All
<b>Remote Command</b>	*CAL?
<b>Example</b>	*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

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Mode	All
<b>Remote Command</b>	:CALibration[:ALL]:NPENDING
<b>Example</b>	CAL:NPEN
Notes	:CALibration[:ALL]:NPENDING is the same as :CALibration[:ALL] including all conditions, status register bits, except this scpi command does not BLOCK the scpi session, so the user should use status register bits to query if the calibration is successfully completed or not.  Typical usage is:

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- 
- 1) :CALibration:ALL:NPENDING (Start a calibration)
  - 2) :STATus:OPERation:CONDITION? (Check if the calibration is completed or not, If bit 0 is set, then the system is doing calibration, the user should repeat this scpi query until the bit is cleared )
  - 3):STATus:QUESTIONable:CALibration:CONDITION? (Check if there are any errors/failures in previous calibration procedure

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Initial S/W Revision	X.14.20
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### All but RF

(In MXE the key label is “All but RF (not including RF Presel)”)

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.

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Key Path	<b>System, Alignments, Align Now</b>
Mode	All
<b>Remote Command</b>	<b>:CALibration:NRF</b> <b>:CALibration:NRF?</b>

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<b>Example</b>	:CAL:NRF
Notes	<p>:CALibration:NRF? returns 0 if successful          :CALibration:NRF? returns 1 if failed</p> <p>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.</p> <p>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.</p> <p>Successful completion will clear bit 14 in the Status Questionable Calibration register and set bit 12 if invoked with "Align Now, All required".</p>
Couplings	<p>Initializes the time for the Last Align Now, All Time.</p> <p>Records the temperature for the Last Align Now, All Temperature.</p>
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

Mode	All
<b>Remote Command</b>	:CALibration:NRF:NPENDING
<b>Example</b>	CAL:NRF:NPEN
Notes	<p>:CALibration:NRF:NPENDING is the same as :CALibration:NRF including all conditions, status register bits, except that this scpi command does not BLOCK the scpi session, so the user should use status register bits to query if the calibration is successfully completed or not.</p> <p>Typical usage is:</p> <ol style="list-style-type: none"> <li>1):CALibration:NRF:NPENDING (start the All but RF calibration)</li> <li>2):STATus:OPERation:CONDition? (If bit 0 is set, then the system is doing calibration, the user should do re-query until this bit is cleared )</li> <li>3):STATus:QUESTIONable:CALibration:CONDition? (to check if there are any errors/failures in previous calibration procedure)</li> </ol>
Initial S/W Revision	X.14.20

## RF

(In MXE the key label is “RF Only”)

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.

<b>Key Path</b>	<b>System, Alignments, Align Now</b>
Mode	All
<b>Remote Command</b>	:CALibration:RF :CALibration:RF?
<b>Example</b>	:CAL:RF
Notes	<p>:CALibration:RF? returns 0 if successful          :CALibration:RF? returns 1 if failed (including interfering user signal)</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>A failure encountered during alignment will generate the Error Condition message “Align RF failed” and set bit 3 in the Status Questionable Calibration register.</p> <p>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.</p> <p>An interfering user supplied signal will result in the instrument requiring an Align Now, RF with the interfering signal removed.</p>
Couplings	<p>Initializes the time for the Last Align Now, RF Time.</p> <p>Records the temperature for the Last Align Now, RF Temperature.</p>
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
<b>Remote Command</b>	<b>:CALibration:RF:NPENDING</b>
<b>Example</b>	CAL:RF:NPEN
Notes	<p>:CALibration:RF:NPENDING is the same as :CALibration:RF including all conditions, status register bits, except that this scpi command does not BLOCK the scpi session, so the user should use status register bits to query if the calibration is successfully completed or not.</p> <p>Typical usage is:</p> <ol style="list-style-type: none"> <li>1):CALibration:RF:NPENDING (Start a RF calibration)</li> <li>2):STATus:OPERation:CONDition? (If bit 0 is set, then the system is doing calibration, the user should do re-query until this bit is cleared )</li> <li>3):STATus:QUEstionable:CALibration:CONDition? ( to check if there are any errors/failures in previous calibration procedure)</li> </ol>
Initial S/W Revision	X.14.20

### 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
<b>Remote Command</b>	<b>:CALibration:EMIXer</b> <b>:CALibration:EMIXer?</b>
<b>Example</b>	:CAL:EMIX
Notes	<p>:CAL:EMIX? returns 0 if successful :CAL:EMIX? returns 1 if failed</p> <p>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.</p> <p>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.</p> <p>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.</p>
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:

Std Header	Product Number: N9020A Serial Number: US46340924 Firmware Revision: A.01.01	
Instrument Info	Time since start-up: Current Temperature:	300 hrs +28 degC
Auto Align Info	Time while Auto Align off:	90 min
Std Align Now	Time since last Align Now All: Temperature since last Align Now All: Time since last Align Now RF: Temperature since last Align Now RF:	12.5 hrs -1.3 degC 5 min +0.1 degC
If TG Option (Not Zorro1)	Time since last Align TG: Temperature since last Align TG:	2.5 hrs +0.2 degC
Opts 508,513 526	Last Characterize Preselector: Last Characterize Preselector Temperature:	Jun 1, 2006 15:00:00 +32.1 degC
		Times & Temperature delta. Shown as "..." if none since start-up.
		Time & Temperature 'stamp'

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:POW:TIME?

<b>Example</b>	: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
<b>Remote Command</b>	:CALibration:TEMPerature:CURREnt?
<b>Example</b>	: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
<b>Remote Command</b>	:CALibration:TIME:LALL?
<b>Example</b>	: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
<b>Remote Command</b>	:CALibration:TEMPerature:LALL?
<b>Example</b>	: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

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<b>Remote Command</b>	:CALibration:TIME:LRF?
<b>Example</b>	: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

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Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TEMPerature:LRF?
<b>Example</b>	: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

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Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TIME:LPReselector?
<b>Example</b>	: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

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Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TEMPerature:LPReselector?
<b>Example</b>	: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.

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State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:AUTO:TIME:OFF?
<b>Example</b>	: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 (N9038A only)
<b>Remote Command</b>	:CALibration:TIME:RFPSelector:LConducted?
<b>Example</b>	:CAL:TIME:RFPS:LCON?
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.
State Saved	No

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All (N9038A only)
<b>Remote Command</b>	:CALibration:TEMPerature:RFPSelector:LConducted?
<b>Example</b>	:CAL:TEMP:RFPS:LCON?
Notes	Value is in degrees Centigrade at which the last successful Align Now, 20 Hz – 30 MHz was executed.
State Saved	No

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All (N9038A only)
<b>Remote Command</b>	:CALibration:TIME:RFPSelector:LRadiated?
<b>Example</b>	:CAL:TIME:RFPS:LRAD?
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.
State Saved	No

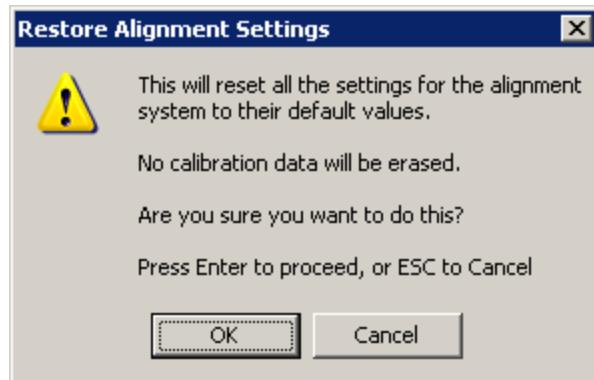
Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All (N9038A only)
<b>Remote Command</b>	<b>:CALibration:TEMPerature:RFPSelector:LRADIated?</b>
<b>Example</b>	:CAL:TEMP:RFPS:LRAD?
Notes	Value is in degrees Centigrade at which the last successful Align Now, 30 MHz – 3.6 GHz was executed.
State Saved	No

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All (N9038A only)
<b>Remote Command</b>	<b>:CALibration:RFPSelector:SCHeduler:TIME:NEXT?</b>
	This query returns data using the following format "YYYY/MM/DD; HH:MM:SS"
<b>Example</b>	:CAL:RFPS:SCH:TIME:NEXT?
Notes	<p>For model N9038A only.</p> <p>The next run time will be updated based on the start date/time and recurrence set by the users.</p> <p>"date" is representation of the date the task will run in the form of "YYYY/MM/DD" where:</p> <ul style="list-style-type: none"> <li>- YYYY is the four digit representation of year. (for example, 2009)</li> <li>- MM is the two digit representation of month. (for example, 01 to 12)</li> <li>- DD is the two digit representation of the day. (for example, 01 to 28, 29, 30 or 31 depending on the month and year)</li> </ul> <p>"time" is a representation of the time of day the task will run in the form of "HH:MM:SS" where:</p> <ul style="list-style-type: none"> <li>- HH is the two digit representation of the hour in 24 hour format</li> <li>- MM is the two digit representation of minute</li> <li>- SS is the two digit representation of seconds</li> </ul>
State Saved	No

### 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.

The PC6 and PC7 CPUs contain a removable SD memory card. With one of these CPU's installed the Backup and Restore Alignment Data wizard will default to the SD card as the backup location. At (every) power-on, the software will check to

determine if the calibration data on the SD memory card (the backup) is newer than the data in use on the SSD. In such situations, before the application is loaded the operator will be given the opportunity to restore the data from the backup. If the operator responds “Yes”, the Backup and Restore Alignment Data wizard will be invoked to perform the restore.

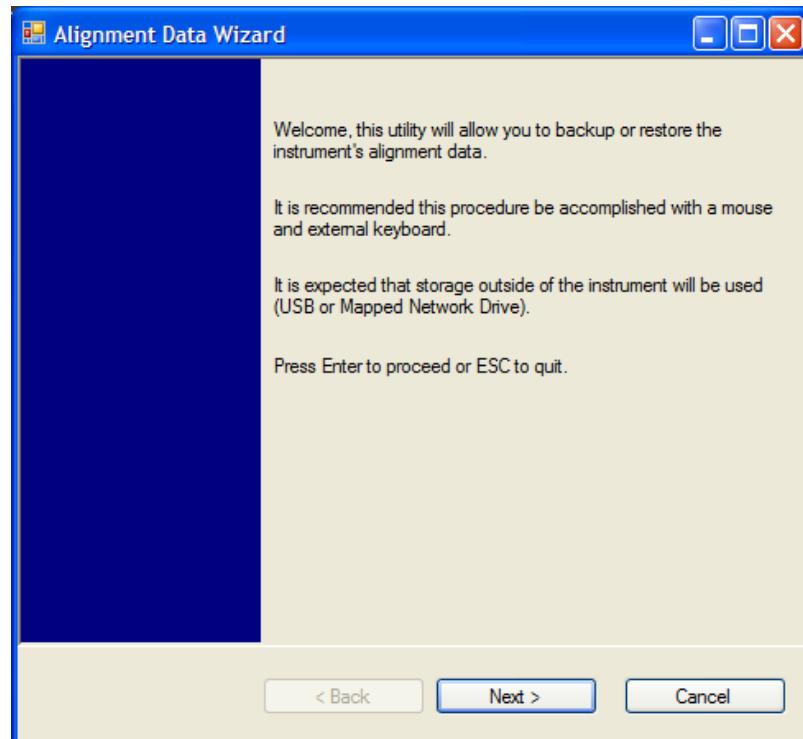
Key Path	System, Alignments
Initial S/W Revision	A.02.00

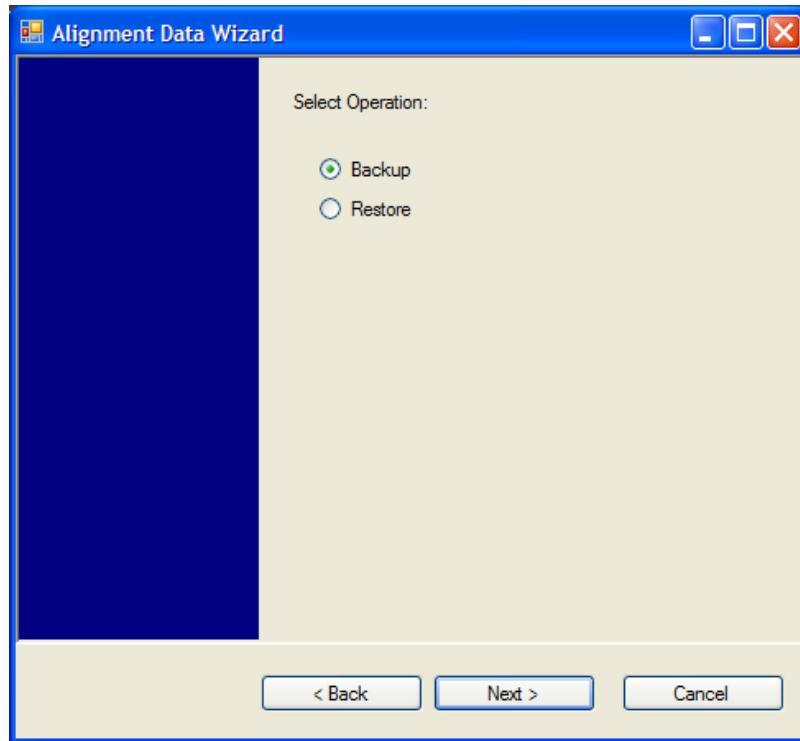
Key Path	System, Alignments
Mode	All
<b>Remote Command</b>	:CALibration:DATA:DEFault
<b>Example</b>	:CAL:DATA:DEF
Couplings	Sets Auto Align to Off. Sets bit 14 in the Status Questionable Calibration register. The Error Condition message “Align Now, All required” is generated.
Initial S/W Revision	Prior to A.02.00

### Alignment Data Wizard

The Backup or Restore Alignment Data wizard guides you through the operation of backing-up or restoring the alignment data.

The following dialog boxes operate without a mouse or external keyboard when you use the default file names.

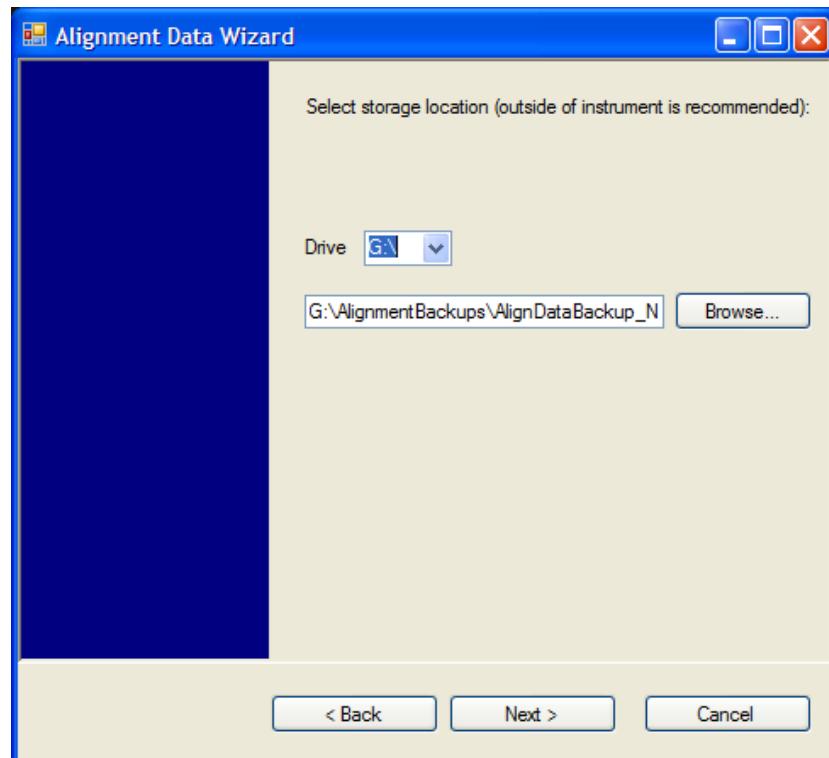




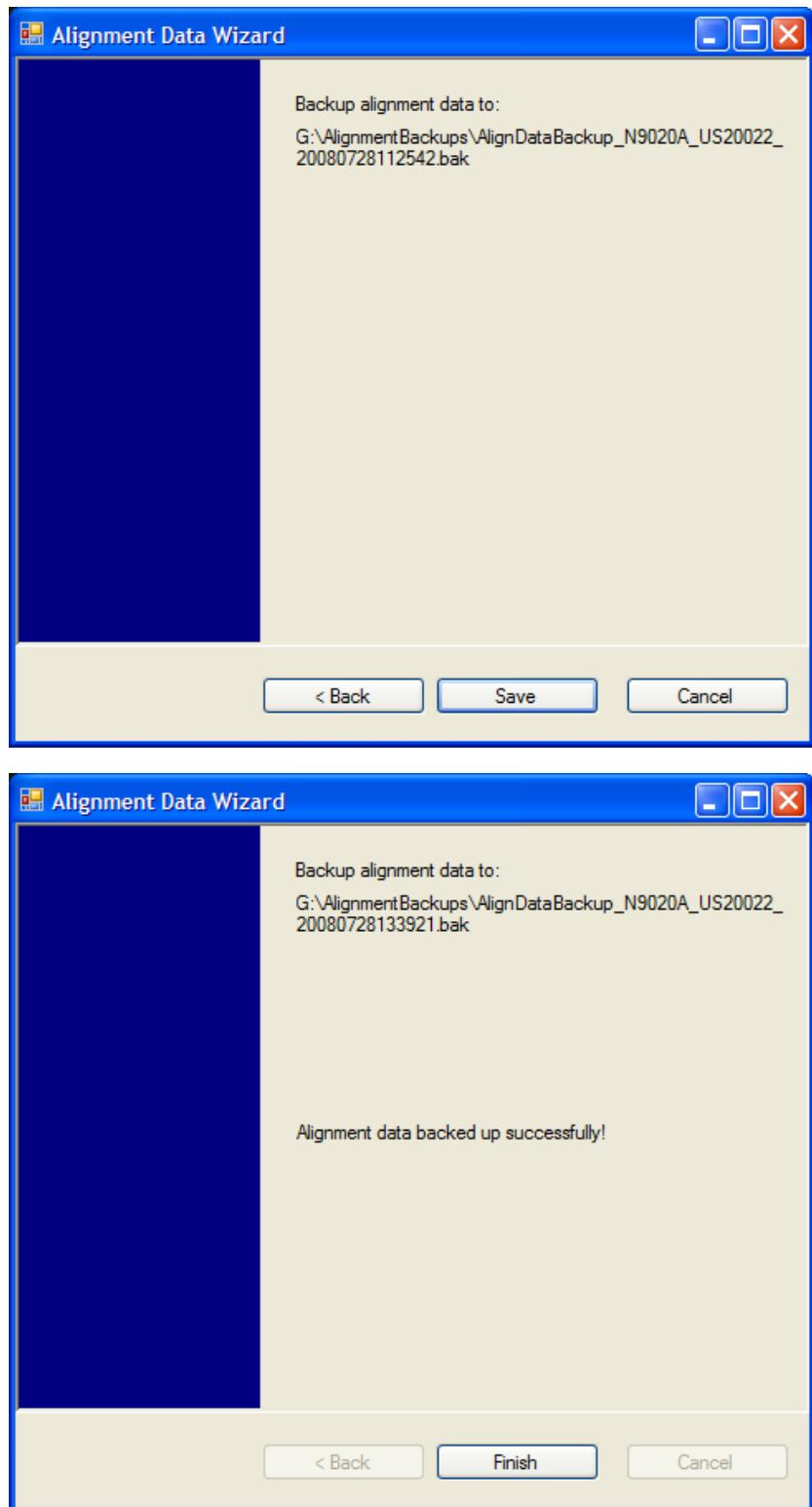
The backup screen indicates the approximate amount of space required to contain the backup file.

The default file name will be AlignDataBackup\_<model number>\_<serial number>\_<date in YYYYMMDDHHMMSS>.bak.

The default backup location will be first drive identified as an external drive (USB or LAN) if such is available; if not, the internal D: partition will be selected.

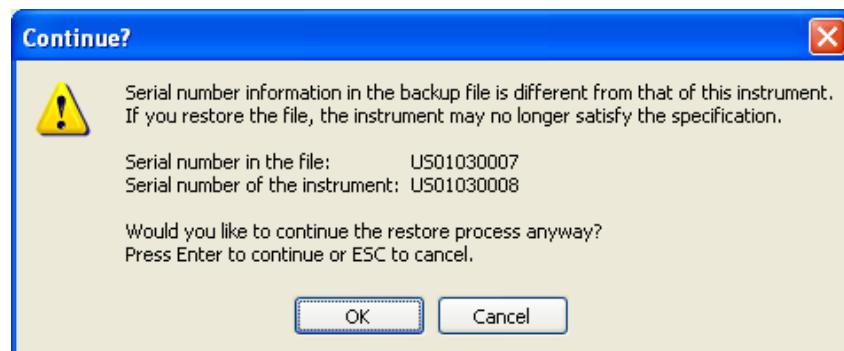


Changing the drive letter will also modify the path displayed in the box below. When this step is first loaded, the drive drop-down menu is populated with connected drives, which provide the user with write access. If there are many unreachable network drives connected to the instrument, this step can 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.

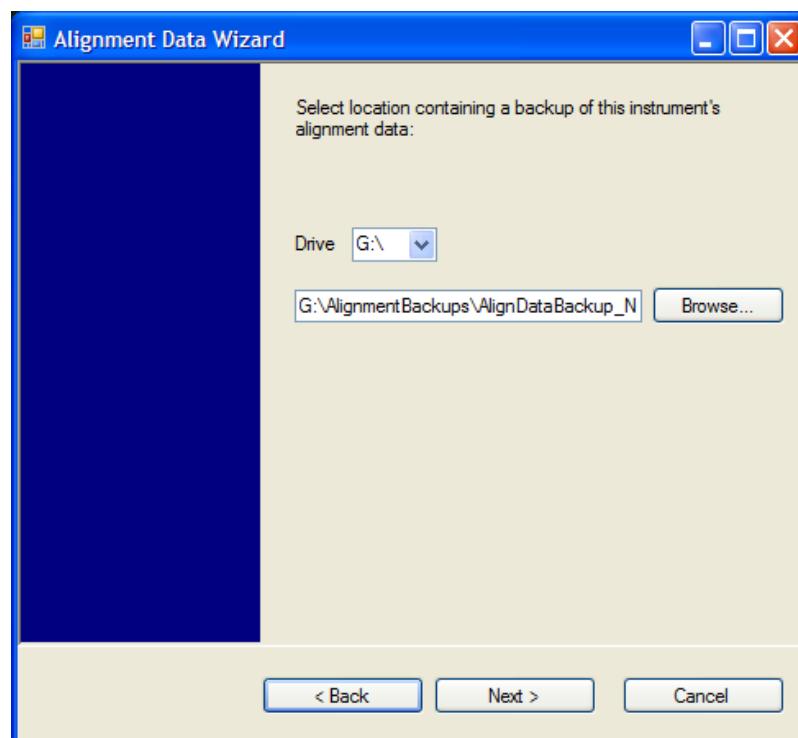


The restore operation checks the validity of the restore file using the database's built-in file validation. If the restore file is corrupt, the existing alignment data will remain in use.

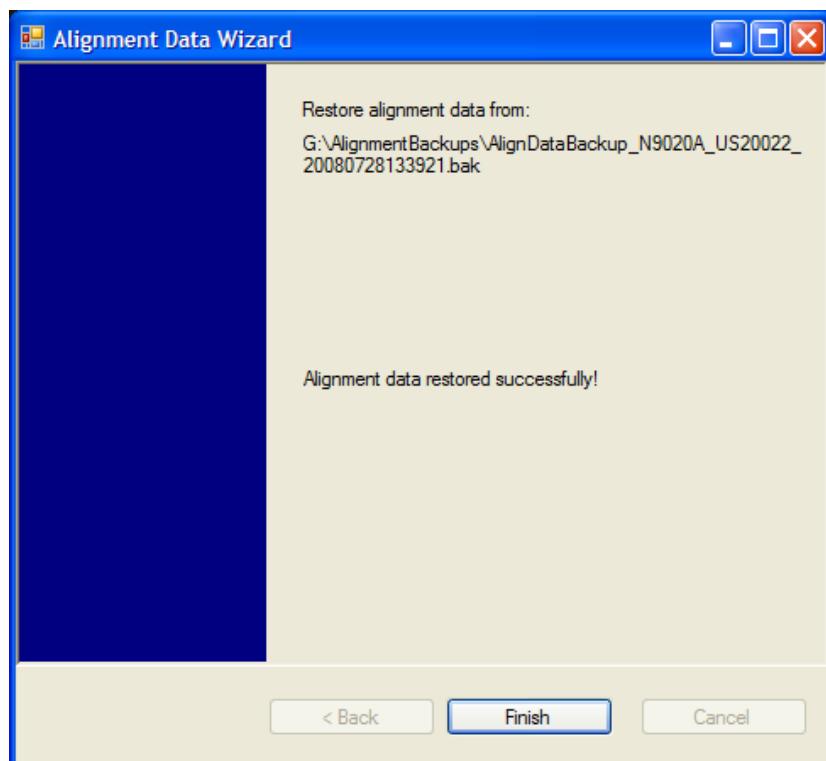
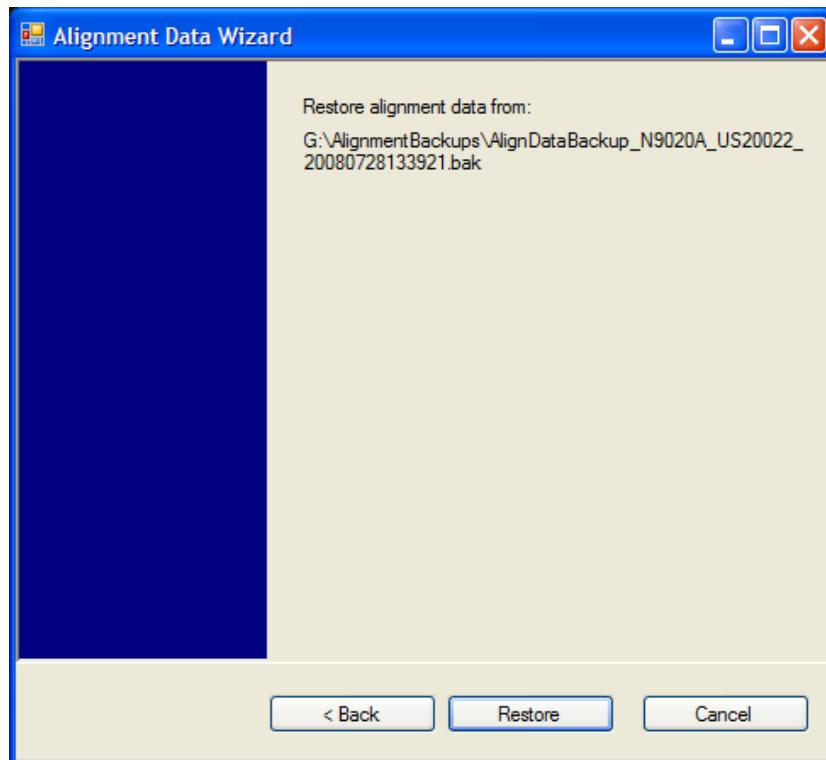
If the serial number information in the backup file being restored is different from that of the instrument, the following message appears (the serial number shown are examples):



The default restore location will be first drive identified as an external drive (USB or LAN) if such is available; if not, the internal D: partition will be selected. The default restore file will be the most recent file that matches the default backup file name format: AlignDataBackup\_<model number>\_<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 provided Folder.

**NOTE**

It is recommended that the Folder provided is outside of the instrument (USB or Mapped Network Drive).

<b>Remote Command</b>	:CALibration:DATA:BACKup <filename>
<b>Example</b>	: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 provided filename.

<b>Remote Command</b>	:CALibration:DATA:RESTore <filename>
<b>Example</b>	: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

<b>Key Path</b>	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
<b>Remote Command</b>	:CALibration:YTF :CALibration:YTF?
<b>Example</b>	:CAL:YTF
Notes	<p>:CALibration:YTF? returns 0 if successful          :CALibration:YTF? returns 1 if failed (including interfering user signal)</p> <p>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.</p> <p>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.</p> <p>Successful completion will clear bit 9 in the Status Questionable Calibration register.</p> <p>A failure encountered during alignment will generate the Error Condition message “Characterize Preselector failed” and set bit 9 in the Status Questionable Calibration register.</p> <p>For Options that support frequencies &gt; 3.6 GHz only.</p>
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	<p>Initializes the time for the Last Characterize Preselector Time.</p> <p>Records the temperature for the Last Characterize Preselector Temperature.</p>
Initial S/W Revision	Prior to A.02.00

Mode	All
<b>Remote Command</b>	:CALibration:YTF:NPENding
<b>Example</b>	CAL:YTF:NPEN
Notes	<p>:CALibration:YTF:NPENding is the same as :CALibration:YTF</p> <p>including all conditions, status register bits, except that this scpi command does not BLOCK the scpi session, so the user should use status register bits to query if the calibration is successfully</p>

---

completed or not. Typical usage is: 1) :CALibration:YTF:NPENDing (Start a YTF calibration) 2) :STATus:OPERation:CONDition? (Check if the calibration is completed or not, If bit 0 is set, then the system is doing calibration, the user should repeat this scpi query until the bit is cleared ) 3):STATus:QUESTIONable:CALibration:EXTended:FAILure:CONDition? (Check if bit 2 is set or not. If this bit is set, that means there are some errors in previous internal source calibration)	
Initial S/W Revision	X.14.20

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### Characterize Reference Clock

Characterizing the reference clock is calibrating the Reference Input Phase with the External Reference Output. This feature is only available when either option DP2 or B40 is present. It requires connecting the 10 MHz OUT to the EXT REF IN port with a BNC cable before running the characterization.

See "Front panel guided calibration sequence" on page 337

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Key Path	System, Alignments, Advanced
Mode	All
<b>Remote Command</b>	:CALibration:REFerence:CLOCK?
<b>Example</b>	:CAL:REF:CLOC:INIT? //connect cable .CAL:REF:CLOC? //disconnect cable .CAL:REF:CLOC:END?
Notes	:CALibration:REFerence:CLOCK? returns 0 if successful :CALibration:REFerence:CLOCK? returns 1 if failed
Dependencies	Option DP2 or B40
Couplings	Initializes the time for the Last Characterize Reference Clock Time. Records the temperature for the Last Characterize Reference Clock Temperature. Expected to be run after :CAL:REF:CLOC:INIT, and before :CAL:REF:CLOC:END.
Initial S/W Revision	A.13.00

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Parameter Name	Characterize Reference Clock Initialization
Mode	All
<b>Remote Command</b>	:CALibration:REFerence:CLOCK:INITialize?
<b>Example</b>	:CAL:REF:CLOC:INIT?
Notes	:CALibration:REFerence:CLOCK:INIT? returns 0 if successful :CALibration:REFerence:CLOCK:INIT? returns 1 if failed

---

Dependencies	Option DP2 or B40
Couplings	Expected to be run before sending the :CAL:REF:CLOC? command. This will stop the current measurement when it has completed (does not abort the current data acquisition), and it will prepare the instrument for the expected cabling.
Force Restart	Yes
Initial S/W Revision	A.12.00

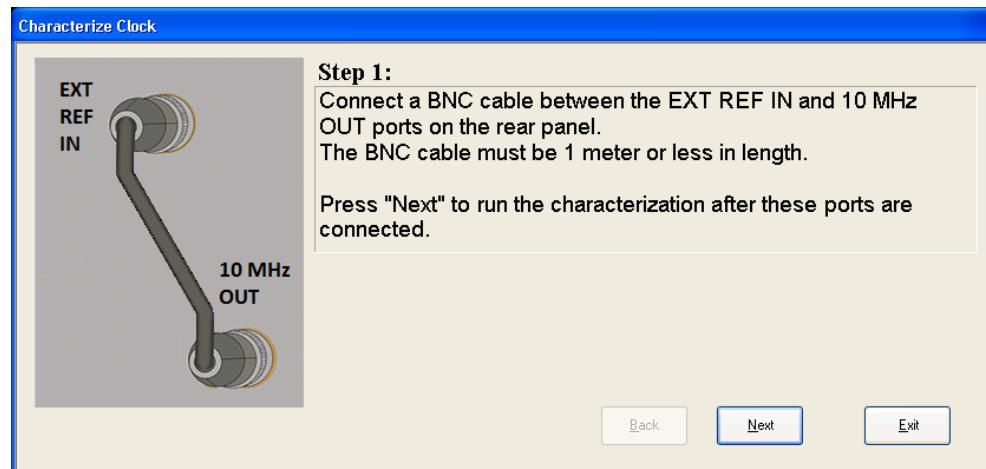
Parameter Name	Characterize Reference Clock End
Mode	All
<b>Remote Command</b>	<b>:CALibration:REFerence:CLOCK:END?</b>
<b>Example</b>	:CAL:REF:CLOC:END?
Notes	:CALibration:REFerence:CLOCK:END? returns 0 if successful :CALibration:REFerence:CLOCK:END? returns 1 if failed
Dependencies	Option DP2 or B40
Couplings	Expected to be run after sending the :CAL:REF:CLOC? command, and after removing the cable used in that Characterize Reference Clock step. This will resume any queued measurements, and it concludes the reference clock characterization.
Force Restart	Yes
Initial S/W Revision	A.12.00

Parameter Name	Last Characterize Reference Clock
Key Path	<a href="#">Visual annotation in the Show Alignment Statistics screen</a>
Parameter Type	String
Mode	All
<b>Remote Command</b>	<b>:CALibration:TIME:REFerence:CLOCK?</b>
<b>Example</b>	:CAL:TIME:REFerence:CLOCK?
Notes	Value is the date and time the last successful Characterize Reference Clock was executed. The date is separated from the time by a space character. Returns "" if Characterize Reference Clock has never been performed on the instrument.
Dependencies	Option DP2 or B40
State Saved	No
Initial S/W Revision	A.12.00

### Front panel guided calibration sequence

When selecting “Characterize Reference Clock” through the front panel, the following form will be shown.

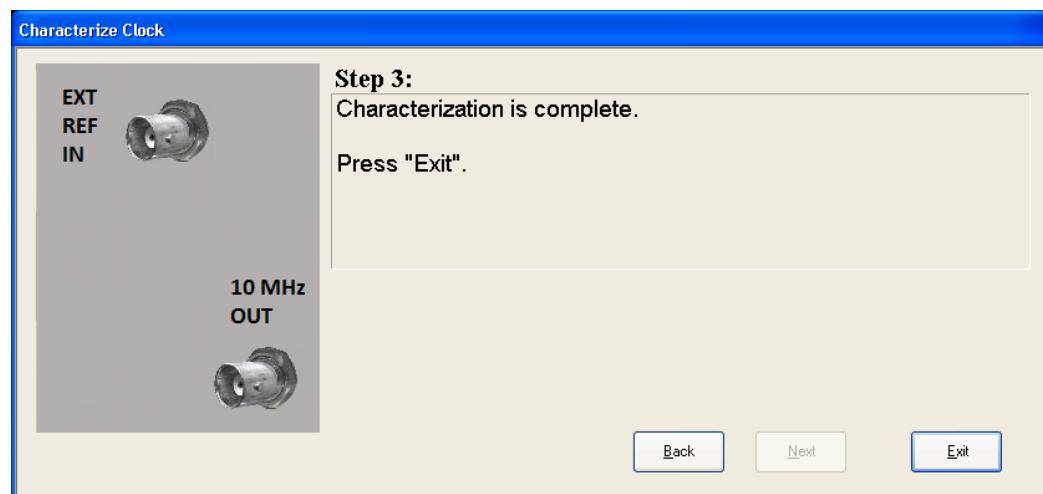
Step 1 of the guided calibration sequence:



Step 2 of the guided calibration sequence:



Step 3 of the guided calibration sequence:



## Characterize Noise Floor

On instruments with the NF2 license installed, the calibrated Noise Floor used by Noise Floor Extensions should be refreshed periodically. To do this, press the **Characterize Noise Floor** key. When you press this key, the instrument stops any measurement currently underway, and a dialog appears with an OK and Cancel button which says:

“This action will take several minutes to perform. Please disconnect all cables from the RF input and press Enter to proceed. Press ESC to cancel.”

When you press Enter or OK, the characterization proceeds. After the characterization, the analyzer restarts the measurement from the beginning (similar to pressing the Restart key). The characterization takes many minutes to run.

The noise floor model used by NFE includes an estimation of the temperature behavior of the noise floor, but this is only an estimation. The noise floor changes little with the age of the components. However, even small changes in the estimated level of the noise floor can make large changes in the effective noise floor, because the effective noise floor is the error in the estimation of the noise floor. Keysight recommends that the Characterize Noise Floor operation be performed when the analyzer is operating at an ambient temperature that is significantly different than the ambient temperature at which this alignment was last run. In addition, Keysight recommends that the Characterize Noise Floor operation be performed after the first 500 hours of operation, and once every calendar year.

The noise floor model from the last operation of Characterize Noise Floor survives across the power cycle.

### NOTE

The Characterize Noise Floor 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 noise floor. You should re-execute this function and allow it to finish before making any further measurements with NFE. Until you do, the analyzer will display a “Characterize Noise Floor required” message and set bit 12 in the Status Questionable Calibration register (STATus:QUEstionable:CALibration:EXTended:NEEDed).

Key Path	System, Alignments, Advanced
Mode	All
Remote Command	:CALibration:NFLoor :CALibration:NFLoor?
Example	:CAL:NFL
Notes	:CALibration:NFLoor? returns 0 if successful :CALibration:NFLoor? returns 1 if failed (including interfering user signal) While Characterize Noise Floor is performing the alignment, bit ? in the Status Operation register is set. Completion, or termination, will clear bit ? 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 characterization will generate the Error Condition message "Characterize Noise Floor failed" message and set bit ? in the Status Questionable Calibration register. Successful completion will clear bit ? in the Status Questionable Calibration register.
Dependencies	This key does not appear in models that do not contain NFE. In these models the SCPI command is accepted without error but no action is taken.
Couplings	Successful completion of Characterize Noise Floor will begin the elapsed time counter or the Last Characterize Noise Floor Time.
Initial S/W Revision	A.14.00

---

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TIME:NFLor?
<b>Example</b>	:CAL:TIME:NFL?
Notes	Value is the date and time the last successful Characterize Noise Floor was executed. The date is separated from the time by a space character. Returns "" if no Characterize Noise Floor has ever been performed on the instrument.
Dependencies	In models that do not include NFE, this command is not enabled and any attempt to set or query will yield an error.
State Saved	No
Initial S/W Revision	A.14.00

---

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TEMPerature:NFLor?
<b>Example</b>	:CAL:TEMP:NFL?
Notes	Value is the temperature of the last successful Characterize Noise Floor was executed. Returns "" if no Characterize Noise Floor has ever been performed on the instrument.
Dependencies	In models that do not include NFE, this command is not enabled and any attempt to set or query will yield an error.
State Saved	No
Initial S/W Revision	A.14.00

---

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TIME:ELAPsed:NFLor?

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<b>Example</b>	:CAL:TIME:ELAP:NFL?
Notes	Value is the elapsed time the instrument was powered-on since the last successful Characterize Noise Floor was executed. Returns "" if no Characterize Noise Floor has ever been performed on the instrument.
Dependencies	In models that do not include NFE, this command is not enabled and any attempt to set or query will yield an error.
State Saved	No
Initial S/W Revision	A.14.00

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### 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
<b>Remote Command</b>	:CALibration:FREQuency:REFerence:MODE CALibrated USER :CALibration:FREQuency:REFerence:MODE?
<b>Example</b>	: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

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### 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
<b>Example</b>	:CAL:FREQ:REF:MODE CAL
Readback Text	[xxx] < where xxx is the calibrated value
Initial S/W Revision	Prior to A.02.00

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## 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
<b>Example</b>	: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
<b>Remote Command</b>	:CALibration:FREQuency:REFerence:FINE <integer> :CALibration:FREQuency:REFerence:FINE?
<b>Example</b>	: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
<b>Backwards Compatibility SCPI</b>	: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

<b>Remote Command</b>	:CALibration:FREQuency:REFerence:COARse <integer> :CALibration:FREQuency:REFerence:COARse?
<b>Example</b>	: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

## RF Preselector

This menu and all of its submenus are only available in models with the RF Preselector, such as the N9038A.

See "Align Now, 20 Hz to 30 MHz" on page 343

See "Align Now, 30 MHz to 3.6 GHz" on page 344

See "Align Now, 20 Hz to 3.6 GHz" on page 345

See "Alert" on page 346

Key Path	System, Alignments
Initial S/W Revision	Prior to A.08..00

### Align Now, 20 Hz to 30 MHz

Immediately executes an alignment of the receiver subsystem. The receiver will stop any measurement currently underway, perform an Align Now All, then perform the RF Preselector alignment, and then restart the measurement from the beginning (similar to pressing the Restart key).

The query form of the remote commands (:CALibration:RFPreSelector:CONDucted?) will invoke the alignment of the RF Preselector on Conducted Band and return a success or failure value. Successful completion will clear the “Align 20 Hz to 30 MHz required” Error Condition, and clear the bit 1 in the Status Questionable Calibration Extended Needed register. The elapsed time counter will begin for Last Align Now, Conducted Time, and the temperature is captured for the Last Align Now, Conducted Temperature. The alignment 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 “Align 20 Hz to 30 MHz required” is set because new alignment data may be employed for an individual subsystem, but not a cohesive set of data for all subsystems.

The “Align 20 Hz to 30 MHz required” Error Condition will appear when this alignment has expired. User is now responsible to perform the Align Now, 20 Hz to 30 MHz in order to keep the receiver in warranted operation. This alignment can only be performed by user as it is not part of the Auto Align process.

Key Path	System, Alignments, RF Preselector, Align Now
Mode	All
<b>Remote Command</b>	:CALibration:RFPreSelector:CONDucted :CALibration:RFPreSelector:CONDucted?
<b>Example</b>	:CAL:RFPS:COND
Notes	For model N9038A only. :CALibration:RFPreSelector:CONDucted? Return 0 if successful :CALibration:RFPreSelector:CONDucted? Return 1 if failed When Align 20 Hz to 30 MHz 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 1 in the Status Questionable Calibration Extended Needed register and bit 0 in Status Questionable Calibration Extended Failure register. A failure encountered during alignment will set the Error Condition “20 Hz to 30 MHz Alignment Failure” and set both bit 1 in the Status Questionable Calibration Extended Needed register and bit 9 in Status Questionable Calibration register.

Dependencies	This key does not appear in other than N9038A models, setting or querying the SCPI will generate an error.
Couplings	Initializes the time for the Last Align Conducted Now, Conducted Time. Records the temperature for the Last Align Conducted Now, Conducted Temperature.
Status Bits/OPC Dependencies	Bit 8 or 9 may be set in the Status Questionable Calibration register. Bit 1 may be set in the Status Questionable Calibration Extended Needed register. Bit 0 may be set in the Status Questionable Calibration Extended Failure register.
Initial S/W Revision	A.08.00

### Align Now, 30 MHz to 3.6 GHz

Immediately executes an alignment of the receiver subsystem. The receiver will stop any measurement currently underway, perform an Align Now All, then perform the RF Preselector alignment, and then restart the measurement from the beginning (similar to pressing the Restart key).

The query form of the remote commands (:CALibration:RFPreSelector:RADiated?) will invoke the alignment of the RF Preselector on Radiated Band and return a success or failure value. Successful completion will clear the “Align 30 MHz to 3.6 GHz required” Error Condition, and clear the bit 2 in the Status Questionable Calibration Extended Needed register. The elapsed time counter will begin for Last Align Now, Radiated Time, and the temperature is captured for the Last Align Now, Radiated Temperature. The alignment 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 “Align 30 MHz to 3.6 GHz required” is set because new alignment data may be employed for an individual subsystem, but not a cohesive set of data for all subsystems.

The “Align 30 MHz to 3.6 GHz required” Error Condition will appear when this alignment has expired. User is now responsible to perform the Align Now, 30 MHz to 3.6 GHz in order to keep the receiver in warranted operation. This alignment can only be performed by user as it is not part of the Auto Align process.

Key Path	System, Alignments, RF Preselector, Align Now
Mode	All
<b>Remote Command</b>	:CALibration:RFPreSelector:RADiated :CALibration:RFPreSelector:RADiated?

<b>Example</b>	:CAL:RFPS:RAD
Notes	<p>For model N9038A only.</p> <p>:CALibration:RFPSel ector:RADiated? Return 0 if successful</p> <p>:CALibration:RFPSel ector:RADiated? Return 1 if failed</p> <p>When Align 30 MHz to 3.6 GHz 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.</p> <p>This command is sequential; it must complete before further SCPI commands are processed.</p> <p>Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORT command. Successful completion will clear bit 2 in the Status Questionable Calibration Extended Needed register and bit 1 in Status Questionable Calibration Extended Failure register.</p> <p>A failure encountered during alignment will set the Error Condition “30 MHz to 3.6 GHz Alignment Failure” and set both bit 2 in the Status Questionable Calibration Extended Needed register and bit 9 in Status Questionable Calibration register.</p>
Dependencies	This key does not appear in other than N9038A models, setting or querying the SCPI will generate an error.
Couplings	<p>Initializes the time for the Last Align Radiated Now, Radiated Time.</p> <p>Records the temperature for the Last Align Radiated Now, Radiated Temperature.</p>
Status Bits/OPC Dependencies	<p>Bit 8 or 9 may be set in the Status Questionable Calibration register.</p> <p>Bit 2 may be set in the Status Questionable Calibration Extended Needed register.</p> <p>Bit 1 may be set in the Status Questionable Calibration Extended Failure register.</p>
Initial S/W Revision	A.08.00

### Align Now, 20 Hz to 3.6 GHz

Immediately executes an alignment of the receiver subsystem. The receiver will stop any measurement currently underway, perform an Align Now All, then perform the RF Preselector alignment, and then restart the measurement from the beginning (similar to pressing the Restart key).

The query form of the remote commands (:CALibration:RFPSel ector:FULL?) will invoke the alignment of the RF Preselector on both Conducted and Radiated Band and return a success or failure value. Successful completion will clear the “Align 20 Hz to 3.6 GHz required” Error Condition, and clear the bit 1 and bit 2 in the Status Questionable Calibration Extended Needed register. The elapsed time counter will begin for Last Align Now, Conducted Time and Last Align Now Radiated Time and the temperature is captured for Last Align Now, Conducted Temperature and Last Align Now, Radiated Temperature. The alignment 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 “Align 20 Hz to 3.6 GHz required” is set because new alignment data may be employed for an individual subsystem, but not a cohesive set of data for all subsystems.

The “Align 20 Hz to 3.6 GHz required” Error Condition will appear when this alignment has expired. It is now your responsibility to perform the Align Now, 20 Hz to 3.6 GHz to keep the receiver in warranted operation. This alignment can only be performed by the user as it is not part of the Auto Align process.

<b>Key Path</b>	System, Alignments, RF Preselector, Align Now
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:RFPSel ector:FULL :CALibration:RFPSel ector:FULL?
<b>Example</b>	:CAL:RFPS:FULL
<b>Notes</b>	<p>For model N9038A only.</p> <p>:CALibration:RFPSel ector:FULL? Return 0 if successful</p> <p>:CALibration:RFPSel ector:FULL? Return 1 if failed</p> <p>When Align 20 Hz to 3.6 GHz 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.</p> <p>This command is sequential; it must complete before further SCPI commands are processed.</p> <p>Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORT command. Successful completion will clear bit 1, bit 2 in the Status Questionable Calibration Extended Needed register and bit 0, bit 1 in Status Questionable Calibration Extended Failure register.</p> <p>A failure encountered during alignment will set the Error Condition "20 Hz to 3.6 GHz Alignment Failure" and set bit1, bit 2 in the Status Questionable Calibration Extended Needed register and bit 9 in Status Questionable Calibration register.</p>
<b>Dependencies</b>	This key only appears in N9038A models, setting or querying the SCPI in other models will generate an error.
<b>Couplings</b>	<p>Initializes the time for the Last Align Conducted Now, Conducted Time.</p> <p>Initializes the time for the Last Align Radiated Now, Radiated Time.</p> <p>Records the temperature for the Last Align Conducted Now, Conducted Temperature.</p> <p>Records the temperature for the Last Align Radiated Now, Radiated Temperature.</p>
<b>Status Bits/OPC Dependencies</b>	<p>Bit 8 or 9 may be set in the Status Questionable Calibration register.</p> <p>Bit 1 and 2 may be set in the Status Questionable Calibration Extended Needed register.</p> <p>Bit 0 and 1 may be set in the Status Questionable Calibration Extended Failure register.</p>
<b>Initial S/W Revision</b>	A.08.00

### Alert

Setting Alert to ON/OFF will enable/disable the display of RF Preselector alignment required message on the status line. The instrument will power up with Alert On mode.

<b>Key Path</b>	System, Alignments, RF Preselector
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:RFPSel ector:ALERT ON OFF 0 1 :CALibration:RFPSel ector:ALERT?
<b>Example</b>	:CAL:RFPS:ALER OFF
<b>Notes</b>	For model N9038A only.

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	Error Condition will be generated when the alert is On and any of the RF Preselector alignments has expired.
Preset	This is unaffected by Preset, but is set to ON on a “Restore System Defaults->Align”.
State Saved	No
Initial S/W Revision	A.08.00

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### Schedule Setup

Enables you to schedule a task to run automatically at the background based on the recurrence and time set in the scheduler. Make sure that the Instrument’s local time is accurate as the Scheduler relies on this information to execute the task.

---

Key Path	System, Alignments, RF Preselector
Initial S/W Revision	A.08.00

---

### Task

There are 3 tasks that can be selected for the scheduler to run.

Task 1 is the 20 Hz to 30 MHz alignment

Task 2 is the 30 MHz to 3.6 GHz alignment

Task 3 is the 20 Hz to 3.6 GHz alignment.

---

Key Path	System, Alignments, RF Preselector, Schedule Setup
Mode	All
<b>Remote Command</b>	:CALibration:RFPSelECtor:SCHeduler:TASK T1 T2 T3 :CALibration:RFPSelECtor:SCHeduler:TASK?
<b>Example</b>	:CAL:RFPS:SCH:TASK T1
Notes	Changing the task will not reset the Scheduler time and the alignment is based on the current scheduled configuration to occur. For model N9038A only.
Preset	This is unaffected by Preset but is set to T3 on a “Restore System Defaults->Align”.
State Saved	No
Range	Task 1   Task 2   Task 3
Initial S/W Revision	A.08.00

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### Date/Time

Enables you to configure the scheduler to run a task starting from this date and time. The date and time rely on the instrument’s local time to execute a scheduled task. The date is based on the format “YYYY/MM/DD” and the time is based on a 24 hour clock.

---

Key Path	System, Alignments, RF Preselector, Schedule Setup
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Mode	All
<b>Remote Command</b>	<pre>:CALibration:RFPSelector:SCHeduler:TIME:STAR "date","time" :CALibration:RFPSelector:SCHeduler:TIME:STAR?</pre> <p>This query returns data using the following format "YYYY/MM/DD; HH:MM:SS"</p>
<b>Example</b>	:CAL:RFPS:SCH:TIME:STAR "2009/8/20", "12:00:00"
Notes	<p>"date" is representation of the date the task will run in the form of "YYYY/MM/DD" where:</p> <ul style="list-style-type: none"> <li>- YYYY is the four digit representation of year. (for example, 2009)</li> <li>- MM is the two digit representation of month. (for example, 01 to 12)</li> <li>- DD is the two digit representation of the day. (for example, 01 to 28, 29, 30 or 31 depending on the month and year)</li> </ul> <p>"time" is a representation of the time of day the task will run in the form of "HH:MM:SS" where:</p> <ul style="list-style-type: none"> <li>- HH is the two digit representation of the hour in 24 hour format</li> <li>- MM is the two digit representation of minute</li> <li>- SS is the two digit representation of seconds</li> </ul> <p>For model N9038A only.</p>
Preset	This is unaffected by Preset but is set to Current date and 00:00:00 on a "Restore System Defaults->Align".
State Saved	No
Initial S/W Revision	A.08.00

### Date

Enables you to configure the date of the scheduled task. The SCPI command to configure the date and time parameters of the scheduler is the same; however, they each have their own front-panel control.

Key Path	System, Alignments, RF Preselector, Schedule Setup, Date/Time
Notes	<p>See "<a href="#">Date/Time</a> " on page 347.</p> <p>For model N9038A only.</p>
Preset	This is unaffected by Preset but is set to Current date and 00:00:00 on a "Restore System Defaults->Align".
State Saved	No
Initial S/W Revision	A.08.00

### Time

Enables you to configure the time of the scheduled task. The SCPI command to configure the date and time parameters of the scheduler is the same; however, they each have their own front panel-control.

Key Path	System, Alignments, RF Preselector, Schedule Setup, Date/Time
Notes	See "Date/Time " on page 347 . For model N9038A only.
Preset	This is unaffected by Preset but is set to Current date and 00:00:00 on a "Restore System Defaults->Align".
State Saved	No
Initial S/W Revision	A.08.00

### Recurrence

Enables you to configure the scheduler to run the task recurrently on a scheduled date and time. You can schedule it to run daily, weekly or alternate weeks.

Key Path	System, Alignments, RF Preselector, Schedule Setup
Mode	All
<b>Remote Command</b>	:CALibration:RFPSelECtor:SCHeduler:RECurrence DAY WEEK OFF :CALibration:RFPSelECtor:SCHeduler:RECurrence?
<b>Example</b>	:CAL:RFPS:SCH:REC DAY
Notes	For model N9038A only.
Preset	This is unaffected by Preset but is set to OFF on a "Restore System Defaults->Align".
State Saved	No
Range	DAY WEEK OFF
Initial S/W Revision	A.08.00

### Every N Weeks

Enables you to configure the scheduler to run the task on a day in every number of week's duration.

Key Path	System, Alignments, RF Preselector, Schedule Setup, Recurrence
Initial S/W Revision	A.08.00

### N of Weeks

Enables you to set the number of weeks that the scheduler will wait to trigger a task.

Key Path	System, Alignments, RF Preselector, Schedule Setup, Recurrence, Every N Weeks
Mode	All
<b>Remote Command</b>	:CALibration:RFPSelECtor:SCHeduler:RECurrence:WEEK <integer> :CALibration:RFPSelECtor:SCHeduler:RECurrence:WEEK?
<b>Example</b>	:CAL:RFPS:SCH:REC:WEEK 2
Notes	New scheduled date to run the alignment task will get updated when this parameter is changed. For model N9038A only.

Preset	This is unaffected by Preset but is set to 1 on a “Restore System Defaults->Align”.
State Saved	No
Range	1-52
Min	1
Max	52
Initial S/W Revision	A.08.00

### Day

Enables you to set the Day of the Week the scheduler will run a scheduled task.

Key Path	System, Alignments, RF Preselector, Schedule Setup, Recurrence, Every N Weeks
Mode	All
<b>Remote Command</b>	:CALibration:RFPSelEC:SCHeDuler:RECurreNCE:DAY SUN   MON   TUE   WED   THU   FRI   SAT :CALibration:RFPSelEC:SCHeDuler:RECurreNCE:DAY?
<b>Example</b>	:CAL:RFPS:SCH:REC:DAY SUN
Notes	For model N9038A only.
Preset	This is unaffected by Preset but is set to SUN on a “Restore System Defaults->Align”.
State Saved	No
Range	Sunday Monday Tuesday Wednesday Thursday Friday Saturday
Initial S/W Revision	A.08.00

### Scheduler

Setting the Scheduler to ON will trigger the execution of the scheduled task based on the recurrence and time set in the scheduler since the last successful of the specific alignment. A warning condition of “RF Preselector alignment scheduler is ON” will be appeared when the scheduler is set to ON. OFF will turn off the Scheduler from running any scheduled task.

Key Path	System, Alignments, RF Preselector
Mode	All
<b>Remote Command</b>	:CALibration:RFPSelEC:SCHeDuler:STATE ON OFF 0 1 :CALibration:RFPSelEC:SCHeDuler:STATE?
<b>Example</b>	:CAL:RFPS:SCH:STAT OFF
Notes	For model N9038A only.
Preset	This is unaffected by Preset but is set to OFF on a “Restore System Defaults->Align”.
State Saved	No
Initial S/W Revision	A.08.00

## 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	:SYST:COMM:GPIB[1][:SELF]:ADDRESS <integer> :SYST:COMM: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 TCPIPO:localhost:inst0:INSTR to send SCPI commands to the analyzer application.

Key Path	System, I/O Config, GPIB	
Mode	All	
Scope	Mode Global	
<b>Remote Command</b>	:SYST:COMM:GPIB[1][:SELF]:CONTROLLER[:ENABLE] ON   OFF   0   1 :SYST:COMM:GPIB[1][:SELF]:CONTROLLER[:ENABLE]?	
<b>Example</b>	: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	
<b>Example</b>	: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	
<b>Example</b>	: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
<b>Remote Command</b>	:SYST:COMM:LAN:SCPI:TELNet:ENABLE OFF ON 0 1 :SYST:COMM:LAN:SCPI:TELNet:ENABLE?
<b>Example</b>	:SYST:COMM:LAN:SCPI:TELNet:ENABLE 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
<b>Remote Command</b>	:SYST:COMM:LAN:SCPI:SOCKET:ENABLE OFF ON 0 1 :SYST:COMM:LAN:SCPI:SOCKET:ENABLE?
<b>Example</b>	:SYST:COMM:LAN:SCPI:SOCKET:ENABLE 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	
<b>Remote Command</b>	:SYST:COMM:LAN:SCPI:SICL:ENABLE OFF ON 0 1 :SYST:COMM:LAN:SCPI:SICL:ENABLE?	
<b>Example</b>	:SYST:COMM:LAN:SCPI:SICL:ENABLE 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	
<b>Remote Command</b>	:SYST:COMM:LAN:SCPI:HISLIP:ENABLE OFF ON 0 1 :SYST:COMM:LAN:SCPI:HISLIP:ENABLE?	
<b>Example</b>	:SYST:COMM:LAN:SCPI:HISLIP:ENABLE 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. The user 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
<b>Remote Command</b>	:SYST:COMMunicate:LAN:SCPI:SOCKET:CONTrol?
<b>Example</b>	: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
<b>Backwards Compatibility SCPI</b>	SYST:COMMunicate:TCPip:CONTrol?
Initial S/W Revision	Prior to A.02.00

### Reset Web Password

The embedded web server contains certain capabilities 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 for software versions less than A.14.49 is ‘agilent’ (without the quotes), for software versions greater than A.14.50 the password is ‘measure4u’ (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. An external keyboard is required to change the password from the factory default. 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

### Device Identification (Remote Command Only)

Enabling the LXI device identification will place the LXI Status Indicator to the 'Identify' state. Disabling the LXI device identification will place the LXI Status Indicator to the 'No Fault' state. The LXI Status indicator is in the upper left region of the instrument's graphical user interface ().

Mode	All
Remote Command	:LXI:IDENTify[:STATE] OFF ON 0 1 :LXI:IDENTify[:STATE]?
Example	:LXI:IDEN ON
Preset	Not part of Preset, but reset to OFF on Restore System Defaults All
State Saved	No

Range	On   Off
Initial S/W Revision	A.12.50

### 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.

If your test software is expecting the response to indicate Agilent Technologies as the Manufacturer, you can conveniently configure the response by pressing the Agilent key.

Key Path	System, I/O Config
Mode	All
<b>Remote Command</b>	:SYST:IDN:CONF <sub>FACTORY AGILENT USER</sub> :SYST:IDN:CONF?
Notes	<ul style="list-style-type: none"> <li>- 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..</li> <li>- It survives shutdown and restart of the software and therefore survives a power cycle</li> </ul>
Preset	This is unaffected by Preset but is set to Factory on a "Restore System Defaults->Misc"
State Saved	No
Initial S/W Revision	A.06.00
Modified at S/W Revision	x.14.50

### Factory

This key selects the factory setting, for example:

"Agilent 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
<b>Example</b>	:SYST:IDN:CONF FACT
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
<b>Example</b>	:SYST:IDN:CONF USER
Initial S/W Revision	A.06.00

### SYSTem:IDN Response setting (Remote command)

This SCPI command is used to set or clear the User SYSTem:IDN response.

<b>Remote Command</b>	:SYSTem:IDN <string> :SYSTem:IDN?
Notes	<ul style="list-style-type: none"> <li>- The format of the &lt;string&gt; must be four fields each separated by a comma, example: :SYST:IDN "XYZ Corp,Model 12,012345,A.01.01"</li> <li>- The four fields are &lt;manufacturer&gt;, &lt;model number&gt;, &lt;serial number&gt;, &lt;firmware revision&gt;. Thus, the text within a field cannot contain a comma.</li> <li>- 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..</li> <li>- It survives shutdown and restart of the software and therefore survives a power cycle</li> <li>- Null string as parameter restores the Factory setting, example: :SYST:IDN ""</li> </ul>
Preset	This is unaffected by Preset but is set to the original factory setting on a "Restore System Defaults->Misc"
Initial S/W Revision	A.06.00

### SYSTem:PERSONa:DEFault

This command will reset the \*IDN response to the instrument default.

<b>Remote Command</b>	SYSTem:PERSONa:DEFault SYSTem:PERSONa:DEFault?
Notes	The query SYST:PERs:DEF? returns the default value of *IDN? even if the current setting of *IDN? is the non-default value. The return value of SYST:PERs:DEF? is a <string>. SYST:PERs:DEF is equivalent to: SYSTem:IDN "" SYSTem:IDN:CONF DEF
Initial S/W Revision	x.17.00

### SYSTem:PERSONa:MANUFACTurer

This command will set the Manufacturer field of the \*IDN? response. The Manufacturer field is the first field of the \*IDN? response.

Remote Command	SYSTem:PERSONa:MANUFACTurer <string> SYSTem:PERSONa:MANUFACTurer?
Notes	When setting the manufacturer field, the current IDN response string is modified to replace the manufacturer field with the string specified by the command. If the resulting IDN response matches one of the predefined responses (SYSTem:IDN:CONFigure FACT   AGIL), then the SYSTem:IDN:CONFigure is set to the corresponding value. If the IDN response with the new manufacturer field is not one of the predefined values, then SYSTem:IDN:CONFigure will be set to USER and SYSTem:IDN will be set to the new IDN response string. The query SYST:PERs:MAN? returns the current value of the *IDN? Manufacturer field.
Initial S/W Revision	x.17.00

### SYSTem:PERSONa:MANUFACTurer:DEFault

This command will reset the Manufacturer field of the \*IDN? response to the default value.

Remote Command	SYSTem:PERSONa:MANUFACTurer:DEFault SYSTem:PERSONa:MANUFACTurer:DEFault?
Notes	The query SYST:PERs:MAN:DEF? returns the default Manufacturer Field value of *IDN? even if the current setting of *IDN? is the non-default value. The return value of SYST:PERs:MAN:DEF? is a <string>.
Initial S/W Revision	x.17.00

### SYSTem:PERSONa:MODEl

This command will set the Model field of the \*IDN? response. The Model field is the second field of the \*IDN? response.

Remote Command	SYSTem:PERSONa:MODEl <string> SYSTem:PERSONa:MODEl?
Notes	When setting the model field, the current IDN response string is modified to replace the model field with the string specified by the command. If the resulting IDN response matches one of the predefined responses (SYSTem:IDN:CONFigure FACT   AGIL), then the SYSTem:IDN:CONFigure is set to the corresponding value. If the IDN response with the new model field is not one of the predefined values, then SYSTem:IDN:CONFigure will be set to USER and SYSTem:IDN will be set to the new IDN response string. The query SYST:PERs:MOD? returns the current value of the *IDN? Model field.
Initial S/W Revision	x.17.00

### SYSTem:PERSONa:MODEl:DEFault

This command will reset the Model field of the \*IDN? response to the default value.

Remote Command	SYSTem:PERSONa:MODEl:DEFault
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<b>SYSTem:PERSONa:MODEl:DEFault?</b>	
Notes	The query SYST:PERS:MOD:DEF? returns the default Model Field value of *IDN? even if the current setting of *IDN? is the non-default value. The return value of SYST:PERS:MOD:DEF? is a <string>.
Initial S/W Revision	x.17.00

### Query USB Connection (Remote Command Only)

Enables you to determine the speed of the USB connection.

Mode	All
<b>Remote Command</b>	:SYSTem:COMMunicate:USB:CONNection?
<b>Example</b>	:SYST:COMM:USB:CONN?
Notes	<p>NONE – Indicates no USB connection has been made.</p> <p>LSPeed – Indicates a USB low speed connection (1.5 Mbps).</p> <p>HSPeed – Indicates that a USB high speed connection (480 Mbps) has been negotiated.</p> <p>FSPeed – Indicates that a USB full speed connection (12 Mbps) has been negotiated.</p>
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
<b>Remote Command</b>	:SYSTem:COMMunicate:USB:STATus?
<b>Example</b>	:SYST:COMM:USB:STAT?
Notes	<p>SUSPended – Indicates that the USB bus is currently in its suspended state. The bus is in the suspended state when:</p> <ul style="list-style-type: none"> <li>– The bus is not connected to any controller</li> <li>– The controller is currently powered off</li> <li>– The controller has explicitly placed the USB device into the suspended state.</li> </ul> <p>When in the suspended state, no USB activity, including start of frame packets are received.</p> <p>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 isn't necessarily receiving or transmitting data.</p>
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
<b>Remote Command</b>	:SYST:COMMunicate:USB:PACKets?
<b>Example</b>	: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

### Lock Remote I/O Session (Remote Command only)

You can lock the SCPI control of the instrument to the I/O Interface and Session by performing a SYSTem:LOCK:REQuest? Query. This permits cooperative sharing of the instrument between multiple computers, or multiple sessions from the same computer.

**NOTE**

Use of cooperative sharing (locking) must take into account the properties of an interface, interfaces are either single session or multiple session:

Interface	Single Session	Multiple Session
GPIB	✓	
USB-488	✓	
LAN VXI-11 (SICL)	✓	
LAN Socket		✓
LAN HiSLIP		✓
LAN Telnet		✓

**NOTE**

It is inappropriate to control the instrument from multiple computers (or multiple processes or threads of a single computer) when using single session interfaces. In particular, care must be taken when using LAN VXI-11 (SICL) interface that only a single computer (or single process or single thread) is controlling the instrument; if multiple computers are controlling the instrument responses may not result in expected operation.

It is not recommended to use VXI-11 with SCPI locking as multiple clients can simultaneously connect to the instrument. If VXI-11 is required then VISA locking must be used in addition to SCPI locking.

The recommended interface is LAN HiSLIP. Since HiSLIP is a multiple session interface, the controlling computer can send lock requests from multiple applications (or multiple threads of a single application) to permit cooperative sharing of the instrument.

<b>Remote Command</b>	SYSTem:LOCK:REQuest?
<b>Example</b>	SYST:LOCK:REQ?
Notes	<p>The command returns a 1 if the lock request is granted, 0 is returned if the request is denied.</p> <p>Single Session interfaces will always return 1 once the same interface has already received a lock request.</p> <p>Lock requests on an individual interface and session can be nested and each request will increase an internal lock count by 1. For every granted request, you will need to perform a SYSTem:LOCK:RELEASE to decrement the internal lock count to fully relinquish the lock.</p> <p>When the instrument is locked bit 0 is set in the Operation Instrument status register.</p> <p>Disconnecting the individual interface and session will release the lock if the lock is granted to the interface and session.</p> <p>A Device Clear over any interface and session will release the lock, regardless of the interface and session which obtained the lock.</p> <p>The following queries are permitted over any interface and session even if an interface has the instrument locked:</p> <ul style="list-style-type: none"> <li>*IDN?</li> <li>*OPT?</li> <li>*STB?</li> <li>*ESR?</li> <li>:SYSTem:DATE?</li> <li>:SYSTem:TIME?</li> <li>:SYSTem:PON:TIME?</li> <li>Queries in the :STATus subsystem</li> <li>Queries in the :SYSTem:ERRor subsystem</li> <li>Queries in the :SYSTem:LKEY subsystem</li> <li>Queries in the :SYSTem:LOCK subsystem</li> <li>Queries in the :SYSTem:METRics subsystem</li> <li>Queries in the :SYSTem:MODule subsystem</li> <li>All other commands and queries will result in the error: -203, "Command protected; Instrument locked by another I/O session"</li> </ul>
State Saved	Not part of Save/Recall
Initial S/W Revision	x.16.10

### Unlock Remote I/O Session (Remote Command only)

You can unlock the SCPI control of an I/O Interface and Session performing a SYSTem:LOCK:RELEASE command. Lock requests on an individual interface and

session can be nested and each request will increase an internal lock count by 1. For every granted request, you will need to perform a release. The lock is not relinquished until the internal lock count is at 0.

<b>Remote Command</b>	SYSTem:LOCK:RELEASE
<b>Example</b>	SYST:LOCK:REL
Notes	When the instrument is unlocked bit 0 is cleared in the Operation Instrument status register.
Initial S/W Revision	x.16.10

#### Remote I/O Session Lock Name (Remote Command only)

You can determine the I/O Interface and Session name of the currently running program with the query SYSTem:LOCK:NAME?.

<b>Remote Command</b>	SYSTem:LOCK:NAME?
<b>Example</b>	SYST:LOCK:NAME?
Notes	<p>The information returned is a string of the format:  “&lt;I/O Interface&gt;[/&lt;IP address&gt;/&lt;Session ID&gt;]”</p> <p>Where IP address and Session ID are only provided for interfaces that provide multiple sessions. Single Session interfaces (GPIB, USB-488, and LAN VXI-11) only list interface name.</p> <p>The Session ID is an internally generated identifier, it is not guaranteed to be consistent across instrument software versions (the identifier is free to change when the software of the instrument is updated). The absolute value of the Session ID is not significant, the identifier will be consistent for a given software version and can be relied upon for lock owner logic comparisons.</p>
Initial S/W Revision	x.16.10

#### Remote I/O Session Lock Owner (Remote Command only)

You can determine which I/O Interface and Session has the SCPI locked with the query SYSTem:LOCK:OWNer?. If no interface and session has the SCPI locked “NONE” is returned.

<b>Remote Command</b>	SYSTem:LOCK:OWNer?
<b>Example</b>	SYST:LOCK:OWN?
Notes	<p>The information returned is a string of the format:  “&lt;I/O Interface&gt;[/&lt;IP address&gt;/&lt;Session ID&gt;]”</p> <p>Where IP address and Session ID are only provided for interfaces that provide multiple sessions. Single Session interfaces (GPIB, USB-488, and LAN VXI-11) only list interface name.</p> <p>The Session ID is an internally generated identifier, it is not guaranteed to be consistent across instrument software versions (the identifier is free to change when the software of the instrument is updated). The absolute value of the Session ID is not significant, the identifier will be consistent for a given software version and can be relied upon for lock owner logic comparisons.</p> <p>If no interface and session have the SCPI locked the return value is “NONE”.</p>
Initial S/W Revision	x.16.10

## Restore Defaults

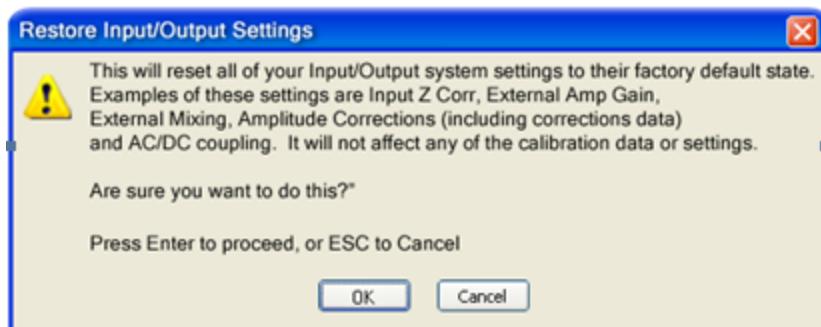
Provides incremental initialization of the system setting groups along with supporting a comprehensive reset of the entire instrument back to a factory default state. The menu selections are the groups of system settings and when one is selected, that particular group of system settings is reset back to their default values.

Key Path	System
Mode	All
<b>Remote Command</b>	:SYST:DEFault [ALL]   ALIGN   INPUT   MISC   MODEs   PON
<b>Example</b>	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:

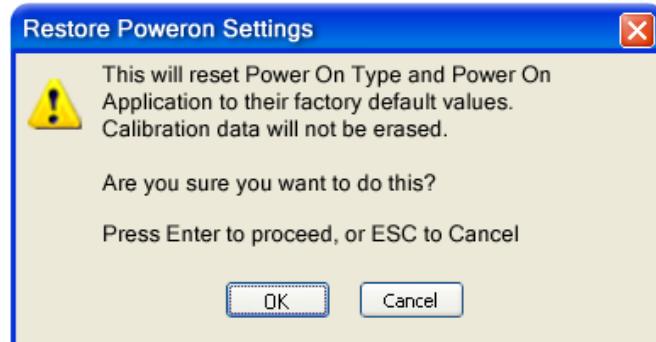


Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF INP
Initial S/W Revision	Prior to A.02.00

## 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
<b>Example</b>	:SYST:DEF PON
Initial S/W Revision	Prior to A.02.00

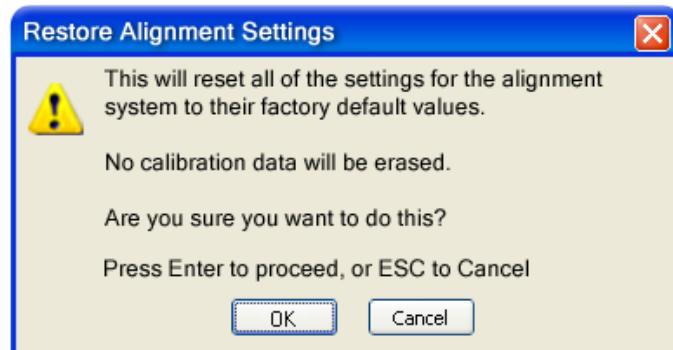
---

### 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:



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Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF ALIG
Initial S/W Revision	Prior to A.02.00

---

### Restore Misc Defaults

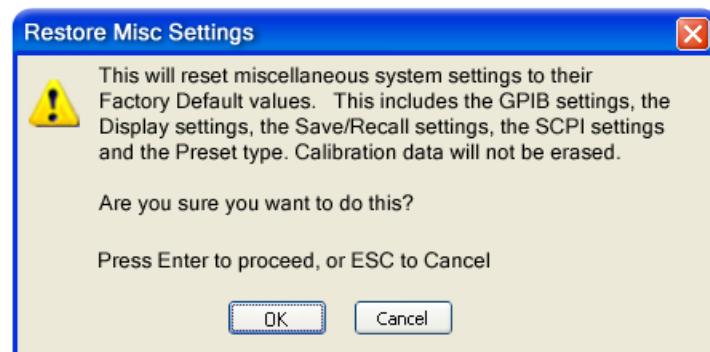
This selection causes miscellaneous system settings to be reset to their default values. With this reset, you lose the GPIB address and it is reset to 18, so this should be used with caution. This level of Restore System Defaults does not affect any other

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
The SYST:PRES:TYPE	MODE
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
Softkey Language	English
System Annotation	ON
Display Theme	TDCOLOR
System IDN Response	Factory result of *IDN?
System IDN Response selection	Factory
Display Intensity	100
Display Backlight	ON
GPIB Address	

18

Confirmation is required to restore the factory default values. The confirmation dialog is:

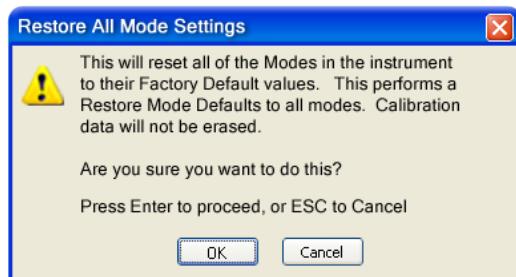


Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF MISC
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	x.14.50

### 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:

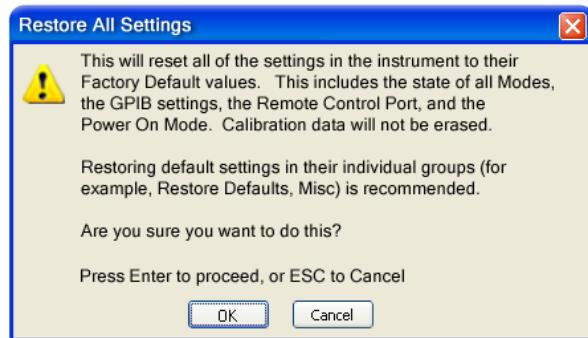


Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF MOD
Couplings	An All Mode will cause the currently running measurement to be aborted, mode switch to the power-on mode and activate the default measurement for the power-on mode.. It gets the mode to a consistent state with all of the 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:



**NOTE**

If you are using an Keysight USB External Mixer, then you will need to perform a Refresh USB Mixer Connection after Restoring All Defaults.

Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF ALL
Notes	If using Keysight USB External Mixer, perform a Refresh USB Mixer Connection (SCPI command :MIX:BAND USB) following a Restore All Defaults.
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
Modified at S/W Revision	A.14.00

## Control Panel...

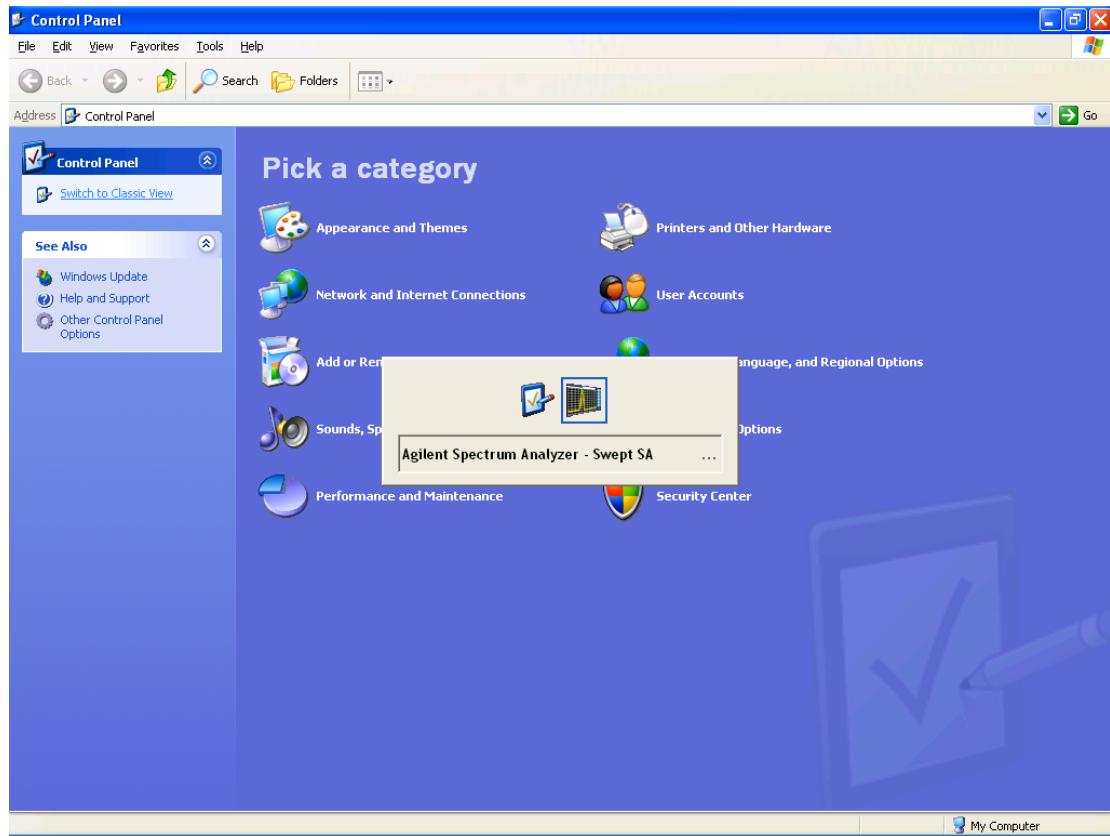
Opens the Windows Control Panel. The Control Panel is used to configure certain elements of Windows that are not configured through the hardkey/softkey System menus.

**NOTE**

This feature is not available if option SF1 is installed.

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	<b>System</b>
Notes	No remote command for this key.
Initial S/W Revision	Prior to A.02.00

### Licensing...

Opens the license explorer.

**NOTE**

This feature is not available if option SF1 is installed.

For Help on this key, select Help in the menu bar at the top of the license explorer window.

Key Path	<b>System</b>
Notes	No equivalent remote command for this key.
Backwards Compatibility	In ESA the SCPI command for displaying the Show Licenses screen is: <b>:SYSTem:CONFigure:LKEY:STATe OFF ON 0 1:SYSTem:CONFigure:LKEY:STATE?</b>
Notes	There are no equivalent SCPI commands in the X-Series for displaying the License Explorer.
Initial S/W Revision	Prior to A.02.00

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<b>Remote Command</b>	<code>:SYST:KEY &lt;"OptionInfo"&gt;, &lt;"LicenseInfo"&gt;</code>
<b>Example</b>	SYST:KEY "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

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<b>Remote Command</b>	<code>:SYST:KEY:DELETE &lt;"OptionInfo"&gt;,&lt;"LicenseInfo"&gt;</code>
<b>Example</b>	SYST:KEY: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

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<b>Remote Command</b>	<code>:SYST:KEY:LIST?</code>
Notes	<p>Return Value: An &lt;arbitrary block data&gt; of all the installed instrument licenses.</p> <p>The format of each license is as follows.</p> <p>&lt;Feature&gt;,&lt;Version&gt;,&lt;Signature&gt;,&lt;Expiration Date&gt;,&lt;Serial Number for Transport&gt;</p> <p>Return Value Example:</p> <p>#3136 N9073A-1FP,1.000,B043920A51CA N9060A-2FP,1.000,4D1D1164BE64 N9020A-508,1.000,389BC042F920 N9073A-1F1,1.000,5D71E9BA814C,13-aug-2005</p> <p>&lt;arbitrary block data&gt; is:</p> <p>#NNNN&lt;data&gt;</p>

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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

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Initial S/W Revision	Prior to A.02.00
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<b>Remote Command</b>	:SYSTem:LKEY? <"OptionInfo">
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<b>Example</b>	SYST:LKEY? "N9073A-1FP"
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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.
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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"

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Initial S/W Revision	Prior to A.02.00
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<b>Remote Command</b>	:SYSTem:HID?
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Notes	Return value is the host ID as a string
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Initial S/W Revision	Prior to A.02.00
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## Security

Accesses capabilities for operating the instrument in a security controlled environment.

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Key Path	System
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Initial S/W Revision	A.04.00
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## 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.

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Key Path	System, Security
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---

Mode	All
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Scope	Mode Global
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<b>Remote Command</b>	:SYST:SECURITY:USB:WPR[ENABLE] ON OFF 0 1 :SYST:SECURITY:USB:WPR[ENABLE]?
<b>Example</b>	: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. An Agilent Recovery will set the USB to write protect OFF
State Saved	No
Range	Read-Write Read only
Initial S/W Revision	A.04.00

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### Read-Write

Selection for allowing full read-write access to the USB ports.

---

Key Path	System, Security, USB
<b>Example</b>	:SYST:SEC:USB:WPR OFF Sets USB ports to Read-Write
Initial S/W Revision	A.04.00

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### Read only

Selection for disabling write access to the USB ports.

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Key Path	System, Security, USB
<b>Example</b>	:SYST:SEC:USB:WPR ON Sets USB ports to Read only
Initial S/W Revision	A.04.00

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### Diagnostics

The Diagnostics key in the System menu gives you access to basic diagnostic capabilities of the instrument.

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Key Path	System
Initial S/W Revision	Prior to A.02.00

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### 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 <b>Only shown if LNP installed</b>	45668
Preselector Bypass Cycles <b>Only shown if MPB installed</b>	31133
High temperature operating extreme	45.75
Low temperature operating extreme	-23.9375
Elapsed Time (On-Time)(hours)	134164

In some CXA models  
this field is called  
“Fixed Atten”

Some CXA models  
omit these fields

The CXA models in which the AC/DC Switch field is called Fixed Atten and that omit the mechanical attenuation fields are the N9000A-503/507 models.

Modular HWs only have time and temperature information in Show Hardware Statistics.

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.

- "Query the Mechanical Relay Cycle Count" on page 374
- "Query the Operating Temperature Extremes" on page 374
- "Query the Elapsed Time since 1st power on" on page 375

### Query the Mechanical Relay Cycle Count

Return the count of mechanical relay cycles.

For N9038A model, there are additional 2 Mechanical Relays which are <N9038A Input2>, <N9038A Bypass>.

<b>Remote Command</b>	:SYST:MRREL:COUNT?
<b>Example</b>	:SYST:MRREL:COUN?
Notes	<p>Query Only</p> <p>The return value is a comma separated list of the individual counts for each mechanical relay.</p> <p>The position of the relays in the list is:</p> <p>“&lt;Cal Signal&gt;, &lt;AC/DC&gt;, &lt;2dB #1 Atten&gt;, &lt;2dB #2 Atten&gt;, &lt;6dB Atten&gt;, &lt;10dB Atten&gt;, &lt;20dB Atten&gt;, &lt;30dB Atten&gt;, &lt;Fixed Atten&gt;, &lt;Low Noise Path Switch&gt;, &lt;Presel Bypass&gt;, &lt;N9038A Input2&gt;, &lt;N9038A Bypass&gt;”</p> <p>Items in the list not pertaining to your particular hardware configuration will return as -999 for those items.</p>
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 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
<b>Remote Command</b>	:SYST:TEMPERATURE:LEXTreme?
<b>Example</b>	:SYST:TEMP:LEXT?
Notes	Value is in degrees Celsius at which the lowest operating temperature has been recorded since 1st power-up.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Mode	All
<b>Remote Command</b>	:SYST:TEMPERATURE:HEXTreme?
<b>Example</b>	:SYST:TEMP:HEXT?

Notes	Value is in degrees Celsius at which the highest operating temperature has been recorded since 1st power-up.
State Saved	No
Initial S/W Revision	Prior to A.02.00

### Query the Elapsed Time since 1<sup>st</sup> power on

Returns the elapsed on-time in minutes since 1st power-on.

**Remote Command** :SYST:PON:ETIMe?

**Example** :SYST:PON:ETIM?

Notes Query Only

Initial S/W Revision Prior to A.02.00

### Advanced

Accesses advanced diagnostic capabilities performed in the factory or under instructions from repair procedures. This menu key is only visible when the logged-in user is “saservice”.

**NOTE**

This feature is not available if option SF1 is installed.

The first access to the Advanced Diagnostic Menu after invoking the instrument application will require an authentication, which is to enter the Service Code. Subsequent accesses to the Advanced Diagnostic Menu are unimpeded. The Authentication dialog looks like:



“OK” is the default key thus the Enter key is used to complete the entry. If invalid Service Code is entered authentication is not granted and you are provided the following dialog:



Key Path System, Diagnostics

Notes	Password is required to access this menu.	
Initial S/W Revision	Prior to A.02.00	

	Keysight Converged	PSA
IP Address	SYSTem:COMMUnicatE:LAN:ADDResS <string>  SYSTem:COMMUnicatE:LAN:ADDResS?	:SYSTem:COMMUnicatE:LAN[:SELF]:IP <string>  :SYSTem:COMMUnicatE:LAN[:SELF]:IP?
Gateway	SYSTem:COMMUnicatE:LAN:DGAteway <string>  SYSTem:COMMUnicatE:LAN:DGAteway?	:SYSTem:COMMUnicatE:LAN [:SELF]:GATEway <string>  :SYSTem:COMMUnicatE:LAN [:SELF]:GATEway?
Subnet Mask	SYSTem:COMMUnicatE:LAN:SMASK <string>  SYSTem:COMMUnicatE:LAN:SMASK?	:SYSTem:COMMUnicatE:LAN [:SELF]:SUBNetmask <string>  :SYSTem:COMMUnicatE:LAN [:SELF]:SUBNetmask?

## 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	<b>System</b>
Initial S/W Revision	Prior to A.02.00

## Softkey Language

Accesses the selection of language displayed on the Softkeys and Softkey Menus. English is the default language. The selection of language is available when the instrument is licensed with a language option.

All Measurement Applications that share common softkeys will display the localized softkey.

The description on the key labels is bounded by the softkey size, any given language will have labels in that language which are shorter or longer than the equivalent label in English. Any localized text on the softkeys that does not fit the label size, will remain in English. Thus for any given menu, keys may be displayed in English and the selected language. Also, labels that are acronyms, engineering, or technology specific terms may remain in English.

All Application and Measurement names will remain in English.

All data in exported files will remain in English.

The Diagnostic and Service menus in the System Subsystem will remain in English.

The Windows operating system must remain in English. Changing the Region and Language settings in the Windows Control Panel is not supported.

External keyboards in English are supported. Localized external keyboards are not supported. When the language selected is not English, a message is presented to the user that any external keyboards must remain English.

Other aspects of the Graphical User Interface remain in the English language. The Remote User Interface, SCPI, remains in English.

Key Path	System
Mode	All
<b>Remote Command</b>	<b>SYSTem:DISPlay:LANGuage ENGLish RUSSian</b> <b>SYSTem:DISPlay:LANGuage?</b>
Preset	This is unaffected by a Preset but is set to ENGLish on a "Restore Misc Defaults" or "Restore System Defaults->All".
Readback	1-of-N selection
Initial S/W Revision	A.13.00

### English

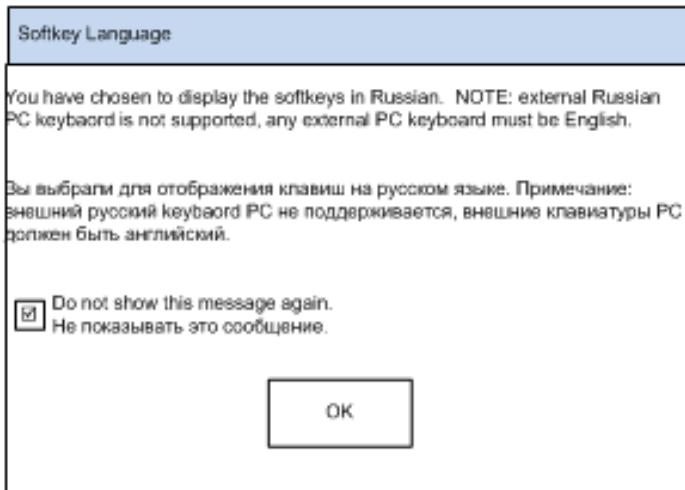
Displays English on the softkey labels.

Key Path	System, Language
<b>Example</b>	SYST:DISP:LANG ENGL
Readback	English
Initial S/W Revision	A.13.00

### Russian

If option AKT is installed, Russian (**русский**) language is displayed on the softkey labels.

When the operator selects this language choice from the softkey, the following message is presented (the message is not presented if Russian is selected from SCPI):



Key Path	System, Language
<b>Example</b>	SYST:DISP:LANG RUSS
Readback	русский
Initial S/W Revision	A.13.00

### 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).

**NOTE**

This feature is not available if option SF1 is installed.

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 379
- "System Log Off (Remote Command Only)" on page 379
- "List installed Options (Remote Command Only)" on page 379
- "Lock the Front-panel keys (Remote Command Only)" on page 380
- "Front Panel activity history (Remote Command only)" on page 380

- "SCPI activity history (Remote Command only)" on page 381
- "Instrument start time (Remote Command only)" on page 381
- "SCPI Version Query (Remote Command Only)" on page 382
- "Date (Remote Command Only)" on page 382
- "Time (Remote Command Only)" on page 382

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Initial S/W Revision	Prior to A.02.00
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### System Powerdown (Remote Command Only)

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<b>Remote Command</b>	<b>SYSTem:PDOWn [NORMAl FORCe]</b>
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.

### System Log Off (Remote Command Only)

This SCPI command provides a means to terminate all open Windows applications and log off the current user. This is equivalent to performing the Windows command "shutdown -l -f -t0".

---

<b>Remote Command</b>	<b>SYSTem:LOFF</b>
<b>Example</b>	SYST:LOFF
Notes	Initiates an immediate log off of the current user. This exits the instrument application, thus any unsaved measurement result will be lost. You cannot use *WAI or *OPC? to synchronize operation. In addition to the instrument application, all other Windows programs will be terminated without the opportunity to save any work in progress. The instrument will require human interaction to perform a Log In to regain instrument operation.
Initial S/W Revision	A.14.50

### List installed Options (Remote Command Only)

Lists the installed options that pertain to the instrument (signal analyzer)..

---

Mode	All
<b>Remote Command</b>	<b>:SYSTem:OPTions?</b>
<b>Example</b>	: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
<b>Remote Command</b>	:SYSTem:KLOCK OFF ON 0 1 :SYSTem:KLOCK?
<b>Example</b>	: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

### Front Panel activity history (Remote Command only)

Instrument front panel usage can be monitored with the query :SYSTem:METRics:FPANel?. The monitoring occurs for front panel Hardkey or Softkey operation (not mouse or touch operation on instruments with Multi-Touch User Interface). The information of the usage pertains to the activity since the instrument application was started; the information does not persist after the application is terminated, or the instrument has been rebooted.

To prevent the front panel from being placed into Remote the monitoring must occur via an I/O protocol such as LAN Socket, or the remote program performing the monitoring must explicitly place the instrument into Local after the query has been performed.

<b>Remote Command</b>	:SYSTem:METRics:FPANel?
<b>Example</b>	SYST:METR:FPAN?
Notes	The return value is a string with the format “YYYY-MM-DD<space>HH:MM:SS”, in instrument local time. If no front panel activity has occurred since the instrument was booted (instrument application started), the return value will be the time the instrument application started. The instrument application start time can be obtained with the query SYSTem:METRics:STIMe?
Initial S/W Revision	x.16.10

### SCPI activity history (Remote Command only)

Instrument remote operation usage via SCPI can be monitored with the query :SYSTem:METRics:SCPI?. The monitoring occurs for SCPI control from any I/O channel (GPIB, USB, or LAN). The information of the usage pertains to the activity since the instrument application was started; the information does not persist after the application is terminated, or the instrument has been rebooted.

<b>Remote Command</b>	:SYSTem:METRics:SCPI?
<b>Example</b>	:SYST:METR:SCPI?
Notes	<p>The return value is a string with the format "YYYY-MM-DD&lt;space&gt;HH:MM:SS", in instrument local time.</p> <p>The following commands are excluded from the history accounting:</p> <ul style="list-style-type: none"><li>*IDN?</li><li>*OPT?</li><li>:SYSTem:DATE?</li><li>:SYSTem:TIME?</li><li>:SYSTem:PON:TIME?</li><li>Queries in the :SYSTem:ERRor subsystem</li><li>Queries in the :SYSTem:LKEY subsystem</li><li>Queries in the :SYSTem:METRics subsystem</li><li>Queries in the :SYSTem:MODule subsystem</li></ul> <p>If no SCPI activity has occurred since the instrument was booted (instrument application started), the return value will be the time the instrument application started. The instrument application start time can be obtained with the query SYSTem:METRics:STIMe?</p>
Initial S/W Revision	x.16.10

### Instrument start time (Remote Command only)

To determine if instrument activity has occurred the SCPI query :SYSTem:METRics:STIMe? can be used to determine the instrument application start time.

<b>Remote Command</b>	:SYSTem:METRics:STIMe?
<b>Example</b>	:SYST:METR:STIM?
Notes	The return value is a string with the format "YYYY-MM-DD<space>HH:MM:SS", in instrument local time.
Initial S/W Revision	x.16.10

### List SCPI Commands (Remote Command Only)

Outputs a list of the valid SCPI commands for the currently selected Mode.

<b>Remote Command</b>	:SYSTem:HELP:HEADers?
<b>Example</b>	:SYST:HELP:HEAD?
Notes	The output is an IEEE Block format with each command separated with the New-Line character (hex 0x0A)

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Initial S/W Revision	Prior to A.02.00
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### 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.

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<b>Remote Command</b>	:SYSTEm:VERSION?
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<b>Example</b>	:SYST:VERS?
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Initial S/W Revision	Prior to A.02.00
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### 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.

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Mode	All
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<b>Remote Command</b>	:SYSTEm:DATE "<year>,<month>,<day>" :SYSTEm:DATE?
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<b>Example</b>	:SYST:DATE "2006,05,26"
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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 Administrator privileges, an error will be generated by this command and no action will be taken.
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Initial S/W Revision	Prior to A.02.00
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### Time (Remote Command Only)

Sets or queries the time in the instrument.

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Mode	All
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<b>Remote Command</b>	:SYSTEm:TIME "<hour>,<minute>,<second>" :SYSTEm:TIME?
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<b>Example</b>	:SYST:TIME "13,05,26"
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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 Administrator privileges, an error will be generated by this command and no action will be taken.
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## 6 System Functions

### System

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Initial S/W Revision

Prior to A.02.00

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## 7 Trigger Functions

## 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 386

See "RF Trigger Source" on page 390

See "I/Q Trigger Source" on page 391

See "More Information" on page 392

Key Path	Front-panel key
<b>Remote Command</b>	<code>:TRIGger:&lt;measurement&gt;[:SEQUence]:SOURce EXTERNAL1   EXTERNAL2   IMMEDIATE   LINE   FRAME   RFBURST   VIDEO   IF   ALARM   LAN   IQMAG   IDEMOD   QDEMOD   IINPUT   QINPUT   AIQMag   TV   PRTChandet   PRTFrame   PXI   INTERNAL</code> <code>:TRIGger:&lt;measurement&gt;[:SEQUence]:SOURce?</code> where <measurement> is the measurement for which you wish to set the Source (blank for the Swept SA measurement)
<b>Example</b>	TRIG:ACP:SOUR EXT 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 390 and "I/Q Trigger Source" on page 391 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	<p>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.</p> <p>INTernal trigger is only available on the M9420A. It triggers on the internal source signal PRTChandet and PRTFrame are only available in the E7515A.</p> <p>PXI trigger is only supported in PXI (modular) instruments.</p>
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.
<b>Backwards Compatibility SCPI</b>	<p><b>:TRIGger[:SEQUence]:SOURce EXternal</b>  For backward compatibility, the parameter EXternal is mapped to EXternal1</p>
<b>Backwards Compatibility SCPI</b>	<p><b>[ :SENSe]:&lt;measurement&gt;:TRIGger:SOURce</b>  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</p>
<b>Backwards Compatibility SCPI</b>	<p><b>[ :SENSe]:&lt;measurement&gt;:TRIGger:SOURce IF</b>  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.</p>
<b>Backwards Compatibility SCPI</b>	<p><b>[ :SENSe]:ACPR:TRIGger:SOURce</b>  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.</p>
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	IMM	IQ not supported	

<b>Meas</b>	<b>Mode</b>	<b>Preset for RF</b>	<b>Preset for IQ</b>	<b>Notes</b>
	OFDMA, 1xEVDO, DVB- T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR			
OBW	SA, WCDMA, C2K, WIMAX OFDMA, TD- SCDMA, 1xEVDO, LTE, LTETDD, CMMB, ISDB-T, MSR	1xEVDO: EXT1 others: IMM	IQ not supported	For 1xEVDO mode, the trigger source is coupled with the gate state, as well as the gate 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,	IMM	IQ not supported	

<b>Meas</b>	<b>Mode</b>	<b>Preset for RF</b>	<b>Preset for IQ</b>	<b>Notes</b>
Digital Cable TV, MSR				
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, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR	1xEVDO(BTS): EXternal1  All others: IMMEDIATE	IQ not supported	
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		LTTEDD:  BTS: External 1  MS: Periodic Timer	LTTEDD:  BTS: External 1  MS:	

<b>Meas</b>	<b>Mode</b>	<b>Preset for RF</b>	<b>Preset for IQ</b>	<b>Notes</b>
		GSM/EDGE: RFBurst All others:	Periodic Timer GSM/EDGE: IQMag All others: IMMEDIATE	
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	

Meas	Mode	Preset for RF	Preset for IQ	Notes
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.

<b>Remote Command</b>	:TRIGger:<measurement>[:SEQUence]:RF:SOURce EXternal1   EXternal2   IMMEDIATE   LINE   FRAME   RFBurst   VIDeo   IF   ALARm   LAN   TV   PRTChandet   PRTFrame   PXI   INTERNAL :TRIGger:<measurement>[:SEQUence]:RF:SOURce?
<b>Example</b>	<pre>TRIG:ACP:RF:SOUR EXT1 Selects the external 1 trigger input for the ACP measurement and the RF input</pre> <pre>TRIG:RF:SOUR VID Selects video triggering for the SANalyzer measurement and the RF input. For SAN, do not use the &lt;measurement&gt; keyword.</pre>
<b>Notes</b>	*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.
<b>Dependencies</b>	<p>Presets and available ranges can vary from mode to mode.</p> <p>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.</p> <p>Not all trigger sources are available for each input. For the <b>RF Trigger Source</b>, the following trigger sources are available:</p> <ul style="list-style-type: none"> <li>- IMMEDIATE - free run triggering</li> <li>- VIDeo - triggers on the video signal level</li> </ul>

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- 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

INTernal trigger is only available on the M9420A. It triggers on the internal source signal

PRTChandet and PRTFrame are only available in the E7515A.

PXI trigger is only supported in PXI (modular) instruments.

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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

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## I/Q Trigger Source

**NOTE**

This command is available only when Option BBA is installed.

This command selects the trigger to be used for the specified measurement when I/Q 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.

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<b>Remote Command</b>	:TRIGger:<measurement>[:SEQUence]:IQ:SOURce EXTERNAL1   EXTERNAL2   IMMEDIATE   IQMag   IDEMod   QDEMod   IINPut   QINPut   AIQMag :TRIGger:<measurement>[:SEQUence]:IQ:SOURce?
<b>Example</b>	TRIG:WAVEform:SOUR IQM Selects I/Q magnitude triggering for the IQ Waveform measurement and the I/Q input
Notes	<p>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.</p> <p>Not all trigger sources are available for each input. For the <b>I/Q Trigger Source</b>, the following trigger sources are available:</p> <ul style="list-style-type: none"> <li>- IMMEDIATE - free run triggering</li> <li>- EXTERNAL1 (or EXTERNAL) - triggers on an externally connected trigger source on the rear panel</li> <li>- EXTERNAL2 - triggers on an externally connected trigger source on the front panel</li> </ul>

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- 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

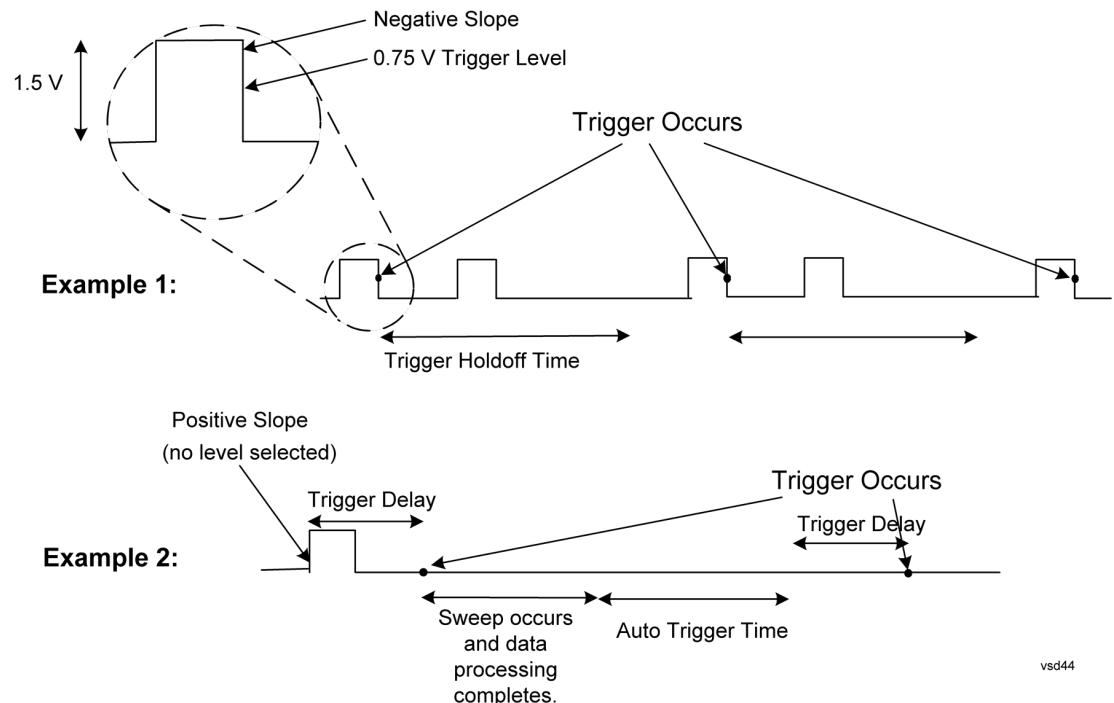
turns black. Now a second press of the key takes you into the Video Trigger Setup menu.

#### 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
<b>Example</b>	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
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:VIDEO:LEVel <ampl> :TRIGger[:SEQUence]:VIDEO:LEVel?
<b>Example</b>	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

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	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
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:IF:LEVel</b> <b>:TRIGger[:SEQUence]:IF:LEVel?</b>
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.

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Key Path	Trigger, Video
<b>Remote Command</b>	<b>:TRIGger[:SEQUence]:VIDeo:SLOPe POSitive NEGative</b> <b>:TRIGger[:SEQUence]:VIDeo:SLOPe?</b>
<b>Example</b>	TRIG:VID:SLOP NEG
Preset	POSitive
State Saved	Saved in instrument state
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:IF:SLOPe NEGative POSitive</b> <b>:TRIGger[:SEQUence]:IF:SLOPe?</b>
	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

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<b>Remote Command</b>	<b>:TRIGger[:SEQUence]:SLOPe POSitive NEGative</b> <b>:TRIGger[:SEQUence]:SLOPe?</b>
<b>Example</b>	TRIG:SLOP NEG

Preset	POPositive
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
<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:VIDEO:DELay &lt;time&gt; :TRIGger[:SEQUence]:VIDEO:DELay? :TRIGger[:SEQUence]:VIDEO:DELay:STATE OFF ON 0 1 :TRIGger[:SEQUence]:VIDEO:DELay:STATE?</pre>
<b>Example</b>	<pre>TRIG:VID:DEL:STAT ON TRIG:VID:DEL 100 ms</pre>
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	<p>! For backward compatibility with VSA/PSA comms apps</p> <pre>:TRIGger[:SEQUence]:IF:DELay :TRIGger[:SEQUence]:DELay</pre> <p>The legacy :TRIGger[:SEQUence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers.</p>
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:DELay &lt;time&gt; :TRIGger[:SEQUence]:DELay? :TRIGger[:SEQUence]:DELay:STATE OFF ON 0 1</pre>
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	<b>:TRIGger[:SEQUence]:DElay:STATE?</b>
<b>Example</b>	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

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<b>Remote Command</b>	<b>:TRIGger[:SEQUence]:OFFSet &lt;time&gt;</b> <b>:TRIGger[:SEQUence]:OFFSet?</b> <b>:TRIGger[:SEQUence]:OFFSet:STATE OFF ON 0 1</b> <b>:TRIGger[:SEQUence]:OFFSet:STATE?</b>
<b>Example</b>	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 $\geq 1$ kHz. For ESA compatibility, X-series analyzers keep track of this offset and adds it to the Trigger Delay for VIDeo, LINE, EXTerinal1 or EXTerinal2 whenever the value is sent to the hardware, if in Zero Span and RBW $\geq 1$ 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

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### X Axis Relative to Trigger

For triggers that support Trigger Delay it is beneficial that in time-domain displays (like Zero Span), X-axis values should be referenced to the Trigger point, that is, the zero value on the X Axis should be wherever the trigger point appears on the X Axis (including to the left or right of the X Axis). For negative trigger delays this means the zero point can actually appear on the X Axis.

Traditionally the zero point is at the left edge of the X Axis, and this behavior is retained for backwards compatibility, but if you turn on **X Axis Relative to Trigger**, the zero point moves to the trigger point and all X Axis values change to be relative to the trigger point.

When the **X Axis Relative to Trigger** switch is On, the trigger point on the X-axis will be marked with a vertical line and an annotation of "TRIG". Additionally, when the switch is On, values which are tied to the X-axis, such as trace data and markers, will have their X values adjusted to be referenced to the trigger point.

The switch is grayed out and Off unless the measurement is a time domain measurement; thus, in Swept SA it is grayed out unless in Zero Span.

Key Path	Trigger, Trigger
<b>Remote Command</b>	:TRIGger[:SEQUence]:XRELative ON OFF 1 0 :TRIGger[:SEQUence]:XRELative?
<b>Example</b>	TRIG:XREL ON
Notes	Although shown in all Trigger menus that have Trig Delay, the function is global to all of them and has the same value in all.
Dependencies	Grayed out unless in Zero Span. When grayed out, shows as Off. Non-forceful grayout, no error if SCPI sent while grayed out.
Preset	Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.18.00
Control Type	Toggle

## 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
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:LINE:SLOPe POSitive NEGative :TRIGger[:SEQUence]:LINE:SLOPe?
<b>Example</b>	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
<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:LINE:DELay &lt;time&gt; :TRIGger[:SEQUence]:LINE:DELay? :TRIGger[:SEQUence]:LINE:DELay:STATe OFF ON 0 1 :TRIGger[:SEQUence]:LINE:DELay:STATe?</pre>
<b>Example</b>	<pre>TRIG:LINE:DEL:STAT ON TRIG:LINE:DEL 100 ms</pre>
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	<p>The legacy :TRIGger[:SEQUence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers.</p> <p>The legacy :TRIGger[:SEQUence]:OFFSet command is supported for the VIDeo, LINE, EXT1, and EXT2 triggers.</p>
Initial S/W Revision	Prior to A.02.00

### X Axis Relative to Trigger

For triggers that support Trigger Delay it is beneficial that in time-domain displays (like Zero Span), X-axis values should be referenced to the Trigger point, that is, the zero value on the X Axis should be wherever the trigger point appears on the X Axis (including to the left or right of the X Axis). For negative trigger delays this means the zero point can actually appear on the X Axis.

Traditionally the zero point is at the left edge of the X Axis, and this behavior is retained for backwards compatibility, but if you turn on **X Axis Relative to Trigger**, the

zero point moves to the trigger point and all X Axis values change to be relative to the trigger point.

When the **X Axis Relative to Trigger** switch is On, the trigger point on the X-axis will be marked with a vertical line and an annotation of "TRIG". Additionally, when the switch is On, values which are tied to the X-axis, such as trace data and markers, will have their X values adjusted to be referenced to the trigger point.

The switch is grayed out and Off unless the measurement is a time domain measurement; thus, in Swept SA it is grayed out unless in Zero Span.

<b>Key Path</b>	Trigger, Trigger
<b>Remote Command</b>	:TRIGger[:SEQUence]:XRELative ON OFF 1 0 :TRIGger[:SEQUence]:XRELative?
<b>Example</b>	TRIG:XREL ON
Notes	Although shown in all Trigger menus that have Trig Delay, the function is global to all of them and has the same value in all.
Dependencies	Grayed out unless in Zero Span. When grayed out, shows as Off. Non-forceful grayout, no error if SCPI sent while grayed out.
Preset	Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.18.00
Control Type	Toggle

## 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.

<b>Key Path</b>	Trigger
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal1:LEVel <level> :TRIGger[:SEQUence]:EXTernal1:LEVel?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:EXTernal:LEVel
	For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	: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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal1:SLOPe POSitive NEGative :TRIGger[:SEQUence]:EXTernal1:SLOPe?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:EXTernal:SLOPe
	For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	: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
<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:EXTERNAL1:DELay &lt;time&gt; :TRIGger[:SEQUence]:EXTERNAL1:DELay? :TRIGger[:SEQUence]:EXTERNAL1:DELay:STATE OFF ON 0 1 :TRIGger[:SEQUence]:EXTERNAL1:DELay:STATE?</pre>
<b>Example</b>	<pre>TRIG:EXT1:DEL:STAT ON TRIG:EXT1:DEL 100 ms</pre>
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
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:EXTERNAL:DELay</b> 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

## X Axis Relative to Trigger

For triggers that support Trigger Delay it is beneficial that in time-domain displays (like Zero Span), X-axis values should be referenced to the Trigger point, that is, the zero value on the X Axis should be wherever the trigger point appears on the X Axis (including to the left or right of the X Axis). For negative trigger delays this means the zero point can actually appear on the X Axis.

Traditionally the zero point is at the left edge of the X Axis, and this behavior is retained for backwards compatibility, but if you turn on **X Axis Relative to Trigger**, the zero point moves to the trigger point and all X Axis values change to be relative to the trigger point.

When the **X Axis Relative to Trigger** switch is On, the trigger point on the X-axis will be marked with a vertical line and an annotation of "TRIG". Additionally, when the

switch is On, values which are tied to the X-axis, such as trace data and markers, will have their X values adjusted to be referenced to the trigger point.

The switch is grayed out and Off unless the measurement is a time domain measurement; thus, in Swept SA it is grayed out unless in Zero Span.

<b>Key Path</b>	Trigger, Trigger
<b>Remote Command</b>	:TRIGger[:SEQUence]:XRELative ON OFF 1 0 :TRIGger[:SEQUence]:XRELative?
<b>Example</b>	TRIG:XREL ON
Notes	Although shown in all Trigger menus that have Trig Delay, the function is global to all of them and has the same value in all.
Dependencies	Grayed out unless in Zero Span. When grayed out, shows as Off. Non-forceful grayout, no error if SCPI sent while grayed out.
Preset	Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.18.00
Control Type	Toggle

## 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.

<b>Key Path</b>	Trigger
<b>Example</b>	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 EXTerinal2 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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal2:LEVel :TRIGger[:SEQUence]:EXTernal2:LEVel?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal2:SLOPe POSITIVE NEGATIVE :TRIGger[:SEQUence]:EXTernal2:SLOPe?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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
<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:EXTernal12:DELay &lt;time&gt; :TRIGger[:SEQUence]:EXTernal12:DELay? :TRIGger[:SEQUence]:EXTernal12:DELay:STATe OFF ON 0 1 :TRIGger[:SEQUence]:EXTernal12:DELay:STATe?</pre>
<b>Example</b>	<pre>TRIG:EXT2:DEL:STAT ON TRIG:EXT2:DEL 100 ms</pre>
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	<p>The legacy :TRIGger[:SEQUence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers.</p> <p>The legacy :TRIGger[:SEQUence]:OFFSet command is supported for the VIdeo, LINE, EXT1, and EXT2 triggers.</p>
Initial S/W Revision	Prior to A.02.00

### X Axis Relative to Trigger

For triggers that support Trigger Delay it is beneficial that in time-domain displays (like Zero Span), X-axis values should be referenced to the Trigger point, that is, the zero value on the X Axis should be wherever the trigger point appears on the X Axis (including to the left or right of the X Axis). For negative trigger delays this means the zero point can actually appear on the X Axis.

Traditionally the zero point is at the left edge of the X Axis, and this behavior is retained for backwards compatibility, but if you turn on **X Axis Relative to Trigger**, the zero point moves to the trigger point and all X Axis values change to be relative to the trigger point.

When the **X Axis Relative to Trigger** switch is On, the trigger point on the X-axis will be marked with a vertical line and an annotation of "TRIG". Additionally, when the switch is On, values which are tied to the X-axis, such as trace data and markers, will have their X values adjusted to be referenced to the trigger point.

The switch is grayed out and Off unless the measurement is a time domain measurement; thus, in Swept SA it is grayed out unless in Zero Span.

Key Path	Trigger, Trigger
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<b>Remote Command</b>	:TRIGger[:SEQUence]:XRELative ON OFF 1 0 :TRIGger[:SEQUence]:XRELative?
<b>Example</b>	TRIG:XREL ON
Notes	Although shown in all Trigger menus that have Trig Delay, the function is global to all of them and has the same value in all.
Dependencies	Grayed out unless in Zero Span. When grayed out, shows as Off. Non-forceful grayout, no error if SCPI sent while grayed out.
Preset	Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.18.00
Control Type	Toggle

## 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	<b>Trigger</b>
<b>Example</b>	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]:RBurst: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
<b>Remote Command</b>	:TRIGger[:SEQUence]:RFBurst:LEVel:ABSolute <ampl> :TRIGger[:SEQUence]:RFBurst:LEVel:ABSolute?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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
<b>Remote Command</b>	:TRIGger[:SEQUence]:RFBurst:LEVel:TYPE ABSolute RELative :TRIGger[:SEQUence]:RFBurst:LEVel:TYPE?
<b>Example</b>	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:

5. 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.
6. 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:
7. absolute RF Burst level = peak level of the previous acquisition + relative RF Burst level
8. 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	<pre>:TRIGger[:SEQUence]:RBurst:LEVel:RELative &lt;rel_ampl&gt; :TRIGger[:SEQUence]:RBurst:LEVel:RELative?</pre>
Example	<pre>TRIG:RFB:LEV:REL -10 dB</pre> <p>sets the trigger level of the RF burst envelope signal to the relative level of -10 dB</p>
Notes	<p>Sending this command does not switch the setting from absolute to relative; to switch it you need to send the :TRIGger[:SEQUence]:RBurst:LEVel:TYPE command, above.</p> <p>The relative trigger level is not available in some measurements. In those measurements the RELative parameter, and the :TRIGger[:SEQUence]:RBurst:LEVel:TYPE command (above), will generate an error if sent.</p>
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
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:RFBurst:LEVel</b> 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
<b>Remote Command</b>	<b>:TRIGger[:SEQUence]:RFBurst:SLOPe POSitive NEGative</b> <b>:TRIGger[:SEQUence]:RFBurst:SLOPe?</b>
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:FRAMe:RFBurst:SLOPe</b>
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
<b>Remote Command</b>	<b>:TRIGger[:SEQUence]:RFBurst:DELay &lt;time&gt;</b> <b>:TRIGger[:SEQUence]:RFBurst:DELay?</b> <b>:TRIGger[:SEQUence]:RFBurst:DELay:STATe OFF ON 0 1</b> <b>:TRIGger[:SEQUence]:RFBurst:DELay:STATe?</b>
<b>Example</b>	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

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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

### X Axis Relative to Trigger

For triggers that support Trigger Delay it is beneficial that in time-domain displays (like Zero Span), X-axis values should be referenced to the Trigger point, that is, the zero value on the X Axis should be wherever the trigger point appears on the X Axis (including to the left or right of the X Axis). For negative trigger delays this means the zero point can actually appear on the X Axis.

Traditionally the zero point is at the left edge of the X Axis, and this behavior is retained for backwards compatibility, but if you turn on **X Axis Relative to Trigger**, the zero point moves to the trigger point and all X Axis values change to be relative to the trigger point.

When the **X Axis Relative to Trigger** switch is On, the trigger point on the X-axis will be marked with a vertical line and an annotation of "TRIG". Additionally, when the switch is On, values which are tied to the X-axis, such as trace data and markers, will have their X values adjusted to be referenced to the trigger point.

The switch is grayed out and Off unless the measurement is a time domain measurement; thus, in Swept SA it is grayed out unless in Zero Span.

Key Path	Trigger, Trigger
<b>Remote Command</b>	:TRIGger[:SEQUence]:XRELative ON OFF 1 0 :TRIGger[:SEQUence]:XRELative?
<b>Example</b>	TRIG:XREL ON
Notes	Although shown in all Trigger menus that have Trig Delay, the function is global to all of them and has the same value in all.
Dependencies	Grayed out unless in Zero Span. When grayed out, shows as Off. Non-forceful grayout, no error if SCPI sent while grayed out.
Preset	Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.18.00
Control Type	Toggle

## 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
<b>Example</b>	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**.

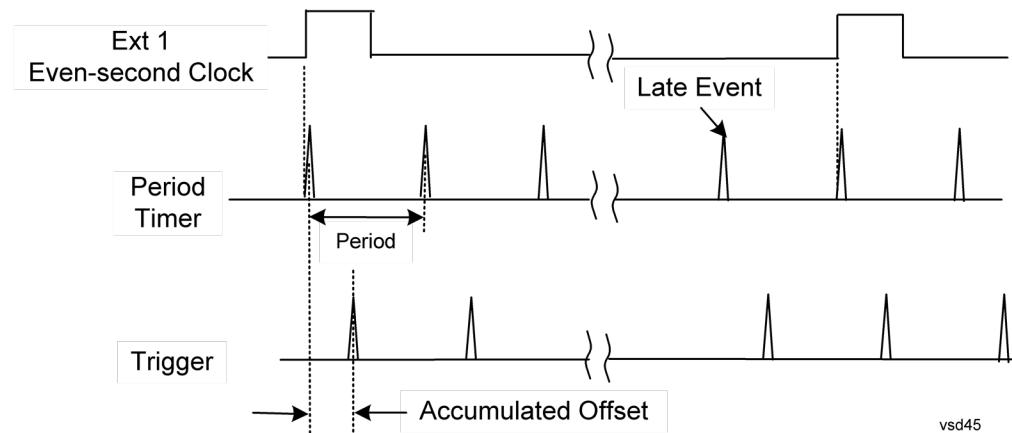
The figure below shows the action of the periodic timer trigger. Before reviewing the figure, we'll explain some uses for the periodic trigger.

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 miss-trigger. Miss-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
<b>Remote Command</b>	:TRIGger[:SEQUence]:FRAMe:PERiod <time> :TRIGger[:SEQUence]:FRAMe:PERiod?
<b>Example</b>	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
<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:FRAMe:OFFSet &lt;time&gt; :TRIGger[:SEQUence]:FRAMe:OFFSet?</pre>
<b>Example</b>	TRIG:FRAM:OFFS 1.2 ms
Notes	<p>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).</p> <p>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 "<a href="#">"Trig Delay" on page 421</a>.</p> <p>An increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.</p>
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

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	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

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### 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.

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<b>Remote Command</b>	<code>:TRIGger[:SEQUence]:FRAMe:ADJJust &lt;time&gt;</code>
<b>Example</b>	TRIG:FRAM:ADJ 1.2 ms
Notes	<p>Note also that Offset is used only when the sync source is set to OFF, otherwise delay is used, see section "<a href="#">"Trig Delay" on page 421</a></p> <p>An increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.</p>
Notes	<p>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.</p> <p>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.</p> <p>This is a "command only" SCPI command, with no query.</p>
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

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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
<b>Remote Command</b>	:TRIGger[:SEQUence]:FRAMe:OFFSet:DISPlay:RESet
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:FRAMe:SYNC EXTernal1   EXTernal2   RFburst   PXI   OFF :TRIGger[:SEQUence]:FRAMe:SYNC?
<b>Example</b>	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. PXI trigger is only supported in PXI (modular) instruments.
Preset	Off GSM/EDGE, MSR,LTE,LTEDD: 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 <b>Periodic Timer</b> trigger key.
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:FRAMe:SYNC EXTernal For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Initial S/W Revision	Prior to A.02.00

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Modified at S/W Revision	A.03.00, A.14.00
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### 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.

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Key Path	Trigger, Periodic Timer, Sync Source
<b>Example</b>	TRIG:FRAM:SYNC OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

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### 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.

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Key Path	Trigger
<b>Example</b>	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

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### Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

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Key Path	Trigger, External 1
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal1:LEVel <level> :TRIGger[:SEQUence]:EXTernal1:LEVel?
<b>Example</b>	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

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	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
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:EXTernal:LEVel</b> For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:FRAMe:EXTernal1:LEVel</b>
Initial S/W Revision	Prior to A.02.00

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### Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

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Key Path	Trigger, External 1
<b>Remote Command</b>	<b>:TRIGger[:SEQUence]:EXTernal1:SLOPe POSitive NEGative</b> <b>:TRIGger[:SEQUence]:EXTernal1:SLOPe?</b>
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:EXTernal:SLOPe</b> For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:FRAMe:EXTernal1:SLOPe</b>
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

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### 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
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTERNAL2:LEVel :TRIGger[:SEQUence]:EXTERNAL2:LEVel?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal2:SLOPe POSitive NEGative :TRIGger[:SEQUence]:EXTernal2:SLOPe?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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
<b>Example</b>	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]:RBurst: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.

<b>Key Path</b>	Trigger, RF Burst
<b>Scope</b>	Meas Global
<b>Remote Command</b>	<code>:TRIGger[:SEQUence]:RFBurst:LEVel:ABSolute &lt;ampl&gt;</code> <code>:TRIGger[:SEQUence]:RFBurst:LEVel:ABSolute?</code>
<b>Example</b>	<code>TRIG:RFB:LEV:ABS 10 dBm</code> sets the trigger level of the RF burst envelope signal to the absolute level of 10 dBm
<b>Notes</b>	Sending this command does not switch the setting from relative to absolute; to switch it you need to send the <code>:TRIGger[:SEQUence]:RFBurst:LEVel:TYPE</code> 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.
<b>Couplings</b>	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
<b>Preset</b>	-20 dBm
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	-200 dBm
<b>Max</b>	100 dBm
<b>Default Unit</b>	depends on the current selected Y-Axis unit
<b>Backwards Compatibility SCPI</b>	<code>:TRIGger[:SEQUence]:FRAMe:RFBurst:LEVel:ABSolute</code>
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.04.00

<b>Key Path</b>	Trigger, RF Burst
<b>Remote Command</b>	<code>:TRIGger[:SEQUence]:RFBurst:LEVel:TYPE ABSolute RELative</code> <code>:TRIGger[:SEQUence]:RFBurst:LEVel:TYPE?</code>
<b>Example</b>	<code>TRIG:RFB:LEV:TYPE REL</code> sets the trigger level type of the RF burst trigger to Relative.
<b>Preset</b>	ABSolute
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.04.00

## Trigger Slope

It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

<b>Key Path</b>	Trigger, RF Burst
<b>Remote Command</b>	:TRIGger[:SEQUence]:RFBurst:SLOPe POSitive NEGative :TRIGger[:SEQUence]:RFBurst:SLOPe?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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.

<b>Key Path</b>	Trigger, Periodic Timer
<b>Remote Command</b>	: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

## X Axis Relative to Trigger

For triggers that support Trigger Delay it is beneficial that in time-domain displays (like Zero Span), X-axis values should be referenced to the Trigger point, that is, the zero value on the X Axis should be wherever the trigger point appears on the X Axis (including to the left or right of the X Axis). For negative trigger delays this means the zero point can actually appear on the X Axis.

Traditionally the zero point is at the left edge of the X Axis, and this behavior is retained for backwards compatibility, but if you turn on **X Axis Relative to Trigger**, the zero point moves to the trigger point and all X Axis values change to be relative to the trigger point.

When the **X Axis Relative to Trigger** switch is On, the trigger point on the X-axis will be marked with a vertical line and an annotation of “TRIG”. Additionally, when the switch is On, values which are tied to the X-axis, such as trace data and markers, will have their X values adjusted to be referenced to the trigger point.

The switch is grayed out and Off unless the measurement is a time domain measurement; thus, in Swept SA it is grayed out unless in Zero Span.

Key Path	Trigger, Trigger
<b>Remote Command</b>	:TRIGger[:SEQUence]:XRELative ON OFF 1 0 :TRIGger[:SEQUence]:XRELative?
<b>Example</b>	TRIG:XREL ON
Notes	Although shown in all Trigger menus that have Trig Delay, the function is global to all of them and has the same value in all.
Dependencies	Grayed out unless in Zero Span. When grayed out, shows as Off. Non-forceful grayout, no error if SCPI sent while grayed out.
Preset	Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.18.00
Control Type	Toggle

## 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: <ul style="list-style-type: none"><li>– If Holdoff is Off, readback Off</li><li>– If Holdoff On and Type = Normal, readback value</li><li>– If Holdoff On and Type = Above, readback value followed by AL</li><li>– If Holdoff On and Type = Below, readback value followed by BL</li><li>– If Holdoff Type selection is not supported by the current measurement, Holdoff Type is always Normal</li></ul>
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
<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:ATRigger &lt;time&gt; :TRIGger[:SEQUence]:ATRigger? :TRIGger[:SEQUence]:ATRigger:STATE OFF ON 0 1 :TRIGger[:SEQUence]:ATRigger:STATE?</pre>
<b>Example</b>	<pre>TRIG:ATR:STAT ON TRIG:ATR 100 ms</pre>
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
<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:HOLDoff &lt;time&gt; :TRIGger[:SEQUence]:HOLDoff? :TRIGger[:SEQUence]:HOLDoff:STATE OFF ON 0 1 :TRIGger[:SEQUence]:HOLDoff:STATE?</pre>
<b>Example</b>	<pre>TRIG:HOLD:STAT ON TRIG:HOLD 100 ms</pre>
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

### Holdoff Type

Lets you set the Trigger Holdoff Type.

**NOTE**

Holdoff Type is not supported by all measurements. If the current measurement does not support it, this key will be blank and the Holdoff Type will be Normal. If the Holdoff Type SCPI is sent while in such a measurement, the SCPI will be accepted and the setting remembered, but it will have no effect until a measurement is in force that supports Holdoff Type.

Trigger Holdoff Type functionality:

NORMal	This is the “oscilloscope” type of trigger holdoff, and is the setting when the Holdoff Type key does not appear. In this type of holdoff, no new trigger will be accepted until the holdoff interval has expired after the previous trigger.
ABOVe	If the trigger slope is positive, a trigger event is generated only if the signal characteristic of interest crosses the trigger threshold (with positive slope) and then remains above the threshold for at least the holdoff time. For negative slope, the trigger event is generated if the signal characteristic crosses the threshold (with negative slope) after having been above the threshold for at least the holdoff time. In either case, the trigger event is associated with the time the level was crossed.
BELow	If the trigger slope is positive, a trigger event is generated only if the signal characteristic of interest crosses the trigger threshold (with positive slope) after having been below the threshold for at least the holdoff time. For negative slope, the trigger event is generated if the signal characteristic crosses the threshold (with negative slope) and then remains below the threshold for at least the holdoff time. In either case, the trigger event is associated with the time the level was crossed.

Key Path	Trigger, Auto/Holdoff
----------	-----------------------

Remote Command	:TRIGger[:SEQUence]:HOLDoff:TYPE NORMal ABOVe BELOW :TRIGger[:SEQUence]:HOLDoff:TYPE?
----------------	--

Example	TRIG:HOLD:TYPE NORM
---------	---------------------

Preset	All modes but GSM/EDGE: Normal GSM/EDGE: Below
--------	---

State Saved	Saved in instrument state
-------------	---------------------------

Initial S/W Revision	A.02.00
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## 8 Monitor Spectrum Measurement

The monitor spectrum measurement is used as a quick, convenient means of looking at the entire spectrum. While the look and feel are similar to the Spectrum Analyzer mode, the functionality is greatly reduced for easy operation. The main purpose of the measurement is to show the spectrum. The default span should cover an appropriate frequency range of the application.

For measurement results and views, see ["View/Display" on page 600](#).

This topic contains the following sections:

["Measurement Commands for Monitor Spectrum" on page 426](#)

["Remote Command Results for Monitor Spectrum Measurement" on page 427](#)

## Measurement Commands for Monitor Spectrum

The following commands can be used to retrieve the measurement results:

```
:CONFigure:MONitor  
:CONFigure:MONitor:NDFault  
:INITiate:MONitor  
:FETCH:MONitor[n]?  
:READ:MONitor[n]?  
:MEASure:MONitor[n]?
```

For more measurement related commands, see the SENSe subsystem, and the section "["Remote Measurement Functions" on page 986](#)".

## Remote Command Results for Monitor Spectrum Measurement

The following table describes the results returned by the queries listed above, according to the index value n.

n	Results Returned
1 (or not specified)	Returns trace1 data with comma separated floating numbers
2	Returns trace2 data with comma separated floating numbers
3	Returns trace3 data with comma separated floating numbers

Key Path	Meas
Initial S/W Revision	Prior to A.02.00

## AMPTD Y Scale

Accesses a menu of functions that enable you to set the vertical scale parameters. These functions control how data on the vertical (Y) axis is displayed and control instrument settings that affect the vertical axis.

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

### Ref Value

Sets the absolute power reference value. However, since Auto Scaling defaults to On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.

Key Path	AMPTD Y Scale
Mode	All except SA and BASIC
<b>Remote Command</b>	<code>:DISPlay:MONitor:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RLEVl &lt;real&gt;</code> <code>:DISPlay:MONitor:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RLEVl?</code>
<b>Example</b>	<code>DISP:MON:VIEW:WIND:TRAC:Y:RLEV 2.0</code> <code>DISP:MON:VIEW:WIND:TRAC:Y:RLEV?</code>
Couplings	When the Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Preset	10.00 dBm
State Saved	Saved in instrument state.
Min	-250.00 dBm
Max	250.00 dBm
Initial S/W Revision	Prior to A.02.00

## 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.

See "Dual Attenuator Configurations:" on page 429

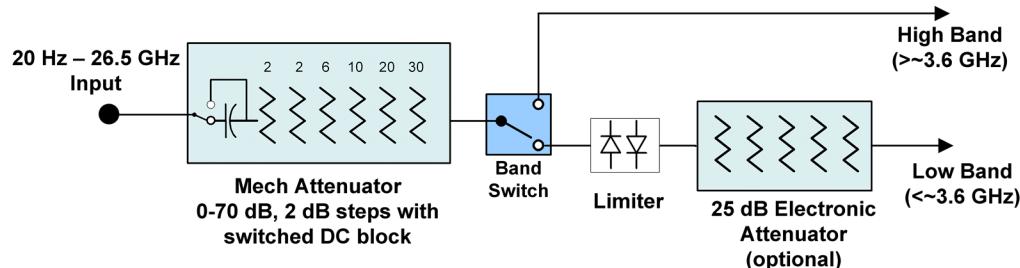
See "Single Attenuator Configuration:" on page 429

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.

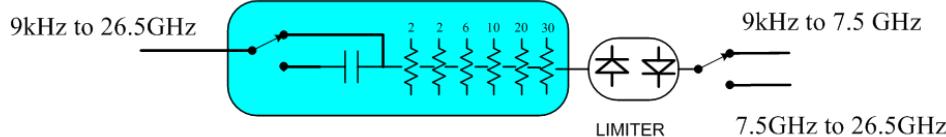
Key Path	AMPTD Y Scale
Scope	Meas Global
Dependencies	In measurements that support the I/Q inputs, this key is unavailable when I/Q is the selected input, and is replaced by the Range key in that case.
Readback Line	Contains a summary in [ ] brackets of the current total attenuation. See the descriptions of the "Mech Atten" on page 930, and "Enable Elec Atten" on page 932 keys for more detail on the contributors to the total attenuation.  Note that when "Pre-Adjust for Min Clip" 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

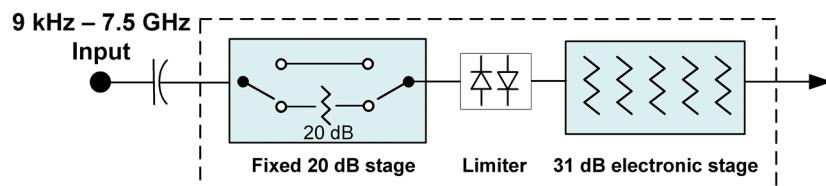


Configuration 2: Mechanical attenuator, no optional electronic attenuator



(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:



You can tell which attenuator configuration you have by pressing the Attenuation key, which (in most Modes) opens the Attenuation menu. If the first key in the Attenuation menu says **Mech Atten** you have the dual attenuator configuration. If the first key says **Atten** you have the single attenuator configuration.



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 431

Key Path	AMPTD Y Scale, Attenuation
Remote Command	<pre>[ :SENSe] :POWer[:RF] :ATTenuation &lt;rel_ampl&gt; [ :SENSe] :POWer[:RF] :ATTenuation? [ :SENSe] :POWer[:RF] :ATTenuation:AUTo OFF ON 0 1 [ :SENSe] :POWer[:RF] :ATTenuation:AUTo?</pre>
Example	<p>POW:ATT 20</p> <p>Dual attenuator configuration: sets the mechanical attenuator to 20 dB</p> <p>Single attenuator mode: sets the main attenuation to 20 dB (see below for definition of "main" attenuation).</p> <p>If the attenuator was in Auto, it sets it to Manual.</p>
Dependencies	<p>Some measurements do not support the Auto setting of <b>(Mech) Atten</b>. In these measurements, the Auto/Man selection is not available, and the Auto/Man line on the key disappears.</p> <p>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 "<a href="#">Enable Elec Atten</a>" on page 932 key description.</p>

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	See "Attenuator Configurations and Auto/Man" on page 431 for more information on the Auto/Man functionality of Attenuation.
Couplings	<p>When <b>(Mech) Atten</b> is in Auto, it uses the following algorithm to determine a value:</p> <p>If the USB Preamp is connected to USB, use 0 dB.</p> <p>Otherwise, <math>\text{Atten} = \text{ReferenceLevel} + \text{PreAmpGain} + \text{ExternalGain} - \text{RefLevelOffset} - \text{MaxMixerLevel} + \text{IF Gain}</math>.</p> <p>Limit this value to be between 6 dB and the Max value. No value below 6 dB can ever be chosen by Auto.</p> <p>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).</p> <p>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.</p> <p>In External Mixing and BBIQ, where the Attenuator is not in the signal path, the Attenuator setting changes as described above when <b>(Mech) Atten</b> is in Auto, but no changes are made to the actual attenuator hardware setting until the input is changed back to the RF Input.</p>
Preset	<p>The preset for Mech Attenuation is "Auto."</p> <p>The Auto value of attenuation is:</p> <p>CXA, EXA, MXA and PXA: 10 dB</p>
State Saved	Saved in instrument state
Min	0 dB
	<p>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.</p>
Max	<p>CXA N9000A-503/507: 50 dB</p> <p>CXA N9000A-513/526: 70dB</p> <p>EXA: 60 dB</p> <p>MXA and PXA: 70 dB</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

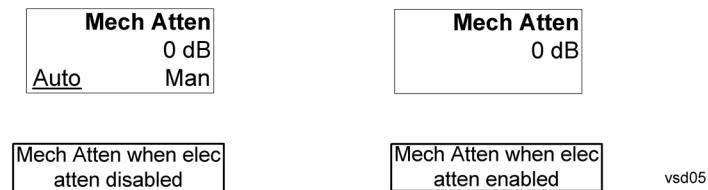
---

### 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 434](#)" 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 931](#)

See Error! Reference source not found.

Key Path	AMPTD Y Scale, Attenuation
<b>Remote Command</b>	<pre>[ :SENSe] :POWeR[ :RF] :EATTenuation :STATe OFF ON 0 1 [ :SENSe] :POWeR[ :RF] :EATTenuation :STATe?</pre>
<b>Example</b>	POW:EATT:STAT ON
Dependencies	<p>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 "<a href="#">"Attenuator Configurations and Auto/Man" on page 931</a>.</p> <p>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 &gt; 3.6 GHz then the <b>Enable Elec Atten</b> key will be OFF and grayed out.</p> <p>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 <b>Enable Elec Atten</b> key will be OFF and grayed out.</p> <p>If either of the above is true, if the SCPI command is sent, an error indicating that the electronic</p>

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	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

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### 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.

<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:EATTenuation &lt;rel_ampl&gt;</code> <code>[ :SENSe]:POWer[:RF]:EATTenuation?</code>
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 <a href="#">"Attenuator Configurations and Auto/Man" on page 931</a> . 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 <b>Enable Elec Atten</b> is off or grayed out, the <b>Elec Atten</b> 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 and gain 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 does not appear 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
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:RANGE:OPTimize IMMEDIATE</code>
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 935](#) 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
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:RANGE:OPTimize:ATTenuation OFF   ELECtrical   COMBined</code> <code>[ :SENSe]:POWer[:RF]:RANGE:OPTimize:ATTenuation?</code>
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. In instruments with Dual Attenuator model, when <b>Enable Elec Atten</b> is off or grayed out, the <b>Pre-Adjust for Min Clip</b> key is grayed out.
Preset	OFF for Swept SA measurement; ON for all other measurements that support <b>Pre-Adjust for Min Clip</b>
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

<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:RANGE:AUTO ON OFF 1 0</code> <code>[ :SENSe]:POWer[:RF]:RANGE:AUTO?</code>
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
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Example	:POW:RANGE:OPT:ATT OFF
Initial S/W Revision	Prior to A.02.00

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### 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

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### 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.

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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

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### (Mech) Atten Step

This controls the step 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
<b>Remote Command</b>	[ :SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement] 10 dB   2 dB [ :SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement]?
<b>Example</b>	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

## Scale/Div

Sets the logarithmic units per vertical graticule division on the display. However, since the Auto Scaling defaults to On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.

Key Path	AMPTD Y Scale
Mode	All except SA and BASIC
Remote Command	<code>:DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:PDIVision &lt;rel_ampl&gt;</code> <code>:DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:PDIVision?</code>
Example	<code>DISP:MON:VIEW:WIND:TRAC:Y:PDIV 5.0 dB</code> <code>DISP:MON:VIEW:WIND:TRAC:Y:PDIV?</code>
Couplings	When the Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Preset	10.00 dB
State Saved	Saved in instrument state.
Min	0.10 dB
Max	20.00 dB
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 439.

<b>Key Path</b>	<b>AMPTD Y Scale</b>
<b>Remote Command</b>	[ :SENSe]:POWer[:RF]:PCENter
<b>Example</b>	POW:PCEN
<b>Notes</b>	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.
<b>Dependencies</b>	<ul style="list-style-type: none"> <li>- Grayed out if the microwave preselector is off. )</li> <li>- If the selected marker's frequency is below Band 1, advisory message 0.5001 is generated and no action is taken.</li> <li>- Grayed out if entirely in Band 0.</li> <li>- 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.</li> <li>- Grayed out in the Spectrogram View.</li> </ul>
<b>Couplings</b>	<p>The active marker position determines where the centering will be attempted.</p> <p>If the analyzer is 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.</p>
<b>Status Bits/OPC dependencies</b>	<p>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.</p> <p>The Measuring bit should remain set while this command is operating and should not go false until the subsequent sweep/measurement has completed.</p>
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.03.00

### Proper Preselector Operation

A number of considerations should be observed to ensure proper operation:

3. 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.
4. 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

5. 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 944 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	<pre>[ :SENSe] :POWer[ :RF] :PADJust &lt;freq&gt; [ :SENSe] :POWer[ :RF] :PADJust?</pre>
Example	<pre>POW:PADJ 100KHz POW:PADJ?</pre>
Notes	The value on the key reads out to 0.1 MHz resolution.
Dependencies	<ul style="list-style-type: none"> <li>- Grayed out if microwave preselector is off. )</li> <li>- Grayed out if entirely in Band 0.</li> <li>- 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.</li> <li>- Grayed out in the Spectrogram View.</li> </ul>
Preset	0 MHz
State Saved	The <b>Presel Adjust</b> value set by <b>Presel Center</b> , or by manually adjusting <b>Presel Adjust</b> , 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	<pre>[ :SENSe] :POWer[ :RF] :MW:PADJust [ :SENSe] :POWer[ :RF] :MMW:PADJust</pre> <p>PSA had multiple preselectors, but the X-Series has only one. These commands simply alias to [:SENSe]:POWER[:RF]:PADJust</p>

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

<b>Remote Command</b>	<code>[SENSe]:POWer[:RF]:PADJust:PRESelector MWAVe   MMWave   EXternal</code> <code>[SENSe]:POWer[:RF]:PADJust:PRESelector?</code>
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

## 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.

Users may choose Low Noise Path Enable. It gives 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
<b>Remote Command</b>	<code>[ :SENSe] :POWer[ :RF] :MW:PATH STD   LNPath   MPBypass   FULL</code> <code>[ :SENSe] :POWer[ :RF] :MW:PATH?</code>
<b>Example</b>	<code>:POW:MW:PATH LNP</code> Enables the Low Noise path
Notes	<p>If a Presel Center is performed, the analyzer will momentarily switch to the Standard Path, regardless of the setting of <b>μW Path Control</b></p> <p>The DC Block will always be 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 <b>Low Noise Path Enable</b>. In the case where the DC Block is switched in the analyzer is now AC coupled. However, if the user has 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.</p> <p>Alignment switching ignores the settings in this menu, and restores them when finished.</p>
Dependencies	Unavailable in BBIQ and External Mixing
Preset	<p>All modes other than IQ Analyzer mode and VXA: STD</p> <p>IQ Analyzer, VXA and WLAN mode:</p> <p>MPB option present and licensed: MPB</p> <p>MPB option not present and licensed: STD</p>
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, <b>μW Path Control</b>
<b>Example</b>	<code>:POW:MW:PATH STD</code>
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.

Image responses are separated from the real signal by twice the 1st IF. For IF Paths of 10 MHz and 25 MHz, the 1st IF is 322.5 MHz, so the image response and the real signal will be separated by 645 MHz. The 1st IF will be different for other IF Path settings. When viewing a real signal and its corresponding image response in internal mixing, the image response will be to the left of the real signal.

Also, the image response and the real signal typically have the same amplitude and exhibit the same shape factor.

However, if Option FS1, Fast Sweep Capability, is enabled, the image response in the Swept SA measurement will appear lower in amplitude and have a much wider shape factor compared to the real signal.

Key Path	AMPTD Y Scale, μW Path Control
<b>Example</b>	: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

<b>Remote Command</b>	[ :SENSe]:POWER[:RF]:MW:PRESelector[:STATe] ON OFF 0 1 [:SENSe]:POWER[:RF]:MW:PRESelector[:STATe]?
<b>Example</b>	: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

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## 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.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the status line. For example ,for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

---

Key Path	AMPTD Y Scale
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:GAIN[:STATe] OFF ON 0 1</code> <code>[ :SENSe]:POWer[:RF]:GAIN[:STATe]?</code>
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.
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be switched On, to Full Range.  Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected.  Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

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Key Path	AMPTD Y Scale, Internal Preamp
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Scope	Meas Global
<b>Remote Command</b>	[ :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
<b>Example</b>	: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
<b>Example</b>	: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
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND FULL

Readback	Full Range
Initial S/W Revision	Prior to A.02.00

## Ref Position

Positions the reference level at the top, center or bottom of the Y Scale display.  
Changing the reference position does not change the reference level value.

Key Path	<b>AMPTD Y Scale</b>
Mode	All except SA and BASIC
<b>Remote Command</b>	:DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACE:Y[:SCALe]:RPOSITION TOP   CENTer   BOTTom  :DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACE:Y[:SCALe]:RPOSITION?
<b>Example</b>	DISP:MON:VIEW:WIND:TRAC:Y:RPOS CENT DISP:MON:VIEW:WIND:TRAC:Y:RPOS?
Preset	TOP
State Saved	Saved in instrument state.
Range	Top Ctr Bot
Initial S/W Revision	Prior to A.02.00

## Auto Scaling

Toggles the Auto Scaling function between On and Off.

Key Path	<b>AMPTD Y Scale</b>
Mode	All except SA and BASIC
<b>Remote Command</b>	:DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACE:Y[:SCALe]:COUPLE 0   1   OFF   ON  :DISPlay:MONitor:VIEW[1]:WINDOW[1]:TRACE:Y[:SCALe]:COUPLE?
<b>Example</b>	DISP:MON:VIEW:WIND:TRAC:Y:COUP ON DISP:MON:VIEW:WIND:TRAC:Y:COUP?
Couplings	When Auto Scaling is On, and the <b>Restart</b> front-panel key is pressed, this function automatically determines the scale per division and reference values based on the measurement results.  When you set a value to either Scale/Div or Ref Value manually, Auto Scaling automatically changes to Off.
Preset	ON
State Saved	Saved in instrument state.
Range	On Off
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 keyactions 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.

See "[More Information](#)" on page 447

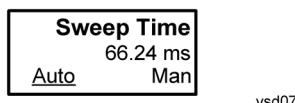
Key Path	Front-panel key
<b>Remote Command</b>	:COUPle ALL   NONE
<b>Example</b>	:COUP ALL
Notes	:COUPle ALL puts all Auto/Man parameters in Auto mode (equivalent to pressing the <b>Auto Couple</b> key). :COUPLE NONE puts all Auto/Man parameters in manual mode. It decouples all the coupled instrument 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.

#### 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).

- If in Auto, Auto is underlined on the calling key.

- If in manual operation, manual is indicated on the calling key, but note that the calling key simply opens the menu and does **not** actually toggle the function.

## BW

Accesses a menu that enables you to specify the resolution bandwidth functions that control the bandwidth and filter selection.

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

### Res BW

Sets the resolution bandwidth for the current measurement. If an unavailable bandwidth is entered with the numeric keypad, the closest available bandwidth is selected.

Key Path	BW
Mode	All except SA and BASIC
<b>Remote Command</b>	<pre>[ :SENSe]:MONitor:BANDwidth[:RESolution] &lt;freq&gt; [ :SENSe]:MONitor:BANDwidth[:RESolution]? [ :SENSe]:MONitor:BANDwidth[:RESolution]:AUTO OFF ON 0 1 [ :SENSe]:MONitor:BANDwidth[:RESolution]:AUTO?</pre>
<b>Example</b>	<pre>MON:BAND 2.4 MHz MON:BAND? MON:BAND:AUTO ON MON:BAND:AUTO?</pre>
Preset	<pre>WCDMA: Automatically calculated WIMAX OFDMA: 100kHz C2K: Automatically calculated BLUETOOTH: Automatically calculated PN: Automatically calculated GSM/EDGE: Automatically calculated TD-SCDMA: Automatically calculated 1xEVDO: 30kHz DVB-T/H: 3.9kHz DTMB (CTTB): 3.9kHz ISDB-T: 3.9kHz CMMB: 3.9kHz LTE: 100 kHz LTETDD: 100 kHz Digital Cable TV: 3.9kHz WLAN: 100 kHz MSR: Automatically calculated LTEAFDD, LTEATDD: 100kHz</pre>

---

WCDMA: ON  
 WIMAX: OFF  
 C2K: ON  
 BLUETOOTH: ON  
 PN: ON  
 GSM/EDGE: ON  
 TD-SCDMA: ON  
 1xEVDO: ON  
 DVB-T/H: OFF  
 DTMB (CTTB): OFF  
 ISDB-T: OFF  
 CMMB: OFF  
 LTE: OFF  
 LTETDD: OFF  
 Digital Cable TV: OFF  
 WLAN: OFF  
 MSR: ON  
 LTEAFDD, LTETDD: OFF

---

State Saved	Saved in instrument state.
-------------	----------------------------

Min	1.0 Hz
-----	--------

Max	8.0 MHz
-----	---------

<b>Backwards Compatibility SCPI</b>	[ :SENSe]:MONitor:BWIDth[:RESolution]
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Initial S/W Revision	Prior to A.02.00
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Modified at S/W Revision	A.02.00
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Modified at S/W Revision	A.03.00
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## Video BW

Changes the analyzer post-detection filter.

---

Key Path	BW
Mode	All except SA and BASIC
<b>Remote Command</b>	<pre>[ :SENSe]:MONitor:BANDwidth:VIDeo &lt;bandwidth&gt; [ :SENSe]:MONitor:BANDwidth:VIDeo? [ :SENSe]:MONitor:BANDwidth:VIDeo:AUTO ON OFF 1 0 [ :SENSe]:MONitor:BANDwidth:VIDeo:AUTO?</pre>
<b>Example</b>	<pre>MON:BAND:VID 10 MHz MON:BAND:VID? MON:BAND:VID:AUTO OFF</pre>

---

---

	MON:BAND:VID:AUTO?
Preset	WCDMA: Automatically calculated WIMAX OFDMA: 1MHz C2K: Automatically calculated BLUETOOTH: Automatically calculated PN: Automatically calculated GSM/EDGE: Automatically calculated TD-SCDMA: Automatically calculated 1xEVDO: 300kHz DVB-T/H: 39kHz DTMB (CTTB): 39kHz ISDB-T: 39kHz CMMB: 39kHz LTE: 1 MHz LTETDD: 1 MHz Digital Cable TV: 39kHz WLAN: 1 MHz MSR: Automatically calculated LTEAFDD, LTEATDD:1 MHz WCDMA: ON WIMAX: OFF C2K: ON BLUETOOTH: ON PN: ON GSM/EDGE: ON TD-SCDMA: ON 1xEVDO: ON DVB-T/H: OFF DTMB (CTTB): OFF ISDB-T: OFF CMMB: OFF LTE: OFF LTETDD: OFF Digital Cable TV: OFF WLAN: OFF MSR: ON LTEAFDD, LTEATDD: OFF
State Saved	Saved in instrument state.
Min	1 Hz
Max	50 MHz

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**Backwards Compatibility SCPI** [:SENSe]:MONitor:BWIDth:VIDeo

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Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00
Modified at S/W Revision	A.03.00

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VBW:3dB RBW

Selects the ratio between the video bandwidth and the equivalent 3 dB resolution bandwidth to be used for setting the VBW when VBW is in Auto.

---

Key Path	BW
Mode	All except SA and BASIC
<b>Remote Command</b>	<pre>[:SENSe]:MONitor:BANDwidth:VIDeo:RATio &lt;real&gt; [:SENSe]:MONitor:BANDwidth:VIDeo:RATio? [:SENSe]:MONitor:BANDwidth:VIDeo:RATio:AUTO OFF ON 0 1 [:SENSe]:MONitor:BANDwidth:VIDeo:RATio:AUTO?</pre>
<b>Example</b>	<pre>MON:BAND:VID:RAT 2 MON:BAND:VID:RAT? MON:BAND:VID:RAT:AUTO 0 MON:BAND:VID:RAT:AUTO?</pre>

---

Preset	1
	ON

---

State Saved	Saved in instrument state.
Min	0.00001
Max	3000000

---

**Backwards Compatibility SCPI** [:SENSe]:MONitor:BWIDth:VIDeo:RATio

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Initial S/W Revision	Prior to A.02.00
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Span:3dB RBW

Selects the ratio between span and resolution bandwidth.

The default setting is Auto with a Span:3 dB RBW ratio of 106:1. You can manually change this ratio by pressing the key, entering a new value, and pressing **Enter**.

---

Key Path	BW
Mode	All except SA and BASIC
<b>Remote Command</b>	<pre>[:SENSe]:MONitor:FREQuency:SPAN:BANDwidth[:RESolution]:RATio &lt;integer&gt; [:SENSe]:MONitor:FREQuency:SPAN:BANDwidth[:RESolution]:RATio?</pre>

---

---

```
[SENSe]:MONitor:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO
OFF | ON | 0 | 1
```

```
[SENSe]:MONitor:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO?
```

---

<b>Example</b>	MON:FREQ:SPAN:BAND:RAT 200
	MON:FREQ:SPAN:BAND:RAT?
	MON:FREQ:SPAN:BAND:RAT:AUTO ON
	MON:FREQ:SPAN:BAND:RAT:AUTO?

---

Preset	106
	ON

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State Saved	Saved in instrument state.
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Min	2
Max	10000

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**Backwards  
Compatibility SCPI**

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Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

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## 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
<b>Remote Command</b>	:INITiate:CONTinuous OFF ON 0 1 :INITiate:CONTinuous?
<b>Example</b>	: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 <b>Cont</b> hardkey, instead there is a <b>Sweep Single/Cont</b> key. In these analyzers, switching the <b>Sweep Single/Cont</b> key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart <b>Max Hold</b> and <b>Min Hold</b> . The X-Series has <b>Single</b> and <b>Cont</b> keys in place of the <b>SweepSingleCont</b> key. In the X-Series, if in single measurement, the <b>Cont</b> 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 will place the analyzer in Single Sweep but will have no effect on the current sequence until k = N, at which point the current sequence will stop and the instrument will go to the idle state.

## File

See "File" on page 287

## FREQ Channel

Accesses a menu allowing you to set Frequency parameters for Phase Noise measurements.

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

### Carrier Freq

Specifies the center frequency of the carrier

Key Path	FREQ Channel
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:FREQuency:CARRier &lt;freq&gt;</code> <code>[ :SENSe]:FREQuency:CARRier?</code>
<b>Example</b>	FREQ:CARR 1 FREQ:CARR?
Notes	When Signal Track is ON, Carrier Frequency is automatically set depending on the signal. When Auto Tune is performed, Carrier Frequency is automatically set as the result of Auto Tuning algorithm.
Preset	1GHz
State Saved	Saved in instrument state.
Min	-79.999995 MHz
Max	Hardware Dependent: Opt503 = 3.699999995 GHz Opt508 = 8.499999995 GHz Opt513 = 13.799999995 GHz Opt526 = 26.999999995 GHz
Initial S/W Revision	Prior to A.02.00

## Input/Output

See "Input/Output" on page 141

## Marker

Accesses a menu that enables you to select, set up and control the markers for the current measurement.

For remote-only commands associated with Marker functionality, see:

- "Marker X Axis Value (Remote Command only)" on page 461
- "Marker X Axis Position (Remote Command only)" on page 462
- "Marker Y Axis Value (Remote Command only)" on page 462

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

### Select Marker

Displays 12 markers available for selection.

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

### Marker Type

Sets the marker control mode to **Normal**, **Delta** or **Off**. If the selected marker is **Off**, pressing **Marker** sets it to **Normal** and places a single marker at the center of the display. At the same time, **Marker X Axis Value** appears on the Active Function area.

Key Path	Marker
Mode	All except SA and BASIC
<b>Remote Command</b>	<pre>:CALCulate:MONitor:MARKer[1] 2 ... 12:MODE POSITION   DELTa   OFF :CALCulate:MONitor:MARKer[1] 2 ... 12:MODE?</pre>
<b>Example</b>	<pre>CALC:MON:MARK:MODE POS CALC:MON:MARK:MODE?</pre>
Notes	<p>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 <b>Marker Trace</b> rules. At the same time, <b>Marker X Axis Value</b> appears on the Active Function area.</p> <p>Default Active Function: the active function for the selected marker's current control mode. If the current control mode is Off, there is no active function and the active function is turned off.</p> <p>Active Function Display: the marker X axis value entered in the active function area displays the marker value to its full entered precision.</p>
Preset	OFF
State Saved	Saved in instrument state.

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Range	Normal Delta Off
Initial S/W Revision	Prior to A.02.00

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## Properties

Accesses a menu that enables you to select the active marker, the reference marker and the trace for the current measurement.

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Key Path	Marker
Initial S/W Revision	Prior to A.02.00

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## Select Marker

Displays 12 markers available for selection.

---

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

---

## Relative To

Selects the desired marker. The selected marker is relative to its reference marker.

---

Key Path	Marker, Properties
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:REFerence <integer> :CALCulate:MONitor:MARKer[1] 2 ... 12:REFerence?
<b>Example</b>	CALC:MON:MARK2:REF 1 CALC:MON:MARK2:REF?
Notes	A marker cannot be relative to itself so that choice is grayed out, and if sent from SCPI generates error -221: "Settings conflict; marker cannot be relative to itself." When queried a single value is returned (the specified marker number's relative marker).
Preset	2 3 4 5 6 7 8 9 10 11 12 1
State Saved	Saved in instrument state.
Min	1
Max	12
Initial S/W Revision	Prior to A.02.00

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## Marker Trace

Assigns the specified marker to the designated trace.

---

Key Path	Marker, Properties
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:TRACe <integer> :CALCulate:MONitor:MARKer[1] 2 ... 12:TRACe?

---

<b>Example</b>	CALC:MON:MARK:TRAC 1 CALC:MON:MARK:TRAC?
Preset	1
State Saved	Saved in instrument state.
Min	1
Max	3
Initial S/W Revision	Prior to A.02.00

## Couple Markers

When this function is true, moving any marker causes an equal X Axis movement of every other marker that is not **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).

Key Path	Marker
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer:COUPle[:STATE] ON OFF 1 0 :CALCulate:MONitor:MARKer:COUPle[:STATE]?
<b>Example</b>	CALC:MON:MARK:COUP ON CALC:MON:MARK:COUP?
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00

## All Markers Off

Turns off all markers on the current measurement.

Key Path	Marker
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer:AOFF
<b>Example</b>	CALC:MON:MARK:AOFF
Initial S/W Revision	Prior to A.02.00

## Marker X Axis Value (Remote Command only)

Sets the marker X Axis value in the current marker X Axis Scale unit. It has no effect if the control mode is **Off**, but is the SCPI equivalent of entering an X value if the control mode is **Normal** or **Delta**.

Mode	All except SA and BASIC
<b>Remote Command</b>	<code>:CALCulate:MONitor:MARKer[1] 2 ... 12:X &lt;freq&gt;</code> <code>:CALCulate:MONitor:MARKer[1] 2 ... 12:X?</code>
<b>Example</b>	CALC:MON:MARK3:X 0 CALC:MON:MARK3:X?
Notes	If no suffix is sent, uses 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 error “Invalid suffix” is generated. The query returns the marker’s absolute X Axis value if the control mode is <b>Normal</b> , or the offset from the marker’s reference marker if the control mode is <b>Delta</b> . The query is returned in the fundamental units for the current marker X Axis scale: Hz for <b>Frequency</b> and <b>Inverse Time</b> , seconds for <b>Period</b> and <b>Time</b> . If the marker is <b>Off</b> the response is not a number.
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query returns a not a number (NAN).
State Saved	No
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00

### Marker X Axis Position (Remote Command only)

Sets the marker X position in trace points. It has no effect if the control mode is **Off**, but is the SCPI equivalent of entering a value if the control mode is **Normal** or **Delta** – except in trace points rather than X Axis Scale units. The entered value is immediately translated into the current X Axis Scale units for setting the value of the marker.

Mode	All except SA and BASIC
<b>Remote Command</b>	<code>:CALCulate:MONitor:MARKer[1] 2 ... 12:X:POSITION &lt;real&gt;</code> <code>:CALCulate:MONitor:MARKer[1] 2 ... 12:X:POSITION?</code>
<b>Example</b>	CALC:MON:MARK:X:POS 0 CALC:MON:MARK:X:POS?
Notes	The query returns the marker’s absolute X Axis value in trace points if the control mode is <b>Normal</b> , or the offset from the marker’s reference marker in trace points if the control mode is <b>Delta</b> . The value is returned as a real number, not an integer, corresponding to the translation from X Axis Scale units to trace points. If the marker is <b>Off</b> the response is not a number.
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query returns a not a number (NAN).
State Saved	No
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00

### Marker Y Axis Value (Remote Command only)

Returns the marker Y Axis value in the current marker.

Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:Y?
<b>Example</b>	CALC:MON:MARK11:Y?
Preset	Result dependent on markers setup and signal source
<b>Backwards Compatibility SCPI</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION:RESult?
Initial S/W Revision	Prior to A.02.00

## Marker Function

Accesses special marker functions such as marker noise, and power in a specified bandwidth or time interval.

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

### Select Marker

Displays 12 markers available for selection.

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

### Marker Function Type

Sets the marker control function type to one of the following:

NOISE	Marker Noise
BPOWer	Band/Interval Power
BDENsity	Band Interval Density
OFF	Marker Function Off

Key Path	Marker Function
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION NOISE   BPOWER   BDENSITY   OFF :CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION?
<b>Example</b>	CALC:MON:MARK:FUNC NOISCALE:C:MON:MARK:FUNC?
Preset	OFF
State Saved	Saved in instrument state.
Range	Marker Noise Band/Interval Power Band Interval Density Marker Function Off
Initial S/W Revision	Prior to A.02.00

### Band Adjust

Accesses a menu that enables you to set the frequency span width and the left and right edge, or time values, for the band or interval of the selected marker.

Key Path	Marker Function
Initial S/W Revision	Prior to A.02.00

## Band/Interval Span for Frequency Domain

Sets the width of the frequency span for the selected marker.

Key Path	Marker Function
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION:BAND:SPAN <freq> :CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION:BAND:SPAN?
<b>Example</b>	CALC:MON:MARK12:FUNC:BAND:SPAN 20 MHz CALC:MON:MARK12:FUNC:BAND:SPAN?
Couplings	Changing the Band/Interval Span necessarily changes the Band/Interval Left and Band/Interval Right values.
Preset	Depends on X axis range of selected Trace.
State Saved	Saved in instrument state.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00

## Band/Interval Left for Frequency Domain

Sets the left edge frequency or time value for the band of the selected marker.

Key Path	Marker Function
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION:BAND:LEFT <freq> :CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION:BAND:LEFT?
<b>Example</b>	CALC:MON:MARK12:FUNC:BAND:LEFT 20 GHz CALC:MON:MARK12:FUNC:BAND:LEFT?
Couplings	Changing the Band/Interval Left necessarily changes the Band/Interval Span value.
Preset	Depends on X axis range of selected Trace.
State Saved	Saved in instrument state.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00

## Band/Interval Right for Frequency Domain

Sets the right edge frequency or time value for the band of the selected marker.

Key Path	Marker Function
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION:BAND:RIGHT <freq> :CALCulate:MONitor:MARKer[1] 2 ... 12:FUNCTION:BAND:RIGHT?

<b>Example</b>	CALC:MON:MARK12:FUNC:BAND:RIGH 20 GHz CALC:MON:MARK12:FUNC:BAND:RIGH?
Couplings	Changing the Band/Interval Right necessarily changes the Band/Interval Span value.
Preset	Depends on X axis range of selected Trace.
State Saved	Saved in instrument state.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00

## Marker To

There is no 'Marker To' functionality supported in Monitor Spectrum. The front-panel key displays a blank menu when pressed.

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

## Meas

The information in this section is common to all measurements. For key and remote command information for a specific measurement, refer to the section that describes the measurement of interest.

Measurements available under the Meas key are specific to the current Mode.

When viewing Help for measurements, note the following:

**NOTE**

Operation for some keys differs between measurements. The information displayed in Help pertains to the current measurement. To see 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.

Key Path	Front-panel key
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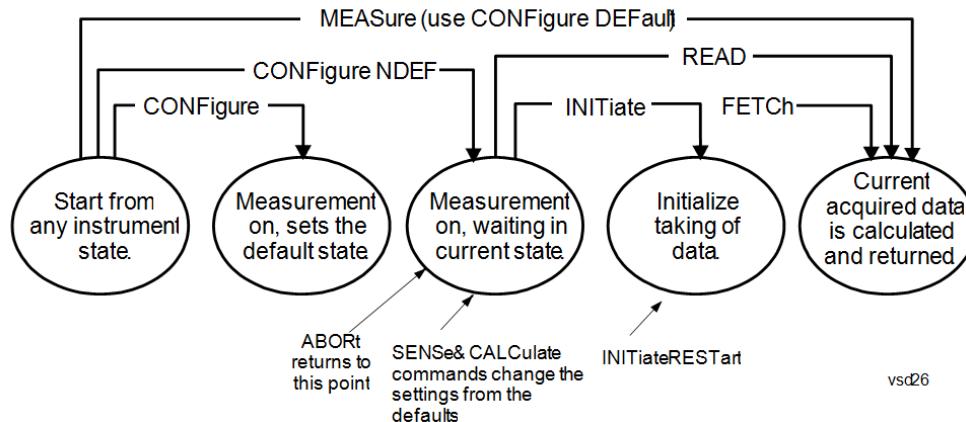
## Remote Measurement Functions

This section contains the following topics:

- "Measurement Group of Commands" on page 987
- "Current Measurement Query (Remote Command Only)" on page 990
- "Limit Test Current Results (Remote Command Only)" on page 990
- "Data Query (Remote Command Only)" on page 990
- "Calculate/Compress Trace Data Query (Remote Command Only)" on page 990
- "Calculate Peaks of Trace Data (Remote Command Only)" on page 996
- "Hardware-Accelerated Fast Power Measurement (Remote Command Only)" on page 997
- "Format Data: Numeric Data (Remote Command Only)" on page 1011
- "Format Data: Byte Order (Remote Command Only)" on page 1012

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## Measurement Group of Commands



### Measure Commands:

: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.

- 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.
- If the function does averaging, it is turned on and the number of averages is set to 10.
- After the data is valid it 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.
- 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.
- ASCII is the default format for the data output. (Older versions of Spectrum Analysis and Phase Noise mode measurements only use ASCII.) The binary data formats should be used for handling large blocks of data since they are smaller and faster than the ASCII format. Refer to the FORMat:DATA command 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 you can use the READ? command to initiate the measurement and query the results.

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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. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to the default settings, use MEASure:<measurement>?.

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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 INIT: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 INIT:CONTinuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query 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 Commands:

: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.

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INITiate Commands:

: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

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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.

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READ Commands:

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: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? it will initiate a new measurement 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 will switch 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. Then you send READ:ACP? It will change from channel power back to ACP and, using the previous ACP settings, will initiate the measurement and return results.
- 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 will be returned. 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 when handling large blocks of data since they are smaller and faster than the ASCII format. (FORMAT:DATA)

### Current Measurement Query (Remote Command Only)

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

<b>Remote Command</b>	:CONFigure?
<b>Example</b>	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. It returns a 0 if the measured results pass when compared with the current limits. It returns a 1 if the measured results fail any limit tests.

<b>Remote Command</b>	:CALCulate:CLIMits:FAIL?
<b>Example</b>	CALC:CLIM:FAIL? queries the current measurement to see if it fails the defined limits. Returns a 0 or 1: 0 it passes, 1 it fails.
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 and FORMat:DATA commands and can return real or ASCII data. (See the format command descriptions under Input/Output in the Analyzer Setup section.)

<b>Remote Command</b>	:CALCulate:DATA[n]?
Notes	The return trace depends on the measurement. In CALCulate:<meas>:DATA[n], n is any valid subopcode for the current measurement. It returns the same data as the FETCh:<measurement>? query where <measurement> 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 analyzer. The command is used with a sub-opcode <n> (default=1) to specify the trace. With trace queries, it is best if the analyzer 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.

<b>Remote Command</b>	<code>:CALCulate:DATA&lt;n&gt;:COMPRESS? BLOCK   CFIT   MAXimum   MINimum   MEAN   DMEan   RMS   RMSCubed   SAMPLE   SDEViation   PPHase [,&lt;sOffset&gt;[,&lt;lLength&gt;[,&lt;rOffset&gt;[,&lt;rLimit&gt;]]]]</code>
<b>Example</b>	<p>To query the mean power of a set of GSM bursts:</p> <p>Supply a signal that is a set of GSM bursts.</p> <p>Select the IQ Waveform measurement (in IQ Analyzer Mode).</p> <p>Set the sweep time to acquire at least one burst.</p> <p>Set the triggers such that acquisition happens at a known position relative to a burst.</p> <p>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.)</p>
Notes	<p>The command supports 5 parameters. Note that the last 4 (&lt;sOffset&gt;, &lt;lLength&gt;, &lt;rOffset&gt;, &lt;rLimit&gt;) are optional. But these optional parameters must be entered in the specified order. For example, if you want to specify &lt;lLength&gt;, then you must also specify &lt;sOffset&gt;. See details below for a definition of each of these parameters.</p> <p>This command uses the data in the format specified by FORMat:DATA, returning either binary or ASCII data.</p>
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- BLOCk or 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. (This is x,y pairs for trace data and I,Q pairs for complex data.)
- CFIT or curve fit - applies curve fitting routines to the data. <sOffset> and <lLength> are required to define the data that you want. <rOffset> is an optional parameter for the desired order of the curve equation. The query will return the following values: the x-offset (in seconds) and the curve coefficients ((order + 1) values).

MIN, MAX, MEAN, DME, RMS, RMSC, SAMP, SDEV and PPH return one data value for each specified region (or <length>) of trace data, for as many regions as possible until you run out of trace data (using <roffset> to specify regions). Or they return the number of regions you specify (using <rlimit>) ignoring any data beyond that.

- MINimum - 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 maximum magnitude of the I/Q pairs is returned.
- MEAN - 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)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i$$

where  $X_i$  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)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} |X_i|$$

where  $|X_i|$  is the magnitude of an I/Q pair, and  $n$  is the number of I/Q pairs in the specified region(s).

- DMEan - 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)

$$DME = 10 \times \log_{10} \left( \frac{1}{n} \sum_{Xi \in \text{region}(s)} 10^{\frac{Xi}{10}} \right)$$

- RMS - 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)

$$RMS = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} X_i^2}$$

where  $X_i$  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)

$$RMS = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} X_i X_i^*}$$

where  $X_i$  is the complex value representation of an I/Q pair,  $X_i^*$  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 - 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 - 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)

$$SDEV = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} (Xi - \bar{X})^2}$$

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).

$$SDEV = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} (|Xi| - \bar{X})^2}$$

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 - 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:

$$\text{Power} = 10 \times \log [10 \times (\text{RMS I/Q value})] + 10.$$

The RMS I/Q value (peak volts) is:

$$\sqrt{\frac{1}{n} \sum_{Xi \in \text{region}} Xi \cdot Xi^*}$$

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:

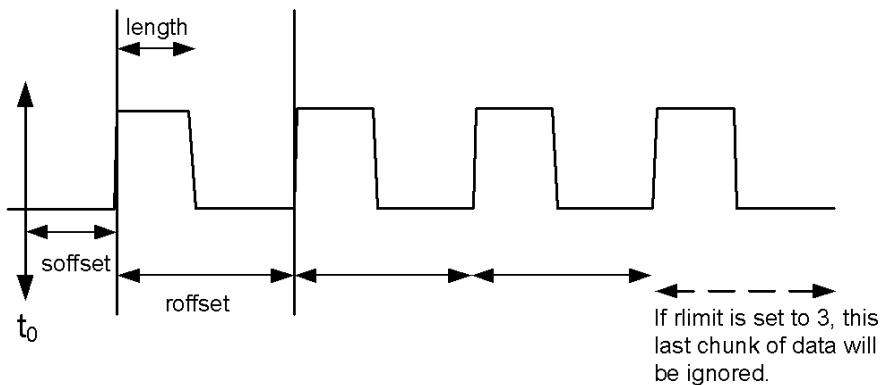
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

where  $Y_i$  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.

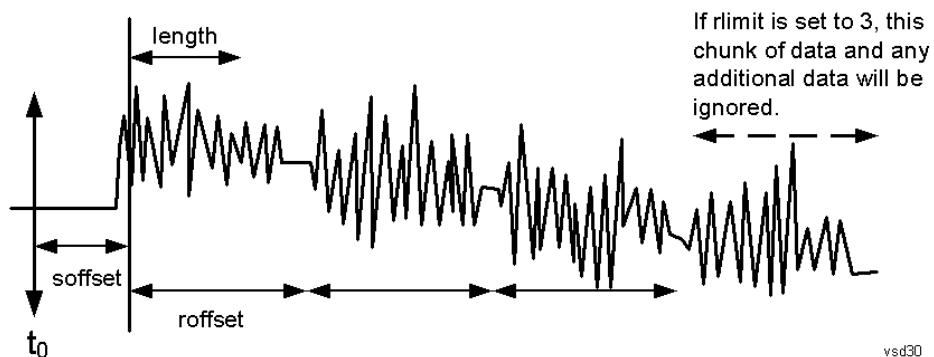
#### Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



#### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



vsd30

<soffset> - start offset is an optional real number. (It is in seconds for time-domain traces, and is 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> – is an optional real number. (It is in seconds for time-domain traces, and is 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. (It is in seconds for time-domain traces, and is 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 above).

<rlimit> – repeat limit is an optional integer. It specifies the number of data items that you want returned. It will ignore any additional items beyond that number. You can use the Start offset and the Repeat limit to pick out exactly what 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 sub-opcode [n]. The peaks must meet the requirements of the peak threshold and excursion values.

n = any valid sub-opcode 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 sub-opcodes 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 the sub-opcode n=0, is the raw trace data which cannot be searched for peaks. And Sub-opcode n=1, is often calculated results values which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDer and FORMat:DATA 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 will identify 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, it 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 the peak list will consist 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. 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 reportedSorting 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.

**Initial S/W Revision**

Prior to A.02.00

### Hardware-Accelerated Fast Power Measurement (Remote Command Only)

The Fast Power option (FP2) enables very fast channel power measurements for instruments with the prerequisite hardware (DP2 and/or B40). It accomplishes this by performing real-time overlapped FFTs at the hardware layer, using software for basic post-processing before returning the result to the user. The upshot of this

approach is improved throughput for user applications that require many sequential power measurements.

The analysis bandwidth of FP2 is limited by the licenses in the instrument, but its maximum overall analysis bandwidth per acquisition is 40 MHz.

FP2 is remote-only, which means the instrument does not switch to any particular mode or measurement. FP2 commands can be sent while another application is in use on the front panel.

Each Fast Power measurement can be predefined using an array index, and up to 1,000 measurements can be stored. In the following documentation, instances of [1,2,...,999] can be substituted with a particular measurement index, e.g. CALC:FPOW:POW1?, CALC:FPOW:POW2?, CALC:FPOW:POW134?. In this way, power measurements can be defined one time in a batch, and then executed multiple times without having to redefine them, similar to “list mode” on other measurements.

In addition to basic channel power measurements, there are a number of other measurement “functions” for each channel, including peak power, peak frequency, and power spectral density. See the Function parameter for more information.

### Reset Fast Power Measurement (Remote Command Only)

Resets the measurement configuration to the defaults.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:RESet
<b>Example</b>	:CALC:FPOW:POW1:RES
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Define Fast Power Measurement (Remote Command Only)

Fast Power acquisitions are configured using the DEFine command. This command accepts a comma-delimited string of configuration parameters and their appropriate values, which are all specified in the subsection below.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:DEFine "configuration string"
<b>Example</b>	:CALC:FPOW:POW1:DEF "CenterFrequency=2e9, AcquisitionTime=0.005"
Notes	See below for a list of measurement variables that can be defined in the configuration string.
Initial S/W Revision	A.14.00

## Acquisition Time

---

Example	CALC:FPOW:POW1:DEF "AcquisitionTime=0.002"
Notes	The acquisition time parameter sets the time in which the entire spectrum is measured. An increase in the acquisition time yields an improvement in measurement repeatability.
Preset	0.001 s
Range	0 s to 1 s
Default Unit	Time (s)
Initial S/W Revision	A.14.00

---

## Center Frequency

---

Example	CALC:FPOW:POW1:DEF "CenterFrequency=2e9"
Notes	The center frequency parameter sets the frequency in which the measurement is centered around. The OffsetFrequency parameter is calculated relative to the center frequency.
Preset	1 GHz
Range	0 Hz to maximum instrument frequency
Default Unit	Frequency (Hz)
Initial S/W Revision	A.14.00

---

## DC Coupled

---

Example	CALC:FPOW:POW1:DEF "DCCoupled=True"
Notes	The DC coupled parameter allows the user to specify whether the DC blocking capacitor is utilized. Set parameter to true when measuring frequencies below 10 MHz.
Preset	False
Range	True (DC Coupled) or False (AC Coupled)
Default Unit	Boolean
Initial S/W Revision	A.14.00

---

## DetectorType

---

Example	CALC:FPOW:POW1:DEF "DetectorType=Peak"
Notes	Option FP2 is required. The detector type parameter allows the user to choose whether a RMS average or peak value is used during the measurement.
Preset	RmsAverage
Range	RmsAverage, Peak
Initial S/W Revision	A.14.00

---

## Do Noise Correction

Example	CALC:FPOW:POW1:DEF "DoNoiseCorrection=True"
Notes	<p>When noise correction is enabled, the linear noise power contributed by the analyzer is subtracted from all measurements. This effectively lowers the noise floor of the analyzer.</p> <p>When noise correction is enabled, the first measurement for a given set of input parameters will take extra time. This is because the analyzer takes an extra acquisition with the RF input disconnected from the analyzer's front end to measure the noise of just the analyzer. The measured noise floor is stored in a cache so the noise acquisition will occur only once for the same state settings. In other words, if noise correction was turned on and the analyzer made an acquisition at frequency A, then frequency B, and back again to frequency A, the hidden initial noise floor acquisition would only occur for the first acquisition at frequency A and the cached noise floor would be used the second time frequency A was measured.</p>
Preset	False
Range	True (enable noise correction) or False (disable noise correction)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Do Spur Suppression

Example	CALC:FPOW:POW1:DEF "DoSpurSuppression=True"
Notes	<p>When measuring very low level signals, or when large out-of-band inputs are input into the analyzer, sometimes unwanted spurs and residuals can appear in the measured spectrum. Spur suppression is a method to help minimize the levels of these internally generated spurs and residuals.</p> <p>When spur suppression is enabled, the analyzer will automatically take two acquisitions using two different internal analog LO frequencies. The FFT spectrums from both acquisitions are combined by taking the minimum power between both traces on a per FFT bin basis. External signals will have the same amplitude for both traces and therefore will return the expected amplitudes. However, low level spurs and residuals generated internally to the analyzer tend to move to different FFT bins depending on the internal analog LO frequency used, and therefore tend to be suppressed using this spur suppression method.</p> <p>Because two acquisitions, rather than a single acquisition, are made when spur suppression is enabled, the measurement time will always be slower when spur suppression is enabled.</p>
Preset	False
Range	True (enable spur suppression) or False (disable spur suppression)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Electronic Attenuator Bypass

Example	CALC:FPOW:POW1:DEF "ElecAttBypass =False"
---------	---

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Notes	The electronic attenuation bypass parameter allows the user to either utilize or bypass the electronic attenuator. The electronic attenuator is only available for frequencies up to 3.6 GHz. Set parameter to true when using frequencies above 3.6 GHz and set the parameter to false when using the preamp.
Preset	True
Range	True (bypass electronic attenuator) or False (use electronic attenuator)
Default Unit	Boolean
Initial S/W Revision	A.14.00

---

## Electronic Attenuation

---

Example	CALC:FPOW:POW1:DEF "ElecAttenuation=10"
Notes	<p>Option EA3 is required.</p> <p>The electronic attenuation value parameter sets the amount of electrical attenuation from 0 to 24 dB (1 dB steps).</p> <p>Set "ElecAttBypass=False" to make sure the electronic attenuator path is enabled.</p>
Preset	0 dB
Range	0 – 24 dB (1 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

---

## IF Gain

---

Example	CALC:FPOW:POW1:DEF "IFGain=10"
Notes	<p>The IF gain parameter allows the user to specify the gain at the IF stage anywhere from -6 to 16 dB (1 dB steps). This is an advanced feature, and for most cases this should remain at its default value of 0 dB.</p>
Preset	0 dB
Range	-6 – 16 dB (1 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

---

## IF Type

---

Example	CALC:FPOW:POW1:DEF "IFTType=B25M"
Notes	<p>The IF type parameter allows the user to select between different IF paths. For example, if the signal is less than 25 MHz wide, then the user can select the B25M path to take advantage of additional filtering on this analog IF path.</p>

---

Preset	B40M
Range	B10M, B25M, B40M
Initial S/W Revision	A.14.00

### Include Power Spectrum

Example	CALC:FPOW:POW1:DEF "IncludePowerSpectrum=True"
Notes	The power spectrum parameter allows the user to read data on the entire spectrum for diagnostic purposes. It is not recommended for production use. See CALC:FPOW:POW[n]:READ2? for details on the binary format of the response.
Preset	False
Range	True (return both channel power and full power spectrum) or False (returns only channel power)
Default Unit	Boolean
Initial S/W Revision	A.14.00

### Mechanical Attenuation

Example	CALC:FPOW:POW1:DEF "MechAttenuation=10"
Notes	The mechanical attenuation value parameter sets the amount of mechanical attenuation anywhere from 0 to 70 dB (2 dB steps).
Preset	0 dB
Range	0 – 70 dB (2 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

### Preamp Mode

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The license for the appropriate preamp is required. The preamp mode parameter specifies whether the preamps are being utilized. Low allows any preamps up to 3.6 GHz, and Full allows all licensed preamps. Set "ElecAttBypass=True" in order to utilize any preamps.
Preset	Off
Range	Off, Low, Full
Initial S/W Revision	A.14.00

## Resolution Bandwidth Mode

---

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The resolution bandwidth mode parameter allows the user to choose whether the RBW filter is automatically or manually set. The BestSpeed value minimizes measurement time, while the Narrowest value minimizes RBW size (minimum of two FFT bins per RBW). To manually specify an RBW, set this parameter to Explicit, and set the ResolutionBW parameter to the desired value.
Preset	BestSpeed
Range	BestSpeed, Narrowest, Explicit
Initial S/W Revision	A.14.00

---

## Resolution Bandwidth

---

Example	CALC:FPOW:POW1:DEF "ResolutionBW=25e3"
Notes	The resolution bandwidth parameter sets the 3-dB bandwidth of the RBW filter. The ResolutionBWMode parameter must be set to Explicit in order to manually set the RBW.
Preset	0 Hz
Default Unit	Hz
Initial S/W Revision	A.14.00

---

## Trigger Delay

---

Example	CALC:FPOW:POW1:DEF "TriggerDelay=0.025"
Notes	The trigger delay parameter sets the time after an external trigger is detected until the measurement is performed.
Preset	0 s
Range	0 – 1 s
Default Unit	Seconds
Initial S/W Revision	A.14.00

---

## Trigger Level

---

Example	CALC:FPOW:POW1:DEF "TriggerLevel=2"
Notes	The trigger level parameter sets the voltage value at which an external trigger is detected.
Preset	1.2 V
Range	-5 to 5 V
Default Unit	Volts
Initial S/W Revision	A.14.00

---

## Trigger Slope

Example	CALC:FPOW:POW1:DEF "TriggerSlope=Negative"
Notes	The trigger slope parameter indicates the direction of the edge trigger voltage for detection.
Preset	Positive
Range	Positive, Negative
Initial S/W Revision	A.14.00

## Trigger Source

Example	CALC:FPOW:POW1:DEF "TriggerSource=Ext1"
Notes	The trigger source parameter allows the user to choose between measurement's triggering freely or controlled by an external input. Ext1 and Ext2 correspond to Trigger 1 In and Trigger 2 In, respectively.
Preset	Free
Range	Free, Ext1, Ext2
Initial S/W Revision	A.14.00

## Trigger Timeout

Example	CALC:FPOW:POW1:DEF "TriggerTimeout=0.1"
Notes	The trigger timeout parameter sets the time in which the analyzer will wait for a trigger before automatically performing the measurement.
Preset	1 s
Range	0 – 1 s
Default Unit	Seconds
Initial S/W Revision	A.14.00

## Signal Input

Example	CALC:FPOW:POW1:DEF "SignalInput=Fp50MHzCW"
Notes	The signal input parameter allows the user to select between using the main RF input or the internal analyzer reference CW signal of 50 MHz.
Preset	FpMainRf
Range	FpMainRf, Fp50MHzCW
Initial S/W Revision	A.14.00

## Use Preselector

---

Example	CALC:FPOW:POW1:DEF "UsePreSelector=True"
Notes	The preselector parameter allows the user to either utilize or bypass the front end tunable filter at frequencies above 3.6 GHz. For frequencies below 3.6 GHz, the preselector is automatically bypassed, so you do not need to set this parameter to False in those cases.
Preset	False
Range	True (use preselector above 3.6 GHz), or False (preselector bypassed)
Default Unit	Boolean
Initial S/W Revision	A.14.00

---

## Channel Bandwidth Array

---

Example	CALC:FPOW:POW1:DEF "Bandwidth=[3.84e6, 5e6, 3.84e6]"
Notes	The bandwidth parameter array defines the bandwidth of each channel that will be measured. All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.
Preset	[1e6]
Range	0 to 40 MHz
Default Unit	Hz
Initial S/W Revision	A.14.00

---

## Channel Filter Type Array

---

Example	CALC:FPOW:POW1:DEF "FilterType=[RRC, IBW, RRC]"
Notes	The filter type parameter allows the user to choose between an integration bandwidth (IBW) filter or a root-raised-cosine (RRC) filter. The integration bandwidth filter weighs all frequencies within the bandwidth equally. The root-raised-cosine filter has an associated shape parameter, defined by the FilterAlpha parameter. All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.
Preset	[IBW]
Range	IBW, RRC
Initial S/W Revision	A.14.00

---

## Channel Filter Alpha Array

---

Example	CALC:FPOW:POW1:DEF "FilterAlpha=[0.5, 0.0, 0.5]"
Notes	The filter alpha parameter allows the user to adjust the alpha value associated with the root-

---

---

raised-cosine (RRC) filter type. Set FilterType to RRC in order to utilize this parameter.  
All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.

---

Preset	[0.22]
Range	0.0 – 1.0
Initial S/W Revision	A.14.00

---

### Channel Measurement Function Array

---

Example	CALC:FPOW:POW1:DEF "Function=[BandPower, PeakPower, BandPower]"
Notes	<p>This parameter array defines what measurement is being made for each individually-specified channel:</p> <p>BandPower: Total power within the specified bandwidth of the channel (dBm)</p> <p>BandDensity: Total power density within the specified bandwidth of the channel (dBm/Hz)</p> <p>PeakPower: The peak power value within the specified bandwidth of the channel (dBm)</p> <p>PeakFrequency: The frequency which corresponds to the peak power value within the specified bandwidth of the channel. This frequency is relative to the center frequency (Hz)</p> <p>XdBBandwidth: The half power (-3.01 dB) bandwidth of the highest amplitude signal that resides within the channel (Hz), dB is configurable using XdBBandwidth parameter</p> <p>OccupiedBandwidth: The bandwidth at which 99% of the total power resides within the channel (Hz), percentage configurable using OccupiedBandwidthPercent parameter</p> <p>All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.</p>
Preset	[BandPower]
Range	BandPower, BandDensity, PeakPower, PeakFrequency, XdBBandwidth, OccupiedBandwidth
Initial S/W Revision	A.14.00

---

### Channel Offset Frequency Array

---

Example	CALC:FPOW:POW1:DEF "OffsetFrequency=[-5e6, 0, 5e6]"
Notes	<p>The offset frequency parameter array defines the difference between the center frequency to the center frequency of each channel.</p> <p>All array parameters should have the same number of elements.</p>
Preset	[0]
Range	0 to 20 MHz
Default Unit	Hz
Initial S/W Revision	A.14.00

---

### Channel Occupied Bandwidth Percent Array

---

Example	CALC:FPOW:POW1:DEF "OccupiedBandwidthPercent =[0.95, 0.95, 0.95]"
Notes	This parameter only applies for channels whose Function is set to OccupiedBandwidth. The occupied bandwidth percent parameter specifies the percent of total power in these channels. The valid range for this parameter is 0.0 to 1.0, where 1.0 represents 100%. The default for this parameter is 0.99, which will return the bandwidth that contains 99% of the total channel power.
Preset	[0.99]
Range	0 – 1.0
Initial S/W Revision	A.14.00

---

### Channel x-dB Bandwidth Array

---

Example	CALC:FPOW:POW1:DEF "XdBBandwidth =[-6.02, -3.01, -1.0]"
Notes	This parameter only applies for channels whose Function is set to XdBBandwidth. The X dB bandwidth parameter is used to specify the power relative to the peak channel power over which the bandwidth is calculated. The parameter value must be a negative number.
Preset	[-3.01]
Range	-200 to 0 dB
Default Unit	dB
Initial S/W Revision	A.14.00

---

### Define Fast Power Measurement Query (Remote Command Only)

The DEFine? command is used to retrieve a list of all defined parameters in an ASCII string format

---

```
M All
o
d
e
R :CALCulate:FPOWer:POWer[1,2,...,999]:DEFInE?
e
m
o
t
e
C
o
m
m
a
n
```

---

---

d

E :CALC:FPOW:POW1:DEF?

x

a

m

p

l

e

N This command query is used to retrieve a list of all defined parameters in an ASCII format.

o The following is an example of the returned results:

t "DCCoupled=False,ElecAttBypass=True,ElecAttenuation=0,IFGain=0,MechAttenuation=0,PreAmpMode=Off,PreSelectorOf  
e fset=0,UsePreSelector=False,ExternalReferenceFrequency=10000000,FrequencyReferenceSource=AutoExternalFrequenc  
s yReference,IFTType=B40M,LOMode=SLW,SignalInput=FpMainRf,AcquisitionTime=0.001,CenterFrequency=1000000000,Re  
solutionBW=0,ResolutionBWMode=BestSpeed,DetectorType=RmsAverage,Bandwidth=[1000000],OffsetFrequency=  
[0],Function=[BandPower],FilterType=[IBW],FilterAlpha=[0.22],OccupiedBandwidthPercent=[0.99],XdBBandwidth=[-  
3.01],DoNoiseCorrection=False,DoSpurSuppression=False,MeasurementMethod=HardwareFFT,IncludePowerSpectrum=F  
alse,TriggerDelay=0,TriggerLevel=1.2,TriggerSlope=Positive,TriggerSource=Free,TriggerTimeout=1"

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### Configure Fast Power Measurement (Remote Command Only)

The configure command begins hardware setup and returns immediately, with no acquisition made. This can be used in parallel with other hardware operations to effectively hide the hardware setup time.

---

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:CONFigure
<b>Example</b>	:CALC:FPOW:POW1:CONF

---

Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Initiate Fast Power Measurement (Remote Command Only)

The INITiate command begins an acquisition and returns immediately. The results of the measurement can be retrieved using FETCh.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:INITiate
<b>Example</b>	:CALC:FPOW:POW1:INIT
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Fetch Fast Power Measurement (Remote Command Only)

The FETCh command query is used to retrieve the results of an acquisition initiated by the INIT command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:FETCH?
<b>Example</b>	:CALC:FPOW:POW1:FETCH?
Notes	<p>Option FP2 is required.            Returns m comma-separated ASCII values, where m corresponds to the number of bandwidths defined.</p> <ul style="list-style-type: none"> <li>1. Declared function return in the 1st specified channel</li> <li>2. Declared function return in the 2nd specified channel</li> <li>...</li> <li>m. Declared function return in the last specified channel</li> </ul> <p>The INIT and FETC? command sequence performs the same functionality of a single CALC:FPOW:POW[n]? query. Units of the returned values are dependent on the Function parameter for each channel.</p>
Initial S/W Revision	A.14.00

### Execute Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]?
<b>Example</b>	:CALC:FPOW:POW1?
Notes	Option FP2 is required. See notes for Fast Power Fetch for return format.
Initial S/W Revision	A.14.00

### Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:READ? :CALCulate:FPOWer:POWer[1,2,...,999]:READ1?
<b>Example</b>	:CALC:FPOW:POW1:READ? :CALC:FPOW:POW1:READ1?
Notes	Option FP2 is required. Returns m 4 byte floating point binary values (Little-Endian), where m corresponds to the number of bandwidths defined.
Initial S/W Revision	A.14.00

### Diagnostic Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format. This command is used primarily for diagnostic purposes to test for ADC overloads and to visibly inspect the spectrum.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:READ2?
<b>Example</b>	:CALC:FPOW:POW1:READ2?
Notes	Option FP2 is required.

**NOTE**

Spectrum data is only returned if the IncludePowerSpectrum parameter is set to True. If IncludePowerSpectrum is False, the number of spectrum points will be zero (0).

Units of the returned values are dependent on the Function parameter per channel (e.g. dBm for BandPower, Hz for PeakFrequency).

Returns binary data (Little-Endian) that contains information on m amount of channels, along with ADC over range and full spectrum data.

---

	The following is the binary format of the response.
	Bandwidth Return Value
	1. Number of channels specified, m [4 byte int]
	2. Declared function result for the 1st specified channel [4 byte float]
	3. Declared function result for the 2nd specified channel [4 byte float]
	...
	(m + 1). Declared function result for the last (mth) specified channel [4 byte float]
	ADC Over Range
	1. ADC over-range occurred (1: true, 0: false) [2 byte short]
	Spectrum Data
	1. Number of points in the spectrum data, k [4 byte int]
	2. Start frequency of spectrum data (Hz) [8 byte double]
	3. Step frequency of spectrum data (Hz) [8 byte double]
	4. FFT bin at 1st point (dBm) [4 byte float]
	5. FFT bin at 2nd point (dBm) [4 byte float]
	...
	(k + 3). FFT bin at last (kth) point (dBm) [4 byte float]
Initial S/W Revision	A.14.00

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### 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.

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<b>Remote Command</b>	:FORMAT[:TRACe][:DATA] ASCii INTeger,32 REAL,32  REAL,64 :FORMAT[:TRACe][:DATA]?
Notes	<p>The query response is:</p> <p>ASCii: ASC,8</p> <p>REAL,32: REAL,32</p> <p>REAL,64: REAL,64</p> <p>INTeger,32: INT,32</p> <p>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).</p> <p>The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.</p>
Dependencies	<p>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).</p> <p>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</p>

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	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

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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 says it uses FORMat:DATA uses any format supported by FORMat:DATA.

The NORMAl order is a byte sequence that 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 is when the byte sequence begins with the LSB first, and ends with the MSB last in the sequence: 4|3|2|1.

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<b>Remote Command</b>	<b>:FORMat:BORDER NORMAl SWAPPed</b>
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:FORMat:BORDer?	
Preset	NORMAl
Initial S/W Revision	Prior to A.02.00

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## Meas Setup

Displays the setup menu for the current measurement. The measurement setup parameters include the number of measurement averages used to calculate the measurement result and the averaging mode. The setup menu also includes the option to reset the measurement settings to their factory defaults.

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

### Avg/Hold Num

Specifies the number of measurement averages used when calculating the measurement result. The average is displayed at the end of each sweep.

After the specified number of average counts, the averaging mode (terminal control) setting determines the averaging action.

Key Path	Meas Setup
Mode	All except SA and BASIC
<b>Remote Command</b>	<code>[ :SENSe]:MONitor:AVERage:COUNT &lt;integer&gt;</code> <code>[ :SENSe]:MONitor:AVERage:COUNT?</code> <code>[ :SENSe]:MONitor:AVERage[:STATe] OFF ON 0 1</code> <code>[ :SENSe]:MONitor:AVERage[:STATe]?</code>
<b>Example</b>	MON:AVER:COUN 25 MON:AVER:COUN? MON:AVER ON MON:AVER?
Preset	10 OFF
State Saved	Saved in instrument state.
Min	1
Max	1000
Initial S/W Revision	Prior to A.02.00

### Avg Mode

Toggles the average mode between exponential (Exp) and Repeat.

- **Exp**– continues measurement averaging, using the specified number of averages to compute each averaged value. The average is displayed at the end of each sweep.
- **Repeat**– causes the measurement to reset the average counter each time the specified number of averages is reached.

<b>Key Path</b>	<b>Meas Setup</b>
Mode	All except SA and BASIC
<b>Remote Command</b>	<code>[ :SENSe]:MONitor:AVERage:TCONTrol EXPonential REPeat</code> <code>[ :SENSe]:MONitor:AVERage:TCONTrol?</code>
<b>Example</b>	MON:AVER:TCON EXP MON:AVER:TCON?
Preset	EXPonential
State Saved	Saved in instrument state.
Range	ExpRepeat
Initial S/W Revision	Prior to A.02.00

### Meas Preset

Restores all the measurement parameters to their default values.

<b>Key Path</b>	<b>Meas Setup</b>
Mode	All except SA and BASIC
<b>Remote Command</b>	<code>:CONFigure:MONitor</code>
<b>Example</b>	CONF:MON
Initial S/W Revision	Prior to A.02.00

## Mode

See "Mode" on page 246

## 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 500 for more information.

Key Path	Front-panel key
<b>Remote Command</b>	<b>:SYST:PRESet</b>
<b>Example</b>	<b>:SYST:PRES</b>
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 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 <b>Mode Preset</b> 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.

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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.

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## 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

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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

See "Mode Setup" on page 281

## Peak Search

Places the selected marker on the trace point with the maximum y-axis value for that marker's trace. Pressing **Peak Search** with the selected marker off causes the selected marker to be set to **Normal**, then a peak search is immediately performed.

Key Path	Front-panel key
Mode	All except SA and BASIC
<b>Remote Command</b>	:CALCulate:MONitor:MARKer[1] 2 ... 12:MAXimum
<b>Example</b>	CALC:MON:MARK2:MAX
Initial S/W Revision	Prior to A.02.00

Print

See "Print" on page 292

## 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 finds 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.

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. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. 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. It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user. 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 509.

Key Path	Recall
Mode	All
<b>Remote Command</b>	:MMEMORY:LOAD:STATE <filename>
<b>Example</b>	:MMEM:LOAD:STAT "myState.state" This recalls the file myState.state on the default path
<b>Example</b>	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. <ul style="list-style-type: none"><li>- If there is a mismatch between file version or model number or instrument version or model number, the recall function tries 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.</li></ul>

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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.

<b>Backwards Compatibility SCPI</b>	<b>:MMEMory:LOAD:STATe 1,&lt;filename&gt;</b>
Initial S/W Revision	For backwards compatibility, the above syntax is supported. The "1" is simply ignored.

Initial S/W Revision	Prior to A.02.00
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## More Information

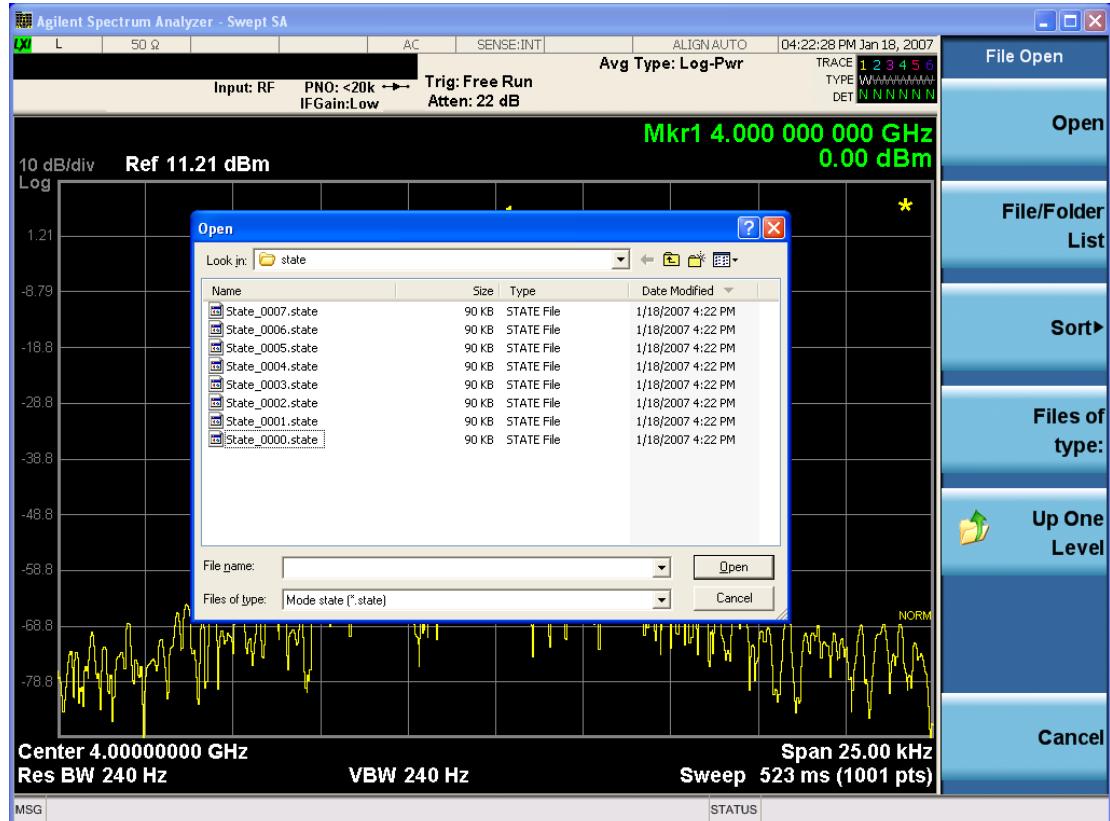
In measurements that support saving Traces, for example, Swept SA, the Trace data is saved along with the State in the State file. When recalling the State, the Trace data is recalled as well. Traces are recalled exactly as they were stored, including the writing mode and update and display modes. If 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 will have 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	<b>Recall, State</b>
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

### 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.

For more information and the SCPI command, see Edit Register Names under the **Save, State** function.

Key Path	<b>Recall, State</b>
Mode	All
Dependencies	N9060A-7FP or N9060B-2FP license required to edit the register names. When the feature is not

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licensed, sending the SCPI command generates an error, -221,"Settings conflict;Option not available"

Initial S/W Revision A.11.00

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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.

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Key Path	Recall, State
<b>Example</b>	*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 <b>Save, State,Edit Register Names</b> 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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### 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
<b>Example</b>	*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 <b>Save, State,Edit Register Names</b> 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

## 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.

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	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

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### 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.

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.

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Key Path	Recall
Mode	SA EDGE GSM PN
<b>Remote Command</b>	:MMEMORY:LOAD:CORRection 1 2 3 4 5 6 7 8, <filename>
<b>Example</b>	: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 D:\User_My_Documents\Instrument\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.

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Couplings	When a correction file is loaded from mass storage, it is automatically turned on ( <b>Correction ON</b> ) and <b>ApplyCorrections</b> is set to On. This allows you to see its effect, thus confirming the load.
Readback	selected Correction
<b>Backwards Compatibility SCPI</b>	<b>:MMEMory:LOAD:CORRection ANTenna   CABLE   OTHer   USER, &lt;filename&gt;</b> 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	<b>Recall, Data, Amplitude Correction</b>
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

### 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 1039 in **Recall, State**, for a full description of this dialog and menu.

Key Path	<b>Recall, Data</b>
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 516

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 <b>Restart</b> hardkey and the INITiate:RESTART command restart trace averages (displayed average count reset to 1) for a trace in <b>Clear Write</b> , but did not restart <b>Max Hold</b> and <b>Min Hold</b> . In the X-Series, the <b>Restart</b> hardkey and the INITiate:RESTART command restart not only <b>Trace Average</b> , but <b>MaxHold</b> and <b>MinHold</b> traces as well. For wireless comms modes in ESA and PSA, the <b>Restart</b> 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, Verbose SCPI) 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
<b>Remote Command</b>	:MMEMORY:STORe:STATe <filename>
<b>Example</b>	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 <b>Save State</b> menu, so that you can see the Register

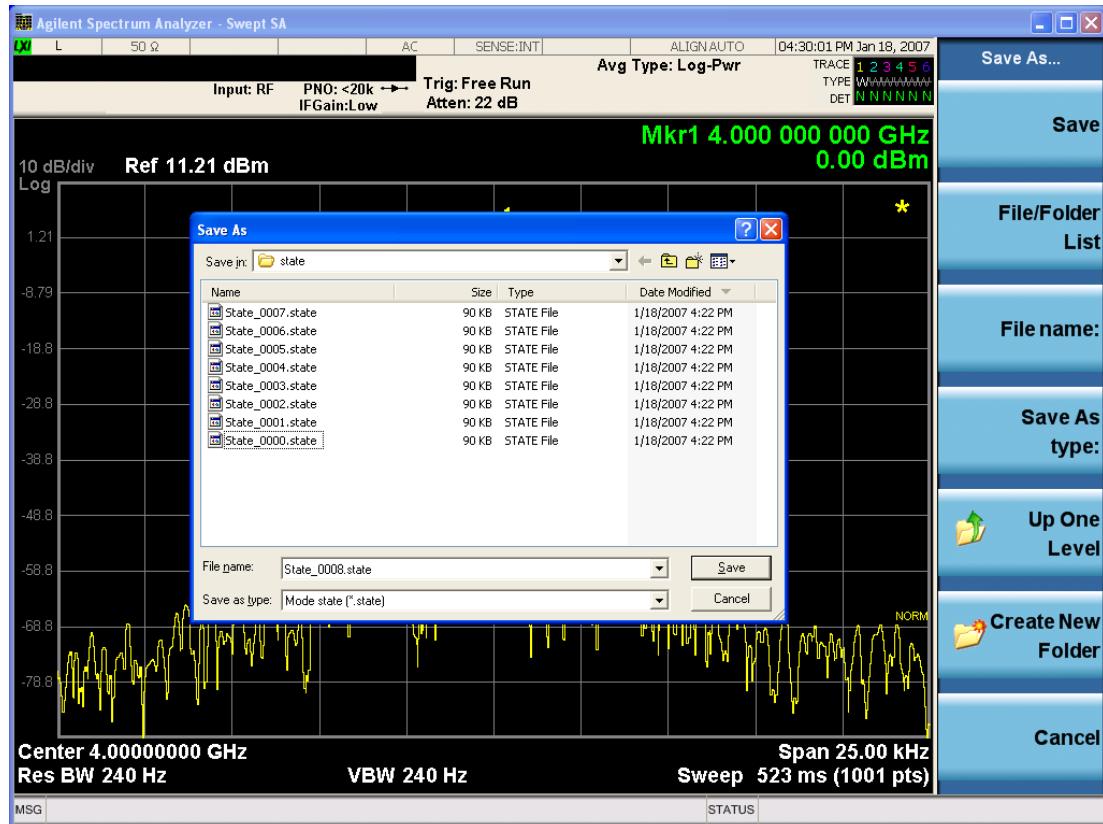
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	key update. After saving to a file, the analyzer automatically returns to the previous menu and any Save As dialog goes away.
<b>Backwards Compatibility SCPI</b>	<b>:MMEMORY:STORE:STATE 1,&lt;filename&gt;</b> For backwards compatibility, the above syntax is supported. The "1" is simply ignored. The command is sequential.
Initial S/W Revision	Prior to A.02.00

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### 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 1034 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	<b>Save, State</b>
Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

#### 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 522

Key Path	Save, State
Mode	All
<b>Remote Command</b>	<code>:MMEMORY:REGister:STATE:LAbel &lt;reg number&gt;,"label"</code> <code>:MMEMORY:REGister:STATE:LAbel? &lt;reg number&gt;</code>
<b>Example</b>	<code>:MMEM:REG:STAT:LAB 1,"my label"</code>
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.: <code>:MMEM:REG:STAT:LAB 1,""</code>
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.

## 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
<b>Example</b>	*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 <b>Edit Register Names</b> 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

## 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
<b>Example</b>	*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 <b>Edit Register Names</b> 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

## 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 you to 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 525

Key Path	Save
<b>Remote Command</b>	<code>:MMEMory:STORe:CORRection 1 2 3 4 5 6, &lt;filename&gt;</code>
<b>Example</b>	: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
<b>Backwards Compatibility SCPI</b>	<code>:MMEMory:STORe:CORRection ANTenna   CABLe   OTHeR   USER, &lt;filename&gt;</code>  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	"Correction Factors for	60 characters max; may be

<b>Line #</b>	<b>Type of field</b>	<b>Example</b>	<b>Notes</b>
	quotes)	11966E"	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)

Line #	Type of field	Example	Notes
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 Bias or 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

### 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 529.

See "Marker Table" on page 529.

See "Peak Table" on page 533.

See "Spectrogram" on page 536

<b>Remote Command</b>	<code>:MMEMory:STORe:RESUlt:MTABle PTABle SPECtrogram &lt;filename&gt;</code>
<b>Example</b>	<p>:MMEM:STOR:RES:MTAB "myResults.csv" Saves the results from the current marker table to the file myResults.csv in the current path.</p> <p>:MMEM:STOR:RES:PTAB "myResults.csv" Saves the results from the current peak table to the file myResults.csv in the current path.</p> <p>:MMEM:STOR:RES:SPEC "myResults.csv" Saves the results from the current Spectrogram display to the file myResults.csv in the current path.</p> <p>The default path is My Documents\SA\data\SAN\results</p>
Notes	<p>If the save is initiated via SCPI, and the file already exists, the file will be overwritten.</p> <p>Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.</p> <p>Both single and double quotes are supported for any filename parameter over SCPI.</p>
Dependencies	<p>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</p> <p>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</p> <p>If a save of Spectrogram results is requested and the Spectrogram is not on, no file is saved and a message is generated.</p> <p>The Spectrogram choice only appears if option EDP is licensed.</p>
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

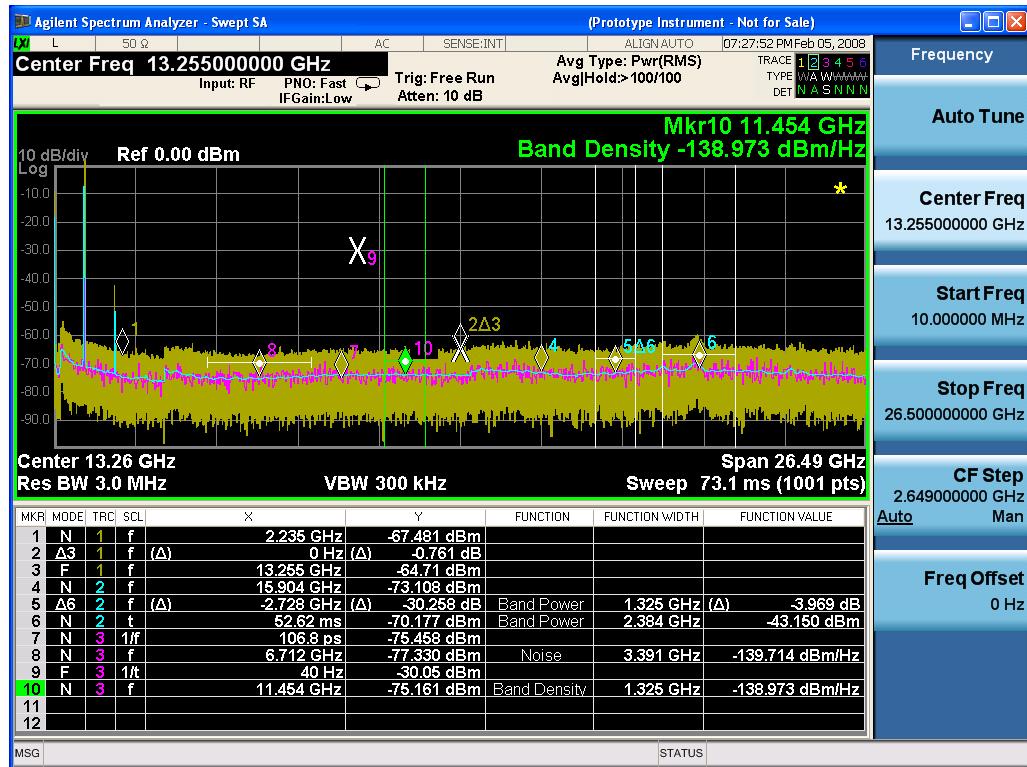
## Meas Results File Contents

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:

Measureme	
ntResult	
<hr/>	
Swept SA	
A.01.40_	N9020A
R0017	
<hr/>	
526 B25	1
PFR P26	
EA3	
<hr/>	
Result Type	Marker Table
Ref Level	0
<hr/>	
Number of Points	1001
<hr/>	
Sweep Time	0.06626
	6667
<hr/>	
Start Frequency	100000
Frequency	00
<hr/>	
Stop Frequency	265000
Frequency	00000
<hr/>	
Average Count	0

Average Type	LogPower (Video)
RBW	300000 0
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	300000 0
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	100000 00
Input	RF
RF Calibrator	Off
Attenuation	10
Ref Level Offset	0

8 Monitor Spectrum Measurement  
Save

External Gain	0								
X Axis Units	Hz								
Y Axis Units	dBm								
DATA									
MKR	MODE	T R C	SCL	X	Y	FUNC TION	FUNC TION WIDT H	FUNC TION VALU E	FUNC TION UNIT
1	Normal	1	Frequ ency	2.2350 E+09	- 67. 48 1	Off	0.0000 E+00	0	None
2	Delta3	1	Frequ ency	0.0000 E+00	- 0.7 61	Off	0.0000 E+00	0	None
3	Fixed	1	Frequ ency	1.3255 E+10	- 64. 71	Off	0.0000 E+00	0	None
4	Normal	2	Frequ ency	1.5904 E+10	- 73. 10 8	Off	0.0000 E+00	0	None
5	Delta7	2	Frequ ency	- 2.7280 E+09	- 30. 25 8	Band Power	1.3250 E+06	- 3.969	dB
6	Normal	2	Time	5.2620 E-02	- 70. 17 7	Band Power	2.3840 E+06	- 43.15	dBm
7	Normal	3	Perio d	1.0680 E-10	- 75. 45 8	Off	0.0000 E+00	0	None
8	Normal	3	Frequ ency	6.7120 E+09	- 77. 33	Noise	3.3910 E+06	- 139.7 14	dBm/ Hz
9	Fixed	3	Inver se Time	4.0000 E+01	- 30. 05	Off	0.0000 E+00	0	None
10	Normal	3	Frequ ency	1.1454 E+10	- 75. 16 1	Band Densi ty	1.3250 E+06	- 138.9 73	dBm/ Hz
11	Off	1	Frequ	0.0000	0	Off	0.0000	0	None

			ency	E+00			E+00		
12	Off	1	Frequ ency	0.0000 E+00	0	Off	0.0000 E+00	0	None

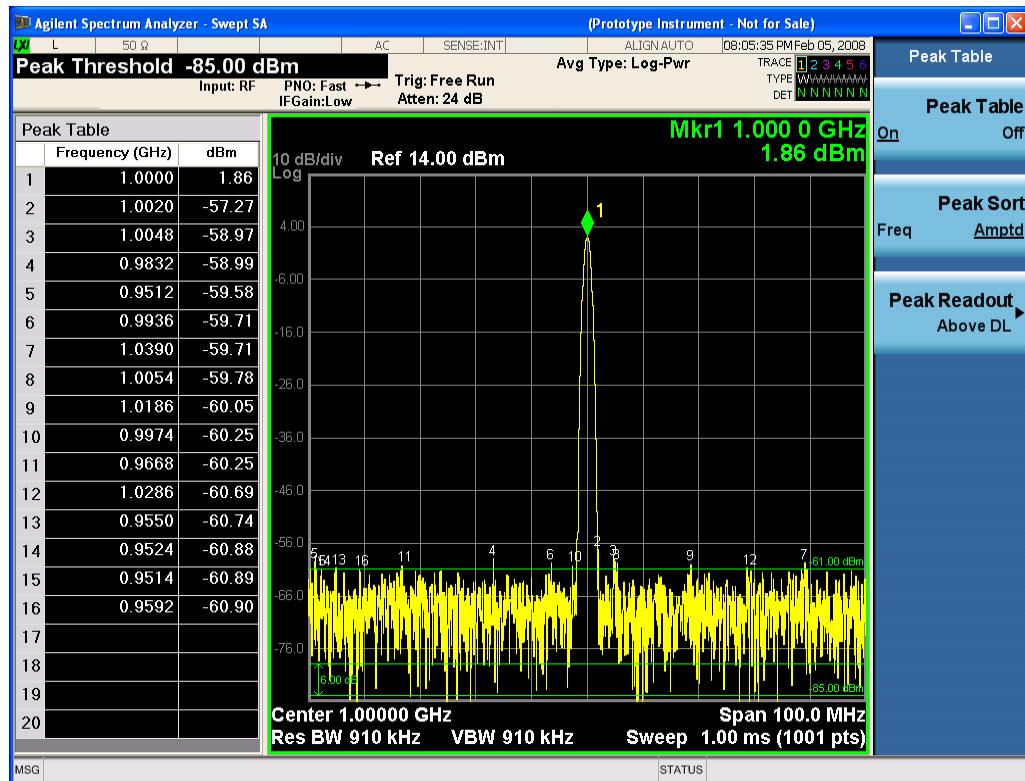
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

The metadata header is very similar to the metadata used in the trace data .csv files. See Trace File Contents. 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:

<b>MeasurementResult</b>	
<b>Swept SA</b>	
A.18.00	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	Amplitud e	Delt a to Limi t
1	1.000009988E+09	-26.08	41.1
2	9.99989974E+08	-26.11	43.9
3	1.000019929E+09	-29.47	35.2
4	9.999799016E+08	-29.54	40.4
5	1.000030002E+09	-37.51	23.1
6	9.999699601E+08	-37.62	32.4
7	9.999999155E+08	-37.71	32.3
8	1.000039943E+09	-48.38	9.1

9	9.999598877E+08	-48.55	21.4
10	1.000049885E+09	-61.43	-8.1
11	9.999499461E+08	-61.66	8.3
12	1.000059957E+09	-76.53	- 26.1
13	9.999398738E+08	-77.01	-7.6
14			
15			
16			
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.

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 different 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 seconds after the Spectrogram started (trace 10 has a start 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:

<b>Result Type</b>	<b>Spectrogram</b>
MeasResult	
Swept SA	
A.11.00.01	N9020A
503 508 513 526 ALL ALV	1
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	
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
RF Calibrator	Off

<b>Result Type</b>	<b>Spectrogram</b>
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
...	
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
...	
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
...	
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 1048 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

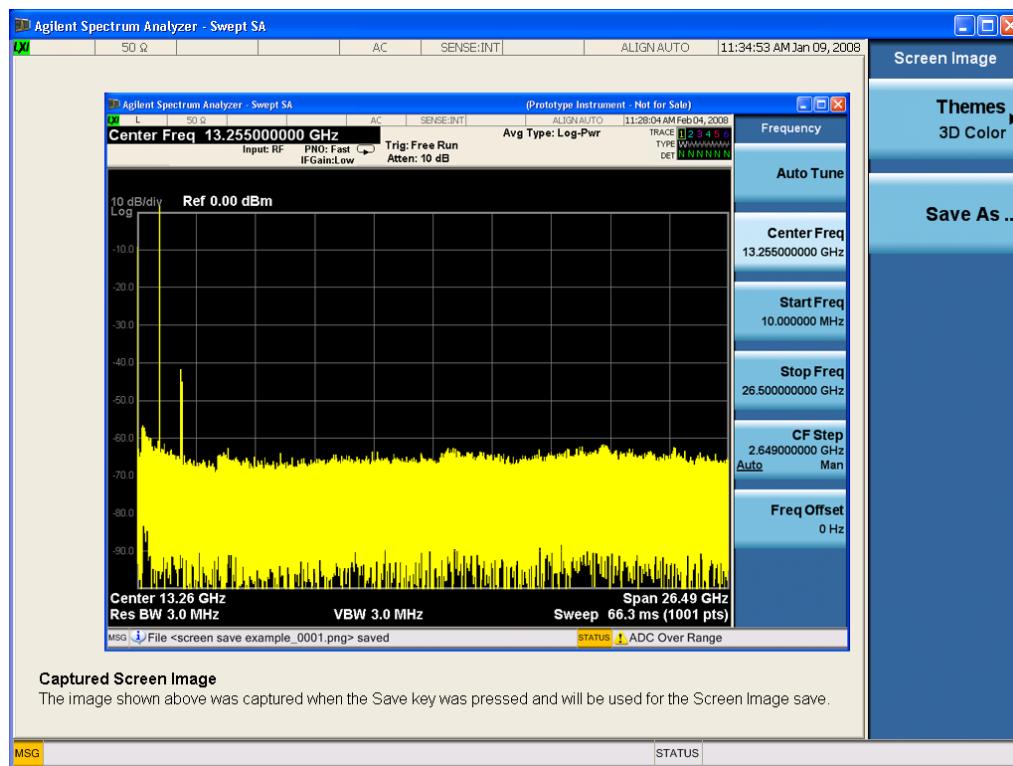
---

## 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
<b>Remote Command</b>	:MMEMory:STORe:SCReen <filename>
<b>Example</b>	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
<b>Backwards Compatibility SCPI</b>	HCOPY:SDUMP:DATA? returns the screen image in a <DEFINITE LENGTH ARBITRARY RESPONSE DATA> element. The response data is IEEE Block format; the controlling computer can strip the header and store the result as a .png file.
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
<b>Remote Command</b>	:MMEMory:STORe:SCReen:THEMe TDColor   TDMonochrome   FCOLor   FMONochrome :MMEMory:STORe:SCReen:THEMe?
<b>Example</b>	: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 you 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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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 1048 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	<b>Save, Screen Image</b>
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)

Key path	<b>SCPI Only</b>
<b>Remote Command</b>	<b>:MMEMory:CATalog? [&lt;directory_name&gt;]</b>
Notes	<p>The string must be a valid logical path.</p> <p>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:</p> <p>&lt;numeric_value&gt;,&lt;numeric_value&gt;,{&lt;file_entry&gt;}</p> <p>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 &lt;file_entry&gt; is a string. Each &lt;file_entry&gt; indicates the name, type, and size of one file in the directory list:</p> <p>&lt;file_name&gt;,&lt;file_type&gt;,&lt;file_size&gt;</p> <p>As the windows file system has an extension that indicates file type, &lt;file_type&gt; is always empty. &lt;file_size&gt; provides the size of the file in bytes. For directories, &lt;file_entry&gt; is surrounded by square brackets and both &lt;file_type&gt; and &lt;file_size&gt; are empty</p>
Initial S/W Revision	Prior to A.02.00

### Mass Storage Change Directory (Remote Command Only)

Key path	<b>SCPI Only</b>
<b>Remote Command</b>	<b>:MMEMory:CDIRectory [&lt;directory_name&gt;] :MMEMory:CDIRectory?</b>
Notes	<p>The string must be a valid logical path.</p> <p>Changes the default directory for a mass memory file system. The &lt;directory_name&gt; parameter is a string. If no parameter is specified, the directory is set to the *RST value.</p> <p>At *RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal.</p> <p>Query returns full path of the default directory.</p>
Initial S/W Revision	Prior to A.02.00

### Mass Storage Copy (Remote Command Only)

Key path	<b>SCPI Only</b>
<b>Remote Command</b>	<b>:MMEMory:COPY &lt;string&gt;,&lt;string&gt;[,&lt;string&gt;,&lt;string&gt;]</b>
Notes	<p>The string must be a valid logical path.</p> <p>Copies an existing file to a new file or an existing directory to a new directory.</p>

---

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 Device Copy (Remote Command Only)

This command transfers data to/from a file and a peripheral device.

---

Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:COPY:DEVice &lt;source_string&gt;,&lt;dest_string&gt;</b>
Notes	<p>The strings must be a valid logical path or a valid device keyword. If the dest_string is a device keyword, the data is copied from the source file to the device. If the source_string is a device keyword, the data is copied to the source file from the device.</p> <p>Valid device keywords are:</p> <ul style="list-style-type: none"> <li>SNS (smart noise source)</li> </ul> <p>An error is generated if the file or device is not found.</p>

---

## Mass Storage Delete (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:DELete &lt;file_name&gt;[,&lt;directory_name&gt;]</b>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a file from the specified directory. The &lt;file_name&gt; 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.</p>
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.

---

Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:DATA &lt;file_name&gt;, &lt;data&gt;</b> <b>:MMEMory:DATA? &lt;file_name&gt;</b>
Notes	<p>The string must be a valid logical path.</p> <p>The command form is MMEMory:DATA &lt;file_name&gt;,&lt;data&gt;. It loads &lt;data&gt; into the file &lt;file_name&gt;. &lt;data&gt; is in 488.2 block format. &lt;file_name&gt; is string data.</p> <p>The query form is MMEMory:DATA? &lt;file_name&gt; with the response being the associated &lt;data&gt; in block format.</p>

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Initial S/W Revision	Prior to A.02.00
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### Mass Storage Make Directory (Remote Command Only)

---

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:MDIRECTORY &lt;directory_name&gt;</code>
Notes	<p>The string must be a valid logical path.</p> <p>Creates a new directory. The &lt;directory_name&gt; parameter specifies the name to be created.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Move (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:MOVE &lt;string&gt;,&lt;string&gt;[,&lt;string&gt;,&lt;string&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>Moves an existing file to a new file or an existing directory to a new directory.</p> <p>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.</p> <p>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.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Remove Directory (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:RDIRECTORY &lt;directory_name&gt;</code>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a directory. The &lt;directory_name&gt; parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

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## Mass Storage Determine Removable Media (Remote Command Only)

This command is used to determine if any removable media devices are connected to the instrument. Primarily, these are USB memory devices plugged-in to the front panel or rear panel USB ports. On instruments with PC6 or PC7 CPU's, one SD card slot is available for removable media. The instrument's primary disk drive is not a removable media device.

Key Path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RMEDIA:LIST?</b>
Notes	The return value is a string containing a list of partition identifiers that are removable media devices. Each identifier is separated by a comma. If no removable media is present, an empty string is returned.  Examples: <ul style="list-style-type: none"><li>- One removable device present results in a return string of "F:".</li><li>- Two removable devices present results in a return string of "F:,G:".</li><li>- No removable devices present results in a return string of "".</li></ul>
Initial S/W Revision	x.15.00

## Mass Storage Determine Removable Media Label (Remote Command Only)

This command is used to set or query a removable media device's label.

Key Path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RMEDIA:LABEL &lt;partition&gt;,&lt;string&gt;</b> <b>:MMEMory:RMEDIA:LABEL? &lt;partition&gt;</b>
<b>Example</b>	MMEM:RMED:LAB "F:","My Device"
Notes	If the <partition> specified does not exist or is not a removable media device, the error -252,"Missing Media" is generated.  Setting the removable media label requires Administrative privileges. If the currently logged in user does not have appropriate privileges the error "-221.9900,Settings conflict;Administrator privileges required" is generated.
Initial S/W Revision	x.15.00

## Mass Storage Determine Removable Media Write-protect status (Remote Command Only)

This command is used to query a removable media device's write-protect status.

Key Path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RMEDIA:WProtect? &lt;partition&gt;</b>

---

<b>Example</b>	MMEM:RMED:WPR? "F:"
Notes	The return value is 1 if the device is write-protected, or 0 if the device is write-enabled. If the <partition> specified does not exist or is not a removable media device the error - 252,"Missing Media" is generated.
Preset	The return value will be depending on SD card installed.
Initial S/W Revision	x.15.00

---

### Mass Storage Determine Removable Media size (Remote Command Only)

This command is used to query a removable media device's total memory size (not available memory size).

---

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMORY:RMEDIA:SIZE? <partition>
<b>Example</b>	MMEM:RMED:SIZE? "F:"
Notes	The return value is integer value in GBytes. Any device that is less than 1 GB returns 0 GB. If the <partition> specified does not exist or is not a removable media device, the error - 252,"Missing Media" is generated.
Initial S/W Revision	x.15.00

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### :SYSTem:SET (Remote Command Only)

Remote command that allows the user to obtain the state of the currently active mode in a form that can then be loaded back into the instrument quickly.

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<b>Remote Command</b>	SYSTem:SET <instrument state in IEEE Block> SYSTem:SET?
Notes	SYST:SET? returns current instrument state of the active mode in IEEE Block data format. The state is in a machine readable format only. Sending the query returns the following format: <syst set preamble><state block data> Where: <syst set preamble> is the format: #NNMM N=number of digits that comprise MMM MMM=length in bytes of following data <state block data> is machine readable state data Example response: #42016<state data> The state is recalled by sending the SYST:SET? Response data to the instrument. From example above: SYST:SET #42016<state data>
Initial S/W Revision	x.17.00

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## 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 549

Key Path	Front-panel key
<b>Example</b>	:INIT:CONT OFF
Notes	See <b>Cont</b> key description.
Backwards Compatibility Notes	<p>For Spectrum Analysis mode in ESA and PSA, the <b>Single</b> 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 <b>Max Hold</b> and <b>Min Hold</b>. In the X-Series, the <b>Single</b> hardkey and the INITiate:IMM command initiate a sweep/ measurement/ average sequence/hold sequence including <b>MaxHold</b> and <b>MinHold</b>.</p> <p>For Spectrum Analysis mode in ESA and PSA, the <b>Single</b> hardkey restarted the sweep regardless of whether or not you were in an active sweep or sweep sequence. In the X-Series, <b>Restart</b> does this but <b>Single</b> only restarts the sweep or sweep sequence if you are in the idle state.</p> <p>INIT[:IMM] in ESA &amp; 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.</p>
Initial S/W Revision	Prior to A.02.00

## More Information

See "Restart" on page 1045 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
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## Span X Scale

Accesses a menu of functions that enable you to set the horizontal scale parameters.

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

### Span

Changes the frequency range symmetrically about the center frequency.

For details of WiDEN preset values, see "["IDEN Mode Span Preset for Monitor Spectrum" on page 552](#).

Key Path	Span X Scale
Mode	All except SA, BASIC
<b>Remote Command</b>	[ :SENSe]:MONitor:FREQuency:SPAN <freq> [ :SENSe]:MONitor:FREQuency:SPAN?
<b>Example</b>	MON:FREQ:SPAN 1 MHz MON:FREQ:SPAN?
Couplings	Changing the span causes the resolution bandwidth to change automatically, and affects data acquisition time.
Preset	WCDMA: 10.0 MHz WIMAX OFDMA: 50.0 MHz C2K: 2.5MHz PN: 1.0 MHz GSM/EDGE: 1.0 MHz TD-SCDMA: 3.2 MHz 1xEVDO: 2.0MHz DVB-T/H: 10.0MHz DTMB (CTTB): 10.0MHz ISDB-T: 10.0MHz CMMB: 10.0MHz LTE: 50 MHz LTETDD: 50 MHz LTE, LTETDD: 20 MHz IDEN: See the table below Digital Cable TV: 10.0MHz WLAN: If Radio Std is 802.11a/b/g 802.11n(20MHz) 802.11ac(20MHz): 25 MHz If Radio Std is 802.11n(40MHz), 802.11ac (40MHz): 50 MHz If Radio Std is 802.11ac(80MHz): 100MHz

---

	If Radio Std is 802.11ac(160MHz): 200MHz MSR: 20.0 MHz LTEAFDD, LTEATDD: 20.0MHz
State Saved	Saved in instrument state.
Min	10 Hz
Max	Hardware Dependent: Option 503 = 3.7 GHz Option 507 = 7.1GHz Option 508 = 8.5 GHz Option 513 = 13.8 GHz Option 526 = 27.0 GHz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00
Modified at S/W Revision	A.03.00

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### IDEN Mode Span Preset for Monitor Spectrum

iDEN Slot Format	WiDEN Slot Format 25kHz	WiDEN Slot Format 50kHz	WiDEN Slot Format 75kHz	WiDEN Slot Format 100kHz	WiDEN Slot Format 50kHz Out
60kHz	60kHz	85kHz	110kHz	135kHz	135kHz

### Full Span

Changes the Span to show the full frequency range of the analyzer.

---

Key Path	Span X Scale
Mode	All except SA and BASIC
<b>Remote Command</b>	[ :SENSe]:MONitor:FREQuency:SPAN:FULL
<b>Example</b>	MON:FREQ:SPAN:FULL
Couplings	Sets the span to the full frequency range, and adjusts the center frequency accordingly.
Initial S/W Revision	Prior to A.02.00

---

### Last Span

Changes the measurement span to the span setting of the previous measurement. If there is no existing previous span value, then the span remains unchanged.

---

Key Path	Span X Scale
Mode	All except SA and BASIC
<b>Remote Command</b>	[ :SENSe]:MONitor:FREQuency:SPAN:PREVIOUS

---

<b>Example</b>	MON:FREQ:SPAN:PREV
Couplings	Selecting last span changes the measurement span value.
Initial S/W Revision	Prior to A.02.00

## Sweep/Control

Access a menu of functions that enable you to set up and control the sweep time for the current measurement

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

### Sweep Time

Selects the length of time in which the spectrum analyzer sweeps the displayed frequency span. Additional overhead time is required by the analyzer. It impacts the sweep rate, but is not calculated as part of the sweep time. Reducing the sweep time increases the rate of sweeps.

Key Path	Sweep/Control
Mode	All except SA and BASIC
<b>Remote Command</b>	<code>[ :SENSe]:MONitor:SWEep:TIME &lt;time&gt;</code> <code>[ :SENSe]:MONitor:SWEep:TIME?</code> <code>[ :SENSe]:MONitor:SWEep:TIME:AUTO OFF ON 0 1</code> <code>[ :SENSe]:MONitor:SWEep:TIME:AUTO?</code>
<b>Example</b>	MON:SWE:TIME 100 ms MON:SWE:TIME? MON:SWE:TIME:AUTO ON MON:SWE:TIME:AUTO?
Preset	Automatically Calculated
State Saved	Saved in instrument state.
Min	1 ms
Max	4000 s
Initial S/W Revision	Prior to A.02.00
MIN/MAX/DEF Support	Yes

### Pause

Pauses a measurement after the current data acquisition is complete.

When Paused, the label on the key changes to **Resume**. Pressing **Resume** continues the measurement at the point where it had been paused.

See "["Pause/Resume" on page 1084](#) under Sweep/Control for more information.

Key Path	Sweep/Control
Initial S/W Revision	Prior to A.02.00

## 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.

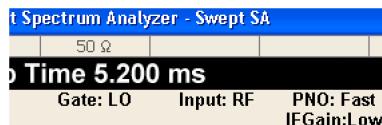
Key Path	Sweep/Control
Scope	Meas Global
Readback	The state and method of Gate, as [Off, LO] or [On, Video]. Note that for measurements that only support gated LO, the method is nonetheless read back, but always as LO.
Initial S/W Revision	Prior to A.02.00

### 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
<b>Remote Command</b>	[ :SENSe]:SWEep:EGATe[:STATe] OFF ON 0 1 [ :SENSe]:SWEep:EGATe[:STATe]?
<b>Example</b>	SWE:EGAT ON SWE:EGAT?
Dependencies	<p>The function is unavailable (grayed out) and Off when:</p> <ul style="list-style-type: none"> <li>– Gate Method is LO or Video and FFT Sweep Type is manually selected.</li> <li>– Gate Method is FFT and Swept Sweep Type is manually selected.</li> <li>– Marker Count is ON.</li> </ul> <p>The following are unavailable whenever Gate is on:</p> <ul style="list-style-type: none"> <li>– FFT under Sweep Type when Method=LO or Video or Swept under Sweep Type when</li> </ul>

---

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
	LTTDD: On
State Saved	Saved in instrument state
Range	On Off
<b>Backwards Compatibility SCPI</b>	[: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 the X-Series.
Initial S/W Revision	Prior to A.02.00

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#### 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.

---

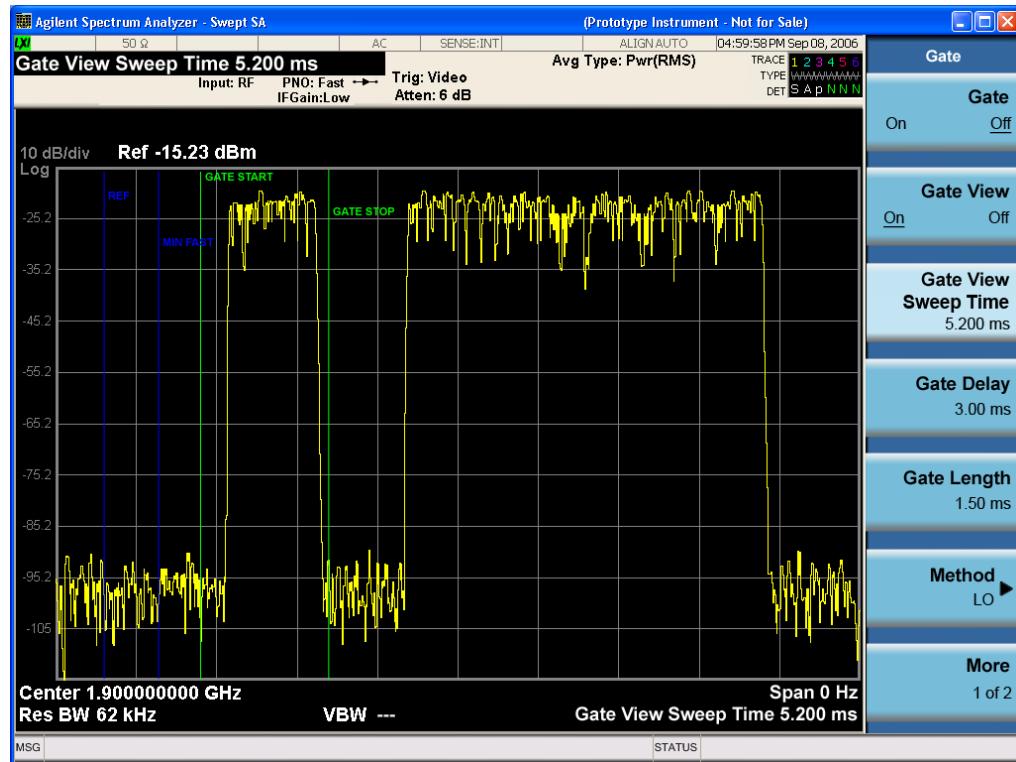
Key Path	Sweep/Control, Gate
<b>Remote Command</b>	[:SENSe]:SWEEp:EGATE:VIEW ON OFF 1 0
	[:SENSe]:SWEEp:EGATE:VIEW?

---

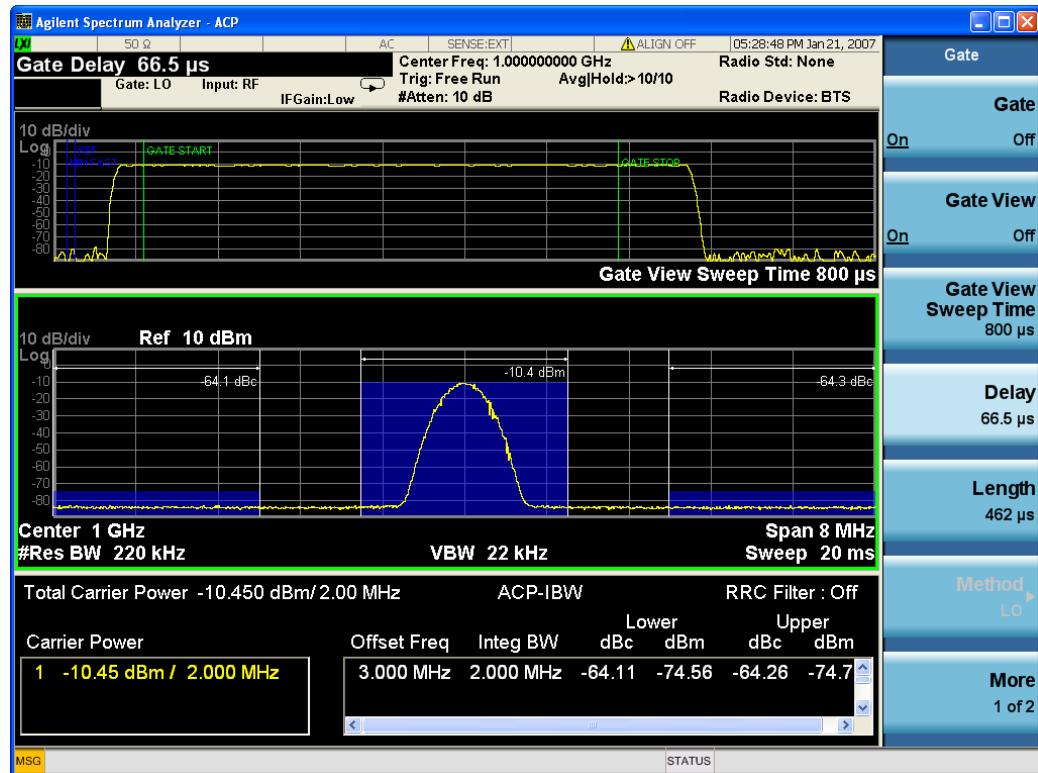
<b>Example</b>	SWE:EGAT:VIEW ON turns on the gate view.
Dependencies	<p>In the Swept SA measurement:</p> <p>In Gate View, the regular Sweep Time key is grayed out . When pressed, the grayed out key puts up the informational message "Use Gate View Sweep Time in the Gate menu."</p> <p>In the other measurements:</p> <p>When you turn Gate View on, the lower window takes on the current state of the instrument.</p> <p>Upon leaving Gate View, the instrument takes on the state of the lower window.</p> <p>When you turn Gate View on, the upper window Sweep Time is set to the gate view sweep time.</p>
Couplings	<p>These couplings apply to the Swept SA measurement:</p> <ul style="list-style-type: none"> <li>- When Gate View is turned on, the instrument is set to Zero Span.</li> <li>- Gate View automatically turns off whenever a Span other than Zero is selected.</li> <li>- 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).</li> <li>- 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 "<a href="#">Gate View Setup </a>" on page 560</li> <li>- When Gate View is turned off, Sweep Time is set to the normal Swept SA measurement sweep time.</li> <li>- If Gate View is on and Gate is off, then turning on Gate turns off Gate View.</li> </ul>
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 :

## 8 Monitor Spectrum Measurement Sweep/Control



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. 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
<b>Remote Command</b>	[ :SENSe]:SWEep:EGATE:TIME <time> [ :SENSe]:SWEep:EGATE:TIME?
<b>Example</b>	SWE:EGAT:TIME 500 ms
Dependencies	Gate View Sweep Time is initialized: <ul style="list-style-type: none"> <li>- On Preset (after initializing delay and length).</li> <li>- Every time the Gate Method is set/changed.</li> </ul> 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.
Preset	519.3 µs WiMAX OFDMA: 5 ms GSM/EDGE: 1 ms
State Saved	Saved in instrument state
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.

<b>Key Path</b>	Sweep/Control, Gate, Gate View Setup
<b>Remote Command</b>	[ :SENSe]:SWEEp:EGATe:VIEW:STARt <time> [ :SENSe]:SWEEp:EGATe:VIEW:STARt?
<b>Example</b>	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.

<b>Key Path</b>	Sweep/Control, Gate
<b>Remote Command</b>	[ :SENSe]:SWEEp:EGATe:DELay <time> [ :SENSe]:SWEEp:EGATe:DELay?
<b>Example</b>	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 WLAN: 500 us
State Saved	Saved in instrument state
Min	0.0 us
Max	100 s
<b>Backwards Compatibility SCPI</b>	[ :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.

<b>Key Path</b>	Sweep/Control, Gate
<b>Remote Command</b>	[ :SENSe]:SWEEp:EGATe:LENGth <time> [ :SENSe]:SWEEp:EGATe:LENGth?

<b>Example</b>	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.   The key is also grayed out if Gate Control = Level.
Preset	461.6 us WiMAX OFDMA: 50 us GSM/EDGE: 200 us WLAN: 1.54 ms
State Saved	Saved in instrument state
Min	100 ns
Max	5 s
<b>Backwards Compatibility SCPI</b>	[:SENSe]:SWEEp:TIME:GATE:LENGth ESA compatibility
Initial S/W Revision	Prior to A.02.00

### Gate Source

The menus under the **Gate Source** key are the same as those under the **Trigger key**, with the exception that neither **Free Run** nor **Video** are available as Gate Source selections. However, a different SCPI command is used to select the Gate Source (see table below) because you may independently set the Gate Source and the Trigger Source.

Any changes to the settings in the setup menus under each Gate Source selection key (for example: Trigger Level, Trigger Delay, etc.) also affect the corresponding settings under the Trigger menu keys. The SCPI commands used for these are the same for Trigger and Gate, since there is only one setting which affects both Gate and Trigger. Example: to set the Trigger Level for External 1 you use the command :TRIG:EXT1:LEV regardless of whether you are using External 1 as a Trigger Source or a Gate Source.

Key Path	Sweep/Control, Gate
<b>Remote Command</b>	[:SENSe]:SWEEp:EGATe:SOURce EXternal1   EXternal2   LINE   FRAME   RFburst   TV   PXI [: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. PXI trigger is only supported in PXI (modular) instruments.

Preset	EXTernal 1 GSM/EDGE, MSR: FRAMe LTETDD: EXTernal 1 When Direction is Downlink, FRAMe when Direction is Uplink.
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, A.14.00

### 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	<b>Trigger</b>
<b>Example</b>	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	<b>Trigger, Line</b>
<b>Remote Command</b>	:TRIGger[:SEQUence]:LINE:SLOPe POSitive NEGative :TRIGger[:SEQUence]:LINE:SLOPe?
<b>Example</b>	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
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal1:LEVel <level> :TRIGger[:SEQUence]:EXTernal1:LEVel?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:EXTernal:LEVel For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	: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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal1:SLOPe POSitive NEGative :TRIGger[:SEQUence]:EXTernal1:SLOPe?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:EXTernal:SLOPe For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	: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
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal2:LEVel :TRIGger[:SEQUence]:EXTernal2:LEVel?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal2:SLOPe POSITIVE NEGATIVE :TRIGger[:SEQUence]:EXTernal2:SLOPe?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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
<b>Example</b>	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]:RBurst: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
<b>Remote Command</b>	:TRIGger[:SEQUence]:RBurst:LEVel:ABSolute <ampl> :TRIGger[:SEQUence]:RBurst:LEVel:ABSolute?
<b>Example</b>	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]:RBurst:LEVel:TYPE command, below. Amplitude Corrections are not taken into account by the Absolute Trigger Level. For example, if

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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
<b>Backwards Compatibility SCPI</b>	<b>:TRIGger[:SEQUence]:FRAMe:RFBurst:LEVel:ABSolute</b>
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

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Key Path	Trigger, RF Burst
<b>Remote Command</b>	<b>:TRIGger[:SEQUence]:RFBurst:LEVel:TYPE ABSolute RELative :TRIGger[:SEQUence]:RFBurst:LEVel:TYPE?</b>
<b>Example</b>	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:

5. 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.

6. 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:
7. absolute RF Burst level = peak level of the previous acquisition + relative RF Burst level
8. 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.

<b>Key Path</b>	Trigger, RF Burst
Scope	Meas Global
<b>Remote Command</b>	:TRIGger[:SEQUence]:RFBurst:LEVel:RELative <rel_ampl> :TRIGger[:SEQUence]:RFBurst:LEVel:RELative?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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.

<b>Key Path</b>	Trigger, RF Burst
<b>Remote Command</b>	:TRIGger[:SEQUence]:RFBurst:SLOPe POSitive NEGative :TRIGger[:SEQUence]:RFBurst:SLOPe?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	: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.

<b>Key Path</b>	Trigger
<b>Example</b>	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**.

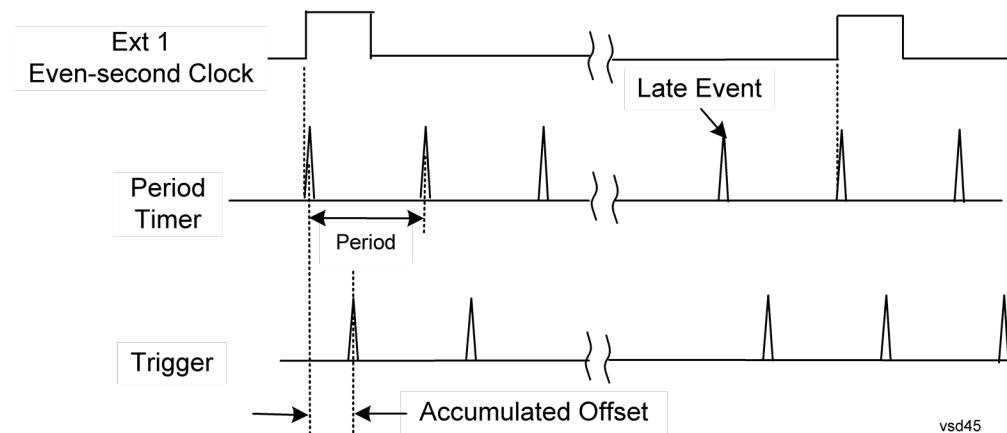
The figure below shows the action of the periodic timer trigger. Before reviewing the figure, we'll explain some uses for the periodic trigger.

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 miss-trigger. Miss-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
<b>Remote Command</b>	:TRIGger[:SEQUence]:FRAMe:PERiod <time> :TRIGger[:SEQUence]:FRAMe:PERiod?
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:FRAMe:OFFSet <time>

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	<b>:TRIGger[:SEQUence]:FRAMe:OFFSet?</b>
<b>Example</b>	TRIG:FRAM:OFFS 1.2 ms
Notes	<p>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).</p> <p>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 "<a href="#">"Trig Delay" on page 421</a>.</p> <p>An increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.</p>
Notes	<p>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.</p> <p>The SCPI query simply returns the value currently showing on the key.</p>
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

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### 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.

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<b>Remote Command</b>	<b>:TRIGger[:SEQUence]:FRAMe:ADJJust &lt;time&gt;</b>
<b>Example</b>	TRIG:FRAM:ADJ 1.2 ms
Notes	<p>Note also that Offset is used only when the sync source is set to OFF, otherwise delay is used, see section "<a href="#">"Trig Delay" on page 421</a>.</p> <p>An increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.</p>
Notes	The front panel interface (for example, the knob) and the :TRIG:FRAM:OFFS command adjust the

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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
<b>Remote Command</b>	:TRIGger[:SEQUence]:FRAMe:OFFSet:DISPlay:RESet
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:FRAMe:SYNC EXTERNAL1   EXTERNAL2   RFBurst   PXI   OFF :TRIGger[:SEQUence]:FRAMe:SYNC?

<b>Example</b>	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.  PXI trigger is only supported in PXI (modular) instruments.
Preset	Off  GSM/EDGE, MSR,LTE,LTETDD: 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 <b>Periodic Timer</b> trigger key.
<b>Backwards Compatibility SCPI</b>	: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, A.14.00

**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
<b>Example</b>	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
<b>Example</b>	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

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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
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### Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

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Key Path	Trigger, External 1
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal1:LEVel <level> :TRIGger[:SEQUence]:EXTernal1:LEVel?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:EXTernal:LEVel
	For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:FRAMe:EXTernal1:LEVel
Initial S/W Revision	Prior to A.02.00

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### Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

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Key Path	Trigger, External 1
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal1:SLOPe POSitive NEGative :TRIGger[:SEQUence]:EXTernal1:SLOPe?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:EXTernal:SLOPe
	For backward compatibility, the parameter EXTernal is mapped to EXTernal1

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<b>Backwards Compatibility SCPI</b>	: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
<b>Example</b>	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
<b>Remote Command</b>	:TRIGger[:SEQUence]:EXTernal2:LEVel :TRIGger[:SEQUence]:EXTernal2:LEVel?
<b>Example</b>	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
<b>Backwards Compatibility SCPI</b>	<code>:TRIGger[:SEQUence]:FRAMe:EXTernal2:LEVel</code>
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
<b>Remote Command</b>	<code>:TRIGger[:SEQUence]:EXTernal2:SLOPe POSitive NEGative</code> <code>:TRIGger[:SEQUence]:EXTernal2:SLOPe?</code>
<b>Example</b>	<code>TRIG:EXT2:SLOP NEG</code>
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
<b>Backwards Compatibility SCPI</b>	<code>:TRIGger[:SEQUence]:FRAMe:EXTernal2:SLOPe</code>
Backwards Compatibility Notes	The legacy <code>:TRIGger[:SEQUence]:SLOPe</code> 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
<b>Example</b>	<code>TRIG:SOUR RFB Swept SA measurement</code> <code>TRIG:&lt;meas&gt;:SOUR RFB Measurements other than Swept SA</code>
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: <code>:TRIGger[:SEQUence]:RBurst:FSELectivity[:STATe] OFF ON 0 1</code> 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
<b>Remote Command</b>	<code>:TRIGger[:SEQUence]:RBurst:LEVel:ABSolute &lt;ampl&gt;</code> <code>:TRIGger[:SEQUence]:RBurst:LEVel:ABSolute?</code>
<b>Example</b>	<code>TRIG:RFB:LEV:ABS 10 dBm</code> sets the trigger level of the RF burst envelope signal to the absolute level of 10 dBm
Notes	<p>Sending this command does not switch the setting from relative to absolute; to switch it you need to send the <code>:TRIGger[:SEQUence]:RBurst:LEVel:TYPE</code> command, below.</p> <p>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.</p> <p>If mode is Bluetooth, the default value is -50 dBm.</p>
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
<b>Backwards</b>	<code>:TRIGger[:SEQUence]:FRAMe:RBurst:LEVel:ABSolute</code>

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### Compatibility SCPI

Initial S/W Revision	Prior to A.02.00
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Modified at S/W Revision	A.04.00
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Key Path	Trigger, RF Burst
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<b>Remote Command</b>	:TRIGger[:SEQUence]:RFBurst:LEVel:TYPE ABSolute RELative :TRIGger[:SEQUence]:RFBurst:LEVel:TYPE?
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<b>Example</b>	TRIG:RFB:LEV:TYPE REL sets the trigger level type of the RF burst trigger to Relative.
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Preset	ABSolute
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State Saved	Saved in instrument state
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Initial S/W Revision	Prior to A.02.00
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Modified at S/W Revision	A.04.00
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### Trigger Slope

It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

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Key Path	Trigger, RF Burst
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<b>Remote Command</b>	:TRIGger[:SEQUence]:RFBurst:SLOPe POSitive NEGative :TRIGger[:SEQUence]:RFBurst:SLOPe?
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<b>Example</b>	TRIG:RFB:SLOP NEG
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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).
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Preset	POSitive
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State Saved	Saved in instrument state
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<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:FRAMe:RFBurst:SLOPe
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Backwards Compatibility Notes	The legacy :TRIGger[:SEQUence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
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Initial S/W Revision	Prior to A.02.00
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### Sync Holdoff

Sync Holdoff specifies the duration that the sync source signal must be kept false before the transition to true to be recognized as the sync timing. The periodic timer phase is aligned when the sync source signal becomes true, after the Holdoff time is satisfied.

A holdoff of 2 ms will work with most WiMAX signals, but there may be cases where the burst off duration is less than 1 ms and this value will need to be changed.

Key Path	Trigger, Periodic Timer
<b>Remote Command</b>	<pre>:TRIGger[:SEQUence]:FRAMe:SYNC:HOLDoff &lt;time&gt; :TRIGger[:SEQUence]:FRAMe:SYNC:HOLDoff? :TRIGger[:SEQUence]:FRAMe:SYNC:HOLDoff:STATe OFF ON 0 1 :TRIGger[:SEQUence]:FRAMe:SYNC:HOLDoff:STATe?</pre>
Preset	On, 1.000 ms
State Saved	Saved in instrument state
Min	0 ms
Max	+500 ms
Default Unit	s
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.

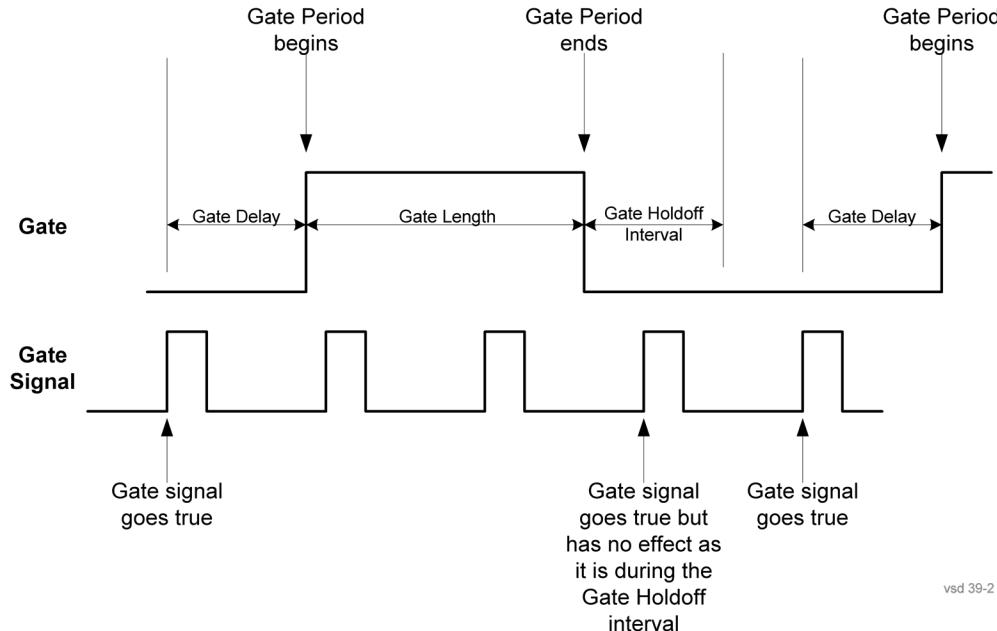
Key Path	Sweep/Control, Gate
<b>Remote Command</b>	<pre>[SENSe]:SWEEp:EGATe:CONTrol EDGE LEVel [SENSe]:SWEEp:EGATe:CONTrol?</pre>
<b>Example</b>	SWE:EGAT:CONT EDGE
Dependencies	If the Gate Method is FFT the Control key is grayed out and Edge is selected. If the Gate Source is TV, Frame or Line, the Control key is grayed out and Edge is selected.
Preset	EDGE
State Saved	Saved in instrument state
<b>Backwards Compatibility SCPI</b>	[: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	<pre>[ :SENSe]:SWEEp:EGATE:HOLDoff &lt;time&gt; [ :SENSe]:SWEEp:EGATE:HOLDoff? [ :SENSe]:SWEEp:EGATE:HOLDoff:AUTO OFF ON 0 1 [ :SENSe]:SWEEp:EGATE:HOLDoff:AUTO?</pre>
Example	<pre>SWE:EGAT:HOLD 0.0002 SWE:EGAT:HOLD? SWE:EGAT:HOLD:AUTO ON SWE:EGAT:HOLD:AUTO?</pre>
Couplings	<p>When <b>Gate Holdoff</b> is <b>Auto</b>, the <b>Gate Holdoff</b> key shows the value calculated by the analyzer for the wait time.</p> <p>Pressing the <b>Gate Holdoff</b> key while it is in <b>Auto</b> 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 <b>Man</b>.</p> <p>Pressing the <b>Gate Holdoff</b> key, while it is in <b>Auto</b> and selected, does not change the value of <b>Gate Holdoff</b>, but causes the setting to change to <b>Man</b>. Now the user can adjust the value.</p> <p>Pressing the key while it is in <b>Man</b> and selected, cause the value to change back to <b>Auto</b>.</p>

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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

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### Gate Delay Compensation

This function allows you to select an RBW-dependent value by which to adjust the gate delay, to compensate for changes in the delay caused by RBW effects.

You can select between uncompensated operation and two types of compensation, **Delay Until RBW Settled** and **Compensate for RBW Group Delay**.

See "[More Information](#)" on page 584

Key Path	Sweep/Control, Gate
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe ] :SWEep:EGATe:DELy:COMPensation:TYPE OFF   SETTled   GDELy</code> <code>[ :SENSe ] :SWEep:EGATe:DELy:COMPensation:TYPE?</code>
<b>Example</b>	<code>SWE:EGAT:DEL:COMP:TYPE SETT</code> <code>SWE:EGAT:DEL:COMP:TYPE?</code>
Notes	<p>Although this function is Meas Global, there are some measurements that do not support this function. In those measurements the operation will be Uncompensated. Going into one of those measurements will not change the Meas Global selection; it will simply display the grayed-out menu key with "Uncompensated" showing as the selection. This is a non-forceful grayout, so the SCPI command is still accepted.</p> <p>If Gate Delay Compensation is not supported at all within a particular mode, the key is not displayed, and if the SCPI command is sent while in a measurement within that mode, an "Undefined Header" message is generated.</p> <p>Measurements that do not support this function include:</p> <ul style="list-style-type: none"> <li>Swept SA</li> </ul>
Preset	<p>TD-SCDMA mode: Compensate for RBW Group Delay</p> <p>All other modes: Delay Until RBW Settled</p>
State Saved	Saved in instrument state
Range	Uncompensated Delay Until RBW Settled Compensate for RBW Group Delay
Readback text	Uncompensated Settled Group Delay
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.11.0

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## More Information

Selecting **Uncompensated** means that the actual gate delay is as you sets it.

Selecting **Delay Until RBW Settled** causes the gate delay to be increased above the user setting by an amount equal to  $3.06/\text{RBW}$ . This compensated delay causes the GATE START and GATE STOP lines on the display to move by the compensation amount, and the actual hardware gate delay to be increased by the same amount. All the other gate lines (for example, MIN FAST) are unaffected. If the RBW subsequently changes, the compensation is readjusted for the new RBW. The value shown on the **Gate Delay** key does NOT change.

**Delay Until RBW Settled** allows excellent measurements of gated signals, by allowing the IF to settle following any transient that affects the burst. Excellent measurements also require that the analysis region not extend into the region affected by the falling edge of the burst. Thus, excellent measurements can only be made over a width that declines with narrowing RBWs, which is achieved by decreasing the gate length below the user setting by an amount equal to  $2.53/\text{RBW}$ . Therefore, for general purpose compensation, you will still want to change the gate length with changes in RBW even if the gate delay is compensated. The compensated Gate Length is limited by the analyzer so that it will never go below 10% of the value shown on the Gate Length key, as otherwise the sweep times could get very long. Anytime the **Gate Length** and **RBW** values combine in such a way that this limiting takes place, a warning is displayed. For measurements which contain multiple sweeps with different RBW like SEM and SPUR, the smallest RBW is used for this limiting.

Selecting **Compensate for RBW Group Delay** causes the gate delay to be increased above the user setting by an amount equal to  $1.81/\text{RBW}$ . This compensated delay causes the GATE START, GATE STOP lines on the display to move by the compensation amount, and the actual hardware gate delay to be increased by the same amount. All the other gate lines (for example, MIN FAST) are unaffected. If the RBW subsequently changes, the compensation is readjusted for the new RBW. The value shown on the **Gate Delay** key does NOT change. **Compensate for RBW Group Delay** also includes gate length compensation; the gate length itself is adjusted as necessary to attempt to compensate for delay effects imposed by the RBW.

**Compensate for RBW Group Delay** is similar to **Delay Until RBW Settled**, but compensates for the group delay of the RBW filter, rather than the filter settling time. As the RBW gets narrow, this can allow the settling tail of the RBW to affect the beginning part of the gated measurement, and allow the beginning of the RBW settling transient to affect the end of the gated measurement. These two effects are symmetric because the RBW response is symmetric. Because the gate length is not automatically compensated, some users might find this compensation to be more intuitive than compensation for RBW settling.

### 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 556](#)". 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.

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**Remote Command** [:SENSe]:SWEEp:EGATe:MINFast?

**Example** SWE:EGAT:MIN?

Initial S/W Revision Prior to A.02.00

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### 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

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### 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

Initial S/W Revision Prior to A.02.00

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### 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
<b>Backwards Compatibility SCPI</b>	[SENSe]:SWEEp:TIME:GATE:POLarity ESA compatibility
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	[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 per sweep. The resolution of setting the sweep time depends on the number of points selected. If **Preset** is selected, the number of points per sweep defaults to 1001. The current value of points is displayed parenthetically, next to the sweep time in the lower right corner of the display.

Key Path	<b>Sweep/Control</b>
Mode	All except SA and BASIC
<b>Remote Command</b>	[SENSe]:MONitor:SWEEp:POINts <integer> [SENSe]:MONitor:SWEEp:POINts?
<b>Example</b>	:MON:SWE:POIN 1000 :MON:SWE:POIN?
Couplings	Whenever the number of sweep points changes, the sweep time is re-quantized.
Preset	1001
State Saved	Saved in instrument state.
Range	1 to 20001
Min	1
Max	20001
Initial S/W Revision	Prior to A.02.00

## System

See "System" on page 293

## Trace/Detector

Accesses a menu that enables you to control the display, storage, detection and manipulation of trace data. Each trace is comprised of a series of data points in which X and Y axis information is stored. The analyzer updates the information for the active trace with each sweep of the current measurement.

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

### Select Trace

Allows you to select which trace you want to use for the current measurement. You can select one of three traces. Monitor Spectrum supports 3 traces, numbered 1 through 3.

Key Path	Trace/Detector
Mode	All except SA and BASIC
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

### Trace Type

Allows you to select the type of trace you want to use for the current measurement. You can assign a trace type to one of the three available traces.

The first page of this menu contains a 1–of–N selection of the trace type for the selected trace:

WRITe	Clear Write
AVERage	Average
MAXHold	Max Hold
MINHold	Min Hold

Key Path	Trace/Detector
Mode	All except SA and BASIC
<b>Remote Command</b>	:TRACe[1] 2 3:MONitor:TYPE WRITe AVERage MAXHold MINHold :TRACe[1] 2 3:MONitor:TYPE?
<b>Example</b>	TRAC:MON:TYPE WRITe TRAC:MON:TYPE?
Preset	WRITe
State Saved	Saved in instrument state.

---

Range	WRITe AVERage MAXHold MINHold for traces 1 through 3
<b>Backwards Compatibility SCPI</b>	<b>:DISPLAY:MONITOR:VIEW:WINDOW:TRACe[1] 2 3:TYPE</b>
Initial S/W Revision	Prior to A.02.00

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## Update

Toggles a trace state between Update and Off. The Off selection makes the trace inactive (or a *stored trace*). This does not affect whether the trace is visible or not. To change the trace visibility, see "["Display" on page 589](#)".

---

Key Path	Trace/Detector
Mode	All except SA and BASIC
<b>Remote Command</b>	<b>:TRACe[1] 2 3:MONitor:UPDAtE[:STATe] ON OFF 0 1</b> <b>:TRACe[1] 2 3:MONitor:UPDAtE[:STATe]?</b>
<b>Example</b>	TRAC3:MON:UPD OFF TRAC3:MON:UPD?
Preset	ON
State Saved	Saved in instrument state.
Range	On Off(View)
Initial S/W Revision	Prior to A.02.00

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## Display

Controls the visibility of a trace. When set to **Blank**, traces do not display nor appear on printouts but are otherwise unaffected. They may be queried and markers may be placed on them.

---

Key Path	Trace/Detector
Mode	All except SA and BASIC
<b>Remote Command</b>	<b>:TRACe[1] 2 3:MONitor:DISPlay[:STATe] ON OFF 0 1</b> <b>:TRACe[1] 2 3:MONitor:DISPlay[:STATe]?</b>
<b>Example</b>	TRAC:MON:DISP ON TRAC:MON:DISP?
Preset	ON OFF OFF
State Saved	Saved in instrument state.
Range	Show Blank
Initial S/W Revision	Prior to A.02.00

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## Detector

Accesses a menu of functions that enable you to control the detectors for the current measurement. The following choices are available:

- **Auto** – the detector selected depends on marker functions, trace functions, average type, and the trace averaging function. See "["Auto" on page 591](#)".
- **Normal** – the detector determines the peak of the CW-like signals, and it yields alternating maximums and minimums of noise-like signals. This is also referred to as Rosenfell detection.
- **Average** – the detector determines the average of the signal within the sweep points. The averaging method depends upon the Average Type selection (voltage, power or log scales).
- **Peak** – the detector determines the maximum of the signal within the sweep points.
- **Sample** – the detector indicates the instantaneous level of the signal at the center of the sweep points represented by each display point.
- **Negative Peak** – the detector determines the minimum of the signal within the sweep points.

In swept analysis, the time interval of the data collection for the display sweep points also represents a frequency interval. In FFT analysis, the sweep points represent just a frequency interval. The detector determines the relationship between the spectrum computed by the FFT and the single data point displayed for the sweep points.

Key Path	Trace/Detector
Mode	All except SA and BASIC
<b>Remote Command</b>	<code>[ :SENSe]:MONitor:DETector:TRACe AVERage   NEGative   NORMAl   POSitive   SAMPLE</code> <code>[ :SENSe]:MONitor:DETector:TRACe?</code>
<b>Example</b>	MON:DET:TRAC NORM MON:DET:TRAC?
Notes	The query returns a name that corresponds to the detector type as shown below. String Returned - Definition <ul style="list-style-type: none"> <li>– NORM - Normal</li> <li>– AVER - Average</li> <li>– POS - Peak</li> <li>– SAMP - Sample</li> <li>– NEG – Negative Peak</li> </ul>
Couplings	When the Detector choice is <b>Auto</b> , the detector selected depends on average type.
Preset	NORMAl

State Saved	Saved in instrument state.
Range	Normal Average(RMS) Peak Sample Negative Peak
<b>Backwards Compatibility SCPI</b>	<code>[ :SENSe]:MONitor:DETector[:FUNCTION]</code>
Initial S/W Revision	Prior to A.02.00

### Auto

Sets the detector for the currently selected trace to **Auto**. When the detector choice is **Auto**, the analyzer selects the detector. The selected detector depends on marker functions, trace functions, and trace averaging functions for the current measurement.

Key Path	Trace/DetectorTrace/Detector, Detector
Mode	All except SA and BASIC
<b>Remote Command</b>	<code>[ :SENSe]:MONitor:DETector:AUTO ON OFF 1 0</code> <code>[ :SENSe]:MONitor:DETector:AUTO?</code>
<b>Example</b>	MON:DET:AUTO OFF MON:DET:AUTO?
Couplings	When the Detector choice is Auto, the detector selected depends on average state and trace type.
Preset	ON
State Saved	Saved in instrument state.
Range	Auto Man
Initial S/W Revision	Prior to A.02.00

### Clear Trace

Clears the selected trace from the display.

Key Path	Trace/Detector
Mode	All except SA and BASIC
<b>Remote Command</b>	<code>:TRACe:MONitor:CLEar [TRACE1] TRACE2 TRACE3</code>
<b>Example</b>	TRAC:MON:CLE
Initial S/W Revision	Prior to A.02.00

Mode	All except SA and BASIC
<b>Remote Command</b>	<code>:DISPlay:MONitor:VIEW:WINDOW:TRACe[1] 2 3:CLEar</code>
<b>Example</b>	DISP:MON:VIEW:WIND:TRAC:CLE
Initial S/W Revision	Prior to A.02.00

## Clear All Traces

Clears all traces from the display.

Key Path	Trace/Detector
Mode	All except SA and BASIC
<b>Remote Command</b>	:TRACe:MONitor:CLEar:ALL
<b>Example</b>	TRAC:MON:CLEAR:ALL
<b>Backwards Compatibility SCPI</b>	:DISPlay:MONitor:VIEW:WINDOW:TRACe:CLEar:ALL
Initial S/W Revision	Prior to A.02.00

## Trigger

See "Trigger" on page 385

### Free Run

See "Free Run" on page 393

### Video

See "Video (IF Envelope)" on page 394

### Trigger Level

See "Trigger Level" on page 394

### Trig Slope

See "Trig Slope" on page 395

### Trig Delay

See "Trig Delay" on page 396

### X Axis Relative to Trigger

See "X Axis Relative to Trigger" on page 421

### Line

See "Line" on page 563

### Trig Slope

See "Trig Slope" on page 563

### Trig Delay

See "Trig Delay" on page 399

### X Axis Relative to Trigger

See "X Axis Relative to Trigger" on page 421

### External 1

See "External 1" on page 575

### Trigger Level

See "Trigger Level" on page 576

### Trig Slope

See "Trig Slope" on page 576

**Trig Delay**

See "Trig Delay" on page 402

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**External 2**

See "External 2" on page 577

**Trigger Level**

See "Trigger Level" on page 577

**Trig Slope**

See "Trig Slope" on page 578

**Trig Delay**

See "Trig Delay" on page 404

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**RF Burst**

See "RF Burst" on page 578

**Absolute Trigger**

See "Absolute Trigger Level" on page 579

**Relative Trigger**

See "Relative Trigger Level" on page 568

**Trig Slope**

See "Trigger Slope" on page 580

**Trig Delay**

See "Trig Delay" on page 409

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Periodic Timer**

See "Periodic Timer (Frame Trigger)" on page 570

**Period**

See "Period" on page 572

**Offset**

See "Offset" on page 572

**Offset Adjust (Remote Command Only)**

See "Offset Adjust (Remote Command Only)" on page 573

**Reset Offset Display**

See "Reset Offset Display" on page 574

**Sync Source**

See "Sync Source" on page 574

**Off**

See "Off" on page 575

**External 1**

See "External 1" on page 575

**Trigger Level**

See "Trigger Level" on page 576

**Trig Slope**

See "Trig Slope" on page 576

**External 2**

See "External 2" on page 577

**Trigger Level**

See "Trigger Level" on page 577

**Trig Slope**

See "Trig Slope" on page 578

**RF Burst**

See "RF Burst" on page 578

**Absolute Trigger**

See "Absolute Trigger Level" on page 579

**Trig Slope**

See "Trigger Slope" on page 580

**Trig Delay**

See "Trig Delay" on page 421

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Auto/Holdoff**

See "Auto/Holdoff" on page 422

**Auto Trig**

See "Auto Trig" on page 423

**Trig Holdoff**

See "Trig Holdoff" on page 423

**Holdoff Type**

See "Holdoff Type" on page 424

## 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	<p>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.</p> <p>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.</p> <p>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.</p> <p>User Preset recalls mode state which can now include data like traces; whereas on ESA and PSA, User Preset did not affect data.</p>
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
<b>Remote Command</b>	<b>:SYST:PRESet:USER</b>
<b>Example</b>	<b>:SYST:PRES:USER:SAVE:SYST:PRES:USER</b>
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
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<b>Remote Command</b>	:SYST:PRESet:USER:ALL
<b>Example</b>	: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
<b>Remote Command</b>	:SYST:PRESet:USER:SAVE
<b>Example</b>	: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

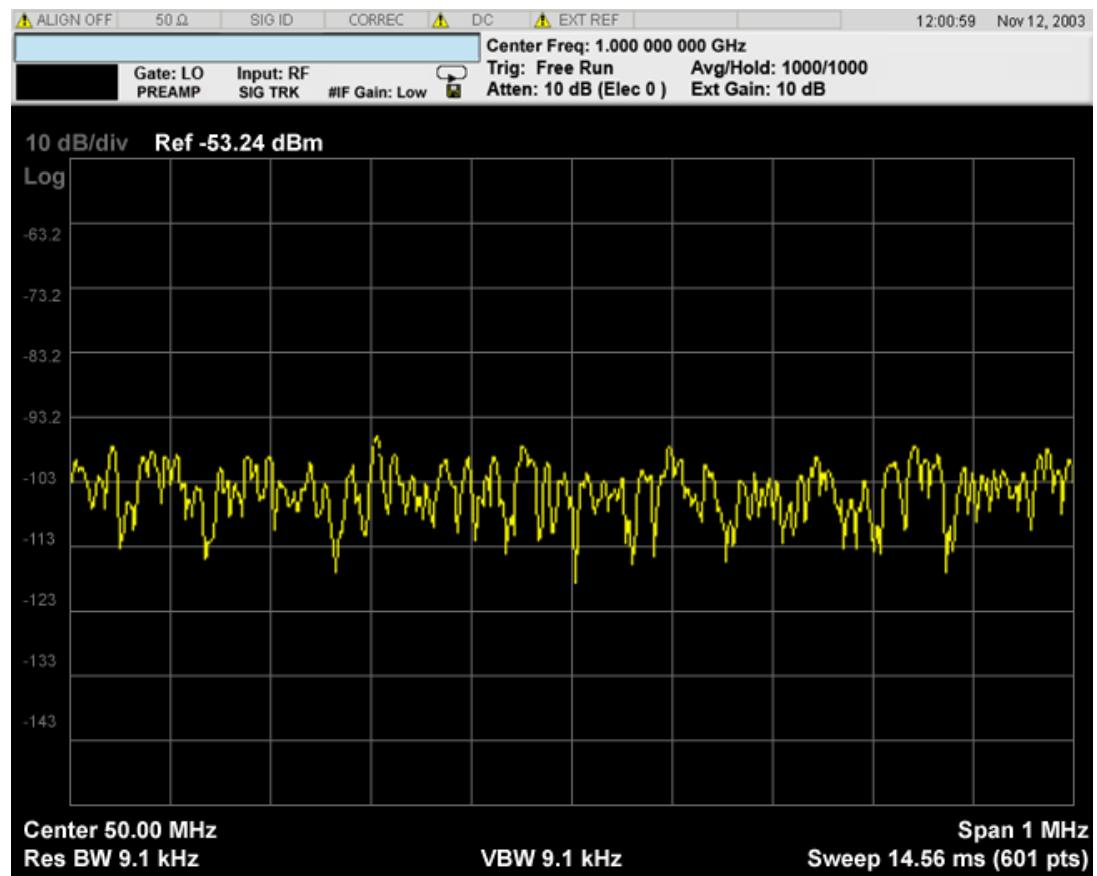
Accesses a menu of functions that enable you to control certain functions related to the display of the analyzer.

The available views and related commands depend on the currently-selected mode. This section includes the following topics:

- "View for all modes except MSR, 1xEV-DO, LTE-Advanced FDD/TDD" on page 600, LTE-Advanced FDD/TDD
- "1xEV-DO Mode View" on page 601
- "MSR and LTE-Advanced FDD/TDD Mode Views" on page 602
- "View Selection by Name (MSR and LTE-Advanced FDD/TDD mode only)" on page 603
- "View Selection by Number (MSR and LTE-Advanced FDD/TDD mode only)" on page 603

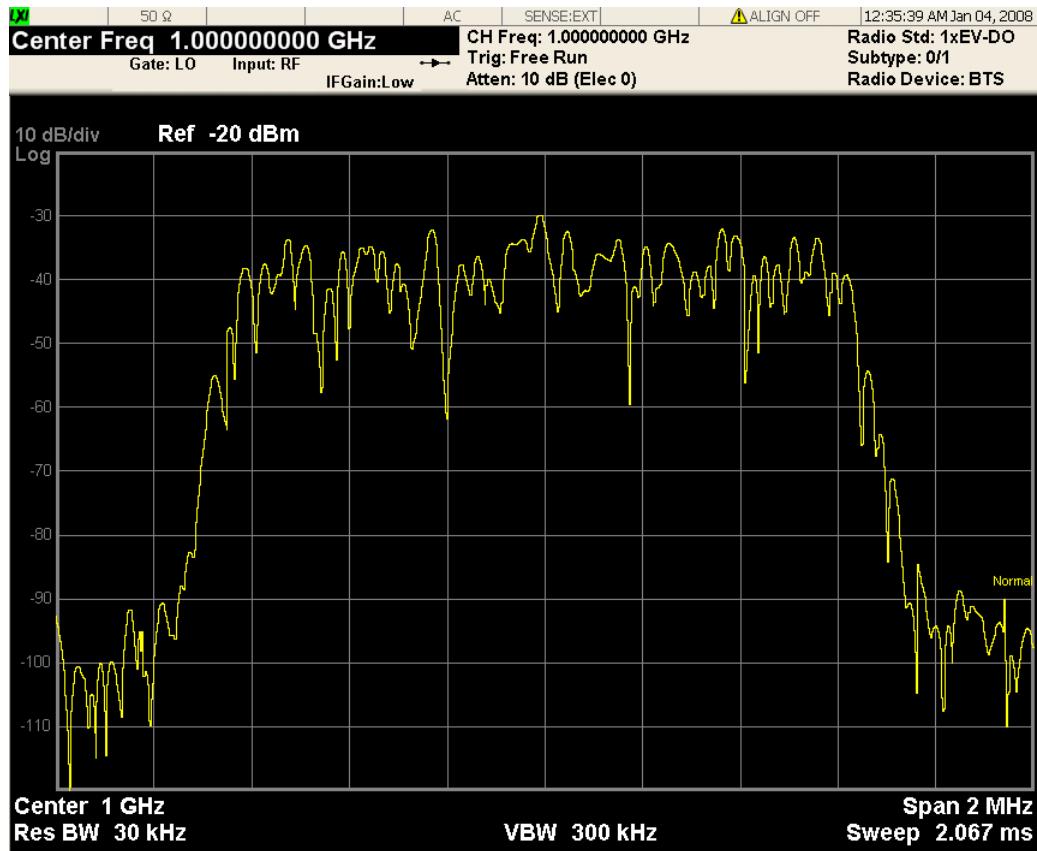
### View for all modes except MSR, 1xEV-DO, LTE-Advanced FDD/TDD

When the current mode is **not** MSR, LTE-Advanced FDD/TDD or 1xEV-DO, there is a single trace view for this measurement, as shown below:



### 1xEV-DO Mode View

When the current mode is 1xEV-DO, a single view is available, as shown in the example below:



The measurement has no results, but has a number of features that make it flexible and simple to use.

### MSR and LTE-Advanced FDD/TDD Mode Views

When the current mode is MSR and LTE-Advanced FDD/TDD, there are two views, Result Trace and Carrier Info, as described in the table below. The Result Trace view is the same as the common Monitor Spectrum view in other modes. Carrier Info is available on the spectrum trace.

<b>Result Trace</b>	The spectrum trace and power bars are displayed in the upper window. Carrier and offset powers are summarized in the lower window.  For more details, see <a href="#">Error! Reference source not found..</a>
<b>Carrier Info</b>	Carrier center frequency can be displayed in either offset or absolute frequency depending on Carrier Freq. The table can be scrolled by <b>Select Carrier</b> in the Config Carriers menu. The highlighted row changes as Select Carrier is changed. The highlighted row and Select Carrier are not coupled.  For more details, see <a href="#">Error! Reference source not found..</a>

## View Selection by Name (MSR and LTE-Advanced FDD/TDD mode only)

Key Path	Display
Mode	MSR, LTEAFDD, LTEATDD
<b>Remote Command</b>	:DISPlay:MONitor:VIEW[:SELect] RTRace CINFormation :DISPlay:MONitor:VIEW[:SELect]?
<b>Example</b>	DISP:MON:VIEW RTR DISP:MON:VIEW?
Preset	RTRace
State Saved	Saved in instrument state
Range	Power Results Carrier Info
Initial S/W Revision	A.10.00

## View Selection by Number (MSR and LTE-Advanced FDD/TDD mode only)

Key Path	DISP:MON:VIEW
Mode	MSR, LTEAFDD, LTEATDD
<b>Remote Command</b>	:DISPlay:MONitor:VIEW:NSELect <integer> :DISPlay:MONitor:VIEW:NSELect?
<b>Example</b>	DISP:MON:VIEW:NSEL 1 DISP:MON:VIEW:NSEL?
Preset	1
State Saved	Saved in instrument state
Min	1
Max	2
Initial S/W Revision	A.10.00

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

## 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.

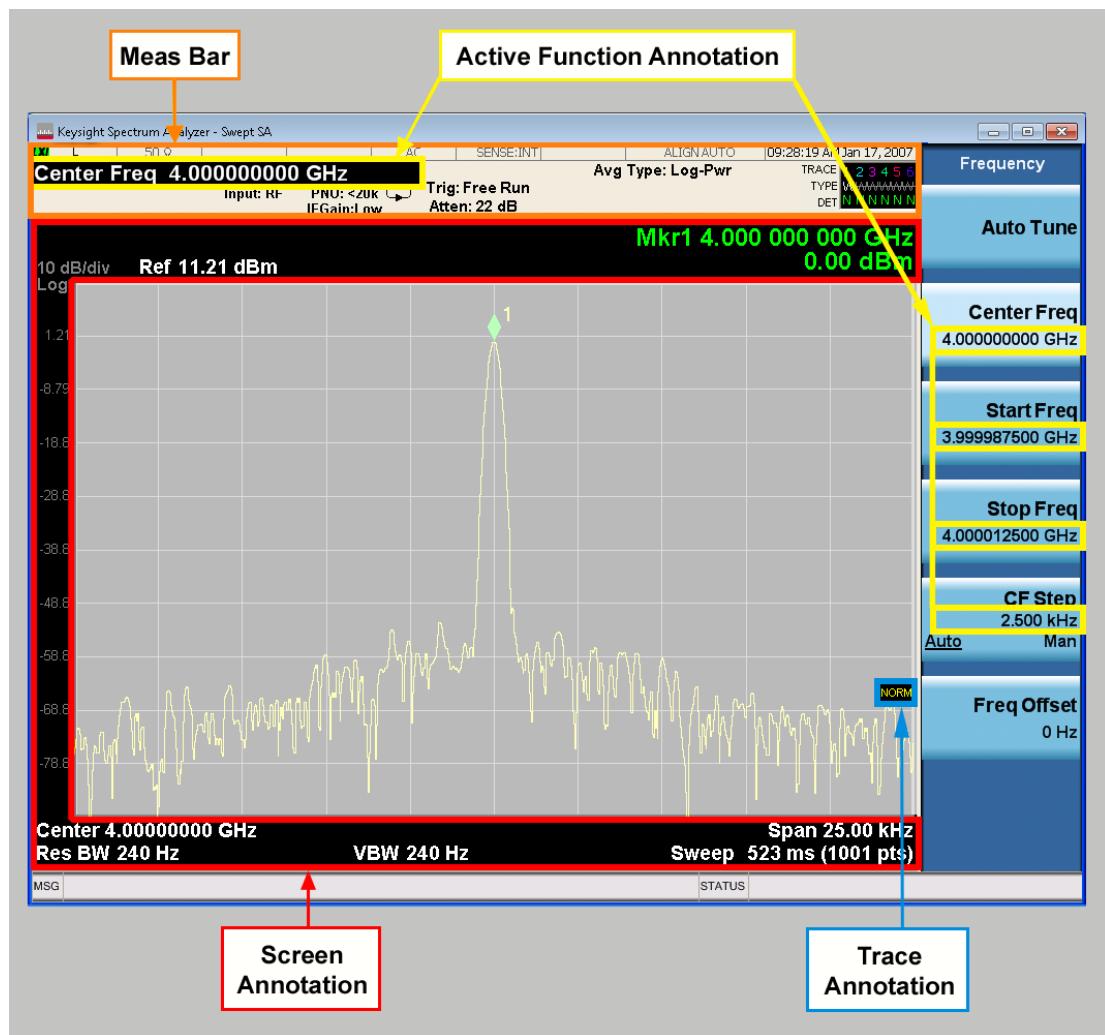
Key Path	Display
Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

### Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

13. 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.
14. 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.
15. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).
16. 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
<b>Remote Command</b>	<pre>:DISPlay:ANNotation:MBAR[:STATe] OFF ON 0 1 :DISPlay:ANNotation:MBAR[:STATe]?</pre>
<b>Example</b>	DISP:ANN:MBAR OFF
Dependencies	Grayed out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.

Preset	On
	This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> is set to Off.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Screen

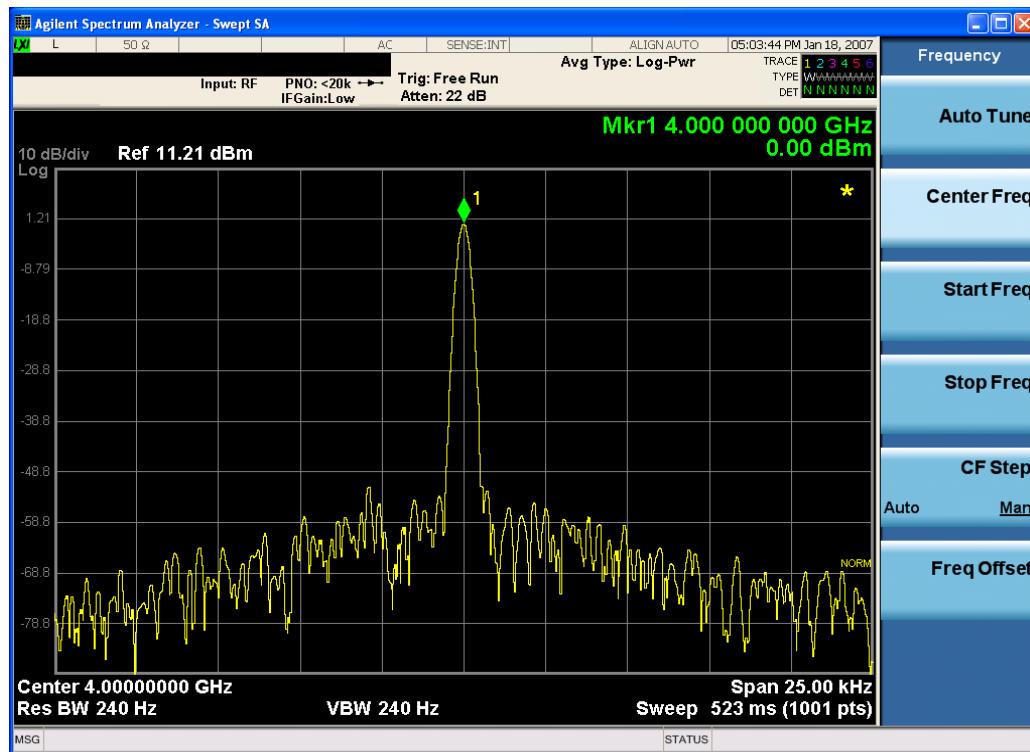
This controls the display of the annunciation and annotation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) and the y-axis annotation. This does NOT include marker annotation (or the N dB result). When off, the graticule expands to fill the 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
<b>Remote Command</b>	:DISPlay:ANNotation:SCReen[:STATe] OFF ON 0 1 :DISPlay:ANNotation:SCReen[:STATe]?
<b>Example</b>	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.
Preset	On
	This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> is set to 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
<b>Remote Command</b>	:DISPlay:ACTivefunc[:STATE] ON OFF 1 0 :DISPlay:ACTivefunc[:STATE]?
<b>Example</b>	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.
Preset	On This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> 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

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	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

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### Graticule

Pressing Graticule turns the display graticule On or Off. It also turns the graticule y-axis annotation on and off.

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Key Path	View/Display, Display
<b>Remote Command</b>	:DISPlay:WINDOW[1]:TRACe:GRATicule:GRID[:STATe] OFF ON 0 1 :DISPlay:WINDOW[1]:TRACe:GRATicule:GRID[:STATe]?
<b>Example</b>	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

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### 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.

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Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

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### 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.

<b>Key Path</b>	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:WINDOW[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDOW[1]:ANNotation[:ALL]?
<b>Example</b>	: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

## 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.

<b>Key Path</b>	Save, Screen Image
<b>Remote Command</b>	:MMEMORY:STOR:SCReen:THEMe TDCOLOR   TDMonochrome   FCOLOR   FMONochrome :MMEMORY:STOR:SCReen:THEMe?
<b>Example</b>	: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 you 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.

<b>Key Path</b>	Save, Screen Image, Themes
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Remote Command</b>	:DISPLAY:BACKlight ON OFF :DISPLAY:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
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
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

## 9 Spot Frequency Measurement

The Spot Frequency measurement continuously measures the phase noise at a single offset frequency (relative to the carrier) specified by the spot offset frequency.

**NOTE**

If a signal at the specified carrier frequency is lower than -50 dBm, an error "Err 211, Carrier(s) Incorrect or Missing" is returned.

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This section contains the following sections:

["Spot Frequency Remote Commands" on page 614](#)

["Remote Results" on page 615](#)

## Spot Frequency Remote Commands

**NOTE**

If a :FETch command is received before all 101 measurement points are completed, the results will be returned after they are completed. READ and MEASure commands restart the measurement and return values only after all 101 measurement points have been completed.

---

The following commands are used to retrieve the measurement results:

```
:CONFigure:SFREquency  
:CONFigure:SFREquency:NDEFault  
:INITiate:SFREquency  
:FETCH:SFREquency[n]?  
:READ:SFREquency[n]?  
:MEASURE:SFREquency[n]?
```

For more measurement related commands, see the SENSe subsystem, and the section "["Remote Measurement Functions"](#) on page 986.

## Remote Results

Index: n	Results Returned
Not specified or n=1	Returns six values: 1. Carrier Power (dBm) 2. Carrier Frequency (Hz) 3. Carrier Frequency Initial (Hz) 4. Carrier Frequency Delta (Hz) 5. (Upper/Right) SSB Noise (dBc/Hz) 6. Average SSB Noise (dBc/Hz)
2	Returns 101 points of the phase noise of the carrier.trace
3	Returns 101 points of carrier frequencies trace.
4	Returns 101 points of carrier powers trace.

Key Path	Meas
Initial S/W Revision	Prior to A.02.00

## AMPTD Y Scale

Accesses a menu of functions that allow you to set the vertical scale parameters.

See “Amplitude” for more information.

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

### Phase Noise Window

Allows the Y Reference value to be set for the Phase Noise graph.

Key Path	AMPTD Y Scale
Mode	PN
<b>Remote Command</b>	:DISPlay:SFRQUENCY:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVl <real> :DISPlay:SFRQUENCY:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVl?
<b>Example</b>	DISP:SFR:VIEW:WIND:TRAC:Y:RLEV 0 DISP:SFR:VIEW:WIND:TRAC:Y:RLEV?
Couplings	When Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Preset	-50
State Saved	Saved in instrument state.
Min	-200
Max	10.0
Initial S/W Revision	Prior to A.02.00

### 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.

See "Dual Attenuator Configurations:" on page 617

See "Single Attenuator Configuration:" on page 617

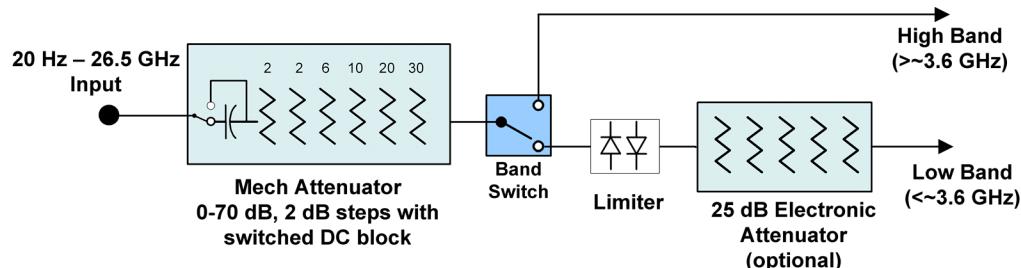
Most Attenuation settings are the same for all measurements – they do not change as you change measurements. Settings like these are called “Meas Global” and are unaffected by Meas Preset.

Key Path	AMPTD Y Scale
----------	---------------

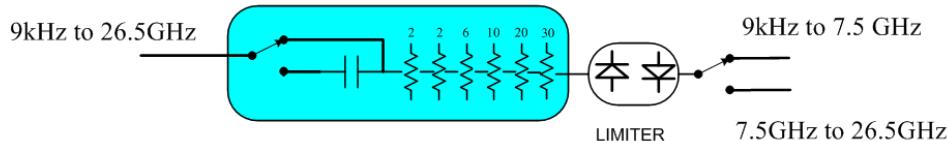
Scope	Meas Global
Dependencies	In measurements that support the I/Q inputs, this key is unavailable when I/Q is the selected input, and is replaced by the Range key in that case.
Readback Line	Contains a summary in [ ] brackets of the current total attenuation. See the descriptions of the "Mech Atten" on page 930, and "Enable Elec Atten" on page 932 keys for more detail on the contributors to the total attenuation.  Note that when "Pre-Adjust for Min Clip" 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

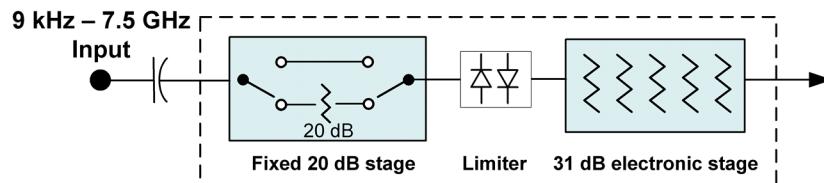


Configuration 2: Mechanical attenuator, no optional electronic attenuator



(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:



You can tell which attenuator configuration you have by pressing the Attenuation key, which (in most Modes) opens the Attenuation menu. If the first key in the Attenuation menu says **Mech Atten** you have the dual attenuator configuration. If the first key says **Atten** 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 619

Key Path	AMPTD Y Scale, Attenuation
Remote Command	<pre>[ :SENSe] :POWer[ :RF] :ATTenuation &lt;rel_ampl&gt; [ :SENSe] :POWer[ :RF] :ATTenuation? [ :SENSe] :POWer[ :RF] :ATTenuation:AUTo OFF ON 0 1 [ :SENSe] :POWer[ :RF] :ATTenuation:AUTo?</pre>
Example	<p>POW:ATT 20</p> <p>Dual attenuator configuration: sets the mechanical attenuator to 20 dB</p> <p>Single attenuator mode: sets the main attenuation to 20 dB (see below for definition of "main" attenuation).</p> <p>If the attenuator was in Auto, it sets it to Manual.</p>
Dependencies	<p>Some measurements do not support the Auto setting of <b>(Mech) Atten</b>. In these measurements, the Auto/Man selection is not available, and the Auto/Man line on the key disappears.</p> <p>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 "<a href="#">Enable Elec Atten</a>" on page 932 key description.</p>

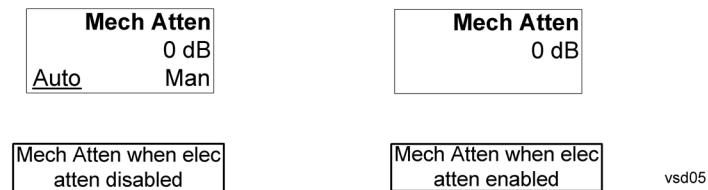
	See "Attenuator Configurations and Auto/Man" on page 619 for more information on the Auto/Man functionality of Attenuation.
Couplings	<p>When <b>(Mech) Atten</b> is in Auto, it uses the following algorithm to determine a value:</p> <p>If the USB Preamp is connected to USB, use 0 dB.</p> <p>Otherwise, <math>\text{Atten} = \text{ReferenceLevel} + \text{PreAmpGain} + \text{ExternalGain} - \text{RefLevelOffset} - \text{MaxMixerLevel} + \text{IF Gain}</math>.</p> <p>Limit this value to be between 6 dB and the Max value. No value below 6 dB can ever be chosen by Auto.</p> <p>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).</p> <p>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.</p> <p>In External Mixing and BBIQ, where the Attenuator is not in the signal path, the Attenuator setting changes as described above when <b>(Mech) Atten</b> is in Auto, but no changes are made to the actual attenuator hardware setting until the input is changed back to the RF Input.</p>
Preset	<p>The preset for Mech Attenuation is "Auto."</p> <p>The Auto value of attenuation is:</p> <p>CXA, EXA, MXA and PXA: 10 dB</p>
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	<p>CXA N9000A-503/507: 50 dB</p> <p>CXA N9000A-513/526: 70dB</p> <p>EXA: 60 dB</p> <p>MXA and PXA: 70 dB</p> <p>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.</p>
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 622 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 931

See Error! Reference source not found.

Key Path	AMPTD Y Scale, Attenuation
<b>Remote Command</b>	<pre>[ :SENSe] :POWeR[ :RF] :EATTenuation :STATe OFF ON 0 1 [ :SENSe] :POWeR[ :RF] :EATTenuation :STATe?</pre>
<b>Example</b>	POW:EATT:STAT ON
Dependencies	<p>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 "<a href="#">Attenuator Configurations and Auto/Man</a>" on page 931.</p> <p>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 &gt; 3.6 GHz then the <b>Enable Elec Atten</b> key will be OFF and grayed out.</p> <p>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 <b>Enable Elec Atten</b> key will be OFF and grayed out.</p> <p>If either of the above is true, if the SCPI command is sent, an error indicating that the electronic</p>

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	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

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### 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.

<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:EATTenuation &lt;rel_ampl&gt;</code> <code>[ :SENSe]:POWer[:RF]:EATTenuation?</code>
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 <a href="#">"Attenuator Configurations and Auto/Man" on page 931</a> . 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 <b>Enable Elec Atten</b> is off or grayed out, the <b>Elec Atten</b> 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 and gain 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 does not appear 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
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:RANGE:OPTimize IMMEDIATE</code>
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 935](#) 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
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:RANGe:OPTimize:ATTenuation OFF   ELECtrical   COMBined</code> <code>[ :SENSe]:POWer[:RF]:RANGe:OPTimize:ATTenuation?</code>
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. In instruments with Dual Attenuator model, when <b>Enable Elec Atten</b> is off or grayed out, the <b>Pre-Adjust for Min Clip</b> key is grayed out.
Preset	OFF for Swept SA measurement; ON for all other measurements that support <b>Pre-Adjust for Min Clip</b>
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

<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:RANGe:AUTO ON OFF 1 0</code> <code>[ :SENSe]:POWer[:RF]:RANGe:AUTO?</code>
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
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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 the step 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

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	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

## Phase Noise Window

Allows the Y Scale per division to be set for the Phase Noise graph.

When set to AUTO the Scale/Div is adjusted such that the trace is visible within the center 80% of the horizontal display, i.e. Scale/Div = (Max Phase Noise Trace Result – Min Phase Noise Trace Result)/8.0

Key Path	AMPTD Y Scale
Mode	PN
<b>Remote Command</b>	<code>:DISPlay:SFRequency:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:PDIVision&lt;rel_ampl&gt;</code> <code>:DISPlay:SFRequency:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:PDIVision?</code>
<b>Example</b>	<code>DISP:SFR:VIEW:WIND:TRAC:Y:PDIV 10</code> <code>DISP:SFR:VIEW:WIND:TRAC:Y:PDIV?</code>
Couplings	When Auto Scale is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scale automatically changes to Off.
Preset	10.0
State Saved	Saved in instrument state.
Min	0.1 dB
Max	20 dB
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 627.

Key Path	AMPTD Y Scale
<b>Remote Command</b>	[ :SENSe ] :POWer [ :RF ] :PCENter
<b>Example</b>	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	<ul style="list-style-type: none"> <li>- Grayed out if the microwave preselector is off. )</li> <li>- If the selected marker's frequency is below Band 1, advisory message 0.5001 is generated and no action is taken.</li> <li>- Grayed out if entirely in Band 0.</li> <li>- 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.</li> <li>- Grayed out in the Spectrogram View.</li> </ul>
Couplings	<p>The active marker position determines where the centering will be attempted.</p> <p>If the analyzer is 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.</p>
Status Bits/OPC dependencies	<p>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.</p> <p>The Measuring bit should remain set while this command is operating and should not go false until the subsequent sweep/measurement has completed.</p>
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:

3. 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.

4. 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
5. 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 944 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	<b>AMPTD Y Scale</b>
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe] :POWer[ :RF] :PADJust &lt;freq&gt;</code> <code>[ :SENSe] :POWer[ :RF] :PADJust?</code>
<b>Example</b>	POW:PADJ 100KHz POW:PADJ?
Notes	The value on the key reads out to 0.1 MHz resolution.
Dependencies	<ul style="list-style-type: none"> <li>- Grayed out if microwave preselector is off.</li> <li>- Grayed out if entirely in Band 0.</li> <li>- 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.</li> <li>- Grayed out in the Spectrogram View.</li> </ul>
Preset	0 MHz
State Saved	The <b>Presel Adjust</b> value set by <b>Presel Center</b> , or by manually adjusting <b>Presel Adjust</b> , is not saved in instrument state, and does not survive a Preset or power cycle.
Min	-500 MHz
Max	500 MHz
Default Unit	Hz
<b>Backwards Compatibility SCPI</b>	<code>[ :SENSe] :POWer[ :RF] :MW:PADJust</code> <code>[ :SENSe] :POWer[ :RF] :MMW:PADJust</code>

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	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

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<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:PADJust:PRESelector MWAVE   MMWave   EXTerinal</code> <code>[ :SENSe]:POWer[:RF]:PADJust:PRESelector?</code>
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

## 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.

Users may choose Low Noise Path Enable. It gives 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	<b>AMPTD Y Scale</b>
Mode	SA, BASIC, PNOISE, VSA , LTE, LTETDD
Scope	Meas Global
<b>Remote Command</b>	<b>[ :SENSe] :POWer[ :RF] :MW:PATH STD   LNPath   MPBypass   FULL</b> <b>[ :SENSe] :POWer[ :RF] :MW:PATH?</b>
<b>Example</b>	:POW:MW:PATH LNP Enables the Low Noise path
Notes	<p>If a Presel Center is performed, the analyzer will momentarily switch to the Standard Path, regardless of the setting of <b>μW Path Control</b></p> <p>The DC Block will always be 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 <b>Low Noise Path Enable</b>. In the case where the DC Block is switched in the analyzer is now AC coupled. However, if the user has 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.</p> <p>Alignment switching ignores the settings in this menu, and restores them when finished.</p>
Dependencies	Unavailable in BBIQ and External Mixing
Preset	<p>All modes other than IQ Analyzer mode and VXA: STD</p> <p>IQ Analyzer, VXA and WLAN mode:</p> <p>MPB option present and licensed: MPB</p> <p>MPB option not present and licensed: STD</p>
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	<b>AMPTD Y Scale, μW Path Control</b>
<b>Example</b>	: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.

Image responses are separated from the real signal by twice the 1st IF. For IF Paths of 10 MHz and 25 MHz, the 1st IF is 322.5 MHz, so the image response and the real signal will be separated by 645 MHz. The 1st IF will be different for other IF Path settings. When viewing a real signal and its corresponding image response in internal mixing, the image response will be to the left of the real signal.

Also, the image response and the real signal typically have the same amplitude and exhibit the same shape factor.

However, if Option FS1, Fast Sweep Capability, is enabled, the image response in the Swept SA measurement will appear lower in amplitude and have a much wider shape factor compared to the real signal.

Key Path	AMPTD Y Scale, μW Path Control
<b>Example</b>	: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

<b>Remote Command</b>	[ :SENSe]:POWER[:RF]:MW:PRESelector[:STATe] ON OFF 0 1 [:SENSe]:POWER[:RF]:MW:PRESelector[:STATe]?
<b>Example</b>	:POW:MW:PRES OFF Bypasses the microwave preselector

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Notes	The ON parameter sets the STD path (:POW:MW:PATH STD) The OFF parameter sets path MPB (:POW:MW:PATH MPB)
Preset	ON

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## 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.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the status line. For example ,for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

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Key Path	AMPTD Y Scale
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:GAIN[:STATe] OFF ON 0 1</code> <code>[ :SENSe]:POWer[:RF]:GAIN[:STATe]?</code>
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.
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be switched On, to Full Range.  Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected.  Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

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Key Path	AMPTD Y Scale, Internal Preamp
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Scope	Meas Global
<b>Remote Command</b>	[ :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
<b>Example</b>	: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
<b>Example</b>	: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
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND FULL

Readback	Full Range
Initial S/W Revision	Prior to A.02.00

## Auto Scale

Enables you to toggle the Auto Scale function between On and Off.

Key path	AMPTD Y Scale
Mode	PN
<b>Remote Command</b>	:DISPlay:SFRequency:VIEW:WINDOW[1] 2:TRACe:Y[:SCALe]:COUPle 0   1   OFF   ON :DISPlay:SFRequency:VIEW:WINDOW[1] 2:TRACe:Y[:SCALe]:COUPle?
<b>Example</b>	DISP:SFR:VIEW:WIND:TRAC:Y:COUP ON DISP:SFR:VIEW:WIND:TRAC:Y:COUP?
Couplings	When Auto Scale is On, upon pressing the Restart front-panel key, this function automatically determines the scale per division and reference values based on the measurement results. When you set a value for either Scale/Div or Ref Value manually, Auto Scale automatically changes to Off.
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00

## Internal Preamp

Accesses a menu that enables you to control the internal preamplifiers. Turning Internal Preamp on gives a better noise figure, but a poorer inter-modulation distortion (TOI) to noise floor dynamic range. You can optimize this setting for your particular measurement. See AMPTD Y Scale, "["Internal Preamp" on page 950](#) for more information.

Key Path	AMPTD/Y Scale
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 keyactions 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.

See "[More Information](#)" on page 635

Key Path	Front-panel key
<b>Remote Command</b>	:COUPle ALL   NONE
<b>Example</b>	:COUP ALL
Notes	:COUPle ALL puts all Auto/Man parameters in Auto mode (equivalent to pressing the <b>Auto Couple</b> 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.

#### 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.



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#### 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).

- If in Auto, Auto is underlined on the calling key.

- If in manual operation, manual is indicated on the calling key, but note that the calling key simply opens the menu and does **not** actually toggle the function.

## BW

This key opens the bandwidth menu, which contains keys to control the Resolution Bandwidth and Video Bandwidth functions of the instrument.

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

### Res BW

Allows you to read back the resolution bandwidth setting or mode. The parameter is read only.

The Res BW is automatically calculated using the following calculation:

$$\text{Res BW} = \text{SpotOffset} * (\text{RBWSpotOffsetRatio} / 100.0);$$

Key path	<b>BW</b>
Mode	PN
<b>Remote Command</b>	<code>[ :SENSe]:SFREquency:BANDwidth[:RESolution]?</code> <code>[ :SENSe]:SFREquency:BANDwidth[:RESolution]:AUTO?</code>
<b>Example</b>	SFR:BWID:RES? SFR:BAND:AUTO?
Notes	Read Only
Preset	Automatically calculated
State Saved	No
Min	Hardware Min Limit
Max	Hardware Max Limit
<b>Backwards Compatibility SCPI</b>	<code>[ :SENSe]:SFREquency:BWIDth[:RESolution]?</code>
Initial S/W Revision	Prior to A.02.00

### Video BW

Allows you to read the video bandwidth setting or mode. The parameter is read only.

The Video BW is automatically calculated using the following calculation:

$$\text{Video BW} = \text{Res BW} * \text{VBW}:3dB\text{ RBW}$$

Key path	<b>BW</b>
Mode	PN
<b>Remote Command</b>	<code>[ :SENSe]:SFREquency:BANDwidth:VIDeo?</code> <code>[ :SENSe]:SFREquency:BANDwidth:VIDeo:AUTO?</code>
<b>Example</b>	SFR:BWID:VID?

	SFR:BAND:VID:AUTO?
Notes	Read Only
Couplings	Coupled to the VBW:3dB RBW
Preset	Automatically calculated
State Saved	No
Min	Hardware Min Limit
Max	Hardware Max Limit
<b>Backwards Compatibility SCPI</b>	[ :SENSe]:SFREQUENCY:BWIDTH:VIDEO?
Initial S/W Revision	Prior to A.02.00

### VBW:3dB RBW

Allows you to specify the video bandwidth to resolution bandwidth ratio.

Key path	Frequency
Mode	PN
<b>Remote Command</b>	<pre>[ :SENSe]:SFREQUENCY:BANDWIDTH:VIDEO:RATIO &lt;real&gt; [ :SENSe]:SFREQUENCY:BANDWIDTH:VIDEO:RATIO? [ :SENSe]:SFREQUENCY:BANDWIDTH:VIDEO:RATIO:AUTO ON OFF 1 0 [ :SENSe]:SFREQUENCY:BANDWIDTH:VIDEO:RATIO:AUTO?</pre>
<b>Example</b>	SFR:BWID:VID:RAT 1 SFR:BAND:VID:RAT:AUTO?
Preset	0.1 ON
State Saved	Saved in instrument state.
Min	0.001
Max	10.0
<b>Backwards Compatibility SCPI</b>	[ :SENSe]:SFREQUENCY:BWIDTH:VIDEO:RATIO
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
<b>Remote Command</b>	:INITiate:CONTinuous OFF ON 0 1 :INITiate:CONTinuous?
<b>Example</b>	: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 <b>Cont</b> hardkey, instead there is a <b>Sweep Single/Cont</b> key. In these analyzers, switching the <b>Sweep Single/Cont</b> key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart <b>Max Hold</b> and <b>Min Hold</b> .  The X-Series has <b>Single</b> and <b>Cont</b> keys in place of the <b>SweepSingleCont</b> key. In the X-Series, if in single measurement, the <b>Cont</b> 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.

## 9 Spot Frequency Measurement Cont (Continuous Measurement/Sweep)

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 will place the analyzer in Single Sweep but will have no effect on the current sequence until  $k = N$ , at which point the current sequence will stop and the instrument will go to the idle state.

## File

See "File" on page 287

## FREQ Channel

Accesses a menu allowing you to set Frequency parameters for Phase Noise measurements.

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

### Auto Tune

When this key is pressed, the measurement automatically searches for and tunes to the strongest signal within the currently specified search span.

Key Path	FREQ Channel
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	[ :SENSe]:FREQuency:CARRier:SEARch
<b>Example</b>	FREQ:CARR:SEAR
Initial S/W Revision	Prior to A.02.00

### Carrier Freq

Specifies the center frequency of the carrier

Key Path	FREQ Channel
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	[ :SENSe]:FREQuency:CARRier <freq> [ :SENSe]:FREQuency:CARRier?
<b>Example</b>	FREQ:CARR 1 FREQ:CARR?
Notes	When Signal Track is ON, Carrier Frequency is automatically set depending on the signal. When Auto Tune is performed, Carrier Frequency is automatically set as the result of Auto Tuning algorithm.
Preset	1GHz
State Saved	Saved in instrument state.
Min	-79.999995 MHz
Max	Hardware Dependent: Opt503 = 3.69999995 GHz Opt508 = 8.49999995 GHz Opt513 = 13.79999995 GHz Opt526 = 26.99999995 GHz
Initial S/W Revision	Prior to A.02.00

## Signal Tracking

Selects whether or not the analyzer tracks a slowly drifting signal. When signal tracking is Off, the analyzer measures at a fixed frequency. When signal tracking is On, the analyzer repeatedly measures the center frequency of the carrier signal on every acquisition to check for any change that might have occurred, and returns to the new frequency if necessary.

Key Path	FREQ Channel
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:FREQuency:CARRier:TRACK[:STATE] OFF ON 0 1</code> <code>[ :SENSe]:FREQuency:CARRier:TRACK[:STATE]?</code>
<b>Example</b>	<code>FREQ:CARR:TRAC</code> <code>FREQ:CARR:TRAC?</code>
Notes	<p>Signal Tracking assumes the new acquisition occurs repeatedly without pause. If the acquisition is paused, the drifting frequency might be bigger than the tracking algorithm expects, in that case, the analyzer might lose the frequency of carrier. Then, the user can perform Auto Tune to find the carrier again.</p> <p>Repeated realignment of the carrier signal when signal tracking is On causes measurements to take slightly longer than when signal tracking is Off.</p>
Preset	ON
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Tracking

Accesses the menu for tracking parameters.

Key Path	FREQ Channel
Initial S/W Revision	Prior to A.02.00

## Span

Specifies the frequency span for signal tracking functionality. The analyzer searches for the carrier signal from CurrentCenterFrequency – (Span / 2) to CurrentCenterFrequency + (Span / 2). A smaller span will provide a more precise result for signal tracking.

Key Path	FREQ Channel, Tracking
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:FREQuency:CARRier:TRACK:SPAN &lt;freq&gt;</code> <code>[ :SENSe]:FREQuency:CARRier:TRACK:SPAN?</code> <code>[ :SENSe]:FREQuency:CARRier:TRACK:SPAN:AUTO ON OFF 1 0</code>

	<b>[ :SENSe]:FREQuency:CARRier:TRACK:SPAN:AUTO?</b>
<b>Example</b>	FREQ:CARR:TRAC:SPAN 100kHz FREQ:CARR:TRAC:SPAN? FREQ:CARR:TRAC:SPAN:AUTO ON FREQ:CARR:TRAC:SPAN:AUTO?
Couplings	When a value other than the default is set, it turns span auto mode to OFF. When AUTO is specified, the span value turns back to default.
Preset	51kHz ON
State Saved	Saved in instrument state.
Min	10.0 kHz
Max	Hardware Dependent: No option = 10MHz WB (25 MHz or wider) = 25MHz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.06.00

### Accuracy

Specifies the accuracy of signal tracking functionality. Tracking with higher accuracy takes longer.

Key Path	FREQ Channel, Tracking
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	<b>[ :SENSe]:FREQuency:CARRier:TRACK:ACCuracy LOW MED HIGH</b> <b>[ :SENSe]:FREQuency:CARRier:TRACK:ACCuracy?</b>
<b>Example</b>	FREQ:CARR:TRAC:ACC LOW FREQ:CARR:TRAC:ACC?
Preset	MED
State Saved	Saved in instrument state.
Range	Low (Slowest) Medium High (Fastest)
Initial S/W Revision	Prior to A.02.00

## Input/Output

See "Input/Output" on page 141

## Marker

There is no ‘Marker’ functionality supported in the Phase Noise Spot Frequency measurement. The front-panel key displays a blank menu when pressed.

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

## Marker Function

There is no ‘Marker Function’ supported in the Phase Noise Spot Frequency measurement. The front-panel key displays a blank menu when pressed.

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

## Marker To

There is no ‘Marker To’ functionality supported in the Phase Noise Spot Frequency measurement. The front-panel key displays a blank menu when pressed.

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

## Meas

The information in this section is common to all measurements. For key and remote command information for a specific measurement, refer to the section that describes the measurement of interest.

Measurements available under the Meas key are specific to the current Mode.

When viewing Help for measurements, note the following:

**NOTE**

Operation for some keys differs between measurements. The information displayed in Help pertains to the current measurement. To see 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.

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

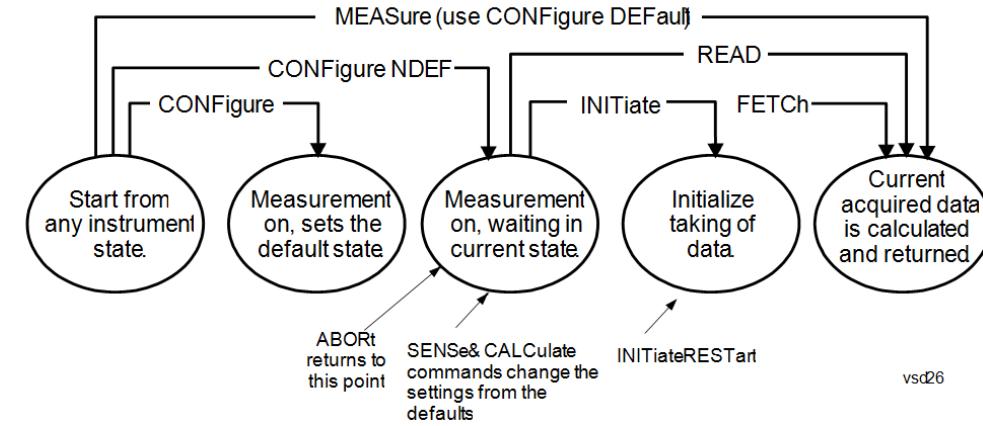
## Remote Measurement Functions

This section contains the following topics:

- "Measurement Group of Commands" on page 987
- "Current Measurement Query (Remote Command Only)" on page 990
- "Limit Test Current Results (Remote Command Only)" on page 990
- "Data Query (Remote Command Only)" on page 990
- "Calculate/Compress Trace Data Query (Remote Command Only)" on page 990
- "Calculate Peaks of Trace Data (Remote Command Only)" on page 996
- "Hardware-Accelerated Fast Power Measurement (Remote Command Only)" on page 997
- "Format Data: Numeric Data (Remote Command Only)" on page 1011
- "Format Data: Byte Order (Remote Command Only)" on page 1012

Initial S/W Revision	Prior to A.02.00
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## Measurement Group of Commands



### Measure Commands:

: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.

- 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.
- If the function does averaging, it is turned on and the number of averages is set to 10.
- After the data is valid it 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.
- 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.
- ASCII is the default format for the data output. (Older versions of Spectrum Analysis and Phase Noise mode measurements only use ASCII.) The binary data formats should be used for handling large blocks of data since they are smaller and faster than the ASCII format. Refer to the FORMat:DATA command 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 you can use the READ? command to initiate the measurement and query the results.

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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. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to 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 INIT: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 INIT:CONTinuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query 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 Commands:

: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.

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INITiate Commands:

: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

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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.

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READ Commands:

: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? it will initiate a new measurement 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 will switch 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. Then you send READ:ACP? It will change from channel power back to ACP and, using the previous ACP settings, will initiate the measurement and return results.
- 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 will be returned. 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 when handling large blocks of data since they are smaller and faster than the ASCII format. (FORMAT:DATA)

### Current Measurement Query (Remote Command Only)

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

<b>Remote Command</b>	:CONFIGURE?
<b>Example</b>	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. It returns a 0 if the measured results pass when compared with the current limits. It returns a 1 if the measured results fail any limit tests.

<b>Remote Command</b>	:CALCULATE:CLIMITS:FAIL?
<b>Example</b>	CALC:CLIM:FAIL? queries the current measurement to see if it fails the defined limits. Returns a 0 or 1: 0 it passes, 1 it fails.
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 and FORMat:DATA commands and can return real or ASCII data. (See the format command descriptions under Input/Output in the Analyzer Setup section.)

<b>Remote Command</b>	:CALCULATE:DATA[n]?
Notes	The return trace depends on the measurement. In CALCULATE:<meas>:DATA[n], n is any valid subopcode for the current measurement. It returns the same data as the FETCh:<measurement>? query where <measurement> 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 analyzer. The command is used with a sub-opcode <n> (default=1) to specify the trace. With trace queries, it is best if the analyzer 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.

<b>Remote Command</b>	:CALCulate:DATA<n>:COMPress? BLOCK   CFIT   MAXimum   MINimum   MEAN   DMEan   RMS   RMSCubed   SAMPlE   SDEViation   PPHase [,<soffset>[,<length>[,<roffset>[,<rlimit>]]]]
<b>Example</b>	<p>To query the mean power of a set of GSM bursts:</p> <p>Supply a signal that is a set of GSM bursts.</p> <p>Select the IQ Waveform measurement (in IQ Analyzer Mode).</p> <p>Set the sweep time to acquire at least one burst.</p> <p>Set the triggers such that acquisition happens at a known position relative to a burst.</p> <p>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.)</p>
Notes	<p>The command supports 5 parameters. Note that the last 4 (&lt;soffset&gt;, &lt;length&gt;, &lt;roffset&gt;, &lt;rlimit&gt;) are optional. But these optional parameters must be entered in the specified order. For example, if you want to specify &lt;length&gt;, then you must also specify &lt;soffset&gt;. See details below for a definition of each of these parameters.</p> <p>This command uses the data in the format specified by FORMat:DATA, returning either binary or ASCII data.</p>
Initial S/W Revision	Prior to A.02.00

- BLOCK or 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. (This is x,y pairs for trace data and I,Q pairs for complex data.)
- CFIT or 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 will return the following values: the x-offset (in seconds) and the curve coefficients ((order + 1) values).

MIN, MAX, MEAN, DME, RMS, RMSC, SAMP, SDEV and PPH return one data value for each specified region (or <length>) of trace data, for as many regions as possible

until you run out of trace data (using <roffset> to specify regions). Or they return the number of regions you specify (using <rlimit>) ignoring any data beyond that.

- MINimum – 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 maximum magnitude of the I/Q pairs is returned.
- MEAN – 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)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i$$

where  $X_i$  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)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} |X_i|$$

where  $|X_i|$  is the magnitude of an I/Q pair, and  $n$  is the number of I/Q pairs in the specified region(s).

- DMEan – 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)

$$DME = 10 \times \log_{10} \left( \frac{1}{n} \sum_{Xi \in \text{region}(s)} 10^{\frac{Xi}{10}} \right)$$

- RMS - 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)

$$RMS = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} X_i^2}$$

-

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)

$$RMS = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} X_i X_i^*}$$

-

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 - 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 - 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)

$$\text{SDEV} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} (X_i - \bar{X})^2}$$

where  $X_i$  is a data point value,  $\bar{X}$  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).

$$\text{SDEV} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} (|X_i| - \bar{X})^2}$$

where  $|X_i|$  is the magnitude of an I/Q pair,  $\bar{X}$  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 - 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:

$$\text{Power} = 10 \times \log [10 \times (\text{RMS I/Q value})] + 10.$$

The RMS I/Q value (peak volts) is:

$$\sqrt{\frac{1}{n} \sum_{X_i \in \text{region}} X_i X_i^*}$$

where  $X_i$  is the complex value representation of an I/Q pair,  $X_i^*$  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:

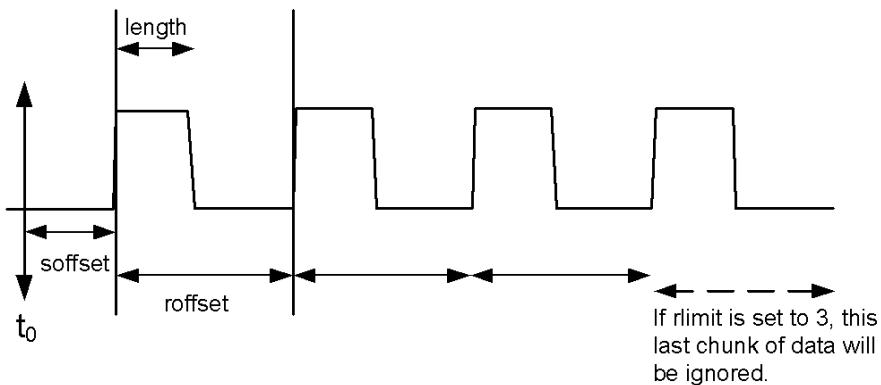
$$\frac{1}{n} \sum_{\substack{Y_i \\ Y_i \in \text{region}}} Y_i$$

where  $Y_i$  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.

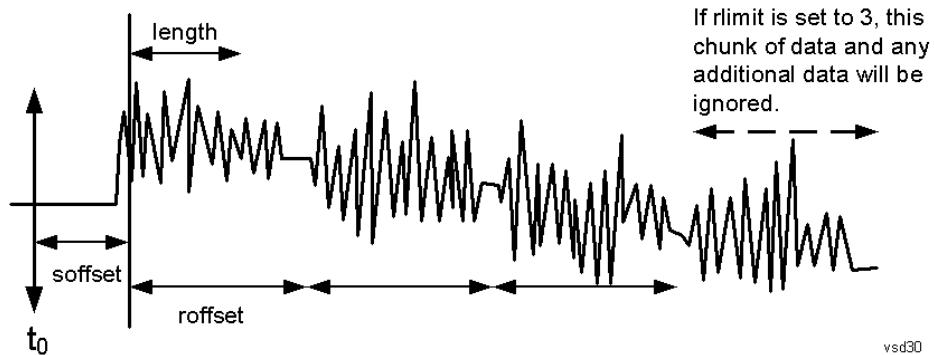
#### Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



#### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



<soffset> - start offset is an optional real number. (It is in seconds for time-domain traces, and is 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> - is an optional real number. (It is in seconds for time-domain traces, and is 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. (It is in seconds for time-domain traces, and is 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 above).

<rlimit> - repeat limit is an optional integer. It specifies the number of data items that you want returned. It will ignore any additional items beyond that number. You can use the Start offset and the Repeat limit to pick out exactly what 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 sub-opcode [n]. The peaks must meet the requirements of the peak threshold and excursion values.

n = any valid sub-opcode 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 sub-opcodes 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 the sub-opcode n=0, is the raw trace data which cannot be searched for peaks. And Sub-opcode n=1, is often calculated results values which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDer and FORMat:DATA 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)

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<b>Remote Command</b>	For Swept SA measurement:  :CALCulate:DATA[1] 2 ... 6:PEAKS? <threshold>,<excursion>[,AMPLitude   FREQuency   TIME[,ALL   GTDLine   LTDLine]]
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	<p>For most other measurements:</p> <pre>:CALCulate:DATA[1] 2 ... 6:PEAKS? &lt;threshold&gt;,&lt;excursion&gt;[,AMPLitude   FREQuency   TIME]</pre>
<b>Example</b>	<p>Example for Swept SA measurement in Spectrum Analyzer Mode:</p> <p>CALC:DATA4:PEAK? -40, 10, FREQ, GTDL This will identify 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.</p> <p>Query Results 1:</p> <p>With FORMat:DATA REAL, 32 selected, it 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).</p> <p>If no peaks are found the peak list will consist of only the number of peaks, (0).</p>
Notes	<p>&lt;n&gt; - is the trace that will be used</p> <p>&lt;threshold&gt; - 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.</p> <p>&lt;excursion&gt; - 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.</p> <p>Values must be provided for threshold and excursion. The sorting and display line parameters are optional (defaults are AMPLitude and ALL).</p> <p>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 reportedSorting order:</p> <p>AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)</p> <p>FREQuency - lists the peaks in order of occurrence, left to right across the x-axis.</p> <p>TIME - lists the peaks in order of occurrence, left to right across the x-axis.</p> <p>Peaks vs. Display Line:</p> <p>ALL - lists all of the peaks found (default if optional parameter not sent).</p> <p>GTDLine (greater than display line) - lists all of the peaks found above the display line.</p> <p>LTDLine (less than display line) - lists all of the peaks found below the display line.</p>
Initial S/W Revision	Prior to A.02.00

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### Hardware-Accelerated Fast Power Measurement (Remote Command Only)

The Fast Power option (FP2) enables very fast channel power measurements for instruments with the prerequisite hardware (DP2 and/or B40). It accomplishes this by performing real-time overlapped FFTs at the hardware layer, using software for basic post-processing before returning the result to the user. The upshot of this

approach is improved throughput for user applications that require many sequential power measurements.

The analysis bandwidth of FP2 is limited by the licenses in the instrument, but its maximum overall analysis bandwidth per acquisition is 40 MHz.

FP2 is remote-only, which means the instrument does not switch to any particular mode or measurement. FP2 commands can be sent while another application is in use on the front panel.

Each Fast Power measurement can be predefined using an array index, and up to 1,000 measurements can be stored. In the following documentation, instances of [1,2,...,999] can be substituted with a particular measurement index, e.g. CALC:FPOW:POW1?, CALC:FPOW:POW2?, CALC:FPOW:POW134?. In this way, power measurements can be defined one time in a batch, and then executed multiple times without having to redefine them, similar to “list mode” on other measurements.

In addition to basic channel power measurements, there are a number of other measurement “functions” for each channel, including peak power, peak frequency, and power spectral density. See the Function parameter for more information.

### Reset Fast Power Measurement (Remote Command Only)

Resets the measurement configuration to the defaults.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:RESet
<b>Example</b>	:CALC:FPOW:POW1:RES
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Define Fast Power Measurement (Remote Command Only)

Fast Power acquisitions are configured using the DEFine command. This command accepts a comma-delimited string of configuration parameters and their appropriate values, which are all specified in the subsection below.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:DEFine "configuration string"
<b>Example</b>	:CALC:FPOW:POW1:DEF "CenterFrequency=2e9, AcquisitionTime=0.005"
Notes	See below for a list of measurement variables that can be defined in the configuration string.
Initial S/W Revision	A.14.00

## Acquisition Time

Example	CALC:FPOW:POW1:DEF "AcquisitionTime=0.002"
Notes	The acquisition time parameter sets the time in which the entire spectrum is measured. An increase in the acquisition time yields an improvement in measurement repeatability.
Preset	0.001 s
Range	0 s to 1 s
Default Unit	Time (s)
Initial S/W Revision	A.14.00

## Center Frequency

Example	CALC:FPOW:POW1:DEF "CenterFrequency=2e9"
Notes	The center frequency parameter sets the frequency in which the measurement is centered around. The OffsetFrequency parameter is calculated relative to the center frequency.
Preset	1 GHz
Range	0 Hz to maximum instrument frequency
Default Unit	Frequency (Hz)
Initial S/W Revision	A.14.00

## DC Coupled

Example	CALC:FPOW:POW1:DEF "DCCoupled=True"
Notes	The DC coupled parameter allows the user to specify whether the DC blocking capacitor is utilized. Set parameter to true when measuring frequencies below 10 MHz.
Preset	False
Range	True (DC Coupled) or False (AC Coupled)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## DetectorType

Example	CALC:FPOW:POW1:DEF "DetectorType=Peak"
Notes	Option FP2 is required. The detector type parameter allows the user to choose whether a RMS average or peak value is used during the measurement.
Preset	RmsAverage
Range	RmsAverage, Peak
Initial S/W Revision	A.14.00

## Do Noise Correction

Example	CALC:FPOW:POW1:DEF "DoNoiseCorrection=True"
Notes	<p>When noise correction is enabled, the linear noise power contributed by the analyzer is subtracted from all measurements. This effectively lowers the noise floor of the analyzer.</p> <p>When noise correction is enabled, the first measurement for a given set of input parameters will take extra time. This is because the analyzer takes an extra acquisition with the RF input disconnected from the analyzer's front end to measure the noise of just the analyzer. The measured noise floor is stored in a cache so the noise acquisition will occur only once for the same state settings. In other words, if noise correction was turned on and the analyzer made an acquisition at frequency A, then frequency B, and back again to frequency A, the hidden initial noise floor acquisition would only occur for the first acquisition at frequency A and the cached noise floor would be used the second time frequency A was measured.</p>
Preset	False
Range	True (enable noise correction) or False (disable noise correction)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Do Spur Suppression

Example	CALC:FPOW:POW1:DEF "DoSpurSuppression=True"
Notes	<p>When measuring very low level signals, or when large out-of-band inputs are input into the analyzer, sometimes unwanted spurs and residuals can appear in the measured spectrum. Spur suppression is a method to help minimize the levels of these internally generated spurs and residuals.</p> <p>When spur suppression is enabled, the analyzer will automatically take two acquisitions using two different internal analog LO frequencies. The FFT spectrums from both acquisitions are combined by taking the minimum power between both traces on a per FFT bin basis. External signals will have the same amplitude for both traces and therefore will return the expected amplitudes. However, low level spurs and residuals generated internally to the analyzer tend to move to different FFT bins depending on the internal analog LO frequency used, and therefore tend to be suppressed using this spur suppression method.</p> <p>Because two acquisitions, rather than a single acquisition, are made when spur suppression is enabled, the measurement time will always be slower when spur suppression is enabled.</p>
Preset	False
Range	True (enable spur suppression) or False (disable spur suppression)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Electronic Attenuator Bypass

Example	CALC:FPOW:POW1:DEF "ElecAttBypass =False"
Notes	The electronic attenuation bypass parameter allows the user to either utilize or bypass the electronic attenuator. The electronic attenuator is only available for frequencies up to 3.6 GHz. Set parameter to true when using frequencies above 3.6 GHz and set the parameter to false when using the preamp.
Preset	True
Range	True (bypass electronic attenuator) or False (use electronic attenuator)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Electronic Attenuation

Example	CALC:FPOW:POW1:DEF "ElecAttenuation=10"
Notes	Option EA3 is required. The electronic attenuation value parameter sets the amount of electrical attenuation from 0 to 24 dB (1 dB steps). Set "ElecAttBypass=False" to make sure the electronic attenuator path is enabled.
Preset	0 dB
Range	0 – 24 dB (1 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

## IF Gain

Example	CALC:FPOW:POW1:DEF "IFGain=10"
Notes	The IF gain parameter allows the user to specify the gain at the IF stage anywhere from -6 to 16 dB (1 dB steps). This is an advanced feature, and for most cases this should remain at its default value of 0 dB.
Preset	0 dB
Range	-6 – 16 dB (1 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

## IF Type

Example	CALC:FPOW:POW1:DEF "IFTType=B25M"
Notes	The IF type parameter allows the user to select between different IF paths. For example, if the signal is less than 25 MHz wide, then the user can select the B25M path to take advantage of

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additional filtering on this analog IF path.

---

Preset	B40M
Range	B10M, B25M, B40M
Initial S/W Revision	A.14.00

---

## Include Power Spectrum

---

Example	CALC:FPOW:POW1:DEF "IncludePowerSpectrum=True"
Notes	The power spectrum parameter allows the user to read data on the entire spectrum for diagnostic purposes. It is not recommended for production use. See CALC:FPOW:POW[n]:READ2? for details on the binary format of the response.
Preset	False
Range	True (return both channel power and full power spectrum) or False (returns only channel power)
Default Unit	Boolean
Initial S/W Revision	A.14.00

---

## Mechanical Attenuation

---

Example	CALC:FPOW:POW1:DEF "MechAttenuation=10"
Notes	The mechanical attenuation value parameter sets the amount of mechanical attenuation anywhere from 0 to 70 dB (2 dB steps).
Preset	0 dB
Range	0 – 70 dB (2 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

---

## Preamplifier Mode

---

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The license for the appropriate preamp is required. The preamp mode parameter specifies whether the preamps are being utilized. Low allows any preamps up to 3.6 GHz, and Full allows all licensed preamps. Set "ElecAttBypass=True" in order to utilize any preamps.
Preset	Off
Range	Off, Low, Full
Initial S/W Revision	A.14.00

---

## Resolution Bandwidth Mode

---

Example	<code>CALC:FPOW:POW1:DEF "PreAmpMode=Low"</code>
Notes	The resolution bandwidth mode parameter allows the user to choose whether the RBW filter is automatically or manually set. The BestSpeed value minimizes measurement time, while the Narrowest value minimizes RBW size (minimum of two FFT bins per RBW). To manually specify an RBW, set this parameter to Explicit, and set the ResolutionBW parameter to the desired value.
Preset	BestSpeed
Range	BestSpeed, Narrowest, Explicit
Initial S/W Revision	A.14.00

---

## Resolution Bandwidth

---

Example	<code>CALC:FPOW:POW1:DEF "ResolutionBW=25e3"</code>
Notes	The resolution bandwidth parameter sets the 3-dB bandwidth of the RBW filter. The ResolutionBWMode parameter must be set to Explicit in order to manually set the RBW.
Preset	0 Hz
Default Unit	Hz
Initial S/W Revision	A.14.00

---

## Trigger Delay

---

Example	<code>CALC:FPOW:POW1:DEF "TriggerDelay=0.025"</code>
Notes	The trigger delay parameter sets the time after an external trigger is detected until the measurement is performed.
Preset	0 s
Range	0 – 1 s
Default Unit	Seconds
Initial S/W Revision	A.14.00

---

## Trigger Level

---

Example	<code>CALC:FPOW:POW1:DEF "TriggerLevel=2"</code>
Notes	The trigger level parameter sets the voltage value at which an external trigger is detected.
Preset	1.2 V
Range	-5 to 5 V
Default Unit	Volts
Initial S/W Revision	A.14.00

---

## Trigger Slope

---

Example	CALC:FPOW:POW1:DEF "TriggerSlope=Negative"
Notes	The trigger slope parameter indicates the direction of the edge trigger voltage for detection.
Preset	Positive
Range	Positive, Negative
Initial S/W Revision	A.14.00

---

## Trigger Source

---

Example	CALC:FPOW:POW1:DEF "TriggerSource=Ext1"
Notes	The trigger source parameter allows the user to choose between measurement's triggering freely or controlled by an external input. Ext1 and Ext2 correspond to Trigger 1 In and Trigger 2 In, respectively.
Preset	Free
Range	Free, Ext1, Ext2
Initial S/W Revision	A.14.00

---

## Trigger Timeout

---

Example	CALC:FPOW:POW1:DEF "TriggerTimeout=0.1"
Notes	The trigger timeout parameter sets the time in which the analyzer will wait for a trigger before automatically performing the measurement.
Preset	1 s
Range	0 – 1 s
Default Unit	Seconds
Initial S/W Revision	A.14.00

---

## Signal Input

---

Example	CALC:FPOW:POW1:DEF "SignalInput=Fp50MHzCW"
Notes	The signal input parameter allows the user to select between using the main RF input or the internal analyzer reference CW signal of 50 MHz.
Preset	FpMainRf
Range	FpMainRf, Fp50MHzCW
Initial S/W Revision	A.14.00

---

## Use Preselector

Example	CALC:FPOW:POW1:DEF "UsePreSelector=True"
Notes	The preselector parameter allows the user to either utilize or bypass the front end tunable filter at frequencies above 3.6 GHz. For frequencies below 3.6 GHz, the preselector is automatically bypassed, so you do not need to set this parameter to False in those cases.
Preset	False
Range	True (use preselector above 3.6 GHz), or False (preselector bypassed)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Channel Bandwidth Array

Example	CALC:FPOW:POW1:DEF "Bandwidth=[3.84e6, 5e6, 3.84e6]"
Notes	The bandwidth parameter array defines the bandwidth of each channel that will be measured. All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.
Preset	[1e6]
Range	0 to 40 MHz
Default Unit	Hz
Initial S/W Revision	A.14.00

## Channel Filter Type Array

Example	CALC:FPOW:POW1:DEF "FilterType=[RRC, IBW, RRC]"
Notes	The filter type parameter allows the user to choose between an integration bandwidth (IBW) filter or a root-raised-cosine (RRC) filter. The integration bandwidth filter weighs all frequencies within the bandwidth equally. The root-raised-cosine filter has an associated shape parameter, defined by the FilterAlpha parameter. All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.
Preset	[IBW]
Range	IBW, RRC
Initial S/W Revision	A.14.00

## Channel Filter Alpha Array

Example	CALC:FPOW:POW1:DEF "FilterAlpha=[0.5, 0.0, 0.5]"
Notes	The filter alpha parameter allows the user to adjust the alpha value associated with the root-

---

raised-cosine (RRC) filter type. Set FilterType to RRC in order to utilize this parameter.  
All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.

---

Preset	[0.22]
Range	0.0 – 1.0
Initial S/W Revision	A.14.00

---

## Channel Measurement Function Array

---

Example	CALC:FPOW:POW1:DEF "Function=[BandPower, PeakPower, BandPower]"
Notes	<p>This parameter array defines what measurement is being made for each individually-specified channel:</p> <ul style="list-style-type: none"> <li>BandPower: Total power within the specified bandwidth of the channel (dBm)</li> <li>BandDensity: Total power density within the specified bandwidth of the channel (dBm/Hz)</li> <li>PeakPower: The peak power value within the specified bandwidth of the channel (dBm)</li> <li>PeakFrequency: The frequency which corresponds to the peak power value within the specified bandwidth of the channel. This frequency is relative to the center frequency (Hz)</li> <li>XdBBandwidth: The half power (-3.01 dB) bandwidth of the highest amplitude signal that resides within the channel (Hz), dB is configurable using XdBBandwidth parameter</li> <li>OccupiedBandwidth: The bandwidth at which 99% of the total power resides within the channel (Hz), percentage configurable using OccupiedBandwidthPercent parameter</li> </ul> <p>All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.</p>
Preset	[BandPower]
Range	BandPower, BandDensity, PeakPower, PeakFrequency, XdBBandwidth, OccupiedBandwidth
Initial S/W Revision	A.14.00

---

## Channel Offset Frequency Array

---

Example	CALC:FPOW:POW1:DEF "OffsetFrequency=[-5e6, 0, 5e6]"
Notes	<p>The offset frequency parameter array defines the difference between the center frequency to the center frequency of each channel.</p> <p>All array parameters should have the same number of elements.</p>
Preset	[0]
Range	0 to 20 MHz
Default Unit	Hz
Initial S/W Revision	A.14.00

---

### Channel Occupied Bandwidth Percent Array

Example	CALC:FPOW:POW1:DEF "OccupiedBandwidthPercent =[0.95, 0.95, 0.95]"
Notes	This parameter only applies for channels whose Function is set to OccupiedBandwidth. The occupied bandwidth percent parameter specifies the percent of total power in these channels. The valid range for this parameter is 0.0 to 1.0, where 1.0 represents 100%. The default for this parameter is 0.99, which will return the bandwidth that contains 99% of the total channel power.
Preset	[0.99]
Range	0 – 1.0
Initial S/W Revision	A.14.00

### Channel x-dB Bandwidth Array

Example	CALC:FPOW:POW1:DEF "XdBBandwidth =[-6.02, -3.01, -1.0]"
Notes	This parameter only applies for channels whose Function is set to XdBBandwidth. The X dB bandwidth parameter is used to specify the power relative to the peak channel power over which the bandwidth is calculated. The parameter value must be a negative number.
Preset	[-3.01]
Range	-200 to 0 dB
Default Unit	dB
Initial S/W Revision	A.14.00

### Define Fast Power Measurement Query (Remote Command Only)

The DEFine? command is used to retrieve a list of all defined parameters in an ASCII string format

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**E** :CALC:FPOW:POW1:DEF?x  
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- N This command query is used to retrieve a list of all defined parameters in an ASCII format.
- O The following is an example of the returned results:
- t "DCCoupled=False,ElecAttBypass=True,ElecAttenuation=0,IFGain=0,MechAttenuation=0,PreAmpMode=Off,PreSelectorOf  
e fset=0,UsePreSelector=False,ExternalReferenceFrequency=10000000,FrequencyReferenceSource=AutoExternalFrequenc  
s yReference,IFTType=B40M,LOMode=SLW,SignalInput=FpMainRf,AcquisitionTime=0.001,CenterFrequency=1000000000,Re  
solutionBW=0,ResolutionBWMode=BestSpeed,DetectorType=RmsAverage,Bandwidth=[1000000],OffsetFrequency=  
[0],Function=[BandPower],FilterType=[IBW],FilterAlpha=[0.22],OccupiedBandwidthPercent=[0.99],XdBBandwidth=[-  
3.01],DoNoiseCorrection=False,DoSpurSuppression=False,MeasurementMethod=HardwareFFT,IncludePowerSpectrum=F  
alse,TriggerDelay=0,TriggerLevel=1.2,TriggerSlope=Positive,TriggerSource=Free,TriggerTimeout=1"
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### Configure Fast Power Measurement (Remote Command Only)

The configure command begins hardware setup and returns immediately, with no acquisition made. This can be used in parallel with other hardware operations to effectively hide the hardware setup time.

---

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:CONFigure
<b>Example</b>	:CALC:FPOW:POW1:CONF

---

---

Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

---

### Initiate Fast Power Measurement (Remote Command Only)

The INITiate command begins an acquisition and returns immediately. The results of the measurement can be retrieved using FETCh.

---

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:INITiate
<b>Example</b>	:CALC:FPOW:POW1:INIT
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

---

### Fetch Fast Power Measurement (Remote Command Only)

The FETCh command query is used to retrieve the results of an acquisition initiated by the INIT command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

---

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:FETCh?
<b>Example</b>	:CALC:FPOW:POW1:FETC?
Notes	Option FP2 is required. Returns m comma-separated ASCII values, where m corresponds to the number of bandwidths defined. 1. Declared function return in the 1st specified channel 2. Declared function return in the 2nd specified channel ... m. Declared function return in the last specified channel The INIT and FETC? command sequence performs the same functionality of a single CALC:FPOW:POW[n]? query. Units of the returned values are dependent on the Function parameter for each channel.
Initial S/W Revision	A.14.00

---

### Execute Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]?
<b>Example</b>	:CALC:FPOW:POW1?
Notes	Option FP2 is required. See notes for Fast Power Fetch for return format.
Initial S/W Revision	A.14.00

### Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:READ? :CALCulate:FPOWer:POWer[1,2,...,999]:READ1?
<b>Example</b>	:CALC:FPOW:POW1:READ? :CALC:FPOW:POW1:READ1?
Notes	Option FP2 is required. Returns m 4 byte floating point binary values (Little-Endian), where m corresponds to the number of bandwidths defined.
Initial S/W Revision	A.14.00

### Diagnostic Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format. This command is used primarily for diagnostic purposes to test for ADC overloads and to visibly inspect the spectrum.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:READ2?
<b>Example</b>	:CALC:FPOW:POW1:READ2?
Notes	Option FP2 is required.
	<p><b>NOTE</b> Spectrum data is only returned if the IncludePowerSpectrum parameter is set to True. If IncludePowerSpectrum is False, the number of spectrum points will be zero (0).</p> <p>Units of the returned values are dependent on the Function parameter per channel (e.g. dBm for BandPower, Hz for PeakFrequency).</p> <p>Returns binary data (Little-Endian) that contains information on m amount of channels, along with ADC over range and full spectrum data.</p>

---

The following is the binary format of the response.

Bandwidth Return Value

1. Number of channels specified, m [4 byte int]
2. Declared function result for the 1st specified channel [4 byte float]
3. Declared function result for the 2nd specified channel [4 byte float]

...

- (m + 1). Declared function result for the last (mth) specified channel [4 byte float]

ADC Over Range

1. ADC over-range occurred (1: true, 0: false) [2 byte short]

Spectrum Data

1. Number of points in the spectrum data, k [4 byte int]
2. Start frequency of spectrum data (Hz) [8 byte double]
3. Step frequency of spectrum data (Hz) [8 byte double]
4. FFT bin at 1st point (dBm) [4 byte float]
5. FFT bin at 2nd point (dBm) [4 byte float]

...

- (k + 3). FFT bin at last (kth) point (dBm) [4 byte float]

---

Initial S/W Revision A.14.00

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### 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.

---

<b>Remote Command</b>	:FORMAT[:TRACe][:DATA] ASCii INTeger,32 REAL,32   REAL,64
	:FORMAT[:TRACe][:DATA]?

---

Notes	<p>The query response is:</p> <p>ASCii: ASC,8</p> <p>REAL,32: REAL,32</p> <p>REAL,64: REAL,64</p> <p>INTeger,32: INT,32</p> <p>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).</p> <p>The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.</p>
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Dependencies	<p>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).</p> <p>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</p>
--------------	---

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	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.YYYYEsZZ

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 says it uses FORMat:DATA uses any format supported by FORMat:DATA.

The NORMal order is a byte sequence that 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 is when the byte sequence begins with the LSB first, and ends with the MSB last in the sequence: 4|3|2|1.

---

<b>Remote Command</b>	:FORMat:BORDER NORMal SWAPPed
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:FORMat:BORDer?	
Preset	NORMAl
Initial S/W Revision	Prior to A.02.00

---

## Meas Setup

Displays the measurement setup menu for the currently selected measurement.

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

### Avg Number

Allows you to specify the number of measurements made when calculating the average result, or to turn averaging on or off.

Key path	Meas Setup
Mode	PN
<b>Remote Command</b>	<pre>[ :SENSe]:SFREQUENCY:AVERage:COUNT &lt;integer&gt; [ :SENSe]:SFREQUENCY:AVERage:COUNT? [ :SENSe]:SFREQUENCY:AVERage[:STATe] OFF ON 0 1 [ :SENSe]:SFREQUENCY:AVERage[:STATe]?</pre>
<b>Example</b>	<pre>SFR:AVER:COUN 10 SFR:AVER:COUN? SFR:AVER ON SFR:AVER?</pre>
Preset	10 OFF
State Saved	Saved in instrument state.
Min	1
Max	1000
Initial S/W Revision	Prior to A.02.00

### Avg Mode

Selects the type of termination control used for the averaging function. This determines the averaging action after the specified number of acquisitions (average count) is reached.

- Avg Mode (Exponential) causes the measurement to keep on measuring with averaging the result exponentially.
- Avg Mode (Repeat) causes the measurement to reset the average counter each time the specified number of averages is reached.

Key path	Meas Setup
Mode	PN
<b>Remote Command</b>	<pre>[ :SENSe]:SFREQUENCY:AVERage:TCONTROL EXPONENTIAL REPEAT</pre>

---

	<b>[ :SENSe]:SFREquency:AVERage:TCONtrol?</b>
<b>Example</b>	SFR:AVER:TCON REP SFR:AVER:TCON?
Preset	EXPonential
State Saved	Saved in instrument state.
Range	EXP   Repeat
Initial S/W Revision	Prior to A.02.00

---

### Meas Type

This parameter determines whether to measure the Phase Noise of a signal, or the DANL Floor of the analyzer.

Phase Noise is the default, and this is the intended use of the measurement, however it can be useful to measure the DANL Floor of the analyzer for two reasons. If the DANL floor is seen to be close to the measured noise, it means that the DANL is causing measurement errors. The effect of the DANL can be subtracted from the measurement using the cancellation process, increasing the dynamic range and reducing errors.

To cancel the DANL, measure it and store it in the reference trace using the softkeys under the display menu.

In DANL Floor mode, the analyzer measures the noise level by maximizing the attenuation. It is accurate enough for most purposes, but removing the input signal from the analyzer before measuring the noise level can be more accurate when the signal level is high.

Some X-Series models have Noise Floor Extension (NFE) capability in the Mode Setup menu. NFE also acts to reduce the effect of DANL on phase noise measurements. The difference is that NFE uses a model of the noise from a factory calibration. This makes NFE more convenient to use. By default it is enabled. It also makes NFE not quite as accurate as making the measurement in exactly the right measurement conditions including temperature and time.

Unfortunately, NFE and cancellation do not work quite as well together as cancellation alone. Therefore, it is best to turn NFE off when storing and using traces for cancellation.

---

Key path	<b>Meas Setup</b>
Mode	PN
<b>Remote Command</b>	<b>[ :SENSe]:SFREquency:METHOD DANL   PN</b> <b>[ :SENSe]:SFREquency:METHOD?</b>
<b>Example</b>	SFR:METH PN SFR:METH?
Preset	PN
State Saved	Saved in instrument state.

---

Range	DANL   Phase Noise
Initial S/W Revision	Prior to A.02.00

## Spot Offset

Specifies the frequency offset at which the phase noise is to be measured.

Key path	Meas Setup
Mode	PN
<b>Remote Command</b>	[ :SENSe]:SFREQuency:SOFFset <freq> [ :SENSe]:SFREQuency:SOFFset?
<b>Example</b>	SFR:SOFF 10000 SFR:SOFF?
Preset	10 kHz
State Saved	Saved in instrument state.
Min	10 Hz
Max	Hardware Dependent: Opt503 = 3.699999995 GHz Opt508 = 8.499999995 GHz Opt513 = 13.799999995 GHz Opt526 = 26.999999995 GHz
Initial S/W Revision	Prior to A.02.00

## Table Index

Allows you to select a result (from the last 101), when in numeric view.

Key path	Meas Setup
Mode	PN
<b>Remote Command</b>	:DISPlay:SFREQuency:VIEW2:WINDOW[1]:TRACe:Y[:SCALe]:RLEVel <integer> :DISPlay:SFREQuency:VIEW2:WINDOW[1]:TRACe:Y[:SCALe]:RLEVel?
<b>Example</b>	DISP:SER:VIEW2:WIND:TRAC:Y:RLEV 1
Notes	Softkey is grayed out when the selected view is “Graphical”
Preset	1
State Saved	Saved in instrument state.
Min	1
Max	101

## Meas Preset

Restores all the measurement parameters to their default values.

Key path	<b>Meas Setup</b>
Mode	PN
<b>Remote Command</b>	<b>:CONFigure:SFRQUENCY</b>
<b>Example</b>	CONF:SFR
Couplings	Selecting Meas Preset restores all measurement parameters to these default values
Initial S/W Revision	Prior to A.02.00

## Advanced

Accesses advanced features. These features are recommended for use only by advanced users.

Key Path	<b>Meas Setup</b>
Initial S/W Revision	Prior to A.02.00

## RBW/Spot Offset

Enables you to specify the Resolution Bandwidth as a percentage of the offset frequency, to minimize the variance without impacting measurement speed.

Key path	<b>Meas Setup, Advanced</b>
Mode	PN
<b>Remote Command</b>	<b>[ :SENSe]:SFREQUENCY:SOFFset:BANDwidth[:RESolution]:RATio &lt;real&gt;</b> <b>[ :SENSe]:SFREQUENCY:SOFFset:BANDwidth[:RESolution]:RATio?</b>
<b>Example</b>	SFR:SOFF:BAND:RAT 10 SFR:SOFF:BAND:RAT?
Couplings	Adjusts “BW, Res BW”
Preset	10
State Saved	Saved in instrument state.
Min	1
Max	100
<b>Backwards Compatibility SCPI</b>	<b>[ :SENSe]:SFREQUENCY:SOFFset:BWIDth[:RESolution]:RATio</b>
Initial S/W Revision	Prior to A.02.00

## Mode

See "Mode" on page 246

## 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 683 for more information.

Key Path	<b>Front-panel key</b>
<b>Remote Command</b>	:SYST:PRESet
<b>Example</b>	:SYST:PRES
Notes	<p>*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.</p> <p>Clears all pending OPC bits. The Status Byte is set to 0.</p>
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	<p>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 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.</p> <p>There is also no "Preset Type" as there is on the PSA. There is a green Mode Preset front-panel key that does a <b>Mode Preset</b> 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.</p> <p>The settings and correction data under the Input/Output front-panel key (examples: Input Z Corr,</p>

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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.

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Initial S/W Revision	Prior to A.02.00
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## 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.

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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

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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

See "Mode Setup" on page 281

## Peak Search

There is no ‘Peak Search’ functionality supported in the Phase Noise Spot Frequency measurement. The front-panel key displays a blank menu when pressed.

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

## Print

See "Print" on page 292

## 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 finds 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.

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 and Traces**. 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	<p>No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe &lt;filename&gt;.</p> <p>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.</p>
Backwards Compatibility Notes	<p>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.</p> <p>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.</p>
Backwards Compatibility Notes	<p>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. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. 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.</p> <p>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.</p> <p>It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user.</p> <p>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.</p>
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 692.

Key Path	Recall
Mode	All
<b>Remote Command</b>	<b>:MMEMory:LOAD:STATe &lt;filename&gt;</b>
<b>Example</b>	:MMEM:LOAD:STAT "myState.state" This recalls the file myState.state on the default path
<b>Example</b>	MMEM:LOAD:STAT "MyStateFile.state" This loads the state file data (on the default file directory path) into the instrument state.
Notes	<p>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.</p> <ul style="list-style-type: none"> <li>- If there is a mismatch between file version or model number or instrument version or model number, the recall function tries 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.</li> </ul> <p>After recalling the state, the Recall State function does the following:</p>

- 
- 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.

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<b>Backwards Compatibility SCPI</b>	<code>:MMEMORY:LOAD:STATE 1,&lt;filename&gt;</code>
Initial S/W Revision	For backwards compatibility, the above syntax is supported. The "1" is simply ignored.

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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:

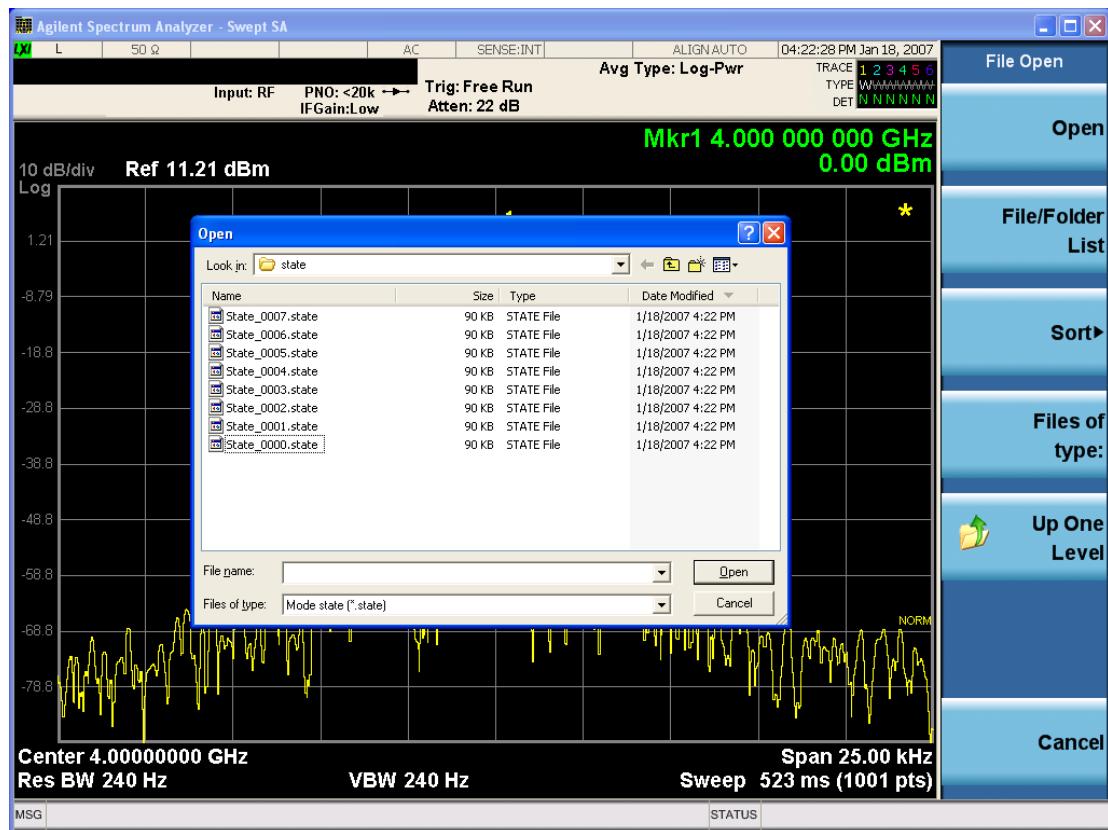
---

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 will have 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	<b>Recall, State</b>
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

### 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.

For more information and the SCPI command, see Edit Register Names under the **Save, State** function.

Key Path	<b>Recall, State</b>
Mode	All
Dependencies	N9060A-7FP or N9060B-2FP license required to edit the register names. When the feature is not licensed, sending the SCPI command generates an error, -221,"Settings conflict;Option not

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	available"
Initial S/W Revision	A.11.00

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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
<b>Example</b>	*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 <b>Save, State,Edit Register Names</b> 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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## 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
<b>Example</b>	*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 <b>Save, State,Edit Register Names</b> 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

## 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.

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	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

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### 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.

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 EDGE GSM PN
<b>Remote Command</b>	:MMEMory:LOAD:CORRection 1 2 3 4 5 6 7 8, <filename>
<b>Example</b>	: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 D:\User_My_Documents\Instrument\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.

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Couplings	When a correction file is loaded from mass storage, it is automatically turned on ( <b>Correction ON</b> ) and <b>Apply Corrections</b> is set to On. This allows you to see its effect, thus confirming the load.
Readback	selected Correction
<b>Backwards Compatibility SCPI</b>	<code>:MMEMORY:LOAD:CORRECTION ANTenna   CABLE   OTHER   USER, &lt;filename&gt;</code> 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

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### 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	<b>Recall, Data, Amplitude Correction</b>
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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### 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 1039 in **Recall, State**, for a full description of this dialog and menu.

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Key Path	<b>Recall, Data</b>
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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## 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 699

Key Path	Front-panel key
<b>Remote Command</b>	:INITiate[:IMMEDIATE] :INITiate:RESTART
<b>Example</b>	: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 <b>Restart</b> hardkey and the INITiate:RESTART command restart trace averages (displayed average count reset to 1) for a trace in <b>Clear Write</b> , but did not restart <b>Max Hold</b> and <b>Min Hold</b> . In the X-Series, the <b>Restart</b> hardkey and the INITiate:RESTART command restart not only <b>Trace Average</b> , but <b>MaxHold</b> and <b>MinHold</b> traces as well. For wireless comms modes in ESA and PSA, the <b>Restart</b> 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, Verbose SCPI) 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
<b>Remote Command</b>	:MMEMORY:STORe:STATe <filename>
<b>Example</b>	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.

---

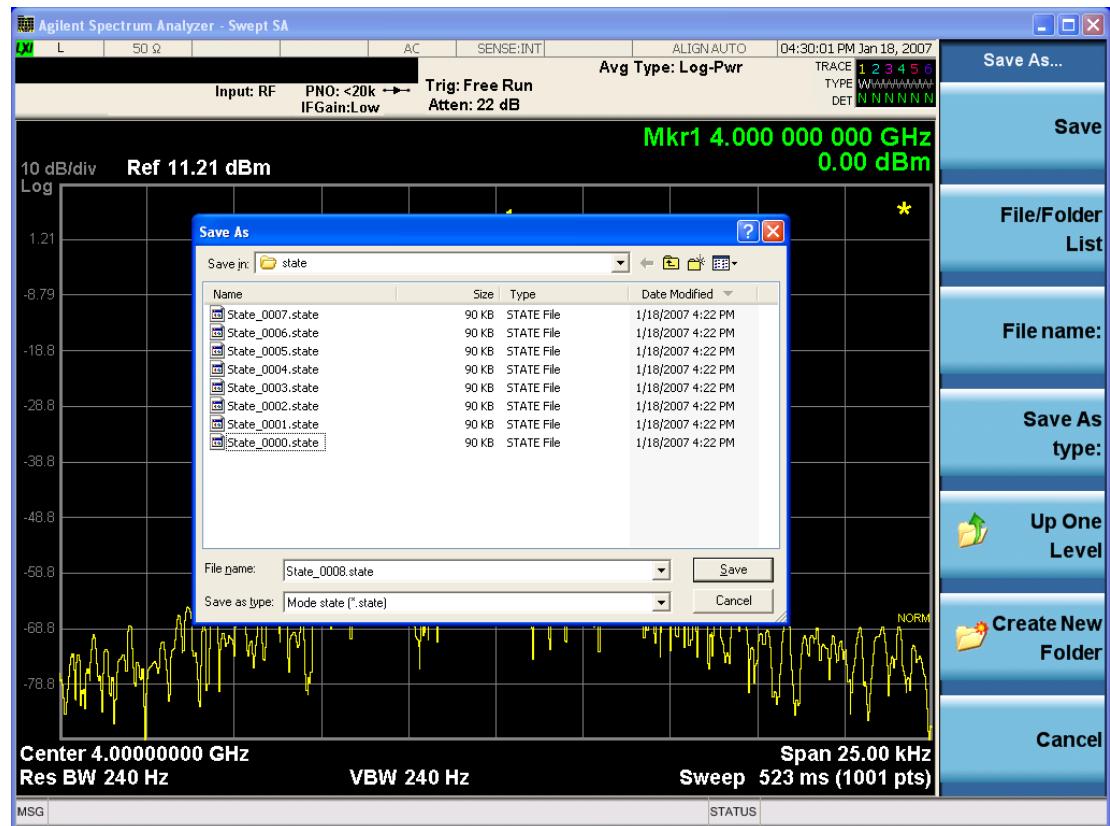
Initial S/W Revision

Prior to A.02.00

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**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 1034](#) 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	<b>Save, State</b>
Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

### 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 706

Key Path	<b>Save, State</b>
Mode	All
<b>Remote Command</b>	:MMEMory:REGister:STATE:LAbel <reg number>,"label" :MMEMory:REGister:STATE:LAbel? <reg number>
<b>Example</b>	: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.

## 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
<b>Example</b>	*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 <b>Edit Register Names</b> key OR "(empty)" if no prior save operation has been performed to this register.

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Initial S/W Revision

Prior to A.02.00

Modified at S/W  
Revision

A.11.00

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## 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
<b>Example</b>	*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 <b>Edit Register Names</b> 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

## 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 you to 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 709

Key Path	Save
<b>Remote Command</b>	<code>:MMEMORY:STORe:CORRection 1 2 3 4 5 6, &lt;filename&gt;</code>
<b>Example</b>	: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
<b>Backwards Compatibility SCPI</b>	: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

<b>Line #</b>	<b>Type of field</b>	<b>Example</b>	<b>Notes</b>
			correction data, refer to the Input/Output, Corrections key description. Allowable values: dBv/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 Bias or 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

### 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 713.

See "Marker Table" on page 713.

See "Peak Table" on page 716.

See "Spectrogram" on page 720

Remote Command	:MMEMORY:STOR:RESULTS:MTAB PTAB 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

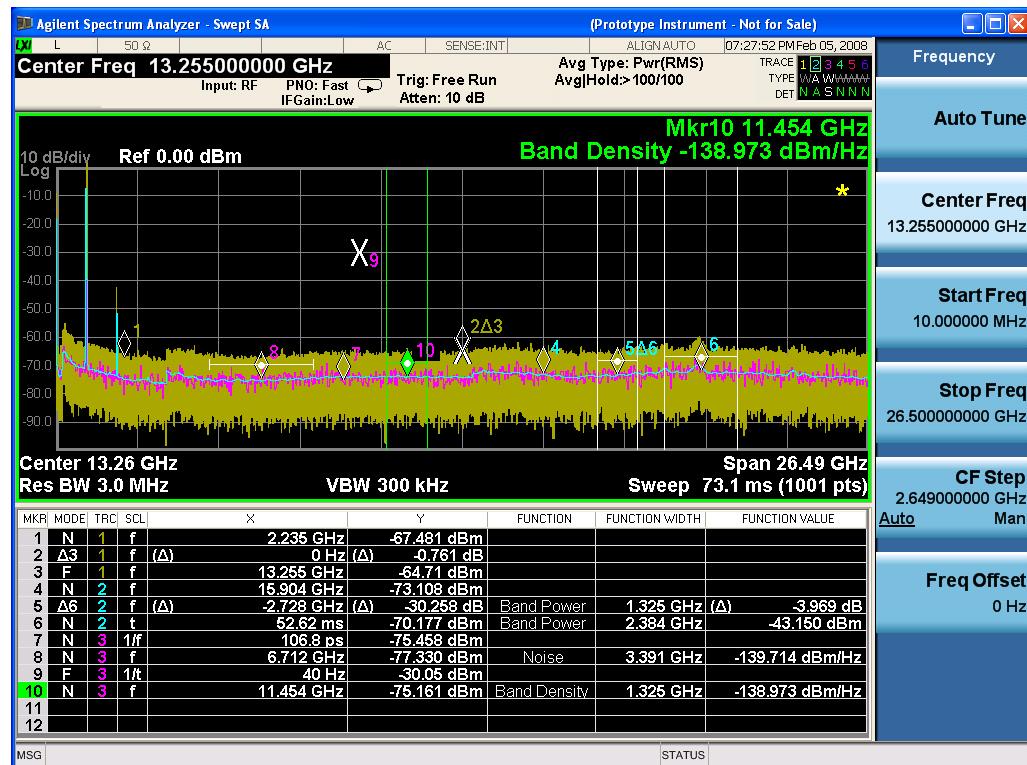
## Meas Results File Contents

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:

---

Measureme  
ntResult

---

Swept SA

---

A.01.40\_ N9020A  
R0017

---

526 B25 1

PFR P26	
EA3	
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.06626 6667
Start Frequency	100000 00
Stop Frequency	265000 00000
Average Count	0
Average Type	LogPower (Video)
RBW	300000 0
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	300000 0
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	T R C	SCL	X	Y	FUNCTION	FUNCTION WIDT H	FUNCTION VALU E	FUNCTION UNIT
1	Normal	1	Frequ ency	2.235 0E+09	- 67. 48 1	Off	0.000 0E+00	0	None
2	Delta3	1	Frequ ency	0.000 0E+00	- 0.7 61	Off	0.000 0E+00	0	None
3	Fixed	1	Frequ ency	1.325 5E+10	- 64. 71	Off	0.000 0E+00	0	None
4	Normal	2	Frequ ency	1.590 4E+10	- 73. 10 8	Off	0.000 0E+00	0	None
5	Delta7	2	Frequ ency	- 2.728 0E+09	- 30. 25 8	Band Power	1.325 0E+06	- 3.969	dB
6	Normal	2	Time	5.262 0E-02	- 70. 17	Band Power	2.384 0E+06	- 43.15	dBm

7										
7	Normal	3	Perio d	1.068 0E-10	- 75. 45 8	Off	0.000 0E+00	0	None	
8	Normal	3	Frequ ency	6.712 0E+09	- 77. 33	Noise	3.391 0E+06	- 139.7 14	dBm/ Hz	
9	Fixed	3	Inver se Time	4.000 0E+01	- 30. 05	Off	0.000 0E+00	0	None	
10	Normal	3	Frequ ency	1.145 4E+10	- 75. 16 1	Band Densi ty	1.325 0E+06	- 138.9 73	dBm/ Hz	
11	Off	1	Frequ ency	0.000 0E+00	0	Off	0.000 0E+00	0	None	
12	Off	1	Frequ ency	0.000 0E+00	0	Off	0.000 0E+00	0	None	

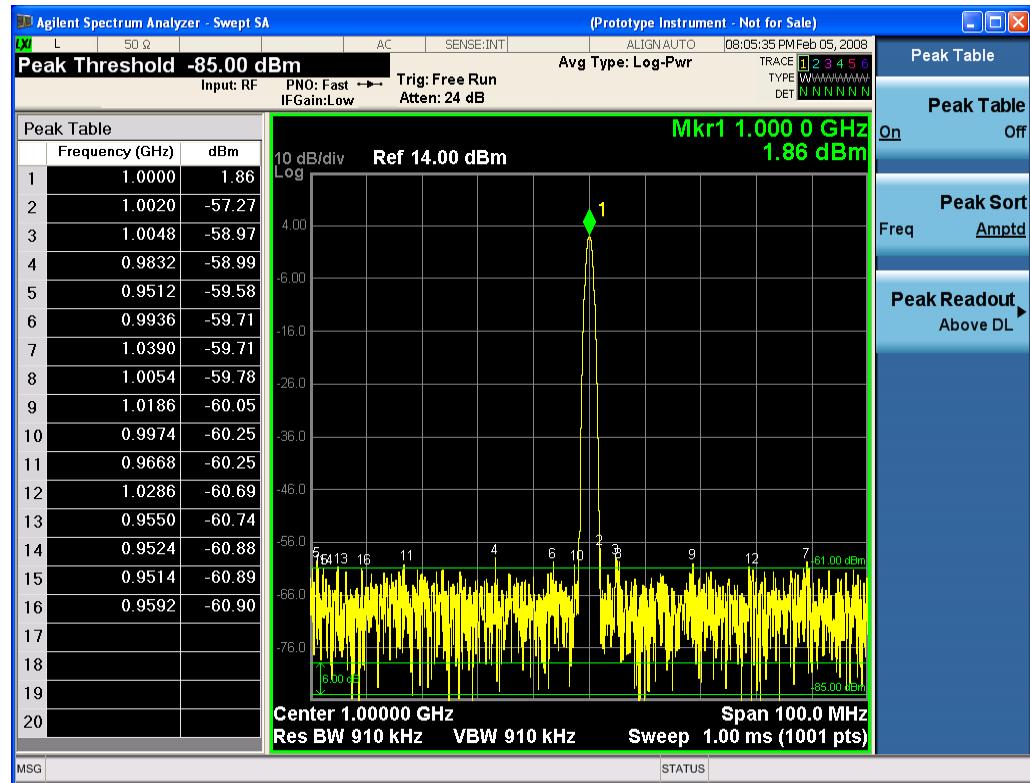
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

The metadata header is very similar to the metadata used in the trace data .csv files. See Trace File Contents. 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:

---

**MeasurementResults**

---



---

Swept SA

---

A.18.00	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	Delta to Limit
1	1.000009988E+09	-26.08	41.1
2	9.99989974E+08	-26.11	43.9
3	1.000019929E+09	-29.47	35.2
4	9.999799016E+08	-29.54	40.4
5	1.000030002E+09	-37.51	23.1
6	9.999699601E+08	-37.62	32.4
7	9.999999155E+08	-37.71	32.3
8	1.000039943E+09	-48.38	9.1
9	9.999598877E+08	-48.55	21.4
10	1.000049885E+09	-61.43	-8.1
11	9.999499461E+08	-61.66	8.3
12	1.000059957E+09	-76.53	-26.1
13	9.999398738E+08	-77.01	-7.6
14			
15			
16			
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.

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

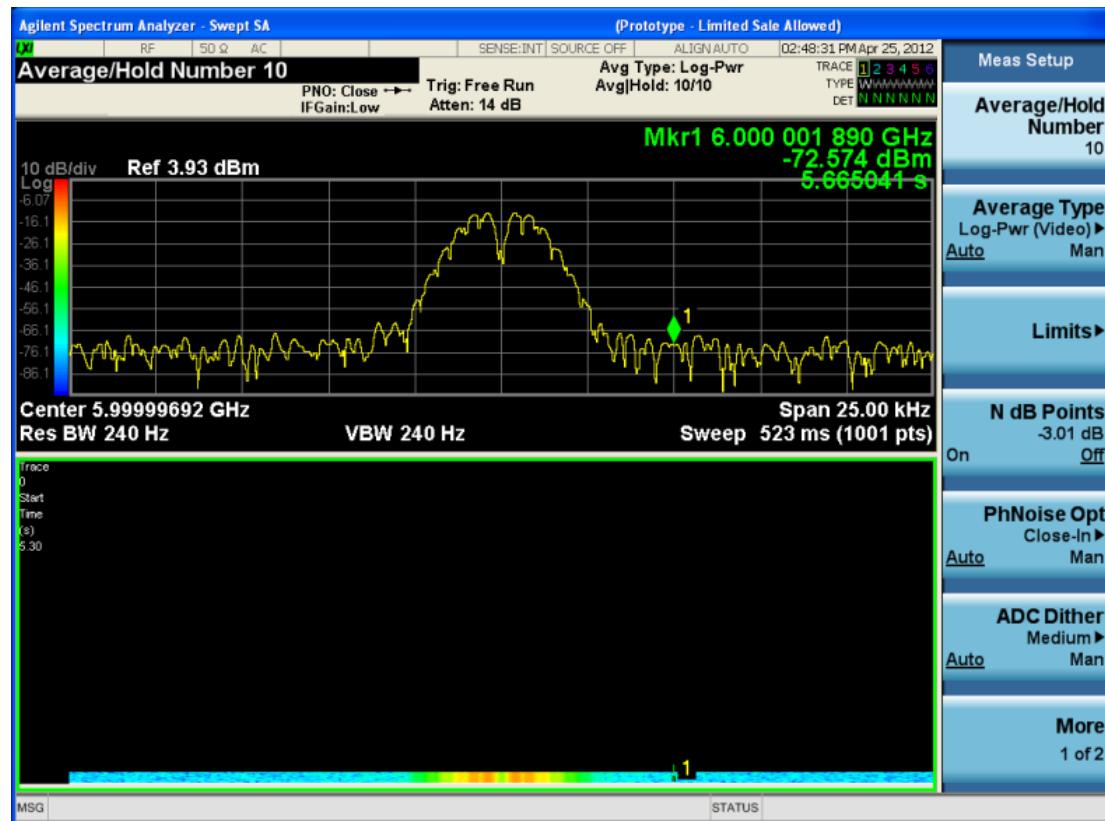
**NOTE**

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 different 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 seconds after the Spectrogram started (trace 10 has a start 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	1
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	

<b>Result Type</b>	<b>Spectrogram</b>
P26 PFR RTL RTS S40 SB1	
SEC SM1 UK6 YAS YAV	
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
RF Calibrator	Off
Attenuation	14
Ref Level Offset	0
External Gain	0
Trace Type	Clearwrite
Detector	Normal
Trace Math	Off
Trace Math Oper1	Trace5

<b>Result Type</b>	<b>Spectrogram</b>
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
<hr/>	
...	
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
<hr/>	
...	
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
...	
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 1048](#) 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

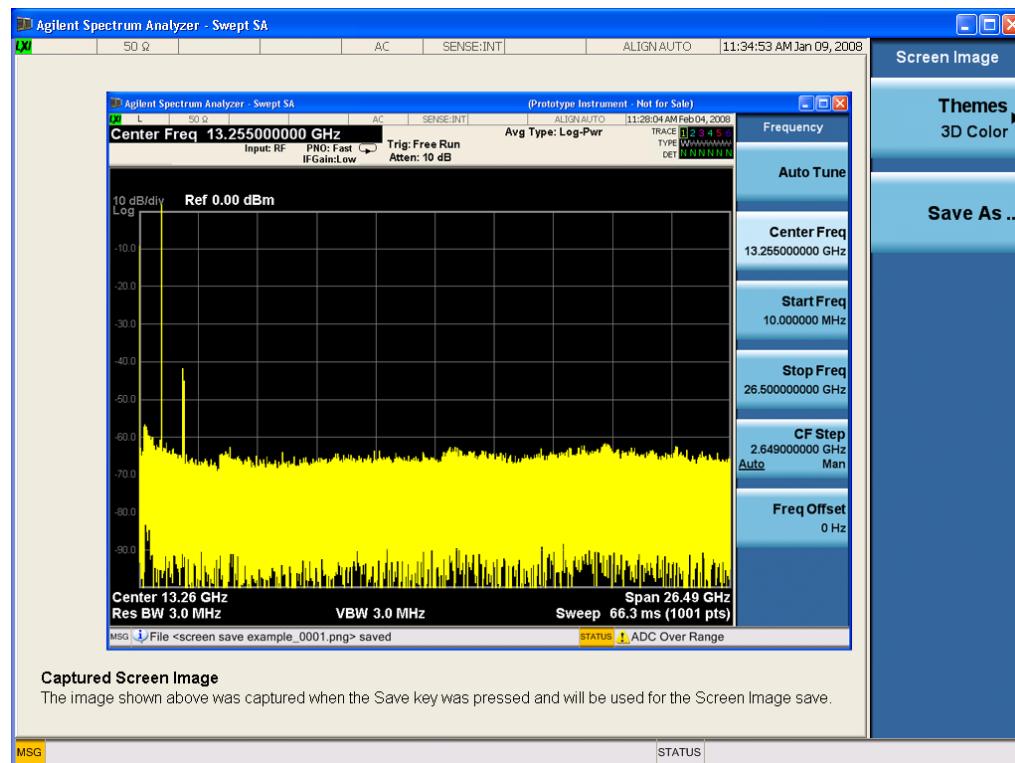
### Screen Image

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
<b>Remote Command</b>	:MMEMORY:STOR:SCReen <filename>
<b>Example</b>	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
<b>Backwards Compatibility SCPI</b>	HCOPY:SDUMP:DATA? returns the screen image in a <DEFINITE LENGTH ARBITRARY RESPONSE DATA> element. The response data is IEEE Block format; the controlling computer can strip the header and store the result as a .png file.
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
<b>Remote Command</b>	:MMEMORY:STOR:SCReen:THEMe TDColor   TDMonochrome   FCOLor   FMONochrome :MMEMORY:STOR:SCReen:THEMe?
<b>Example</b>	: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 you 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
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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 1048 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	<b>Save, Screen Image</b>
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

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## Mass Storage Catalog (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:CATalog? [&lt;directory_name&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>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:</p> $\langle\text{numeric\_value}\rangle,\langle\text{numeric\_value}\rangle,\{\langle\text{file\_entry}\rangle\}$ <p>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 <math>\langle\text{file\_entry}\rangle</math> is a string. Each <math>\langle\text{file\_entry}\rangle</math> indicates the name, type, and size of one file in the directory list:</p> $\langle\text{file\_name}\rangle,\langle\text{file\_type}\rangle,\langle\text{file\_size}\rangle$ <p>As the windows file system has an extension that indicates file type, <math>\langle\text{file\_type}\rangle</math> is always empty. <math>\langle\text{file\_size}\rangle</math> provides the size of the file in bytes. For directories, <math>\langle\text{file\_entry}\rangle</math> is surrounded by square brackets and both <math>\langle\text{file\_type}\rangle</math> and <math>\langle\text{file\_size}\rangle</math> are empty</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Change Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:CDIRectory [&lt;directory_name&gt;]</code> <code>:MMEMory:CDIRectory?</code>
Notes	<p>The string must be a valid logical path.</p> <p>Changes the default directory for a mass memory file system. The <math>\langle\text{directory\_name}\rangle</math> parameter is a string. If no parameter is specified, the directory is set to the *RST value.</p> <p>At *RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal.</p> <p>Query returns full path of the default directory.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Copy (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:COPY &lt;string&gt;,&lt;string&gt;[,&lt;string&gt;,&lt;string&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>Copies an existing file to a new file or an existing directory to a new directory.</p> <p>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.</p> <p>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.</p> <p>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.</p>

## Mass Storage Device Copy (Remote Command Only)

This command transfers data to/from a file and a peripheral device.

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:COPY:DEVICE &lt;source_string&gt;,&lt;dest_string&gt;</code>
Notes	<p>The strings must be a valid logical path or a valid device keyword. If the dest_string is a device keyword, the data is copied from the source file to the device. If the source_string is a device keyword, the data is copied to the source file from the device.</p> <p>Valid device keywords are:</p> <ul style="list-style-type: none"> <li>SNS (smart noise source)</li> </ul> <p>An error is generated if the file or device is not found.</p>

## Mass Storage Delete (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:DELETE &lt;file_name&gt;[,&lt;directory_name&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a file from the specified directory. The &lt;file_name&gt; 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.</p>
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.

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:DATA &lt;file_name&gt;, &lt;data&gt;</code> <code>:MMEMORY:DATA? &lt;file_name&gt;</code>
Notes	<p>The string must be a valid logical path.</p> <p>The command form is MMEMORY:DATA &lt;file_name&gt;,&lt;data&gt;. It loads &lt;data&gt; into the file &lt;file_name&gt;. &lt;data&gt; is in 488.2 block format. &lt;file_name&gt; is string data.</p> <p>The query form is MMEMORY:DATA? &lt;file_name&gt; with the response being the associated &lt;data&gt; in block format.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Make Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:MDIRECTORY &lt;directory_name&gt;</code>
Notes	<p>The string must be a valid logical path.</p> <p>Creates a new directory. The &lt;directory_name&gt; parameter specifies the name to be created.</p>

---

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.

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Initial S/W Revision	Prior to A.02.00
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### Mass Storage Move (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:MOVE &lt;string&gt;,&lt;string&gt;[,&lt;string&gt;,&lt;string&gt;]</b>
Notes	<p>The string must be a valid logical path.</p> <p>Moves an existing file to a new file or an existing directory to a new directory.</p> <p>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.</p> <p>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.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Remove Directory (Remote Command Only)

---

Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RDIRectory &lt;directory_name&gt;</b>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a directory. The &lt;directory_name&gt; parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Determine Removable Media (Remote Command Only)

This command is used to determine if any removable media devices are connected to the instrument. Primarily, these are USB memory devices plugged-in to the front panel or rear panel USB ports. On instruments with PC6 or PC7 CPU's, one SD card slot is available for removable media. The instrument's primary disk drive is not a removable media device.

---

Key Path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RMEDIA:LIST?</b>

---

---

Notes	The return value is a string containing a list of partition identifiers that are removable media devices. Each identifier is separated by a comma. If no removable media is present, an empty string is returned.  Examples: <ul style="list-style-type: none"><li>- One removable device present results in a return string of "F:".</li><li>- Two removable devices present results in a return string of "F;G;".</li><li>- No removable devices present results in a return string of "".</li></ul>
Initial S/W Revision	x.15.00

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## Mass Storage Determine Removable Media Label (Remote Command Only)

This command is used to set or query a removable media device's label.

---

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMORY:RMEDIA:LABEL <partition>,<string> :MMEMORY:RMEDIA:LABEL? <partition>
<b>Example</b>	MMEM:RMED:LAB "F:","My Device"
Notes	If the <partition> specified does not exist or is not a removable media device, the error -252,"Missing Media" is generated.  Setting the removable media label requires Administrative privileges. If the currently logged in user does not have appropriate privileges the error "-221.9900,Settings conflict;Administrator privileges required" is generated.
Initial S/W Revision	x.15.00

---

## Mass Storage Determine Removable Media Write-protect status (Remote Command Only)

This command is used to query a removable media device's write-protect status.

---

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMORY:RMEDIA:WProtect? <partition>
<b>Example</b>	MMEM:RMED:WPR? "F:"
Notes	The return value is 1 if the device is write-protected, or 0 if the device is write-enabled.  If the <partition> specified does not exist or is not a removable media device the error -252,"Missing Media" is generated.
Preset	The return value will be depending on SD card installed.
Initial S/W Revision	x.15.00

---

## Mass Storage Determine Removable Media size (Remote Command Only)

This command is used to query a removable media device's total memory size (not available memory size).

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMORY:RMEDIA:SIZE? <partition>
<b>Example</b>	MMEM:RMED:SIZE? "F:"
Notes	The return value is integer value in GBytes. Any device that is less than 1 GB returns 0 GB. If the <partition> specified does not exist or is not a removable media device, the error -252,"Missing Media" is generated.
Initial S/W Revision	x.15.00

## :SYSTem:SET (Remote Command Only)

Remote command that allows the user to obtain the state of the currently active mode in a form that can then be loaded back into the instrument quickly.

<b>Remote Command</b>	SYSTem:SET <instrument state in IEEE Block> SYSTem:SET?
Notes	SYST:SET? returns current instrument state of the active mode in IEEE Block data format. The state is in a machine readable format only. Sending the query returns the following format: <syst set preamble><state block data> Where: <syst set preamble> is the format: #NMMM N=number of digits that comprise MMM MMM=length in bytes of following data <state block data> is machine readable state data Example response: #42016<state data> The state is recalled by sending the SYST:SET? Response data to the instrument. From example above: SYST:SET #42016<state data>
Initial S/W Revision	x.17.00

## 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 733

Key Path	Front-panel key
<b>Example</b>	:INIT:CONT OFF
Notes	See <b>Cont</b> key description.
Backwards Compatibility Notes	<p>For Spectrum Analysis mode in ESA and PSA, the <b>Single</b> 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 <b>Max Hold</b> and <b>Min Hold</b>. In the X-Series, the <b>Single</b> hardkey and the INITiate:IMM command initiate a sweep/ measurement/ average sequence/hold sequence including <b>MaxHold</b> and <b>MinHold</b>.</p> <p>For Spectrum Analysis mode in ESA and PSA, the <b>Single</b> hardkey restarted the sweep regardless of whether or not you were in an active sweep or sweep sequence. In the X-Series, <b>Restart</b> does this but <b>Single</b> only restarts the sweep or sweep sequence if you are in the idle state.</p> <p>INIT[:IMM] in ESA &amp; 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.</p>
Initial S/W Revision	Prior to A.02.00

## More Information

See "Restart" on page 1045 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
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## SPAN X Scale

There is no 'SPAN X Scale' functionality supported in the Phase Noise Spot Frequency measurement. The front-panel key displays a blank menu when pressed.

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

## 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

Allows you to specify the sweep time.

When sweep time mode is set to auto the sweep time is calculated as:

$$\text{sweeptime} = \max(1e-3, (4.222 / \text{rbw})) \text{ thus}$$

$$\text{sweeptime} = \max(1e-3, (17.8084 / \text{rbw}))$$

Key path	Sweep/Control
Mode	PN
<b>Remote Command</b>	<pre>[ :SENSe]:SFREQUENCY:SWEep:TIME &lt;time&gt; [ :SENSe]:SFREQUENCY:SWEep:TIME? [ :SENSe]:SFREQUENCY:SWEep:TIME:AUTO ON OFF 1 0 [ :SENSe]:SFREQUENCY:SWEep:TIME:AUTO?</pre>
<b>Example</b>	<pre>SFR:SWE:TIME 0.01 SFR:SWE:TIME? :SFR:SWE:TIME:AUTO ON :SFR:SWE:TIME:AUTO?</pre>
Preset	Automatically calculated
State Saved	Saved in instrument state.
Min	1 ms
Max	4000
Initial S/W Revision	Prior to A.02.00

### Pause/Resume

Pauses a measurement after the current data acquisition is complete.

When Paused, the label on the key changes to Resume. Pressing Resume unpauses the measurement. When you are Paused, pressing **Restart**, **Single** or **Cont** does a Resume.

Key Path	Sweep/Control
<b>Remote Command</b>	<code>:INITiate:PAUSE</code>
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
<b>Remote Command</b>	: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 analyzer 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 analyzer is set for Continuous measurement, it 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 set for Single measurement, it remains in the "idle" state until an :INIT:IMM command is received.

<b>Remote Command</b>	:ABORT
<b>Example</b>	:ABOR
Notes	If :INITiate:CONTinuous is ON, then a new continuous measurement will start 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 feed into OPC are cleared by the ABORT, the ABORT will cause the *OPC query to return true.
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## System

See "System" on page 293

## Trace/Detector

No Trace/Detector settings are available for this measurement. You may query the measurement for a read-only result as follows:

Queries and returns the detection mode.

**NOTE**

This parameter is query only and always set to average detector.

Mode	PN
<b>Remote Command</b>	[ :SENSe]:SFREquency:DETector[:FUNCTION]?
<b>Example</b>	SFR:DET?
Notes	Read Only
Preset	AVERage
State Saved	Saved in instrument state.
Range	AVERage
Initial S/W Revision	Prior to A.02.00

## Trigger

See "Trigger" on page 385

### Free Run

See "Free Run" on page 393

### Video

See "Video (IF Envelope)" on page 394

### Line

See "Line" on page 563

### Trig Slope

See "Trig Slope" on page 563

### Trig Delay

See "Trig Delay" on page 399

### X Axis Relative to Trigger

See "X Axis Relative to Trigger" on page 421

### External 1

See "External 1" on page 575

### Trigger Level

See "Trigger Level" on page 576

### Trig Slope

See "Trig Slope" on page 576

### Trig Delay

See "Trig Delay" on page 402

### X Axis Relative to Trigger

See "X Axis Relative to Trigger" on page 421

### External 2

See "External 2" on page 577

### Trigger Level

See "Trigger Level" on page 577

**Trig Slope**

See "Trig Slope" on page 578

**Trig Delay**

See "Trig Delay" on page 404

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**RF Burst**

See "RF Burst" on page 578

**Absolute Trigger**

See "Absolute Trigger Level" on page 579

**Relative Trigger**

See "Relative Trigger Level" on page 568

**Trig Slope**

See "Trigger Slope" on page 580

**Trig Delay**

See "Trig Delay" on page 409

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Periodic Timer**

See "Periodic Timer (Frame Trigger)" on page 570

**Period**

See "Period" on page 572

**Offset**

See "Offset" on page 572

**Offset Adjust (Remote Command Only)**

See "Offset Adjust (Remote Command Only)" on page 573

**Reset Offset Display**

See "Reset Offset Display" on page 574

**Sync Source**

See "Sync Source" on page 574

**Off**

See "Off" on page 575

**External 1**

See "External 1" on page 575

**Trigger Level**

See "Trigger Level" on page 576

**Trig Slope**

See "Trig Slope" on page 576

**External 2**

See "External 2" on page 577

**Trigger Level**

See "Trigger Level" on page 577

**Trig Slope**

See "Trig Slope" on page 578

**RF Burst**

See "RF Burst" on page 578

**Absolute Trigger**

See "Absolute Trigger Level" on page 579

**Trig Slope**

See "Trigger Slope" on page 580

**Trig Delay**

See "Trig Delay" on page 421

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Auto/Holdoff**

See "Auto/Holdoff" on page 422

**Auto Trig**

See "Auto Trig" on page 423

**Trig Holdoff**

See "Trig Holdoff" on page 423

**Holdoff Type**

See "Holdoff Type" on page 424

## 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	<p>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.</p> <p>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.</p> <p>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.</p> <p>User Preset recalls mode state which can now include data like traces; whereas on ESA and PSA, User Preset did not affect data.</p>
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
<b>Remote Command</b>	:SYST:PRESet:USER
<b>Example</b>	: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
----------	-------------

<b>Remote Command</b>	:SYST:PRESet:USER:ALL
<b>Example</b>	: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
<b>Remote Command</b>	:SYST:PRESet:USER:SAVE
<b>Example</b>	: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

Accesses a menu of functions that enable you to set the display parameters.

For more information see: "[Graphical View](#)" on page 755 and "[Numerical \(Table View\)](#)" on page 757.

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

### 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.

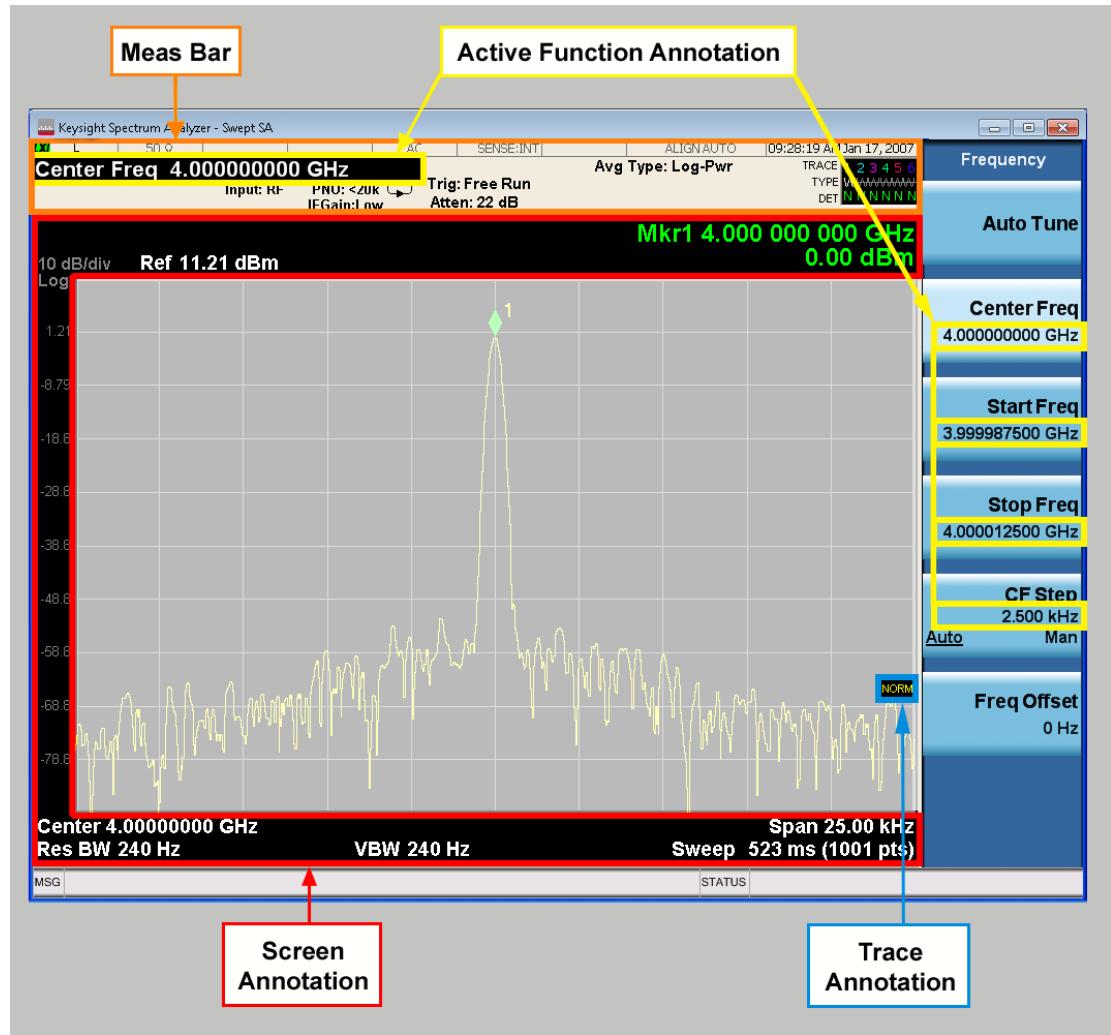
Key Path	<b>Display</b>
Key Path	<b>View/Display</b>
Initial S/W Revision	Prior to A.02.00

### Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

13. 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.
14. 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.
15. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).
16. 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:ANnOAtion:MBAR[:STATe] OFF|ON|0|1  
                              :DISPlay:ANnOAtion: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 <b>System DisplaySettings, Annotation</b> 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
<b>Remote Command</b>	:DISPlay:ANNotation:SCReen[:STATe] OFF ON 0 1 :DISPlay:ANNotation:SCReen[:STATe]?
<b>Example</b>	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.
Preset	On This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

---

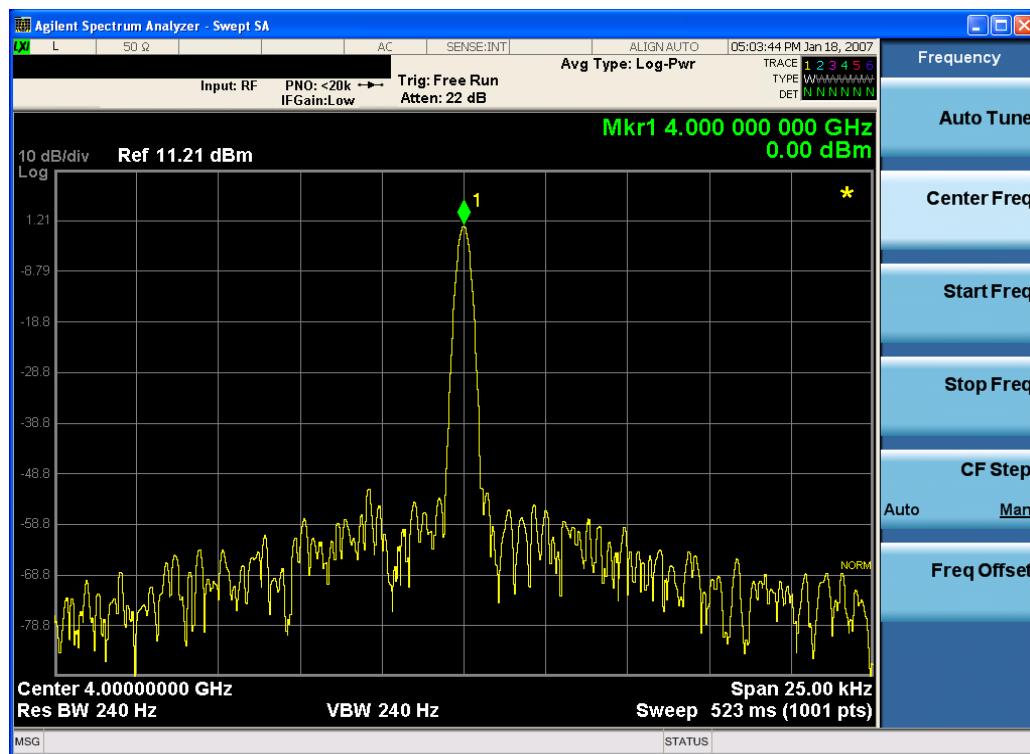
## Active Function Values On/Off

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..

## 9 Spot Frequency Measurement

### View/Display



<b>Key Path</b>	View/Display, Display, Annotation
<b>Remote Command</b>	:DISPlay:ACTivefunc[:STATe] ON OFF 1 0 :DISPlay:ACTivefunc[:STATe]?
<b>Example</b>	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.
Preset	On This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> 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.

<b>Key Path</b>	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
<b>Remote Command</b>	:DISPlay:<measurement>:ANNotation:TITLe:DATA <string> :DISPlay:<measurement>:ANNotation:TITLe:DATA?
<b>Example</b>	<p>DISP:ANN:TITL:DATA "This Is My Title"</p> <p>This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer &lt;measurement&gt; name is not used.</p> <p>DISP:ACP:ANN:TITL:DATA "This Is My Title"</p> <p>This example is for Measurements other than Swept SA.</p> <p>Both set the title to: This Is My Title</p>
Notes	<p>Pressing this key cancels any active function.</p> <p>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.</p>
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
<b>Example</b>	<p>The following commands clear the title and restore the measurement's original title:</p> <p>DISP:ANN:TITL:DATA ""</p> <p>This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer &lt;measurement&gt; name is not used.</p> <p>DISP:ACP:ANN:TITL:DATA ""</p>

---

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
<b>Remote Command</b>	:DISPlay:WINDOW[1]:TRACE:GRATICULE:GRID[:STATe] OFF ON 0 1 :DISPlay:WINDOW[1]:TRACE:GRATICULE:GRID[:STATe]?
<b>Example</b>	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

---

### 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
<b>Remote Command</b>	:DISPlay:WINDOW[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDOW[1]:ANNotation[:ALL]?
<b>Example</b>	: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

## 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
<b>Remote Command</b>	:MMEMory:STOR:SCReen:THEMe TDColor   TDMonochrome   FCOLor   FMONochrome :MMEMory:STOR:SCReen:THEMe?
<b>Example</b>	: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 you 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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Remote Command</b>	:DISPLAY:BACKlight ON OFF :DISPLAY:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
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
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

## Graphical View

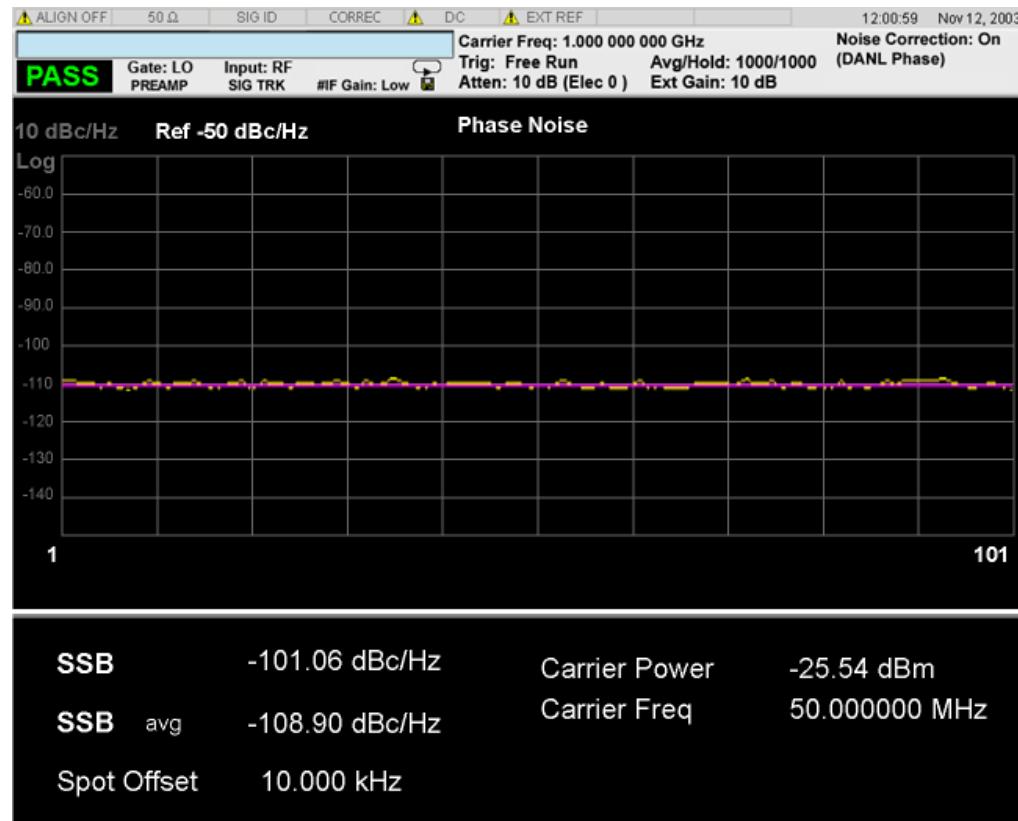
Selects a graphical display of Phase Noise results (default display) with 2 graphs: a scrolling display of Phase Noise vs. Sample Number at the offset frequency and a Delta Frequency vs. Frequency graph showing signal tracking. A table of numerical results for SSB phase noise, carrier frequency and carrier power is shown below the graphs.

The yellow trace represents the measured Phase Noise of each measurement cycle. The purple trace represents the averaged value of Phase Noise during measurement cycles.

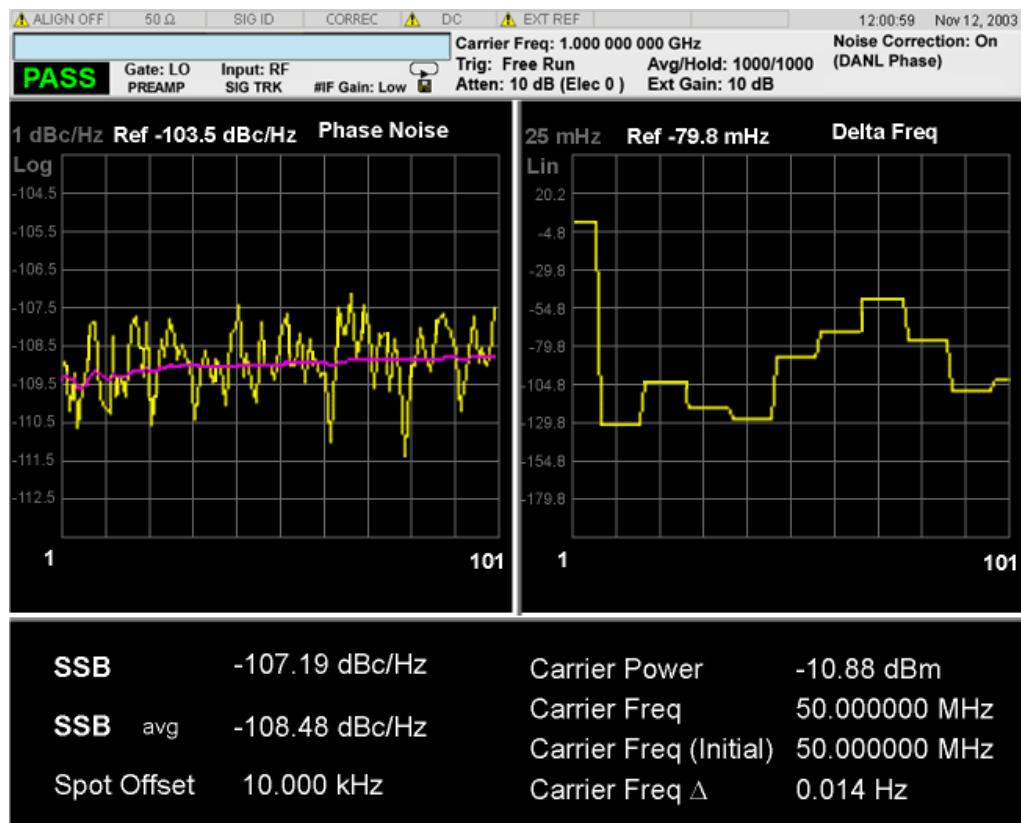
See "["Display" on page 1097](#)" for more information.

Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

## 9 Spot Frequency Measurement View/Display



The Carrier Frequency graph denotes Frequency vs. Time (number of measurements), plotting the Frequency Drift of the carrier. This view appears when Signal Tracking is enabled. Carrier Freq(Initial) and Carrier Freq  $\Delta$  are also shown in the results summary.



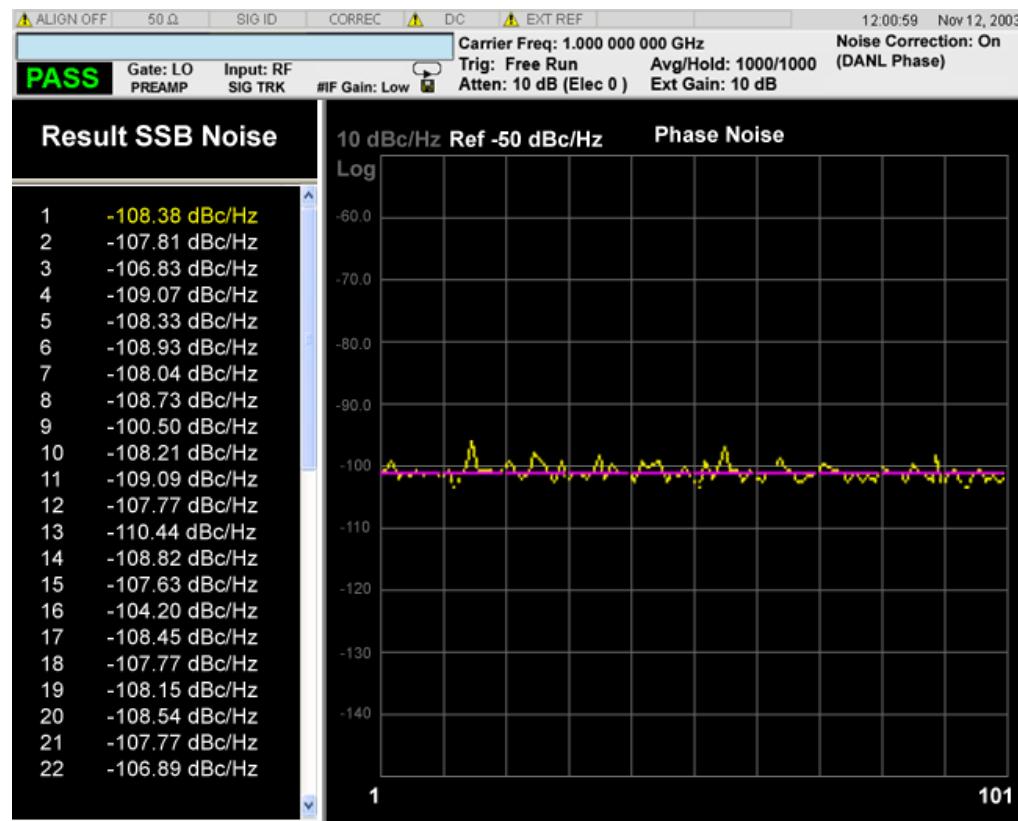
### Numerical (Table View)

The Numerical (Table View) allows the user to view a list of spot offsets and results together with a visual trace of the last 100 samples measured. Use the scroll bar to view results outside the window. See also "Table Index" on page 679 under Meas Setup.

See "Display" on page 1097 for more information.

Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

## 9 Spot Frequency Measurement View/Display



## 10 Log Plot Measurement

The Log Plot measurement makes a phase noise measurement over the range of frequencies specified by the minimum and maximum offset frequencies. After the measurement is completed, the phase noise plot is displayed. .

**NOTE**

If a signal at the specified carrier frequency is lower than -50 dBm, an error “Err 211, Carrier(s) Incorrect or Missing” is returned.

---

This section contains the following sections:

- ["Log Plot Remote Commands" on page 760](#)
- ["Remote Command SCPI Results" on page 761](#)

## Log Plot Remote Commands

The following commands are used to retrieve the measurement results:

```
:CONFigure:LPLot  
:CONFigure:LPLot:NDFault  
:INITiate:LPLot  
:FETCH:LPLot[n]?  
:READ:LPLot[n]?  
:MEASure:LPLot[n]?
```

For more measurement related commands, see the SENSe subsystem, and the "Remote Measurement Functions" on page 986.

## Remote Command SCPI Results

n	Results Returned
Not specified or n=1	Returns seven comma-separated scalar values corresponding following measurement results: 1. Carrier Power (dBm) 2. Carrier Frequency (Hz) 3. RMS Phase Noise over the entire smoothed trace (degrees) 4. RMS Phase Noise over the entire smoothed trace (radians) 5. Residual FM over the entire smoothed trace (Hz) 6. Spot Noise at the Start Offset Frequency (dBc/Hz) 7. Spot Noise at the Stop Offset Frequency (dBc/Hz)
2	Returns three comma-separated scalar values corresponding to the following measurement values: 1. Number of x/y value pairs in Trace 1 2. Number of x/y value pairs in Trace 2 3. Number of x/y value pairs in Trace 3
3	Returns a comma-separated list of the data points from Trace 1. The number of data points in the trace depends on the implementation and the frequency range being measured. This can be found by using the :LPLOT2? command (above):
4	Returns a comma-separated list of the data points from Trace 2. The number of data points in the trace depends on the implementation and the frequency range being measured. This can be found by using the :LPLOT2? command (above):
5	Returns a comma-separated list of the data points from Trace 3. The number of data points in the trace depends on the implementation and the frequency range being measured. This can be found by using the :LPLOT3? command (above):
6	Returns a comma-separated list of the data points which represent the values found on each trace at each decade offset frequency.  The points in the list are returned in the following order: Frequency Offset, Trace number 1 (yellow) amplitude, Trace number 2 (cyan blue) amplitude and Trace number 3 (magenta pink) amplitude.  Any data points that do not have an associated trace, or any data points that are not covered by a particular frequency return SCPI_NAN (Not A Number). The total number of values listed can be calculated by multiplying the number of decades by 4, and adding 4.

## 10 Log Plot Measurement

Key Path	Meas
Initial S/W Revision	Prior to A.02.00

## AMPTD Y Scale

Accesses a menu of functions that allow you to set vertical display scale parameters.

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

### Ref Value

Determines the ref level to be used in measuring the log plot.

Key Path	AMPTD/Y Scale
Mode	PN
<b>Remote Command</b>	<code>:DISPlay:LPLot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel &lt;real&gt;</code> <code>:DISPlay:LPLot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?</code>
<b>Example</b>	<code>DISP:LPL:VIEW:WIND:TRAC:Y:RLEV -70</code> <code>DISP:LPL:VIEW:WIND:TRAC:Y:RLEV?</code>
Preset	-70
State Saved	Saved in instrument state.
Min	-200
Max	200.0
Initial S/W Revision	Prior to A.02.00

## 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.

See "Dual Attenuator Configurations:" on page 764

See "Single Attenuator Configuration:" on page 764

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

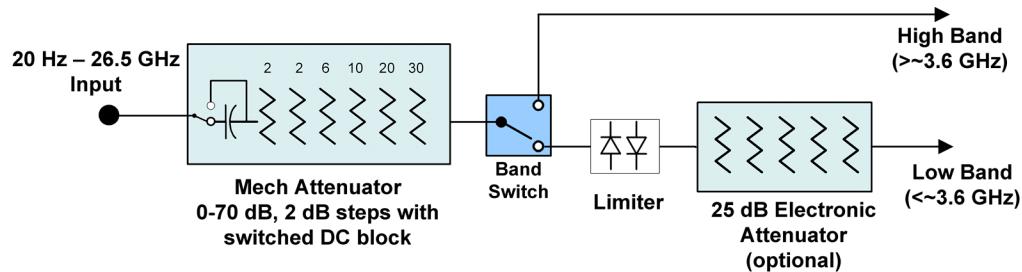
---

	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 930, and "Enable Elec Atten" on page 932 keys for more detail on the contributors to the total attenuation.  Note that when "Pre-Adjust for Min Clip" 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

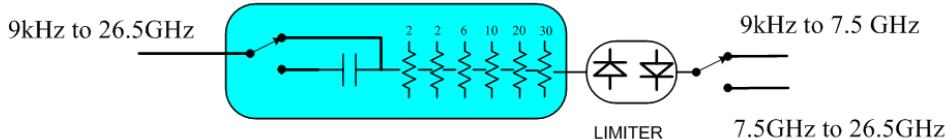
---

### Dual Attenuator Configurations:

Configuration 1: Mechanical attenuator + optional electronic attenuator

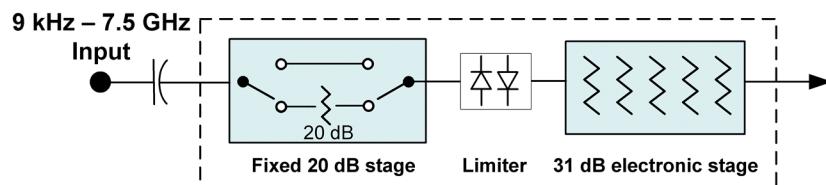


Configuration 2: Mechanical attenuator, no optional electronic attenuator

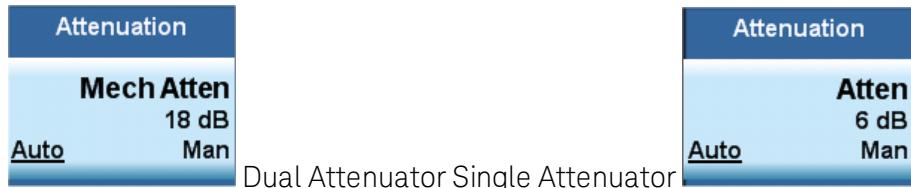


(note that Configuration 2 is not strictly speaking a dual-section attenuator, since there is no electronic section available. However, it behaves exactly like Configuration 1 without the Electronic Attenuator option EA3, therefore for the sake of this document it is grouped into the “Dual Attenuator” configuration)

### Single Attenuator Configuration:



You can tell which attenuator configuration you have by pressing the Attenuation key, which (in most Modes) opens the Attenuation menu. If the first key in the Attenuation menu says **Mech Atten** you have the dual attenuator configuration. If the first key says **Atten** you have the single attenuator configuration.



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 766

Key Path	AMPTD Y Scale, Attenuation
<b>Remote Command</b>	<pre>[ :SENSe]:POWer[:RF]:ATTen<u>uation</u> &lt;rel_ampl&gt; [ :SENSe]:POWer[:RF]:ATTen<u>uation</u>? [ :SENSe]:POWer[:RF]:ATTen<u>uation</u>:AUTO OFF ON 0 1 [ :SENSe]:POWer[:RF]:ATTen<u>uation</u>:AUTO?</pre>
<b>Example</b>	<p>POW:ATT 20</p> <p>Dual attenuator configuration: sets the mechanical attenuator to 20 dB</p> <p>Single attenuator mode: sets the main attenuation to 20 dB (see below for definition of “main” attenuation).</p> <p>If the attenuator was in Auto, it sets it to Manual.</p>
Dependencies	<p>Some measurements do not support the Auto setting of <b>(Mech) Atten</b>. In these measurements, the Auto/Man selection is not available, and the Auto/Man line on the key disappears.</p> <p>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 "<a href="#">Enable Elec Atten</a>" on page 932 key description.</p> <p>See "<a href="#">Attenuator Configurations and Auto/Man</a>" on page 766 for more information on the Auto/Man functionality of Attenuation.</p>
Couplings	<p>When <b>(Mech) Atten</b> is in Auto, it uses the following algorithm to determine a value:</p> <p>If the USB Preamp is connected to USB, use 0 dB.</p>

---

Otherwise, 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.

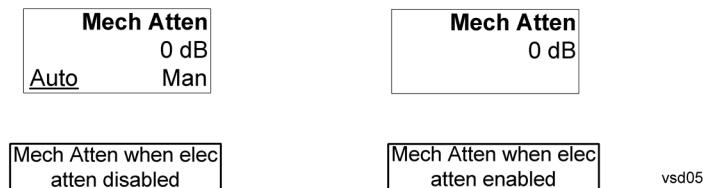
In External Mixing and BBIQ, where the Attenuator is not in the signal path, the Attenuator setting changes as described above when **(Mech) Atten** is in Auto, but no changes are made to the actual attenuator hardware setting until the input is changed back to the RF Input.

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 769 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 931

See Error! Reference source not found.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	<pre>[ :SENSe]:POWer[:RF]:EATTenuation:STATE OFF ON 0 1 [ :SENSe]:POWer[:RF]:EATTenuation:STATE?</pre>
Example	POW:EATT:STAT ON
Dependencies	<p>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 "<a href="#">Attenuator Configurations and Auto/Man</a>" on page 931.</p> <p>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 &gt; 3.6 GHz then the <b>Enable Elec Atten</b> key will be OFF and grayed out.</p> <p>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 <b>Enable Elec Atten</b> key will be OFF and grayed out.</p> <p>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.</p> <p>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.</p> <p>The SCPI-only "soft" electronic attenuation for the single-attenuator configuration is not</p>

	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

### 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	<b>AMPTD Y Scale, Attenuation</b>
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:EATTenuation &lt;rel_ampl&gt;</code> <code>[ :SENSe]:POWer[:RF]:EATTenuation?</code>
Notes	Electronic Attenuation's specification is defined only when Mechanical Attenuation is 6 dB.

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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 " <a href="#">Attenuator Configurations and Auto/Man</a> " on page 931. 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 <b>Enable Elec Atten</b> is off or grayed out, the <b>Elec Atten</b> 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

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### Adjust Atten for Min Clip

Sets the combination of mechanical and electronic attenuation and gain 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 does not appear in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

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Key Path	AMPTD Y Scale, Attenuation
<b>Remote Command</b>	[ :SENSe ] :POWER [ :RF ] :RANGE:OPTImize IMMEDIATE
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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### Pre-Adjust for Min Clip

If this function is on, it does the adjustment described under "[Adjust Atten for Min Clip](#)" on page 935 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
<b>Remote Command</b>	<code>[ :SENSe] :POWer[ :RF] :RANGE:OPTimize:ATTenuation OFF   ELECtrical   COMBined</code> <code>[ :SENSe] :POWer[ :RF] :RANGE:OPTimize:ATTenuation?</code>
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. In instruments with Dual Attenuator model, when <b>Enable Elec Atten</b> is off or grayed out, the <b>Pre-Adjust for Min Clip</b> key is grayed out.
Preset	OFF for Swept SA measurement; ON for all other measurements that support <b>Pre-Adjust for Min Clip</b>
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

<b>Remote Command</b>	<code>[ :SENSe] :POWer[ :RF] :RANGE:AUTO ON OFF 1 0</code> <code>[ :SENSe] :POWer[ :RF] :RANGE:AUTO?</code>
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	<code>:POW:RANGE:OPT:ATT OFF</code>
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 the step 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
<b>Remote Command</b>	[ :SENSe[:RF]:ATTenuation:STEP[:INCRement] 10 dB   2 dB [:SENSe[:RF]:ATTenuation:STEP[:INCRement]?]
<b>Example</b>	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

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Modified at S/W Revision	A.03.00
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## Scale/Div

Determines the displayed amplitude range in the log plot graph. Each y-division in the graticule is worth this amount, so the total is 10x this amount.

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Key Path	AMPTD Y Scale
Mode	PN
<b>Remote Command</b>	:DISPlay:LPLot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:PDIVision <rel_ampl> :DISPlay:LPLot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:PDIVision?
<b>Example</b>	DISP:LPL:VIEW:WIND:TRAC:Y:PDIV 10 DISP:LPL:VIEW:WIND:TRAC:Y:PDIV?
Preset	10.0
State Saved	Saved in instrument state.
Min	0.1 dB
Max	20 dB
Initial S/W Revision	Prior to A.02.00

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## 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 774.

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Key Path	AMPTD Y Scale
<b>Remote Command</b>	[:SENSe]:POWer[:RF]:PCENTER
<b>Example</b>	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

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	message shown by the key press is also shown in response to the remote command.
Dependencies	<ul style="list-style-type: none"> <li>- Grayed out if the microwave preselector is off. )</li> <li>- If the selected marker's frequency is below Band 1, advisory message 0.5001 is generated and no action is taken.</li> <li>- Grayed out if entirely in Band 0.</li> <li>- 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.</li> <li>- Grayed out in the Spectrogram View.</li> </ul>
Couplings	<p>The active marker position determines where the centering will be attempted. If the analyzer is 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.</p>
Status Bits/OPC dependencies	<p>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.</p>
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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### Proper Preselector Operation

A number of considerations should be observed to ensure proper operation:

3. 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.
4. 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
5. 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 944 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
<b>Remote Command</b>	<code>[ :SENSe ] :POWer [ :RF ] :PADJust &lt;freq&gt;</code> <code>[ :SENSe ] :POWer [ :RF ] :PADJust?</code>
<b>Example</b>	<code>POW:PADJ 100KHz</code> <code>POW:PADJ?</code>
Notes	The value on the key reads out to 0.1 MHz resolution.
Dependencies	<ul style="list-style-type: none"> <li>- Grayed out if microwave preselector is off. )</li> <li>- Grayed out if entirely in Band 0.</li> <li>- 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.</li> <li>- Grayed out in the Spectrogram View.</li> </ul>
Preset	0 MHz
State Saved	The <b>Presel Adjust</b> value set by <b>Presel Center</b> , or by manually adjusting <b>Presel Adjust</b> , is not saved in instrument state, and does not survive a Preset or power cycle.
Min	-500 MHz
Max	500 MHz
Default Unit	Hz
<b>Backwards Compatibility SCPI</b>	<code>[ :SENSe ] :POWer [ :RF ] :MW:PADJust</code> <code>[ :SENSe ] :POWer [ :RF ] :MMW:PADJust</code> <p>PSA had multiple preselectors, but the X-Series has only one. These commands simply alias to <code>[ :SENSe ] :POWer [ :RF ] :PADJust</code></p>
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:PADJust:PRESelector MWAVE   MMWave   EXTerinal</code> <code>[ :SENSe]:POWer[:RF]:PADJust:PRESelector?</code>
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

## 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.

Users may choose Low Noise Path Enable. It gives 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	<b>AMPTD Y Scale</b>
Mode	SA, BASIC, PNOISE, VSA , LTE, LTETDD
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:MW:PATH STD   LNPath   MPBypass   FULL</code> <code>[ :SENSe]:POWer[:RF]:MW:PATH?</code>
<b>Example</b>	: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,

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regardless of the setting of  **$\mu$ W Path Control**

The DC Block will always be 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 the user has 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, <b><math>\mu</math>W Path Control</b>
<b>Example</b>	:POW:MW:PATH STD
Readback Text	Standard Path
Initial S/W Revision	A.04.00

### **$\mu$ W 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 unselected 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.

Image responses are separated from the real signal by twice the 1st IF. For IF Paths of 10 MHz and 25 MHz, the 1st IF is 322.5 MHz, so the image response and the real signal will be separated by 645 MHz. The 1st IF will be different for other IF Path settings. When viewing a real signal and its corresponding image response in internal mixing, the image response will be to the left of the real signal.

Also, the image response and the real signal typically have the same amplitude and exhibit the same shape factor.

However, if Option FS1, Fast Sweep Capability, is enabled, the image response in the Swept SA measurement will appear lower in amplitude and have a much wider shape factor compared to the real signal.

Key Path	AMPTD Y Scale, $\mu$ W Path Control
<b>Example</b>	: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	$\mu$ W Preselector Bypass
Initial S/W Revision	A.04.00

<b>Remote Command</b>	[ :SENSe]:POWer[:RF]:MW:PRESelector[:STATe] ON OFF 0 1 [ :SENSe]:POWer[:RF]:MW:PRESelector[:STATe]?
<b>Example</b>	: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.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the status line. For example ,for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

Key Path	AMPTD Y Scale
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:GAIN[:STATe] OFF ON 0 1</code> <code>[ :SENSe]:POWer[:RF]:GAIN[:STATe]?</code>
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.
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be switched On, to Full Range. Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected. Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

Key Path	AMPTD Y Scale, Internal Preamp
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:GAIN:BAND LOW FULL</code> <code>[ :SENSe]:POWer[:RF]:GAIN:BAND?</code>
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
<b>Example</b>	: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
<b>Example</b>	: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
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND FULL
Readback	Full Range
Initial S/W Revision	Prior to A.02.00

### Ref Position

Positions the reference level at the top, center or bottom of the Y Scale display. Changing the reference position does not change the reference level value.

Key Path	AMPTD Y Scale
Mode	PN
<b>Remote Command</b>	:DISPlay:LPLot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION TOP   CENTer   BOTTOM :DISPlay:LPLot:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION?

<b>Example</b>	DISP:LPL:VIEW:WIND:TRAC:Y:RPOS TOP DISP:LPL:VIEW:WIND:TRAC:Y:RPOS?
Preset	TOP
State Saved	Saved in instrument state.
Range	Top   Ctr   Bot
Initial S/W Revision	Prior to A.02.00

## 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.

Users may choose Low Noise Path Enable. It gives 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
<b>Remote Command</b>	[ :SENSe]:POWer[:RF]:MW:PATH STD LNPath MPBypass FULL [ :SENSe]:POWer[:RF]:MW:PATH?
<b>Example</b>	: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,

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regardless of the setting of  **$\mu$ W Path Control**

The DC Block will always be 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 the user has 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

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## 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.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the status line. For example ,for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

Key Path	<b>AMPTD Y Scale</b>
Scope	Meas Global
<b>Remote Command</b>	<b>[ :SENSe]:POWer[:RF]:GAIN[:STATe] OFF ON 0 1</b>  <b>[ :SENSe]:POWer[:RF]:GAIN[:STATe]?</b>
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.
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be

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generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be switched On, to Full Range.

Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected.

Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.

Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

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Key Path	AMPTD Y Scale, Internal Preamp
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe] :POWer[ :RF] :GAIN:BAND LOW FULL</code> <code>[ :SENSe] :POWer[ :RF] :GAIN:BAND?</code>
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

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## 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 keyactions 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.

See "[More Information](#)" on page 784

Key Path	Front-panel key
<b>Remote Command</b>	:COUPLe ALL NONE
<b>Example</b>	:COUP ALL
Notes	:COUPLe ALL puts all Auto/Man parameters in Auto mode (equivalent to pressing the <b>Auto Couple</b> 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.

#### 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.



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#### 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).

- If in Auto, Auto is underlined on the calling key.

- If in manual operation, manual is indicated on the calling key, but note that the calling key simply opens the menu and does **not** actually toggle the function.

## BW

There is no BW functionality for this measurement. The front-panel key displays a blank menu when pressed.

Key Path	Front-panel key
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
<b>Remote Command</b>	:INITiate:CONTinuous OFF ON 0 1 :INITiate:CONTinuous?
<b>Example</b>	: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 <b>Cont</b> hardkey, instead there is a <b>Sweep Single/Cont</b> key. In these analyzers, switching the <b>Sweep Single/Cont</b> key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart <b>Max Hold</b> and <b>Min Hold</b> .  The X-Series has <b>Single</b> and <b>Cont</b> keys in place of the <b>SweepSingleCont</b> key. In the X-Series, if in single measurement, the <b>Cont</b> 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.

## 10 Log Plot Measurement Cont (Continuous Measurement/Sweep)

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 will place the analyzer in Single Sweep but will have no effect on the current sequence until  $k = N$ , at which point the current sequence will stop and the instrument will go to the idle state.

## File

See "File" on page 287

## FREQ Channel

Accesses a menu allowing you to set Frequency parameters for Phase Noise measurements.

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

### Auto Tune

When this key is pressed, the measurement automatically searches for and tunes to the strongest signal within the currently specified search span.

Key Path	FREQ Channel
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	[ :SENSe]:FREQuency:CARRier:SEARch
<b>Example</b>	FREQ:CARR:SEAR
Initial S/W Revision	Prior to A.02.00

### Carrier Freq

Specifies the center frequency of the carrier

Key Path	FREQ Channel
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	[ :SENSe]:FREQuency:CARRier <freq> [ :SENSe]:FREQuency:CARRier?
<b>Example</b>	FREQ:CARR 1 FREQ:CARR?
Notes	When Signal Track is ON, Carrier Frequency is automatically set depending on the signal. When Auto Tune is performed, Carrier Frequency is automatically set as the result of Auto Tuning algorithm.
Preset	1GHz
State Saved	Saved in instrument state.
Min	-79.999995 MHz
Max	Hardware Dependent: Opt503 = 3.69999995 GHz Opt508 = 8.49999995 GHz Opt513 = 13.79999995 GHz Opt526 = 26.99999995 GHz
Initial S/W Revision	Prior to A.02.00

## Signal Tracking

Selects whether or not the analyzer tracks a slowly drifting signal. When signal tracking is Off, the analyzer measures at a fixed frequency. When signal tracking is On, the analyzer repeatedly measures the center frequency of the carrier signal on every acquisition to check for any change that might have occurred, and returns to the new frequency if necessary.

Key Path	FREQ Channel
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:FREQuency:CARRier:TRACK[:STATE] OFF ON 0 1</code> <code>[ :SENSe]:FREQuency:CARRier:TRACK[:STATE]?</code>
<b>Example</b>	<code>FREQ:CARR:TRAC</code> <code>FREQ:CARR:TRAC?</code>
Notes	<p>Signal Tracking assumes the new acquisition occurs repeatedly without pause. If the acquisition is paused, the drifting frequency might be bigger than the tracking algorithm expects, in that case, the analyzer might lose the frequency of carrier. Then, the user can perform Auto Tune to find the carrier again.</p> <p>Repeated realignment of the carrier signal when signal tracking is On causes measurements to take slightly longer than when signal tracking is Off.</p>
Preset	ON
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Tracking

Accesses the menu for tracking parameters.

Key Path	FREQ Channel
Initial S/W Revision	Prior to A.02.00

## Span

Specifies the frequency span for signal tracking functionality. The analyzer searches for the carrier signal from CurrentCenterFrequency – (Span / 2) to CurrentCenterFrequency + (Span / 2). A smaller span will provide a more precise result for signal tracking.

Key Path	FREQ Channel, Tracking
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:FREQuency:CARRier:TRACK:SPAN &lt;freq&gt;</code> <code>[ :SENSe]:FREQuency:CARRier:TRACK:SPAN?</code> <code>[ :SENSe]:FREQuency:CARRier:TRACK:SPAN:AUTO ON OFF 1 0</code>

	<b>[ :SENSe]:FREQuency:CARRier:TRACK:SPAN:AUTO?</b>
<b>Example</b>	FREQ:CARR:TRAC:SPAN 100kHz FREQ:CARR:TRAC:SPAN? FREQ:CARR:TRAC:SPAN:AUTO ON FREQ:CARR:TRAC:SPAN:AUTO?
Couplings	When a value other than the default is set, it turns span auto mode to OFF. When AUTO is specified, the span value turns back to default.
Preset	51kHz ON
State Saved	Saved in instrument state.
Min	10.0 kHz
Max	Hardware Dependent: No option = 10MHz WB (25 MHz or wider) = 25MHz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.06.00

### Accuracy

Specifies the accuracy of signal tracking functionality. Tracking with higher accuracy takes longer.

Key Path	FREQ Channel, Tracking
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	<b>[ :SENSe]:FREQuency:CARRier:TRACK:ACCuracy LOW MED HIGH</b> <b>[ :SENSe]:FREQuency:CARRier:TRACK:ACCuracy?</b>
<b>Example</b>	FREQ:CARR:TRAC:ACC LOW FREQ:CARR:TRAC:ACC?
Preset	MED
State Saved	Saved in instrument state.
Range	Low (Slowest) Medium High (Fastest)
Initial S/W Revision	Prior to A.02.00

## Input/Output

See "Input/Output" on page 141

## Marker

Accesses a menu that enables you to select, set up and control the markers for the current measurement.

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

### Select Marker

Displays 12 markers available for selection.

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

### Marker Type

Sets the marker control mode as described under Normal, Delta and Off, below. All interactions and dependencies detailed under the key description are enforced when the remote command is sent.

Marker Type	Description
Normal	Equivalent to a Spot Frequency marker, this allows you to place and adjust a marker upon the log trace and read the 'Spot Noise' value at any frequency.
Delta	Enables you to compare and find the delta between any two spot frequencies or noise values.

You can have up to 12 independent markers in any combination of the above active at any time, although only the active marker is displayed in the top right hand side of the graph area. To display all of the active marker values at once, the Marker Table operation can be invoked.

Key Path	Marker
Mode	PN
<b>Remote Command</b>	:CALCulate:LPLot:MARKer[1] 2 ... 12:MODE POSITION DELTa OFF :CALCulate:LPLot:MARKer[1] 2 ... 12:MODE?
<b>Example</b>	CALC:LPLot:MARK:MODE POS CALC:LPLot:MARK:MODE?
Notes	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 <b>Marker Trace</b> rules. At the same time, <b>Marker X Axis Value</b> appears on the Active Function area.  Default Active Function: the active function for the selected marker's current control mode. If the current control mode is Off, there is no active function and the active function is turned off.  Active Function Display: the marker X axis value entered in the active function area displays the marker value to its full entered precision.

Preset	OFF
State Saved	Saved in instrument state.
Range	Normal Delta Off
Initial S/W Revision	Prior to A.02.00

### Marker X Axis Value (Remote Command Only)

Sets the marker X Axis value in the current marker X Axis Scale unit. It has no effect if the control mode is Off, but is the SCPI equivalent of entering an X value if the control mode is Normal or Delta.

Mode	PN
<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:X <freq> :CALCulate:LPlot:MARKer[1] 2 ... 12:X?
<b>Example</b>	CALC:LPlot:MARK3:X 10kHz CALC:LPlot:MARK3:X?
Notes	If no suffix is sent, uses 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 error “Invalid suffix” is generated. If the specified marker is Fixed and a Marker Function is on, error -221 “Settings conflict; cannot adjust Fixed marker while Marker Function is on” is generated. The query returns the marker’s absolute X Axis value if the control mode is <b>Normal</b> , or the offset from the marker’s reference marker if the control mode is <b>Delta</b> . The query is returned in the fundamental units for the current marker X Axis scale: Hz for <b>Frequency</b> and <b>Inverse Time</b> , seconds for <b>Period</b> and <b>Time</b> . If the marker is <b>Off</b> the response is Not A Number.
Preset	10kHz
Preset	After a preset, all Markers are turned OFF, so Marker X Axis Value query returns Not A Number (NAN).
State Saved	No
Min	-9.9E37
Max	9.9E37
Initial S/W Revision	Prior to A.02.00
MIN/MAX/DEF Support	Yes

### Marker X Axis Position (Remote Command Only)

Sets the marker X position in trace points. It has no effect if the control mode is **Off**, but is the SCPI equivalent of entering a value if the control mode is **Normal** or **Delta** – except in trace points rather than X Axis Scale units. The entered value is immediately translated into the current X Axis Scale units for setting the value of the marker.

Mode	PN
<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:X:POSition <integer> :CALCulate:LPlot:MARKer[1] 2 ... 12:X:POSition?

<b>Example</b>	CALC:LPlot:MARK10:X:POS 0 CALC:LPlot:MARK10:X:POS?
Notes	If the specified marker is Fixed and a Marker Function is on, error -221 "Settings conflict; cannot adjust Fixed marker while Marker Function is on" is generated.  The query returns the marker's absolute X Axis value in trace points if the control mode is <b>Normal</b> , or the offset from the marker's reference marker in trace points if the control mode is <b>Delta</b> . The value is returned as a real number, not an integer, corresponding to the translation from X Axis Scale units to trace points. If the marker is <b>Off</b> the response is Not A Number.
Preset	500
Preset	After a preset, all Markers are turned OFF, so Marker X Axis Value query returns Not A Number (NAN).
State Saved	No
Min	-9.9E37
Max	9.9E37
Initial S/W Revision	Prior to A.02.00
MIN/MAX/DEF Support	Yes

### Marker Y Axis Value (Remote Command Only)

Queries Y Axis value in the current marker Y Axis unit. The Marker Y Axis unit depends on the selected marker mode and marker function.

- Normal - dBc/Hz
- Delta - dB
- Integrated Noise (Degree) - degree
- Integrated Noise (Radian) - Radian
- Integrated Noise (Seconds) - Seconds
- Integrated Noise (dBc) - dBc
- Residual FM - Hz
- Averaged Noise Density - dBc/Hz

Mode	PN
<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:Y?
<b>Example</b>	CALC:LPlot:MARK11:Y?
Notes	The query returns the marker Y-axis result, if the control mode is <b>Normal</b> or <b>Delta</b> . If the marker is <b>Off</b> the response is Not A Number.
State Saved	No
Initial S/W Revision	Prior to A.02.00

## Properties

Accesses a menu that allows you to set marker properties and to access the marker trace menu.

Key Path	<b>Marker</b>
Initial S/W Revision	Prior to A.02.00

### Select Marker

Displays 12 markers available for selection.

Key Path	<b>Marker</b>
Initial S/W Revision	Prior to A.02.00

### Relative To

Selects the marker that the selected marker is relative to (its reference marker).

Key Path	<b>Marker, Properties</b>
Mode	PN
<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:REFERENCE <integer> :CALCulate:LPlot:MARKer[1] 2 ... 12:REFERENCE?
<b>Example</b>	CALC:LPlot:MARK:REF?
Notes	A marker cannot be relative to itself so that choice is grayed out, and if sent from SCPI generates error -221: "Settings conflict; marker cannot be relative to itself." When queried a single value is returned (the specified marker number's relative marker). You must be in the Spectrum Analysis mode, GSM mode to use this command. Use INSTRument:SELect to set the mode.
Preset	2 3 4 5 6 7 8 9 10 11 12 1
State Saved	Saved in instrument state.
Min	1
Max	12
Initial S/W Revision	Prior to A.02.00

### Marker Trace

Assigns the specified marker to the designated trace.

Key Path	<b>Marker, PropertiesPeak Search</b>
Mode	Int32
<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:TRACe <integer> :CALCulate:LPlot:MARKer[1] 2 ... 12:TRACe?
<b>Example</b>	CALC:LPlot:MARK:TRAC 2 CALC:LPlot:MARK:TRAC?

Preset	2
State Saved	Saved in instrument state.
Min	1
Max	3
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.

Key Path	Marker
Mode	PN
<b>Remote Command</b>	<code>:CALCulate:LPLot:MARKer:TABLE[:STATe] OFF ON 0 1</code> <code>:CALCulate:LPLot:MARKer:TABLE[:STATe]?</code>
<b>Example</b>	<code>CALC:LPL:MARK:TABL 1</code> <code>CALC:LPL:MARK:TABL?</code>
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00

### Couple Marker

When this function is true, moving any marker causes an equal X Axis movement of every other marker which is not Off, including **Fixed** markers. 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).

Key Path	Marker
Mode	PN
<b>Remote Command</b>	<code>:CALCulate:LPLot:MARKer:COUPLE[:STATe] ON OFF 1 0</code> <code>:CALCulate:LPLot:MARKer:COUPLE[:STATe]?</code>
<b>Example</b>	<code>CALC:LPLot:MARK:COUP ON</code> <code>CALC:LPLot:MARK:COUP?</code>
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00

### All Markers Off

Turns off all markers.

Key Path	Marker
Mode	PN
<b>Remote Command</b>	:CALCulate:LPlot:MARKer:AOFF
<b>Example</b>	CALC:LPlot:MARK:AOFF
Initial S/W Revision	Prior to A.02.00

## Marker Function

Marker Functions are enhancements to the basic Marker functionality of the instrument, which 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.

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

### Select Marker

Displays 12 markers available for selection.

Key Path	Marker Function
Initial S/W Revision	Prior to A.02.00

### Marker Function Type

Sets the marker function type. All interactions and dependencies detailed under the key description are enforced when the softkey is pressed or remote command is sent.

Marker Type	Description
Integrated Noise (Degree)	Provides a simple method of setting up, calculating and displaying the rms degree result. This is generally calculated over a specific frequency range, and is therefore implemented as a 'band' marker.
Integrated Noise (Radian)	Same as RMS Degree, although the result is displayed in Radians.
Integrated Noise (Jitter)	Provides the RMS Jitter result calculated from the carrier frequency and the RMS Degree (or Radian) result.
Integrated Noise (dBc)	Provides a total power in a specified marker band span. Unit of result is dBc.
Residual FM (Weighted Integ)	Provides a simple method of setting up, calculating and displaying the residual FM result. This is generally calculated over a specific frequency range, and is therefore implemented as a 'band' marker.
Averaged Noise Density	Provides an averaged noise density in a specified marker band span.

Key Path	Marker Function
Mode	PN
Remote Command	:CALCulate:LPLot:MARKer[1] 2 ... 12:FUNCTION RMSNoise   RFM   AVERage   OFF :CALCulate:LPLot:MARKer[1] 2 ... 12:FUNCTION?
Example	CALC:LPL:MARK:FUNC RFM

---

	CALC:LPL:MARK:FUNC?
Dependencies	Averaged Noise Density, AVERage, is available only when Option N9068A-AFP is installed.
Preset	OFF
State Saved	Saved in instrument state.
Range	Integrated(RMS)Noise  Residual FM(Weighted Integ) Averaged Noise Density Marker Function Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

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### Integrated Noise (Units)

Sets the units of the marker result of RMS Noise Marker. From SCPI, if the specified marker is not activated for the RMS noise function, then the change does not affect the marker result. It is stored and valid when the RMS noise function is activated.

---

Key Path	Marker Function, RMS Noise
Mode	PN
Remote Command	:CALCulate:LPLot:MARKer[1] 2 ... 12:RMSNoise:MODE DEGRee   RADian   JITTER   DBC :CALCulate:LPLot:MARKer[1] 2 ... 12:RMSNoise:MODE?
Example	CALC:LPL:MARK:RMSN:MODE DEGR CALC:LPL:MARK:RMSN:MODE?
Preset	DEGRee
State Saved	Saved in instrument state.
Range	Degree Radian Seconds (Jitter) dBc
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

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### Band Adjust

Accesses a menu that enables you to set the span or right and left edges of the selected marker.

---

Key Path	Marker Function
Initial S/W Revision	Prior to A.02.00

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### Band Span

Sets the width of the span for the selected marker.

---

Key Path	Marker Function, Band Adjust
Mode	PN

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<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:BAND:SPAN <freq> :CALCulate:LPlot:MARKer[1] 2 ... 12:BAND:SPAN?
<b>Example</b>	CALC:LPL:MARK:BAND:SPAN 1MHz CALC:LPL:MARK:BAND:SPAN?
Couplings	Changing the Band Span necessarily changes the Band Left and Band Right values Band Span is set to 0 when the marker is turned off Band 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	5% of Span
State Saved	Saved in instrument state.
Range	Graph Start and Stop Offset Frequencies
Min	Graph Start Frequency
Max	Graph Stop Frequency
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.

Key Path	Marker Function, Band Adjust
Mode	PN
<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:BAND:LEFT <freq> :CALCulate:LPlot:MARKer[1] 2 ... 12:BAND:LEFT?
<b>Example</b>	CALC:LPL:MARK:BAND:LEFT 1MHz CALC:LPL:MARK:BAND:LEFT?
Couplings	Changing the Band Left necessarily changes the Band Span value Band Span is set to 0 when the marker is turned off so that means Band Left is set to the center value at this time Band 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	5% of Span
State Saved	Saved in instrument state.
Range	Graph Start and Stop Offset Frequencies
Min	Graph Start Frequency
Max	Graph Stop Frequency
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

## Band/Interval Right

Sets the right edge frequency or time for the band of the selected marker. The left edge is unaffected.

Key Path	Marker Function, Band Adjust
Mode	PN
<b>Remote Command</b>	:CALCulate:LPLot:MARKer[1] 2 ... 12:BAND:RIGHT <freq> :CALCulate:LPLot:MARKer[1] 2 ... 12:BAND:RIGHT?
<b>Example</b>	CALC:LPL:MARK:BAND:RIGH 1MHz CALC:LPL:MARK:BAND:RIGH?
Couplings	Changing the Band Right necessarily changes the Band Span value Band Span is set to 0 when the marker is turned off so that means Band Right is set to the center value at this time Band 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	5% of Span
State Saved	Saved in instrument state.
Range	Graph Start and Stop Offset Frequencies
Min	Graph Start Frequency
Max	Graph Stop Frequency
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

## Marker To

There is no Marker To functionality supported in this measurement. The front-panel key displays a blank menu when pressed.

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

## Meas

The information in this section is common to all measurements. For key and remote command information for a specific measurement, refer to the section that describes the measurement of interest.

Measurements available under the Meas key are specific to the current Mode.

When viewing Help for measurements, note the following:

**NOTE**

Operation for some keys differs between measurements. The information displayed in Help pertains to the current measurement. To see 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.

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

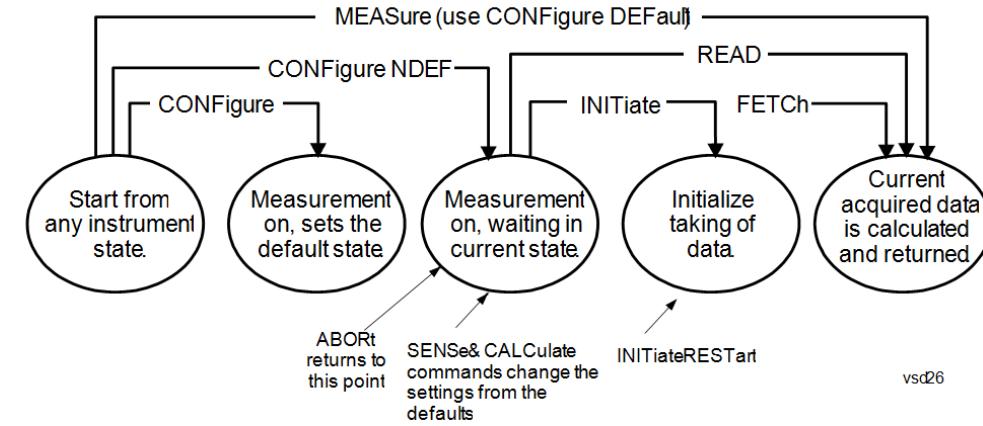
## Remote Measurement Functions

This section contains the following topics:

- "Measurement Group of Commands" on page 987
- "Current Measurement Query (Remote Command Only)" on page 990
- "Limit Test Current Results (Remote Command Only)" on page 990
- "Data Query (Remote Command Only)" on page 990
- "Calculate/Compress Trace Data Query (Remote Command Only)" on page 990
- "Calculate Peaks of Trace Data (Remote Command Only)" on page 996
- "Hardware-Accelerated Fast Power Measurement (Remote Command Only)" on page 997
- "Format Data: Numeric Data (Remote Command Only)" on page 1011
- "Format Data: Byte Order (Remote Command Only)" on page 1012

Initial S/W Revision	Prior to A.02.00
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## Measurement Group of Commands



### Measure Commands:

: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.

- 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.
- If the function does averaging, it is turned on and the number of averages is set to 10.
- After the data is valid it 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.
- 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.
- ASCII is the default format for the data output. (Older versions of Spectrum Analysis and Phase Noise mode measurements only use ASCII.) The binary data formats should be used for handling large blocks of data since they are smaller and faster than the ASCII format. Refer to the FORMat:DATA command 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 you can 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. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to 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 INIT: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 INIT:CONTinuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query 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 Commands:

: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 Commands:

: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

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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 Commands:

: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? it will initiate a new measurement 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 will switch 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. Then you send READ:ACP? It will change from channel power back to ACP and, using the previous ACP settings, will initiate the measurement and return results.
- 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 will be returned. 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 when handling large blocks of data since they are smaller and faster than the ASCII format. (FORMAT:DATA)

### Current Measurement Query (Remote Command Only)

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

<b>Remote Command</b>	:CONFIGURE?
<b>Example</b>	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. It returns a 0 if the measured results pass when compared with the current limits. It returns a 1 if the measured results fail any limit tests.

<b>Remote Command</b>	:CALCULATE:CLIMITS:FAIL?
<b>Example</b>	CALC:CLIM:FAIL? queries the current measurement to see if it fails the defined limits. Returns a 0 or 1: 0 it passes, 1 it fails.
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 and FORMat:DATA commands and can return real or ASCII data. (See the format command descriptions under Input/Output in the Analyzer Setup section.)

<b>Remote Command</b>	:CALCULATE:DATA[n]?
Notes	The return trace depends on the measurement. In CALCULATE:<meas>:DATA[n], n is any valid subopcode for the current measurement. It returns the same data as the FETCh:<measurement>? query where <measurement> 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 analyzer. The command is used with a sub-opcode <n> (default=1) to specify the trace. With trace queries, it is best if the analyzer 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.

<b>Remote Command</b>	:CALCulate:DATA<n>:COMPress? BLOCK   CFIT   MAXimum   MINimum   MEAN   DMEan   RMS   RMSCubed   SAMPlE   SDEViation   PPHase [,<soffset>[,<length>[,<roffset>[,<rlimit>]]]]
<b>Example</b>	<p>To query the mean power of a set of GSM bursts:</p> <p>Supply a signal that is a set of GSM bursts.</p> <p>Select the IQ Waveform measurement (in IQ Analyzer Mode).</p> <p>Set the sweep time to acquire at least one burst.</p> <p>Set the triggers such that acquisition happens at a known position relative to a burst.</p> <p>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.)</p>
Notes	<p>The command supports 5 parameters. Note that the last 4 (&lt;soffset&gt;, &lt;length&gt;, &lt;roffset&gt;, &lt;rlimit&gt;) are optional. But these optional parameters must be entered in the specified order. For example, if you want to specify &lt;length&gt;, then you must also specify &lt;soffset&gt;. See details below for a definition of each of these parameters.</p> <p>This command uses the data in the format specified by FORMat:DATA, returning either binary or ASCII data.</p>
Initial S/W Revision	Prior to A.02.00

- BLOCK or 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. (This is x,y pairs for trace data and I,Q pairs for complex data.)
- CFIT or 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 will return the following values: the x-offset (in seconds) and the curve coefficients ((order + 1) values).

MIN, MAX, MEAN, DME, RMS, RMSC, SAMP, SDEV and PPH return one data value for each specified region (or <length>) of trace data, for as many regions as possible

until you run out of trace data (using <roffset> to specify regions). Or they return the number of regions you specify (using <rlimit>) ignoring any data beyond that.

- MINimum – 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 maximum magnitude of the I/Q pairs is returned.
- MEAN – 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)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i$$

where  $X_i$  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)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} |X_i|$$

where  $|X_i|$  is the magnitude of an I/Q pair, and  $n$  is the number of I/Q pairs in the specified region(s).

- DMEan – 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)

$$DME = 10 \times \log_{10} \left( \frac{1}{n} \sum_{Xi \in \text{region}(s)} 10^{\frac{Xi}{10}} \right)$$

- RMS - 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)

$$RMS = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} X_i^2}$$

-

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)

$$RMS = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} X_i X_i^*}$$

-

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 x log[10 x (rms value)<sup>2</sup>]**

- SAMPLe - 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 - 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)

$$SDEV = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} (Xi - \bar{X})^2}$$

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).

$$SDEV = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} (|Xi| - \bar{X})^2}$$

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 - 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:

$$\text{Power} = 10 \times \log [10 \times (\text{RMS I/Q value})] + 10.$$

The RMS I/Q value (peak volts) is:

$$\sqrt{\frac{1}{n} \sum_{Xi \in \text{region}} Xi \cdot Xi^*}$$

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:

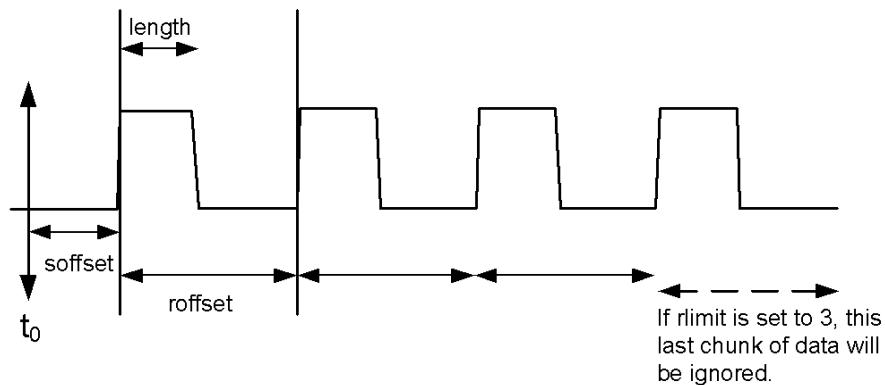
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

where  $Y_i$  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.

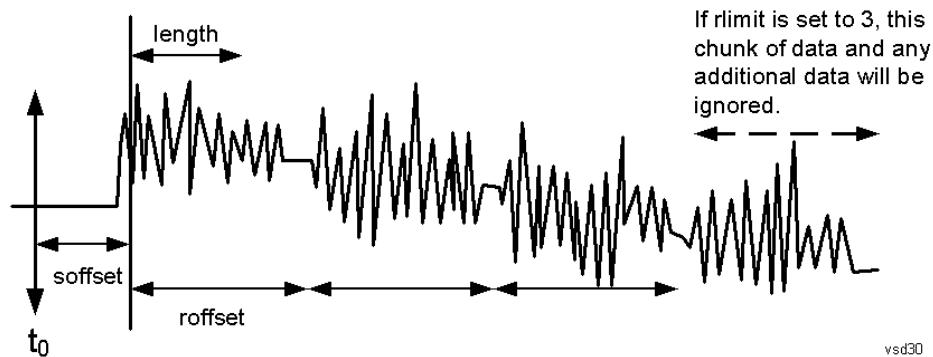
#### Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



#### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



<softset> - start offset is an optional real number. (It is in seconds for time-domain traces, and is 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> - is an optional real number. (It is in seconds for time-domain traces, and is 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. (It is in seconds for time-domain traces, and is 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 above).

<rlimit> - repeat limit is an optional integer. It specifies the number of data items that you want returned. It will ignore any additional items beyond that number. You can use the Start offset and the Repeat limit to pick out exactly what 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 sub-opcode [n]. The peaks must meet the requirements of the peak threshold and excursion values.

n = any valid sub-opcode 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 sub-opcodes 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 the sub-opcode n=0, is the raw trace data which cannot be searched for peaks. And Sub-opcode n=1, is often calculated results values which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDer and FORMat:DATA 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)

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<b>Remote Command</b>	For Swept SA measurement:  :CALCulate:DATA[1] 2 ... 6:PEAKS? <threshold>,<excursion>[,AMPLitude   FREQuency   TIME[,ALL   GTDLine   LTDLine]]
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	<p>For most other measurements:</p> <pre>:CALCulate:DATA[1] 2 ... 6:PEAKS? &lt;threshold&gt;,&lt;excursion&gt;[,AMPLitude   FREQuency   TIME]</pre>
<b>Example</b>	<p>Example for Swept SA measurement in Spectrum Analyzer Mode:</p> <p>CALC:DATA4:PEAK? -40, 10, FREQ, GTDL This will identify 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.</p> <p>Query Results 1:</p> <p>With FORMat:DATA REAL, 32 selected, it 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).</p> <p>If no peaks are found the peak list will consist of only the number of peaks, (0).</p>
Notes	<p>&lt;n&gt; - is the trace that will be used</p> <p>&lt;threshold&gt; - 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.</p> <p>&lt;excursion&gt; - 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.</p> <p>Values must be provided for threshold and excursion. The sorting and display line parameters are optional (defaults are AMPLitude and ALL).</p> <p>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 reportedSorting order:</p> <p>AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)</p> <p>FREQuency - lists the peaks in order of occurrence, left to right across the x-axis.</p> <p>TIME - lists the peaks in order of occurrence, left to right across the x-axis.</p> <p>Peaks vs. Display Line:</p> <p>ALL - lists all of the peaks found (default if optional parameter not sent).</p> <p>GTDLine (greater than display line) - lists all of the peaks found above the display line.</p> <p>LTDLine (less than display line) - lists all of the peaks found below the display line.</p>
Initial S/W Revision	Prior to A.02.00

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### Hardware-Accelerated Fast Power Measurement (Remote Command Only)

The Fast Power option (FP2) enables very fast channel power measurements for instruments with the prerequisite hardware (DP2 and/or B40). It accomplishes this by performing real-time overlapped FFTs at the hardware layer, using software for basic post-processing before returning the result to the user. The upshot of this

approach is improved throughput for user applications that require many sequential power measurements.

The analysis bandwidth of FP2 is limited by the licenses in the instrument, but its maximum overall analysis bandwidth per acquisition is 40 MHz.

FP2 is remote-only, which means the instrument does not switch to any particular mode or measurement. FP2 commands can be sent while another application is in use on the front panel.

Each Fast Power measurement can be predefined using an array index, and up to 1,000 measurements can be stored. In the following documentation, instances of [1,2,...,999] can be substituted with a particular measurement index, e.g. CALC:FPOW:POW1?, CALC:FPOW:POW2?, CALC:FPOW:POW134?. In this way, power measurements can be defined one time in a batch, and then executed multiple times without having to redefine them, similar to “list mode” on other measurements.

In addition to basic channel power measurements, there are a number of other measurement “functions” for each channel, including peak power, peak frequency, and power spectral density. See the Function parameter for more information.

### Reset Fast Power Measurement (Remote Command Only)

Resets the measurement configuration to the defaults.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:RESet
<b>Example</b>	:CALC:FPOW:POW1:RES
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Define Fast Power Measurement (Remote Command Only)

Fast Power acquisitions are configured using the DEFine command. This command accepts a comma-delimited string of configuration parameters and their appropriate values, which are all specified in the subsection below.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:DEFine "configuration string"
<b>Example</b>	:CALC:FPOW:POW1:DEF "CenterFrequency=2e9, AcquisitionTime=0.005"
Notes	See below for a list of measurement variables that can be defined in the configuration string.
Initial S/W Revision	A.14.00

## Acquisition Time

Example	CALC:FPOW:POW1:DEF "AcquisitionTime=0.002"
Notes	The acquisition time parameter sets the time in which the entire spectrum is measured. An increase in the acquisition time yields an improvement in measurement repeatability.
Preset	0.001 s
Range	0 s to 1 s
Default Unit	Time (s)
Initial S/W Revision	A.14.00

## Center Frequency

Example	CALC:FPOW:POW1:DEF "CenterFrequency=2e9"
Notes	The center frequency parameter sets the frequency in which the measurement is centered around. The OffsetFrequency parameter is calculated relative to the center frequency.
Preset	1 GHz
Range	0 Hz to maximum instrument frequency
Default Unit	Frequency (Hz)
Initial S/W Revision	A.14.00

## DC Coupled

Example	CALC:FPOW:POW1:DEF "DCCoupled=True"
Notes	The DC coupled parameter allows the user to specify whether the DC blocking capacitor is utilized. Set parameter to true when measuring frequencies below 10 MHz.
Preset	False
Range	True (DC Coupled) or False (AC Coupled)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## DetectorType

Example	CALC:FPOW:POW1:DEF "DetectorType=Peak"
Notes	Option FP2 is required. The detector type parameter allows the user to choose whether a RMS average or peak value is used during the measurement.
Preset	RmsAverage
Range	RmsAverage, Peak
Initial S/W Revision	A.14.00

## Do Noise Correction

Example	CALC:FPOW:POW1:DEF "DoNoiseCorrection=True"
Notes	<p>When noise correction is enabled, the linear noise power contributed by the analyzer is subtracted from all measurements. This effectively lowers the noise floor of the analyzer.</p> <p>When noise correction is enabled, the first measurement for a given set of input parameters will take extra time. This is because the analyzer takes an extra acquisition with the RF input disconnected from the analyzer's front end to measure the noise of just the analyzer. The measured noise floor is stored in a cache so the noise acquisition will occur only once for the same state settings. In other words, if noise correction was turned on and the analyzer made an acquisition at frequency A, then frequency B, and back again to frequency A, the hidden initial noise floor acquisition would only occur for the first acquisition at frequency A and the cached noise floor would be used the second time frequency A was measured.</p>
Preset	False
Range	True (enable noise correction) or False (disable noise correction)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Do Spur Suppression

Example	CALC:FPOW:POW1:DEF "DoSpurSuppression=True"
Notes	<p>When measuring very low level signals, or when large out-of-band inputs are input into the analyzer, sometimes unwanted spurs and residuals can appear in the measured spectrum. Spur suppression is a method to help minimize the levels of these internally generated spurs and residuals.</p> <p>When spur suppression is enabled, the analyzer will automatically take two acquisitions using two different internal analog LO frequencies. The FFT spectrums from both acquisitions are combined by taking the minimum power between both traces on a per FFT bin basis. External signals will have the same amplitude for both traces and therefore will return the expected amplitudes. However, low level spurs and residuals generated internally to the analyzer tend to move to different FFT bins depending on the internal analog LO frequency used, and therefore tend to be suppressed using this spur suppression method.</p> <p>Because two acquisitions, rather than a single acquisition, are made when spur suppression is enabled, the measurement time will always be slower when spur suppression is enabled.</p>
Preset	False
Range	True (enable spur suppression) or False (disable spur suppression)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Electronic Attenuator Bypass

Example	CALC:FPOW:POW1:DEF "ElecAttBypass =False"
Notes	The electronic attenuation bypass parameter allows the user to either utilize or bypass the electronic attenuator. The electronic attenuator is only available for frequencies up to 3.6 GHz. Set parameter to true when using frequencies above 3.6 GHz and set the parameter to false when using the preamp.
Preset	True
Range	True (bypass electronic attenuator) or False (use electronic attenuator)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Electronic Attenuation

Example	CALC:FPOW:POW1:DEF "ElecAttenuation=10"
Notes	Option EA3 is required. The electronic attenuation value parameter sets the amount of electrical attenuation from 0 to 24 dB (1 dB steps). Set "ElecAttBypass=False" to make sure the electronic attenuator path is enabled.
Preset	0 dB
Range	0 – 24 dB (1 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

## IF Gain

Example	CALC:FPOW:POW1:DEF "IFGain=10"
Notes	The IF gain parameter allows the user to specify the gain at the IF stage anywhere from -6 to 16 dB (1 dB steps). This is an advanced feature, and for most cases this should remain at its default value of 0 dB.
Preset	0 dB
Range	-6 – 16 dB (1 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

## IF Type

Example	CALC:FPOW:POW1:DEF "IFTType=B25M"
Notes	The IF type parameter allows the user to select between different IF paths. For example, if the signal is less than 25 MHz wide, then the user can select the B25M path to take advantage of

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additional filtering on this analog IF path.

Preset	B40M
Range	B10M, B25M, B40M
Initial S/W Revision	A.14.00

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### Include Power Spectrum

Example	CALC:FPOW:POW1:DEF "IncludePowerSpectrum=True"
Notes	The power spectrum parameter allows the user to read data on the entire spectrum for diagnostic purposes. It is not recommended for production use. See CALC:FPOW:POW[n]:READ2? for details on the binary format of the response.
Preset	False
Range	True (return both channel power and full power spectrum) or False (returns only channel power)
Default Unit	Boolean
Initial S/W Revision	A.14.00

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### Mechanical Attenuation

Example	CALC:FPOW:POW1:DEF "MechAttenuation=10"
Notes	The mechanical attenuation value parameter sets the amount of mechanical attenuation anywhere from 0 to 70 dB (2 dB steps).
Preset	0 dB
Range	0 – 70 dB (2 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

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### Preamplifier Mode

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The license for the appropriate preamp is required. The preamp mode parameter specifies whether the preamps are being utilized. Low allows any preamps up to 3.6 GHz, and Full allows all licensed preamps. Set "ElecAttBypass=True" in order to utilize any preamps.
Preset	Off
Range	Off, Low, Full
Initial S/W Revision	A.14.00

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## Resolution Bandwidth Mode

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The resolution bandwidth mode parameter allows the user to choose whether the RBW filter is automatically or manually set. The BestSpeed value minimizes measurement time, while the Narrowest value minimizes RBW size (minimum of two FFT bins per RBW). To manually specify an RBW, set this parameter to Explicit, and set the ResolutionBW parameter to the desired value.
Preset	BestSpeed
Range	BestSpeed, Narrowest, Explicit
Initial S/W Revision	A.14.00

## Resolution Bandwidth

Example	CALC:FPOW:POW1:DEF "ResolutionBW=25e3"
Notes	The resolution bandwidth parameter sets the 3-dB bandwidth of the RBW filter. The ResolutionBWMode parameter must be set to Explicit in order to manually set the RBW.
Preset	0 Hz
Default Unit	Hz
Initial S/W Revision	A.14.00

## Trigger Delay

Example	CALC:FPOW:POW1:DEF "TriggerDelay=0.025"
Notes	The trigger delay parameter sets the time after an external trigger is detected until the measurement is performed.
Preset	0 s
Range	0 – 1 s
Default Unit	Seconds
Initial S/W Revision	A.14.00

## Trigger Level

Example	CALC:FPOW:POW1:DEF "TriggerLevel=2"
Notes	The trigger level parameter sets the voltage value at which an external trigger is detected.
Preset	1.2 V
Range	-5 to 5 V
Default Unit	Volts
Initial S/W Revision	A.14.00

## Trigger Slope

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Example	CALC:FPOW:POW1:DEF "TriggerSlope=Negative"
Notes	The trigger slope parameter indicates the direction of the edge trigger voltage for detection.
Preset	Positive
Range	Positive, Negative
Initial S/W Revision	A.14.00

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## Trigger Source

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Example	CALC:FPOW:POW1:DEF "TriggerSource=Ext1"
Notes	The trigger source parameter allows the user to choose between measurement's triggering freely or controlled by an external input. Ext1 and Ext2 correspond to Trigger 1 In and Trigger 2 In, respectively.
Preset	Free
Range	Free, Ext1, Ext2
Initial S/W Revision	A.14.00

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## Trigger Timeout

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Example	CALC:FPOW:POW1:DEF "TriggerTimeout=0.1"
Notes	The trigger timeout parameter sets the time in which the analyzer will wait for a trigger before automatically performing the measurement.
Preset	1 s
Range	0 – 1 s
Default Unit	Seconds
Initial S/W Revision	A.14.00

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## Signal Input

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Example	CALC:FPOW:POW1:DEF "SignalInput=Fp50MHzCW"
Notes	The signal input parameter allows the user to select between using the main RF input or the internal analyzer reference CW signal of 50 MHz.
Preset	FpMainRf
Range	FpMainRf, Fp50MHzCW
Initial S/W Revision	A.14.00

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## Use Preselector

Example	CALC:FPOW:POW1:DEF "UsePreSelector=True"
Notes	The preselector parameter allows the user to either utilize or bypass the front end tunable filter at frequencies above 3.6 GHz. For frequencies below 3.6 GHz, the preselector is automatically bypassed, so you do not need to set this parameter to False in those cases.
Preset	False
Range	True (use preselector above 3.6 GHz), or False (preselector bypassed)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Channel Bandwidth Array

Example	CALC:FPOW:POW1:DEF "Bandwidth=[3.84e6, 5e6, 3.84e6]"
Notes	The bandwidth parameter array defines the bandwidth of each channel that will be measured. All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.
Preset	[1e6]
Range	0 to 40 MHz
Default Unit	Hz
Initial S/W Revision	A.14.00

## Channel Filter Type Array

Example	CALC:FPOW:POW1:DEF "FilterType=[RRC, IBW, RRC]"
Notes	The filter type parameter allows the user to choose between an integration bandwidth (IBW) filter or a root-raised-cosine (RRC) filter. The integration bandwidth filter weighs all frequencies within the bandwidth equally. The root-raised-cosine filter has an associated shape parameter, defined by the FilterAlpha parameter. All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.
Preset	[IBW]
Range	IBW, RRC
Initial S/W Revision	A.14.00

## Channel Filter Alpha Array

Example	CALC:FPOW:POW1:DEF "FilterAlpha=[0.5, 0.0, 0.5]"
Notes	The filter alpha parameter allows the user to adjust the alpha value associated with the root-

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raised-cosine (RRC) filter type. Set FilterType to RRC in order to utilize this parameter.  
All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.

Preset	[0.22]
Range	0.0 – 1.0
Initial S/W Revision	A.14.00

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## Channel Measurement Function Array

Example	CALC:FPOW:POW1:DEF "Function=[BandPower, PeakPower, BandPower]"
Notes	<p>This parameter array defines what measurement is being made for each individually-specified channel:</p> <ul style="list-style-type: none"> <li>BandPower: Total power within the specified bandwidth of the channel (dBm)</li> <li>BandDensity: Total power density within the specified bandwidth of the channel (dBm/Hz)</li> <li>PeakPower: The peak power value within the specified bandwidth of the channel (dBm)</li> <li>PeakFrequency: The frequency which corresponds to the peak power value within the specified bandwidth of the channel. This frequency is relative to the center frequency (Hz)</li> <li>XdBBandwidth: The half power (-3.01 dB) bandwidth of the highest amplitude signal that resides within the channel (Hz), dB is configurable using XdBBandwidth parameter</li> <li>OccupiedBandwidth: The bandwidth at which 99% of the total power resides within the channel (Hz), percentage configurable using OccupiedBandwidthPercent parameter</li> </ul> <p>All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.</p>
Preset	[BandPower]
Range	BandPower, BandDensity, PeakPower, PeakFrequency, XdBBandwidth, OccupiedBandwidth
Initial S/W Revision	A.14.00

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## Channel Offset Frequency Array

Example	CALC:FPOW:POW1:DEF "OffsetFrequency=[-5e6, 0, 5e6]"
Notes	<p>The offset frequency parameter array defines the difference between the center frequency to the center frequency of each channel.</p> <p>All array parameters should have the same number of elements.</p>
Preset	[0]
Range	0 to 20 MHz
Default Unit	Hz
Initial S/W Revision	A.14.00

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### Channel Occupied Bandwidth Percent Array

Example	CALC:FPOW:POW1:DEF "OccupiedBandwidthPercent =[0.95, 0.95, 0.95]"
Notes	This parameter only applies for channels whose Function is set to OccupiedBandwidth. The occupied bandwidth percent parameter specifies the percent of total power in these channels. The valid range for this parameter is 0.0 to 1.0, where 1.0 represents 100%. The default for this parameter is 0.99, which will return the bandwidth that contains 99% of the total channel power.
Preset	[0.99]
Range	0 – 1.0
Initial S/W Revision	A.14.00

### Channel x-dB Bandwidth Array

Example	CALC:FPOW:POW1:DEF "XdBBandwidth =[-6.02, -3.01, -1.0]"
Notes	This parameter only applies for channels whose Function is set to XdBBandwidth. The X dB bandwidth parameter is used to specify the power relative to the peak channel power over which the bandwidth is calculated. The parameter value must be a negative number.
Preset	[-3.01]
Range	-200 to 0 dB
Default Unit	dB
Initial S/W Revision	A.14.00

### Define Fast Power Measurement Query (Remote Command Only)

The DEFine? command is used to retrieve a list of all defined parameters in an ASCII string format

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R :CALCulate:FPOWer:POWer[1,2,...,999]:DEFine?
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**E** :CALC:FPOW:POW1:DEF?x  
a  
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- N This command query is used to retrieve a list of all defined parameters in an ASCII format.
- O The following is an example of the returned results:
- t "DCCoupled=False,ElecAttBypass=True,ElecAttenuation=0,IFGain=0,MechAttenuation=0,PreAmpMode=Off,PreSelectorOf  
e fset=0,UsePreSelector=False,ExternalReferenceFrequency=10000000,FrequencyReferenceSource=AutoExternalFrequenc  
s yReference,IFTType=B40M,LOMode=SLW,SignalInput=FpMainRf,AcquisitionTime=0.001,CenterFrequency=1000000000,Re  
solutionBW=0,ResolutionBWMode=BestSpeed,DetectorType=RmsAverage,Bandwidth=[1000000],OffsetFrequency=  
[0],Function=[BandPower],FilterType=[IBW],FilterAlpha=[0.22],OccupiedBandwidthPercent=[0.99],XdBBandwidth=[-  
3.01],DoNoiseCorrection=False,DoSpurSuppression=False,MeasurementMethod=HardwareFFT,IncludePowerSpectrum=F  
alse,TriggerDelay=0,TriggerLevel=1.2,TriggerSlope=Positive,TriggerSource=Free,TriggerTimeout=1"
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### Configure Fast Power Measurement (Remote Command Only)

The configure command begins hardware setup and returns immediately, with no acquisition made. This can be used in parallel with other hardware operations to effectively hide the hardware setup time.

---

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:CONFigure
<b>Example</b>	:CALC:FPOW:POW1:CONF

---

Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Initiate Fast Power Measurement (Remote Command Only)

The INITiate command begins an acquisition and returns immediately. The results of the measurement can be retrieved using FETCh.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:INITiate
<b>Example</b>	:CALC:FPOW:POW1:INIT
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Fetch Fast Power Measurement (Remote Command Only)

The FETCh command query is used to retrieve the results of an acquisition initiated by the INIT command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:FETCh?
<b>Example</b>	:CALC:FPOW:POW1:FETC?
Notes	Option FP2 is required. Returns m comma-separated ASCII values, where m corresponds to the number of bandwidths defined. 1. Declared function return in the 1st specified channel 2. Declared function return in the 2nd specified channel ... m. Declared function return in the last specified channel The INIT and FETC? command sequence performs the same functionality of a single CALC:FPOW:POW[n]? query. Units of the returned values are dependent on the Function parameter for each channel.
Initial S/W Revision	A.14.00

### Execute Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]?
<b>Example</b>	:CALC:FPOW:POW1?
Notes	Option FP2 is required. See notes for Fast Power Fetch for return format.
Initial S/W Revision	A.14.00

### Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:READ? :CALCulate:FPOWer:POWer[1,2,...,999]:READ1?
<b>Example</b>	:CALC:FPOW:POW1:READ? :CALC:FPOW:POW1:READ1?
Notes	Option FP2 is required. Returns m 4 byte floating point binary values (Little-Endian), where m corresponds to the number of bandwidths defined.
Initial S/W Revision	A.14.00

### Diagnostic Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format. This command is used primarily for diagnostic purposes to test for ADC overloads and to visibly inspect the spectrum.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:READ2?
<b>Example</b>	:CALC:FPOW:POW1:READ2?
Notes	Option FP2 is required.
	<p><b>NOTE</b> Spectrum data is only returned if the IncludePowerSpectrum parameter is set to True. If IncludePowerSpectrum is False, the number of spectrum points will be zero (0).</p> <p>Units of the returned values are dependent on the Function parameter per channel (e.g. dBm for BandPower, Hz for PeakFrequency).</p> <p>Returns binary data (Little-Endian) that contains information on m amount of channels, along with ADC over range and full spectrum data.</p>

---

The following is the binary format of the response.

Bandwidth Return Value

1. Number of channels specified, m [4 byte int]
2. Declared function result for the 1st specified channel [4 byte float]
3. Declared function result for the 2nd specified channel [4 byte float]

...

- (m + 1). Declared function result for the last (mth) specified channel [4 byte float]

ADC Over Range

1. ADC over-range occurred (1: true, 0: false) [2 byte short]

Spectrum Data

1. Number of points in the spectrum data, k [4 byte int]
2. Start frequency of spectrum data (Hz) [8 byte double]
3. Step frequency of spectrum data (Hz) [8 byte double]
4. FFT bin at 1st point (dBm) [4 byte float]
5. FFT bin at 2nd point (dBm) [4 byte float]

...

- (k + 3). FFT bin at last (kth) point (dBm) [4 byte float]

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Initial S/W Revision A.14.00

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### 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.

---

<b>Remote Command</b>	:FORMAT[:TRACe][:DATA] ASCii INTeger,32 REAL,32   REAL,64
	:FORMAT[:TRACe][:DATA]?

---

Notes	<p>The query response is:</p> <p>ASCii: ASC,8</p> <p>REAL,32: REAL,32</p> <p>REAL,64: REAL,64</p> <p>INTeger,32: INT,32</p> <p>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).</p> <p>The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.</p>
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Dependencies	<p>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).</p> <p>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</p>
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	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

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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.YYYYE<sub>s</sub>ZZ

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 says it uses FORMat:DATA uses any format supported by FORMat:DATA.

The NORMAl order is a byte sequence that 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 is when the byte sequence begins with the LSB first, and ends with the MSB last in the sequence: 4|3|2|1.

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<b>Remote Command</b>	:FORMat:BORDER NORMAl SWAPPed
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:FORMat:BORDer?	
Preset	NORMAl
Initial S/W Revision	Prior to A.02.00

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## Meas Setup

Accesses a menu of keys that enables you to select Phase Noise measurement parameters.

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

### Avg Number

Specifies the number of measurements made when calculating the average result, or turn averaging on or off.

Key Path	Meas Setup
Mode	PN
<b>Remote Command</b>	<pre>[ :SENSe]:LPLot:AVERage:COUNt &lt;integer&gt; [:SENSe]:LPLot:AVERage:COUNt? [:SENSe]:LPLot:AVERage[:STATe] OFF ON 0 1 [:SENSe]:LPLot:AVERage[:STATe]?</pre>
<b>Example</b>	<pre>LPL:AVER:COUNt 10 LPL:AVER:COUNt? :LPL:AVER ON :LPL:AVER?</pre>
Preset	<pre>10 OFF</pre>
State Saved	Saved in instrument state.
Min	1
Max	1000
Initial S/W Revision	Prior to A.02.00

### Avg Mode

Selects the type of termination control used for the averaging function. This determines the averaging action after the specified number of data acquisitions (average count) is reached.

When set to Exponential (Exp) the measurement averaging continues using the specified number of averages to compute each exponentially-weighted averaged value. The average is displayed at the end of each sweep.

When set to Repeat, the measurement resets the average counter each time the specified number of averages is reached.

Key Path	Meas Setup

Mode	PN
<b>Remote Command</b>	[ :SENSe]:LPLot:AVERage:TCONtrol EXPonential REPeat [ :SENSe]:LPLot:AVERage:TCONtrol?
<b>Example</b>	LPL:AVER:TCON REP LPL:AVER:TCON?
Preset	REPeat
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Meas Type

Determines whether to measure the Phase Noise of a signal, or the DANL Floor of the analyzer.

Phase Noise is the default, and this is the intended use of the measurement, however it can be useful to measure the DANL Floor of the analyzer for two reasons. If the DANL floor is seen to be close to the measured noise, it means that the DANL is causing measurement errors. The effect of the DANL can be subtracted from the measurement using the cancellation process, increasing the dynamic range and reducing errors.

To cancel the DANL, measure it and store it in the reference trace using the softkeys under the display menu.

In DANL Floor mode, the analyzer measures the noise level by maximizing the attenuation.

Some X-Series models have NFE (Noise Floor Extension) capability in the Mode Setup menu. NFE also acts to reduce the effect of DANL on phase noise measurements. The difference is that NFE uses a model of the noise from a factory calibration. This makes NFE more convenient to use. By default it is enabled. It also makes NFE not quite as accurate as making the measurement in exactly the right measurement conditions including temperature and time.

Unfortunately, NFE and cancellation don't work quite as well together as cancellation alone. Therefore, it is best to turn NFE off when storing and using traces for cancellation.

Key Path	Meas Setup
Mode	PN
<b>Remote Command</b>	[ :SENSe]:LPLot:METHod DANL PN [ :SENSe]:LPLot:METHod?
<b>Example</b>	LPL:METH PN LPL:METH?
Preset	PN
State Saved	Saved in instrument state.

Range	Phase Noise DANL Floor
Initial S/W Revision	Prior to A.02.00

## Smoothing

Changes the amount of smoothing that is done after the measurement is complete. The smoothing function is much faster than filtering. However, it may cause errors if the noise changes rapidly with frequency, or if there are discrete signals present.

Key Path	Meas Setup
Mode	PN
<b>Remote Command</b>	<code>[ :SENSe]:LPLOT:SMooth &lt;real&gt;</code> <code>[ :SENSe]:LPLOT:SMooth?</code>
<b>Example</b>	LPL:SMO 4 LPL:SMO?
Notes	Changing the Smooth Trace parameter forces the smoothed trace to be recalculated based upon the raw trace – and in turn this forces all results to recalculated. There is no need to perform a full restart.
Preset	4
State Saved	Saved in instrument state.
Min	0
Max	16
Initial S/W Revision	Prior to A.02.00

## Decade Table

Toggles the decade table display between On and Off.

The decade table shows the measured values for each plot at every point where the trace(s) cross(es) a decade line on the display.

Key Path	Meas Setup
Mode	PN
<b>Remote Command</b>	<code>:CALCulate:LPLot:DECaDe:TABLE[:STATe] OFF ON 0 1</code> <code>:CALCulate:LPLot:DECaDe:TABLE[:STATe]?</code>
<b>Example</b>	CALC:LPL:DEC:TABL ON CALC:LPL:DEC:TABL?
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00

## Spurious Table

Key Path	Meas Setup
Mode	PN
<b>Remote Command</b>	<code>:CALCulate:LPLot:SPURious:TABLE[:STATe] OFF ON 0 1</code> <code>:CALCulate:LPLot:SPURious:TABLE[:STATe]?</code>
<b>Example</b>	CALC:LPL:SPUR:TABL ON CALC:LPL:SPUR:TABL?
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	A.18.00

## Cancellation

Accesses a menu that enables you to set parameters for cancellation functionality.

Key Path	Meas Setup
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

## Cancellation On/Off

Toggles the phase noise cancellation feature between On and Off.

One application of this feature is to allow a previously made measurement of the instrument's DANL noise floor to be automatically subtracted from the current measurement. The DANL of the instrument must be measured and stored in a reference trace before the cancellation feature can be used.

Another application is to allow the phase noise of some other signal to be subtracted from the current measurement. This other signal might be a CW signal from a source that has lower phase noise than the analyzer. This other signal must be measured and stored in a reference trace before the cancellation feature can be used.

The cancellation process can work even better than the Noise Floor Extension process (available in some X-Series models) in reducing the effect of the analyzer broadband noise floor, because it can characterize that noise in exactly the right measurement conditions including temperature and time. Unfortunately, NFE and cancellation don't work quite as well together as cancellation alone. Therefore, it is best to turn NFE off when storing and using traces for cancellation.

Key Path	Meas Setup, Cancellation
Mode	PN
<b>Remote Command</b>	<code>[ :SENSe]:LPLot:CANCellation[:STATe] OFF ON 0 1</code> <code>[ :SENSe]:LPLot:CANCellation[:STATe]?</code>

---

<b>Example</b>	LPL:CANC ON LPL:CANC?
Notes	Cancellation works only if the reference trace contains data
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

---

### Ref Trace

Changes the trace that is used as a reference DANL floor trace for the cancellation feature. The trace must be in View mode, and contain a valid trace that covers the same frequency range as that being measured.

---

Key Path	Meas Setup, Cancellation
Mode	PN
<b>Remote Command</b>	[ :SENSe]:LPLOT:CANCellation:TRACe <integer> [ :SENSe]:LPLOT:CANCellation:TRACe?
<b>Example</b>	LPL:CANC:TRAC 3 LPL:CANC:TRAC?
Preset	3
State Saved	Saved in instrument state.
Min	1
Max	3
Initial S/W Revision	Prior to A.02.00

---

### Threshold Delta

This value determines the minimum delta between the reference and pre-cancellation traces that must exist before any cancellation is performed. The delta is evaluated on a tracepoint per tracepoint basis.

---

Key Path	Meas Setup, Cancellation
Mode	PN
<b>Remote Command</b>	[ :SENSe]:LPLOT:CANCellation:DELTa <rel_ampl> [ :SENSe]:LPLOT:CANCellation:DELTa?
<b>Example</b>	LPL:CANC:DELT 0.01 LPL:CANC:DELT?
Preset	0.01 dB

---

State Saved	Saved in instrument state.
Min	0.001 dB
Max	5 dB
Initial S/W Revision	Prior to A.02.00

## Meas Preset

Restores all measurement parameters to their default values.

Key Path	Meas Setup
Mode	PN
<b>Remote Command</b>	:CONF:LPLOT
<b>Example</b>	CONF:LPL
Couplings	Selecting Meas Preset restores all measurement parameters to their default values.
Initial S/W Revision	Prior to A.02.00

## Advanced

Accesses advanced features. These features are recommended for use only by advanced users.

Key Path	Meas Setup
Initial S/W Revision	Prior to A.02.00

## AM Rejection

Enables/disables the AM Rejection functionality.

AM component in measured signals can be rejected with enabling this functionality. The analyzer normalizes each I and Q points with the length of its IQ vector. Thus, reject the amplitude variance caused by the AM component.

AM Rejection is only available in the area lower than the offset frequency specified by the "AM Rejection Offset" on page 839 parameter.

Key Path	Meas Setup, Advanced
Mode	PN
<b>Remote Command</b>	[ :SENSe]:LPLOT:AMRejection ON OFF 1 0 [:SENSe]:LPLOT:AMRejection?
<b>Example</b>	LPL:AMR ON LPL:AMR?
Preset	On
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00

## AM Rejection Offset

Controls the offset boundary where AM Rejection is enabled.

Key Path	Meas Setup, Advanced
<b>Remote Command</b>	[ :SENSe]:LPLot:AMRejection:OFFSet <freq> [ :SENSe]:LPLot:AMRejection:OFFSet?
<b>Example</b>	LPL:AMR:OFFS 10MHz LPL:AMR:OFFS?
Preset	1 MHz
State Saved	Saved in instrument state.
Initial S/W Revision	A.18.00

## Overdrive with Mech Atten

Accesses a menu that enables you to set the Overdrive functionalities.

Key Path	Meas Setup
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.06.00

## Overdrive with Mech Attn

Enables/disables the Overdrive functionality.

Overdrive is only available in the portion of the measurement where the offset frequency is greater than the value specified by AM Rejection Offset parameter.

Key Path	Meas Setup, Advanced, Overdrive with Mech Atten
Mode	PN
<b>Remote Command</b>	[ :SENSe]:LPLot:ODRive ON OFF 1 0 [ :SENSe]:LPLot:ODRive?
<b>Example</b>	LPL:ODR ON LPL:ODR?
Preset	CXA2: ON Others including CXA3: OFF
State Saved	Saved in instrument state.
Range	Enable Disable
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.06.00

### Allow 0 dB Attenuation

Allows the Overdrive function to set the RF Attenuator down to 0 dB when it's On. It makes the measurement with the maximum dynamic range; however, you need to make sure the RF input signal power does not give damage to the mixer.

When it's Off (default), the Overdrive function does not set RF Attenuator less than 6dB.

<b>Key Path</b>	Meas Setup, Advanced, Overdrive with Mech Atten
Mode	PN
<b>Remote Command</b>	<code>[ :SENSe]:LPLot:ODRive:ATTenuation:ZERO ON OFF 1 0</code> <code>[ :SENSe]:LPLot:ODRive:ATTenuation:ZERO?</code>
<b>Example</b>	LPL:ODR:ATT:ZERO 0 LPL:ODR:ATT:ZERO?
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	A.06.00

### Filtering (Remote Command Only for backward compatibility)

<b>Key Path</b>	Meas Setup, Filtering
Mode	PN
<b>Remote Command</b>	<code>[ :SENSe]:LPLot:FILTering NONE LITTLE MEDIUM MAXIMUM</code>
<b>Example</b>	LPL:FILT NONE
Notes	<p>Write Only</p> <p>Allows you to specify how much filtering is to be done. The amount of filtering is determined by the video bandwidth to resolution bandwidth ratio (vbw/rbw ratio), and can be set to one of four pre-determined levels:</p> <ul style="list-style-type: none"> <li>- None: VBW/RBW = 1.000</li> <li>- Little: VBW/RBW = 0.300</li> <li>- Medium: VBW/RBW = 0.100</li> <li>- Maximum: VBW/RBW = 0.030</li> </ul>
Couplings	This parameter couples to Vbw:3dB RBW parameter.
State Saved	Saved in instrument state.
Range	None Little Medium Maximum
Initial S/W Revision	Prior to A.02.00
Mode	PN

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**Remote Command** [:SENSe]:LPLOT:FILTering:NONE

**Example** LPL:FILT:NONE

Initial S/W Revision Prior to A.02.00

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Mode PN

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**Remote Command** [:SENSe]:LPLOT:FILTering:LITTle

**Example** LPL:FILT:LITT

Initial S/W Revision Prior to A.02.00

---

Mode PN

---

**Remote Command** [:SENSe]:LPLOT:FILTering:MEDIUM

**Example** LPL:FILT:MED

Initial S/W Revision Prior to A.02.00

---

Mode PN

---

**Remote Command** [:SENSe]:LPLOT:FILTering:MAXimum

**Example** LPL:FILT:MAX

Initial S/W Revision Prior to A.02.00

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## Mode

See "Mode" on page 246

## 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 844 for more information.

Key Path	<b>Front-panel key</b>
<b>Remote Command</b>	<b>:SYST:PRESet</b>
<b>Example</b>	<b>:SYST:PRES</b>
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 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 <b>Mode Preset</b> 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.

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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.

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Initial S/W Revision	Prior to A.02.00
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## 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

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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

See "Mode Setup" on page 281

## Peak Search

### Spurious identification algorithm

For peak search in the log plot measurement, Marker is activated only when peak search algorithm for spurious identification found spurious signals. This algorithm uses Spur Threshold calculated based on the standard deviation of the raw trace when treating the smoothed trace as an average.

`threshold = standard_deviations * 3`

The reason to use this non-constant value as the threshold is to reduce the false alarm probability in spurious identification. When the noise level is high, using a constant value increases that probability. Assuming that noise is Gaussian, the probability is sufficiently low with the above threshold (=three times of standard deviation).

If (raw trace value – smoothed trace value > threshold) is true, that point of the trace is recognized as a spurious signal.

Accesses a menu of keys that enable you to move the selected marker to spurious signals. Spurious signals are automatically detected and rejected from a smoothed trace, therefore this function works only when the selected marker is on the “Raw” trace.

Key Path	Peak Search
Mode	PN
<b>Remote Command</b>	<code>:CALCulate:LPLot:MARKer[1] 2 ... 12:SPURious:MAXimum[:PEAK]</code>
<b>Example</b>	<code>CALC:LPL:MARK:SPUR:MAX</code>
Notes	This command works only when the selected marker is on the “Raw” trace.
Dependencies	This feature is available only when Option N9068A-AFP is installed.
State Saved	No
Initial S/W Revision	A.10.00

### Next Spurious

Moves the selected marker to the next higher spurious signal. The height of a spurious is defined to be the difference between the top of a spurious and a smoothed trace.

See also "[Spurious identification algorithm](#)" on page 847.

Key Path	Peak Search, Next Spur
Mode	PN
<b>Remote Command</b>	<code>:CALCulate:LPLot:MARKer[1] 2 ... 12:SPURious:MAXimum:NEXT</code>
<b>Example</b>	<code>CALC:LPL:MARK:SPUR:MAX:NEXT</code>
Notes	This command works only when the selected marker is on the “Raw” trace and spurious signals

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exist.

---

Dependencies This feature is available only when Option N9068A-AFP is installed.

---

State Saved No

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Initial S/W Revision A.10.00

## Next Spurious Right

Moves the selected marker to the next spurious signal to the right of the current marker position.

See also "Spurious identification algorithm" on page 847.

---

Key Path	Peak Search, Next Spur Right
Mode	PN
<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:SPURious:MAXimum:RIGHT
<b>Example</b>	CALC:LPL:MARK:SPUR:MAX:RIGH
Notes	This command works only when the selected marker is on the "Raw" trace and spurious signals exist.
Dependencies	This feature is available only when Option N9068A-AFP is installed.
State Saved	No
Initial S/W Revision	A.10.00

---

## Next Spurious Left

Moves the selected marker to the next spurious signal to the left of the current marker position.

See also "Spurious identification algorithm" on page 847.

---

Key Path	Peak Search, Next Spur Left
Mode	PN
<b>Remote Command</b>	:CALCulate:LPlot:MARKer[1] 2 ... 12:SPURious:MAXimum:LEFT
<b>Example</b>	CALC:LPL:MARK:SPUR:MAX:LEFT
Notes	This command works only when the selected marker is on the "Raw" trace and spurious signals exist.
Dependencies	This feature is available only when Option N9068A-AFP is installed.
State Saved	No
Initial S/W Revision	A.10.00

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## Print

See "Print" on page 292

## 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 finds 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.

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 and Traces**. 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	<p>No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe &lt;filename&gt;.</p> <p>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.</p>
Backwards Compatibility Notes	<p>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.</p> <p>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.</p>
Backwards Compatibility Notes	<p>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. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. 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.</p> <p>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.</p> <p>It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user.</p> <p>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.</p>
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 854.

Key Path	Recall
Mode	All
<b>Remote Command</b>	:MMEMORY:LOAD:STATe <filename>
<b>Example</b>	:MMEM:LOAD:STAT "myState.state" This recalls the file myState.state on the default path
<b>Example</b>	MMEM:LOAD:STAT "MyStateFile.state" This loads the state file data (on the default file directory path) into the instrument state.
Notes	<p>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.</p> <ul style="list-style-type: none"> <li>- If there is a mismatch between file version or model number or instrument version or model number, the recall function tries 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.</li> </ul>

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.

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<b>Backwards Compatibility SCPI</b>	<code>:MMEMORY:LOAD:STATE 1,&lt;filename&gt;</code>
Initial S/W Revision	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:

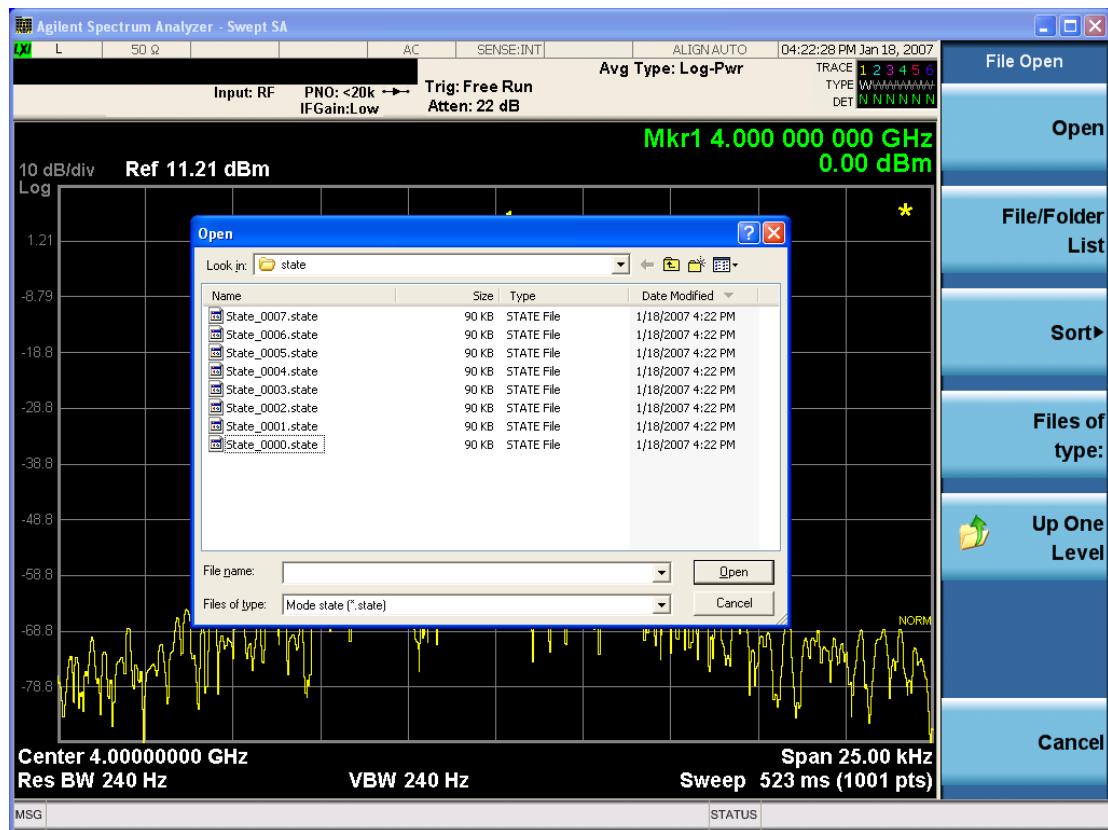
---

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 will have 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	<b>Recall, State</b>
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

### 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.

For more information and the SCPI command, see **Edit Register Names** under the **Save, State** function.

Key Path	<b>Recall, State</b>
Mode	All
Dependencies	N9060A-7FP or N9060B-2FP license required to edit the register names. When the feature is not licensed, sending the SCPI command generates an error, -221,"Settings conflict;Option not

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	available"
Initial S/W Revision	A.11.00

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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
<b>Example</b>	*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 <b>Save, State,Edit Register Names</b> 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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## 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
<b>Example</b>	*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 <b>Save, State,Edit Register Names</b> 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

## 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

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### 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.

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 EDGE GSM PN
<b>Remote Command</b>	:MMEMory:LOAD:CORRection 1 2 3 4 5 6 7 8, <filename>
<b>Example</b>	: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 D:\User_My_Documents\Instrument\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.

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Couplings	When a correction file is loaded from mass storage, it is automatically turned on ( <b>Correction ON</b> ) and <b>Apply Corrections</b> is set to On. This allows you to see its effect, thus confirming the load.
Readback	selected Correction
<b>Backwards Compatibility SCPI</b>	<code>:MMEMORY:LOAD:CORRECTION ANTenna   CABLE   OTHER   USER, &lt;filename&gt;</code> 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

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### 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	<b>Recall, Data, Amplitude Correction</b>
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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### 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 1039 in **Recall, State**, for a full description of this dialog and menu.

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Key Path	<b>Recall, Data</b>
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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## 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 861

Key Path	Front-panel key
<b>Remote Command</b>	:INITiate[:IMMEDIATE] :INITiate:RESTART
<b>Example</b>	: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 <b>Restart</b> hardkey and the INITiate:RESTART command restart trace averages (displayed average count reset to 1) for a trace in <b>Clear Write</b> , but did not restart <b>Max Hold</b> and <b>Min Hold</b> . In the X-Series, the <b>Restart</b> hardkey and the INITiate:RESTART command restart not only <b>Trace Average</b> , but <b>MaxHold</b> and <b>MinHold</b> traces as well. For wireless comms modes in ESA and PSA, the <b>Restart</b> 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, Verbose SCPI) 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
<b>Remote Command</b>	:MMEMORY:STORe:STATe <filename>
<b>Example</b>	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.

---

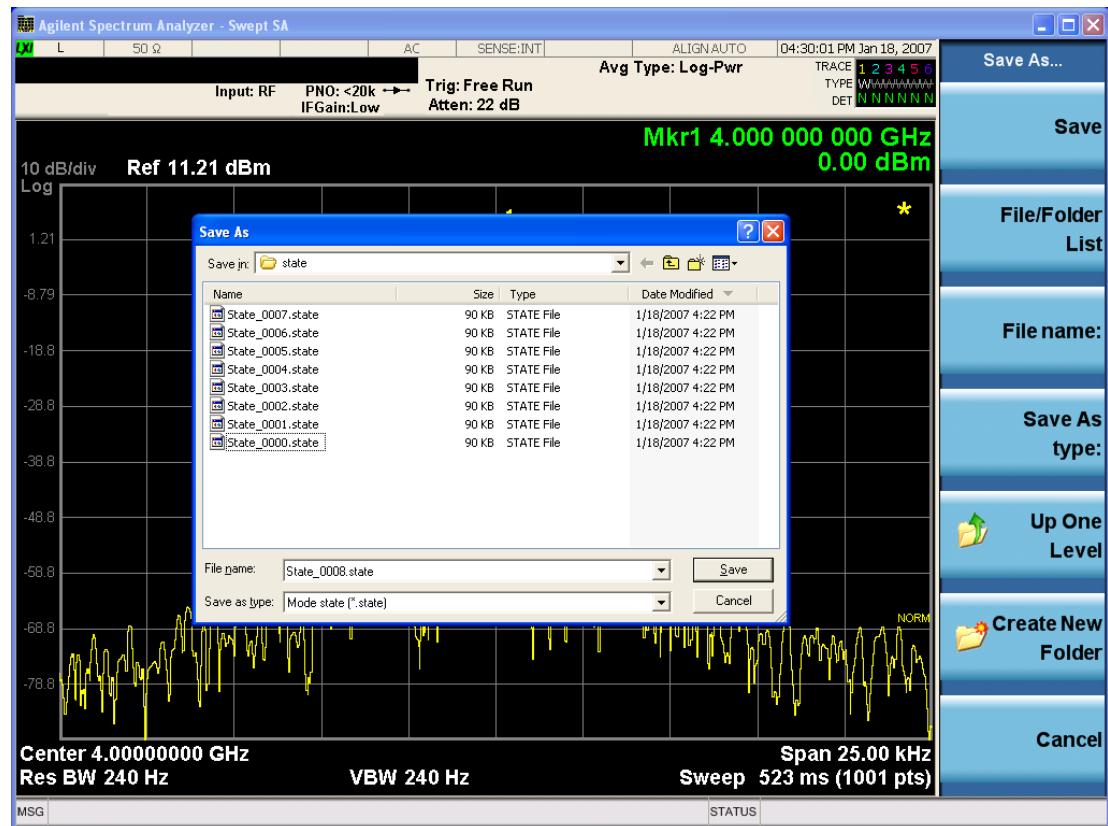
Initial S/W Revision

Prior to A.02.00

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**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 1034](#) 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	<b>Save, State</b>
Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

### 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 868

Key Path	<b>Save, State</b>
Mode	All
<b>Remote Command</b>	:MMEMory:REGister:STATE:LAbel <reg number>,"label" :MMEMory:REGister:STATE:LAbel? <reg number>
<b>Example</b>	: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.

## 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
<b>Example</b>	*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 <b>Edit Register Names</b> key OR "(empty)" if no prior save operation has been performed to this register.

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Initial S/W Revision

Prior to A.02.00

Modified at S/W  
Revision

A.11.00

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## 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.

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Key Path	Save, State
Mode	All
<b>Example</b>	*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 <b>Edit Register Names</b> 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

## 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 you to 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 871

Key Path	Save
<b>Remote Command</b>	<code>:MMEMORY:STORe:CORRection 1 2 3 4 5 6, &lt;filename&gt;</code>
<b>Example</b>	: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
<b>Backwards Compatibility SCPI</b>	: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

<b>Line #</b>	<b>Type of field</b>	<b>Example</b>	<b>Notes</b>
			correction data, refer to the Input/Output, Corrections key description. Allowable values: dBv/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 Bias or 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

### 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 875.

See "Marker Table" on page 875.

See "Peak Table" on page 878.

See "Spectrogram" on page 882

Remote Command	:MMEMORY:STOR:RESULTS:MTAB PTAB 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

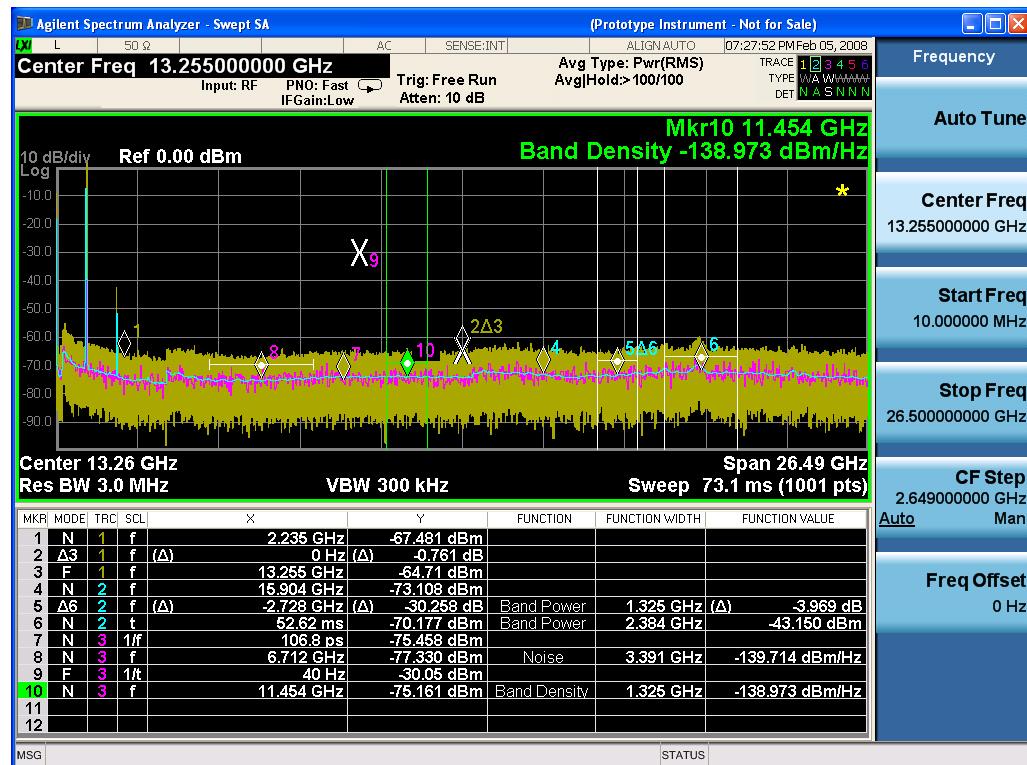
## Meas Results File Contents

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:

---

Measureme  
ntResult

---

Swept SA

---

A.01.40\_ N9020A  
R0017

---

526 B25 1

---

PFR P26	
EA3	
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.06626 6667
Start Frequency	100000 00
Stop Frequency	265000 00000
Average Count	0
Average Type	LogPow er (Video)
RBW	300000 0
RBW Filter	Gaussia n
RBW Filter BW	3dB
VBW	300000 0
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 Optimizatio n	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	T R C	SCL	X	Y	FUNCTION	FUNCTION WIDT H	FUNCTION VALU E	FUNCTION UNIT
1	Normal	1	Frequ ency	2.235 0E+09	- 67. 48 1	Off	0.000 0E+00	0	None
2	Delta3	1	Frequ ency	0.000 0E+00	- 0.7 61	Off	0.000 0E+00	0	None
3	Fixed	1	Frequ ency	1.325 5E+10	- 64. 71	Off	0.000 0E+00	0	None
4	Normal	2	Frequ ency	1.590 4E+10	- 73. 10 8	Off	0.000 0E+00	0	None
5	Delta7	2	Frequ ency	- 2.728 0E+09	- 30. 25 8	Band Power	1.325 0E+06	- 3.969	dB
6	Normal	2	Time	5.262 0E-02	- 70. 17	Band Power	2.384 0E+06	- 43.15	dBm

							7			
7	Normal	3	Perio d	1.068 0E-10	- 75. 45 8	Off	0.000 0E+00	0	None	
8	Normal	3	Frequ ency	6.712 0E+09	- 77. 33	Noise	3.391 0E+06	- 139.7 14	dBm/ Hz	
9	Fixed	3	Inver se Time	4.000 0E+01	- 30. 05	Off	0.000 0E+00	0	None	
10	Normal	3	Frequ ency	1.145 4E+10	- 75. 16 1	Band Densi ty	1.325 0E+06	- 138.9 73	dBm/ Hz	
11	Off	1	Frequ ency	0.000 0E+00	0	Off	0.000 0E+00	0	None	
12	Off	1	Frequ ency	0.000 0E+00	0	Off	0.000 0E+00	0	None	

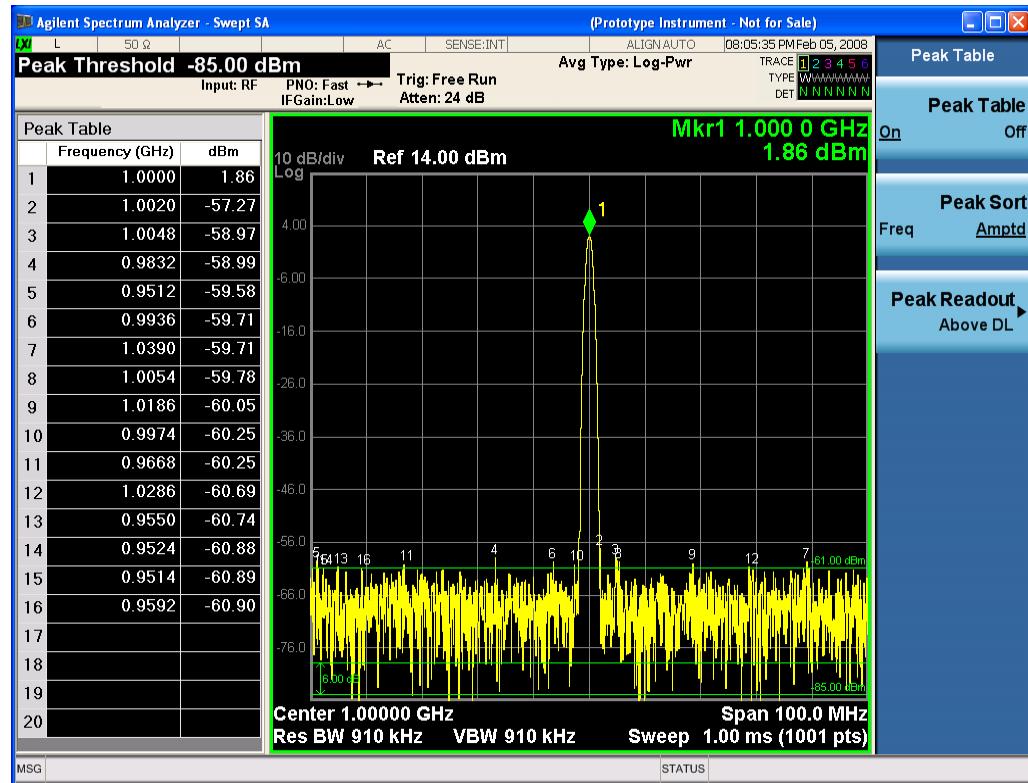
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

The metadata header is very similar to the metadata used in the trace data .csv files. See Trace File Contents. 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:

---

**MeasurementResults**

---



---

Swept SA

---

A.18.00	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	Delta to Limit
1	1.000009988E+09	-26.08	41.1
2	9.99989974E+08	-26.11	43.9
3	1.000019929E+09	-29.47	35.2
4	9.999799016E+08	-29.54	40.4
5	1.000030002E+09	-37.51	23.1
6	9.999699601E+08	-37.62	32.4
7	9.999999155E+08	-37.71	32.3
8	1.000039943E+09	-48.38	9.1
9	9.999598877E+08	-48.55	21.4
10	1.000049885E+09	-61.43	-8.1
11	9.999499461E+08	-61.66	8.3
12	1.000059957E+09	-76.53	-26.1
13	9.999398738E+08	-77.01	-7.6
14			
15			
16			
17			

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## 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.

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 different 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 seconds after the Spectrogram started (trace 10 has a start 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	1
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	

<b>Result Type</b>	<b>Spectrogram</b>
P26 PFR RTL RTS S40 SB1	
SEC SM1 UK6 YAS YAV	
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
RF Calibrator	Off
Attenuation	14
Ref Level Offset	0
External Gain	0
Trace Type	Clearwrite
Detector	Normal
Trace Math	Off
Trace Math Oper1	Trace5

<b>Result Type</b>	<b>Spectrogram</b>
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
<hr/>	
...	
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
<hr/>	
...	
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
...	
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 1048](#) 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

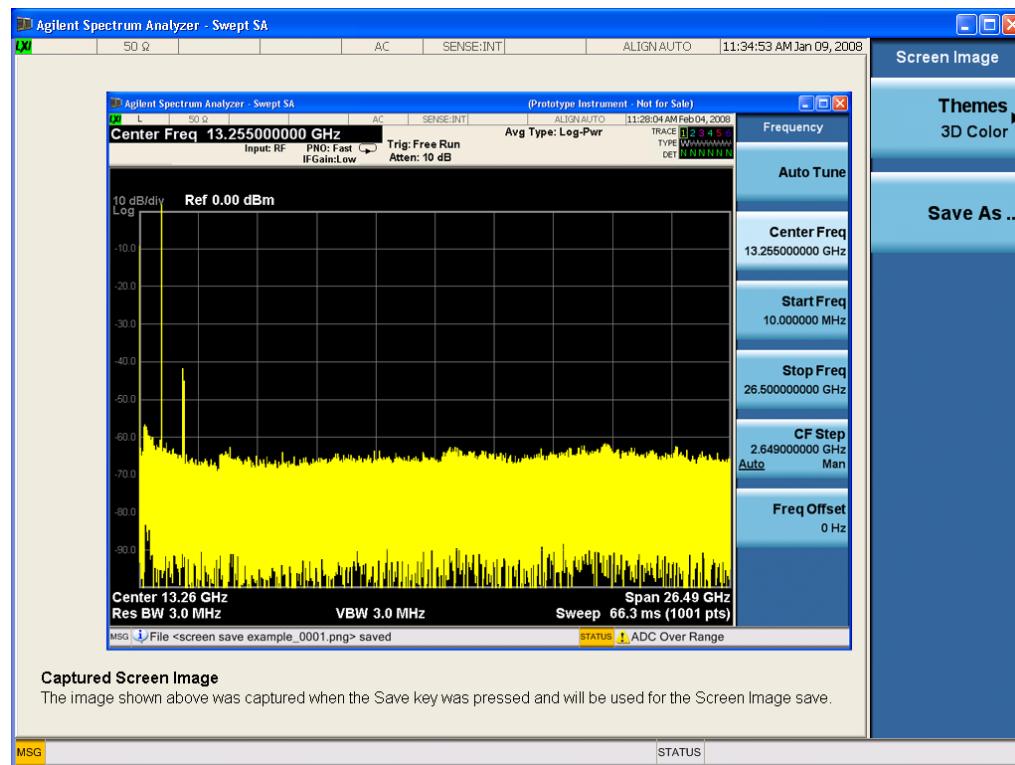
### Screen Image

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
<b>Remote Command</b>	:MMEMORY:STOR:SCReen <filename>
<b>Example</b>	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
<b>Backwards Compatibility SCPI</b>	HCOPY:SDUMP:DATA? returns the screen image in a <DEFINITE LENGTH ARBITRARY RESPONSE DATA> element. The response data is IEEE Block format; the controlling computer can strip the header and store the result as a .png file.
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
<b>Remote Command</b>	:MMEMORY:STOR:SCReen:THEMe TDColor   TDMonochrome   FCOLor   FMONochrome :MMEMORY:STOR:SCReen:THEMe?
<b>Example</b>	: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 you 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
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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 1048 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	<b>Save, Screen Image</b>
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

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## Mass Storage Catalog (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:CATalog? [&lt;directory_name&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>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:</p> $\langle\text{numeric\_value}\rangle,\langle\text{numeric\_value}\rangle,\{\langle\text{file\_entry}\rangle\}$ <p>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 <math>\langle\text{file\_entry}\rangle</math> is a string. Each <math>\langle\text{file\_entry}\rangle</math> indicates the name, type, and size of one file in the directory list:</p> $\langle\text{file\_name}\rangle,\langle\text{file\_type}\rangle,\langle\text{file\_size}\rangle$ <p>As the windows file system has an extension that indicates file type, <math>\langle\text{file\_type}\rangle</math> is always empty. <math>\langle\text{file\_size}\rangle</math> provides the size of the file in bytes. For directories, <math>\langle\text{file\_entry}\rangle</math> is surrounded by square brackets and both <math>\langle\text{file\_type}\rangle</math> and <math>\langle\text{file\_size}\rangle</math> are empty</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Change Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:CDIRectory [&lt;directory_name&gt;]</code> <code>:MMEMory:CDIRectory?</code>
Notes	<p>The string must be a valid logical path.</p> <p>Changes the default directory for a mass memory file system. The <math>\langle\text{directory\_name}\rangle</math> parameter is a string. If no parameter is specified, the directory is set to the *RST value.</p> <p>At *RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal.</p> <p>Query returns full path of the default directory.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Copy (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:COPY &lt;string&gt;,&lt;string&gt;[,&lt;string&gt;,&lt;string&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>Copies an existing file to a new file or an existing directory to a new directory.</p> <p>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.</p> <p>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.</p> <p>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.</p>

## Mass Storage Device Copy (Remote Command Only)

This command transfers data to/from a file and a peripheral device.

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:COPY:DEVICE &lt;source_string&gt;,&lt;dest_string&gt;</code>
Notes	<p>The strings must be a valid logical path or a valid device keyword. If the dest_string is a device keyword, the data is copied from the source file to the device. If the source_string is a device keyword, the data is copied to the source file from the device.</p> <p>Valid device keywords are:</p> <ul style="list-style-type: none"> <li>SNS (smart noise source)</li> </ul> <p>An error is generated if the file or device is not found.</p>

## Mass Storage Delete (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:DELETE &lt;file_name&gt;[,&lt;directory_name&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a file from the specified directory. The &lt;file_name&gt; 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.</p>
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.

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:DATA &lt;file_name&gt;, &lt;data&gt;</code> <code>:MMEMORY:DATA? &lt;file_name&gt;</code>
Notes	<p>The string must be a valid logical path.</p> <p>The command form is MMEMORY:DATA &lt;file_name&gt;,&lt;data&gt;. It loads &lt;data&gt; into the file &lt;file_name&gt;. &lt;data&gt; is in 488.2 block format. &lt;file_name&gt; is string data.</p> <p>The query form is MMEMORY:DATA? &lt;file_name&gt; with the response being the associated &lt;data&gt; in block format.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Make Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:MDIRECTORY &lt;directory_name&gt;</code>
Notes	<p>The string must be a valid logical path.</p> <p>Creates a new directory. The &lt;directory_name&gt; parameter specifies the name to be created.</p>

---

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.

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Initial S/W Revision	Prior to A.02.00
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### Mass Storage Move (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:MOVE &lt;string&gt;,&lt;string&gt;[,&lt;string&gt;,&lt;string&gt;]</b>
Notes	<p>The string must be a valid logical path.</p> <p>Moves an existing file to a new file or an existing directory to a new directory.</p> <p>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.</p> <p>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.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Remove Directory (Remote Command Only)

---

Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RDIRectory &lt;directory_name&gt;</b>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a directory. The &lt;directory_name&gt; parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed.</p> <p>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.</p>
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Determine Removable Media (Remote Command Only)

This command is used to determine if any removable media devices are connected to the instrument. Primarily, these are USB memory devices plugged-in to the front panel or rear panel USB ports. On instruments with PC6 or PC7 CPU's, one SD card slot is available for removable media. The instrument's primary disk drive is not a removable media device.

---

Key Path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RMEDIA:LIST?</b>

---

---

Notes	The return value is a string containing a list of partition identifiers that are removable media devices. Each identifier is separated by a comma. If no removable media is present, an empty string is returned.  Examples: <ul style="list-style-type: none"><li>- One removable device present results in a return string of "F:".</li><li>- Two removable devices present results in a return string of "F;G;".</li><li>- No removable devices present results in a return string of "".</li></ul>
Initial S/W Revision	x.15.00

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## Mass Storage Determine Removable Media Label (Remote Command Only)

This command is used to set or query a removable media device's label.

---

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMory:RMEDIA:LAbel <partition>,<string> :MMEMory:RMEDIA:LAbel? <partition>
<b>Example</b>	MMEM:RMED:LAB "F:","My Device"
Notes	If the <partition> specified does not exist or is not a removable media device, the error -252,"Missing Media" is generated.  Setting the removable media label requires Administrative privileges. If the currently logged in user does not have appropriate privileges the error "-221.9900,Settings conflict;Administrator privileges required" is generated.
Initial S/W Revision	x.15.00

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## Mass Storage Determine Removable Media Write-protect status (Remote Command Only)

This command is used to query a removable media device's write-protect status.

---

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMory:RMEDIA:WProtect? <partition>
<b>Example</b>	MMEM:RMED:WPR? "F:"
Notes	The return value is 1 if the device is write-protected, or 0 if the device is write-enabled.  If the <partition> specified does not exist or is not a removable media device the error -252,"Missing Media" is generated.
Preset	The return value will be depending on SD card installed.
Initial S/W Revision	x.15.00

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## Mass Storage Determine Removable Media size (Remote Command Only)

This command is used to query a removable media device's total memory size (not available memory size).

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMORY:RMEDIA:SIZE? <partition>
<b>Example</b>	MMEM:RMED:SIZE? "F:"
Notes	The return value is integer value in GBytes. Any device that is less than 1 GB returns 0 GB. If the <partition> specified does not exist or is not a removable media device, the error -252,"Missing Media" is generated.
Initial S/W Revision	x.15.00

## :SYSTem:SET (Remote Command Only)

Remote command that allows the user to obtain the state of the currently active mode in a form that can then be loaded back into the instrument quickly.

<b>Remote Command</b>	SYSTem:SET <instrument state in IEEE Block> SYSTem:SET?
Notes	SYST:SET? returns current instrument state of the active mode in IEEE Block data format. The state is in a machine readable format only. Sending the query returns the following format: <syst set preamble><state block data> Where: <syst set preamble> is the format: #NMMM N=number of digits that comprise MMM MMM=length in bytes of following data <state block data> is machine readable state data Example response: #42016<state data> The state is recalled by sending the SYST:SET? Response data to the instrument. From example above: SYST:SET #42016<state data>
Initial S/W Revision	x.17.00

## 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 895

Key Path	Front-panel key
<b>Example</b>	:INIT:CONT OFF
Notes	See <b>Cont</b> key description.
Backwards Compatibility Notes	<p>For Spectrum Analysis mode in ESA and PSA, the <b>Single</b> 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 <b>Max Hold</b> and <b>Min Hold</b>. In the X-Series, the <b>Single</b> hardkey and the INITiate:IMM command initiate a sweep/ measurement/ average sequence/hold sequence including <b>MaxHold</b> and <b>MinHold</b>.</p> <p>For Spectrum Analysis mode in ESA and PSA, the <b>Single</b> hardkey restarted the sweep regardless of whether or not you were in an active sweep or sweep sequence. In the X-Series, <b>Restart</b> does this but <b>Single</b> only restarts the sweep or sweep sequence if you are in the idle state.</p> <p>INIT[:IMM] in ESA &amp; 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.</p>
Initial S/W Revision	Prior to A.02.00

## More Information

See "Restart" on page 1045 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
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## SPAN X Scale

Accesses a menu of functions that enable you to control the horizontal scale and Span functions of the instrument. These settings apply only to the Log Plot measurement.

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

### Start Offset

Determines the start frequency offset for the log plot graph. This is relative to the carrier frequency, and refers to the upper sideband only.

Key Path	X Scale
Mode	PN
<b>Remote Command</b>	<code>[ :SENSe]:LPLot:FREQuency:OFFSet:STARt &lt;freq&gt;</code> <code>[ :SENSe]:LPLot:FREQuency:OFFSet:STARt?</code>
<b>Example</b>	LPL:FREQ:OFFS:STAR 100 LPL:FREQ:OFFS:STAR?
Notes	Related to Stop Offset in that the values must be an integer number of decades apart. Setting this value may modify the Stop Offset parameter to preserve this condition.
Couplings	Dependent upon "X Scale, Stop Offset" Adjusts "X Scale, Stop Offset" to preserve integer number of decades
Preset	100 Hz
State Saved	Saved in instrument state.
Min	1Hz
Max	Hardware Dependent: Opt503 = 3.69999995 GHz Opt508 = 8.49999995 GHz Opt513 = 13.79999995 GHz Opt526 = 26.99999995 GHz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Stop Offset

Determines the stop frequency offset for the log plot graph. This is relative to the carrier frequency, and refers to the upper sideband only.

Key Path	X Scale
Mode	PN

<b>Remote Command</b>	<code>[ :SENSe]:LPLot:FREQuency:OFFSet:STOP &lt;freq&gt;</code> <code>[ :SENSe]:LPLot:FREQuency:OFFSet:STOP?</code>
<b>Example</b>	LPL:FREQ:OFFS:STOP 1000000 LPL:FREQ:OFFS:STOP?
Notes	Related to Start Offset in that the values must be an integer number of decades apart. Setting this value may modify the Start Offset parameter to preserve this condition.
Couplings	Dependent upon "X Scale, Start Offset" Adjusts "X Scale, Start Offset" to preserve integer number of decades
Preset	1 MHz
State Saved	Saved in instrument state.
Min	100Hz
Max	Hardware Dependent: Opt503 = 3.69999995 GHz Opt508 = 8.49999995 GHz Opt513 = 13.79999995 GHz Opt526 = 26.99999995 GHz
Initial S/W Revision	Prior to A.02.00

## Sweep/Control

Accesses a menu that enables you to pause and restart the measurement.

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

### Pause/Resume

Pauses a measurement after the current data acquisition is complete.

When Paused, the label on the key changes to Resume. Pressing Resume unpauses the measurement. When you are Paused, pressing **Restart**, **Single** or **Cont** does a Resume.

Key Path	Sweep/Control
<b>Remote Command</b>	: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
<b>Remote Command</b>	: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

## System

See "System" on page 293

## Trace/Detector

Provides a menu of keys allowing you to select Phase Noise trace parameters, including Copying and Tracing selected traces.

See "[Trace Data](#)" on page 901 for information on saved trace data.

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

## Trace Data

You have the ability to save and restore the Log Plot traces. When a trace is restored, the mode of the trace is set to View.

File Format Name	Log Plot Trace
Extension	LPT
Front Panel Access	File Type, Log Plot Trace
Format Encoding	Binary (host endian)
Saving Supported:	Yes
Loading Supported:	Yes

TraceDataType is an Enumerated Type:

- Int32Format = 0,/\* Our Y-Coordinate data type \*/
- Int64Format = 1,
- Float32Format = 2,
- Float64Format = 3/\* Our X-Coordinate data type \*/

Section Name	Data Type	Data	Comments
File Header	uint32	fileType	
	uint32	headerSize	Size in bytes
	uint32	version	hex - 0x000B0105 == B.01.00 Rev05
	uint32	magicNumber	Always 0xFD6E7F7A
	uint32	numTraces	Always 1 (in this version)
	uint32	maxTraceLength	Length in trace points
Trace N Header	int32	traceHeaderSize	Size in bytes
	int32	traceIndex	Trace index – Always 1 (in this version)

	int32	traceLen	Length in trace points
	TraceDataType	traceXFormat	Data Type used for x axis
	TraceDataType	traceYFormat	Data Type used for y axis
	int32	traceDestination	Trace to replace
	int32	magicNumber	Always 0x49B0F6AE
Trace N X Data	See traceXFormat filed (at present float32)	*data	Array of Trace points (X component)
Trace N Y Data	See traceYFormat filed (at present int32)	*data	Array of Trace points (Y component)

### Select Trace

Selects the active trace for setting trace type from soft keys. When Blank is selected, trace disappears.

Key Path	Trace/Detector
Mode	PN
Preset	Trace 2
Initial S/W Revision	Prior to A.02.00

### Trace Type

Sets the type of selected trace.

Key Path	Trace/Detector
Mode	PN
<b>Remote Command</b>	:TRACe[1 2 3:LPLot:TYPE RAW SMOothed VIEW BLANK :TRACe[1 2 3:LPLot:TYPE?
<b>Example</b>	TRAC:LPL:TYPE RAW TRAC:LPL:TYPE?
Notes	You must be in the Phase Noise mode to use this command. Use INSTRument:SELect to set the mode.
Preset	RAW SMO BLAN
State Saved	Saved in instrument state.
Range	Raw Smoothed Reference(View) Blank
<b>Backwards Compatibility SCPI</b>	:CALCulate:LPLot:TRACe1:MODE :CALCulate:LPLot:TRACe2:MODE

---

**:CALCulate:LPlot:TRACe3:MODE**

---

Initial S/W Revision	Prior to A.02.00
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## Copy/Exchange

Enables you to copy or exchange traces from one trace to another.

---

Key Path	Trace/Detector
----------	----------------

---

Initial S/W Revision	Prior to A.02.00
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---

### From Trace

Specifies the source trace for Copy/Exchange Trace.

---

Key Path	Trace/Detector,CopyExchange
----------	-----------------------------

---

Mode	PN
------	----

---

Preset	1
--------	---

---

State Saved	Saved in instrument state.
-------------	----------------------------

---

Min	1
-----	---

---

Max	3
-----	---

---

Initial S/W Revision	Prior to A.02.00
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---

### To Trace

Specifies the destination trace for Copy / Exchange Trace.

---

Key Path	Trace/Detector, CopyExchange
----------	------------------------------

---

Mode	PN
------	----

---

Preset	2
--------	---

---

State Saved	Saved in instrument state.
-------------	----------------------------

---

Min	1
-----	---

---

Max	3
-----	---

---

Initial S/W Revision	Prior to A.02.00
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---

### Copy Now

Copies the content from the Source Trace into the Destination trace and places the destination trace mode into View

---

Key Path	Trace/Detector, CopyExchange
----------	------------------------------

---

Mode	PN
------	----

---

<b>Remote Command</b>	:TRACe:LPlot:COPY TRACE1 TRACE2 TRACE3,TRACE1 TRACE2 TRACE3
-----------------------	---

---

<b>Example</b>	TRAC:LPL:COPY TRACE1,TRACE2
----------------	-----------------------------

---

---

Couplings	Sets the trace mode of the destination trace into View
Initial S/W Revision	Prior to A.02.00

---

### Backward Compatibility commands

PSA has several commands for copy function. These are for backward compatibility support of those commands.

---

Mode	PN
<b>Remote Command</b>	<b>:CALCulate:LPlot:TRACe:COPY12</b>
Initial S/W Revision	Prior to A.02.00

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---

Mode	PN
<b>Remote Command</b>	<b>:CALCulate:LPlot:TRACe:COPY13</b>
Initial S/W Revision	Prior to A.02.00

---

---

Mode	PN
<b>Remote Command</b>	<b>:CALCulate:LPlot:TRACe:COPY21</b>
Initial S/W Revision	Prior to A.02.00

---

---

Mode	PN
<b>Remote Command</b>	<b>:CALCulate:LPlot:TRACe:COPY23</b>
Initial S/W Revision	Prior to A.02.00

---

---

Mode	PN
<b>Remote Command</b>	<b>:CALCulate:LPlot:TRACe:COPY31</b>
Initial S/W Revision	Prior to A.02.00

---

---

Mode	PN
<b>Remote Command</b>	<b>:CALCulate:LPlot:TRACe:COPY32</b>
Initial S/W Revision	Prior to A.02.00

---

### Exchange Now

Exchanges the content of the Source Trace into the Destination trace and places the source and destination trace modes into View.

Key Path	Trace/Detector, CopyExchange
Mode	PN
<b>Remote Command</b>	:TRACe:LPLot:EXChange TRACE1   TRACE2   TRACE3,TRACE1   TRACE2   TRACE3
<b>Example</b>	TRAC:LPL:EXCH TRACE1,TRACE2
Couplings	Sets the trace mode of the source and destination trace into View
Initial S/W Revision	Prior to A.02.00

### Positional relation of traces (Remote Command Only)

Queries positional relation of the specified two traces.

Mode	PN
<b>Remote Command</b>	:CALCulate:LPLot:TRACe:COMPare? <trace_num1>,<trace_num2>
<b>Example</b>	CALC:LPL:TRAC:COMP? 1,2
Notes	If trace1 is positioned above trace2, this command returns "ABOVe". If trace1 crosses with trace2, it returns "CROSS". If trace1 is positioned below trace2, it returns "BELow".
Dependencies	This command is available only when Option N9068A-AFP is installed.
Initial S/W Revision	A.10.00

### Backward Compatibility commands

PSA has several commands for exchange functions. These are for backward compatibility support of those commands.

Mode	PN
<b>Remote Command</b>	:CALCulate:LPLot:TRACe:SWAP12
Initial S/W Revision	Prior to A.02.00

Mode	PN
<b>Remote Command</b>	:CALCulate:LPLot:TRACe:SWAP13
Initial S/W Revision	Prior to A.02.00

Mode	PN
<b>Remote Command</b>	:CALCulate:LPLot:TRACe:SWAP21
Initial S/W Revision	Prior to A.02.00

Mode	PN
------	----

---

**Remote Command** :CALCulate:LPlot:TRACe:SWAP23

Initial S/W Revision Prior to A.02.00

---

Mode PN

---

**Remote Command** :CALCulate:LPlot:TRACe:SWAP31

Initial S/W Revision Prior to A.02.00

---

Mode PN

---

**Remote Command** :CALCulate:LPlot:TRACe:SWAP32

Initial S/W Revision Prior to A.02.00

---

## Detector

This parameter is read only and always set to average detector.

---

Mode PN

**Remote Command** [:SENSe]:LPlot:DETector[:FUNCTION]?

**Example** LPL:DET?

Notes Read Only

Preset AVERage

Range AVERage

Initial S/W Revision Prior to A.02.00

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## Trigger

See "Trigger" on page 385

### Free Run

See "Free Run " on page 393

### Video

See "Video (IF Envelope) " on page 394

### Line

See "Line" on page 563

### Trig Slope

See "Trig Slope" on page 563

### Trig Delay

See "Trig Delay" on page 399

### X Axis Relative to Trigger

See "X Axis Relative to Trigger" on page 421

### External 1

See "External 1" on page 575

### Trigger Level

See "Trigger Level" on page 576

### Trig Slope

See "Trig Slope" on page 576

### Trig Delay

See "Trig Delay" on page 402

### X Axis Relative to Trigger

See "X Axis Relative to Trigger" on page 421

### External 2

See "External 2 " on page 577

**Trigger Level**

See "Trigger Level" on page 577

**Trig Slope**

See "Trig Slope" on page 578

**Trig Delay**

See "Trig Delay" on page 404

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**RF Burst**

See "RF Burst" on page 578

**Absolute Trigger**

See "Absolute Trigger Level" on page 579

**Relative Trigger**

See "Relative Trigger Level" on page 568

**Trig Slope**

See "Trigger Slope" on page 580

**Trig Delay**

See "Trig Delay" on page 409

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Periodic Timer**

See "Periodic Timer (Frame Trigger)" on page 570

**Period**

See "Period" on page 572

**Offset**

See "Offset" on page 572

**Offset Adjust (Remote Command Only)**

See "Offset Adjust (Remote Command Only)" on page 573

**Reset Offset Display**

See "Reset Offset Display" on page 574

**Sync Source**

See "Sync Source" on page 574

**Off**

See "Off" on page 575

**External 1**

See "External 1" on page 575

**Trigger Level**

See "Trigger Level" on page 576

**Trig Slope**

See "Trig Slope" on page 576

**External 2**

See "External 2" on page 577

**Trigger Level**

See "Trigger Level" on page 577

**Trig Slope**

See "Trig Slope" on page 578

**RF Burst**

See "RF Burst" on page 578

**Absolute Trigger**

See "Absolute Trigger Level" on page 579

**Trig Slope**

See "Trigger Slope" on page 580

**Trig Delay**

See "Trig Delay" on page 421

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Auto/Holdoff**

See "Auto/Holdoff" on page 422

**Auto Trig**

See "Auto Trig" on page 423

**Trig Holdoff**

See "Trig Holdoff" on page 423

**Holdoff Type**

See "Holdoff Type" on page 424

## 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	<p>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.</p> <p>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.</p> <p>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.</p> <p>User Preset recalls mode state which can now include data like traces; whereas on ESA and PSA, User Preset did not affect data.</p>
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
<b>Remote Command</b>	<b>:SYST:PRESet:USER</b>
<b>Example</b>	<b>:SYST:PRES:USER:SAVE:SYST:PRES:USER</b>
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
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<b>Remote Command</b>	:SYST:PRESet:USER:ALL
<b>Example</b>	: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
<b>Remote Command</b>	:SYST:PRESet:USER:SAVE
<b>Example</b>	: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

## 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.

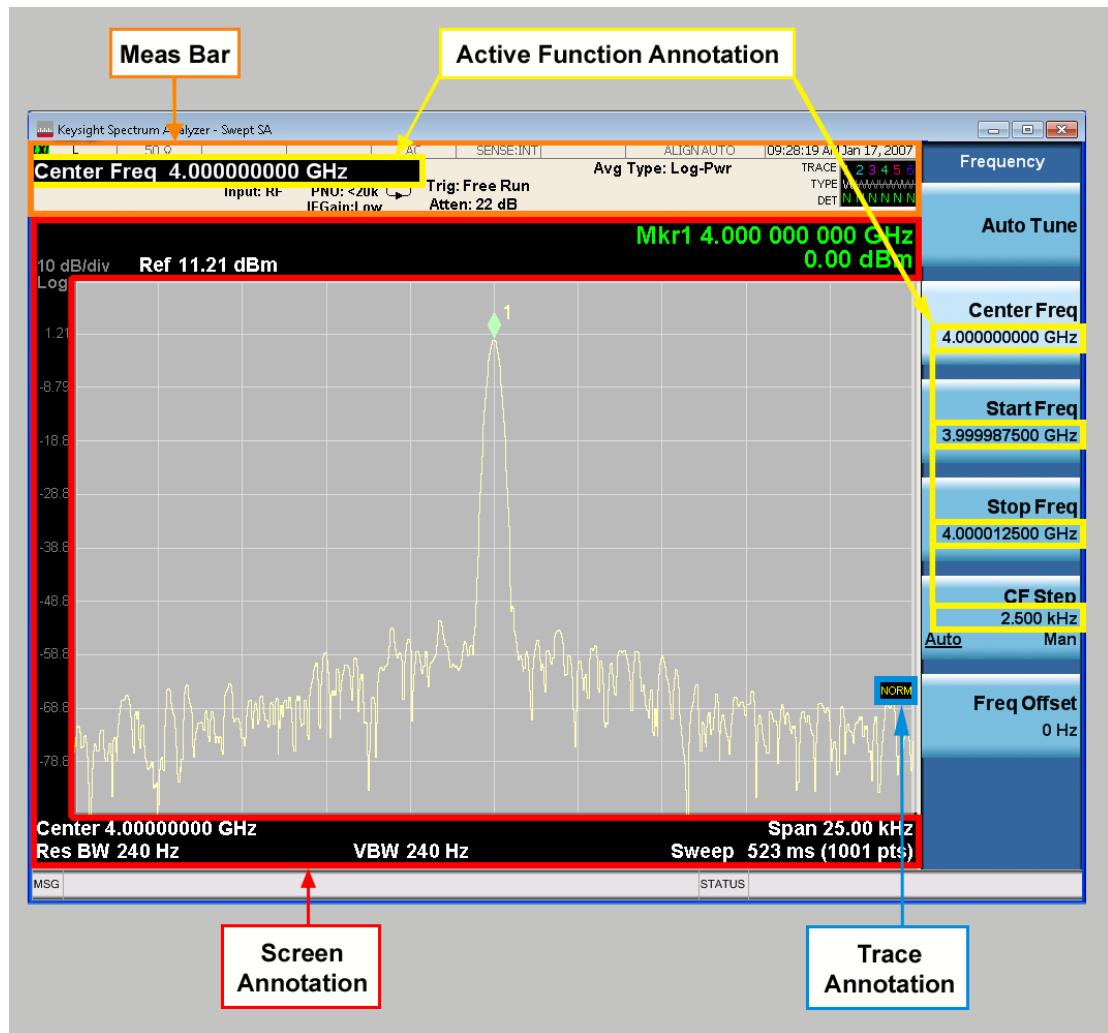
Key Path	Display
Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

## Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

13. 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.
14. 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.
15. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).
16. 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	<pre>:DISPlay:ANNotation:MBAR[:STATe] OFF ON 0 1 :DISPlay:ANNotation:MBAR[:STATe]?</pre>
Example	DISP:ANN:MBAR OFF
Dependencies	Grayed out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.

Preset	On
	This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> is set to Off.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Screen

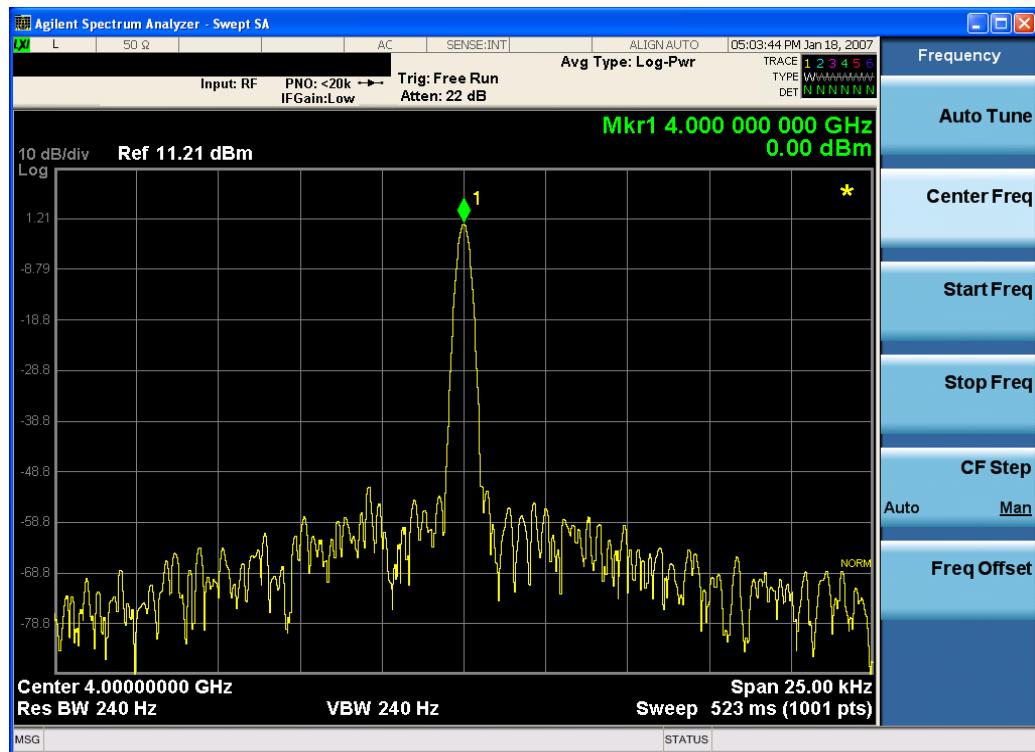
This controls the display of the annunciation and annotation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) and the y-axis annotation. This does NOT include marker annotation (or the N dB result). When off, the graticule expands to fill the 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
<b>Remote Command</b>	:DISPlay:ANNotation:SCReen[:STATe] OFF ON 0 1 :DISPlay:ANNotation:SCReen[:STATe]?
<b>Example</b>	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.
Preset	On
	This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> is set to 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
<b>Remote Command</b>	:DISPlay:ACTivefunc[:STATE] ON OFF 1 0 :DISPlay:ACTivefunc[:STATE]?
<b>Example</b>	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.
Preset	On This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> 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>:ANNAnnotation: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
<b>Remote Command</b>	:DISPLAY:WINDOW[1]:TRACe:GRATICULE:GRID[:STATe] OFF ON 0 1 :DISPLAY:WINDOW[1]:TRACe:GRATICULE:GRID[:STATe]?
<b>Example</b>	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

---

### 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.

<b>Key Path</b>	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:WINDOW[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDOW[1]:ANNotation[:ALL]?
<b>Example</b>	: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

### 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.

<b>Key Path</b>	Save, Screen Image
<b>Remote Command</b>	:MMEMORY:STOR:SCReen:THEMe TDCOLOR   TDMonochrome   FCOLOR   FMONochrome :MMEMORY:STOR:SCReen:THEMe?
<b>Example</b>	: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 you 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.

<b>Key Path</b>	Save, Screen Image, Themes
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Remote Command</b>	:DISPLAY:BACKlight ON OFF :DISPLAY:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
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
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

## 11 Waveform Measurement

The waveform measurement is a generic measurement for viewing the input signal waveforms in the time domain. This measurement represents how the instrument performs the zero span functionality found in traditional spectrum analyzers. For more details, see “["Waveform Measurement Description" on page 926](#)” below.

This topic contains the following sections:

- ["Measurement Commands for Waveform" on page 924](#)
- ["Remote Command Results for the Waveform Measurement" on page 925](#)

## Measurement Commands for Waveform

The general functionality of CONFigure, INITiate, FETCh, MEASure, and READ are described at this section.

```
:CONFigure:WAVEform  
:CONFigure:WAVEform:NDEFault  
:INITiate:WAVEform  
:FETCh:WAVEform[n]?  
:MEASure:WAVEform[n]?  
:READ:WAVEform[n]?
```

For more measurement related commands, see the SENSe subsystem, and the section "["Remote Measurement Functions" on page 986](#)".

## Remote Command Results for the Waveform Measurement

The following table denotes the returned results from the FETCh|MEASure|READ commands:

n	Results Returned
0	Returns unprocessed I/Q trace data, as a series of trace point values, in volts. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values.
1	<p>Returns the following scalar results:</p> <ol style="list-style-type: none"> <li>1. <b>Sample Time</b> is a floating point number representing the time between samples when using the trace queries (n=0, 2, and so forth).</li> <li>2. <b>Mean Power</b> is the mean power (in dBm). This is the power across the entire trace. If averaging is on, the power is for the latest acquisition.</li> <li>3. <b>Mean Power Averaged</b> is the power (in dBm) for N averages, if averaging is on. This is the power across the entire trace. If averaging is on, the power is for the latest acquisition. If averaging is off, the value of the mean power averaged is the same as the value of the mean power.</li> <li>4. <b>Number of samples</b> is the number of data points in the captured signal. This number is useful when performing a query on the signal (i.e. when n=0, 2, etc.).</li> <li>5. <b>Peak-to-mean ratio</b> has units of dB. This is the ratio of the maximum signal level to the mean power. Valid values are only obtained with averaging turned off. If averaging is on, the peak-to-mean ratio is calculated using the highest peak value, rather than the displayed average peak value.</li> <li>6. <b>Maximum value</b> is the maximum of the most recently acquired data (in dBm).</li> <li>7. <b>Minimum value</b> is the minimum of the most recently acquired data (in dBm).</li> </ol>
2	Returns trace point values of the entire captured signal envelope trace data. These data points are floating point numbers representing the power of the signal (in dBm). There are N data points, where N is the number of samples. The period between the samples is defined by the sample time.

## Waveform Measurement Description

Also available under the basic Waveform measurement is an I/Q window, which shows the I and Q signal waveforms in parameters of voltage versus time to disclose the voltages that comprise the complex modulated waveform of a digital signal.

The waveform measurement can also be used to perform general purpose power measurements to a high degree of accuracy.

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

## AMPTD Y Scale

Accesses a menu of functions that enable you to set the vertical scale parameters.

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

### Ref Value (RF Envelope View)

Sets the Y Scale reference value (in dBm) when the RF Envelope View is active. By default, the measurement determines the reference value with Auto Scaling. Entering a reference value manually turns Auto Scaling off.

Key Path	<b>AMPTD Y Scale</b>
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,LTEATDD, LTEAFDD
<b>Remote Command</b>	:DISPlay:WAVeform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVl <ampl> :DISPlay:WAVeform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVl?
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:Y:RLEV -50 dBm DISP:WAV:VIEW:WIND:TRAC:Y:RLEV?
Notes	You must be in the mode that includes Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	When Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Preset	10.00 dBm
State Saved	Saved in instrument state.
Range	-250.00 dBm to 250.00 dBm
Min	-250.00 dBm
Max	250.00 dBm
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Ref Value (I/Q Waveform View)

Sets the Y Scale reference value (in volts) when the I/Q Waveform View is active. By default, the measurement determines the reference value with Auto Scaling. Entering a reference value manually turns Auto Scaling off.

Key Path	<b>AMPTD Y Scale</b>
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDB-T, CMMB, LTE, LTETDD, DCATV, WLAN,LTEATDD, LTEAFDD
<b>Remote Command</b>	:DISPlay:WAVeform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RLEVl <voltage> :DISPlay:WAVeform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RLEVl?

---

<b>Example</b>	DISP:WAV:VIEW2:WIND:TRAC:Y:RLEV 25 V DISP:WAV:VIEW2:WIND:TRAC:Y:RLEV?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	When Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Preset	0 V
State Saved	Saved in instrument state.
Min	-250 V
Max	250 V
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

---

## 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.

See "[Dual Attenuator Configurations:](#)" on page 929

See "[Single Attenuator Configuration:](#)" on page 929

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.

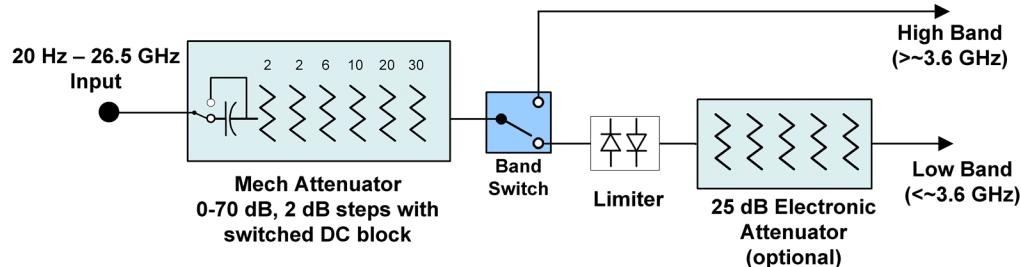
---

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 , " <a href="#">(Mech) Atten</a> " on page 930, and " <a href="#">Enable Elec Atten</a> " on page 932 keys for more detail on the contributors to the total attenuation.  Note that when "Pre-Adjust for Min Clip" 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

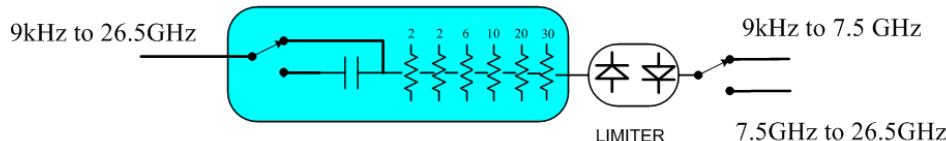
---

### Dual Attenuator Configurations:

Configuration 1: Mechanical attenuator + optional electronic attenuator

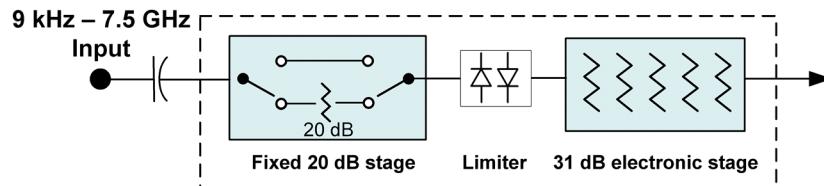


Configuration 2: Mechanical attenuator, no optional electronic attenuator

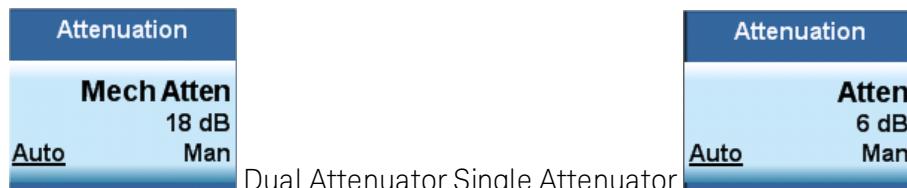


(note that Configuration 2 is not strictly speaking a dual-section attenuator, since there is no electronic section available. However, it behaves exactly like Configuration 1 without the Electronic Attenuator option EA3, therefore for the sake of this document it is grouped into the “Dual Attenuator” configuration)

### Single Attenuator Configuration:



You can tell which attenuator configuration you have by pressing the Attenuation key, which (in most Modes) opens the Attenuation menu. If the first key in the Attenuation menu says **Mech Atten** you have the dual attenuator configuration. If the first key says **Atten** you have the single attenuator configuration.



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 931

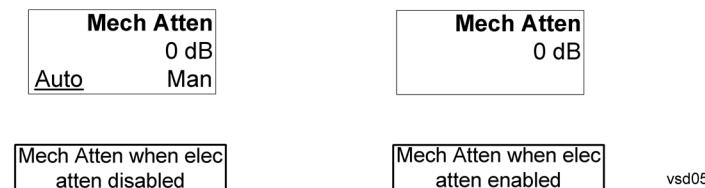
Key Path	AMPTD Y Scale, Attenuation
<b>Remote Command</b>	<pre>[ :SENSe]:POWer[:RF]:ATTenuation &lt;rel_ampl&gt; [ :SENSe]:POWer[:RF]:ATTenuation? [ :SENSe]:POWer[:RF]:ATTenuation:AUTO OFF ON 0 1 [ :SENSe]:POWer[:RF]:ATTenuation:AUTO?</pre>
<b>Example</b>	<p>POW:ATT 20</p> <p>Dual attenuator configuration: sets the mechanical attenuator to 20 dB</p> <p>Single attenuator mode: sets the main attenuation to 20 dB (see below for definition of "main" attenuation).</p> <p>If the attenuator was in Auto, it sets it to Manual.</p>
Dependencies	<p>Some measurements do not support the Auto setting of <b>(Mech) Atten</b>. In these measurements, the Auto/Man selection is not available, and the Auto/Man line on the key disappears.</p> <p>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 "<a href="#">Enable Elec Atten</a>" on page 932 key description.</p> <p>See "<a href="#">Attenuator Configurations and Auto/Man</a>" on page 931 for more information on the Auto/Man functionality of Attenuation.</p>
Couplings	<p>When <b>(Mech) Atten</b> is in Auto, it uses the following algorithm to determine a value:</p> <p>If the USB Preamp is connected to USB, use 0 dB.</p> <p>Otherwise, Atten = ReferenceLevel + PreAmpGain + ExternalGain – RefLevelOffset - MaxMixerLevel + IF Gain.</p> <p>Limit this value to be between 6 dB and the Max value. No value below 6 dB can ever be chosen by Auto.</p> <p>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).</p> <p>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.</p> <p>In External Mixing and BBIQ, where the Attenuator is not in the signal path, the Attenuator setting changes as described above when <b>(Mech) Atten</b> is in Auto, but no changes are made to the actual attenuator hardware setting until the input is changed back to the RF Input.</p>

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:



vsd05

## 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 934 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 931

See Error! Reference source not found.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	<code>[ :SENSe ] :POWer[ :RF ] :EATTenuation:STATe OFF ON 0 1</code> <code>[ :SENSe ] :POWer[ :RF ] :EATTenuation:STATe?</code>
Example	POW:EATT:STAT ON
Dependencies	<p>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 "<a href="#">Attenuator Configurations and Auto/Man</a>" on page 931.</p> <p>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 &gt; 3.6 GHz then the <b>Enable Elec Atten</b> key will be OFF and grayed out.</p> <p>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 <b>Enable Elec Atten</b> key will be OFF and grayed out.</p> <p>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.</p> <p>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.</p> <p>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.</p>
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

## 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
<b>Remote Command</b>	<code>[ :SENSe] :POWer[ :RF] :EATTenuation &lt;rel_ampl&gt;</code> <code>[ :SENSe] :POWer[ :RF] :EATTenuation?</code>
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 <a href="#">“Attenuator Configurations and Auto/Man” on page 931</a> . 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 <b>Enable Elec Atten</b> is off or grayed out, the <b>Elec Atten</b> key is grayed out.
Preset	0 dB
State Saved	Saved in instrument state
Min	0 dB

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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

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### Adjust Atten for Min Clip

Sets the combination of mechanical and electronic attenuation and gain 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 does not appear 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
<b>Remote Command</b>	[ :SENSe]:POWer[:RF]:RANGE:OPTimize IMMEDIATE
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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### Pre-Adjust for Min Clip

If this function is on, it does the adjustment described under ["Adjust Atten for Min Clip" on page 935](#) 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
<b>Remote Command</b>	[ :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.  In instruments with Dual Attenuator model, when <b>Enable Elec Atten</b> is off or grayed out, the Pre-

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**Adjust for Min Clip** key is grayed out.

Preset	OFF for Swept SA measurement; ON for all other measurements that support <b>Pre-Adjust for Min Clip</b>
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

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**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

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### 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.

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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

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### 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.

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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

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## 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 the step 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

## Range

This key is only available when I/Q is the selected input. It replaces the Attenuation key in that case.

Each input channel (I and Q) has four internal gain ranges. The maximum allowed voltage in each gain range is slightly more than the nominal value, so the break point between ranges is a couple of millivolts higher than the nominal (setting a peak voltage of 0.502 mV will still map to the 0.5 V Peak range).

Gain Setting	Volts RMS	Volts Peak	Volts Peak - Peak	dBm (50Ω)	Break Point
0 dB	0.7071	1.0	2.0	10	n/a
6 dB	0.3536	0.5	1.0	4	0.502 V Peak
12 dB	0.1768	0.25	0.5	-2	0.252 V Peak
18 dB	0.0884	0.125	0.25	-8	0.127 V Peak

Key Path	AMPTD Y Scale
Notes	Visible only when the selected input is I/Q.
State Saved	No
Readback Text	<p>When Range is Auto, "[Auto]"</p> <p>When Range is Man and I &amp; Q are the same, "[&lt;range value&gt;]"</p> <p>When Range is Man and I &amp; Q are different:</p> <p>"[I: &lt;I range value&gt;</p> <p>Q: &lt;Q range value&gt;]"</p> <p>See I Range and Q Range for the &lt;range value&gt; enumeration definition.</p>
Initial S/W Revision	Prior to A.02.00

### Range Auto/Man

The Auto setting for Range causes the range to be set based on the Y Scale settings. When Range is "Auto", the I & Q Range are set based on the top of the Y Scale when the Y scale is in dB units (for example, power), or to the max(abs(top), abs(bottom)) when the Y scale reference is not at the top of the screen.

Not all measurements support Range Auto/Man. If Auto is not supported in the current measurement, this key is grayed out and shows "Man" and MAN is returned to a SCPI query, but this does NOT change the Auto/Man setting for Range. When you go to a measurement that supports Auto, it goes back to Auto if it was previously in Auto mode.

Key Path	AMPTD Y Scale, Range
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:VOLTage:IQ:RANGe:AUTO OFF ON 0 1</code> <code>[ :SENSe]:VOLTage:IQ:RANGe:AUTO?</code>
<b>Example</b>	<p>Put the I Range and Q Range in manual.</p> <code>VOLT:IQ:RANG:AUTO OFF</code>
Dependencies	If Auto is not supported, sending the SCPI command will generate an error.
Couplings	When in Auto, both I Range and Q Range are set to the same value, computed as follows:

---

Maximum absolute value is computed for the Y Scale. The top and bottom of the graph are computed based on Ref Value, Scale/Div, and Ref Position. Formula:  $Y_{Max} = \max(\text{abs}(\text{top}), \text{abs}(\text{bottom}))$ .

The I Range and Q Range are then set to  $Y_{Max}$ .

Preset	ON
State Saved	Saved in instrument state
Range	Auto   Man
Initial S/W Revision	Prior to A.02.00

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<b>Remote Command</b>	<code>[ :SENSe]:POWer:IQ:RANGe:AUTO OFF ON 0 1</code> <code>[ :SENSe]:POWer:IQ:RANGe:AUTO?</code>
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<b>Example</b>	Put the I Range and Q Range in manual.  <code>POW:IQ:RANG:AUTO OFF</code>
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---

Notes	The POW:IQ:RANG:AUTO is an alternate form of the VOLT:IQ:RANG:AUTO command. This is to maintain consistency with I Range and Q Range, which support both the POWER and VOLTAGE forms of the command.
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Preset	ON
Range	Auto   Man
Initial S/W Revision	Prior to A.02.00

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## I/Q Gain Ranges

See the following sections:

- "1 V Peak" on page 942
- "0.5 V Peak" on page 943
- "0.25 V Peak" on page 943
- "0.125 V Peak" on page 943

## I Range

This is the internal gain range for the I channel when Input Path is I Only or I and I/Q, and it is used for both the I and Q channels when the Input Path is I+jQ. See "[I/Q Gain Ranges](#)" on page 939.

Key Path	AMPTD Y Scale, Range
<b>Remote Command</b>	<code>[ :SENSe]:VOLTage:IQ[:I]:RANGe[:UPPer] &lt;voltage&gt;</code> <code>[ :SENSe]:VOLTage:IQ[:I]:RANGe[:UPPer]?</code>
<b>Example</b>	Set the I Range to 0.5 V Peak  <code>VOLT:IQ:RANG 0.5 V</code>

---

---

Notes	The numeric entries are mapped to the smallest gain range whose break point is greater than or equal to the value, or 1 V Peak if the value is greater than 1 V.
Couplings	When Q Same as I is On, the I Range value will be copied to the Q Range. Changing the value will also set Range = Man.
Preset	1 V Peak
State Saved	Saved in instrument state
Range	1 V Peak   0.5 V Peak   0.25 V Peak   0.125 V Peak
Min	0.125 V
Max	1 V
Initial S/W Revision	Prior to A.02.00

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<b>Remote Command</b>	<code>[ :SENSe]:POWer:IQ[:I]:RANGe[:UPPer] &lt;ampl&gt;</code> <code>[ :SENSe]:POWer:IQ[:I]:RANGe[:UPPer]? </code>
<b>Example</b>	Set the I Range to 0.5 V Peak when Reference Z is 50Ω, and to 1.0 V Peak when Reference Z is 75Ω.  <code>POW:IQ:RANG 4 dBm</code>
Notes	The POWER form of the command is provided for convenience. It maps to the same underlying gain range parameter as the VOLtage form of the command.  The Reference Z (not the I channel Input Z) is used to convert the power to peak voltage, which is then used to set the I Range as with the VOLtage form of the command. The power values of the 4 range states (1V Peak, 0.5V Peak, 0.25V Peak, and 0.125V Peak) will vary with Reference Z. Here are some examples:  50Ω: 10, 4, -2, -8 75Ω: 8.2, 2.2, -3.8, -9.8 600Ω: -0.8, -6.8, -12.8, -18.9
Preset	10.0 dBm
Range	-20 dBm to 10 dBm
Min	-20 dBm
Max	10 dBm
Initial S/W Revision	Prior to A.02.00

---

## 1 V Peak

Set the channel gain state to 1 Volt Peak.

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Key Path	AMPTD Y Scale, I Range   Q Range
Initial S/W Revision	Prior to A.02.00

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## 0.5 V Peak

Set the channel gain state to 0.5 Volt Peak.

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Key Path	AMPTD Y Scale, I Range   Q Range
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Initial S/W Revision	Prior to A.02.00
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### 0.25 V Peak

Set the channel gain state to 0.25 Volt Peak.

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Key Path	AMPTD Y Scale, I Range   Q Range
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Initial S/W Revision	Prior to A.02.00
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### 0.125 V Peak

Set the channel gain state to 0.125 Volt Peak.

---

Key Path	AMPTD Y Scale, I Range   Q Range
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Initial S/W Revision	Prior to A.02.00
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### Q Range Value

This is the internal gain range for the Q channel. See "[I/Q Gain Ranges](#)" on page 939. The Q Range only applies to Input Path Q Only and Ind I/Q. For input I+jQ the I Range determines both I and Q channel range settings.

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Key Path	AMPTD Y Scale, Range
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<b>Remote Command</b>	[ :SENSe]:VOLTage:IQ:Q:RANGe[:UPPer] <voltage> [ :SENSe]:VOLTage:IQ:Q:RANGe[:UPPer]?
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<b>Example</b>	Set the Q Range to 0.5 V Peak VOLT:IQ:Q:RANG 0.5 V
----------------	---

Notes	The numeric entries are mapped to the smallest gain range whose break point is greater than or equal to the value, or 1 V Peak if the value is greater than 1 V.  The Q Range is only used for Input Path Q Only and Ind I/Q. For input I+jQ the I Range determines both I and Q channel range settings.
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Couplings	When Q Same as I is On, the I Range value will be copied to the Q Range and the range value keys are disabled.  Changing the value will also set Range = Man.
-----------	---

Preset	1 V Peak
--------	----------

State Saved	Saved in instrument state
-------------	---------------------------

Range	1 V Peak   0.5 V Peak   0.25 V Peak   0.125 V Peak
-------	--

Min	0.125 V
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Max	1 V
-----	-----

Initial S/W Revision	Prior to A.02.00
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<b>Remote Command</b>	[ :SENSe]:POWer:IQ:Q:RANGe[:UPPer] <ampl>
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	<b>[ :SENSe] :POWer :IQ:Q:RANGE[ :UPPer ]?</b>
<b>Example</b>	Will set the Q Range to 0.5 V Peak when Reference Z is $50\Omega$ , and to 1.0 V Peak when Reference Z is $75\Omega$ .  POW:IQ:Q:RANG 4 dBm
Notes	The POWer form of the command is provided for convenience. It maps to the same underlying gain range parameter as the VOLtage form of the command.  The Reference Z (not the Q channel Input Z) is used to convert the power to peak voltage, which is then used to set the Q Range as with the VOLtage form of the command. The power values of the 4 range states (1V Peak, 0.5V Peak, 0.25V Peak, and 0.125V Peak) will vary with Reference Z. Here are some examples:  $50\Omega$ : 10, 4, -2, -8 $75\Omega$ : 8.2, 2.2, -3.8, -9.8 $600\Omega$ : -0.8, -6.8, -12.8, -18.9
Preset	10.0 dBm
Range	-20 dBm to 10 dBm
Min	-20 dBm
Max	10 dBm
Initial S/W Revision	Prior to A.02.00

### Q Same as I

Many, but not all, usages require the I and Q channels to have an identical setup. To simplify channel setup, the Q Same as I will cause the Q channel range 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 Off, the I and Q channel setups will be identical.

Key Path	AMPTD Y Scale, Range, Q Range
<b>Remote Command</b>	<b>[ :SENSe] :VOLtage   POWer :IQ:MIRRored OFF   ON   0   1</b> <b>[ :SENSe] :VOLtage   POWer :IQ:MIRRored?</b>
<b>Example</b>	Turn off the mirroring of I Range to Q Range.  VOLT:IQ:MIRR OFF  POW:IQ:MIRR OFF
Couplings	When On, the I Range value is mirrored (copied) to the Q Range.
Preset	On
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

### 1 V Peak

Set the channel gain state to 1 Volt Peak.

---

Key Path	<b>AMPTD Y Scale, I Range   Q Range</b>
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Initial S/W Revision	Prior to A.02.00
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### 0.5 V Peak

Set the channel gain state to 0.5 Volt Peak.

---

Key Path	<b>AMPTD Y Scale, I Range   Q Range</b>
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Initial S/W Revision	Prior to A.02.00
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### 0.25 V Peak

Set the channel gain state to 0.25 Volt Peak.

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Key Path	<b>AMPTD Y Scale, I Range   Q Range</b>
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Initial S/W Revision	Prior to A.02.00
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### 0.125 V Peak

Set the channel gain state to 0.125 Volt Peak.

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Key Path	<b>AMPTD Y Scale, I Range   Q Range</b>
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Initial S/W Revision	Prior to A.02.00
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### Scale/Div (RF Envelope View)

Sets the scale per division for the RF Envelope result waveform (time domain) measurements in the graph window.

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Key Path	<b>AMPTD Y Scale</b>
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Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1xEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, LTEATDD, LTEAFDD
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<b>Remote Command</b>	:DISPlay:WAVeform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision <rel_ampl>
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:DISPlay:WAVeform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?

<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:Y:PDIV 5
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DISP:WAV:VIEW:WIND:TRAC:Y:PDIV?

Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
-------	--

Couplings	When Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
-----------	---

Preset	10.00 dB
--------	----------

State Saved	Saved in instrument state.
-------------	----------------------------

Range	0.10 dB to 20.00 dB
-------	---------------------

Min	0.10 dB
Max	20.00 dB
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Scale/Div (I/Q Waveform View)

Sets the scale per division for the I/Q signal waveform graph.

Key Path	AMPTD Y Scale
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, LTEATDD, LTEAFDD
Remote Command	:DISPlay:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision <voltage> :DISPlay:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
Example	DISP:WAV:VIEW2:WIND:TRAC:Y:PDIV 25mV DISP:WAV:VIEW2:WIND:TRAC:Y:PDIV?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	When Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Preset	100.0 mV
State Saved	Saved in instrument state.
Min	1.0 nV
Max	20 V
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### 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 945.

Key Path	AMPTD Y Scale
<b>Remote Command</b>	[ :SENSe[:POWer[:RF]:PCENter]
<b>Example</b>	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	<ul style="list-style-type: none"> <li>- Grayed out if the microwave preselector is off. )</li> <li>- If the selected marker's frequency is below Band 1, advisory message 0.5001 is generated and no action is taken.</li> <li>- Grayed out if entirely in Band 0.</li> <li>- 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.</li> <li>- Grayed out in the Spectrogram View.</li> </ul>
Couplings	<p>The active marker position determines where the centering will be attempted. If the analyzer is 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.</p>
Status Bits/OPC dependencies	<p>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.</p> <p>The Measuring bit should remain set while this command is operating and should not go false until the subsequent sweep/measurement has completed.</p>
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:

3. 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.

4. 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
5. 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 944 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	<b>AMPTD Y Scale</b>
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe] :POWer[ :RF] :PADJust &lt;freq&gt;</code> <code>[ :SENSe] :POWer[ :RF] :PADJust?</code>
<b>Example</b>	POW:PADJ 100KHz POW:PADJ?
Notes	The value on the key reads out to 0.1 MHz resolution.
Dependencies	<ul style="list-style-type: none"> <li>- Grayed out if microwave preselector is off.</li> <li>- Grayed out if entirely in Band 0.</li> <li>- 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.</li> <li>- Grayed out in the Spectrogram View.</li> </ul>
Preset	0 MHz
State Saved	The <b>Presel Adjust</b> value set by <b>Presel Center</b> , or by manually adjusting <b>Presel Adjust</b> , is not saved in instrument state, and does not survive a Preset or power cycle.
Min	-500 MHz
Max	500 MHz
Default Unit	Hz
<b>Backwards Compatibility SCPI</b>	<code>[ :SENSe] :POWer[ :RF] :MW:PADJust</code> <code>[ :SENSe] :POWer[ :RF] :MMW:PADJust</code>

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	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

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<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:PADJust:PRESelector MWAVE   MMWave   EXTerinal</code> <code>[ :SENSe]:POWer[:RF]:PADJust:PRESelector?</code>
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

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## 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.

Users may choose Low Noise Path Enable. It gives 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	<b>AMPTD Y Scale</b>
Mode	SA, BASIC, PNOISE, VSA , LTE, LTETDD
Scope	Meas Global
<b>Remote Command</b>	<b>[ :SENSe] :POWer[ :RF] :MW:PATH STD   LNPath   MPBypass   FULL</b> <b>[ :SENSe] :POWer[ :RF] :MW:PATH?</b>
<b>Example</b>	:POW:MW:PATH LNP Enables the Low Noise path
Notes	<p>If a Presel Center is performed, the analyzer will momentarily switch to the Standard Path, regardless of the setting of <b>μW Path Control</b></p> <p>The DC Block will always be 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 <b>Low Noise Path Enable</b>. In the case where the DC Block is switched in the analyzer is now AC coupled. However, if the user has 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.</p> <p>Alignment switching ignores the settings in this menu, and restores them when finished.</p>
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	<b>AMPTD Y Scale, μW Path Control</b>
<b>Example</b>	: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.

Image responses are separated from the real signal by twice the 1st IF. For IF Paths of 10 MHz and 25 MHz, the 1st IF is 322.5 MHz, so the image response and the real signal will be separated by 645 MHz. The 1st IF will be different for other IF Path settings. When viewing a real signal and its corresponding image response in internal mixing, the image response will be to the left of the real signal.

Also, the image response and the real signal typically have the same amplitude and exhibit the same shape factor.

However, if Option FS1, Fast Sweep Capability, is enabled, the image response in the Swept SA measurement will appear lower in amplitude and have a much wider shape factor compared to the real signal.

Key Path	AMPTD Y Scale, μW Path Control
<b>Example</b>	: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

<b>Remote Command</b>	[ :SENSe]:POWER[:RF]:MW:PRESelector[:STATe] ON OFF 0 1 [:SENSe]:POWER[:RF]:MW:PRESelector[:STATe]?
<b>Example</b>	: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

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## 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.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the status line. For example ,for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

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Key Path	AMPTD Y Scale
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:POWer[:RF]:GAIN[:STATe] OFF ON 0 1</code> <code>[ :SENSe]:POWer[:RF]:GAIN[:STATe]?</code>
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.
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be switched On, to Full Range.  Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected.  Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

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Key Path	AMPTD Y Scale, Internal Preamp
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Scope	Meas Global
<b>Remote Command</b>	[ :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
<b>Example</b>	: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
<b>Example</b>	: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
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND FULL

Readback	Full Range
Initial S/W Revision	Prior to A.02.00

### Ref Position (RF Envelope View)

Positions the reference level at the top, center or bottom of the Y Scale display.  
Changing the reference position does not change the reference level value.

Key Path	AMPTD Y Scale
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1xEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, LTEATDD, LTEAFDD
<b>Remote Command</b>	:DISPlay:WAVeform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION TOP   CENTER   BOTTOM :DISPlay:WAVeform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION?
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:Y:RPOS CENT DISP:WAV:VIEW:WIND:TRAC:Y:RPOS?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	TOP
State Saved	Saved in instrument state.
Range	Top Ctr Bot
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Ref Position (I/Q Waveform View)

Positions the reference level at the top, center or bottom of the Y Scale display.  
Changing the reference position does not change the reference level value.

Key Path	AMPTD Y Scale
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1xEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, LTEATDD, LTEAFDD
<b>Remote Command</b>	:DISPlay:WAVeform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION TOP   CENTER   BOTTOM :DISPlay:WAVeform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION?
<b>Example</b>	DISP:WAV:VIEW2:WIND:TRAC:Y:RPOS CENT DISP:WAV:VIEW2:WIND:TRAC:Y:RPOS?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	CENT
State Saved	Saved in instrument state.
Range	Top Ctr Bot
Initial S/W Revision	Prior to A.02.00

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Modified at S/W A.03.00  
Revision

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## Auto Scaling

Toggles the Auto Scaling function between On and Off. When the **Restart** front-panel key is pressed, this function automatically determines the scale per division and reference values based on the measurement results.

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Key Path	AMPTD Y Scale
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, LTEATDD, LTEAFDD
<b>Remote Command</b>	:DISPlay:WAVeform:VIEW[1] 2:WINDOW[1]:TRACe:Y[:SCALE]:COUPle 0   1   OFF   ON :DISPlay:WAVeform:VIEW[1] 2:WINDOW[1]:TRACe:Y[:SCALE]:COUPle?
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:Y:COUP OFF DISP:WAV:VIEW:WIND:TRAC:Y:COUP?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	When Auto Scaling is On, upon pressing the Restart front-panel key, this function automatically switches the scale per division and reference values into the defaults. When you set a value to either Scale/Div or Ref Value manually, Auto Scaling automatically changes to Off.
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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## 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 keyactions 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.

See "[More Information](#)" on page 954

Key Path	Front-panel key
<b>Remote Command</b>	:COUPLe ALL NONE
<b>Example</b>	:COUP ALL
Notes	:COUPLe ALL puts all Auto/Man parameters in Auto mode (equivalent to pressing the <b>Auto Couple</b> 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.

#### 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).

- If in Auto, Auto is underlined on the calling key.

- If in manual operation, manual is indicated on the calling key, but note that the calling key simply opens the menu and does **not** actually toggle the function.

## BW

Accesses a menu that enables you to control the information bandwidth functions of the instrument. You can also select the filter type for the measurement.

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

### Digital IF BW

Enables you to set the Digital IF (formerly Info BW) bandwidth of the instrument.

Key Path	<b>BW</b>
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TD-SCDMA, 1xEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	<code>[ :SENSe]:WAVEform:DIF:BANDwidth &lt;freq&gt;</code> <code>[ :SENSe]:WAVEform:DIF:BANDwidth?</code>
<b>Example</b>	WAV:DIF:BAND 1kHz WAV:DIF:BAND?
Notes	Max value depends on the IF Path Selection
Remote Command Notes	You must be in a mode that includes the Waveform measurements to use this command. Use INSTRument:SElect to set the mode.
Dependencies	For applications that have the IF Path Selection menu such as the BASIC mode, if IF Path Auto is OFF, the maximum value depends on which IF Path is currently selected. If 10 MHz, 25 MHz, 40 MHz, 85 MHz, 125 MHz, 140 MHz or 160 MHz paths are selected, the maximum value of this parameter will be 10, 25, 40, 85, 125, 140 or 160 MHz, respectively. If IF Path Auto is ON, the maximum value will be the maximum Digital IF BW available in the instrument regardless of the current IF Path Selection. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available Digital IF BW of the instrument is 140 MHz. Thus, if IF Path Auto is ON and IF Path Selection is 25 MHz, the maximum Digital IF BW is not limited to 25 MHz but is 140 MHz.
Preset	All except the following list: 100 kHz GSM/EDGE: 510 kHz TDSCDMA: 1.3 MHz 1xEVDO: 1.3 MHz DVB-T/H: 8.0 MHz DTMB (CTTB): 8.0 MHz ISDB-T: 6.0 MHz CMMB: 8.0 MHz Digital Cable TV: 8 MHz LTEAFDD, LTEATDD: 6 MHz LTETDD: 6 MHz LTE: 6 MHz WLAN: Hardware Dependent No option = 10 MHz

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Option B25 = 25 MHz  
 Option B40:  
     if Radio Std is 802.11a/b/g/n(20MHz) = 25 MHz  
     if Radio Std is 802.11n(40MHz) = 40 MHz  
     if Radio Std is 802.11ac(20MHz) = 25 MHz  
     if Radio Std is 802.11ac(40MHz) = 40 MHz  
     if Radio Std is 802.11ah(1MHz) = 3 MHz  
     if Radio Std is 802.11ah(2MHz) = 3 MHz  
     if Radio Std is 802.11ah(4MHz) = 4 MHz  
     if Radio Std is 802.11ah(8MHz) = 8 MHz  
     if Radio Std is 802.11ah(16MHz) = 16 MHz  
     if Radio Std is 802.11j/p(10MHz) = 10 MHz  
     if Radio Std is 802.11p(5MHz) = 5 MHz

Option B1X:  
     if Radio Std is 802.11ac(80MHz) = 80 MHz

Option B1Y:  
     if Radio Std is 802.11ac(160MHz) = 160 MHz

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State Saved	Saved in instrument state.
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Min	10 Hz
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Max	Hardware Dependent: RF Input: No Option = 10 MHz Option B25 = 25 MHz Option B40 = 40 MHz Option B85 = 85.0 MHz Option B1A = 125.0 MHz Option B1X = 140 MHz Option B1Y = 160 MHz I/Q Input: No Option = 10 MHz per channel (20 MHz for I+jQ) Option B25 = 25 MHz per channel (50 MHz for I+jQ) Option S40 = 40 MHz per channel (80 MHz for I+jQ)
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<b>Backwards Compatibility SCPI</b>	[ :SENSe]:WAVeform:BANDwidth[:RESolution] [ :SENSe]:WAVeform:BWIDth[:RESolution]
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Initial S/W Revision	Prior to A.02.00
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Modified at S/W Revision	A.03.00, A.13.00
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## Filter Type

Selects the type of bandwidth filter that is used.

Besides the Gaussian filter shape, a variety of other filter types are available with variable alpha settings for maximum control over the filter shape.

<b>Key Path</b>	<b>BW</b>
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	<pre>[ :SENSe]:WAveform:DIF:FILTter:TYPE GAUssian FLATtop [ :SENSe]:WAveform:DIF:FILTter:TYPE? (With DIF40 and/or WBDIF) [ :SENSe]:WAveform:DIF:FILTter:TYPE GAUssian   FLATtop   SNYQuist   RSNYquist   RCOSine   RRCosine [ :SENSe]:WAveform:DIF:FILTter:TYPE?</pre>
<b>Example</b>	<pre>WAV:DIF:FILT:TYPE GAUS WAV:DIF:FILT:TYPE?</pre>
Remote Command Notes	You must be in a mode that includes the Waveform measurements to use this command. Use INSTRument:SELect to set the mode.
Dependencies	Gaussian and Flattop are available in all DIF configurations. For the other filter types, the filters are only available when Option DP2, B40, or wider IF Bandwidth option is installed.
Preset	BASIC with DP2, B40, or wider IF Bandwidth option: FLATtop All other apps: GAUssian
State Saved	Saved in instrument state.
Range	Gaussian FlatTop When Option DP2, B40, or wider IF Bandwidth option is installed, the range is as follows. Gaussian Flattop Short nyquist Root Short Nquist Raised Cosine Root RaisedCosine
<b>Backwards Compatibility SCPI</b>	<pre>[ :SENSe]:WAveform:BANDwidth:SHApe [ :SENSe]:WAveform:BWIDth:SHApe [ :SENSe]:WAveform:BANDwidth BWIDth[:RESolution]:TYPE</pre>
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00, A.13.00

## Filter Type Bwcc

This parameter is strictly for Bwcc purposes.

<b>Remote Command</b>	<pre>[ :SENSe]:WAveform:WBIF:FILTter[:TYPE] GAUssian   NONE   NYQuist   RNYQuist   RCOSine   RRCosine [ :SENSe]:WAveform:WBIF:FILTter[:TYPE]?</pre>
Preset	BASIC with Option DP2, B40, or wider IF Bandwidth option: FLATtop All other apps: GAUssian

## Gaussian

When Option DP2, B40, or wider IF Bandwidth option is installed, the capability for arbitrary Digital IF bandwidths is available. However, for instruments without DP2,

B40, or wider IF Bandwidth option , the selectable Gaussian filter bandwidths are predetermined as shown in the following list. There are 160 Info BWs (RBWs) arranged in a 24-per-decade sequence from 1 Hz through 3 MHz, plus the 4, 5, 6 and 8 MHz settings.

The following table list all 160 Gaussian filter types.

### Gaussian filters

Normal (-3 dB)	-6 dB	Noise	Impulse
1.0 Hz	1.41 Hz	1.06 Hz	1.49 Hz
1.1 Hz	1.55 Hz	1.16 Hz	1.63 Hz
1.2 Hz	1.69 Hz	1.27 Hz	1.77 Hz
1.3 Hz	1.83 Hz	1.37 Hz	1.92 Hz
1.5 Hz	2.11 Hz	1.59 Hz	2.22 Hz
1.6 Hz	2.25 Hz	1.69 Hz	2.37 Hz
1.8 Hz	2.53 Hz	1.90 Hz	2.66 Hz
2.0 Hz	2.81 Hz	2.12 Hz	2.96 Hz
2.2 Hz	3.09 Hz	2.33 Hz	3.25 Hz
2.4 Hz	3.38 Hz	2.54 Hz	3.55 Hz
2.7 Hz	3.80 Hz	2.86 Hz	3.99 Hz
3.0 Hz	4.22 Hz	3.17 Hz	4.44 Hz
3.3 Hz	4.64 Hz	3.49 Hz	4.88 Hz
3.6 Hz	5.06 Hz	3.81 Hz	5.32 Hz
3.9 Hz	5.49 Hz	4.12 Hz	5.77 Hz
4.3 Hz	6.05 Hz	4.55 Hz	6.36 Hz
4.7 Hz	6.61 Hz	4.97 Hz	6.95 Hz

5.1 Hz	7.17 Hz	5.39 Hz	7.54 Hz
5.6 Hz	7.87 Hz	5.92 Hz	8.27 Hz
6.2 Hz	8.72 Hz	6.56 Hz	9.17 Hz
6.8 Hz	9.55 Hz	7.18 Hz	10.0 Hz
7.5 Hz	10.5 Hz	7.93 Hz	11.1 Hz
8.2 Hz	11.5 Hz	8.66 Hz	12.1 Hz
9.1 Hz	12.8 Hz	9.64 Hz	13.5 Hz
10 Hz	14.0 Hz	10.6 Hz	14.8 Hz
11 Hz	15.4 Hz	11.6 Hz	16.2 Hz
12 Hz	16.9 Hz	12.7 Hz	17.7 Hz
13 Hz	18.3 Hz	13.7 Hz	19.2 Hz
15 Hz	21.1 Hz	15.9 Hz	22.2 Hz
16 Hz	22.5 Hz	16.9 Hz	23.7 Hz
18 Hz	25.3 Hz	19.1 Hz	26.6 Hz
20 Hz	28.1 Hz	21.1 Hz	29.5 Hz
22 Hz	30.9 Hz	23.2 Hz	32.5 Hz
24 Hz	33.8 Hz	25.4 Hz	35.5 Hz
27 Hz	38.0 Hz	28.6 Hz	40.0 Hz
30 Hz	42.3 Hz	31.8 Hz	44.5 Hz
33 Hz	46.3 Hz	34.8 Hz	48.7 Hz
36 Hz	50.7 Hz	38.1 Hz	53.3 Hz
39 Hz	54.9 Hz	41.3 Hz	57.7 Hz

43 Hz	60.5 Hz	45.5 Hz	63.6 Hz
47 Hz	66.1 Hz	49.7 Hz	69.5 Hz
51 Hz	71.7 Hz	53.9 Hz	75.3 Hz
56 Hz	78.9 Hz	59.3 Hz	83.0 Hz
62 Hz	87.3 Hz	65.6 Hz	91.7 Hz
68 Hz	95.5 Hz	71.8 Hz	100 Hz
75 Hz	106 Hz	79.4 Hz	111 Hz
82 Hz	115 Hz	86.8 Hz	121 Hz
91 Hz	128 Hz	96.4 Hz	135 Hz
100 Hz	141 Hz	106 Hz	148 Hz
110 Hz	154 Hz	116 Hz	162 Hz
120 Hz	169 Hz	127 Hz	178 Hz
130 Hz	183 Hz	137 Hz	192 Hz
150 Hz	211 Hz	159 Hz	222 Hz
160 Hz	225 Hz	169 Hz	237 Hz
180 Hz	253 Hz	190 Hz	266 Hz
200 Hz	281 Hz	211 Hz	295 Hz
220 Hz	309 Hz	232 Hz	325 Hz
240 Hz	337 Hz	254 Hz	355 Hz
270 Hz	380 Hz	286 Hz	400 Hz
300 Hz	422 Hz	317 Hz	444 Hz
330 Hz	463 Hz	348 Hz	487 Hz
360 Hz	507 Hz	381 Hz	533 Hz
390 Hz	550 Hz	413 Hz	578 Hz
430 Hz	605 Hz	455 Hz	636 Hz
470 Hz	662 Hz	498 Hz	696 Hz
510 Hz	718 Hz	540 Hz	755 Hz
560 Hz	789 Hz	593 Hz	829 Hz
620 Hz	872 Hz	655 Hz	916 Hz
680 Hz	958 Hz	720 Hz	1.01 kHz

750 Hz	1.06 kHz	794 Hz	1.11 kHz
820 Hz	1.15 kHz	866 Hz	1.21 kHz
910 Hz	1.28 kHz	964 Hz	1.35 kHz
1.0 kHz	1.41 kHz	1.06 kHz	1.48 kHz
1.1 kHz	1.55 kHz	1.17 kHz	1.63 kHz
1.2 kHz	1.69 kHz	1.27 kHz	1.78 kHz
1.3 kHz	1.83 kHz	1.38 kHz	1.93 kHz
1.5 kHz	2.11 kHz	1.59 kHz	2.22 kHz
1.6 kHz	2.26 kHz	1.70 kHz	2.37 kHz
1.8 kHz	2.54 kHz	1.91 kHz	2.67 kHz
2.0 kHz	2.82 kHz	2.12 kHz	2.96 kHz
2.2 kHz	3.10 kHz	2.33 kHz	3.26 kHz
2.4 kHz	3.38 kHz	2.54 kHz	3.56 kHz
2.7 kHz	3.80 kHz	2.86 kHz	4.00 kHz
3.0 kHz	4.23 kHz	3.18 kHz	4.44 kHz
3.3 kHz	4.65 kHz	3.49 kHz	4.89 kHz
3.6 kHz	5.06 kHz	3.81 kHz	5.32 kHz
3.9 kHz	5.48 kHz	4.12 kHz	5.76 kHz
4.3 kHz	6.07 kHz	4.56 kHz	6.38 kHz
4.7 kHz	6.62 kHz	4.98 kHz	6.96 kHz
5.1 kHz	7.16 kHz	5.38 kHz	7.53 kHz
5.6 kHz	7.87 kHz	5.92 kHz	8.27 kHz

6.2 kHz	8.74 kHz	6.57 kHz	9.18 kHz
6.8 kHz	9.58 kHz	7.20 kHz	10.1 kHz
7.5 kHz	10.5 kHz	7.92 kHz	11.1 kHz
8.2 kHz	11.5 kHz	8.66 kHz	12.1 kHz
9.1 kHz	12.8 kHz	9.64 kHz	13.5 kHz
10 kHz	14.1 kHz	10.6 kHz	14.8 kHz
11 kHz	15.4 kHz	11.6 kHz	16.2 kHz
12 kHz	16.9 kHz	12.7 kHz	17.8 kHz
13 kHz	18.3 kHz	13.7 kHz	19.2 kHz
15 kHz	21.2 kHz	15.9 kHz	22.3 kHz
16 kHz	22.4 kHz	16.8 kHz	23.5 kHz
18 kHz	25.2 kHz	19.0 kHz	26.5 kHz
20 kHz	28.4 kHz	21.3 kHz	29.8 kHz
22 kHz	31.2 kHz	23.4 kHz	32.8 kHz
24 kHz	33.8 kHz	25.4 kHz	35.6 kHz
27 kHz	38.1 kHz	28.7 kHz	40.1 kHz
30 kHz	42.1 kHz	31.7 kHz	44.3 kHz
33 kHz	46.8 kHz	35.2 kHz	49.2 kHz
36 kHz	50.1 kHz	37.7 kHz	52.7 kHz
39 kHz	54.8 kHz	41.2 kHz	57.6 kHz
43 kHz	61.1 kHz	46.0 kHz	64.3 kHz
47 kHz	66.2	49.8	69.6 kHz

	kHz	kHz	
51 kHz	72.3 kHz	54.3 kHz	76.0 kHz
56 kHz	79.5 kHz	59.8 kHz	83.6 kHz
62 kHz	86.3 kHz	64.9 kHz	90.8 kHz
68 kHz	96.5 kHz	72.6 kHz	101 kHz
75 kHz	106 kHz	79.7 kHz	111 kHz
82 kHz	114 kHz	86.0 kHz	120 kHz
91 kHz	129 kHz	97.3 kHz	136 kHz
100 kHz	140 kHz	105 kHz	147 kHz
110 kHz	154 kHz	116 kHz	162 kHz
120 kHz	169 kHz	127 kHz	178 kHz
130 kHz	182 kHz	137 kHz	192 kHz
150 kHz	210 kHz	158 kHz	221 kHz
160 kHz	223 kHz	168 kHz	235 kHz
180 kHz	253 kHz	190 kHz	266 kHz
200 kHz	280 kHz	211 kHz	295 kHz
220 kHz	308 kHz	232 kHz	324 kHz
240 kHz	336 kHz	253 kHz	353 kHz
270 kHz	380 kHz	286 kHz	400 kHz
300 kHz	420 kHz	316 kHz	441 kHz
330 kHz	467 kHz	352 kHz	491 kHz
360 kHz	506 kHz	380 kHz	532 kHz

390 kHz	550 kHz	414 kHz	578 kHz
430 kHz	599 kHz	451 kHz	629 kHz
470 kHz	660 kHz	497 kHz	693 kHz
510 kHz	715 kHz	538 kHz	750 kHz
560 kHz	786 kHz	592 kHz	826 kHz
620 kHz	867 kHz	653 kHz	912 kHz
680 kHz	952 kHz	717 kHz	1.00 MHz
750 kHz	1.05 MHz	791 kHz	1.10 MHz
820 kHz	1.14 MHz	859 kHz	1.19 MHz
910 kHz	1.27 MHz	960 kHz	1.34 MHz
1.0 MHz	1.40 MHz	1.06 MHz	1.47 MHz
1.1 MHz	1.53 MHz	1.15 MHz	1.61 MHz
1.2 MHz	1.66 MHz	1.26 MHz	1.75 MHz
1.3 MHz	1.80 MHz	1.36 MHz	1.89 MHz
1.5 MHz	2.06 MHz	1.56 MHz	2.17 MHz
1.6 MHz	2.19 MHz	1.66 MHz	2.29 MHz
1.8 MHz	2.51 MHz	1.91 MHz	2.63 MHz
2.0 MHz	2.75 MHz	2.10 MHz	2.88 MHz
2.2 MHz	3.00 MHz	2.30 MHz	3.14 MHz
2.4 MHz	3.30 MHz	2.54 MHz	3.45 MHz
2.7 MHz	3.63 MHz	2.81 MHz	3.78 MHz
3.0 MHz	4.09	3.18	4.22 MHz

	MHz	MHz	
4 MHz	5.30 MHz	4.23 MHz	5.30 MHz
5 MHz	5.78 MHz	4.81 MHz	5.41 MHz
6 MHz	6.31 MHz	5.50 MHz	5.82 MHz
8 MHz	8.07 MHz	7.21 MHz	6.90 MHz

### Flattop

When Option DP2, B40, or wider IF Bandwidth option is installed, the capability for arbitrary Digital IF bandwidths is available. However, for instruments without Option DP2, B40 or wider IF Bandwidth option, the selectable Flattop filter bandwidths are predefined as shown in the following table. There are 134 Digital IF BWs (RBWs).

The following table lists all 134 Flattop filter types.

### Flattop Filters

3.0 Hz	3.3 Hz	3.6 Hz	3.9 Hz
4.3 Hz	4.7 Hz	5.1 Hz	5.6 Hz
6.2 Hz	6.8 Hz	7.5 Hz	8.2 Hz
9.1 Hz	10 Hz	11 Hz	12 Hz
13 Hz	15 Hz	16 Hz	18 Hz
20 Hz	22 Hz	24 Hz	27 Hz
30 Hz	33 Hz	36 Hz	39 Hz
43 Hz	47 Hz	51 Hz	56 Hz
62 Hz	68 Hz	75 Hz	82 Hz
91 Hz	100 Hz	110 Hz	120 Hz
130 Hz	150 Hz	160 Hz	180 Hz
200 Hz	220 Hz	240 Hz	270 Hz
300 Hz	330 Hz	360 Hz	390 Hz
430 Hz	470 Hz	510 Hz	560 Hz
620 Hz	680 Hz	750 Hz	820 Hz
910 Hz	1.0 kHz	1.1 kHz	1.2 kHz
1.3 kHz	1.5 kHz	1.6 kHz	1.8 kHz
2.0 kHz	2.2 kHz	2.4 kHz	2.7 kHz
3.0 kHz	3.3 kHz	3.6 kHz	3.9 kHz
4.3 kHz	4.7 kHz	5.1 kHz	5.6 kHz
6.2 kHz	6.8 kHz	7.5 kHz	8.2 kHz

9.1 kHz	10 kHz	11 kHz	12 kHz
13 kHz	15 kHz	16 kHz	18 kHz
20 kHz	22 kHz	24 kHz	27 kHz
30 kHz	33 kHz	36 kHz	39 kHz
43 kHz	47 kHz	51 kHz	56 kHz
62 kHz	68 kHz	75 kHz	82 kHz
91 kHz	100 kHz	110 kHz	120 kHz
130 kHz	150 kHz	160 kHz	180 kHz
200 kHz	220 kHz	240 kHz	270 kHz
300 kHz	330 kHz	390 kHz	430 kHz
510 kHz	620 kHz	750 kHz	1.0 MHz
1.5 MHz	3.0 MHz	4 MHz	5 MHz
6 MHz	8 MHz		

## Filter BW

This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.

Key Path	BW
Mode	BASIC
<b>Remote Command</b>	<pre>[ :SENSe]:WAveform:DIF:FILTer:BANDwidth &lt;freq&gt; [ :SENSe]:WAveform:DIF:FILTer:BANDwidth? [ :SENSe]:WAveform:DIF:FILTer:BANDwidth:AUTO ON OFF 1 0 [ :SENSe]:WAveform:DIF:FILTer:BANDwidth:AUTO?</pre>
<b>Example</b>	<pre>WAV:DIF:FILT:BAND 1MHz WAV:DIF:FILT:BAND? WAV:DIF:FILT:BAND:AUTO 0 WAV:DIF:FILT:BAND:AUTO?</pre>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
Dependencies	This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.
Couplings	Sets the same value as the current Digital IF BW value upon a preset or when Channel Filter Bandwidth Auto is ON.
Preset	Same value as Digital IF BW ON
State Saved	Saved in instrument state.
Min	10 Hz

---

Max	Clipped to the current Digital IF BW value.
Initial S/W Revision	A.04.00, A.13.00

---

## Channel Filter Bandwidth Bwcc (Remote Command Only)

This is the backward compatibility command for Channel Filter Bandwidth.

---

Mode	BASIC
<b>Remote Command</b>	<code>[ :SENSe]:WAVeform:WBIF:FILTer:BANDwidth &lt;real&gt;</code> <code>[ :SENSe]:WAVeform:WBIF:FILTer:BANDwidth?</code>
<b>Example</b>	<code>WAV:WBIF:FILT:BAND 0.3</code> <code>WAV:WBIF:FILT:BAND?</code>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Dependencies	This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.
Couplings	The value is determined by the following equation. $\text{ChannelFilterBwBwcc} = (\text{ChannelFilterBw}/(\text{DigitalIFBw} * \text{OverSampleRatio}))$
Preset	0.8
State Saved	Saved in instrument state.
Min	0.01
Max	1.0
Initial S/W Revision	A.04.00
Modified at S/W Revision	A.13.00

---

## Filter Alpha

Sets the filter alpha for the DIF filter. This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.

---

Key Path	<b>BW</b>
Mode	BASIC
<b>Remote Command</b>	<code>[ :SENSe]:WAVeform:DIF:FILTer:ALPHA &lt;real&gt;</code> <code>[ :SENSe]:WAVeform:DIF:FILTer:ALPHA?</code>
<b>Example</b>	<code>WAV:DIF:FILT:ALPH 0.5</code> <code>WAV:DIF:FILT:ALPH?</code>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Dependencies	This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.
Preset	0.2
State Saved	Saved in instrument state.
Min	0.01

---

Max	1.00
<b>Backwards Compatibility SCPI</b>	[ :SENSe]:WAVeform:WBIF:FILTer:ALPHa
Modified at S/W Revision	A.13.00

## 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
<b>Remote Command</b>	:INITiate:CONTinuous OFF ON 0 1 :INITiate:CONTinuous?
<b>Example</b>	: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 <b>Cont</b> hardkey, instead there is a <b>Sweep Single/Cont</b> key. In these analyzers, switching the <b>Sweep Single/Cont</b> key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart <b>Max Hold</b> and <b>Min Hold</b> . The X-Series has <b>Single</b> and <b>Cont</b> keys in place of the <b>SweepSingleCont</b> key. In the X-Series, if in single measurement, the <b>Cont</b> 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 will place the analyzer in Single Sweep but will have no effect on the current sequence until  $k = N$ , at which point the current sequence will stop and the instrument will go to the idle state.

## File

See "File" on page 287

## FREQ Channel

Accesses a menu allowing you to set Frequency parameters for Phase Noise measurements.

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

### Carrier Freq

Specifies the center frequency of the carrier

Key Path	FREQ Channel
Mode	PN
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe]:FREQuency:CARRier &lt;freq&gt;</code> <code>[ :SENSe]:FREQuency:CARRier?</code>
<b>Example</b>	FREQ:CARR 1 FREQ:CARR?
Notes	When Signal Track is ON, Carrier Frequency is automatically set depending on the signal. When Auto Tune is performed, Carrier Frequency is automatically set as the result of Auto Tuning algorithm.
Preset	1GHz
State Saved	Saved in instrument state.
Min	-79.999995 MHz
Max	Hardware Dependent: Opt503 = 3.699999995 GHz Opt508 = 8.499999995 GHz Opt513 = 13.799999995 GHz Opt526 = 26.999999995 GHz
Initial S/W Revision	Prior to A.02.00

## Input/Output

See "Input/Output" on page 141

## Marker

Accesses a menu that enables you to select, set up and control the markers for the current measurement.

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

### Select Marker

Displays 12 markers available for selection.

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

### Marker Type

Sets the marker control mode to **Normal**, **Delta**, **Fixed** or **Off**. All interactions and dependencies detailed under the key description are enforced when the remote command is sent. 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. At the same time, the Marker X Axis Value appears on the Active Function area.

The default active function is the active function for the currently selected marker control mode. If the current control mode is Off, there is no active function and the active function is turned off.

Key Path	Marker
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	<b>:CALCulate:WAVeform:MARKer[1] 2 ... 12:MODE POSITION   DELTa   OFF</b> <b>:CALCulate:WAVeform:MARKer[1] 2 ... 12:MODE?</b>
<b>Example</b>	CALC:WAV:MARK:MODE OFF CALC:WAV:MARK:MODE?
Notes	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 <b>Marker Trace</b> rules. At the same time, <b>Marker X Axis Value</b> appears on the Active Function area.  Default Active Function: the active function for the selected marker's current control mode. If the current control mode is Off, there is no active function and the active function is turned off.  Active Function Display: the marker X axis value entered in the active function area displays the marker value to its full entered precision.  You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	OFF

State Saved	Saved in instrument state.
Range	Normal Delta Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Marker X Axis Value (Remote Command Only)

Sets the marker X Axis value in the current marker X Axis Scale unit. It has no effect if the control mode is Off, but is the SCPI equivalent of entering an X value if the control mode is Normal or Delta.

Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	:CALCulate:WAVeform:MARKer[1] 2 ... 12:X <time> :CALCulate:WAVeform:MARKer[1] 2 ... 12:X?
<b>Example</b>	CALC:WAV:MARK:X 50 ms CALC:WAV:MARK:X?
Notes	If no suffix is sent, uses 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 error "Invalid suffix" is generated. If the specified marker is Fixed and a Marker Function is on, error -221 "Settings conflict; cannot adjust Fixed marker while Marker Function is on" is generated.  The query returns the marker's absolute X Axis value if the control mode is <b>Normal</b> , or the offset from the marker's reference marker if the control mode is <b>Delta</b> . The query is returned in the fundamental units for the current marker X Axis scale: Hz for <b>Frequency</b> and <b>Inverse Time</b> , seconds for <b>Period</b> and <b>Time</b> . If the marker is <b>Off</b> the response is not a number.  You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	0
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query returns a not a number (NAN).
State Saved	No
Min	(9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Marker X Axis Position (Remote Command Only)

Sets the marker X position in trace points. It has no effect if the control mode is Off, but is the SCPI equivalent of entering a value if the control mode is Normal or Delta. The entered value is immediately translated into the current X Axis Scale units for setting the value of the marker.

Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	<code>:CALCulate:WAVeform:MARKer[1] 2 ... 12:X:POSITION &lt;real&gt;</code> <code>:CALCulate:WAVeform:MARKer[1] 2 ... 12:X:POSITION?</code>
<b>Example</b>	CALC:WAV:MARK:X:POS 500 CALC:WAV:MARK:X:POS?
Notes	The query returns the marker's absolute X Axis value in trace points if the control mode is <b>Normal</b> or the offset from the marker's reference marker in trace points if the control mode is <b>Delta</b> . The value is returned as a real number, not an integer, corresponding to the translation from X Axis Scale units to trace points. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	0
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query returns a not a number (NAN).
State Saved	No
Min	(9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Marker Y Axis Value (Remote Command Only)

Queries the marker Y Axis value in the current marker Y Axis unit.

Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	<code>:CALCulate:WAVeform:MARKer[1] 2 ... 12:Y?</code>
<b>Example</b>	CALC:WAV:MARK1:Y?
Notes	When the marker is on, IQ waveform returns I and Q values. Case #1 - Trace RF, I or Q: returns a single double value. >:CALC:WAV:MARK1:Y? -2.402406506109E+001 Case #2 - Trace IQ: returns a double array of two values, the first is I, and the second is Q. >:CALC:WAV:MARK1:Y? -3.006944493834E-003,+9.9870666467354E-004 The IQ selection is for backward compatibility purposes. It is recommended that the users use the I and/or Q selection instead. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	Result dependent on the marker setup and signal source.

State Saved	No
<b>Backwards Compatibility SCPI</b>	:CALCulate:WAVeform:MARKer[1] 2 ... 12:FUNCTION:RESult?
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Properties

Accesses the marker properties menu.

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

## Select Marker

Displays 12 markers available for selection.

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

## Relative To

Selects the marker that the selected marker is relative to (its *reference marker*).

Key Path	Marker, Properties
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1xEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	:CALCulate:WAVeform:MARKer[1] 2 ... 12:REFERENCE <integer> :CALCulate:WAVeform:MARKer[1] 2 ... 12:REFERENCE?
<b>Example</b>	CALC:WAV:MARK:REF 8 CALC:WAV:MARK:REF?
Notes	A marker cannot be relative to itself so that choice is grayed out, and if sent from SCPI generates error -221: "Settings conflict; marker cannot be relative to itself." When queried a single value is returned (the specified marker numbers relative marker). You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	2 3 4 5 6 7 8 9 10 11 12 1
State Saved	Saved in instrument state.
Min	1
Max	12
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Marker Trace

Assigns the specified marker to the designated trace.

Key Path	Marker
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	:CALCulate:WAVeform:MARKer[1] 2 ... 12:TRACe RFENvelope   I   Q   IQ :CALCulate:WAVeform:MARKer[1] 2 ... 12:TRACe?
<b>Example</b>	CALC:WAV:MARK:TRAC RFEN CALC:WAV:MARK:TRAC?
Notes	Assigns the specified marker to the designated trace. The IQ selection is for backward compatibility purposes. It is recommended that the users use the I and/or Q selection instead. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
Preset	RFEN
State Saved	Saved in instrument state.
Range	RF Envelope   I   Q   IQ
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Couple Markers

Toggles the state of the markers to be coupled On or Off. When this function is true (On), moving any marker causes an equal X-axis movement of every other marker which is not Off. “Equal X-axis movement” refers to 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) are preserved.

Key Path	Marker
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	:CALCulate:WAVeform:MARKer[:STATE] ON OFF 1 0 :CALCulate:WAVeform:MARKer[:STATE]?
<b>Example</b>	CALC:WAV:MARK:COUP ON CALC:WAV:MARK:COUP ON
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.

Range	On Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### All Markers Off

Turns off all markers.

Key Path	Marker
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, LTEATDD, LTEAFDD
<b>Remote Command</b>	<b>:CALCulate:WAVeform:MARKer:AOFF</b>
<b>Example</b>	CALC:WAV:MARK:AOFF
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Backward Compatibility SCPI Commands

Sets or queries the state of a marker. Setting a marker that is OFF to state ON or 1 puts it in Normal mode and places it at the center of the screen.

Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<b>Remote Command</b>	<b>:CALCulate:WAVeform:MARKer[1] 2 ... 12:STATE OFF ON 0 1</b> <b>:CALCulate:WAVeform:MARKer[1] 2 ... 12:STATE?</b>
<b>Example</b>	CALC:WAV:MARK:STAT ON CALC:WAV:MARK:STAT?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Marker ->

There is no 'Marker ->' functionality supported in Waveform measurements. The front-panel key displays a blank menu when pressed.

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

## Marker Function

Accesses a menu of marker functions that perform post-processing operations on markers based on the measurement specifications. Marker functions are distinct from measurement functions, 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 Function menu controls which marker functions are turned on and allows you to adjust the setup parameters for each function. These parameters include the following, but only one parameter can be assigned to a given marker:

- Marker Noise
- Band/Interval Power
- Band/Interval Density
- Marker Function Off

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

### Select Marker

Displays 12 markers available for selection.

Key Path	Marker
Initial S/W Revision	Prior to A.02.00

### Marker Function Type

Sets the marker control function type to, Marker Noise, Band/Interval Power, Band Interval Density, or Marker Function Off

Key Path	Marker Function
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	:CALCulate:WAVeform:MARKer[1] 2 ... 12:FUNCTION BPOWer   BDENsity   OFF :CALCulate:WAVeform:MARKer[1] 2 ... 12:FUNCTION?
<b>Example</b>	CALC:WAV:MARK:FUNC BPOW CALC:WAV:MARK:FUNC?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	OFF

State Saved	Saved in instrument state.
Range	Band/Interval Power Band Interval Density Marker Function Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Band Adjust

Accesses a menu that enables you to set the frequency span width and the left and right edge, or time values, for the band or interval of the selected marker.

Key Path	<b>Marker Function</b>
Initial S/W Revision	Prior to A.02.00

## Band/Interval Span for Time Domain

Sets the width of the frequency span for the selected marker.

Key Path	<b>Marker Function</b>
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, LTEATDD, LTEAFDD
<b>Remote Command</b>	:CALCulate:WAVEform:MARKer[1] 2 ... 12:FUNCTION:BAND:SPAN <time> :CALCulate:WAVEform:MARKer[1] 2 ... 12:FUNCTION:BAND:SPAN?
<b>Example</b>	CALC:WAV:MARK:FUNC:BAND:SPAN 20 ms CALC:WAV:MARK:FUNC:BAND:SPAN?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	Changing the Band/Interval Span necessarily changes the Band/Interval Left and Band/Interval Right values
Preset	0
Preset	10% of Meas Time
State Saved	Saved in instrument state.
Min	0
Max	100 s
<b>Backwards Compatibility SCPI</b>	:CALCulate:WAVEform:MARKer[1] 2 ... 4:X:SPAN
Initial S/W Revision	<b>Prior to A.02.00</b>
Modified at S/W Revision	A.03.00

## Band/Interval Left for Time Domain

Sets the left edge frequency or time value for the band of the selected marker.

Key Path	Marker Function
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	<code>:CALCulate:WAVeform:MARKer[1] 2 ... 12:FUNCTION:BAND:LEFT &lt;time&gt;</code> <code>:CALCulate:WAVeform:MARKer[1] 2 ... 12:FUNCTION:BAND:LEFT?</code>
<b>Example</b>	<code>CALC:WAV:MARK12:FUNC:BAND:LEFT 1 s</code> <code>CALC:WAV:MARK12:FUNC:BAND:LEFT?</code>
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	Changing the Band/Interval Left necessarily changes the Band/Interval Span and Band/Interval Right values
Preset	0
Preset	5% of Meas Time
State Saved	Saved in instrument state.
Min	0
Max	100 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Band/Interval Right for Time Domain

Sets the right edge frequency or time value for the band of the selected marker.

Key Path	Marker Function
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN,,LTEATDD, LTEAFDD
<b>Remote Command</b>	<code>:CALCulate:WAVeform:MARKer[1] 2 ... 12:FUNCTION:BAND:RIGHT &lt;time&gt;</code> <code>:CALCulate:WAVeform:MARKer[1] 2 ... 12:FUNCTION:BAND:RIGHT?</code>
<b>Example</b>	<code>CALC:WAV:MARK12:FUNC:BAND:RIGH 1 s</code> <code>CALC:WAV:MARK12:FUNC:BAND:RIGH?</code>
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	Changing the Band/Interval Left necessarily changes the Band/Interval Span and Band/Interval Right values
Preset	0
Preset	5% of Meas Time
State Saved	Saved in instrument state.
Min	0
Max	100 s
Initial S/W Revision	Prior to A.02.00

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Modified at S/W                  A.03.00  
Revision

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## Meas

The information in this section is common to all measurements. For key and remote command information for a specific measurement, refer to the section that describes the measurement of interest.

Measurements available under the Meas key are specific to the current Mode.

When viewing Help for measurements, note the following:

**NOTE**

Operation for some keys differs between measurements. The information displayed in Help pertains to the current measurement. To see 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.

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

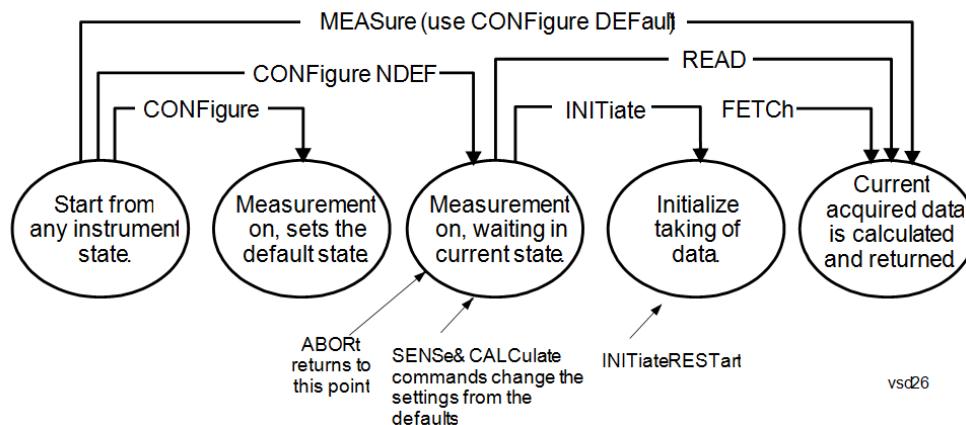
## Remote Measurement Functions

This section contains the following topics:

- "Measurement Group of Commands" on page 987
- "Current Measurement Query (Remote Command Only)" on page 990
- "Limit Test Current Results (Remote Command Only)" on page 990
- "Data Query (Remote Command Only)" on page 990
- "Calculate/Compress Trace Data Query (Remote Command Only)" on page 990
- "Calculate Peaks of Trace Data (Remote Command Only)" on page 996
- "Hardware-Accelerated Fast Power Measurement (Remote Command Only)" on page 997
- "Format Data: Numeric Data (Remote Command Only)" on page 1011
- "Format Data: Byte Order (Remote Command Only)" on page 1012

Initial S/W Revision	Prior to A.02.00
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## Measurement Group of Commands



### Measure Commands:

: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.

- 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.
- If the function does averaging, it is turned on and the number of averages is set to 10.
- After the data is valid it 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.
- 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.
- ASCII is the default format for the data output. (Older versions of Spectrum Analysis and Phase Noise mode measurements only use ASCII.) The binary data formats should be used for handling large blocks of data since they are smaller and faster than the ASCII format. Refer to the FORMat:DATA command 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 you can 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. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to 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 INIT: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 INIT:CONTinuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query 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 Commands:

: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 Commands:

: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 Commands:

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: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? it will initiate a new measurement 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 will switch 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. Then you send READ:ACP? It will change from channel power back to ACP and, using the previous ACP settings, will initiate the measurement and return results.
- 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 will be returned. 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 when handling large blocks of data since they are smaller and faster than the ASCII format. (FORMAT:DATA)

### Current Measurement Query (Remote Command Only)

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

<b>Remote Command</b>	:CONFigure?
<b>Example</b>	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. It returns a 0 if the measured results pass when compared with the current limits. It returns a 1 if the measured results fail any limit tests.

<b>Remote Command</b>	:CALCulate:CLIMits:FAIL?
<b>Example</b>	CALC:CLIM:FAIL? queries the current measurement to see if it fails the defined limits. Returns a 0 or 1: 0 it passes, 1 it fails.
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 and FORMat:DATA commands and can return real or ASCII data. (See the format command descriptions under Input/Output in the Analyzer Setup section.)

<b>Remote Command</b>	:CALCulate:DATA[n]?
Notes	The return trace depends on the measurement. In CALCulate:<meas>:DATA[n], n is any valid subopcode for the current measurement. It returns the same data as the FETCh:<measurement>? query where <measurement> 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 analyzer. The command is used with a sub-opcode <n> (default=1) to specify the trace. With trace queries, it is best if the analyzer 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.

<b>Remote Command</b>	<code>:CALCulate:DATA&lt;n&gt;:COMPRESS? BLOCK   CFIT   MAXimum   MINimum   MEAN   DMEan   RMS   RMSCubed   SAMPLE   SDEViation   PPHase [,&lt;soffset&gt;[,&lt;length&gt;[,&lt;roffset&gt;[,&lt;rlimit&gt;]]]]</code>
<b>Example</b>	<p>To query the mean power of a set of GSM bursts:</p> <p>Supply a signal that is a set of GSM bursts.</p> <p>Select the IQ Waveform measurement (in IQ Analyzer Mode).</p> <p>Set the sweep time to acquire at least one burst.</p> <p>Set the triggers such that acquisition happens at a known position relative to a burst.</p> <p>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.)</p>
Notes	<p>The command supports 5 parameters. Note that the last 4 (&lt;soffset&gt;, &lt;length&gt;, &lt;roffset&gt;, &lt;rlimit&gt;) are optional. But these optional parameters must be entered in the specified order. For example, if you want to specify &lt;length&gt;, then you must also specify &lt;soffset&gt;. See details below for a definition of each of these parameters.</p> <p>This command uses the data in the format specified by FORMat:DATA, returning either binary or ASCII data.</p>
Initial S/W Revision	Prior to A.02.00

- BLOCk or 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. (This is x,y pairs for trace data and I,Q pairs for complex data.)
- CFIT or 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 will return the following values: the x-offset (in seconds) and the curve coefficients ((order + 1) values).

MIN, MAX, MEAN, DME, RMS, RMSC, SAMP, SDEV and PPH return one data value for each specified region (or <length>) of trace data, for as many regions as possible until you run out of trace data (using <roffset> to specify regions). Or they return the number of regions you specify (using <rlimit>) ignoring any data beyond that.

- MINimum - 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 maximum magnitude of the I/Q pairs is returned.
- MEAN - 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)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i$$

-

where  $X_i$  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)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} |X_i|$$

-

where  $|X_i|$  is the magnitude of an I/Q pair, and  $n$  is the number of I/Q pairs in the specified region(s).

- DMEan - 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)

$$DME = 10 \times \log_{10} \left( \frac{1}{n} \sum_{X_i \in \text{region}(s)} 10^{\frac{X_i}{10}} \right)$$

- RMS - 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)

$$RMS = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i^2}$$

where  $X_i$  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)

$$RMS = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i X_i^*}$$

where  $X_i$  is the complex value representation of an I/Q pair,  $X_i^*$  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 - 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 - 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)

$$SDEV = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} (Xi - \bar{X})^2}$$

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).

$$SDEV = \sqrt{\frac{1}{n} \sum_{Xi \in \text{region}(s)} (|Xi| - \bar{X})^2}$$

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 - 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:

$$\text{Power} = 10 \times \log [10 \times (\text{RMS I/Q value})] + 10.$$

The RMS I/Q value (peak volts) is:

$$\sqrt{\frac{1}{n} \sum_{Xi \in \text{region}} Xi \cdot Xi^*}$$

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:

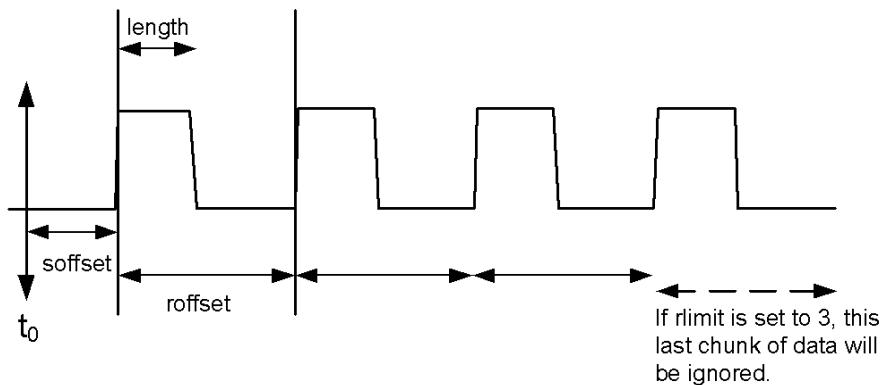
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

where  $Y_i$  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.

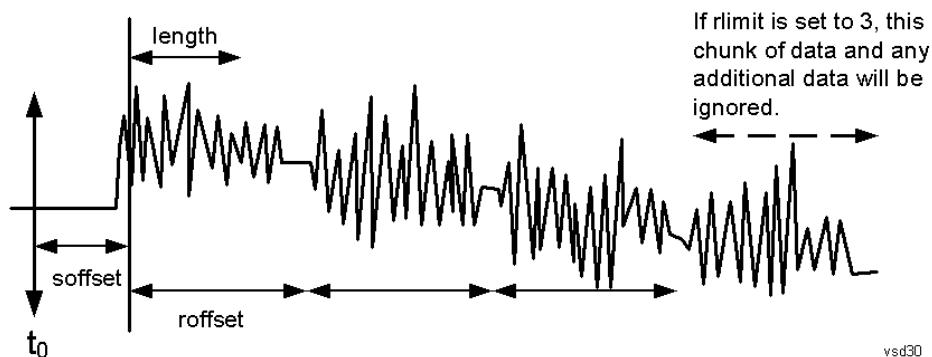
#### Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



#### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



vsd30

<soffset> - start offset is an optional real number. (It is in seconds for time-domain traces, and is 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> – is an optional real number. (It is in seconds for time-domain traces, and is 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. (It is in seconds for time-domain traces, and is 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 above).

<rlimit> – repeat limit is an optional integer. It specifies the number of data items that you want returned. It will ignore any additional items beyond that number. You can use the Start offset and the Repeat limit to pick out exactly what 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 sub-opcode [n]. The peaks must meet the requirements of the peak threshold and excursion values.

n = any valid sub-opcode 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 sub-opcodes 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 the sub-opcode n=0, is the raw trace data which cannot be searched for peaks. And Sub-opcode n=1, is often calculated results values which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDer and FORMat:DATA 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 will identify 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, it 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 the peak list will consist 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. 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 reportedSorting 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.

**Initial S/W Revision**

Prior to A.02.00

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**Hardware-Accelerated Fast Power Measurement (Remote Command Only)**

The Fast Power option (FP2) enables very fast channel power measurements for instruments with the prerequisite hardware (DP2 and/or B40). It accomplishes this by performing real-time overlapped FFTs at the hardware layer, using software for basic post-processing before returning the result to the user. The upshot of this

approach is improved throughput for user applications that require many sequential power measurements.

The analysis bandwidth of FP2 is limited by the licenses in the instrument, but its maximum overall analysis bandwidth per acquisition is 40 MHz.

FP2 is remote-only, which means the instrument does not switch to any particular mode or measurement. FP2 commands can be sent while another application is in use on the front panel.

Each Fast Power measurement can be predefined using an array index, and up to 1,000 measurements can be stored. In the following documentation, instances of [1,2,...,999] can be substituted with a particular measurement index, e.g. CALC:FPOW:POW1?, CALC:FPOW:POW2?, CALC:FPOW:POW134?. In this way, power measurements can be defined one time in a batch, and then executed multiple times without having to redefine them, similar to “list mode” on other measurements.

In addition to basic channel power measurements, there are a number of other measurement “functions” for each channel, including peak power, peak frequency, and power spectral density. See the Function parameter for more information.

### Reset Fast Power Measurement (Remote Command Only)

Resets the measurement configuration to the defaults.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:RESet
<b>Example</b>	:CALC:FPOW:POW1:RES
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Define Fast Power Measurement (Remote Command Only)

Fast Power acquisitions are configured using the DEFine command. This command accepts a comma-delimited string of configuration parameters and their appropriate values, which are all specified in the subsection below.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:DEFine "configuration string"
<b>Example</b>	:CALC:FPOW:POW1:DEF "CenterFrequency=2e9, AcquisitionTime=0.005"
Notes	See below for a list of measurement variables that can be defined in the configuration string.
Initial S/W Revision	A.14.00

## Acquisition Time

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Example	CALC:FPOW:POW1:DEF "AcquisitionTime=0.002"
Notes	The acquisition time parameter sets the time in which the entire spectrum is measured. An increase in the acquisition time yields an improvement in measurement repeatability.
Preset	0.001 s
Range	0 s to 1 s
Default Unit	Time (s)
Initial S/W Revision	A.14.00

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## Center Frequency

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Example	CALC:FPOW:POW1:DEF "CenterFrequency=2e9"
Notes	The center frequency parameter sets the frequency in which the measurement is centered around. The OffsetFrequency parameter is calculated relative to the center frequency.
Preset	1 GHz
Range	0 Hz to maximum instrument frequency
Default Unit	Frequency (Hz)
Initial S/W Revision	A.14.00

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## DC Coupled

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Example	CALC:FPOW:POW1:DEF "DCCoupled=True"
Notes	The DC coupled parameter allows the user to specify whether the DC blocking capacitor is utilized. Set parameter to true when measuring frequencies below 10 MHz.
Preset	False
Range	True (DC Coupled) or False (AC Coupled)
Default Unit	Boolean
Initial S/W Revision	A.14.00

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## DetectorType

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Example	CALC:FPOW:POW1:DEF "DetectorType=Peak"
Notes	Option FP2 is required. The detector type parameter allows the user to choose whether a RMS average or peak value is used during the measurement.
Preset	RmsAverage
Range	RmsAverage, Peak
Initial S/W Revision	A.14.00

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## Do Noise Correction

Example	CALC:FPOW:POW1:DEF "DoNoiseCorrection=True"
Notes	<p>When noise correction is enabled, the linear noise power contributed by the analyzer is subtracted from all measurements. This effectively lowers the noise floor of the analyzer.</p> <p>When noise correction is enabled, the first measurement for a given set of input parameters will take extra time. This is because the analyzer takes an extra acquisition with the RF input disconnected from the analyzer's front end to measure the noise of just the analyzer. The measured noise floor is stored in a cache so the noise acquisition will occur only once for the same state settings. In other words, if noise correction was turned on and the analyzer made an acquisition at frequency A, then frequency B, and back again to frequency A, the hidden initial noise floor acquisition would only occur for the first acquisition at frequency A and the cached noise floor would be used the second time frequency A was measured.</p>
Preset	False
Range	True (enable noise correction) or False (disable noise correction)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Do Spur Suppression

Example	CALC:FPOW:POW1:DEF "DoSpurSuppression=True"
Notes	<p>When measuring very low level signals, or when large out-of-band inputs are input into the analyzer, sometimes unwanted spurs and residuals can appear in the measured spectrum. Spur suppression is a method to help minimize the levels of these internally generated spurs and residuals.</p> <p>When spur suppression is enabled, the analyzer will automatically take two acquisitions using two different internal analog LO frequencies. The FFT spectrums from both acquisitions are combined by taking the minimum power between both traces on a per FFT bin basis. External signals will have the same amplitude for both traces and therefore will return the expected amplitudes. However, low level spurs and residuals generated internally to the analyzer tend to move to different FFT bins depending on the internal analog LO frequency used, and therefore tend to be suppressed using this spur suppression method.</p> <p>Because two acquisitions, rather than a single acquisition, are made when spur suppression is enabled, the measurement time will always be slower when spur suppression is enabled.</p>
Preset	False
Range	True (enable spur suppression) or False (disable spur suppression)
Default Unit	Boolean
Initial S/W Revision	A.14.00

## Electronic Attenuator Bypass

Example	CALC:FPOW:POW1:DEF "ElecAttBypass =False"
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Notes	The electronic attenuation bypass parameter allows the user to either utilize or bypass the electronic attenuator. The electronic attenuator is only available for frequencies up to 3.6 GHz. Set parameter to true when using frequencies above 3.6 GHz and set the parameter to false when using the preamp.
Preset	True
Range	True (bypass electronic attenuator) or False (use electronic attenuator)
Default Unit	Boolean
Initial S/W Revision	A.14.00

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### Electronic Attenuation

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Example	CALC:FPOW:POW1:DEF "ElecAttenuation=10"
Notes	<p>Option EA3 is required.</p> <p>The electronic attenuation value parameter sets the amount of electrical attenuation from 0 to 24 dB (1 dB steps).</p> <p>Set "ElecAttBypass=False" to make sure the electronic attenuator path is enabled.</p>
Preset	0 dB
Range	0 – 24 dB (1 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

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### IF Gain

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Example	CALC:FPOW:POW1:DEF "IFGain=10"
Notes	<p>The IF gain parameter allows the user to specify the gain at the IF stage anywhere from -6 to 16 dB (1 dB steps). This is an advanced feature, and for most cases this should remain at its default value of 0 dB.</p>
Preset	0 dB
Range	-6 – 16 dB (1 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

---

### IF Type

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Example	CALC:FPOW:POW1:DEF "IFTType=B25M"
Notes	<p>The IF type parameter allows the user to select between different IF paths. For example, if the signal is less than 25 MHz wide, then the user can select the B25M path to take advantage of additional filtering on this analog IF path.</p>

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Preset	B40M
Range	B10M, B25M, B40M
Initial S/W Revision	A.14.00

### Include Power Spectrum

Example	CALC:FPOW:POW1:DEF "IncludePowerSpectrum=True"
Notes	The power spectrum parameter allows the user to read data on the entire spectrum for diagnostic purposes. It is not recommended for production use. See CALC:FPOW:POW[n]:READ2? for details on the binary format of the response.
Preset	False
Range	True (return both channel power and full power spectrum) or False (returns only channel power)
Default Unit	Boolean
Initial S/W Revision	A.14.00

### Mechanical Attenuation

Example	CALC:FPOW:POW1:DEF "MechAttenuation=10"
Notes	The mechanical attenuation value parameter sets the amount of mechanical attenuation anywhere from 0 to 70 dB (2 dB steps).
Preset	0 dB
Range	0 – 70 dB (2 dB steps)
Default Unit	dB
Initial S/W Revision	A.14.00

### Preamp Mode

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The license for the appropriate preamp is required. The preamp mode parameter specifies whether the preamps are being utilized. Low allows any preamps up to 3.6 GHz, and Full allows all licensed preamps. Set "ElecAttBypass=True" in order to utilize any preamps.
Preset	Off
Range	Off, Low, Full
Initial S/W Revision	A.14.00

## Resolution Bandwidth Mode

---

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The resolution bandwidth mode parameter allows the user to choose whether the RBW filter is automatically or manually set. The BestSpeed value minimizes measurement time, while the Narrowest value minimizes RBW size (minimum of two FFT bins per RBW). To manually specify an RBW, set this parameter to Explicit, and set the ResolutionBW parameter to the desired value.
Preset	BestSpeed
Range	BestSpeed, Narrowest, Explicit
Initial S/W Revision	A.14.00

---

## Resolution Bandwidth

---

Example	CALC:FPOW:POW1:DEF "ResolutionBW=25e3"
Notes	The resolution bandwidth parameter sets the 3-dB bandwidth of the RBW filter. The ResolutionBWMode parameter must be set to Explicit in order to manually set the RBW.
Preset	0 Hz
Default Unit	Hz
Initial S/W Revision	A.14.00

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## Trigger Delay

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Example	CALC:FPOW:POW1:DEF "TriggerDelay=0.025"
Notes	The trigger delay parameter sets the time after an external trigger is detected until the measurement is performed.
Preset	0 s
Range	0 – 1 s
Default Unit	Seconds
Initial S/W Revision	A.14.00

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## Trigger Level

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Example	CALC:FPOW:POW1:DEF "TriggerLevel=2"
Notes	The trigger level parameter sets the voltage value at which an external trigger is detected.
Preset	1.2 V
Range	-5 to 5 V
Default Unit	Volts
Initial S/W Revision	A.14.00

---

## Trigger Slope

Example	CALC:FPOW:POW1:DEF "TriggerSlope=Negative"
Notes	The trigger slope parameter indicates the direction of the edge trigger voltage for detection.
Preset	Positive
Range	Positive, Negative
Initial S/W Revision	A.14.00

## Trigger Source

Example	CALC:FPOW:POW1:DEF "TriggerSource=Ext1"
Notes	The trigger source parameter allows the user to choose between measurement's triggering freely or controlled by an external input. Ext1 and Ext2 correspond to Trigger 1 In and Trigger 2 In, respectively.
Preset	Free
Range	Free, Ext1, Ext2
Initial S/W Revision	A.14.00

## Trigger Timeout

Example	CALC:FPOW:POW1:DEF "TriggerTimeout=0.1"
Notes	The trigger timeout parameter sets the time in which the analyzer will wait for a trigger before automatically performing the measurement.
Preset	1 s
Range	0 – 1 s
Default Unit	Seconds
Initial S/W Revision	A.14.00

## Signal Input

Example	CALC:FPOW:POW1:DEF "SignalInput=Fp50MHzCW"
Notes	The signal input parameter allows the user to select between using the main RF input or the internal analyzer reference CW signal of 50 MHz.
Preset	FpMainRf
Range	FpMainRf, Fp50MHzCW
Initial S/W Revision	A.14.00

## Use Preselector

---

Example	CALC:FPOW:POW1:DEF "UsePreSelector=True"
Notes	The preselector parameter allows the user to either utilize or bypass the front end tunable filter at frequencies above 3.6 GHz. For frequencies below 3.6 GHz, the preselector is automatically bypassed, so you do not need to set this parameter to False in those cases.
Preset	False
Range	True (use preselector above 3.6 GHz), or False (preselector bypassed)
Default Unit	Boolean
Initial S/W Revision	A.14.00

---

## Channel Bandwidth Array

---

Example	CALC:FPOW:POW1:DEF "Bandwidth=[3.84e6, 5e6, 3.84e6]"
Notes	The bandwidth parameter array defines the bandwidth of each channel that will be measured. All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.
Preset	[1e6]
Range	0 to 40 MHz
Default Unit	Hz
Initial S/W Revision	A.14.00

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## Channel Filter Type Array

---

Example	CALC:FPOW:POW1:DEF "FilterType=[RRC, IBW, RRC]"
Notes	The filter type parameter allows the user to choose between an integration bandwidth (IBW) filter or a root-raised-cosine (RRC) filter. The integration bandwidth filter weighs all frequencies within the bandwidth equally. The root-raised-cosine filter has an associated shape parameter, defined by the FilterAlpha parameter. All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.
Preset	[IBW]
Range	IBW, RRC
Initial S/W Revision	A.14.00

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## Channel Filter Alpha Array

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Example	CALC:FPOW:POW1:DEF "FilterAlpha=[0.5, 0.0, 0.5]"
Notes	The filter alpha parameter allows the user to adjust the alpha value associated with the root-

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raised-cosine (RRC) filter type. Set FilterType to RRC in order to utilize this parameter.  
All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.

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Preset	[0.22]
Range	0.0 – 1.0
Initial S/W Revision	A.14.00

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### Channel Measurement Function Array

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Example	CALC:FPOW:POW1:DEF "Function=[BandPower, PeakPower, BandPower]"
Notes	<p>This parameter array defines what measurement is being made for each individually-specified channel:</p> <p>BandPower: Total power within the specified bandwidth of the channel (dBm)</p> <p>BandDensity: Total power density within the specified bandwidth of the channel (dBm/Hz)</p> <p>PeakPower: The peak power value within the specified bandwidth of the channel (dBm)</p> <p>PeakFrequency: The frequency which corresponds to the peak power value within the specified bandwidth of the channel. This frequency is relative to the center frequency (Hz)</p> <p>XdBBandwidth: The half power (-3.01 dB) bandwidth of the highest amplitude signal that resides within the channel (Hz), dB is configurable using XdBBandwidth parameter</p> <p>OccupiedBandwidth: The bandwidth at which 99% of the total power resides within the channel (Hz), percentage configurable using OccupiedBandwidthPercent parameter</p> <p>All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.</p>
Preset	[BandPower]
Range	BandPower, BandDensity, PeakPower, PeakFrequency, XdBBandwidth, OccupiedBandwidth
Initial S/W Revision	A.14.00

---

### Channel Offset Frequency Array

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Example	CALC:FPOW:POW1:DEF "OffsetFrequency=[-5e6, 0, 5e6]"
Notes	<p>The offset frequency parameter array defines the difference between the center frequency to the center frequency of each channel.</p> <p>All array parameters should have the same number of elements.</p>
Preset	[0]
Range	0 to 20 MHz
Default Unit	Hz
Initial S/W Revision	A.14.00

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## Channel Occupied Bandwidth Percent Array

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Example	CALC:FPOW:POW1:DEF "OccupiedBandwidthPercent =[0.95, 0.95, 0.95]"
Notes	This parameter only applies for channels whose Function is set to OccupiedBandwidth. The occupied bandwidth percent parameter specifies the percent of total power in these channels. The valid range for this parameter is 0.0 to 1.0, where 1.0 represents 100%. The default for this parameter is 0.99, which will return the bandwidth that contains 99% of the total channel power.
Preset	[0.99]
Range	0 – 1.0
Initial S/W Revision	A.14.00

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## Channel x-dB Bandwidth Array

---

Example	CALC:FPOW:POW1:DEF "XdBBandwidth =[-6.02, -3.01, -1.0]"
Notes	This parameter only applies for channels whose Function is set to XdBBandwidth. The X dB bandwidth parameter is used to specify the power relative to the peak channel power over which the bandwidth is calculated. The parameter value must be a negative number.
Preset	[-3.01]
Range	-200 to 0 dB
Default Unit	dB
Initial S/W Revision	A.14.00

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## Define Fast Power Measurement Query (Remote Command Only)

The DEFine? command is used to retrieve a list of all defined parameters in an ASCII string format

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```
M All
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R :CALCulate:FPOWer:POWer[1,2,...,999]:DEFInE?
e
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o
t
e
C
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a
n
```

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d

E :CALC:FPOW:POW1:DEF?

x

a

m

p

l

e

N This command query is used to retrieve a list of all defined parameters in an ASCII format.

o The following is an example of the returned results:

t "DCCoupled=False,ElecAttBypass=True,ElecAttenuation=0,IFGain=0,MechAttenuation=0,PreAmpMode=Off,PreSelectorOf  
e fset=0,UsePreSelector=False,ExternalReferenceFrequency=10000000,FrequencyReferenceSource=AutoExternalFrequenc  
s yReference,IFTType=B40M,LOMode=SLW,SignalInput=FpMainRf,AcquisitionTime=0.001,CenterFrequency=1000000000,Re  
solutionBW=0,ResolutionBWMode=BestSpeed,DetectorType=RmsAverage,Bandwidth=[1000000],OffsetFrequency=  
[0],Function=[BandPower],FilterType=[IBW],FilterAlpha=[0.22],OccupiedBandwidthPercent=[0.99],XdBBandwidth=[-  
3.01],DoNoiseCorrection=False,DoSpurSuppression=False,MeasurementMethod=HardwareFFT,IncludePowerSpectrum=F  
alse,TriggerDelay=0,TriggerLevel=1.2,TriggerSlope=Positive,TriggerSource=Free,TriggerTimeout=1"

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### Configure Fast Power Measurement (Remote Command Only)

The configure command begins hardware setup and returns immediately, with no acquisition made. This can be used in parallel with other hardware operations to effectively hide the hardware setup time.

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Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:CONFigure
<b>Example</b>	:CALC:FPOW:POW1:CONF

---

Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Initiate Fast Power Measurement (Remote Command Only)

The INITiate command begins an acquisition and returns immediately. The results of the measurement can be retrieved using FETCh.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:INITiate
<b>Example</b>	:CALC:FPOW:POW1:INIT
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

### Fetch Fast Power Measurement (Remote Command Only)

The FETCh command query is used to retrieve the results of an acquisition initiated by the INIT command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:FETCH?
<b>Example</b>	:CALC:FPOW:POW1:FETCH?
Notes	<p>Option FP2 is required.            Returns m comma-separated ASCII values, where m corresponds to the number of bandwidths defined.</p> <ul style="list-style-type: none"> <li>1. Declared function return in the 1st specified channel</li> <li>2. Declared function return in the 2nd specified channel</li> <li>...</li> <li>m. Declared function return in the last specified channel</li> </ul> <p>The INIT and FETC? command sequence performs the same functionality of a single CALC:FPOW:POW[n]? query. Units of the returned values are dependent on the Function parameter for each channel.</p>
Initial S/W Revision	A.14.00

### Execute Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]?
<b>Example</b>	:CALC:FPOW:POW1?
Notes	Option FP2 is required. See notes for Fast Power Fetch for return format.
Initial S/W Revision	A.14.00

### Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:READ? :CALCulate:FPOWer:POWer[1,2,...,999]:READ1?
<b>Example</b>	:CALC:FPOW:POW1:READ? :CALC:FPOW:POW1:READ1?
Notes	Option FP2 is required. Returns m 4 byte floating point binary values (Little-Endian), where m corresponds to the number of bandwidths defined.
Initial S/W Revision	A.14.00

### Diagnostic Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format. This command is used primarily for diagnostic purposes to test for ADC overloads and to visibly inspect the spectrum.

Mode	All
<b>Remote Command</b>	:CALCulate:FPOWer:POWer[1,2,...,999]:READ2?
<b>Example</b>	:CALC:FPOW:POW1:READ2?
Notes	Option FP2 is required.

**NOTE**

Spectrum data is only returned if the IncludePowerSpectrum parameter is set to True. If IncludePowerSpectrum is False, the number of spectrum points will be zero (0).

Units of the returned values are dependent on the Function parameter per channel (e.g. dBm for BandPower, Hz for PeakFrequency).

Returns binary data (Little-Endian) that contains information on m amount of channels, along with ADC over range and full spectrum data.

---

The following is the binary format of the response.	
Bandwidth Return Value	
1. Number of channels specified, m [4 byte int]	
2. Declared function result for the 1st specified channel [4 byte float]	
3. Declared function result for the 2nd specified channel [4 byte float]	
...	
(m + 1). Declared function result for the last (mth) specified channel [4 byte float]	
ADC Over Range	
1. ADC over-range occurred (1: true, 0: false) [2 byte short]	
Spectrum Data	
1. Number of points in the spectrum data, k [4 byte int]	
2. Start frequency of spectrum data (Hz) [8 byte double]	
3. Step frequency of spectrum data (Hz) [8 byte double]	
4. FFT bin at 1st point (dBm) [4 byte float]	
5. FFT bin at 2nd point (dBm) [4 byte float]	
...	
(k + 3). FFT bin at last (kth) point (dBm) [4 byte float]	
Initial S/W Revision	A.14.00

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### 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.

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<b>Remote Command</b>	:FORMAT[:TRACe][:DATA] ASCii INTeger,32 REAL,32  REAL,64 :FORMAT[:TRACe][:DATA]?
Notes	<p>The query response is:</p> <p>ASCii: ASC,8</p> <p>REAL,32: REAL,32</p> <p>REAL,64: REAL,64</p> <p>INTeger,32: INT,32</p> <p>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).</p> <p>The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.</p>
Dependencies	<p>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).</p> <p>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</p>

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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 says it uses FORMat:DATA uses any format supported by FORMat:DATA.

The NORMAl order is a byte sequence that 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 is when the byte sequence begins with the LSB first, and ends with the MSB last in the sequence: 4|3|2|1.

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<b>Remote Command</b>	<b>:FORMat:BORDER NORMAl SWAPPed</b>
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:FORMat:BORDer?	
Preset	NORMAl
Initial S/W Revision	Prior to A.02.00

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## Meas Setup

Displays the setup menu keys that enable you to control the parameters for the current measurement.

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

### Average/Hold Num

Sets the number of sweeps (average counts) that are averaged. After the specified number of sweeps, the averaging mode (terminal control) setting determines the averaging action.

Key Path	Meas Setup
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	<code>[ :SENSe]:WAVeform:AVERage:COUNt &lt;integer&gt;</code> <code>[ :SENSe]:WAVeform:AVERage:COUNt?</code> <code>[ :SENSe]:WAVeform:AVERage[:STATE] OFF ON 0 1</code> <code>[ :SENSe]:WAVeform:AVERage[:STATE]?</code>
<b>Example</b>	WAV:AVER:COUN 1001 WAV:AVER:COUN? WAV:AVER ON WAV:AVER?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
Preset	10 OFF
State Saved	Saved in instrument state.
Min	1
Max	20001
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Avg Mode

Enables you to set the averaging mode.

- When set to Exponential (Exp) the measurement averaging continues using the specified number of averages to compute each averaged value. The average is displayed at the end of each sweep.

- When set to Repeat, the measurement resets the average counter each time the specified number of averages is reached.

Key Path	Meas Setup
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	[ :SENSe]:WAVeform:AVERage:TControl EXPonential REPeat [ :SENSe]:WAVeform:AVERage:TControl?
<b>Example</b>	WAV:AVER:TCON REP WAV:AVER:TCON?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	EXPonential
State Saved	Saved in instrument state.
Range	Exp Repeat
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Avg Type

Selects the type of averaging.

Key Path	Meas Setup
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	[ :SENSe]:WAVeform:AVERage:TYPE LOG   MAXimum   MINimum   RMS   SCALar [ :SENSe]:WAVeform:AVERage:TYPE?
<b>Example</b>	WAV:AVER:TYPE RMS WAV:AVER:TYPE?
Notes	The SCPI selection of MAX and MIN are kept for BWCC, but they are removed from the front panel access because they are not an Average function. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	RMS
State Saved	Saved in instrument state.
Range	Pwr Avg(RMS) Log-Pwr Avg(Video) Voltage Avg
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## HW Averaging

Changes the number of time averages is to be made using hardware. This averaging is much faster than the standard averaging done in software. The hardware averaging is done on the complex voltage time trace data before any measurement application averaging is done. Both types of averaging (HW and SW) can be done on the same measurement data.

When time averaging is being done in HW, each trace update represents N fresh data acquisitions averaged together, where N is the number of averages. You cannot access the individual time data. Note that in the waveform measurement this averaging is done prior to the standard averaging done within the application. Thus the yellow trace in this measurement shows the result of the time averaging. Subsequent averaging is orthogonal to this hardware based time averaging.

So it is possible to turn off the averaging within the application but still have the HW averaging set to a certain number. In other words, turning averaging off within the measurement will not affect HW averaging. If HW averaging needs to be turned off, simply set the HW Averaging parameter to 1.

The default value for Time Avg Num is 1. This means that there is no HW averaging. When the value is set to something greater than 1, HW averaging is turned ON.

This feature is most useful for a periodic signal with known periods used in conjunction with the Periodic trigger. Thus, when in Auto, the Trigger Source automatically changes to Periodic trigger when Time Avg Num is turned ON. The trigger period will be set to the current Meas Time value. Any changes to Meas Time will change the Periodic trigger period to the same value and vice versa. If a trigger source other than Periodic trigger is manually selected, the Time Avg Num toggle is set to Man. To use this feature, one of the two conditions below has to be satisfied.

- a. Sample Rate  $\leq$  20[MHz] (or 50[MHz] depending on which IF Path is used)
- b. Acquisition Points  $\leq$  2048

If neither of the conditions are satisfied, the key will become disabled.

## Time Avg Num

Sets the number of HW averages to be executed per each data acquisition.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe]:WAVeform:AVERage:TACount &lt;integer&gt;</code> <code>[ :SENSe]:WAVeform:AVERage:TACount?</code> <code>[ :SENSe]:WAVeform:AVERage:TACount:AUTO OFF ON 0 1</code> <code>[ :SENSe]:WAVeform:AVERage:TACount:AUTO?</code>
<b>Example</b>	<code>WAV:AVER:TAC 10WAV:AVER:TAC?WAV:AVER:TAC:AUTO ONWAV:AVER:TAC:AUTO?</code>
Notes	This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.
Dependencies	a. Sample Rate $\leq$ 20[MHz] (or 50[MHz] depending on which IF Path is used)

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	b. Acquisition Points ≤ 2048
Preset	1
	OFF
State Saved	Saved in instrument state
Min	1
Max	65535
Default Unit	Enter

---

## Meas Time

Sets how long the measurement is performed. Meas Time is dependent on the number of samples and the sample rate.

$$\text{MeasTime} \approx (N - 1) * \text{SampleInterval} = (N - 1) * \frac{1}{\text{SampleRate}} \quad (\text{N: Number of samples})$$

Due to the nature of discrete sample points, the requested Meas Time and the actual duration of the measurement signal (derived from the formula above) can be slightly different (within 1 sample interval).

The number of samples can be found below the X axis of the trace window and the Sample Rate as a key in the Meas Setup menu. Alternatively, the number of samples can be retrieved as the fourth element of the FETCh|MEASure|READ query and Sample Rate from the [:SENSe]:WAveform:SRATE? query.

---

Key Path	Meas Setup
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
Remote Command	[ :SENSe]:WAveform:SWEep:TIME <time> [ :SENSe]:WAveform:SWEep:TIME?
Example	WAV:SWE:TIME 50 ms WAV:SWE:TIME?
Notes	Specifies and returns how long the measurement is performed. It is the time record length of the measurement waveform. The Max time may be reduced when the sample frequency is high due to the memory limitation. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	All except the following list: 2.000000 ms LTEAFDD, LTEATDD: 10 ms LTETDD: 10 ms LTE: 10 ms
State Saved	Saved in instrument state.
Range	1.000 (s to 100.00 s)
Min	1.000 us

---

Max	3200 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00, A.14.00

## Sample Rate

Enables you to set an arbitrary sample rate for the acquired data to be processed.

Key Path	Meas Setup
Mode	BASIC
<b>Remote Command</b>	<code>[ :SENSe]:WAVeform:SRATE &lt;freq&gt;</code> <code>[ :SENSe]:WAVeform:SRATE?</code>
<b>Example</b>	WAV:SRAT 1.3636 MHz
Notes	Command and query available when Option DP2, B40, or wider IF Bandwidth option is installed. For other configuration, only query is available.
Couplings	The coupling between Sample Rate and IF BW depends on Physics implementation.
Preset	BASIC: 125.0 kHz PNOISE: 125.0 kHz WCDMA: 125.0 kHz C2K: 125.0 kHz EDGE/GSM: 637.5 kHz WIMAXOFDMA: 125.0 kHz TDSCDMA: 1.625 MHz 1xEVDO: 1.625 MHz DVB: 10 MHz DTMB: 10 MHz ISDBT: 7.5 MHz CMMB: 10 MHz DCATV: 10 MHz WLAN: 31.25 MHz LTEATDD: 7.5 MHz LTEAFDD: 7.5 MHz MSR: 125.0 kHz
Min	12.5 Hz
Max	<ul style="list-style-type: none"> <li>- (For Option DP2, B40 or wider IF Bandwidth option )</li> <li>- Digital IF 10 MHz path: 12.5 MHz</li> <li>- Digital IF 25 MHz path: 31.25 MHz</li> <li>- Digital IF 40 MHz path: 50 MHz</li> <li>- Option B85 85 MHz path: 106.25 MHz</li> </ul>

- 
- Option B1A 125 MHz path: 156.25 MHz
  - Option B1X 140 MHz path: 175 MHz
  - Option B1Y 160 MHz path: 200 MHz
  - Option B2X 140 MHz path: 300 MHz
  - Option B5X 160 MHz path: 300 MHz
  - (For all other configuration)
  - 10 MHz path: 15 MHz
  - Option B25 25 MHz path: 45 MHz

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Modified at S/W	13.00
Revision	

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## PhNoise Opt

Selects the LO (local oscillator) phase noise behavior for various desired operating conditions.

---

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe]:WAVeform:FREQuency:SYNThesis[:STATe] 1 2 3</code> <code>[ :SENSe]:WAVeform:FREQuency:SYNThesis[:STATe]?</code>
<b>Example</b>	<code>WAV:FREQ:SYNT 2</code> 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 (In PXA, the local oscillator hardware provides for extra-low phase noise at the expense of some speed.)
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 Digital IF BW after preset < 150 kHz for MXA/EXA and > 400 kHz for PXA the state of this function after Preset will be 1 for MXA/EXA and 2 for PXA.
State Saved	Saved in instrument state.
Min	1
Min	1
Max	3
Initial S/W Revision	Prior to A.07.00
Modified at S/W	A.07.00
Revision	

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## Auto

Selects the LO (local oscillator) phase noise behavior to optimize dynamic range and speed for various instrument operating conditions.

The X-Series has two grades of LO; a high performance LO that gives the best phase noise performance; and a medium-performance LO that gives excellent performance.

In models with the high performance LO, Auto will choose:

	Best Close in Phase Noise	Best Wide-offset Phase Noise
Filter BW	$\leq 400$ kHz	$> 400$ kHz

In models with the medium-performance LO, Auto will choose:

	Best Close in Phase Noise	Best Wide-offset Phase Noise
Filter BW	$\leq 150$ kHz	$> 150$ kHz

Note that Fast Tuning will not be selected when in Auto.

Key Path	Meas Setup, PhNoise Opt
Remote Command	<code>[ :SENSe ] :WAVeform:FREQuency:SYNTthesis:AUTO[ :STATE ] OFF   ON   0   1</code> <code>[ :SENSe ] :WAVeform:FREQuency:SYNTthesis:AUTO[ :STATE ]?</code>
Example	WAV:FREQ:SYNT:AUTO ON
Preset	ON
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.07.00

## Best Close-in P Noise

The LO phase noise is optimized for smaller offsets from the carrier, at the expense of phase noise farther out.

Key Path	Meas Setup, PhNoise Opt
Example	WAV:FREQ:SYNT 1
Couplings	The frequency below which the phase noise is optimized is model dependent: <ul style="list-style-type: none"><li>- CXA: n/a</li><li>- EXA: [offset <math>\leq 150</math> kHz]</li><li>- MXA: [offset <math>\leq 150</math> kHz]</li><li>- PXA: [offset <math>\leq 400</math> kHz]</li></ul>

---

Readback	Close-in.  If manually selected, “Man” will be underlined. 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 <150 kHz]
Initial S/W Revision	Prior to A.07.00

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### Best Wide-offset P Noise

The LO phase noise is optimized for wider offsets from the carrier. Closer offsets are compromised and the throughput of measurements (especially remote measurements where the center frequency is changing rapidly), is reduced.

---

Key Path	<b>Meas Setup, PhNoise Opt</b>
<b>Example</b>	WAV:FREQ:SYNT 2
Couplings	The frequency below which the phase noise is optimized is model dependent:  CXA: n/a EXA: [offset >150 kHz] MXA: [offset >150 kHz] PXA: [offset >400 kHz]
Readback	Wide-offset.  If manually selected, “Man” will be underlined. 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 >150 kHz]
Initial S/W Revision	Prior to A.07.00

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### Advanced

Accesses a menu of advanced functions that are used for specific applications. These settings should not be changed for most measurements.

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Key Path	<b>Meas Setup</b>
Initial S/W Revision	Prior to A.02.00

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### ADC Dither

Accesses the ADC Dither control menu.

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Key Path	<b>Meas Setup, Advanced</b>
Initial S/W Revision	Prior to A.02.00

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### ADC Dither Auto

Sets ADC dithering to automatically select whether dithering is needed.

---

Key Path	<b>Meas Setup, Advanced, ADC Dither</b>
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT,

---

	CMMB, LTE, LTETDD, DCATV, WLAN, MSR,LTEATDD, LTEAFDD
<b>Remote Command</b>	[ :SENSe]:WAVeform:ADC:DITHer:AUTO[:STATE] OFF ON 0 1 [ :SENSe]:WAVeform:ADC:DITHer:AUTO[:STATE]?
<b>Example</b>	WAV:ADC:DITH:AUTO ON WAV:ADC:DITH:AUTO?
Notes	The dither function improves linearity for low level signals, at the expense of a higher noise floor. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### ADC Dither

Toggles the dither function On and Off. The dither function improves linearity for low level signals, at the expense of a higher noise floor.

The reduced clipping-to-noise ratio results in higher noise, because the clipping level of the ADC relative to the front terminals remains unchanged with the introduction of dither. The enhanced linearity is mostly improved scale fidelity.

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.

Key Path	Meas Setup, Advanced, ADC Dither
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR,LTEATDD, LTEAFDD
<b>Remote Command</b>	[ :SENSe]:WAVeform:ADC:DITHer[:STATe] OFF ON 0 1 [ :SENSe]:WAVeform:ADC:DITHer[:STATe]?
<b>Example</b>	WAV:ADC:DITH ON WAV:ADC:DITH?
Notes	The dither function improves linearity for low level signals, at the expense of a higher noise floor. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	Auto Man
<b>Backwards</b>	[ :SENSe]:WBIF:ADC:DITHer

<b>Compatibility SCPI</b>	[ :SENSe ] :WAVEform:PDITher
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### IF Gain

Accesses the keys to select the IF Gain settings.

When in Autorange mode, the IF checks its range once for data acquisition, to provide the best signal to noise ratio. You can specify the range for the best speed, and optimize for noise or for large signals.

When the IF Gain is set to Autorange, the IF Gain is set to High initially for each chunk of data. The data is then acquired. If the IF overloads, then the IF Gain is set to Low and the data is re-acquired. Because of this operation, the Autorange 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.

When Digital Bus Out (under the Input/Output menu) is ON, the IF Gain State Autorange selection is not allowed. Thus, in this case, IF Gain State will be set to Low.

This only applies to the RF input. It does not apply to baseband I/Q input.

Key Path	Meas Setup, Advanced
Initial S/W Revision	Prior to A.02.00

### IF Gain Auto

Activates the auto rules for IF Gain

Key Path	Meas Setup, Advanced, IF Gain
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	[ :SENSe ] :WAVEform:IF:GAIN:AUTO[:STATE] ON OFF 1 0 [ :SENSe ] :WAVEform:IF:GAIN:AUTO[:STATE]?
<b>Example</b>	WAV:IF:GAIN:AUTO ON WAV:IF:GAIN:AUTO?
Notes	This only applies to the RF input. It does not apply to baseband I/Q input. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.

Range	On Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### IF Gain State

Selects the range of IF gain.

Key Path	Meas Setup, Advanced, IF Gain
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	[ :SENSe]:WAVeform:IF:GAIN[:STATE] AUTO orange LOW HIGH [:SENSe]:WAVeform:IF:GAIN[:STATE]?
<b>Example</b>	WAV:IF:GAIN HIGH WAV:IF:GAIN?
Notes	This only applies to the RF input and does not apply to baseband I/Q input. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode. If the user tries to select Autorange while Digital Bus Out is ON, an error message -221 "Settings conflict; "IF Gain Autorange not allowed when Digital Bus Out is ON" is displayed.
Couplings	If the user tries to select Autorange via SCPI while Digital Bus Out is ON, an error message -224, "Illegal parameter value; "IF Gain Autorange not allowed when Digital Bus Out is on" is displayed. If the user tries to select Autorange via front panel while Digital Bus Out is ON, an advisory message "IF Gain Autorange not allowed when Digital Bus Out is on" is displayed.
Preset	LOW
State Saved	Saved in instrument state.
Range	Autorange (Slower Follows Signals) Low (Best for Large Signals) High (Best Noise Level)
Readback Text	Autorange Low High
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### IF Gain Offset

Sets the IF Gain offset in 2 dB step from -6 dB to +6 dB. Increasing the gain can increase the amplitude of small signals as long as you do not overdrive the hardware. Wideband gain should usually be adjusted after setting the input attenuation.

Internally, the IF Gain value will change based on the current configuration of the hardware. If you choose to offset this value, you may do so with this parameter. The value specified is not an absolute value but relative to the current internal IF Gain setting.

For example:

IF Gain Low + IF Gain Offset +4 dB = Total IF Gain of +4 dB (0 + 4 = 4)

IF Gain High + IF Gain Offset +4 dB = Total IF Gain of +14 dB (10 + 4 = 14)

IF Gain Low + IF Gain Offset -6 dB = Total IF Gain of -6 dB (0 - 6 = -6)

IF Gain High + IF Gain Offset -6 dB = Total IF Gain of +6 dB (10 - 6 = 4)

The total IF Gain range when IF Gain Offset is available is a minimum of 0 - 6 = -6 dB and a maximum of 10 + 6 = 16 dB. The available IF Gain depends on the IF Path and center frequency. The maximum IF Gain may not be achievable at all times depending on the configuration.

Key Path	Meas Setup, Advanced
<b>Remote Command</b>	[ :SENSe]:WAVeform:IF:GAIN:OFFSet <rel_ampl > [ :SENSe]:WAVeform:IF:GAIN:OFFSet?
<b>Example</b>	WAV:IF:GAIN:OFFS 2 Sets the IF Gain offset to 2
Preset	0
State Saved	Saved in instrument state.
Min	-6
Max	+6
Default Unit	dB

### Meas Preset

Restores all the measurement parameters to their default values.

Key Path	Meas Setup
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR,LTEATDD, LTEAFDD
<b>Remote Command</b>	:CONFigure:WAVeform
<b>Example</b>	CONF:WAV
Notes	Restore default values of all parameters. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Mode

See "Mode" on page 246

## 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 1028 for more information.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:SYST:PRESet
<b>Example</b>	: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 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 <b>Mode Preset</b> 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.

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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.

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Initial S/W Revision

Prior to A.02.00

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## 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

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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

See "Mode Setup" on page 281

## Peak Search

Places the selected marker on the trace point with the maximum y-axis value for that marker's trace and accesses a menu that enables you to select to do a next peak or minimum peak search.

Key Path	Front-panel key
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR,LTEATDD, LTEAFDD
<b>Remote Command</b>	<b>:CALCulate:WAVeform:MARKer[1] 2 ... 12:MAXimum</b>
<b>Example</b>	CALC:WAV:MARK2:MAX
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Next Peak

Moves the selected marker to the next highest local maximum with a value less than that of the current marker.

Key Path	Peak Search
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR,LTEATDD, LTEAFDD
<b>Remote Command</b>	<b>:CALCulate:WAVeform:MARKer[1] 2 ... 12:MAXimum:NEXT</b>
<b>Example</b>	CALC:WAV:MARK:MAX:NEXT
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Min Search

Moves the selected marker to the minimum y-axis value on the current trace.

Key Path	Peak Search
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR,LTEATDD, LTEAFDD
<b>Remote Command</b>	<b>:CALCulate:WAVeform:MARKer[1] 2 ... 12:MINimum</b>
<b>Example</b>	CALC:WAV:MARK:MIN
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.

## 11 Waveform Measurement

### Peak Search

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Print

See "Print" on page 292

## 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 finds 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.

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.

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Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00

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## 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 and Traces**. 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	<p>No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe &lt;filename&gt;.</p> <p>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.</p>
Backwards Compatibility Notes	<p>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.</p> <p>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.</p>
Backwards Compatibility Notes	<p>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. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. 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.</p> <p>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.</p> <p>It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user.</p> <p>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.</p>
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 1038.

Key Path	Recall
Mode	All
<b>Remote Command</b>	:MMEMORY:LOAD:STATe <filename>
<b>Example</b>	:MMEM:LOAD:STAT "myState.state" This recalls the file myState.state on the default path
<b>Example</b>	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. <ul style="list-style-type: none"><li>- If there is a mismatch between file version or model number or instrument version or model number, the recall function tries 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.</li></ul>
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.

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<b>Backwards Compatibility SCPI</b>	<code>:MMEMORY:LOAD:STATE 1,&lt;filename&gt;</code>
Initial S/W Revision	For backwards compatibility, the above syntax is supported. The "1" is simply ignored.

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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:

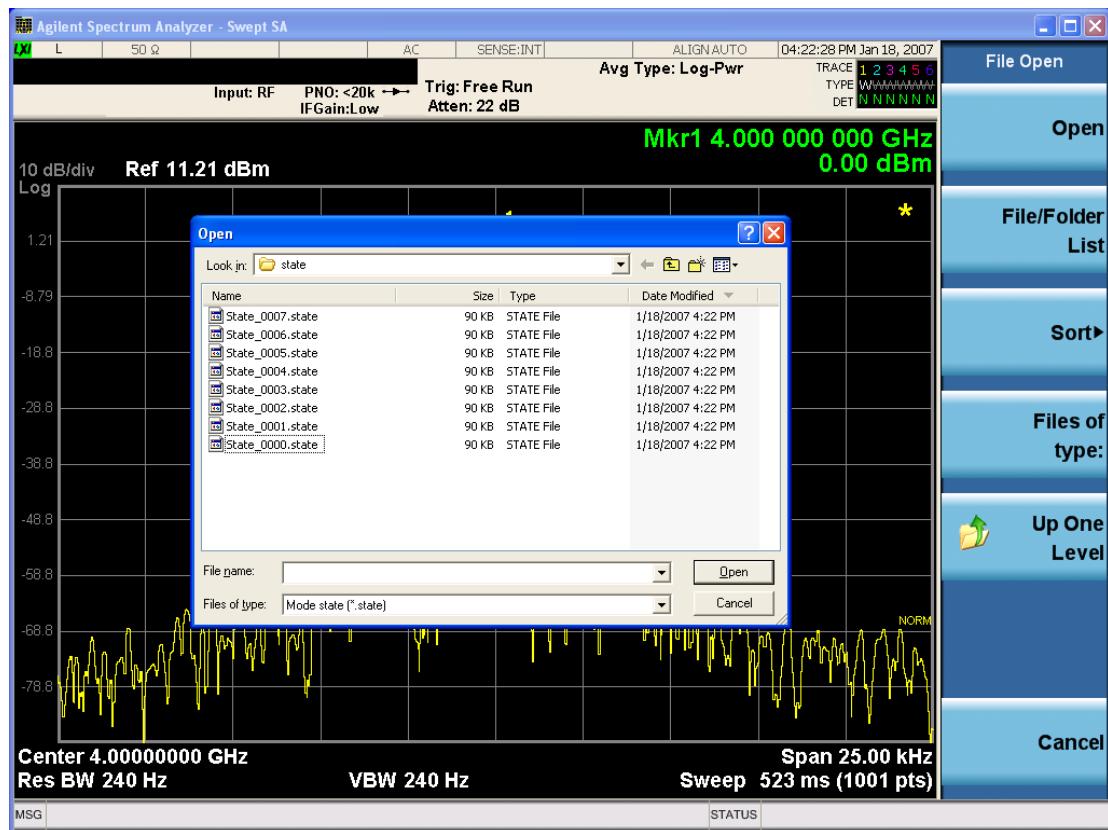
---

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 will have their data immediately overwritten.

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## 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	<b>Recall, State</b>
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

### 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.

For more information and the SCPI command, see Edit Register Names under the **Save, State** function.

Key Path	<b>Recall, State</b>
Mode	All
Dependencies	N9060A-7FP or N9060B-2FP license required to edit the register names. When the feature is not licensed, sending the SCPI command generates an error, -221,"Settings conflict;Option not

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	available"
Initial S/W Revision	A.11.00

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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
<b>Example</b>	*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 <b>Save, State,Edit Register Names</b> 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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## 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
<b>Example</b>	*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 <b>Save, State,Edit Register Names</b> 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

## 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.

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	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

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### 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.

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 EDGE GSM PN
<b>Remote Command</b>	<b>:MMEMory:LOAD:CORRection 1 2 3 4 5 6 7 8, &lt;filename&gt;</b>
<b>Example</b>	: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 D:\User_My_Documents\Instrument\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.

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Couplings	When a correction file is loaded from mass storage, it is automatically turned on ( <b>Correction ON</b> ) and <b>Apply Corrections</b> is set to On. This allows you to see its effect, thus confirming the load.
Readback	selected Correction
<b>Backwards Compatibility SCPI</b>	<code>:MMEMORY:LOAD:CORRECTION ANTenna   CABLE   OTHER   USER, &lt;filename&gt;</code> 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

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### 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	<b>Recall, Data, Amplitude Correction</b>
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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### 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 1039 in **Recall, State**, for a full description of this dialog and menu.

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Key Path	<b>Recall, Data</b>
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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## 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 1045

Key Path	Front-panel key
<b>Remote Command</b>	:INITiate[:IMMEDIATE] :INITiate:RESTART
<b>Example</b>	: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 <b>Restart</b> hardkey and the INITiate:RESTART command restart trace averages (displayed average count reset to 1) for a trace in <b>Clear Write</b> , but did not restart <b>Max Hold</b> and <b>Min Hold</b> . In the X-Series, the <b>Restart</b> hardkey and the INITiate:RESTART command restart not only <b>Trace Average</b> , but <b>MaxHold</b> and <b>MinHold</b> traces as well. For wireless comms modes in ESA and PSA, the <b>Restart</b> 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, Verbose SCPI) 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
<b>Remote Command</b>	:MMEMORY:STORe:STATe <filename>
<b>Example</b>	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

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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.

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**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.

---

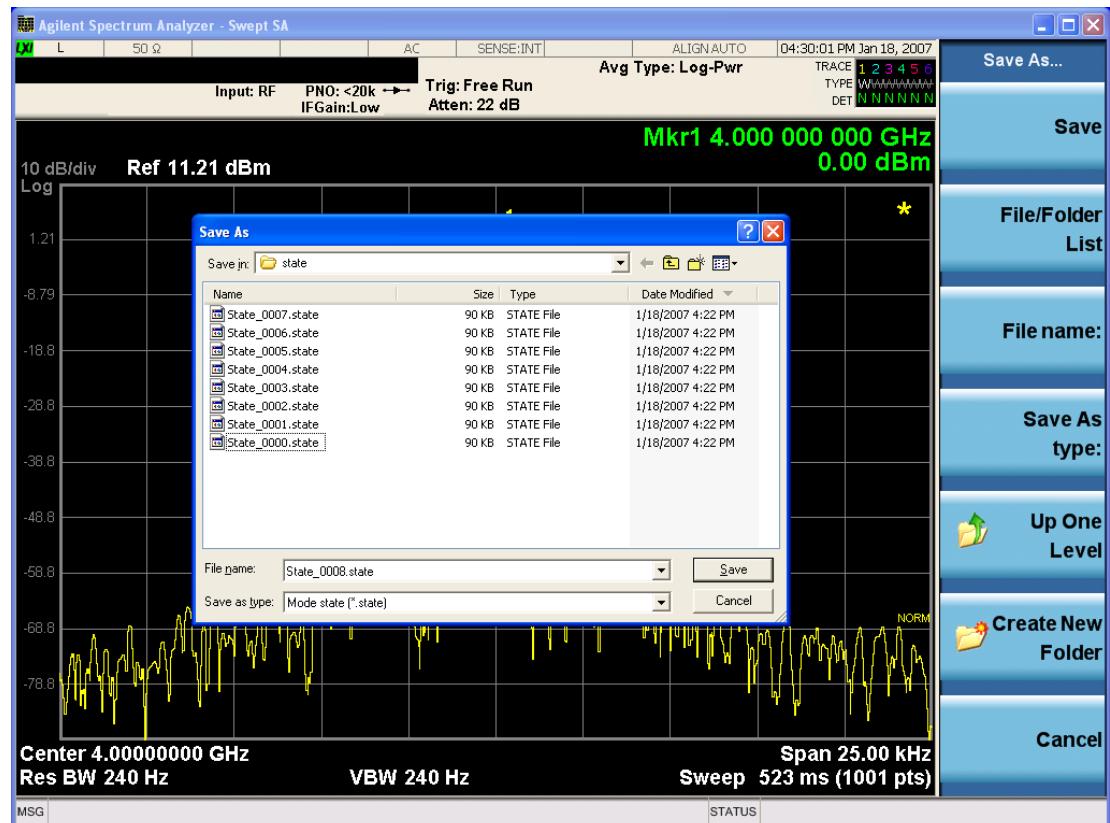
Initial S/W Revision

Prior to A.02.00

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**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 1034](#) 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	<b>Save, State</b>
Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

### 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 1052

Key Path	<b>Save, State</b>
Mode	All
<b>Remote Command</b>	:MMEMory:REGister:STATE:LAbel <reg number>,"label" :MMEMory:REGister:STATE:LAbel? <reg number>
<b>Example</b>	: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.

## 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
<b>Example</b>	*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 <b>Edit Register Names</b> 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

## 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

## 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 you to 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 1055](#)

Key Path	Save
<b>Remote Command</b>	<code>:MMEMORY:STORe:CORRection 1 2 3 4 5 6, &lt;filename&gt;</code>
<b>Example</b>	: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
<b>Backwards Compatibility SCPI</b>	: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

<b>Line #</b>	<b>Type of field</b>	<b>Example</b>	<b>Notes</b>
			correction data, refer to the Input/Output, Corrections key description. Allowable values: dBv/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 Bias or 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

### 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 1059.

See "Marker Table" on page 1059.

See "Peak Table" on page 1062.

See "Spectrogram" on page 1066

Remote Command	:MMEMORY:STOR:RESULTS:MTAB PTAB 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

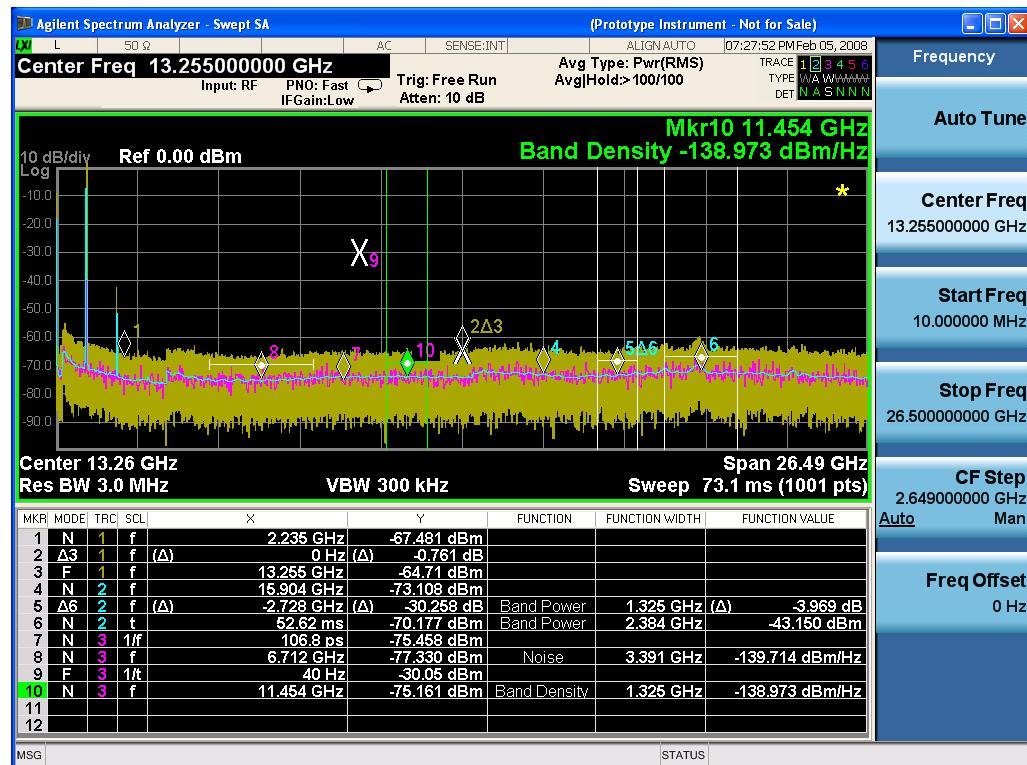
## Meas Results File Contents

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:

---

Measureme  
ntResult

---

Swept SA

---

A.01.40\_ N9020A  
R0017

---

526 B25 1

PFR P26	
EA3	
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.06626 6667
Start Frequency	100000 00
Stop Frequency	265000 00000
Average Count	0
Average Type	LogPower er (Video)
RBW	300000 0
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	300000 0
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	T R C	SCL	X	Y	FUNCTION	FUNCTION WIDT H	FUNCTION VALU E	FUNCTION UNIT
1	Normal	1	Frequ ency	2.235 0E+09	- 67. 48 1	Off	0.000 0E+00	0	None
2	Delta3	1	Frequ ency	0.000 0E+00	- 0.7 61	Off	0.000 0E+00	0	None
3	Fixed	1	Frequ ency	1.325 5E+10	- 64. 71	Off	0.000 0E+00	0	None
4	Normal	2	Frequ ency	1.590 4E+10	- 73. 10 8	Off	0.000 0E+00	0	None
5	Delta7	2	Frequ ency	- 2.728 0E+09	- 30. 25 8	Band Power	1.325 0E+06	- 3.969	dB
6	Normal	2	Time	5.262 0E-02	- 70. 17	Band Power	2.384 0E+06	- 43.15	dBm

7										
7	Normal	3	Perio d	1.068 0E-10	- 75. 45 8	Off	0.000 0E+00	0	None	
8	Normal	3	Frequ ency	6.712 0E+09	- 77. 33	Noise	3.391 0E+06	- 139.7 14	dBm/ Hz	
9	Fixed	3	Inver se Time	4.000 0E+01	- 30. 05	Off	0.000 0E+00	0	None	
10	Normal	3	Frequ ency	1.145 4E+10	- 75. 16 1	Band Densi ty	1.325 0E+06	- 138.9 73	dBm/ Hz	
11	Off	1	Frequ ency	0.000 0E+00	0	Off	0.000 0E+00	0	None	
12	Off	1	Frequ ency	0.000 0E+00	0	Off	0.000 0E+00	0	None	

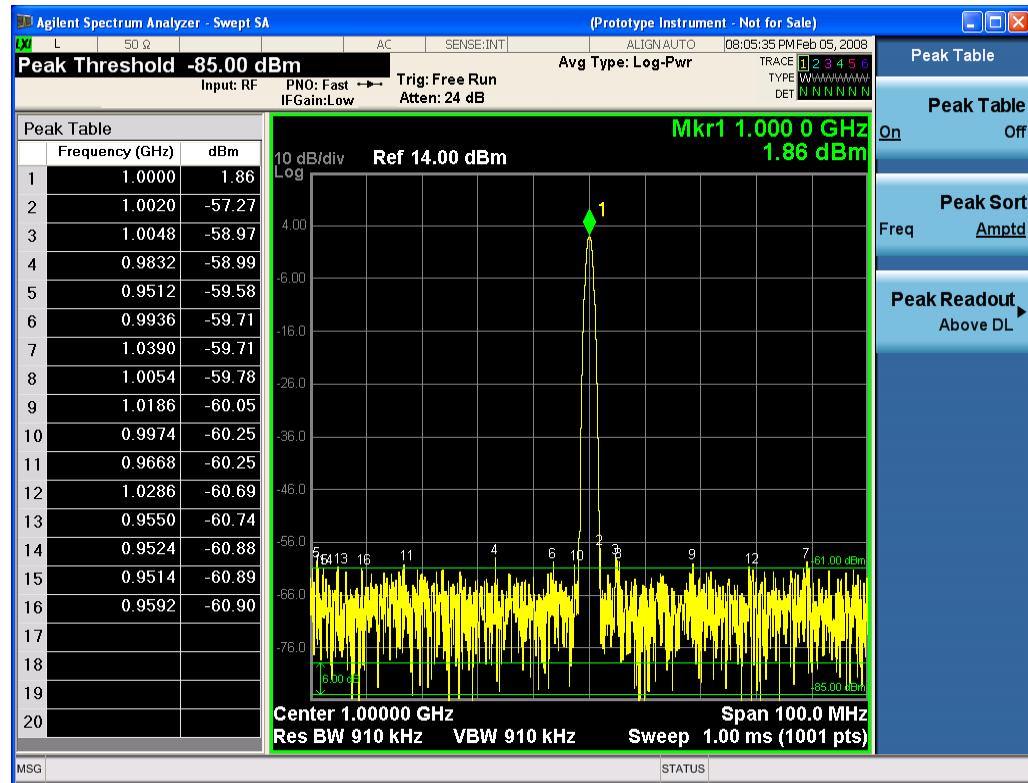
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

The metadata header is very similar to the metadata used in the trace data .csv files. See Trace File Contents. 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:

---

**MeasurementResults**


---



---

 Swept SA

A.18.00	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	Delta to Limit
1	1.000009988E+09	-26.08	41.1
2	9.99989974E+08	-26.11	43.9
3	1.000019929E+09	-29.47	35.2
4	9.999799016E+08	-29.54	40.4
5	1.000030002E+09	-37.51	23.1
6	9.999699601E+08	-37.62	32.4
7	9.999999155E+08	-37.71	32.3
8	1.000039943E+09	-48.38	9.1
9	9.999598877E+08	-48.55	21.4
10	1.000049885E+09	-61.43	-8.1
11	9.999499461E+08	-61.66	8.3
12	1.000059957E+09	-76.53	-26.1
13	9.999398738E+08	-77.01	-7.6
14			
15			
16			
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.

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

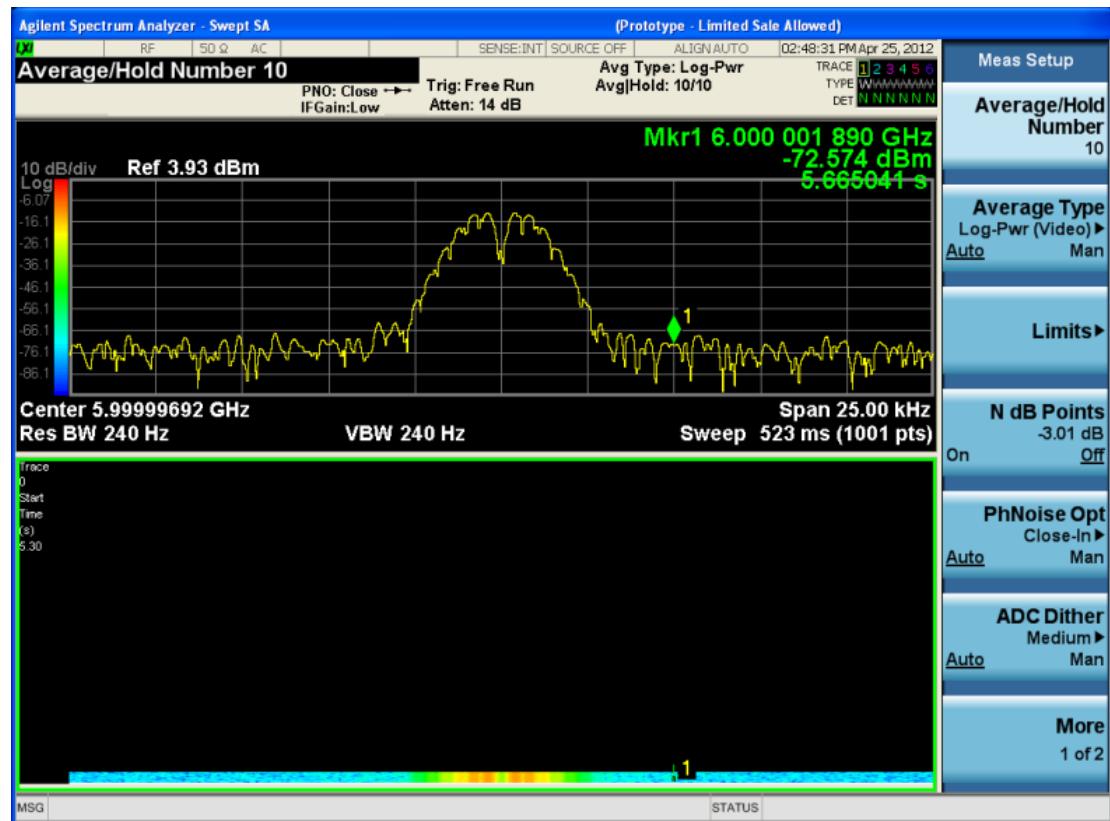
**NOTE**

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 different 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 seconds after the Spectrogram started (trace 10 has a start 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	1
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	

<b>Result Type</b>	<b>Spectrogram</b>
P26 PFR RTL RTS S40 SB1	
SEC SM1 UK6 YAS YAV	
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
RF Calibrator	Off
Attenuation	14
Ref Level Offset	0
External Gain	0
Trace Type	Clearwrite
Detector	Normal
Trace Math	Off
Trace Math Oper1	Trace5

<b>Result Type</b>	<b>Spectrogram</b>
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
<hr/>	
...	
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
<hr/>	
...	
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
...	
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 1048](#) 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

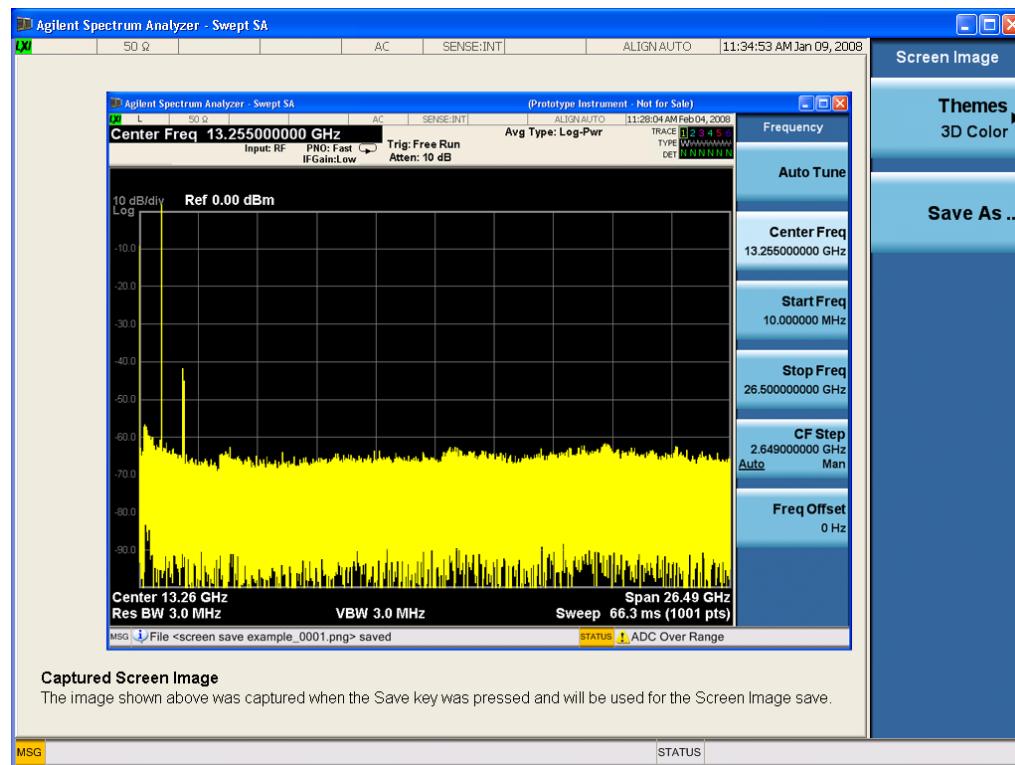
### Screen Image

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
<b>Remote Command</b>	:MMEMORY:STOR:SCReen <filename>
<b>Example</b>	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
<b>Backwards Compatibility SCPI</b>	HCOPY:SDUMP:DATA? returns the screen image in a <DEFINITE LENGTH ARBITRARY RESPONSE DATA> element. The response data is IEEE Block format; the controlling computer can strip the header and store the result as a .png file.
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
<b>Remote Command</b>	:MMEMORY:STOR:SCReen:THEMe TDColor   TDMonochrome   FCOLor   FMONochrome :MMEMORY:STOR:SCReen:THEMe?
<b>Example</b>	: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 you 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
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	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	<b>Save, Screen Image, Themes</b>
<b>Example</b>	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

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### 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 1048 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	<b>Save, Screen Image</b>
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

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## Mass Storage Catalog (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:CATalog? [&lt;directory_name&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>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:</p> $\langle\text{numeric\_value}\rangle,\langle\text{numeric\_value}\rangle,\{\langle\text{file\_entry}\rangle\}$ <p>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 <math>\langle\text{file\_entry}\rangle</math> is a string. Each <math>\langle\text{file\_entry}\rangle</math> indicates the name, type, and size of one file in the directory list:</p> $\langle\text{file\_name}\rangle,\langle\text{file\_type}\rangle,\langle\text{file\_size}\rangle$ <p>As the windows file system has an extension that indicates file type, <math>\langle\text{file\_type}\rangle</math> is always empty. <math>\langle\text{file\_size}\rangle</math> provides the size of the file in bytes. For directories, <math>\langle\text{file\_entry}\rangle</math> is surrounded by square brackets and both <math>\langle\text{file\_type}\rangle</math> and <math>\langle\text{file\_size}\rangle</math> are empty</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Change Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:CDIRectory [&lt;directory_name&gt;]</code> <code>:MMEMory:CDIRectory?</code>
Notes	<p>The string must be a valid logical path.</p> <p>Changes the default directory for a mass memory file system. The <math>\langle\text{directory\_name}\rangle</math> parameter is a string. If no parameter is specified, the directory is set to the *RST value.</p> <p>At *RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal.</p> <p>Query returns full path of the default directory.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Copy (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMory:COPY &lt;string&gt;,&lt;string&gt;[,&lt;string&gt;,&lt;string&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>Copies an existing file to a new file or an existing directory to a new directory.</p> <p>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.</p> <p>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.</p> <p>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.</p>

## Mass Storage Device Copy (Remote Command Only)

This command transfers data to/from a file and a peripheral device.

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:COPY:DEVICE &lt;source_string&gt;,&lt;dest_string&gt;</code>
Notes	<p>The strings must be a valid logical path or a valid device keyword. If the dest_string is a device keyword, the data is copied from the source file to the device. If the source_string is a device keyword, the data is copied to the source file from the device.</p> <p>Valid device keywords are:</p> <ul style="list-style-type: none"> <li>SNS (smart noise source)</li> </ul> <p>An error is generated if the file or device is not found.</p>

## Mass Storage Delete (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:DELETE &lt;file_name&gt;[,&lt;directory_name&gt;]</code>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a file from the specified directory. The &lt;file_name&gt; 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.</p>
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.

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:DATA &lt;file_name&gt;, &lt;data&gt;</code> <code>:MMEMORY:DATA? &lt;file_name&gt;</code>
Notes	<p>The string must be a valid logical path.</p> <p>The command form is MMEMORY:DATA &lt;file_name&gt;,&lt;data&gt;. It loads &lt;data&gt; into the file &lt;file_name&gt;. &lt;data&gt; is in 488.2 block format. &lt;file_name&gt; is string data.</p> <p>The query form is MMEMORY:DATA? &lt;file_name&gt; with the response being the associated &lt;data&gt; in block format.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Make Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	<code>:MMEMORY:MDIRECTORY &lt;directory_name&gt;</code>
Notes	<p>The string must be a valid logical path.</p> <p>Creates a new directory. The &lt;directory_name&gt; parameter specifies the name to be created.</p>

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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.

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Initial S/W Revision	Prior to A.02.00
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### Mass Storage Move (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:MOVE &lt;string&gt;,&lt;string&gt;[,&lt;string&gt;,&lt;string&gt;]</b>
Notes	<p>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.</p>
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Remove Directory (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RDIRectory &lt;directory_name&gt;</b>
Notes	<p>The string must be a valid logical path. Removes a directory. The &lt;directory_name&gt; 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.</p>
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Determine Removable Media (Remote Command Only)

This command is used to determine if any removable media devices are connected to the instrument. Primarily, these are USB memory devices plugged-in to the front panel or rear panel USB ports. On instruments with PC6 or PC7 CPU's, one SD card slot is available for removable media. The instrument's primary disk drive is not a removable media device.

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Key Path	SCPI Only
<b>Remote Command</b>	<b>:MMEMory:RMEDIA:LIST?</b>

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Notes	The return value is a string containing a list of partition identifiers that are removable media devices. Each identifier is separated by a comma. If no removable media is present, an empty string is returned.  Examples: <ul style="list-style-type: none"><li>- One removable device present results in a return string of "F:".</li><li>- Two removable devices present results in a return string of "F;G;".</li><li>- No removable devices present results in a return string of "".</li></ul>
Initial S/W Revision	x.15.00

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## Mass Storage Determine Removable Media Label (Remote Command Only)

This command is used to set or query a removable media device's label.

---

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMory:RMEDIA:LAbel <partition>,<string> :MMEMory:RMEDIA:LAbel? <partition>
<b>Example</b>	MMEM:RMED:LAB "F:","My Device"
Notes	If the <partition> specified does not exist or is not a removable media device, the error -252,"Missing Media" is generated.  Setting the removable media label requires Administrative privileges. If the currently logged in user does not have appropriate privileges the error "-221.9900,Settings conflict;Administrator privileges required" is generated.
Initial S/W Revision	x.15.00

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## Mass Storage Determine Removable Media Write-protect status (Remote Command Only)

This command is used to query a removable media device's write-protect status.

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Key Path	SCPI Only
<b>Remote Command</b>	:MMEMory:RMEDIA:WProtect? <partition>
<b>Example</b>	MMEM:RMED:WPR? "F:"
Notes	The return value is 1 if the device is write-protected, or 0 if the device is write-enabled.  If the <partition> specified does not exist or is not a removable media device the error -252,"Missing Media" is generated.
Preset	The return value will be depending on SD card installed.
Initial S/W Revision	x.15.00

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## Mass Storage Determine Removable Media size (Remote Command Only)

This command is used to query a removable media device's total memory size (not available memory size).

Key Path	SCPI Only
<b>Remote Command</b>	:MMEMORY:RMEDIA:SIZE? <partition>
<b>Example</b>	MMEM:RMED:SIZE? "F:"
Notes	The return value is integer value in GBytes. Any device that is less than 1 GB returns 0 GB. If the <partition> specified does not exist or is not a removable media device, the error -252,"Missing Media" is generated.
Initial S/W Revision	x.15.00

## :SYSTem:SET (Remote Command Only)

Remote command that allows the user to obtain the state of the currently active mode in a form that can then be loaded back into the instrument quickly.

<b>Remote Command</b>	SYSTem:SET <instrument state in IEEE Block> SYSTem:SET?
Notes	SYST:SET? returns current instrument state of the active mode in IEEE Block data format. The state is in a machine readable format only. Sending the query returns the following format: <syst set preamble><state block data> Where: <syst set preamble> is the format: #NMMM N=number of digits that comprise MMM MMM=length in bytes of following data <state block data> is machine readable state data Example response: #42016<state data> The state is recalled by sending the SYST:SET? Response data to the instrument. From example above: SYST:SET #42016<state data>
Initial S/W Revision	x.17.00

## 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 1079

Key Path	Front-panel key
<b>Example</b>	:INIT:CONT OFF
Notes	See <b>Cont</b> key description.
Backwards Compatibility Notes	<p>For Spectrum Analysis mode in ESA and PSA, the <b>Single</b> 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 <b>Max Hold</b> and <b>Min Hold</b>. In the X-Series, the <b>Single</b> hardkey and the INITiate:IMM command initiate a sweep/ measurement/ average sequence/hold sequence including <b>MaxHold</b> and <b>MinHold</b>.</p> <p>For Spectrum Analysis mode in ESA and PSA, the <b>Single</b> hardkey restarted the sweep regardless of whether or not you were in an active sweep or sweep sequence. In the X-Series, <b>Restart</b> does this but <b>Single</b> only restarts the sweep or sweep sequence if you are in the idle state.</p> <p>INIT[:IMM] in ESA &amp; 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.</p>
Initial S/W Revision	Prior to A.02.00

## More Information

See "Restart" on page 1045 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
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## Span X Scale

Accesses a menu of functions that enable you to set the horizontal scale parameters.

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

### Ref Value

Sets the reference value for time on the horizontal axis. When Auto Scaling is set to On, the displayed plots use a Scale/Div value determined by the analyzer, based on the measurement result.

Key Path	SPAN X Scale
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	:DISPlay:WAVeform:VIEW[1] 2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel <time> :DISPlay:WAVeform:VIEW[1] 2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel?
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:X:RLEV 10 ms DISP:WAV:VIEW:WIND:TRAC:X:RLEV?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	If Auto Scaling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Auto Scaling automatically changes to Off.
Preset	0.00 s
State Saved	Saved in instrument state.
Min	-1.000 s
Max	10.00 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Scale/Div

Sets the horizontal scale by changing a time value per division.

Key Path	SPAN X Scale
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	:DISPlay:WAVeform:VIEW[1] 2:WINDOW[1]:TRACe:X[:SCALE]:PDIVision <time> :DISPlay:WAVeform:VIEW[1] 2:WINDOW[1]:TRACe:X[:SCALE]:PDIVision?
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:X:PDIV 500 us

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**DISP:WAV:VIEW:WIND:TRAC:X:PDIV?**

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Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	If Auto Scaling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Auto Scaling automatically changes to Off.
Preset	All except the following list: 200.0 us LTEAFDD, LTEATDD: 1.000 ms LTETDD: 1.000 ms LTE: 1.000 ms
State Saved	Saved in instrument state.
Min	1.000 ns
Max	320 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00, A.14.00

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## Ref Position

Sets the reference position for the X axis to Left, Center or Right.

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Key Path	<b>SPAN X Scale</b>
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	<b>:DISPlay:WAVEform:VIEW[1] 2:WINDOW[1]:TRACe:X[:SCALE]:RPOSITION LEFT   CENTER   RIGHT :DISPlay:WAVEform:VIEW[1] 2:WINDOW[1]:TRACe:X[:SCALE]:RPOSITION?</b>
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:X:RPOS LEFT DISP:WAV:VIEW:WIND:TRAC:X:RPOS?
Notes	Allows you to set the reference position to Left, Ctr (center) or Right. You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Preset	LEFT
State Saved	Saved in instrument state.
Range	Left Ctr Right
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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## Auto Scaling

Toggles the scale coupling function between On and Off.

Key Path	SPAN X Scale
Mode	BASIC, PNOISE, WCDMA, C2K, GSM, WIMAXOFDMA, TDSCDMA, 1XEVDO, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR, LTEATDD, LTEAFDD
<b>Remote Command</b>	<code>:DISPlay:WAVEform:VIEW[1] 2:WINDOW[1]:TRACe:X[:SCALE]:COUPle 0   1   OFF   ON</code> <code>:DISPlay:WAVEform:VIEW[1] 2:WINDOW[1]:TRACe:X[:SCALE]:COUPle?</code>
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:X:COUP ON DISP:WAV:VIEW:WIND:TRAC:X:COUP?
Notes	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SELect to set the mode.
Couplings	When Auto Scaling is On and the Restart front-panel key is pressed, this function automatically determines the scale per division and reference values based on the measurement results. When you set a value to either Scale/Div or Ref Value manually, Auto Scaling automatically changes to Off.
Preset	1
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## 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

### Pause/Resume

Pauses a measurement after the current data acquisition is complete.

When Paused, the label on the key changes to Resume. Pressing Resume unpauses the measurement. When you are Paused, pressing **Restart**, **Single** or **Cont** does a Resume.

Key Path	Sweep/Control
<b>Remote Command</b>	<b>:INITiate:PAUSE</b>
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
<b>Remote Command</b>	<b>:INITiate:RESume</b>
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 analyzer 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 analyzer is set for Continuous measurement, it 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 set for Single measurement, it remains in the "idle" state until an :INIT:IMM command is received.

<b>Remote Command</b>	<b>:ABORT</b>
<b>Example</b>	:ABOR
Notes	If :INITiate:CONTinuous is ON, then a new continuous measurement will start immediately; with

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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 feed into OPC are cleared by the ABORT, the ABORt will cause the *OPC query to return true.
Initial S/W Revision	Prior to A.02.00

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## System

See "System" on page 293

## Trace/Detector

There is no Trace/Detector functionality supported in the Waveform measurement.  
The front-panel key displays a blank menu when pressed.

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

## Trigger

See "Trigger" on page 385

### Free Run

See "Free Run" on page 393

### Video

See "Video (IF Envelope)" on page 394

### Trigger Level

See "Trigger Level" on page 394

### Trig Slope

See "Trig Slope" on page 395

### Trig Delay

See "Trig Delay" on page 396

### X Axis Relative to Trigger

See "X Axis Relative to Trigger" on page 421

### Line

See "Line" on page 563

### Trig Slope

See "Trig Slope" on page 563

### Trig Delay

See "Trig Delay" on page 399

### X Axis Relative to Trigger

See "X Axis Relative to Trigger" on page 421

### External 1

See "External 1" on page 575

### Trigger Level

See "Trigger Level" on page 576

### Trig Slope

See "Trig Slope" on page 576

**Trig Delay**

See "Trig Delay" on page 402

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**External 2**

See "External 2 " on page 577

**Trigger Level**

See "Trigger Level" on page 577

**Trig Slope**

See "Trig Slope" on page 578

**Trig Delay**

See "Trig Delay " on page 404

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**RF Burst**

See "RF Burst" on page 578

**Absolute Trigger**

See "Absolute Trigger Level" on page 579

**Relative Trigger**

See "Relative Trigger Level" on page 568

**Trig Slope**

See "Trigger Slope" on page 580

**Trig Delay**

See "Trig Delay" on page 409

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Periodic Timer**

See "Periodic Timer (Frame Trigger)" on page 570

**Period**

See "Period" on page 572

**Offset**

See "Offset" on page 572

**Offset Adjust (Remote Command Only)**

See "Offset Adjust (Remote Command Only)" on page 573

**Reset Offset Display**

See "Reset Offset Display" on page 574

**Sync Source**

See "Sync Source" on page 574

**Off**

See "Off" on page 575

**External 1**

See "External 1" on page 575

**Trigger Level**

See "Trigger Level" on page 576

**Trig Slope**

See "Trig Slope" on page 576

**External 2**

See "External 2" on page 577

**Trigger Level**

See "Trigger Level" on page 577

**Trig Slope**

See "Trig Slope" on page 578

**RF Burst**

See "RF Burst" on page 578

**Absolute Trigger**

See "Absolute Trigger Level" on page 579

**Trig Slope**

See "Trigger Slope" on page 580

**Trig Delay**

See "Trig Delay" on page 421

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Baseband I/Q**

See \_\_ on page X

**I/Q Mag**

See \_\_ on page X

**Trigger Level**

See \_\_ on page X

**Trig Slope**

See \_\_ on page X

**Trig Delay**

See \_\_ on page X

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

I

See \_\_ on page X

**Trigger Level**

See \_\_ on page X

**Trig Slope**

See \_\_ on page X

**Trig Delay**

See \_\_ on page X

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Q**

See \_\_\_\_ on page X

**Trigger Level**

See \_\_\_\_ on page X

**Trig Slope**

See \_\_\_\_ on page X

**Trig Delay**

See \_\_\_\_ on page X

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Input I**

See \_\_\_\_ on page X

**Trigger Level**

See \_\_\_\_ on page X

**Trig Slope**

See \_\_\_\_ on page X

**Trig Delay**

See \_\_\_\_ on page X

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Input Q**

See \_\_\_\_ on page X

**Trigger Level**

See \_\_\_\_ on page X

**Trig Slope**

See \_\_\_\_ on page X

**Trig Delay**

See \_\_\_\_ on page X

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Aux Channel Center Freq**

See   on page X

**Trigger Level**

See   on page X

**Trig Slope**

See   on page X

**Trig Delay**

See   on page X

**X Axis Relative to Trigger**

See "X Axis Relative to Trigger" on page 421

**Trigger Center Freq**

See   on page X

**Trigger BW**

See   on page X

**Auto/Holdoff**

See "Auto/Holdoff" on page 422

**Auto Trig**

See "Auto Trig" on page 423

**Trig Holdoff**

See "Trig Holdoff" on page 423

**Holdoff Type**

See "Holdoff Type" on page 424

## 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	<p>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.</p> <p>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.</p> <p>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.</p> <p>User Preset recalls mode state which can now include data like traces; whereas on ESA and PSA, User Preset did not affect data.</p>
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
<b>Remote Command</b>	:SYST:PRESet:USER
<b>Example</b>	: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
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<b>Remote Command</b>	:SYST:PRESet:USER:ALL
<b>Example</b>	: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
<b>Remote Command</b>	:SYST:PRESet:USER:SAVE
<b>Example</b>	: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.

## 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

## 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.

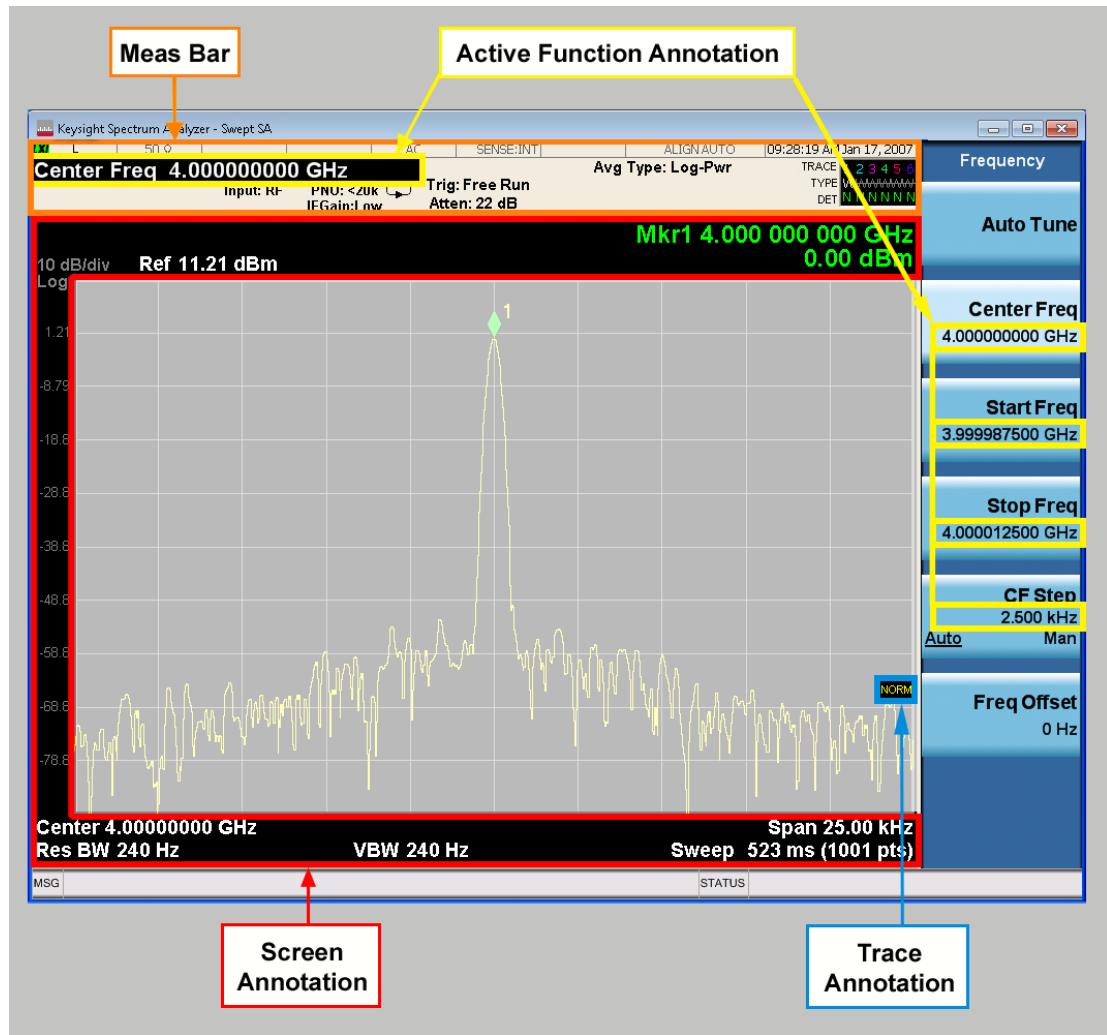
Key Path	Display
Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

## Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

13. 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.
14. 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.
15. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).
16. 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

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### 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 <b>System DisplaySettings, Annotation</b> 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.

---

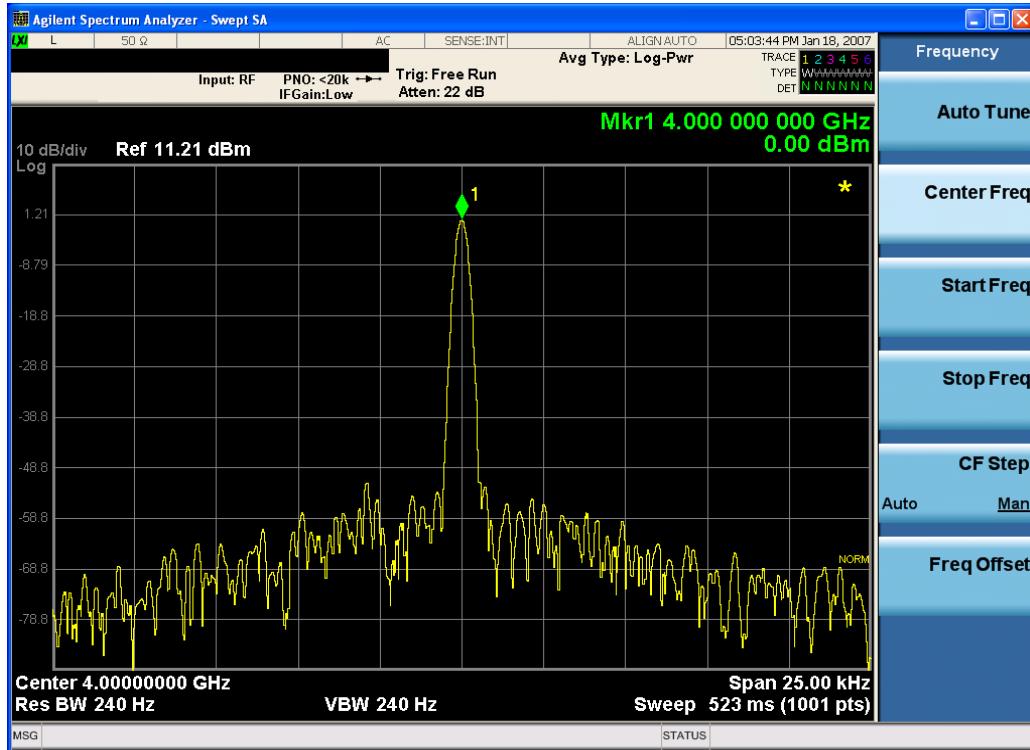
Key Path	View/Display, Display, Annotation
<b>Remote Command</b>	:DISPlay:ANNotation:SCReen[:STATe] OFF ON 0 1 :DISPlay:ANNotation:SCReen[:STATe]?
<b>Example</b>	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.
Preset	On
	This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> is set to 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
<b>Remote Command</b>	:DISPlay:ACTivefunc[:STATe] ON OFF 1 0 :DISPlay:ACTivefunc[:STATe]?
<b>Example</b>	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when <b>System Display Settings, Annotation</b> is set to Off.
Preset	On This should remain Off through a Preset when <b>System DisplaySettings, Annotation</b> 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
<b>Remote Command</b>	:DISPlay:<measurement>:ANNotation:TITLe:DATA <string> :DISPlay:<measurement>:ANNotation:TITLe:DATA?
<b>Example</b>	<p>DISP:ANN:TITL:DATA "This Is My Title"</p> <p>This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer &lt;measurement&gt; name is not used.</p> <p>DISP:ACP:ANN:TITL:DATA "This Is My Title"</p> <p>This example is for Measurements other than Swept SA.</p> <p>Both set the title to: This Is My Title</p>
Notes	<p>Pressing this key cancels any active function.</p> <p>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.</p>
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
<b>Example</b>	<p>The following commands clear the title and restore the measurement's original title:</p> <p>DISP:ANN:TITL:DATA ""</p> <p>This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer &lt;measurement&gt; name is not used.</p> <p>DISP:ACP:ANN:TITL:DATA ""</p>

---

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

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## 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
<b>Remote Command</b>	:DISPlay:WINDOW[1]:TRACE:GRATICULE:GRID[:STATe] OFF ON 0 1 :DISPlay:WINDOW[1]:TRACE:GRATICULE:GRID[:STATe]?
<b>Example</b>	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

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## 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

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## 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
<b>Remote Command</b>	:DISPlay:WINDOW[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDOW[1]:ANNotation[:ALL]?
<b>Example</b>	: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

## 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
<b>Remote Command</b>	:MMEMory:STOR:SCReen:THEMe TDColor   TDMonochrome   FCOLor   FMONochrome :MMEMory:STOR:SCReen:THEMe?
<b>Example</b>	: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 you 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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Example</b>	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
<b>Remote Command</b>	:DISPLAY:BACKlight ON OFF :DISPLAY:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
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.

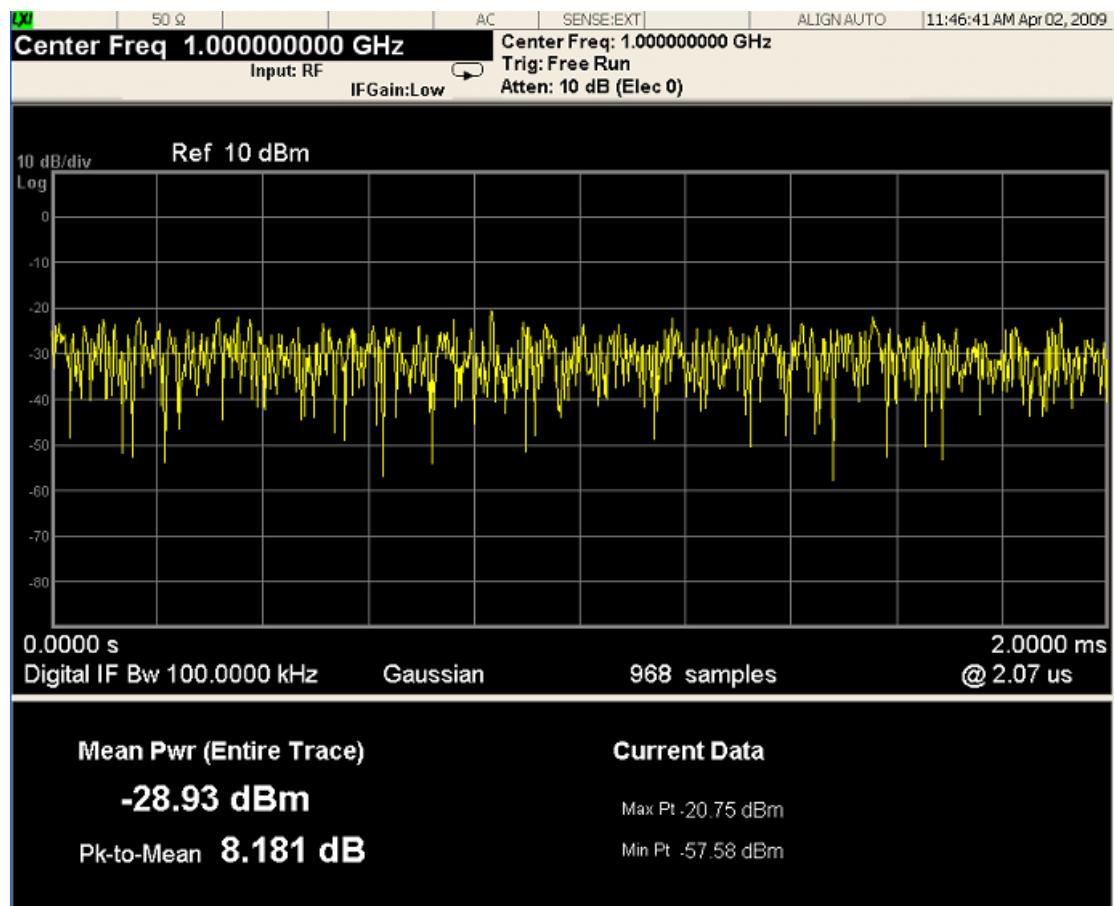
Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

## RF Envelope

This view shows an example of the RF Envelope result for the waveform (time domain) measurements in the graph window. The measured values for the mean power and peak-to-mean power are shown in the text window.

## 11 Waveform Measurement

### View/Display



### Numeric Results

Name	Type	Description	Unit	Format
Mean Pwr	Float64	The mean power (dBm). This is either the power across the entire trace, or the power between markers if the markers are enabled.	dBm	XX.XX dBm
Pk-to-Mean	Float64	This is the ratio of the maximum signal level to the mean power.	dB	XX.XX dB
Max Pt	Float64	The maximum of the most recently acquired data.	dBm	XX.XX dBm
Min Pt	Float64	The minimum of the most recently acquired data.	dBm	XX.XX dBm

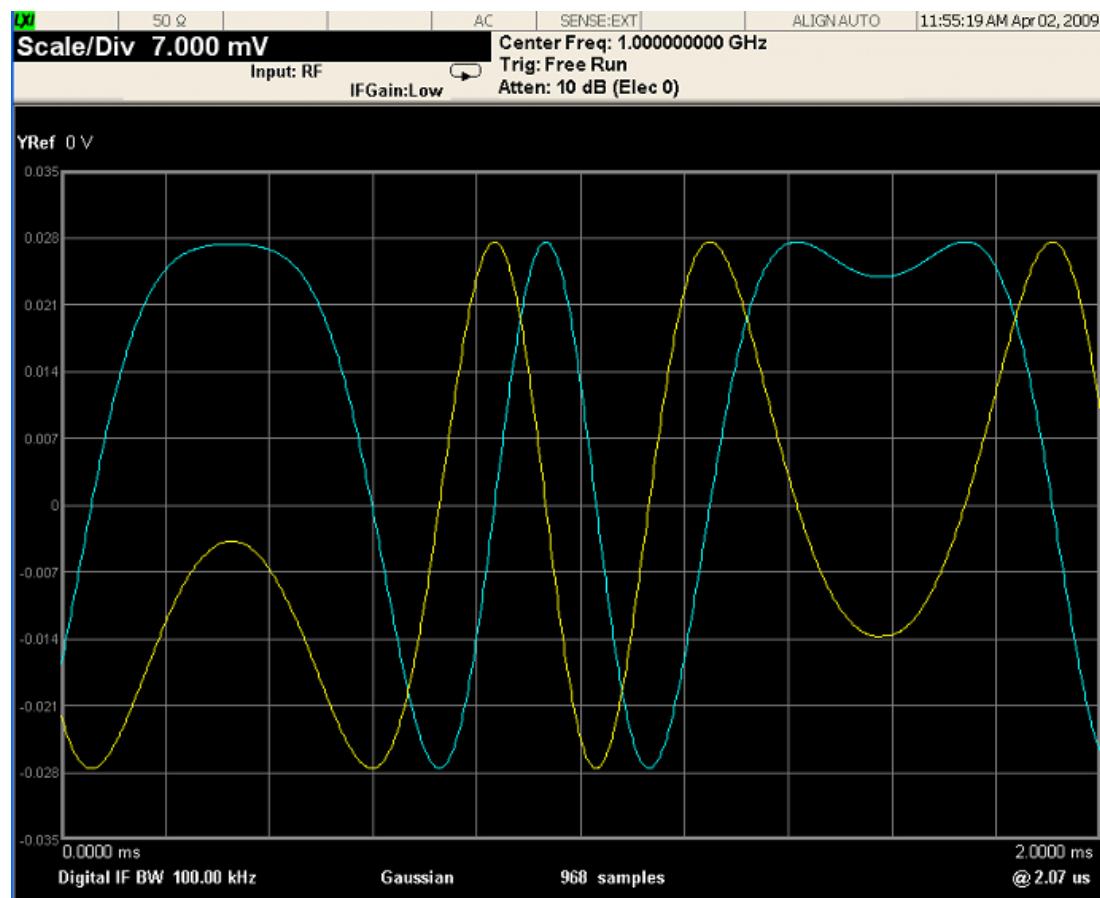
---

Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

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## I/Q Waveform

This view shows the I and Q signal waveforms in parameters of voltage versus time.



Key Path	View/Display
Initial S/W Revision	Prior to A.02.00



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without notice.

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