

# **Agilent X-Series Signal Analyzer**

This help file provides documentation for the following X-Series Analyzers:

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

## **IQ Analyzer Mode User's & Programmer's Reference**



**Agilent Technologies**

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## Table of Contents

## 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 XP Pro® 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 analyzer 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 Signal Analyzer.

For the latest information on Agilent Signal Analyzer measurement applications and upgrade kits, visit the following internet URL.

[http://www.agilent.com/find/sa\\_upgrades](http://www.agilent.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 Agilent Technologies service or sales office for assistance.

## Obtaining and Installing a License Key

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

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

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

C:\Programming Files\Agilent\Licensing

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

## Updating Measurement Application Software

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

improvements and expanded functionality.

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

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

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

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

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

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

You can load the updated software package into the analyzer 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 analyzer:

[www.agilent.com/find/cxa](http://www.agilent.com/find/cxa)

[www.agilent.com/find/exa](http://www.agilent.com/find/exa)

[www.agilent.com/find/mxa](http://www.agilent.com/find/mxa)

[www.agilent.com/find/pxa](http://www.agilent.com/find/pxa)

2. The home page for your instrument appears (in some cases, you may see an initial splash screen containing a button named View the Webpage, which you should click to display the home page).
3. Locate the Options tab, as highlighted in the example below, which shows the home page for the MXA.
4. Click the Options tab, to display a list of available options and accessories for your instrument.

## Front-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

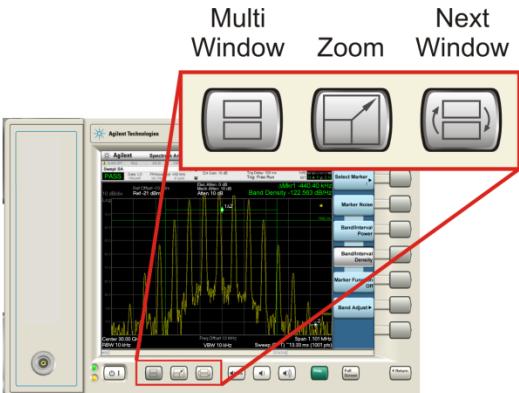
The instrument's Rear-panel features are fully detailed in the section "Rear-Panel Features" (under the chapter "Front and Rear Panel Features") of the document:

[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.

---

<b>Remote Command</b>	:DISPLAY:WINDOW:FORMAT:ZOOM
<b>Remote Command</b>	: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

---

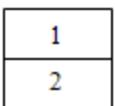
## Next Window

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

---

<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.

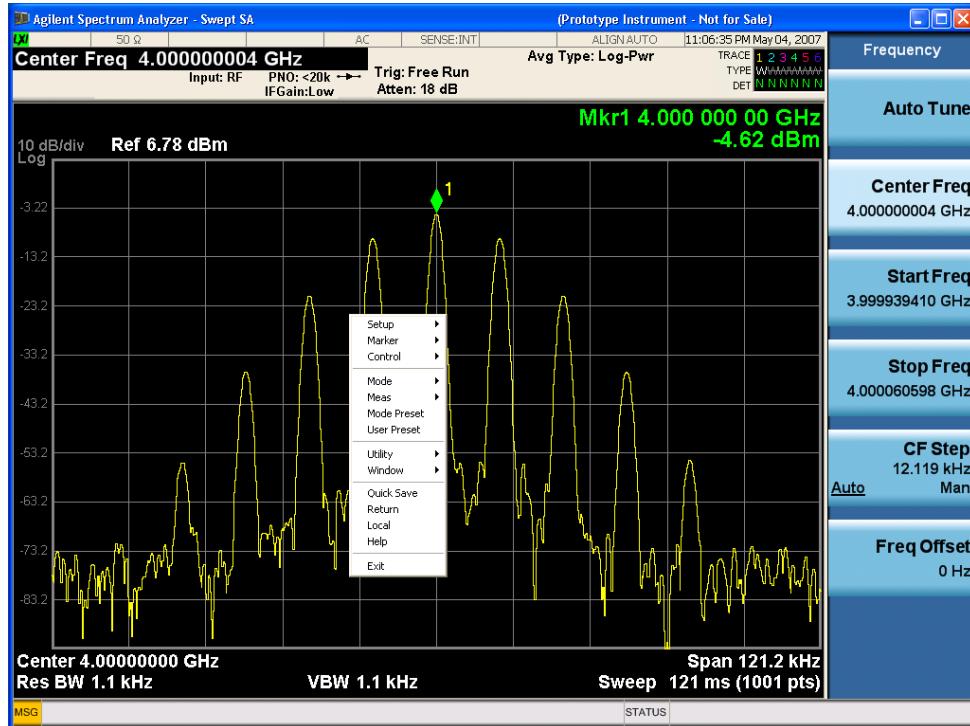
---

## 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

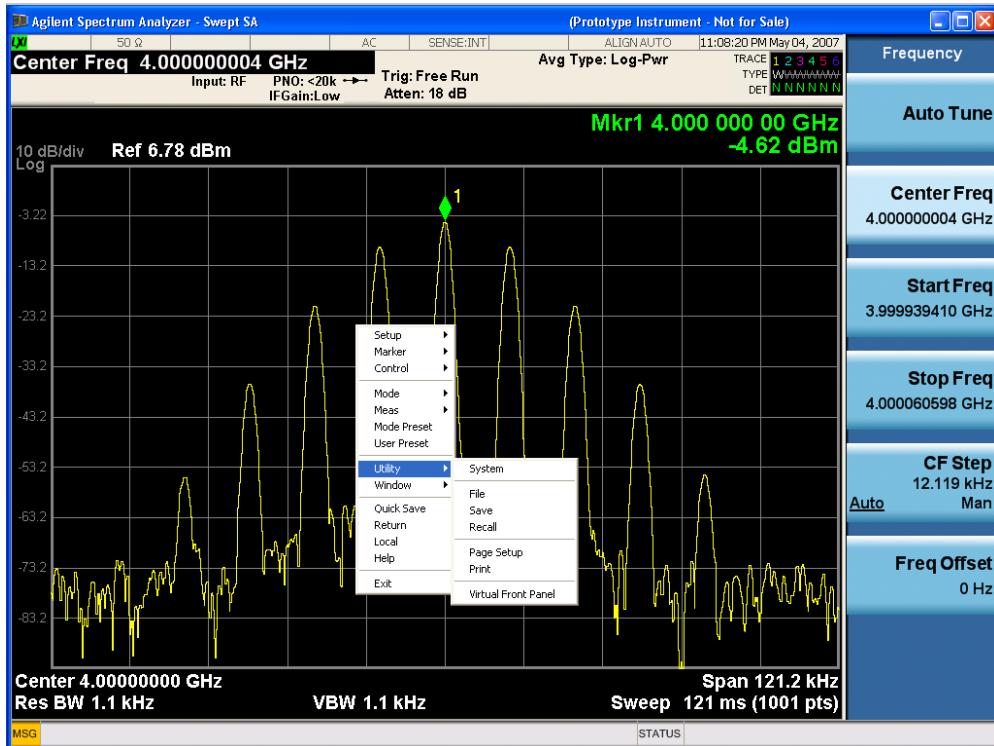
If you plug in a mouse and right-click on the analyzer screen, a menu will appear as below:



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:

## 1 About the Analyzer

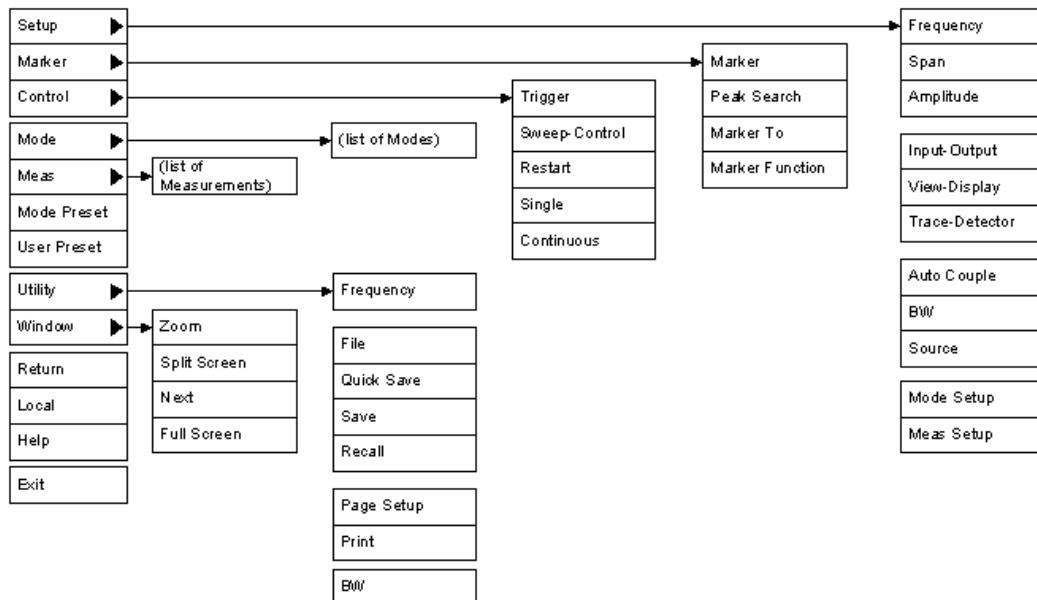
### Mouse and Keyboard Control



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.

**NOTE** This feature is not available if option SF1 is installed.

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

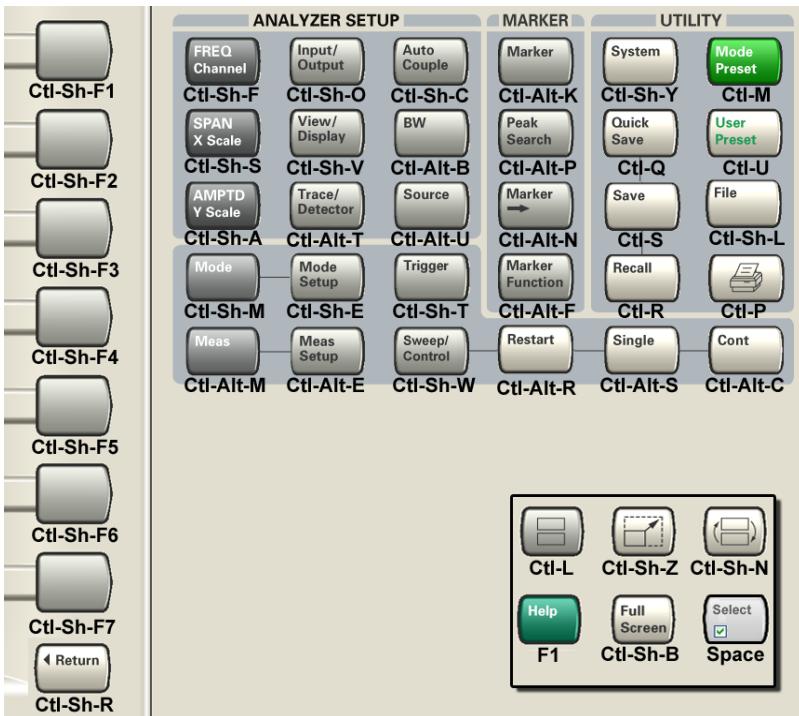
## [1 About the Analyzer](#)

### [Mouse and Keyboard Control](#)

<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

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 analyzers, this information is contained in the document "Security Features and Document of Volatility". This document is **not** included in the Documentation CD, or the instrument's on-disk library, but it may be downloaded from Agilent's web site.

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

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

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

## 2 About the IQ Analyzer Mode

This chapter provides information on using the IQ Analyzer Mode in your Agilent Signal Analyzer. It also documents some of the available optional hardware that can be used in this mode. This includes options such as EA3 (electronic attenuator) and preamp options (P02, P08, P13, P26). The X-Series Option B25 must be used with the measurements found in IQ Analyzer Mode since the optional wideband hardware cannot be accessed in other modes.



## What Does IQ Analyzer Mode Do?

The IQ Analyzer Mode makes 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.

- Complex Spectrum Measurement (Frequency Domain)

This measurement is comparable to a precision microwave spectrum analyzer measurement that also provides demodulated I/Q data for individual I and Q amplitude data pairs.

- I/Q Waveform Measurement (Time Domain)

This measurement is comparable to a precision vector signal analyzer measurement that also provides demodulated I/Q data for individual magnitude and phase analysis.

**NOTE**

LXI-B capability is available in the IQ Analyzer Mode. The LXI Standard (Lan eXtensions for Instruments) brings the connectivity of the internet to the Test and Measurement industry. LXI-B adds a number of tools that a system integrator may use to improve the efficiency of measurements and to improve the visibility into the system. Refer to the Programmer's Guide which can be viewed and printed from the Additional Documentation page in Help or in your instrument at:

C:\Program Files\Agilent\SignalAnalysis\Infrastructure\Help\bookfiles\x\_series\_prog.pdf.

---

The following optional alternate hardware is typically used with IQ Analyzer Mode:

- [Option EA3](#) provides an alternate attenuator that switches electronically. It has a maximum of 40 dB in 1 dB steps. (The standard attenuator is 70 dB maximum attenuation in 2 dB steps.). This hardware may be accessed from within IQ Analyzer Mode, but only with the narrowband IF path. It cannot be used with the B25 wideband path.
- [Option B25](#) provides an alternate wideband digital IF signal path with a maximum bandwidth of 25 MHz. This hardware can only be accessed from within measurements in IQ analyzer mode and other demod measurements such as EVM for EDGE and 802.16 OFDMA or N9064A VXA mode.

## Using the Electronic Attenuator Hardware (Option EA3)

Option EA3 is required for many of the optional measurement personalities. This optional attenuator does the fast switching necessary to accommodate the complicated multiple-sweep, averaged measurements required for digital communication systems testing. The hardware is specified for measurements up to a maximum of 3.6 GHz and works with many different measurement personalities. These additional measurement personalities are purchased separately and are accessed using the **Mode** key. See [Installing Application Software](#) for information about loading measurement instrument software.

## Using the Wideband Analysis Hardware (Option B25 for MXA and EXA)

Option B25 hardware enables up to 25 MHz of capture bandwidth. IQ Analyzer Mode is provided to access this wideband hardware.

There are couplings and interactions when using the optional hardware with other options and hardware.

- B25 access is not limited to IQ analyzer mode. We can use B25 from 89600 VSA software and modulation analysis in other modes.
- If this wideband hardware is installed, IQ Analyzer Mode always makes measurements above 3.6 GHz using the wideband path. The standard "narrowband" path is not available in IQ Analyzer Mode above 3.6 GHz.
- Option EA3 (1 dB electronic attenuator for digital communications) is not required for operation of the wideband option B25.
- If the wideband hardware is installed, but the electronic attenuator (EA3) is **not** installed, then the wideband input path is used for all measurements in IQ Analyzer Mode. Since the standard narrowband path is not available in IQ Analyzer Mode without Option EA3, only the Option B25 specifications apply.
- The preamp options (MXA P03, P08, P13, P26 and EXA P03) cannot be used in IQ Analyzer Mode with Option B25.

**TIP**

Improved accuracy can be obtained using an external calibration. This capability is available using the Agilent 89600 Vector Signal Analysis Software.

## 3 Programming the Analyzer

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

["What Programming Information is Available?" on page 48](#)

["STATus Subsystem " on page 67](#)

["Common Commands" on page 107](#)



## What Programming Information is Available?

The X-Series Documentation can be accessed through the Additional Documentation page in the instrument Help system and is included on the Documentation CD shipped with the instrument. It can also be found online at: [http://www.agilent.com/find/mxa\\_manuals](http://www.agilent.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 book, but are in the User's and Programmer's Reference.</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 analyzer'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 Windows XP Remote Desktop 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>
Agilent Application Notes	Printable PDF versions of pertinent application notes.
Agilent VISA User's Guide	Describes the Agilent Virtual Instrument Software Architecture (VISA) library and shows how to use it to develop I/O applications and instrument drivers on Windows PCs.

## List of SCPI Commands

```
*CAL?
*CLS
*ESE <integer>
*ESE?
*ESR?
*IDN?
*OPC
*OPC?
*OPT?
*RCL <register#>
*RST
*SAV <register#>
*SRE <integer>
*SRE?
*STB?
*TRG
*TST?
*WAI
ABORT
CALCulate:CLIMits:FAIL?
CALCulate:DATA<n>:COMPress? BLOCK | CFIT | MAXimum | MINimum | MEAN |
DMEan | RMS | RMSCubed | SAMPLE | SDEViation | PPHase[, <soffset>[, <length>[, <roffset>[, <rlimit>]]]]
CALCulate:DATA[n]?
CALCulate:DATA[1]|2|...6:PEAKs? <threshold>, <excursion>[, AMPLitude |
FREQuency | TIME[, ALL | GTDLine | LTDLine]]
CALCulate:DATA[1]|2|...6:PEAKs? <threshold>, <excursion>[, AMPLitude |
FREQuency | TIME]
CALCulate:SPECtrum:MARKer:AOFF
CALCulate:SPECtrum:MARKer:COUPle[:STATE] ON | OFF | 1 | 0
CALCulate:SPECtrum:MARKer:COUPle[:STATE]?
CALCulate:SPECtrum:MARKer[1]|2|...12:CPSearch[:STATE] ON | OFF | 1 | 0
CALCulate:SPECtrum:MARKer[1]|2|...12:CPSearch[:STATE]?
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION NOISE | BPOWER | BDENSity |
OFF
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION?
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION:BAND:LEFT <freq>
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION:BAND:LEFT?
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION:BAND:RIGHT <freq>
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION:BAND:RIGHT?
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION:BAND:SPAN <freq>
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION:BAND:SPAN?
CALCulate:SPECtrum:MARKer[1]|2|...12:FUNCTION:RESULT?
CALCulate:SPECtrum:MARKer[1]|2|...12:MAXimum
CALCulate:SPECtrum:MARKer[1]|2|...12:MAXimum:LEFT
CALCulate:SPECtrum:MARKer[1]|2|...12:MAXimum:NEXT
CALCulate:SPECtrum:MARKer[1]|2|...12:MAXimum:RIGHT
CALCulate:SPECtrum:MARKer[1]|2|...12:MINimum
CALCulate:SPECtrum:MARKer[1]|2|...12:MODE POSition | DELTa | OFF
CALCulate:SPECtrum:MARKer[1]|2|...12:MODE?
```

```
CALCulate:SPECTrum:MARKer:PEAK:EXCursion <rel_ampl>
CALCulate:SPECTrum:MARKer:PEAK:EXCursion?
CALCulate:SPECTrum:MARKer:PEAK:EXCursion:STATE OFF | ON | 0 | 1
CALCulate:SPECTrum:MARKer:PEAK:EXCursion:STATE?
CALCulate:SPECTrum:MARKer:PEAK:SEARch:MODE MAXimum | PARameter
CALCulate:SPECTrum:MARKer:PEAK:SEARch:MODE?
CALCulate:SPECTrum:MARKer:PEAK:THReShold <ampl>
CALCulate:SPECTrum:MARKer:PEAK:THReShold?
CALCulate:SPECTrum:MARKer:PEAK:THReShold:STATE OFF | ON | 0 | 1
CALCulate:SPECTrum:MARKer:PEAK:THReShold:STATE?
CALCulate:SPECTrum:MARKer[1]|2|...12:PTPeak
CALCulate:SPECTrum:MARKer[1]|2|...12:REFerence <integer>
CALCulate:SPECTrum:MARKer[1]|2|...12:REFerence?
CALCulate:SPECTrum:MARKer[1]|2|...12[:SET]:CENTER
CALCulate:SPECTrum:MARKer[1]|2|...12[:SET]:RLEVel
CALCulate:SPECTrum:MARKer[1]|2|...12:STATE OFF | ON | 0 | 1
CALCulate:SPECTrum:MARKer[1]|2|...12:STATE?
CALCulate:SPECTrum:MARKer[1]|2|...12:TRACe SPECTrum | ASPectrum | I | Q |
IQ
CALCulate:SPECTrum:MARKer[1]|2|...12:TRACe?
CALCulate:SPECTrum:MARKer[1]|2|...12:X <freq>
CALCulate:SPECTrum:MARKer[1]|2|...12:X?
CALCulate:SPECTrum:MARKer[1]|2|...12:X:POSITION <freq>
CALCulate:SPECTrum:MARKer[1]|2|...12:X:POSITION?
CALCulate:SPECTrum:MARKer[1]|2|...12:Y?
CALCulate:WAVEform:MARKer:AOFF
CALCulate:WAVEform:MARKer:COUPLE[:STATE] ON | OFF | 1 | 0
CALCulate:WAVEform:MARKer:COUPLE[:STATE]?
CALCulate:WAVEform:MARKer[1]|2|...12:FUNCTION BPOWer | BDENsity | OFF
CALCulate:WAVEform:MARKer[1]|2|...12:FUNCTION?
CALCulate:WAVEform:MARKer[1]|2|...12:FUNCTION:BAND:LEFT <time>
CALCulate:WAVEform:MARKer[1]|2|...12:FUNCTION:BAND:LEFT?
CALCulate:WAVEform:MARKer[1]|2|...12:FUNCTION:BAND:RIGHT <time>
CALCulate:WAVEform:MARKer[1]|2|...12:FUNCTION:BAND:RIGHT?
CALCulate:WAVEform:MARKer[1]|2|...12:FUNCTION:BAND:SPAN <time>
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 POSITION | DELTa | OFF
CALCulate:WAVEform:MARKer[1]|2|...12:MODE?
CALCulate:WAVEform:MARKer[1]|2|...12:REFerence <integer>
CALCulate:WAVEform:MARKer[1]|2|...12:REFerence?
CALCulate:WAVEform:MARKer[1]|2|...12:STATE OFF | ON | 0 | 1
CALCulate:WAVEform:MARKer[1]|2|...12:STATE?
CALCulate:WAVEform:MARKer[1]|2|...12:TRACe RFENvelope | I | Q | IQ
CALCulate:WAVEform:MARKer[1]|2|...12:TRACe?
CALCulate:WAVEform:MARKer[1]|2|...12:X <time>
CALCulate:WAVEform:MARKer[1]|2|...12:X?
CALCulate:WAVEform:MARKer[1]|2|...12:X:POSITION <real>
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:AUTO ALERT
CALibration:AUTO ON | PARTial | OFF
CALibration:AUTO?
CALibration:AUTO:ALERT TTEMperature | DAY | WEEK | NONE
CALibration:AUTO:ALERT?
CALibration:AUTO:MODE ALL | NRF
CALibration:AUTO:MODE?
CALibration:AUTO:TIME:OFF?
CALibration:DATA:BACKup <filename>
CALibration:DATA:DEFault
CALibration:DATA:RESTore <filename>
CALibration:EXPired?
CALibration:FREQuency:REFerence:COARse
CALibration:FREQuency:REFerence:COARse <integer>
CALibration:FREQuency:REFerence:COARse?
CALibration:FREQuency:REFerence:FINE <integer>
CALibration:FREQuency:REFerence:FINE?
CALibration:FREQuency:REFerence:MODE CALibrated | USER
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:NRF
CALibration:NRF?
CALibration:RF
CALibration:RF?
CALibration:RFPSelector:ALERT ON | OFF | 0 | 1
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 DAY | WEEK | OFF
CALibration:RFPSelector:SCHeduler:RECurrence?
CALibration:RFPSelector:SCHeduler:RECurrence:DAY SUN | MON | TUE | WED |
THU | FRI | SAT
CALibration:RFPSelector:SCHeduler:RECurrence:DAY?
CALibration:RFPSelector:SCHeduler:RECurrence:WEEK <integer>
```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
CALibration:RFPSelector:SCHeDuler:RECurrence:WEEK?
CALibration:RFPSelector:SCHeDuler:STATE ON | OFF | 0 | 1
CALibration:RFPSelector:SCHeDuler:STATE?
CALibration:RFPSelector:SCHeDuler:TASK T1 | T2 | T3
CALibration:RFPSelector:SCHeDuler:TASK?
CALibration:RFPSelector:SCHeDuler:TIME:NEXT?
CALibration:RFPSelector:SCHeDuler:TIME:START "date", "time"
CALibration:RFPSelector:SCHeDuler:TIME:START?
CALibration:SOURce:STATE OFF | ON | 0 | 1
CALibration:SOURce:STATE?
CALibration:TEMPerature:CURRent?
CALibration:TEMPerature:LALL?
CALibration:TEMPerature:LPReselector?
CALibration:TEMPerature:LRF?
CALibration:TEMPerature:RFPSelector:LCONDucted?
CALibration:TEMPerature:RFPSelector:LRADIated?
CALibration:TEMPerature:SOURce:LALL?
CALibration:TIME:LALL?
CALibration:TIME:LPReselector?
CALibration:TIME:LRF?
CALibration:TIME:RFPSelector:LCONDucted?
CALibration:TIME:RFPSelector:LRADIated?
CALibration:TIME:SOURce:LALL?
CALibration:YTF
CALibration:YTF?
CONF FSC
CONFigure?
CONFigure:SPECtrum
CONFigure:SPECtrum
CONFigure:SPECtrum:NDEFault
CONFigure:WAVEform
CONFigure:WAVEform
CONFigure:WAVEform:NDEFault
COUPLE ALL | NONE
DISPLAY:<measurement>:ANNotation:TITLE:DATA <string>
DISPLAY:<measurement>:ANNotation:TITLE:DATA?
DISPLAY:ACTivefunc[:STATE] ON | OFF | 1 | 0
DISPLAY:ACTivefunc[:STATE]?
DISPLAY:ANNotation:MBAR[:STATE] OFF | ON | 0 | 1
DISPLAY:ANNotation:MBAR[:STATE]?
DISPLAY:ANNotation:SCReen[:STATE] OFF | ON | 0 | 1
DISPLAY:ANNotation:SCReen[:STATE]?
DISPLAY:BACKlight ON | OFF
DISPLAY:BACKlight?
DISPLAY:BACKlight:INTensity <integer>
DISPLAY:BACKlight:INTensity?
DISPLAY:SPECtrum:VIEW[1]:WINDOW[1]|2:TRACe:Y[:SCALE]:COUPLE ON | OFF | 1 |
0
DISPLAY:SPECtrum:VIEW[1]:WINDOW[1]|2:TRACe:Y[:SCALE]:COUPLE?
DISPLAY:SPECtrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALE]:PDIVision <voltage>
DISPLAY:SPECtrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision <rel_ampl>
DISPLAY:SPECtrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALE]:PDIVision?
DISPLAY:SPECtrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
```

```

DISPLAY:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALE]:RLEVel < voltage >
DISPLAY:SPECTrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel < ampl >
DISPLAY:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALE]:RLEVel?
DISPLAY:SPECTrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?
DISPLAY:SPECTrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSition TOP | CENTER
| BOTTom
DISPLAY:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALE]:RPOSition TOP | CENTER |
BOTTom
DISPLAY:SPECTrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSition?
DISPLAY:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALE]:RPOSition?
DISPLAY:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:COUPLE 0 | 1 | OFF |
ON
DISPLAY:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:COUPLE?
DISPLAY:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:PDIVision < time >
DISPLAY:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:PDIVision?
DISPLAY:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel < time >
DISPLAY:WAVEform:VIEW[1]|2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel?
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?
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?
DISPLAY:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision < voltage >
DISPLAY:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision < rel_ampl >
DISPLAY:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
DISPLAY:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
DISPLAY:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel < voltage >
DISPLAY:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel < ampl >
DISPLAY:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?
DISPLAY:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RLEVel?
DISPLAY:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSition TOP | CENTER
| BOTTom
DISPLAY:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RPOSition TOP | CENTER |
BOTTom
DISPLAY:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSition?
DISPLAY:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:RPOSition?
DISPLAY:WINDOW[1]:ANNotation[:ALL] OFF | ON | 0 | 1
DISPLAY:WINDOW[1]:ANNotation[:ALL]?
DISPLAY:WINDOW:FORMAT:TILE
DISPLAY:WINDOW:FORMAT:ZOOM
DISPLAY:WINDOW[:SELect] < number >
DISPLAY:WINDOW[:SELect]?
DISPLAY:WINDOW[1]:TRACe:GRATICULE:GRID[:STATE] OFF | ON | 0 | 1
DISPLAY:WINDOW[1]:TRACe:GRATICULE:GRID[:STATE]?
FETCH:SPECTrum[n]?
FETCH:WAVEform[n]?
FORMAT:BORDer NORMal | SWAPped
FORMAT:BORDer?
FORMAT[:TRACe][:DATA] ASCii | INTeger, 32 | REAL, 32 | REAL, 64
FORMAT[:TRACe][:DATA]?
GLOBAL:DEFault

```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
GLOBal:FREQuency:CENTER[:STATE] 1 | 0 | ON | OFF
GLOBal:FREQuency:CENTER[:STATE]?
HCOPy:ABORT
HCOPy[:IMMediate]
INITiate:CONTinuous OFF | ON | 0 | 1
INITiate:CONTinuous?
INITiate[:IMMediate]
INITiate:PAUSE
INITiate:REStart
INITiate:RESume
INITiate:SPECTrum
INITiate:WAVEform
INPUT:COUpling AC | DC
INPUT:COUpling?
INPUT:COUpling:I|Q DC | LFR1 | LFR2
INPUT:COUpling:I|Q?
INPUT:IMPedance:IQ U50 | B50 | U1M | B1M
INPUT:IMPedance:IQ?
INPUT:IMPedance:REFerence <integer>
INPUT:IMPedance:REFerence?
INPUT[1]:IQ:BALanced[:STATE] OFF | ON | 0 | 1
INPUT[1]:IQ:BALanced[:STATE]?
INPUT:IQ[:I]:DIFFerential OFF | ON | 0 | 1
INPUT:IQ[:I]:DIFFerential?
INPUT[1]:IQ[:I]:IMPedance LOW | HIGH
INPUT[1]:IQ[:I]:IMPedance?
INPUT:IQ:MIRRored OFF | ON | 0 | 1
INPUT:IQ:MIRRored?
INPUT:IQ:Q:DIFFerential OFF | ON | 0 | 1
INPUT:IQ:Q:DIFFerential?
INPUT[1]:IQ:Q:IMPedance LOW | HIGH
INPUT[1]:IQ:Q:IMPedance?
INPUT[1]:IQ:TYPE IQ | I | Q
INPUT[1]:IQ:TYPE?
INPUT:MIXer EXTernal | INTernal
INPUT:MIXer?
INPUT:OFFSet:I|Q <voltage>
INPUT:OFFSet:I|Q?
INSTrument:CATalog?
INSTrument:COUPLE:DEFault
INSTrument:COUPLE:FREQuency:CENTER ALL | NONE
INSTrument:COUPLE:FREQuency:CENTER?
INSTrument:DEFault
INSTrument:NSELect <integer>
INSTrument:NSELect?
INSTrument[:SElect] SANalyzer
INSTrument[:SElect] 'SA' | 'PNOISE' | 'EDGE' | 'GSM' | 'BASIC'
INSTrument[:SElect] RECeiver
INSTrument[:SElect] SA | SEQAN | EMI | BASIC | WCDMA | EDGEGSM |
WIMAXOFDMA | VSA | PNOISE | NFIGure | ADEM0D | BTooth | TDSCDMA | CDMA2K |
CDMA1XEV | LTE | LTETDD | MSR | DVB | DTMB | DCATV | ISDBT | CMMB | WLAN |
CWLAN | CWIMAXOFDM | WIMAXFIXED | IDEN | RLC | SCPILC | VSA89601
```

```

INSTRument[:SElect] GSM
INSTRument[:SElect]?
INST:SEL SCPILC
INST:SEL EMI
MEASURE:SPECtrum[n]?
MEASURE:WAVeform[n]?
MMEMory:LOAD:CORRection ANTenna | CABLe | OTHer | USER, <filename>
MMEMory:LOAD:CORRection 1 | 2 | 3 | 4 | 5 | 6, <filename>
MMEMory:LOAD:STATE <filename>
MMEMory:LOAD:STATE 1, <filename>
MMEMory:REGister:STATE:LABEL <regnumber>, "label"
MMEMory:REGister:STATE:LABEL? <regnumber>
MMEMory:STORe:CORRection ANTenna | CABLe | OTHer | USER, <filename>
MMEMory:STORe:CORRection 1 | 2 | 3 | 4 | 5 | 6, <filename>
MMEMory:STORe:RESults:MTABle|PTABle|SPECtrogram <filename>
MMEMory:STORe:SCReen <filename>
MMEMory:STORe:SCReen:THEMe TDColor | TDMonochrome | FCOLOR | FMONochrome
MMEMory:STORe:SCReen:THEMe?
MMEMory:STORe:STATE <filename>
MMEMory:STORe:STATE 1, <filename>
OUTPUT:ANALog OFF | SVIdeo | LOGVideo | LINVideo | DAUDio
OUTPUT:ANALog?
OUTPUT:ANALog:AUTO OFF | ON | 0 | 1
OUTPUT:ANALog:AUTO?
OUTPUT:AUX SIF | AIF | LOGVideo | OFF
OUTPUT:AUX?
OUTPUT:AUX:AIF <value>
OUTPUT:AUX:AIF?
OUTPUT:DBUS[1][:STATE] ON | OFF | 1 | 0
OUTPUT:DBUS[1][:STATE]?
OUTPUT:IQ:OUTPut IQ1 | IQ250 | OFF
OUTPUT:IQ:OUTPut?
READ:SPECtrum[n]?
READ:WAVeform[n]?
[:SENSe]:<measurement>:TRIGger:SOURce IF
[:SENSe]:<measurement>:TRIGger:SOURce
[:SENSe]:ACPR:TRIGger:SOURce
[:SENSe]:CORRection:BTS[:RF]:GAIN <rel_ampl>
[:SENSe]:CORRection:BTS[:RF]:GAIN?
[:SENSe]:CORRection:BTS[:RF]:LOSS <rel_ampl>
[:SENSe]:CORRection:BTS[:RF]:LOSS?
[:SENSe]:CORRection:CSET:ALL:DELETE
[:SENSe]:CORRection:CSET:ALL[:STATE] ON | OFF | 1 | 0
[:SENSe]:CORRection:CSET:ALL[:STATE]?
[:SENSe]:CORRection:CSET[1]:ANTenna[:UNIT] GAUSS | PTESla | UVM | UAM | UA
| NOConversion
[:SENSe]:CORRection:CSET[1]:ANTenna[:UNIT]?
[:SENSe]:CORRection:CSET[1]|2|...6:COMMent "text"
[:SENSe]:CORRection:CSET[1]|2|...6:COMMent?
[:SENSe]:CORRection:CSET[1]|2|...6:DATA <freq>, <ampl>, ...
[:SENSe]:CORRection:CSET[1]|2|...6:DATA?
[:SENSe]:CORRection:CSET[1]|2|...6:DATA:MERGe <freq>, <ampl>, ...
[:SENSe]:CORRection:CSET[1]|2|...6:DELETE

```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
[ :SENSe] :CORRection:CSET[1]|2|...6:DESCription "text"
[ :SENSe] :CORRection:CSET[1]|2|...6:DESCription?
[ :SENSe] :CORRection:CSET[1]|2|...6[:STATE] ON | OFF | 1 | 0
[ :SENSe] :CORRection:CSET[1]|2|...6[:STATE]?
[ :SENSe] :CORRection:CSET[1]|2|...6:X:SPACing LINear | LOGarithmic
[ :SENSe] :CORRection:CSET[1]|2|...6:X:SPACing?
[ :SENSe] :CORRection:IMPedance[:INPut] [:MAGNitude] 50 | 75
[ :SENSe] :CORRection:IMPedance[:INPut] [:MAGNitude]?
[ :SENSe] :CORRection:IQ:I:GAIN <rel_ampl>
[ :SENSe] :CORRection:IQ:I:GAIN?
[ :SENSe] :CORRection:IQ:I|Q:ATTenuation <rel_ampl>
[ :SENSe] :CORRection:IQ:I|Q:ATTenuation?
[ :SENSe] :CORRection:IQ:I|Q:ATTenuation:RATio <real>
[ :SENSe] :CORRection:IQ:I|Q:ATTenuation:RATio?
[ :SENSe] :CORRection:IQ[:I]:SKEW <seconds>
[ :SENSe] :CORRection:IQ[:I]:SKEW?
[ :SENSe] :CORRection:IQ:Q:GAIN <rel_ampl>
[ :SENSe] :CORRection:IQ:Q:GAIN?
[ :SENSe] :CORRection:IQ:Q:SKEW <seconds>
[ :SENSe] :CORRection:IQ:Q:SKEW?
[ :SENSe] :CORRection:MS[:RF]:GAIN <rel_ampl>
[ :SENSe] :CORRection:MS[:RF]:GAIN?
[ :SENSe] :CORRection:MS[:RF]:LOSS <rel_ampl>
[ :SENSe] :CORRection:MS[:RF]:LOSS?
[ :SENSe] :CORRection:OFFSet[:MAGNitude]
[ :SENSe] :CORRection:SA[:RF]:GAIN <rel_ampl>
[ :SENSe] :CORRection:SA[:RF]:GAIN?
[ :SENSe] :FEED AREFerence
[ :SENSe] :FEED IQ | IONLY | QONLY
[ :SENSe] :FEED RF | AIQ | EMIXer
[ :SENSe] :FEED?
[ :SENSe] :FEED?
[ :SENSe] :FEED:AREFerence REF50 | REF4800 | OFF
[ :SENSe] :FEED:AREFerence?
[ :SENSe] :FEED:IQ:TYPE IQ | IONLY | QONLY | INDependent
[ :SENSe] :FEED:IQ:TYPE?
[ :SENSe] :FREQuency:CENTer <freq>
[ :SENSe] :FREQuency:CENTer?
[ :SENSe] :FREQuency:EMIXer:CENTer <freq>
[ :SENSe] :FREQuency:EMIXer:CENTer?
[ :SENSe] :FREQuency:IQ:CENTer <freq>
[ :SENSe] :FREQuency:IQ:CENTer?
[ :SENSe] :FREQuency:RF:CENTer <freq>
[ :SENSe] :FREQuency:RF:CENTer?
[ :SENSe] :IFPath B10M | B25M | B40M | B85M | B125M | B140M | B160M
[ :SENSe] :IFPath?
[ :SENSe] :IFPath:AUTO ON | OFF | 1 | 0
[ :SENSe] :IFPath:AUTO?
[ :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
[ :SENSe] :MIXer:BAND?
[ :SENSe] :MIXer:BIAS <real>
```

```
[SENSe]:MIXer:BIAS?
[:SENSe]:MIXer:BIAS:STATE OFF | ON | 0 | 1
[:SENSe]:MIXer:BIAS:STATE?
[:SENSe]:MIXer:CIFLoss <rel_ampl>
[:SENSe]:MIXer:CIFLoss?
[:SENSe]:POWER:IQ[:I]:RANGE[:UPPer] <ampl>
[:SENSe]:POWER:IQ[:I]:RANGE[:UPPer]?
[:SENSe]:POWER:IQ:Q:RANGE[:UPPer] <ampl>
[:SENSe]:POWER:IQ:Q:RANGE[:UPPer]?
[:SENSe]:POWER:IQ:RANGE:AUTO OFF | ON | 0 | 1
[:SENSe]:POWER:IQ:RANGE:AUTO?
[:SENSe]:POWER[:RF]:ATTenuation <rel_ampl>
[:SENSe]:POWER[:RF]:ATTenuation?
[:SENSe]:POWER[:RF]:ATTenuation:AUTO OFF | ON | 0 | 1
[:SENSe]:POWER[:RF]:ATTenuation:AUTO?
[:SENSe]:POWER[:RF]:ATTenuation:STEP[:INCRement] 10 dB | 2 dB
[:SENSe]:POWER[:RF]:ATTenuation:STEP[:INCRement]?
[:SENSe]:POWER[:RF]:EATTenuation <rel_ampl>
[:SENSe]:POWER[:RF]:EATTenuation?
[:SENSe]:POWER[:RF]:EATTenuation:STATE OFF | ON | 0 | 1
[:SENSe]:POWER[:RF]:EATTenuation:STATE?
[:SENSe]:POWER[:RF]:GAIN:BAND LOW | FULL
[:SENSe]:POWER[:RF]:GAIN:BAND?
[:SENSe]:POWER[:RF]:GAIN[:STATE] OFF | ON | 0 | 1
[:SENSe]:POWER[:RF]:GAIN[:STATE]?
[:SENSe]:POWER[:RF]:MMW:PADJust
[:SENSe]:POWER[:RF]:MW:PADJust
[:SENSe]:POWER[:RF]:MW:PATH STD | LNPath | MPBypass | FULL
[:SENSe]:POWER[:RF]:MW:PATH?
[:SENSe]:POWER[:RF]:MW:PRESelector[:STATE] ON | OFF | 0 | 1
[:SENSe]:POWER[:RF]:MW:PRESelector[:STATE]?
[:SENSe]:POWER[:RF]:PADJust <freq>
[:SENSe]:POWER[:RF]:PADJust?
[:SENSe]:POWER[:RF]:PADJust:PRESelector MWAVE | MMWave | EXTERNAL
[:SENSe]:POWER[:RF]:PADJust:PRESelector?
[:SENSe]:POWER[:RF]:PCENTER
[:SENSe]:POWER[:RF]:RANGE:CLIPping:LEVEL?
[:SENSe]:POWER[:RF]:RANGE:OPTimize IMMEDIATE
[:SENSe]:ROSCillator:BANDwidth WIDE | NARROW
[:SENSe]:ROSCillator:BANDwidth?
[:SENSe]:ROSCillator:COUPLing NORMAL | NACQuisition
[:SENSe]:ROSCillator:COUPLing?
[:SENSe]:ROSCillator:EXTERNAL:FREQuency <freq>
[:SENSe]:ROSCillator:EXTERNAL:FREQuency?
[:SENSe]:ROSCillator:SOURce INTERNAL | EXTERNAL
[:SENSe]:ROSCillator:SOURce?
[:SENSe]:ROSCillator:SOURce:TYPE INTERNAL | EXTERNAL | SENSe
[:SENSe]:ROSCillator:SOURce:TYPE?
[:SENSe]:SPECTrum:ADC:DITHer:AUTO[:STATE] ON | OFF | 1 | 0
[:SENSe]:SPECTrum:ADC:DITHer:AUTO[:STATE]?
[:SENSe]:SPECTrum:ADC:DITHer[:STATE] ON | OFF | 1 | 0
[:SENSe]:SPECTrum:ADC:DITHer[:STATE]?
[:SENSe]:SPECTrum:AVERage:COUNT <integer>
```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
[ :SENSe] :SPECTrum:AVERage:COUNT?
[ :SENSe] :SPECTrum:AVERage[:STATe] ON | OFF | 1 | 0
[ :SENSe] :SPECTrum:AVERage[:STATe]?
[ :SENSe] :SPECTrum:AVERage:TACount <integer>
[ :SENSe] :SPECTrum:AVERage:TACount?
[ :SENSe] :SPECTrum:AVERage:TCONTROL EXPonential | REPeat
[ :SENSe] :SPECTrum:AVERage:TCONTROL?
[ :SENSe] :SPECTrum:AVERage:TYPE RMS | LOG | SCALar | MAXimum | MINimum |
[ :SENSe] :SPECTrum:AVERage:TYPE?
[ :SENSe] :SPECTrum:BANDwidth|BWIDth:IF:SHAPe
[ :SENSe] :SPECTrum:BANDwidth|BWIDth:IF[:SIZE]
[ :SENSe] :SPECTrum:BANDwidth:PFFT[:SIZE]
[ :SENSe] :SPECTrum:BANDwidth:PFFT:TYPE
[ :SENSe] :SPECTrum:BANDwidth[:RESolution] <bandwidth>
[ :SENSe] :SPECTrum:BANDwidth[:RESolution]?
[ :SENSe] :SPECTrum:BANDwidth[:RESolution]:AUTO ON | OFF | 1 | 0
[ :SENSe] :SPECTrum:BANDwidth[:RESolution]:AUTO?
[ :SENSe] :SPECTrum:BWIDth:PFFT[:SIZE]
[ :SENSe] :SPECTrum:BWIDth:PFFT:TYPE
[ :SENSe] :SPECTrum:BWIDth[:RESolution]
[ :SENSe] :SPECTrum:DIF:BANDwidth <freq>
[ :SENSe] :SPECTrum:DIF:BANDwidth?
[ :SENSe] :SPECTrum:DIF:BANDwidth:AUTO ON | OFF | 1 | 0
[ :SENSe] :SPECTrum:DIF:BANDwidth:AUTO?
[ :SENSe] :SPECTrum:DIF:FILTer:ALPHa <real>
[ :SENSe] :SPECTrum:DIF:FILTer:ALPHa?
[ :SENSe] :SPECTrum:DIF:FILTer:BANDwidth <freq>
[ :SENSe] :SPECTrum:DIF:FILTer:BANDwidth?
[ :SENSe] :SPECTrum:DIF:FILTer:BANDwidth:AUTO ON | OFF | 1 | 0
[ :SENSe] :SPECTrum:DIF:FILTer:BANDwidth:AUTO?
[ :SENSe] :SPECTrum:DIF:FILTer:TYPE
[ :SENSe] :SPECTrum:DIF:FILTer:TYPE?
[ :SENSe] :SPECTrum:FFT:LENGth <integer>
[ :SENSe] :SPECTrum:FFT:LENGth?
[ :SENSe] :SPECTrum:FFT:LENGth:AUTO ON | OFF | 1 | 0
[ :SENSe] :SPECTrum:FFT:LENGth:AUTO?
[ :SENSe] :SPECTrum:FFT:RBWPoints <real>
[ :SENSe] :SPECTrum:FFT:RBWPoints?
[ :SENSe] :SPECTrum:FFT:WINDOW:LENGth <integer>
[ :SENSe] :SPECTrum:FFT:WINDOW:LENGth?
[ :SENSe] :SPECTrum:FFT:WINDOW[:TYPE] FLATtop | UNIForm | HANNing | HAMMING
| GAUSSian | BLACKman | BH4Tap | KB70 | KB90 | KB110
[ :SENSe] :SPECTrum:FFT:WINDOW[:TYPE]?
[ :SENSe] :SPECTrum:FREQuency:SPAN <freq>
[ :SENSe] :SPECTrum:FREQuency:SPAN?
[ :SENSe] :SPECTrum:FREQuency:SYNTthesis:AUTO[:STATe] OFF | ON | 0 | 1
[ :SENSe] :SPECTrum:FREQuency:SYNTthesis:AUTO[:STATe]?
[ :SENSe] :SPECTrum:FREQuency:SYNTthesis[:STATe] 1 | 2 | 3
[ :SENSe] :SPECTrum:FREQuency:SYNTthesis[:STATe]?
[ :SENSe] :SPECTrum:IF:GAIN:AUTO[:STATe] ON | OFF | 1 | 0
[ :SENSe] :SPECTrum:IF:GAIN:AUTO[:STATe]?
[ :SENSe] :SPECTrum:IF:GAIN:OFFSET <rel_ampl>
[ :SENSe] :SPECTrum:IF:GAIN:OFFSET?
```

```

[:SENSe]:SPECtrum:SRATE?
[:SENSe]:SPECtrum:WBIF:FILTter:ALPHA
[:SENSe]:SPECtrum:WBIF:FILTter:BANDwidth <real>
[:SENSe]:SPECtrum:WBIF:FILTter:BANDwidth?
[:SENSe]:SPECtrum:WBIF:FILTter[:TYPE]
[:SENSe]:SPECtrum:WBIF:FILTter[:TYPE]?
[:SENSe]:VOLTage:IQ[:I]:RANGE[:UPPer] <voltage>
[:SENSe]:VOLTage:IQ[:I]:RANGE[:UPPer]?
[:SENSe]:VOLTage:IQ:Q:RANGE[:UPPer] <voltage>
[:SENSe]:VOLTage:IQ:Q:RANGE[:UPPer]?
[:SENSe]:VOLTage:IQ:RANGE:AUTO OFF | ON | 0 | 1
[:SENSe]:VOLTage:IQ:RANGE:AUTO?
[:SENSe]:VOLTage|POWER:IQ:MIRRored OFF | ON | 0 | 1
[:SENSe]:VOLTage|POWER:IQ:MIRRored?
[:SENSe]:WAVEform:ADC:DITHer:AUTO[:STATE] OFF | ON | 0 | 1
[:SENSe]:WAVEform:ADC:DITHer:AUTO[:STATE]?
[:SENSe]:WAVEform:ADC:DITHer[:STATE] OFF | ON | 0 | 1
[:SENSe]:WAVEform:ADC:DITHer[:STATE]?
[:SENSe]:WAVEform:APERture?
[:SENSe]:WAVEform:AVERage:COUNt <integer>
[:SENSe]:WAVEform:AVERage:COUNt?
[:SENSe]:WAVEform:AVERage[:STATE] OFF | ON | 0 | 1
[:SENSe]:WAVEform:AVERage[:STATE]?
[:SENSe]:WAVEform:AVERage:TACount <integer>
[:SENSe]:WAVEform:AVERage:TACount?
[:SENSe]:WAVEform:AVERage:TCONtrol EXPonential | REPeat
[:SENSe]:WAVEform:AVERage:TCONtrol?
[:SENSe]:WAVEform:AVERage:TYPE LOG | MAXimum | MINimum | RMS | SCALar
[: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 <freq>
[:SENSe]:WAVEform:DIF:BANDwidth?
[:SENSe]:WAVEform:DIF:FILTter:ALPHA <real>
[:SENSe]:WAVEform:DIF:FILTter:ALPHA?
[:SENSe]:WAVEform:DIF:FILTter:BANDwidth <freq>
[:SENSe]:WAVEform:DIF:FILTter:BANDwidth?
[:SENSe]:WAVEform:DIF:FILTter:BANDwidth:AUTO ON | OFF | 1 | 0
[:SENSe]:WAVEform:DIF:FILTter:BANDwidth:AUTO?
[:SENSe]:WAVEform:DIF:FILTter:TYPE GAUSSian | FLATtop
[:SENSe]:WAVEform:DIF:FILTter:TYPE GAUSSian | FLATtop | SNYQuist |
RSNYquist | RCOSine | RRCosine
[:SENSe]:WAVEform:DIF:FILTter:TYPE?
[:SENSe]:WAVEform:DIF:FILTter:TYPE?
[:SENSe]:WAVEform:FREQuency:SYNthesis:AUTO[:STATE] OFF | ON | 0 | 1
[:SENSe]:WAVEform:FREQuency:SYNthesis:AUTO[:STATE]?
[:SENSe]:WAVEform:FREQuency:SYNthesis[:STATE] 1 | 2 | 3
[:SENSe]:WAVEform:FREQuency:SYNthesis[:STATE]?
[:SENSe]:WAVEform:IF:GAIN:AUTO[:STATE] ON | OFF | 1 | 0
[:SENSe]:WAVEform:IF:GAIN:AUTO[:STATE]?

```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
[ :SENSe] :WAVEform:IF:GAIN:OFFSet <rel_ampl>
[ :SENSe] :WAVEform:IF:GAIN:OFFSet?
[ :SENSe] :WAVEform:IF:GAIN[:STATe] AUTOOrange | LOW | HIGH
[ :SENSe] :WAVEform:IF:GAIN[:STATe]?
[ :SENSe] :WAVEform:PDITher
[ :SENSe] :WAVEform:SRATe <freq>
[ :SENSe] :WAVEform:SRATe?
[ :SENSe] :WAVEform:SWEep:TIME <time>
[ :SENSe] :WAVEform:SWEep:TIME?
[ :SENSe] :WAVEform:WBIF:ADC:DITHer
[ :SENSe] :WAVEform:WBIF:FILTter:ALPHA
[ :SENSe] :WAVEform:WBIF:FILTter:BANDwidth <real>
[ :SENSe] :WAVEform:WBIF:FILTter:BANDwidth?
[ :SENSe] :WAVEform:WBIF:FILTter[:TYPE] GAUssian | NONE | NYQuist | RNYQuist
| RCOSine | RRCosine
[ :SENSe] :WAVEform:WBIF:FILTter[:TYPE]?
STATus:OPERation:CONDITION?
STATus:OPERation:ENABLE <integer>
STATus:OPERation:ENABLE?
STATus:OPERation[:EVENT]?
STATus:OPERation:NTRansition <integer>
STATus:OPERation:NTRansition?
STATus:OPERation:PTRansition <integer>
STATus:OPERation:PTRansition?
STATus:PRESet
STATus:QUESTIONable:CALibration:CONDITION?
STATus:QUESTIONable:CALibration:ENABLE <integer>
STATus:QUESTIONable:CALibration:ENABLE?
STATus:QUESTIONable:CALibration[:EVENT]?
STATus:QUESTIONable:CALibration:EXTended:FAILure:CONDITION?
STATus:QUESTIONable:CALibration:EXTended:FAILure:ENABLE <integer>
STATus:QUESTIONable:CALibration:EXTended:FAILure:ENABLE?
STATus:QUESTIONable:CALibration:EXTended:FAILure[:EVENT]?
STATus:QUESTIONable:CALibration:EXTended:FAILure:NTRansition <integer>
STATus:QUESTIONable:CALibration:EXTended:FAILure:NTRansition?
STATus:QUESTIONable:CALibration:EXTended:FAILure:PTRansition <integer>
STATus:QUESTIONable:CALibration:EXTended:FAILure:PTRansition?
STATus:QUESTIONable:CALibration:EXTended:NEEDed:CONDITION?
STATus:QUESTIONable:CALibration:EXTended:NEEDed:ENABLE <integer>
STATus:QUESTIONable:CALibration:EXTended:NEEDed:ENABLE?
STATus:QUESTIONable:CALibration:EXTended:NEEDed[:EVENT]?
STATus:QUESTIONable:CALibration:EXTended:NEEDed:NTRansition <integer>
STATus:QUESTIONable:CALibration:EXTended:NEEDed:NTRansition?
STATus:QUESTIONable:CALibration:EXTended:NEEDed:PTRansition <integer>
STATus:QUESTIONable:CALibration:EXTended:NEEDed:PTRansition?
STATus:QUESTIONable:CALibration:NTRansition <integer>
STATus:QUESTIONable:CALibration:NTRansition?
STATus:QUESTIONable:CALibration:PTRansition <integer>
STATus:QUESTIONable:CALibration:PTRansition?
STATus:QUESTIONable:CALibration:SKIPped:CONDITION?
STATus:QUESTIONable:CALibration:SKIPped:ENABLE <integer>
STATus:QUESTIONable:CALibration:SKIPped:ENABLE?
STATus:QUESTIONable:CALibration:SKIPped[:EVENT]?
```

```
STATUS:QUESTIONABLE:CALibration:SKIPPed:NTRansition <integer>
STATUS:QUESTIONABLE:CALibration:SKIPPed:NTRansition?
STATUS:QUESTIONABLE:CALibration:SKIPPed:PTRansition <integer>
STATUS:QUESTIONABLE:CALibration:SKIPPed:PTRansition?
STATUS:QUESTIONABLE:CONDition?
STATUS:QUESTIONABLE:ENABLE 16
STATUS:QUESTIONABLE:ENABLE?
STATUS:QUESTIONABLE[:EVENT]?
STATUS:QUESTIONABLE:FREQuency:CONDition?
STATUS:QUESTIONABLE:FREQuency:ENABLE <integer>
STATUS:QUESTIONABLE:FREQuency:ENABLE?
STATUS:QUESTIONABLE:FREQuency[:EVENT]?
STATUS:QUESTIONABLE:FREQuency:NTRansition <integer>
STATUS:QUESTIONABLE:FREQuency:NTRansition?
STATUS:QUESTIONABLE:FREQuency:PTRansition <integer>
STATUS:QUESTIONABLE:FREQuency:PTRansition?
STATUS:QUESTIONABLE:INTegrity:CONDition?
STATUS:QUESTIONABLE:INTegrity:ENABLE <integer>
STATUS:QUESTIONABLE:INTegrity:ENABLE?
STATUS:QUESTIONABLE:INTegrity[:EVENT]?
STATUS:QUESTIONABLE:INTegrity:NTRansition <integer>
STATUS:QUESTIONABLE:INTegrity:NTRansition?
STATUS:QUESTIONABLE:INTegrity:PTRansition <integer>
STATUS:QUESTIONABLE:INTegrity:PTRansition?
STATUS:QUESTIONABLE:INTegrity:SIGNAl:CONDition?
STATUS:QUESTIONABLE:INTegrity:SIGNAl:ENABLE <integer>
STATUS:QUESTIONABLE:INTegrity:SIGNAl:ENABLE?
STATUS:QUESTIONABLE:INTegrity:SIGNAl[:EVENT]?
STATUS:QUESTIONABLE:INTegrity:SIGNAl:NTRansition <integer>
STATUS:QUESTIONABLE:INTegrity:SIGNAl:NTRansition?
STATUS:QUESTIONABLE:INTegrity:SIGNAl:PTRansition <integer>
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 <integer>
STATUS:QUESTIONABLE:INTegrity:UNCalibrated:NTRansition?
STATUS:QUESTIONABLE:INTegrity:UNCalibrated:PTRansition <integer>
STATUS:QUESTIONABLE:INTegrity:UNCalibrated:PTRansition?
STATUS:QUESTIONABLE:NTRansition 16
STATUS:QUESTIONABLE:NTRansition?
STATUS:QUESTIONABLE:POWer:CONDition?
STATUS:QUESTIONABLE:POWer:ENABLE <integer>
STATUS:QUESTIONABLE:POWer:ENABLE?
STATUS:QUESTIONABLE:POWer[:EVENT]?
STATUS:QUESTIONABLE:POWer:NTRansition <integer>
STATUS:QUESTIONABLE:POWer:NTRansition?
STATUS:QUESTIONABLE:POWer:PTRansition <integer>
STATUS:QUESTIONABLE:POWer:PTRansition?>
STATUS:QUESTIONABLE:PTRansition <integer>
STATUS:QUESTIONABLE:PTRansition?
STATUS:QUESTIONABLE:TEMPerature:CONDition?
```

```
STATus:QUESTIONable:TEMPerature:ENABLE <integer>
STATus:QUESTIONable:TEMPerature:ENABLE?
STATus:QUESTIONable:TEMPerature[:EVENT]?
STATus:QUESTIONable:TEMPerature:NTRansition <integer>
STATus:QUESTIONable:TEMPerature:NTRansition?
STATus:QUESTIONable:TEMPerature:PTRansition <integer>
STATus:QUESTIONable:TEMPerature:PTRansition?
SYSTem:APPLication:CATalog[:NAME]?
SYSTem:APPLication:CATalog[:NAME]:COUNT?
SYSTem:APPLication:CATalog:OPTION? <model>
SYSTem:APPLication:CATalog:REVision? <model>
SYSTem:APPLication[:CURRENT][:NAME]?
SYSTem:APPLication[:CURRENT]:OPTION?
SYSTem:APPLication[:CURRENT]:REVision?
SYSTem:COMMUnicatE:GPIB[1][:SELF]:ADDReSS <integer>
SYSTem:COMMUnicatE:GPIB[1][:SELF]:ADDReSS?
SYSTem:COMMUnicatE:GPIB[1][:SELF]:CONTroller[:ENABLE] ON | OFF | 0 | 1
SYSTem:COMMUnicatE:GPIB[1][:SELF]:CONTroller[:ENABLE]?
SYSTem:COMMUnicatE:LAN:SCPI:HISlip:ENABLE OFF | ON | 0 | 1
SYSTem:COMMUnicatE:LAN:SCPI:HISlip:ENABLE?
SYSTem:COMMUnicatE:LAN:SCPI:SICL:ENABLE OFF | ON | 0 | 1
SYSTem:COMMUnicatE:LAN:SCPI:SICL:ENABLE?
SYSTem:COMMUnicatE:LAN:SCPI:SOCKet:CONTrol?
SYSTem:COMMUnicatE:LAN:SCPI:SOCKet:ENABLE OFF | ON | 0 | 1
SYSTem:COMMUnicatE:LAN:SCPI:SOCKet:ENABLE?
SYSTem:COMMUnicatE:LAN:SCPI:TELNet:ENABLE OFF | ON | 0 | 1
SYSTem:COMMUnicatE:LAN:SCPI:TELNet:ENABLE?
SYSTem:COMMUnicatE:USB:CONNection?
SYSTem:COMMUnicatE:USB:PACKets?
SYSTem:COMMUnicatE:USB:STATus?
SYSTem:CONFigure[:SYSTem]?
SYSTem:DATE "<year>, <month>, <day>"?
SYSTem:DATE?
SYSTem:DEFault [ALL] | ALIGN | INPut | MISC | MODEs | PON
SYSTem:ERRor[:NEXT]?
SYSTem:ERRor:OVERload[:STATE] 0 | 1 | OFF | ON
SYSTem:ERRor:VERBose OFF | ON | 0 | 1
SYSTem:ERRor:VERBose?
SYSTem:HELP:HEADers?
SYSTem:HID?
SYSTem:IDN <string>
SYSTem:IDN?
SYSTem:KLOCK OFF | ON | 0 | 1
SYSTem:KLOCK?
SYSTem:LKEY <"OptionInfo">, <"LicenseInfo">
SYSTem:LKEY? <"OptionInfo">
SYSTem:LKEY:DElete <"OptionInfo">, <"LicenseInfo">
SYSTem:LKEY:LIST?
SYSTem:MRELay:COUNT?
SYSTem:OPTions?
SYSTem:PDOWn [NORMal | FORCe]
SYSTem:PON:APPLication:LLIST <stringofINSTRument:SElectnames>
SYSTem:PON:APPLication:LLIST?
```

```
SYSTEM:PON:APPLication:VMEMemory[:AVAvailble]?
SYSTEM:PON:APPLication:VMEMemory:TOTal?
SYSTEM:PON:APPLication:VMEMemory:USED?
SYSTEM:PON:APPLication:VMEMemory:USED:NAME? <INSTrument:SElectname>
SYSTEM:PON:ETIMe?
SYSTEM:PON:MODE SA | BASIC | ADEM0D | NFIGURE | PNOISE | CDMA2K | TDSCDMA
| VSA | VSA89601 | WCDMA | WIMAXOFDMA
SYSTEM:PON:MODE?
SYSTEM:PON:TIME?
SYSTEM:PON:TYPE MODE | USER | LAST
SYSTEM:PON:TYPE PRESet
SYSTEM:PON:TYPE?
SYSTEM:PRESet
SYSTEM:PRESet:TYPE FACTory | MODE | USER
SYSTEM:PRESet:TYPE?
SYSTEM:PRESet:USER
SYSTEM:PRESet:USER:ALL
SYSTEM:PRESet:USER:SAVE
SYSTEM:PRINT:THEMe TDColor | TDMonochrome | FCOLor | FMONochrome
SYSTEM:PRINT:THEMe?
SYSTEM:PUP:PROCeSS
SYSTEM:SECurity:USB:WProtect[:ENABLE] ON | OFF | 0 | 1
SYSTEM:SECurity:USB:WProtect[:ENABLE]?
SYSTEM:SHOW OFF | EROr | SYSTem | HARDware | LXI | HWStatistics |
ALIGNment | SOFTware | CAPplication
SYSTEM:SHOW?
SYSTEM:TEMPerature:HEXTreme?
SYSTEM:TEMPerature:LEXTreme?
SYSTEM:TIME "<hour>, <minute>, <second>"
```

SYSTEM:TIME?

```
SYSTEM:VERSION?
```

TRACE:SPECtrum:STRace[:STATE] OFF | ON | 0 | 1

```
TRACE:SPECtrum:STRace[:STATE]?
```

TRIGger:<measurement>[:SEQUence]:IQ:SOURce EXTERNAL1 | EXTERNAL2 |  
IMMEDIATE | IQMag | IDEMod | QDEMod | IINPut | QINPut | AIQMag

```
TRIGger:<measurement>[:SEQUence]:IQ:SOURce?
```

TRIGger:<measurement>[:SEQUence]:RF:SOURce EXTERNAL1 | EXTERNAL2 |  
IMMEDIATE | LINE | FRAMe | RFBurst | VIDeo | IF | ALARm | LAN | TV

```
TRIGger:<measurement>[:SEQUence]:RF:SOURce?
```

TRIGger:<measurement>[:SEQUence]:SOURce EXTERNAL1 | EXTERNAL2 | IMMEDIATE  
| LINE | FRAMe | RFBurst | VIDeo | IF | ALARm | LAN | IQMag | IDEMod |  
QDEMod | IINPut | QINPut | AIQMag | TV

```
TRIGger:<measurement>[:SEQUence]:SOURce?
```

TRIGger[:SEQUence]:AIQMag:BANDwidth <freq>

```
TRIGger[:SEQUence]:AIQMag:BANDwidth?
```

TRIGger[:SEQUence]:AIQMag:CENTER <freq>

```
TRIGger[:SEQUence]:AIQMag:CENTER?
```

TRIGger[:SEQUence]:AIQMag:DELAY <time>

```
TRIGger[:SEQUence]:AIQMag:DELAY?
```

TRIGger[:SEQUence]:AIQMag:DELAY:STATE OFF | ON | 0 | 1

```
TRIGger[:SEQUence]:AIQMag:DELAY:STATE?
```

TRIGger[:SEQUence]:AIQMag:LEVEL <ampl>

```
TRIGger[:SEQUence]:AIQMag:LEVel?
TRIGger[:SEQUence]:AIQMag:SLOPe POSitive | NEGative
TRIGger[:SEQUence]:AIQMag:SLOPe?
TRIGger[:SEQUence]:ATRigger <time>
TRIGger[:SEQUence]:ATRigger?
TRIGger[:SEQUence]:ATRigger:STATE OFF | ON | 0 | 1
TRIGger[:SEQUence]:ATRigger:STATE?
TRIGger[:SEQUence]:DELay <time>
TRIGger[:SEQUence]:DELay?
TRIGger[:SEQUence]:DELay:STATE OFF | ON | 0 | 1
TRIGger[:SEQUence]:DELay:STATE?
TRIGger[:SEQUence]:EXTernal2:DELay <time>
TRIGger[:SEQUence]:EXTernal:DELay
TRIGger[:SEQUence]:EXTernal1:DELay <time>
TRIGger[:SEQUence]:EXTernal1:DELay?
TRIGger[:SEQUence]:EXTernal2:DELay?
TRIGger[:SEQUence]:EXTernal1:DELay:STATE OFF | ON | 0 | 1
TRIGger[:SEQUence]:EXTernal2:DELay:STATE OFF | ON | 0 | 1
TRIGger[:SEQUence]:EXTernal1:DELay:STATE?
TRIGger[:SEQUence]:EXTernal2:DELay:STATE?
TRIGger[:SEQUence]:EXTernal2:LEVel
TRIGger[:SEQUence]:EXTernal:LEVel
TRIGger[:SEQUence]:EXTernal1:LEVel <level>
TRIGger[:SEQUence]:EXTernal2:LEVel?
TRIGger[:SEQUence]:EXTernal1:LEVel?
TRIGger[:SEQUence]:EXTernal2:SLOPe POSitive | NEGative
TRIGger[:SEQUence]:EXTernal1:SLOPe POSitive | NEGative
TRIGger[:SEQUence]:EXTernal:SLOPe
TRIGger[:SEQUence]:EXTernal1:SLOPe?
TRIGger[:SEQUence]:EXTernal2:SLOPe?
TRIGger[:SEQUence]:FRAMe:ADJust <time>
TRIGger[:SEQUence]:FRAMe:DELay <time>
TRIGger[:SEQUence]:FRAMe:DELay?
TRIGger[:SEQUence]:FRAMe:DELay:STATE OFF | ON | 0 | 1
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 <time>
TRIGger[:SEQUence]:FRAMe:OFFSet?
TRIGger[:SEQUence]:FRAMe:OFFSet:DISPLAY:RESet
TRIGger[:SEQUence]:FRAMe:PERiod <time>
TRIGger[:SEQUence]:FRAMe:PERiod?
TRIGger[:SEQUence]:FRAMe:RBurst:LEVel:ABSolute
TRIGger[:SEQUence]:FRAMe:RBurst:SLOPe
TRIGger[:SEQUence]:FRAMe:SYNC EXTernal
TRIGger[:SEQUence]:FRAMe:SYNC EXTernal1 | EXTernal2 | RBurst | OFF
TRIGger[:SEQUence]:FRAMe:SYNC?
TRIGger[:SEQUence]:HOLDoff <time>
TRIGger[:SEQUence]:HOLDoff?
TRIGger[:SEQUence]:HOLDoff:STATE OFF | ON | 0 | 1
TRIGger[:SEQUence]:HOLDoff:STATE?
```

```
TRIGGER[:SEQUENCE]:IDEMOD:DELAY <time>
TRIGGER[:SEQUENCE]:IDEMOD:DELAY?
TRIGGER[:SEQUENCE]:IDEMOD:DELAY:STATE OFF | ON | 0 | 1
TRIGGER[:SEQUENCE]:IDEMOD:DELAY:STATE?
TRIGGER[:SEQUENCE]:IDEMOD:LEVEL <voltage>
TRIGGER[:SEQUENCE]:IDEMOD:LEVEL?
TRIGGER[:SEQUENCE]:IDEMOD:SLOPE POSITIVE | NEGATIVE
TRIGGER[:SEQUENCE]:IDEMOD:SLOPE?
TRIGGER[:SEQUENCE]:IF:LEVEL
TRIGGER[:SEQUENCE]:IF:LEVEL?
TRIGGER[:SEQUENCE]:IF:SLOPE NEGATIVE | POSITIVE
TRIGGER[:SEQUENCE]:IF:SLOPE?
TRIGGER[:SEQUENCE]:IINPUT:DELAY <time>
TRIGGER[:SEQUENCE]:IINPUT:DELAY?
TRIGGER[:SEQUENCE]:IINPUT:DELAY:STATE OFF | ON | 0 | 1
TRIGGER[:SEQUENCE]:IINPUT:DELAY:STATE?
TRIGGER[:SEQUENCE]:IINPUT:LEVEL <voltage>
TRIGGER[:SEQUENCE]:IINPUT:LEVEL?
TRIGGER[:SEQUENCE]:IINPUT:SLOPE POSITIVE | NEGATIVE
TRIGGER[:SEQUENCE]:IINPUT:SLOPE?
TRIGGER[:SEQUENCE]:IQMAG:DELAY <time>
TRIGGER[:SEQUENCE]:IQMAG:DELAY?
TRIGGER[:SEQUENCE]:IQMAG:DELAY:STATE OFF | ON | 0 | 1
TRIGGER[:SEQUENCE]:IQMAG:DELAY:STATE?
TRIGGER[:SEQUENCE]:IQMAG:LEVEL <ampl>
TRIGGER[:SEQUENCE]:IQMAG:LEVEL?
TRIGGER[:SEQUENCE]:IQMAG:SLOPE POSITIVE | NEGATIVE
TRIGGER[:SEQUENCE]:IQMAG:SLOPE?
TRIGGER[:SEQUENCE]:LINE:DELAY <time>
TRIGGER[:SEQUENCE]:LINE:DELAY?
TRIGGER[:SEQUENCE]:LINE:DELAY:STATE OFF | ON | 0 | 1
TRIGGER[:SEQUENCE]:LINE:DELAY:STATE?
TRIGGER[:SEQUENCE]:LINE:SLOPE POSITIVE | NEGATIVE
TRIGGER[:SEQUENCE]:LINE:SLOPE?
TRIGGER[:SEQUENCE]:OFFSET <time>
TRIGGER[:SEQUENCE]:OFFSET?
TRIGGER[:SEQUENCE]:OFFSET:STATE OFF | ON | 0 | 1
TRIGGER[:SEQUENCE]:OFFSET:STATE?
TRIGGER[:SEQUENCE]:QDEMOD:DELAY <time>
TRIGGER[:SEQUENCE]:QDEMOD:DELAY?
TRIGGER[:SEQUENCE]:QDEMOD:DELAY:STATE OFF | ON | 0 | 1
TRIGGER[:SEQUENCE]:QDEMOD:DELAY:STATE?
TRIGGER[:SEQUENCE]:QDEMOD:LEVEL <voltage>
TRIGGER[:SEQUENCE]:QDEMOD:LEVEL?
TRIGGER[:SEQUENCE]:QDEMOD:SLOPE POSITIVE | NEGATIVE
TRIGGER[:SEQUENCE]:QDEMOD:SLOPE?
TRIGGER[:SEQUENCE]:QINPUT:DELAY <time>
TRIGGER[:SEQUENCE]:QINPUT:DELAY?
TRIGGER[:SEQUENCE]:QINPUT:DELAY:STATE OFF | ON | 0 | 1
TRIGGER[:SEQUENCE]:QINPUT:DELAY:STATE?
TRIGGER[:SEQUENCE]:QINPUT:LEVEL <voltage>
TRIGGER[:SEQUENCE]:QINPUT:LEVEL?
TRIGGER[:SEQUENCE]:QINPUT:SLOPE POSITIVE | NEGATIVE
```

```
TRIGger[:SEQUence]:QINPut:SLOPe?
TRIGger[:SEQUence]:RFBurst:DELay <time>
TRIGger[:SEQUence]:RFBurst:DELay?
TRIGger[:SEQUence]:RFBurst:DELay:STATE OFF | ON | 0 | 1
TRIGger[:SEQUence]:RFBurst:DELay:STATE?
TRIGger[:SEQUence]:RFBurst:LEVel
TRIGger[:SEQUence]:RFBurst:LEVel:ABSolute <ampl>
TRIGger[:SEQUence]:RFBurst:LEVel:ABSolute?
TRIGger[:SEQUence]:RFBurst:LEVel:RELative <rel_ampl>
TRIGger[:SEQUence]:RFBurst:LEVel:RELative?
TRIGger[:SEQUence]:RFBurst:LEVel:TYPE ABSolute | RELative
TRIGger[:SEQUence]:RFBurst:LEVel:TYPE?
TRIGger[:SEQUence]:RFBurst:SLOPe POSitive | NEGative
TRIGger[:SEQUence]:RFBurst:SLOPe?
TRIGger[:SEQUence]:SLOPe POSitive | NEGative
TRIGger[:SEQUence]:SLOPe?
TRIGger[:SEQUence]:SOURCe EXTernal
TRIGger[:SEQUence]:VIDeo:DELay <time>
TRIGger[:SEQUence]:VIDeo:DELay?
TRIGger[:SEQUence]:VIDeo:DELay:STATE OFF | ON | 0 | 1
TRIGger[:SEQUence]:VIDeo:DELay:STATE?
TRIGger[:SEQUence]:VIDeo:LEVel <ampl>
TRIGger[:SEQUence]:VIDeo:LEVel?
TRIGger[:SEQUence]:VIDeo:SLOPe POSitive | NEGative
TRIGger[:SEQUence]:VIDeo:SLOPe?
TRIGger|TRIGger1|TRIGger2[:SEQUence]:OUTPut HSWP | MEASuring | MAIN | GATE
| GTrigger | OEVen | SPOint | SSWeep | SSETtled | S1Marker | S2Marker |
S3Marker | S4Marker | OFF
TRIGger|TRIGger1|TRIGger2[:SEQUence]:OUTPut?
TRIGger|TRIGger1|TRIGger2[:SEQUence]:OUTPut:POLarity POSitive | NEGative
TRIGger|TRIGger1|TRIGger2[:SEQUence]:OUTPut:POLarity?
```

## STATus Subsystem

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

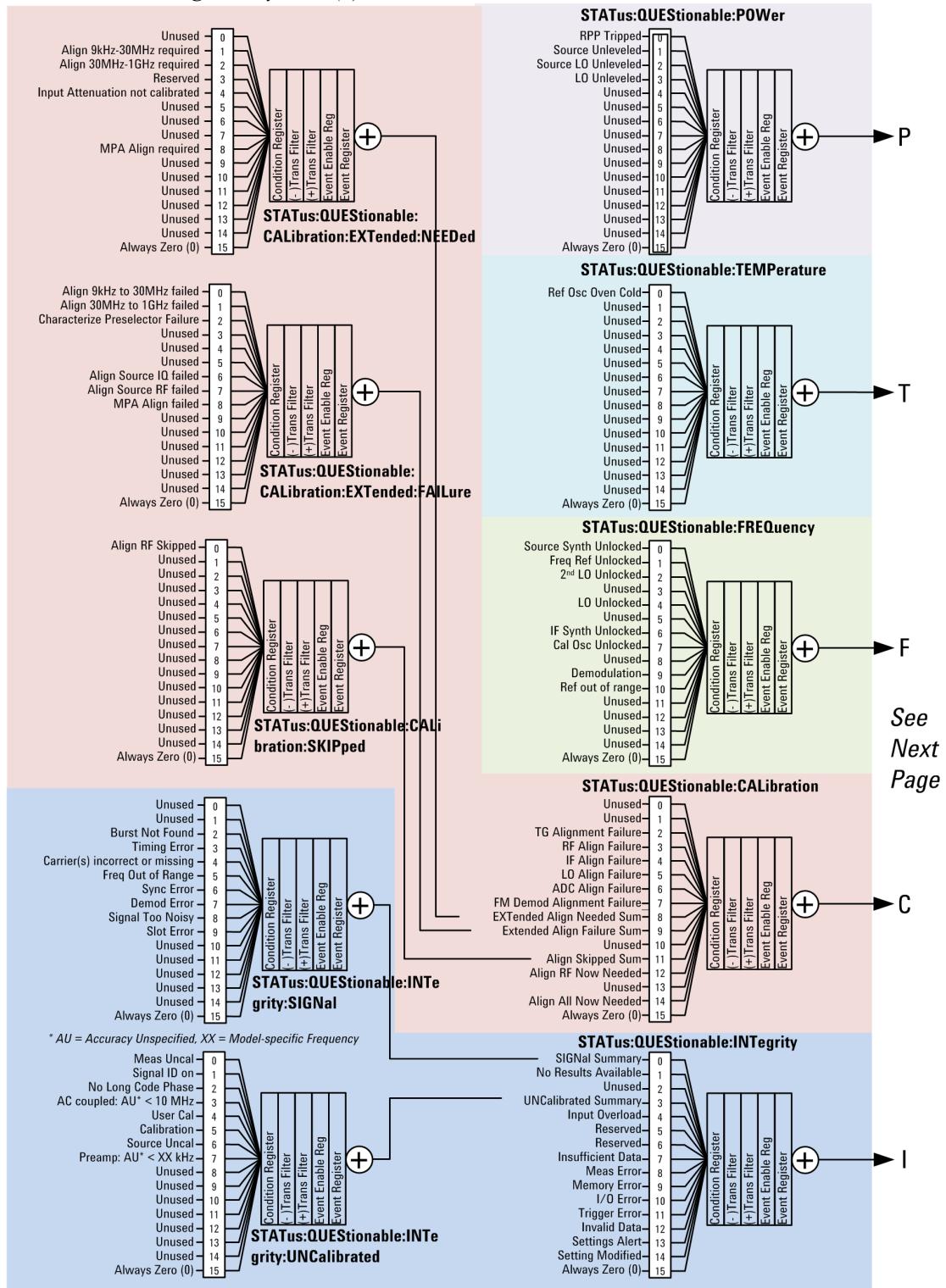
For readability, the diagram is split into two sections:

- ["X-Series Status Register System \(1\) " on page 68](#)
- ["X-Series Status Register System \(2\) " on page 69](#)

### 3 Programming the Analyzer

#### STATUs Subsystem

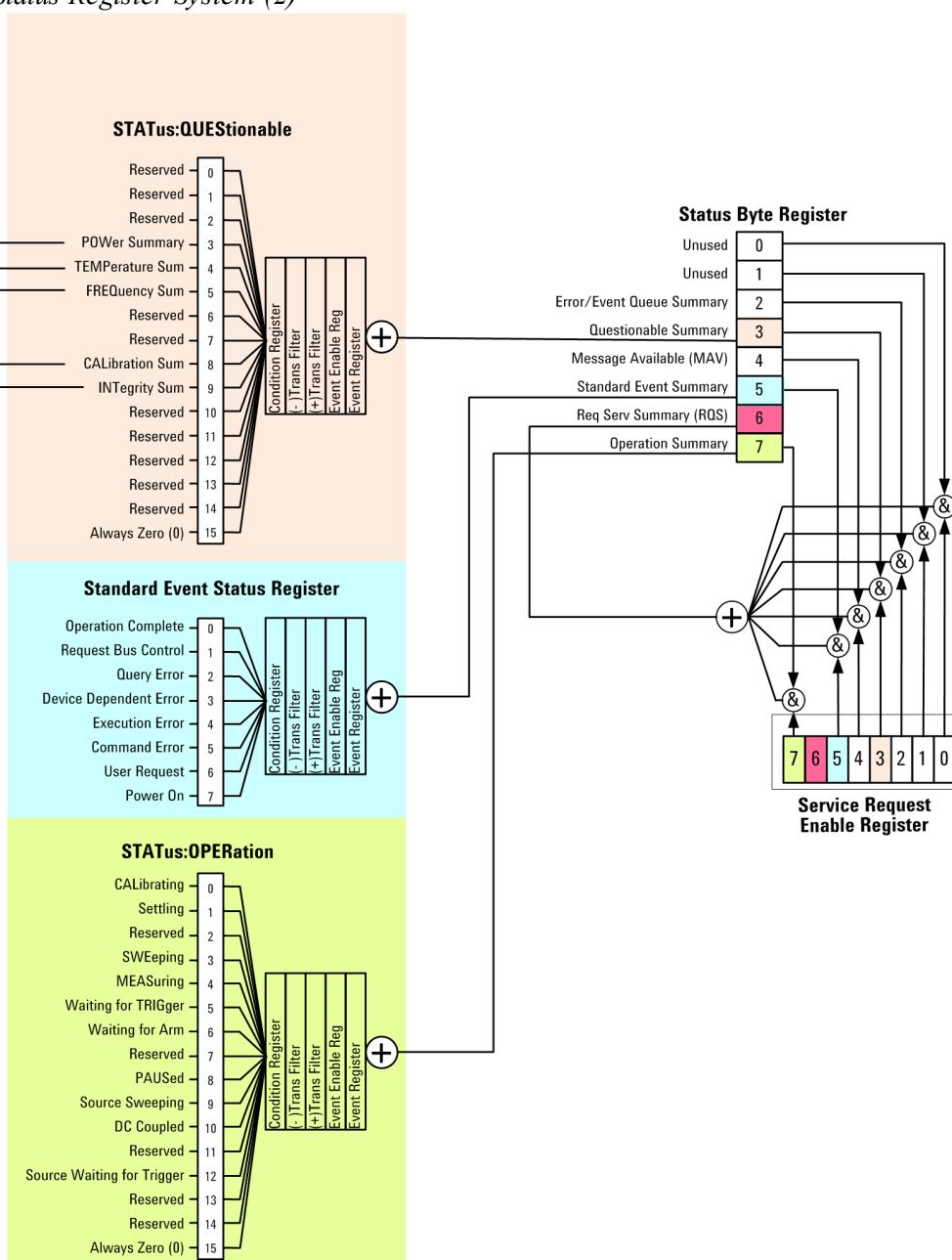
##### X-Series Status Register System (1)



See  
Next  
Page

## X-Series Status Register System (2)

See  
Previous  
Page



## Detailed Description

The STA Tus 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:
  - Determine which register contains the bit that reports the condition.
  - Send the unique SCPI query that reads that register.
  - Examine the bit to see if the condition has changed.

You can monitor conditions in different ways.

- Check the current instrument hardware and firmware status.

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

- Monitor a particular condition (bit).

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

- Monitor a particular type of change in a condition (bit).

—The transition registers are preset to register if the condition goes from 0 to 1 (false to true, or a positive transition).

—This can be changed so the selected condition is detected if the bit goes from 1 to 0 (true to false, or a negative transition).

—It can also be set for both types of transitions occurring.

—Or it can be set for neither transition. If both transition registers are set to 0 for a particular bit position, that bit will not be set in the event register for either type of change.

## Using a Status Register

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

Figure: Status Register Bit Values

Bit Number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Decimal Value																

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.

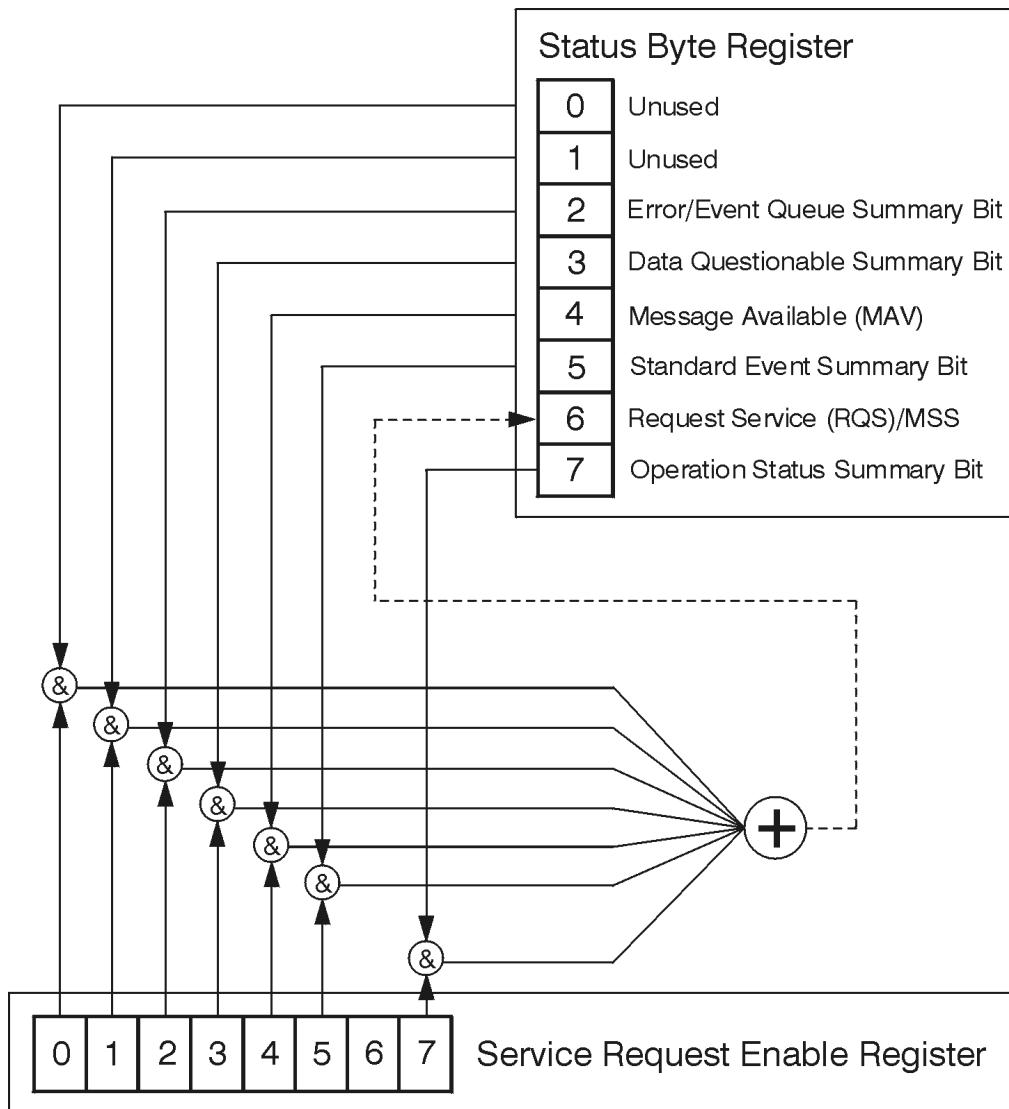
If the status register is configured to SRQ on end-of-measurement and the measurement is in continuous mode, then restarting a measurement (INIT command) can cause the measuring bit to pulse low. This causes an SRQ when you have not actually reached the "end-of-measurement" condition. To avoid this:

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.

Description	Standard Operation Status Summary Bit	Request Service (RQS) Summary Bit	Standard Event Status Summary Bit	Message Available (MAV)	Data Questionable Status Summary Bit	Error/Event Queue Summary Bit	Unused	Unused
Bit Number	7	6	5	4	3	2	1	0

\*STB?

### Status Byte Register

ck725a

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

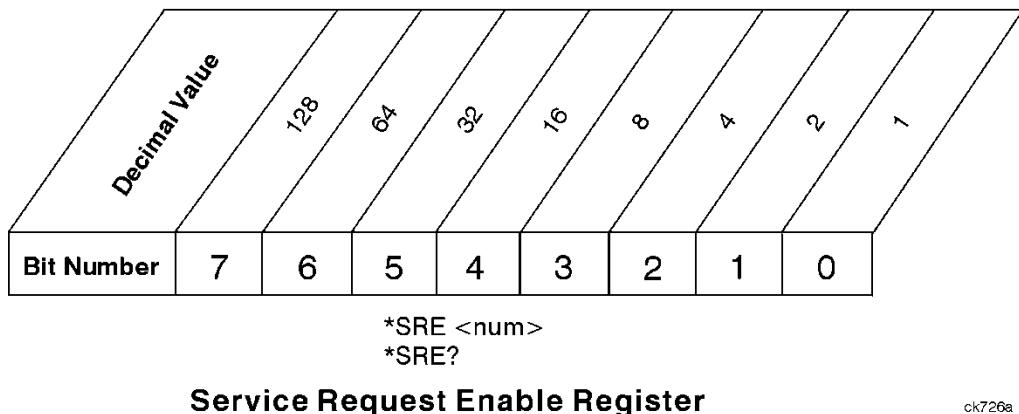
To query the status byte register, send the command \*STB? The response will be the decimal sum of the bits which are set to 1. For example, if bit number 7 and bit number 3 are set to 1, the decimal sum of the 2 bits is 128 plus 8. So the decimal value 136 is returned. The \*STB command does not clear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

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

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

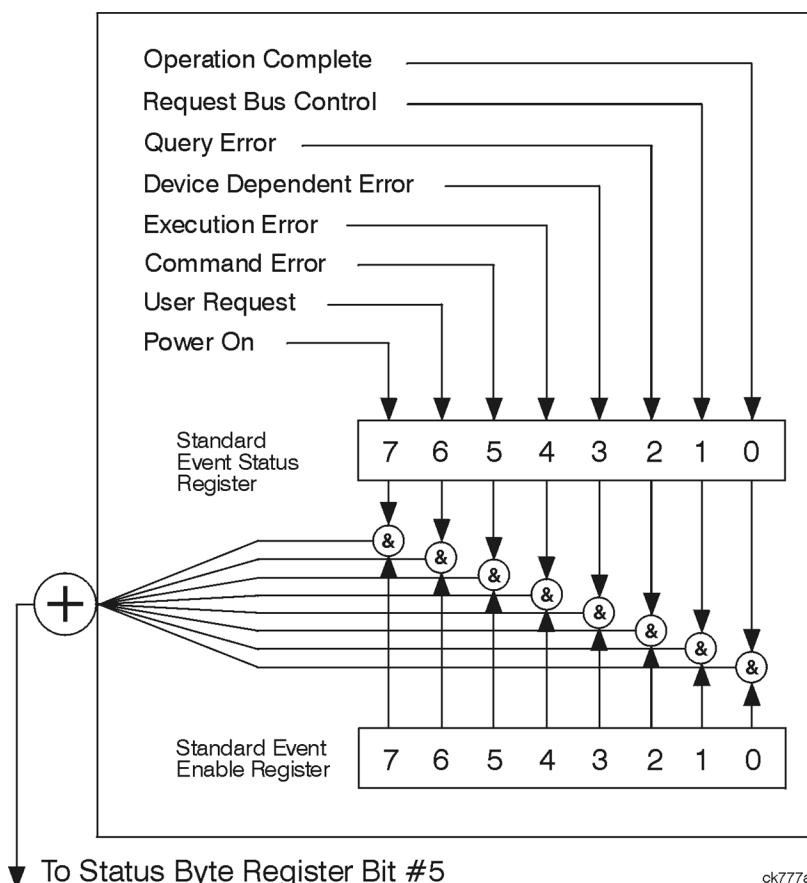
\*SRE 192 (because  $192 = 128 + 64$ ). You must always add 64 (the numeric value of RQS bit 6) to your numeric sum when you enable any bits for a service request. The command \*SRE? returns the decimal value of the sum of the bits previously enabled with the \*SRE <integer> command.

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



ck726a

## Standard Event Status Register



The standard event status register contains the following bits:

Description	Power On	User Request Key (Local)	Command Error	Execution Error	Device Dependent Error	Query Error	Request Control	Operation Complete
Bit Number	7	6	5	4	3	2	1	0

\*ESR?

**Standard Event Status Register**

ck727a

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

The standard event status register is used to determine the specific event that set bit 5 in the status byte register. To query the standard event status register, send 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).

Bit Number	7	6	5	4	3	2	1	0
Decimal Value	128	64	32	16	8	4	2	1
*ESE <num>								
*ESE?								

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

## STATus Subsystem Command Descriptions

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

Numeric values for bit patterns can be entered using decimal or hexadecimal representations. (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

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>	:STATus:OPERation:CONDITION?
<b>Example</b>	STAT:OPER:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

#### Operation Enable

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

to enable.

**NOTE**

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

Mode	All
<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

### 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

### 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

---

### 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.

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

---

## Questionable Register

### 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 16 :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 16 :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

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
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:PTRansition <integer> :STATus:QUESTIONable:CALibration:PTRansition?
<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

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

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

Mode	All
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:SKIPPed:CONDition?
<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

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 dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

## Questionable Calibration Extended Needed Register

### Questionable Calibration Extended Needed Condition

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

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

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

### Questionable Calibration Extended Needed Enable

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

Mode	All
<b>Remote Command</b>	:STATus:QUESTIONable:CALibration:EXTended:NEEDed:ENABLE <integer> :STATus:QUESTIONable:CALibration:EXTended:NEEDed:ENABLE?
<b>Example</b>	STAT:QUES:CAL:EXT:NEED:ENAB 2 Can be used to query if an EMI conducted alignment is needed.

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

### Questionable Calibration Extended Needed Event Query

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

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

Mode	All
<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

### Questionable Calibration Extended Needed Negative Transition

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

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

## Questionable Calibration Extended Needed Positive Transition

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

Mode	All
<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

## Questionable Frequency Register

### 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
<b>Remote Command</b>	:STATus:QUESTIONable:FREQuency:CONDITION?
<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

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:CONDITION?
<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

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	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

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### 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.

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Mode	All
<b>Remote Command</b>	:STATus:QUESTIONable:INTegrity:PTRansition <integer> :STATus:QUESTIONable:INTegrity:PTRansition?
<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

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### Questionable Integrity Signal Register

#### 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.

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Mode	All
<b>Remote Command</b>	:STATus:QUESTIONable:INTegrity:SIGNal:COND?
<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

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### 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</b>	:STATus:QUEStionable:INTegrity:SIGNal:NTRansition <integer>

<b>Command</b>	: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

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
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<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 dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

## Questionable Power Register

### Questionable Power Condition

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

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

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

### Questionable Power Enable

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

Mode	All
<b>Remote Command</b>	:STATUs:QUESTIONable:POWER:ENABLE <integer> :STATUs:QUESTIONable:POWER:ENABLE?
<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.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

### Questionable Power Event Query

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

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

Mode	All
------	-----

<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

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



## Common Commands

["All" on page 283](#)

["Clear Status " on page 109](#)

["Standard Event Status Enable " on page 109](#)

["Standard Event Status Register Query " on page 110](#)

["Identification Query " on page 110](#)

["Operation Complete " on page 111](#)

["Query Instrument Options " on page 112](#)

["Recall Instrument State " on page 112](#)

["\\*RST \(Remote Command Only\)" on page 113](#)

["Save Instrument State " on page 113](#)

["Service Request Enable " on page 114](#)

["Status Byte Query " on page 114](#)

["Trigger " on page 115](#)

["Self Test Query " on page 115](#)

["Wait-to-Continue " on page 115](#)

### 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
Remote Command	:CALibration[:ALL] :CALibration[:ALL]?
Example	:CAL
Notes	<p>:CALibration[:ALL]? returns 0 if successful          :CALibration[:ALL]? returns 1 if failed          :CALibration[:ALL]? is the same as *CAL?</p> <p>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.</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.</p> <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.          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.</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
Remote Command	*CAL?
Example	*CAL?
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

## Clear Status

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

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

## Standard Event Status Enable

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

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

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

## Standard Event Status Register Query

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

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

## Identification Query

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

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

- Manufacturer

- Model
- Serial number
- Firmware version

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

## Operation Complete

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

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

Remote Command	*OPC *OPC?
Example	INIT:CONT 0 Selects single sweeping. INIT:IMM Initiates a sweep. *OPC? Holds off any further commands until the sweep is complete.
Status Bits/OPC dependencies	Not global to all remote ports or front panel. *OPC only considers operation that was initiated on the same port as the *OPC command was issued from. *OPC is an overlapped command, but *OPC? is sequential.
Backwards Compatibility Notes	<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</li> </ol>

---

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

---

## Query Instrument Options

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

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

---

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

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## Recall Instrument State

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

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

---

Remote Command	*RCL <register #>
Example	*RCL 7 Recalls the instrument state that is currently stored in register 7.
Notes	Registers 0 through 6 are accessible from the front panel in menu keys for Recall Registers.

---

Min	0
Max	127
Status Bits/OPC dependencies	The command is sequential.
Initial S/W Revision	Prior to A.02.00

## \*RST (Remote Command Only)

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

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

## Save Instrument State

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

Remote Command	*SAV <register #>
Example	*SAV 9 Saves the instrument state in register 9.
Notes	Registers 0 through 6 are accessible from the front panel in menu keys for Save Registers.
Min	0
Max	127

Status Bits/OPC dependencies	The command is sequential.
Initial S/W Revision	Prior to A.02.00

## Service Request Enable

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

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

<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]?
Preset	0
Min	0
Max	255
Status Bits/OPC dependencies	Service Request Enable Register (all bits, 0 – 7).
Initial S/W Revision	Prior to A.02.00

## Status Byte Query

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

<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 in the standard event status register is set.
Notes	See related command *CLS.
Status Bits/OPC dependencies	Status Byte Register (all bits, 0 – 7).
Initial S/W Revision	Prior to A.02.00

## Trigger

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

---

Key Path	No equivalent key. See related keys Single and Restart.
<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

---

## 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.

---

<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

---

## Wait-to-Continue

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

---

<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 as 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 120

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 <code>[SENSe]:FEED RF</code> 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 <code>[SENSe]:FEED AREFerence</code> command is provided, and is aliased to <code>[SENSe]:FEED:AREF REF50</code> , which causes the input to be switched to the 50 MHz calibrator. The <code>[SENSe]:FEED RF</code> 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 <code>[SENSe]:FEED?</code> 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>

---

	<p>The parameters IQ   IONLy   QONLy are supported for backwards compatibility with the E44406A.</p> <p>[:SENSe]:FEED IQ aliases to [:SENSe]:FEED: IQ:TYPE IQ</p> <p>[:SENSe]:FEED IONLy aliases to [:SENSe]:FEED:IQ:TYPE IONLy</p> <p>[:SENSe]:FEED QONLy aliases to [:SENSe]:FEED:IQ:TYPE QONLy</p> <p>The query [:SENSe]:FEED? will always return AIQ whatever the type of legacy parameters IQ   IONLy   QONLy has been used.</p>
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
<b>Remote Command</b>	<pre>:INPut:MIXer EXTernal INTernal :INPut:MIXer?</pre>
<b>Example</b>	<pre>INP:MIX INT INP:MIX?</pre>
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 EXTerml 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 UNPReselect</p> <p>: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
Readback	The RF input port, RF coupling, and current input impedance settings appear on this key as: "XX, YY, ZZ" where XX is RF, RF2, RFIO1, RFIO2, depending on what input is selected (only appears on analyzers with multiple RF inputs) YY is AC or DC ZZ is 50Ω or 75Ω
Initial S/W Revision	Prior to A.02.00

### Input Z Correction

Sets the input impedance for unit conversions. This affects the results when the y-axis unit is voltage or current units (dBmV, dBμV, dBμA, V, A), but not when it is power units (dBm, W). The impedance you select is for computational purposes only, since the actual impedance is set by internal hardware to 50 ohms. Setting the computational input impedance to 75 ohms is useful when using a 75 ohm to 50 ohm adapter to measure a 75 ohm device on an analyzer with a 50 ohm input impedance.

There are a variety ways to make 50 to 75 ohm transitions, such as impedance transformers or minimum loss pads. The choice of the solution that is best for your measurement situation requires balancing the amount of loss that you can tolerate with the amount of measurement frequency range that you need. If you are using one of these pads/adaptors with the Input Z Corr function, you might also want to use the Ext Gain key. This function is

used to set a correction value to compensate for the gain (loss) through your pad. This correction factor is applied to the displayed measurement values.

<b>Key Path</b>	Input/Output, RF Input
<b>Remote Command</b>	[ :SENSe]:CORRection:IMPedance[:INPut][:MAGNitude] 50 75 [ :SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]?
<b>Example</b>	CORR:IMP 75 sets the input impedance correction to 75 ohms. CORR:IMP?
<b>Couplings</b>	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.
<b>Preset</b>	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.
<b>State Saved</b>	Saved in instrument state
<b>Readback</b>	50 Ω or 75 Ω. Current setting reads back to the RF key.
<b>Initial S/W Revision</b>	Prior to A.02.00

## RF Coupling

Specifies alternating current (AC) or direct current (DC) coupling at the analyzer RF input port. Selecting AC coupling switches in a blocking capacitor that blocks any DC voltage present at the analyzer input. This decreases the input frequency range of the analyzer, but prevents damage to the input circuitry of the analyzer if there is a DC voltage present at the RF input.

In AC coupling mode, you can view signals below the corner frequency of the DC block, but below a certain frequency the amplitude accuracy is not specified. The frequency below which specifications do not apply is:

X-Series Model	Lowest Freq for meeting specs when AC coupled	Lowest Freq for meeting specs when DC coupled
N9000A-503/507	100 kHz	n/a
N9000A-C75 Input 2	1 MHz	n/a
N9000A-513/526	10 MHz	9 kHz
N9010A	10 MHz	9 kHz
N9020A	10 MHz	20 Hz
N9030A	10 MHz	3 Hz

Some amplitude specifications apply only when coupling is set to DC. Refer to the appropriate amplitude specifications and characteristics for your analyzer.

When operating in DC coupled mode, ensure protection of the analyzer input circuitry by limiting the DC part of the input level to within 200 mV of 0 Vdc. In AC or DC coupling, limit the input RF power to +30 dBm (1 Watt).

Key Path	Input/Output, RF Input
Remote Command	:INPut:COUPling AC DC :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

## 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.

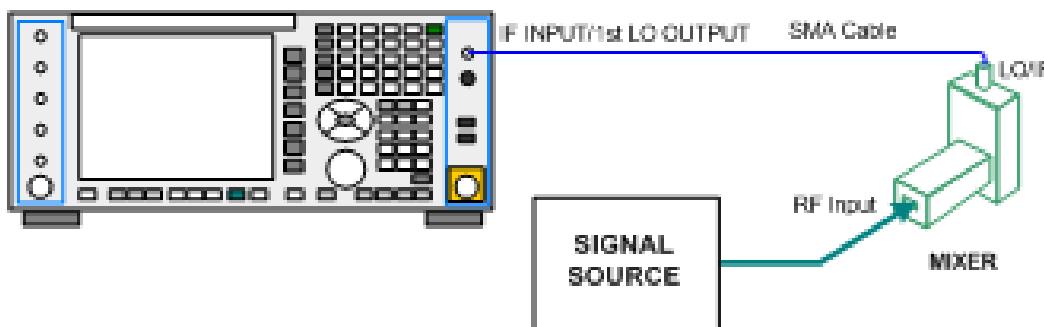
When External Mixer is selected, the Center Freq key controls the setting of the Center Freq in external mixing, which is separate from the settings of Center Freq for the RF Input or BBIQ. Each input retains its unique settings for Center Freq. A unique SCPI command is provided solely for the external 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 123

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

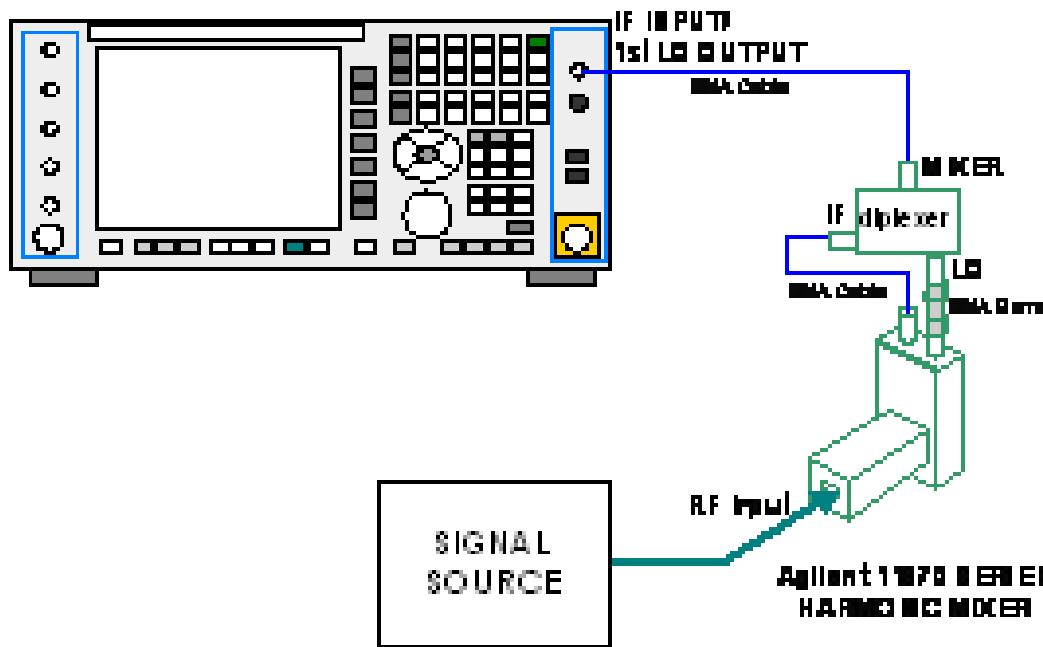


Legacy HP/Agilent and some third party mixers have separate LO In and IF out connections. This requires you to use an external diplexer to connect these mixers. A diplexer can easily be purchased for this purpose (for example, Diplexer Model # DPL.26 or # DPL.313B from OML Inc., Morgan Hill CA)

The connection diagram for such a legacy mixer is:

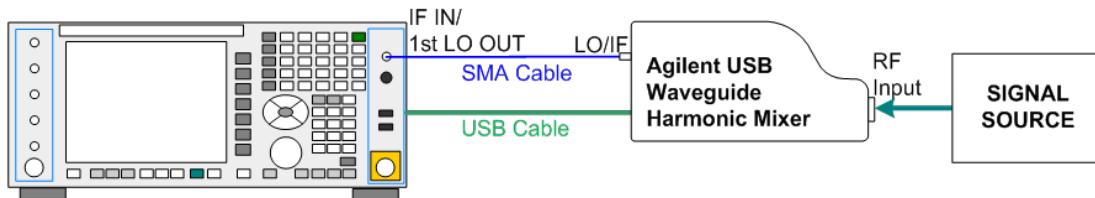
## 4 Input/Output Functions

### Input/Output



In addition, External Mixing in the X-Series supports the new Agilent 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 Agilent USB mixers is:



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

	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

\* 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.

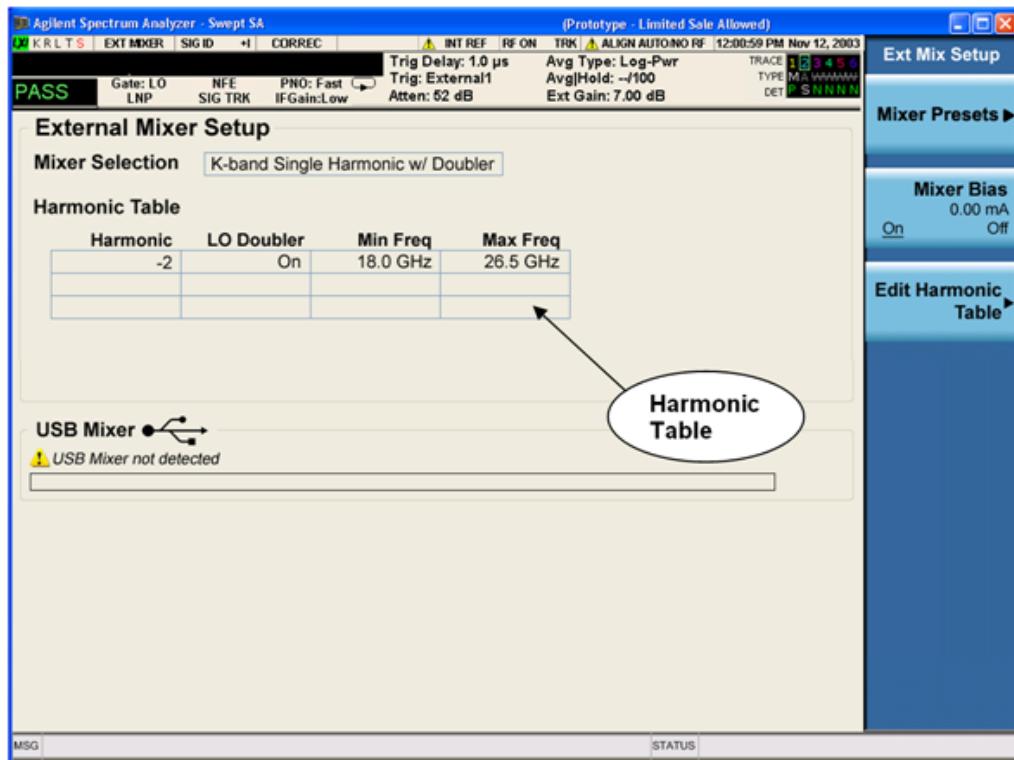
**NOTE**

The Agilent 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.
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

## 4 Input/Output Functions

### Input/Output



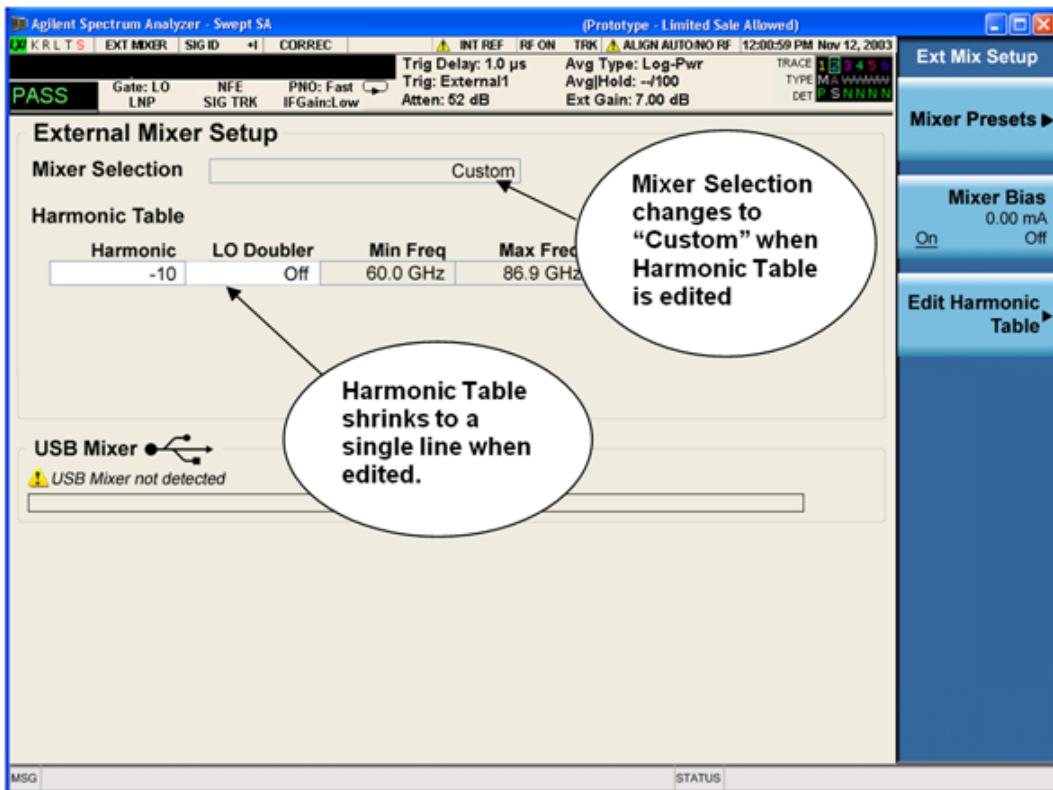
The External Mixer Setup screen looks like this

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 ( $\text{Span} = \text{Stop Freq} - \text{Start Freq}$ ), 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.

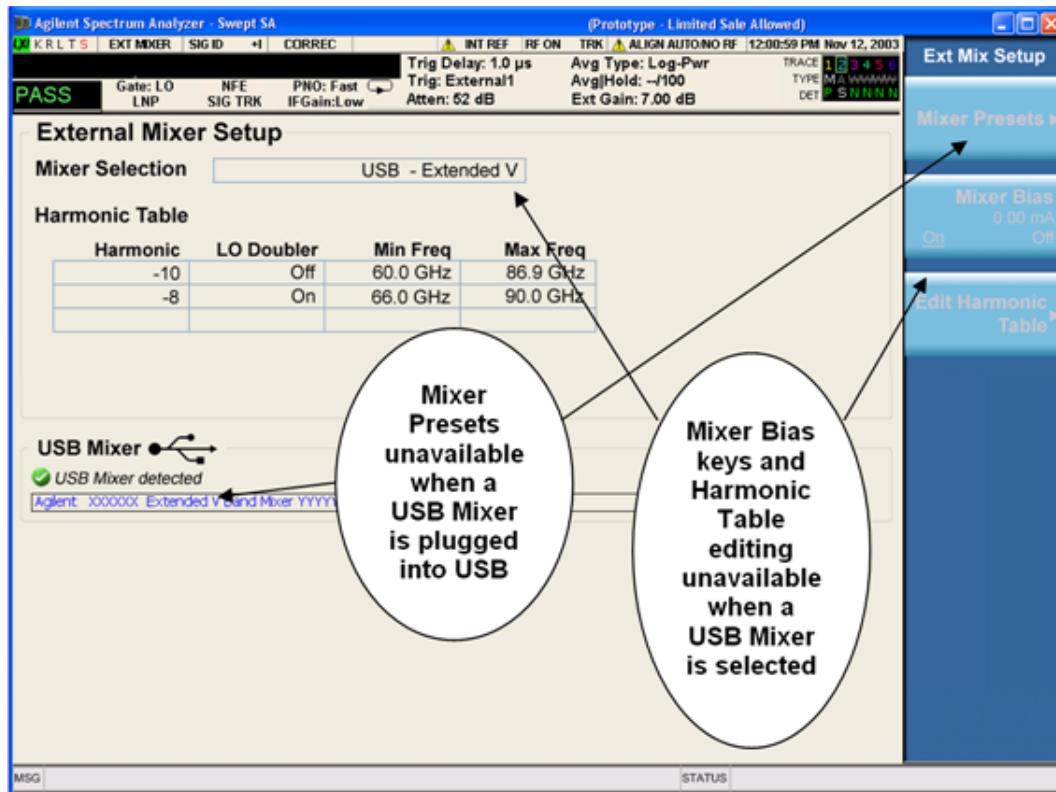
The analyzer supports the Agilent M1970 Series Harmonic Mixers with USB connection. While in External Mixing, if one of these mixers is plugged in to a USB port, it is automatically detected and displayed in the “USB Mixer” area of the setup screen, including its model number and serial number.

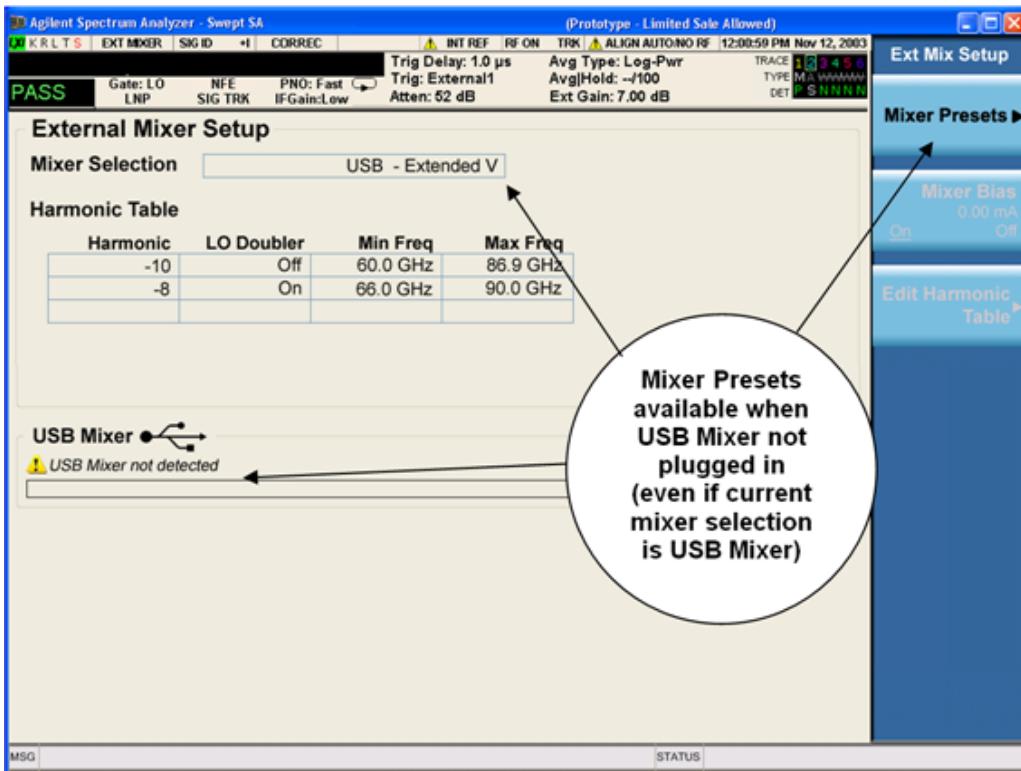
The analyzer assumes that if you plug a mixer into the USB, that is the mixer you want to use. Therefore:

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 Agilent USB Mixer is plugged into the analyzer’s USB port, the Mixer Selection remains unchanged.

3. When recalling an instrument state, if an Agilent 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 Agilent M1970 series mixers is:

Mixer Model	Mixer Selection display on Setup Screen	Readback on softkeys
Agilent M1970E: Option 001: 60 to 90 GHz	USB - M1970E E-Band	USB Mixer
Waveguide Harmonic Mixer		E-Band
Agilent M1970V Option 001: 50 to 75 GHz	USB - M1970V-001 V-Band	USB Mixer
Waveguide Harmonic Mixer		V-Band
Agilent M1970V Option 002: 50 to 80 GHz	USB - M1970V-002 Extended V-Band	USB Mixer
Waveguide Harmonic Mixer		Extended V
Agilent M1970W: 75 to 110 GHz	USB - M1970W W-Band	USB Mixer
Waveguide Harmonic Mixer		W-Band

The Agilent 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 Agilent legacy mixers,
- three for general purpose mixers:

- o presets that use a single harmonic and no doubling
- o presets that use a single harmonic but double the LO
- o 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>	<code>[::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</code> <code>[::SENSe]::MIXer:BAND?</code>
<b>Example</b>	<code>:MIX:BAND A</code> <code>:MIX:BAND?</code>
<b>Notes</b>	A Q U V W select Agilent 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 query form of this command returns the following if an Agilent USB Mixer is plugged into the analyzer's USB port: USBE Agilent E-Band USB Mixer USBV Agilent V-Band USB Mixer

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USBVEXT Agilent Extended V-Band USB Mixer

USBWAgilent W-Band USB Mixer

Note that the parameters CUSTOM, USBV, USBVEXT, and USBW are query responses only, and cannot be sent TO the analyzer.

The following cross-reference matches the mixer band designators used by Agilent to the EIA waveguide designations:

EIAAgilentFreq 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

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Preset	When Restore Input/Output Defaults is performed, an "A" mixer preset is also issued (11970A band), unless an Agilent USB Mixer is plugged into the analyzer's USB port, in which case the Mixer Selection remains unchanged.
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 Agilent 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

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## Agilent 11970

This menu allows you to preset for one of the models in the HP/Agilent 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 133

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Key Path	Input/Output, External Mixer, Ext Mix Setup, Mixer Presets
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## 4 Input/Output Functions

### Input/Output

<b>Example</b>	MIX:BAND A
Initial S/W Revision	A.08.01

## 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	Agilent 11970A	Agilent 11970A	1	-6	26.5	30.45	28.475
			2	-8	30.35	40	35.175
Q-band	Agilent 11970Q	Agilent 11970Q	1	-8	33	40.8	36.9
			2	-10	39.8	50	44.9
U-band	Agilent 11970U	Agilent 11970U	..	-10	40	60	50
V-band	Agilent 11970V	Agilent 11970V	1	-12	50	66	58
			2	-14	53	75	64
W-band	Agilent 11970W	Agilent 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
Example	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 L0x1 K-band	-4	18	26.5	22.25
A-band	A-band Single Harmonic, no doubler	Sngl harm L0x1 A-band	-6	26.5	40	33.25
D-band	D-band Single Harmonic, no	Sngl harm L0x1	-20	110	170	140

## 4 Input/Output Functions

### Input/Output

Mixer	Readout in setup screen	Readback on softkeys	Harm #	RF start	RF stop	RF center
	doubler	D-band				
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
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<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 L0x2 K-band	-14	110	170	140
F-band	F-band Single Harmonic w/doubler	Sngl harm L0x2 A-band	-10	90	140	115
G-band	G-band Single Harmonic w/doubler	Sngl harm L0x2 A-band	-16	140	220	180
J-band	J-band Single Harmonic w/doubler	Sngl harm L0x2 A-band	-24	220	325	272.5
K-band	K-band Single Harmonic w/doubler	Sngl harm L0x2 A-band	-2	18	26.5	22.25
Q-band	Q-band Single Harmonic w/doubler	Sngl harm L0x2 A-band	-4	33	50	41.5
V-band	V-band Single Harmonic w/doubler	Sngl harm L0x2 A-band	-6	50	75	62.5
W-band	W-band Single Harmonic w/doubler	Sngl harm L0x2 A-band	-8	75	110	92.5
Y-band	Y-band Single Harmonic w/doubler	Sngl harm L0x2 A-band	-20	170	260	215
Extended	Extended Single Harmonic w/doubler	Sngl harm L0x2 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	Range	Harm #	Dblr?	RF start	RF stop	RF Center
A-band	A-band	Multi harm	1	-4	N	26.5	34.1	30.3
	Multiple Harmonic	A-band	2	-4	Y	33.1	40	36.55
E-band	E-band	Multi harm	1	-6	Y	60	83	71.5
	Multiple Harmonic	E-band	2	-8	Y	65	90	77.5
U-band	U-band	Multi harm	1	-6	N	40	51.5	45.75
	Multiple Harmonic	U-band	2	-6	Y	49.5	60	54.75
Coaxial	Coaxial	Multi harm	1	-4	N	26.5	34	30.25
	Multiple Harmonic	Coaxial	2	-4	Y	32.5	55	43.75
			3	-6	Y	50	70	60

## 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
Remote Command	<pre>[::SENSe] :MIXer:BIAS &lt;real&gt; [::SENSe] :MIXer:BIAS? [::SENSe] :MIXer:BIAS:STATE OFF ON 0 1 [::SENSe] :MIXer:BIAS:STATE?</pre>
Example	<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

## 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

Key Path	Input/Output, External Mixer
Key Path	Input/Output, External Mixer, Calibrate Mixer
<b>Remote Command</b>	<code>[ :SENSe]:MIXer:CIFLoss &lt;rel_ampl&gt;</code> <code>[ :SENSe]:MIXer:CIFLoss?</code>
<b>Example</b>	<code>:MIX:CIFL 0.23 DB</code> <code>:MIX:CIFL?</code>
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 138 is installed.

## 4 Input/Output Functions

### Input/Output

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
<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  $1\text{ M}\Omega$  input passive probes as well as the Agilent 113x Series active differential probes using the Infinimax probe interface.

The Agilent 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  $50\text{ }\Omega$  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  $1\text{ M}\Omega$  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 Agilent 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 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 Agilent 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-

## 4 Input/Output Functions

### Input/Output

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.

1. The following commands are supported:

```
:CALibration:IQ:FLATness  
:INPut:IMPedance:IQ U50|B50|U1M|B1M  
:INPut:IMPedance:REference <integer>  
2. The [:SENSe]:FEED RF|IQ|IONLY|QONLY|AREference|IFALign command supports all parameters except IFALign. The FEED? query will return only RF|AIQ|AREF.  
3. 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>	Input/Output, I/Q
<b>Remote Command</b>	<code>[ :SENSe] :FEED: IQ:TYPE IQ   IONLY   QONLY   INDependent</code> <code>[ :SENSe] :FEED: IQ:TYPE?</code>
<b>Example</b>	Set the input to be both the I and Q channels, combined as $I + j * Q$ . <code>FEED:IQ:TYPE IQ</code>
<b>Notes</b>	The Independent I and Q selection is only available in GPVSA
<b>Preset</b>	IQ
<b>State Saved</b>	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"
<b>Range</b>	I+jQ   I Only   Q Only   Independent I and Q
<b>Readback Text</b>	I+jQ   I Only   Q Only   Ind I/Q
<b>Initial S/W Revision</b>	Prior to A.02.00

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<b>Remote Command</b>	<code>:INPut [1] :IQ:TYPE IQ I Q</code> <code>:INPut [1] :IQ:TYPE?</code>
<b>Notes</b>	For R&S FSQ-B71 compatibility
<b>Preset</b>	IQ
<b>Initial S/W Revision</b>	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.

<b>Key Path</b>	Input/Output, I/Q, I Setup
<b>Remote Command</b>	<pre>:INPut:IQ[:I]:DIFFerential OFF ON 0 1 :INPut:IQ[:I]:DIFFerential?</pre>
<b>Example</b>	Put the I channel in Differential Input mode INP:IQ:DIFF ON
<b>Notes</b>	<p>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.</p> <p>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.</p>
<b>Couplings</b>	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.
<b>Preset</b>	Off
<b>State Saved</b>	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"
<b>Range</b>	Off   On
<b>Initial S/W Revision</b>	Prior to A.02.00

<b>Remote Command</b>	<pre>:INPut[1]:IQ:BALanced[:STATE] OFF ON 0 1 :INPut[1]:IQ:BALanced[:STATE]?</pre>
<b>Notes</b>	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.
<b>Preset</b>	OFF
<b>Initial S/W Revision</b>	Prior to A.02.00

## I Input Z

Selects the input impedance for the I channel. The impedance applies to both the I and I-bar ports.

The input impedance controls the hardware signal path impedance match. It is not used for converting voltage to power. The voltage to power conversion always uses the Reference Z parameter. The Reference Z parameter applies to both I and Q channels.

<b>Key Path</b>	Input/Output, I/Q, I Setup
<b>Remote Command</b>	:INPut[1]:IQ[:I]:IMPedance LOW HIGH :INPut[1]:IQ[:I]:IMPedance?
<b>Example</b>	Set the I channel input impedance to 1 MΩ INP:IQ:IMP HIGH
<b>Notes</b>	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.
<b>Couplings</b>	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.
<b>Preset</b>	LOW
<b>State Saved</b>	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"
<b>Range</b>	50 Ω   1 MΩ
<b>Initial S/W Revision</b>	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.

<b>Key Path</b>	Input/Output, I/Q, I Setup
<b>Remote Command</b>	[:SENSe]:CORRection:IQ[:I]:SKEW <seconds> [:SENSe]:CORRection:IQ[:I]:SKEW?
<b>Example</b>	Delay the data for the I channel by 10 ns. CORR:IQ:SKEW 10 ns
<b>Preset</b>	0
<b>State Saved</b>	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 154.

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 197](#)".

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling
Readback Text	The last calibration date, or if no calibration exists, "(empty)". <code>Last: &lt;cal date&gt;</code> <code>&lt;cal time&gt;</code> Example: <code>Last: 8/22/2007</code> <code>1:02:49 PM</code>
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

### 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>	:INPut:IMPedance:IQ U50 B50 U1M B1M :INPut:IMPedance:IQ?
<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 = 50Ω B50: Differential Input = On, Input Z = 50Ω U1M: Differential Input = Off, Input Z = 1 MΩ B1M: Differential Input = On, Input Z = 1 MΩ This command is for backwards compatibility. It combines the Input Z (50Ω or 1 MΩ) parameter with the Differential Input (Off = "Unbalanced", On = "Balanced") parameter into a single enumeration. This backwards compatibility SCPI command was for an instrument without independent settings for the I and Q channels. Therefore, it is tied only to the I channel and does not provide an equivalent for the Q channel. For proper operation of the backwards compatibility command Q Same as I should be set to On. Also, note the subtle difference between this SCPI command and the backwards compatibility command for Input Z. The Input Z SCPI has "IQ" before "IMP" while this command has that order reversed.
Couplings	This command does not have an independent parameter, but instead is tied to the Differential Input and Input Z parameters. The coupling for those parameters apply to

---

this command too.

Preset	U50
Initial S/W Revision	Prior to A.02.00

---

## Q Setup

Access the channel setup parameters for the Q channel.

---

Key Path	Input/Output, I/Q
Readback Text	When Q Same as I is On the readback is "Q Same as I".
Initial S/W Revision	Prior to A.02.00

---

## Q Same as I

Many, but not all, usages require the I and Q channels have an identical setup. To simplify channel setup, the Q Same as I will cause the Q channel parameters to be mirrored from the I channel. That way you only need to set up one channel (the I channel). The I channel values are copied to the Q channel, so at the time Q Same as I is turned off the I and Q channel setups will be identical. This does not apply to Probe settings or to parameters that are determined by the probe.

---

Key Path	Input/Output, I/Q, Q Setup
<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.

<b>Key Path</b>	Input/Output, I/Q, Q Setup
<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
<b>Notes</b>	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.
<b>Couplings</b>	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.
<b>Preset</b>	Off
<b>State Saved</b>	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"
<b>Range</b>	Off   On
<b>Initial S/W Revision</b>	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.

<b>Key Path</b>	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 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

## 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.

<b>Key Path</b>	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

## Q Probe

Accesses the probe setup parameters for the Q channel. See "[I/Q Probe Setup](#)" on page 154.

Key Path	Input/Output, I/Q, Q Setup
State Saved	No
Readback Text	[<Q port probe id>] This is reporting the type of probe sensed on the Q port. There is no parameter for overriding what is sensed.
Initial S/W Revision	Prior to A.02.00

### Attenuation

The attenuation is part of the calibration data stored with the probe type and is initially the value that was returned by the last calibration. You can modify this value and any changes will be stored with the calibration data and will survive power cycles and presets. When a probe calibration is performed the attenuation value will be overwritten by the calibration.

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
Remote Command	[ :SENSe]:CORRection:IQ:I Q:ATTenuation:RATio <real> [ :SENSe]:CORRection:IQ:I Q:ATTenuation:RATio?
Example	Set the attenuation for the current I probe to 100.00:1. CORR:IQ:I:ATT:RAT 100
Notes	Each probe type has its own attenuation setting. As probes are changed the attenuation value will reflect the new probe's setting. Changing the attenuation affects only the current probe type's setting and leaves all others unchanged. When the IQ Path is I+jQ, the Q probe attenuation setting must match the I Probe attenuation setting within 1 dB. If this is not the case, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Attenuation.
Preset	Each probe type has its own default. The default for the "Unknown" probe type is 1:1.
State Saved	Saved with probe calibration data. It survives a power cycle and is not affected by a Preset or Restore.
Range	0.001 to 10000
Min	0.001
Max	10000
Initial S/W Revision	Prior to A.02.00

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

Remote Command	[ :SENSe]:CORRection:IQ:I Q:ATTenuation <rel_ampl> [ :SENSe]:CORRection:IQ:I Q:ATTenuation?
Example	Set the attenuation for the current I probe type to 100.00:1. CORR:IQ:I:ATT 20 dB

Range	-60 dB to +80 dB
Min	-60 dB
Max	+80 dB
Initial S/W Revision	Prior to A.02.00

### Calibrate

Invokes the guided probe calibration. The guided probe calibration is context sensitive and depends on the channel (I or Q) and the Differential Input state. The calibration is only performed on the selected channel. When Differential Input is on, both the probe attached to the main port and the probe attached to the complementary port are calibrated. When Differential Input is off, only the probe attached to the main port is calibrated. See "["I/Q Guided Calibration" on page 197](#)".

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling
Readback Text	The last calibration date, or if no calibration exists, "(empty)".  Last: <cal date> <cal time>  Example: Last: 8/22/2007 1:02:49 PM
Initial S/W Revision	Prior to A.02.00

### Clear Calibration

Clears the calibration data for the current port and probe. It does not clear the data for other probe types or other ports. If the sensed probe has EEPROM identification, only the data for that specific probe is cleared. After this command has completed, the probe calibration state will be the same as if no probe calibration had ever been performed for the specified channel and probe. The probe attenuation will be the default value for that probe type and the Cable Calibration frequency response corrections will be used. This command is dependent on the Differential Input state. When Differential Input is on, both the data for the probe attached to the main port and the data for the probe attached to the complementary port are cleared. When Differential Input is off, only data for the probe attached to the main port is cleared.

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
<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

## 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 144](#) ).

<b>Key Path</b>	Input/Output, I/Q
<b>Remote Command</b>	:INPut:IMPedance:REFerence <integer> :INPut:IMPedance:REFerence?
<b>Example</b>	Set the I/Q reference impedance to 50 Ω INP:IMP:REF 50
Preset	50 Ω
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	1 Ω to 1 MΩ
Min	1 Ω
Max	1 MΩ
Initial S/W Revision	Prior to A.02.00

## I/Q Cable Calibrate...

The I/Q cable calibration creates correction data for each of the front panel I/Q ports. This calibration data is used whenever no probe specific calibration data is available. It is important that all ports are calibrated using the same short BNC cable so that the data is comparable from port to port.

The guided calibration (front panel only) will show connection diagrams and guide you through the isolation calibration and calibrating each port. The calibration data for each port is stored separately, so as soon as a port is calibrated that data is saved and will be used. If you press "Exit" to exit the calibration process, the data for the ports already completed will still be used. It is recommended that a calibration be completed once started, or if exited, that it be properly done before the next use of the I/Q ports. The "Next" button will perform the calibration for the current port and then proceed to the next step in the calibration procedure. The "Back" button will return to the prior port in the procedure. Both keys and dialog buttons are supplied for ease of use. The dialog buttons are for mouse use and the softkeys for front panel use.

The calibration can also be done via SCPI, but no connection diagrams will be shown. You will have to make the correct connections before issuing each port calibration command. Again, it is recommended that all ports be calibrated at the same time.

The instrument state remains as it was prior to entering the calibration procedure except while a port is actually being calibrated. Once a port is calibrated it returns to the prior state. A port calibration is in process only from the time the "Next" button is pressed until the next screen is shown. For SCPI, this corresponds to the time from issuing the CAL:IQ:FLAT:I|IB|Q|QB command until the operation is complete.

For example, if the prior instrument state is Cal Out = Off, Input = I+jQ, and Differential = Off, then up until the time the "Next" button is pressed the I Input and Q Input LEDs are on and the Cal Out, I-bar Input and Q-bar

Input LEDs are off. Once the "Next" button is pressed for the I port calibration, only the Cal Out and I Input LEDs will be on and the others will be off. When the screen progresses to the next step ("Next" button again enabled), the prior state is restored and only the I Input and Q Input LEDs are on (Cal Out is off again).

The last calibration date and time for each port will be displayed. Any calibrations that are more than a day older than the most recent calibration will be displayed with the color amber.

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

## 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 Agilent 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 Agilent 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 197](#)).

## 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	<code>[::SENSe]::CORRection:IQ:I Q::ATTenuation:RATio &lt;real&gt;</code> <code>[::SENSe]::CORRection:IQ:I Q::ATTenuation:RATio?</code>
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

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

Remote Command	[:SENSe]:CORRection:IQ:I Q:ATTenuation <rel_ampl> [:SENSe]:CORRection:IQ:I Q:ATTenuation?
Example	Set the attenuation for the current I probe type to 100.00:1. CORR:IQ:I:ATT 20 dB
Range	-60 dB to +80 dB
Min	-60 dB
Max	+80 dB
Initial S/W Revision	Prior to A.02.00

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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.

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
Remote Command	:INPut:OFFSet:I Q <voltage> :INPut:OFFSet:I Q?
Example	Remove a DC offset of -0.5 V from the I channel input. INP:OFFS:I -0.5

---

Notes	Only some probe types support Offset. For those that do, each probe type has its own Offset setting. As probes are changed the Offset value will reflect the new probe's setting. Changing the Offset affects only the current probe type's setting and leaves all others unchanged.
Preset	0 V
State Saved	Saved with probe calibration data. It survives power cycle and is not affected by Preset or Restore.
Range	-18 V to +18 V
Min	-18 V
Max	+18 V
Initial S/W Revision	Prior to A.02.00

## Coupling

Some probe types allow coupling to reject low frequencies. This will filter out the DC component of a signal that is composed of a DC bias plus some AC signal. This control is visible only for probe types that have this capability.

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
Remote Command	:INPut:COUPling:I Q DC LFR1 LFR2 :INPut:COUPling:I Q?
Example	Set the probe to low frequency rejection below 1.7 Hz. INP:COUP:I LFR1
Notes	Only some probe types support Coupling. For those that do, each probe type has its own Coupling setting. As probes are changed the Coupling value will reflect the new probe's setting. Changing the Coupling affects only the current probe type's setting and leaves all others unchanged.
Preset	DC
State Saved	Saved with probe calibration data. It survives a power cycle and is not affected by a Preset or Restore.
Range	DC   AC 1.7 Hz LFR1   AC 0.14 Hz LFR2
Readback Text	DC   LFR1   LFR2
Initial S/W Revision	Prior to A.02.00

## DC

Turns off low frequency rejection, allowing signals down to DC.

---

<b>Key Path</b>	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

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### LFR1

Turns on low frequency rejection, rejecting signal component lower than 1.7 Hz.

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<b>Key Path</b>	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling
<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

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### LFR2

Turns on low frequency rejection, rejecting signal component lower than 0.14 Hz.

---

<b>Key Path</b>	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling
<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

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### 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 197](#)".

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<b>Key Path</b>	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling
<b>Readback Text</b>	The last calibration date, or if no calibration exists, "(empty)". Last: <cal date> <cal time> Example: Last: 8/22/2007

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	1:02:49 PM
Initial S/W Revision	Prior to A.02.00

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### Clear Calibration

Clears the calibration data for the current port and probe. It does not clear the data for other probe types or other ports. If the sensed probe has EEPROM identification, only the data for that specific probe is cleared. After this command has completed, the probe calibration state will be the same as if no probe calibration had ever been performed for the specified channel and probe. The probe attenuation will be the default value for that probe type and the Cable Calibration frequency response corrections will be used. This command is dependent on the Differential Input state. When Differential Input is on, both the data for the probe attached to the main port and the data for the probe attached to the complementary port are cleared. When Differential Input is off, only data for the probe attached to the main port is cleared.

---

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
Remote Command	:CALibration:IQ:PROBe:I Q:CLEAR
Example	Clear the calibration data for the I channel and the current probe (with EEPROM identification) or probe type (without EEPROM identification). :CAL:IQ:PROBe:I:CLEAR
Initial S/W Revision	Prior to A.02.00

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### RF Calibrator

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

---

Key Path	Input/Output
Remote Command	[::SENSe] :FEED:AREFerence REF50 REF4800 OFF [::SENSe] :FEED:AREFerence?
Example	FEED:AREF REF50 selects the 50 MHz amplitude reference as the signal input. FEED:AREF REF4800 selects the 4.8 GHz amplitude reference as the signal input FEED:AREF OFF turns the calibrator "off" (switches back to the selected input – RF or I/Q)
Dependencies	Selecting an input (RF or I/Q) turns the Calibrator OFF. This is true whether the input is selected by the keys or with the [:SENSe]:FEED command. The 4.8 GHz internal reference is only available in some models and frequency range options. If the 4.8 GHz reference is not present, the 4.8 GHz softkey will be blanked, and if the REF4800 parameter is sent, the analyzer will generate an error.
Couplings	When one of the calibrator signals is selected, the analyzer routes that signal (an

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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

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<b>Remote Command</b>	:CALibration:SOURce:STATE OFF ON 0 1 :CALibration:SOURce:STATE?
Notes	For ESA backwards compatibility. In the ESA the calibrator was a separate output which you connected to the input and switched on with this command. In the X-Series, the ON parameter is aliased to the [SENSe]:FEED:AREF REF50 command and the OFF parameter is aliased to [SENSe]:FEED:AREF OFF. When CALibration:SOURce:STATE? is received, 1 will be returned if any of the references is selected and 0 if the Calibrator is "Off"
Preset	OFF
Initial S/W Revision	Prior to A.02.00

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## 50 MHz

Selects the 50 MHz internal reference as the input signal.

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Key Path	Input/Output, RF Calibrator
<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	Input/Output, RF Calibrator
<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 4.8 GHz softkey will be blanked,

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and if the REF4800 parameter is sent, the analyzer will generate an error.

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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	Input/Output, RF Calibrator
<b>Example</b>	:FEED:AREF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

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## 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.

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In the Spectrum Analyzer mode, a Preamp is the common external device providing gain or loss. In a measurement application mode like GSM or W-CDMA, the gain or loss could be from a BTS (Base Transceiver Station) or an MS (Mobile Station). So in the Spectrum Analyzer mode MS and BTS would be grayed out and the only choice would be Ext Preamp. Similarly in some of the digital communications applications, Ext Preamp will be grayed out and you would have a choice of MS or BTS.

Key Path	Input/Output
Couplings	The Ext Preamp, MS, and BS keys may be grayed out depending on which measurement is currently selected. If any of the grayed out keys are pressed, or the equivalent SCPI command is sent, an advisory message is generated.
Readback	1-of-N selection   [variable]
Initial S/W Revision	Prior to A.02.00

## Ext Preamp

This function is similar to the reference level offset function. Both affect the displayed signal level. Ref Lvl Offset is a mathematical offset only, no analyzer configuration is affected. Ext Preamp gain is used when determining the auto-coupled value of the Attenuator. The External Gain value and the Maximum Mixer Level settings are both part of the automatic setting equation for the RF attenuation setting. (10 dB of Attenuation is added for every 10 dB of External Gain.)

Note that the Ref Lvl Offset and Maximum Mixer Level are described in the Amplitude section. They are reset by the instrument Preset. The External Preamp Gain is reset by the "Restore Input/Output Defaults" or "Restore System Defaults->All functions. . The External Gain is subtracted from the amplitude readout so that the displayed signal level represents the signal level at the output of the device-under-test, which is the input of the external device that is providing gain or loss.

Key Path	Input/Output, External Gain
Remote Command	<code>[ :SENSe] :CORRection:SA[:RF]:GAIN &lt;rel_ampl&gt;</code> <code>[ :SENSe] :CORRection:SA[:RF]:GAIN?</code>
Example	CORR:SA:GAIN 10 sets the Ext Gain value to 10 dB CORR:SA:GAIN -10 sets the Ext Gain value to -10 dB (that is, an attenuation of 10 dB)
Notes	Does not auto return.
Dependencies	The reference level limits are determined in part by the External Gain/Atten, Max Mixer Level, and RF Atten. This key is grayed out in Modes that do not support External Gain
Preset	This is unaffected by Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Min	-120 dB
Max	120 dB
Readback	Preamp Gain, <Ext Gain value> dB
Backwards Compatibility SCPI	<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

## MS

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

Key Path	Input/Output, External Gain
<b>Remote Command</b>	<code>[ :SENSe] :CORRection:MS [:RF] :GAIN &lt;rel_ampl&gt;</code> <code>[ :SENSe] :CORRection:MS [:RF] :GAIN?</code>
<b>Example</b>	CORR:MS:GAIN 10 sets the Ext Gain value to 10 dB CORR:MS:GAIN -10 sets the Ext Gain value to -10 dB (that is, a loss of 10 dB.)
Notes	Does not auto return.
Dependencies	The reference level limits are determined in part by the External Gain, Max Mixer Level, RF Atten  This key is grayed out in modes that do not support MS.
Preset	This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state.
Min	-100 dB
Max	100 dB
Readback	MS, <Ext Gain value> dB
Initial S/W Revision	Prior to A.02.00

<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

## BTS

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

<b>Key Path</b>	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.)
<b>Notes</b>	Does not auto return.
<b>Dependencies</b>	The reference level limits are determined in part by the External Gain, Max Mixer Level, RF Atten  This key is grayed out in modes that do not support BTS.
<b>Preset</b>	This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	-100 dB
<b>Max</b>	100 dB
<b>Readback</b>	BTS, <Ext Gain value> dB
<b>Initial S/W Revision</b>	Prior to A.02.00

<b>Remote Command</b>	<code>[ :SENSe] :CORRection:BTS [:RF] :LOSS &lt;rel_ampl&gt;</code> <code>[ :SENSe] :CORRection:BTS [:RF] :LOSS?</code>
<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
<b>Notes</b>	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
<b>Preset</b>	This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
<b>Min</b>	100 dB
<b>Max</b>	-100 dB
<b>Initial S/W Revision</b>	Prior to A.02.00

## I Ext Gain

This function affects only the I channel input, except when the Input Path is I+jQ. In I+jQ this setting is applied to both I and Q channel inputs. It is not available unless the Baseband I/Q option (BBA) is installed.

<b>Key Path</b>	Input/Output, External Gain
<b>Remote Command</b>	<code>[::SENSe]:CORRection:IQ:I:GAIN &lt;rel_ampl&gt;</code> <code>[::SENSe]:CORRection:IQ:I:GAIN?</code>
<b>Example</b>	Set the I Ext Gain to 10 dB  <code>CORR:IQ:I:GAIN 10</code>  Set the I Ext Gain to –10 dB (that is, a loss of 10 dB.)  <code>CORR:IQ:I:GAIN –10</code>
<b>Notes</b>	Not available unless option BBA is installed
<b>Preset</b>	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"
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	–100 dB
<b>Max</b>	100 dB
<b>Readback Text</b>	I Gain, <I Ext Gain> dB
<b>Initial S/W Revision</b>	Prior to A.02.00

## Q Ext Gain

This function affects only the Q channel input and only when the Input Path is not I+jQ. It is not available unless the Baseband I/Q option (BBA) is installed.

<b>Key Path</b>	Input/Output, External Gain
<b>Remote Command</b>	<code>[::SENSe]:CORRection:IQ:Q:GAIN &lt;rel_ampl&gt;</code> <code>[::SENSe]:CORRection:IQ:Q:GAIN?</code>
<b>Example</b>	Set the Q Ext Gain to 10 dB  <code>CORR:IQ:Q:GAIN 10</code>  Set the Q Ext Gain to –10 dB (that is, a loss of 10 dB.)  <code>CORR:IQ:Q:GAIN –10</code>
<b>Notes</b>	Not available unless option BBA is installed.
<b>Preset</b>	0 dB  This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"

State Saved	Saved in instrument state
Min	-100 dB
Max	100 dB
Readback Text	Q Gain, <I Ext Gain> dB
Initial S/W Revision	Prior to A.02.00

## Restore Input/Output Defaults

This selection causes the group of settings and data associated with the Input/Output key to be a reset to their default values. In addition, when a Source is installed, licensed and selected, Restore Input/Output defaults will initiate a Source Preset.

This level of Restore System Defaults does not affect any other system settings or mode settings and does not cause a mode switch. All the features described in this section are reset using this key, including Input Corrections and Data (described in the Corrections section).

Key Path	Input/Output
<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 to be applied to that trace at that frequency. So if a table entry shows 30 dB that means we ADD 30 dB to each trace to correct it before displaying it.

In zero span, where the frequency is always the center frequency of the analyzer, we apply the (interpolated) correction for the center frequency to all points in the trace. In the event where there are two correction amplitudes at the center frequency, we apply the first one in the table.

Note that the corrections are applied as the data is taken; therefore, a trace in View (Update Off) will not be affected by changes made to the corrections table after the trace is put in View.

Key Path	Input/Output, Corrections
Mode	SA, DVB-T/H, DTMB, SEQAN, TDSCDMA
Dependencies	This key will only appear if you have the proper option installed in your instrument. Amplitude correction may not be available in all modes; if a mode does not support amplitude correction, the Corrections key should be blanked while in that mode. If an application supports corrections but the current measurement does not, then the key should be grayed out in that measurement
Preset	Corrections arrays are reset (deleted) by Restore Input/Output Defaults. They survive shutdown and restarting of the analyzer application, which means they will survive a power cycle.
Initial S/W Revision	A.02.00

## Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1 Correction 2 Correction 3 Correction 4 Correction 5 Correction 6
Initial S/W Revision	A.02.00

## Correction On/Off

Turning the Selected Correction on allows the values in it to be applied to the data. This also automatically turns on "Apply Corrections" (sets it to ON), otherwise the correction would not take effect.

A new sweep is initiated if an amplitude correction is switched on or off. Note that changing, sending or loading corrections data does NOT directly initiate a sweep, however in general these operations will turn corrections on, which DOES initiate a sweep.

Key Path	Input/Output, Corrections
Remote Command	[ :SENSe] :CORRection:CSET [1]   2   ... 6 [:STATe] ON   OFF   1   0 [ :SENSe] :CORRection:CSET [1]   2   ... 6 [:STATe] ?

<b>Example</b>	SENS:CORR:CSET1 ON
Dependencies	<p>Turning this on automatically turns on "Apply Corrections"</p> <p>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.</p> <p>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.</p> <p>This command will generate an "Option not available" error unless you have the proper option installed in your instrument.</p>
Preset	Not affected by a Preset. Set to OFF by Restore Input/Output Defaults
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

## Properties

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

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

## Select Correction

Specifies the selected correction. The term "selected correction" is used throughout this document to specify which correction will be affected by the functions.

Key Path	Input/Output, Corrections
Mode	SA
Notes	The selected correction is remembered even when not in the correction menu.
Preset	Set to Correction 1 by Restore Input/Output Defaults
Readback	Correction 1 Correction 2 Correction 3 Correction 4 Correction 5 Correction 6
Initial S/W Revision	A.02.00

## 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.

<b>Key Path</b>	Input/Output, Corrections, Properties
<b>Mode</b>	SA
<b>Remote Command</b>	<pre>[ :SENSe] :CORRection:CSET[1]:ANTenna[:UNIT] GAUSS   PTESla   UVM   UAM   UA   NOConversion</pre> <pre>[ :SENSe] :CORRection:CSET[1]:ANTenna[:UNIT] ?</pre>
<b>Example</b>	CORR:CSET:ANT GAUS
Dependencies	<p>Only the first correction array (Correction 1) supports antenna units.</p> <p>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.</p>
Preset	Unaffected by Preset. Set to NOC by Restore Input/Output Defaults
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

## None

Selects no antenna unit for this Correction set. Thus no Y Axis unit will be forced.

<b>Key Path</b>	Input/Output, Corrections, Properties, Antenna Unit
<b>Example</b>	:CORR:CSET:ANT NOC
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

---

### **dB $p$ T**

Sets the antenna unit to dB $p$ T. If this correction is turned on, and Apply Corrections is on, the Y Axis Unit will then be forced to dB $p$ T 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	"dB $p$ T"
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 170

Key Path	Input/Output, Corrections, Properties
<b>Remote Command</b>	<code>[::SENSe]::CORRection:CSET[1 2 ...6:X:SPACing LINear   LOGarithmic</code> <code>[::SENSe]::CORRection:CSET[1 2 ...6:X:SPACing?</code>
<b>Example</b>	<code>CORR:CSET:X:SPAC LIN</code>
Preset	Unaffected by a Preset. Set to Linear by Restore Input/Output Defaults.
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

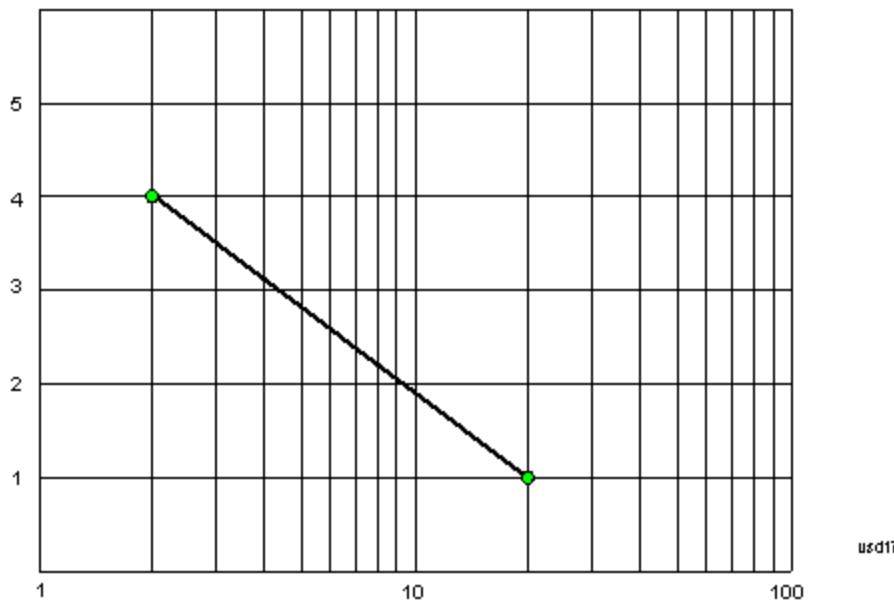
## Interpolation

For each bucket processed by the application, all of the correction factors at the frequency of interest (center frequency of each bucket) are summed and added to the amplitude. All trace operations and post processing treat this post-summation value as the true signal to use.

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

For amplitudes that lie between two user specified frequency points, we interpolate to determine the amplitude value. You may select either linear or logarithmic interpolation between the frequencies.

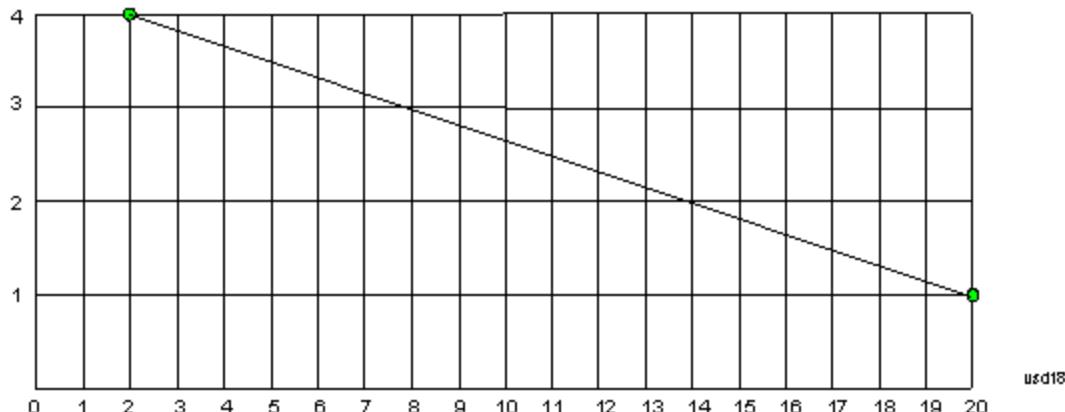
If we interpolate on a log scale, we assume that the line between the two points is a straight line on the log scale. For example, let's say the two points are (2,4) and (20,1). A straight line between them on a log scale looks like:



On a linear scale (like that of the spectrum analyzer), this translates to:



If we interpolate on a linear scale, we assume that the two points are connected by a straight line on the linear scale, as below:



The correction to be used for each bucket is taken from the interpolated correction curve at the center of the bucket.

### Description

Sets an ASCII description field which will be stored in an exported file. Can be displayed in the active function area by selecting as the active function, if desired to appear in a screen capture.

Key Path	Input/Output, Corrections, Properties
<b>Remote Command</b>	<code>[::SENSe]:CORRection:CSET[1] 2 ...6:DESCription "text"</code> <code>[::SENSe]:CORRection:CSET[1] 2 ...6:DESCription?</code>
<b>Example</b>	<code>:CORR:CSET1:DESC "11941A Antenna correction"</code>
Notes	45 chars max; may not fit on display if max chars used
Preset	Unaffected by a Preset. Set to empty by Restore Input/Output Defaults
State Saved	Saved in instrument state.
Initial S/W Revision	A.02.00

### Comment

Sets an ASCII comment field which will be stored in an exported file. Can be displayed in the active function area by selecting as the active function, if desired to appear in a screen capture.

Key Path	Input/Output, Corrections, Properties
<b>Remote Command</b>	<code>[::SENSe]:CORRection:CSET[1] 2 ...6:COMMent "text"</code> <code>[::SENSe]:CORRection:CSET[1] 2 ...6:COMMent?</code>
<b>Example</b>	<code>:CORR:CSET1:COMM "this is a comment"</code>
Notes	60 chars max; may not fit on display if max chars used
Preset	Unaffected by Preset. Set to empty by Restore Input/Output Defaults
State Saved	Saved in instrument state
Initial S/W Revision	A.02.00

### Table Editor Operation

Only one table editor can be on at any time; turning on the Table Editor for any item turns off all other table editors that are open.

The Table Editor shows the current state of the internal database being edited. If the Table Editor is turned off the internal database remains intact and when is again visible, reflects any updates that were made remotely or by the front-panel access.

When the table editor is turned on, it appears as a window pane to the left of the main window. This pane contains the table being edited. The table editor softkey menu will vary somewhat depending on the number and title of the columns being edited.

See also:

[Navigating](#)

[Editing](#)

---

Key Path	Freq/Channel, Edit Freq List, EditMeas Setup, ENR, Meas Table, EditMeas Setup, ENR, Cal Table, EditMeas Setup, Limits, EditMeas Setup, Loss Comp, Before DUT, Table, EditMeas Setup, Loss Comp, After DUT, Table, Edit
Initial S/W Revision	Prior to A.04.00

---

## Navigate

Enables you to move around in the table editor using the up and down arrow keys.

---

Key Path	<ul style="list-style-type: none"> <li>• Freq, Edit Freq List, Edit</li> <li>• Meas Setup, ENR, Meas Table, Edit</li> <li>• Meas Setup, ENR, Cal Table, Edit</li> <li>• Meas Setup, Limits, Edit</li> <li>• Meas Setup, Loss Comp, Before DUT, Table, Edit</li> <li>• Meas Setup, Loss Comp, After DUT, Table, Edit</li> </ul>
Mode	NFIGURE
Remote Command	No SCPI. Front panel only.
Notes	
Preset	Navigate
State Saved	No
Range	Navigate   Frequency   Amplitude (optional) Range of enumerates can be 2 or 3, depending on current use, but first member will always be Navigate. Additional members are provided by the user of the Common Table Editor
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	<ul style="list-style-type: none"> <li>• Note that the arrow keys always navigate between rows.</li> </ul>

---

## Insert Point Below

Inserts point below the currently selected row.

---

### Key Path

- Freq, Edit Freq List, Edit
- Meas Setup, ENR, Meas Table, Edit
- Meas Setup, ENR, Cal Table, Edit
- Meas Setup, Limits, Edit
- Meas Setup, Loss Comp, Before DUT, Table, Edit
- Meas Setup, Loss Comp, After DUT, Table, Edit

---

Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	If the currently-selected point is being edited, the point is completed. A new point is inserted below the currently-selected point; the data in the new point is copied from the current point. The independent variable (usually Frequency) is highlighted for edit.

---

## Delete Point

Deletes currently selected row in the table editor.

---

### Key Path

- Freq, Edit Freq List, Edit
- Meas Setup, ENR, Meas Table, Edit
- Meas Setup, ENR, Cal Table, Edit
- Meas Setup, Limits, Edit
- Meas Setup, Loss Comp, Before DUT, Table, Edit
- Meas Setup, Loss Comp, After DUT, Table, Edit

---

Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	It will immediately delete the currently-selected point, whether or not that point is being edited, and select Navigate. The point following the currently-selected point (or the point proceeding if there is none) will be selected.

---

## 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.

<b>Key Path</b>	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
<b>Notes</b>	Pressing this key when no corrections are present is accepted without error.
<b>Initial S/W Revision</b>	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 166) are used.

<b>Key Path</b>	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.
<b>Preset</b>	Not affected by Preset. Set to OFF by Restore Input/Output Defaults
<b>State Saved</b>	Saved in instrument state.
<b>Initial S/W Revision</b>	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.

<b>Key Path</b>	Input/Output, Corrections
<b>Remote Command</b>	[ :SENSe]:CORRection:CSET:ALL:DELETE
<b>Example</b>	CORR:CSET:ALL:DEL
<b>Initial S/W Revision</b>	A.02.00

## Set (Replace) Data (Remote Command Only)

The command takes an ASCII series of alternating frequency and amplitude points, each value separated by commas.

The values sent in the command will totally replace all existing correction points in the specified set.

An Ampcor array can contain 2000 points maximum.

<b>Remote Command</b>	<code>[::SENSe]:CORRection:CSET[1] 2 ...6:DATA &lt;freq&gt;, &lt;ampl&gt;, . . .</code> <code>[::SENSe]:CORRection:CSET[1] 2 ...6:DATA?</code>
<b>Example</b>	<code>CORR:CSET1:DATA 10000000, -1.0, 20000000, 1.0</code> This defines two correction points at (10 MHz, -1.0 dB) and (20 MHz, 1.0 dB) for correction set 1.
Preset	Empty after Restore Input/Output Defaults. Survives a shutdown or restart of analyzer application (including a power cycle).
State Saved	Saved in instrument state.
Min	Freq: 0 Hz Amptd: -1000 dBm
Max	Freq: 1 THz Amptd: +1000 dBm
Initial S/W Revision	A.02.00

## Merge Correction Data (Remote Command Only)

The command takes an ASCII series of alternating frequency and amplitude points, each value separated by commas. The difference between this command and Set Data is that this merges new correction points into an existing set.

Any new point with the same frequency as an existing correction point will replace the existing point's amplitude with that of the new point.

An Ampcor array can contain 2000 total points, maximum.

<b>Remote Command</b>	<code>[::SENSe]:CORRection:CSET[1] 2 ...6:DATA:MERGe &lt;freq&gt;, &lt;ampl&gt;, ...</code>
<b>Example</b>	<code>CORR:CSET1:DATA:MERGE 15000000, -5.0, 25000000, 5.0</code> This adds two correction points at (15 MHz, -5.0 dB) and (25 MHz, 5.0 dB) to whatever values already exist in correction set 1.
Preset	Empty after Restore Input/Output Defaults. Survives shutdown/restart of analyzer application (including power cycle)
Min	Freq: 0 Hz Amptd: -1000 dBm
Max	Freq: 1 THz

---

	Amptd: +1000 dBm
Initial S/W Revision	A.02.00

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## Remote Correction Data Set Commands

This section describes the remote (SCPI) commands used to put values into correction sets. See the correction / table editor section of the Input/Output section for the information on front panel entry of correction data.

["Set \(Replace\) Data \(Remote Command Only\)" on page 177](#)

["Merge Correction Data \(Remote Command Only\)" on page 177](#)

### Set (Replace) Data (Remote Command Only)

The command takes an ASCII series of alternating frequency and amplitude points, each value separated by commas.

The values sent in the command will totally replace all existing correction points in the specified set.

An Ampcor array can contain 2000 points maximum.

---

<b>Remote Command</b>	<code>[ :SENSe]:CORRection:CSET[1]   2   ... 6:DATA &lt;freq&gt;, &lt;ampl&gt;, . . .</code>
-----------------------	--

---

	<code>[ :SENSe]:CORRection:CSET[1]   2   ... 6:DATA?</code>
--	---

---

<b>Example</b>	<code>CORR:CSET1:DATA 10000000, -1.0, 20000000, 1.0</code>
----------------	--

---

	This defines two correction points at (10 MHz, -1.0 dB) and (20 MHz, 1.0 dB) for correction set 1.
--	--

---

Preset	Empty after Restore Input/Output Defaults. Survives a shutdown or restart of analyzer application (including a power cycle).
--------	--

---

State Saved	Saved in instrument state.
-------------	----------------------------

---

Min	Freq: 0 Hz Amptd: -1000 dBm
-----	--------------------------------

---

Max	Freq: 1 THz Amptd: +1000 dBm
-----	---------------------------------

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Initial S/W Revision	A.02.00
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### Merge Correction Data (Remote Command Only)

The command takes an ASCII series of alternating frequency and amplitude points, each value separated by commas. The difference between this command and Set Data is that this merges new correction points into an existing set.

Any new point with the same frequency as an existing correction point will replace the existing point's amplitude with that of the new point.

An Ampcor array can contain 2000 total points, maximum.

<b>Remote Command</b>	<code>[SENSe] :CORRection:CSET[1]   2   ... 6 :DATA:MERGe &lt;freq&gt;, &lt;ampl&gt;, ...</code>
<b>Example</b>	<pre>CORR:CSET1:DATA:MERGE 15000000, -5.0, 25000000, 5.0</pre> <p>This adds two correction points at (15 MHz, -5.0 dB) and (25 MHz, 5.0 dB) to whatever values already exist in correction set 1.</p>
Preset	Empty after Restore Input/Output Defaults. Survives shutdown/restart of analyzer application (including power cycle)
Min	Freq: 0 Hz Amptd: -1000 dBm
Max	Freq: 1 THz Amptd: +1000 dBm
Initial S/W Revision	A.02.00

## Freq Ref In

Specifies the frequency reference as being the internal reference, external reference or sensing the presence of an external reference.

When the frequency reference is set to internal, the internal 10 MHz reference is used even if an external reference is connected.

When the frequency reference is set to external, the instrument will use the external reference. However, if there is no external signal present, or it is not within the proper amplitude range, a condition error message is generated. When the external signal becomes valid, the error is cleared.

If Sense is selected, the instrument checks whether a signal is present at the external reference connector and will automatically switch to the external reference when a signal is detected. When no signal is present, it automatically switches to the internal reference. No message is generated as the reference switches between external and internal. The monitoring of the external reference occurs approximately on 1 millisecond intervals, and never occurs in the middle of a measurement acquisition, only at the end of the measurement (end of the request).

If for any reason the instrument's frequency reference is not able to obtain lock, Status bit 2 in the Questionable Frequency register will be true and a condition error message is generated. When lock is regained, Status bit 2 in the Questionable Frequency register will be cleared and the condition error will be cleared.

If an external frequency reference is being used, you must enter the frequency of the external reference if it is not exactly 10 MHz. The External Ref Freq key is provided for this purpose.

Key Path	Input/Output
<b>Remote Command</b>	<code>[SENSe] :ROSCillator:SOURce:TYPE INTERNAL EXTERNAL SENSe</code> <code>[SENSe] :ROSCillator:SOURce:TYPE?</code>
Preset	This is unaffected by a Preset but is set to SENSe on a "Restore Input/Output Defaults" or "Restore System Defaults->All".

State Saved	Saved in instrument state.
Status Bits/OPC dependencies	STATus:QUEStionable:FREQuency bit 2 set if unlocked.
Backwards Compatibility Notes	Freq Ref In was not saved in state in the legacy instruments. It is a part of state in the X-Series.
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	<code>[SENSe]:ROSCillator:SOURce?</code>
Notes	<p>The query <code>[SENSe]:ROSCillator:SOURce?</code> returns the current switch setting. This means:</p> <ol style="list-style-type: none"> <li>1. If it was set to SENSe but there is no external reference so the instrument is actually using the internal reference, then this query returns INTernal and not SENSe.</li> <li>2. If it was set to SENSe and there is an external reference present, the query returns EXTerinal and not SENSe.</li> <li>3. If it was set to EXTerinal, then the query returns "EXTerinal"</li> <li>4. If it was set to INTernal, then the query returns "INTernal"</li> </ol>
Preset	SENSe
Backwards Compatibility Notes	<p>The query <code>[SENSe]:ROSCillator:SOURce?</code> 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 <code>[SENSe]:ROSCillator:SOURce</code> 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

<b>Remote Command</b>	<code>[SENSe]:ROSCillator:SOURce INTernal EXTERNAL</code>
Notes	For PSA compatibility the command form is provided and is directly mapped to <code>[SENSe]:ROSCillator:SOURce:TYPE</code>
Initial S/W Revision	Prior to A.02.00

## Sense

The external reference is used if a valid signal is sensed at the Ext Ref input. Otherwise the internal reference is used.

Key Path	Input/Output, Freq Ref In
Example	<code>:ROSC:SOUR:TYPE SENS</code>

Readback	Sense
Initial S/W Revision	Prior to A.02.00

## Internal

The internal reference is used.

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

## 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.
<b>Notes</b>	Still available with Internal selected, to allow setup for when External is in use.
<b>Preset</b>	This is unaffected by a Preset but is set to 10 MHz on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
<b>Min</b>	CXA: 10 MHz EXA: 10 MHz or 13 MHz, depending on whether N9010A-R13 is licensed MXA: 1 MHz PXA: 1 MHz
<b>Max</b>	CXA: 10 MHz EXA: 10 MHz MXA: 50 MHz PXA: 50 MHz
<b>Default Unit</b>	Hz
<b>Initial S/W Revision</b>	Prior to A.02.00

---

## External Reference Lock BW

This control lets you adjust the External Reference phase lock bandwidth. This control is available in some models of the X-Series.

The PXA variable reference loop bandwidth allows an external reference to be used and have the analyzer close-in phase noise improved to match that of the reference. This could result in an improvement of tens of decibels. The choice of “Wide” or “Narrow” affects the phase noise at low offset frequencies, especially 4 to 400 Hz offset. When using an external reference with superior phase noise, we recommend setting the external reference phase-locked-loop bandwidth to wide (60 Hz), to take advantage of that superior performance. When using an external reference with inferior phase noise performance, we recommend setting that bandwidth to narrow (15 Hz). In these relationships, inferior and superior phase noise are with respect to  $-134 \text{ dBc/Hz}$  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.

---

<b>Key Path</b>	Input/Output, Freq Ref In
<b>Scope</b>	Mode Global
<b>Remote Command</b>	[ :SENSe]:ROSCillator:BANDwidth WIDE NARROW [ :SENSe]:ROSCillator:BANDwidth?
<b>Example</b>	ROSC:BAND WIDE
<b>Dependencies</b>	This key only appears in analyzers equipped with the required hardware.

---

Preset	This is unaffected by a Preset but is set to Narrow on a "Restore Input/Output Defaults" or "Restore System Defaults -> All"
State Saved	Saved in Input/Output state.
Initial S/W Revision	A.04.00

## External Ref Coupling

Only appears with option ERC installed and licensed.

This function lets you couple the sweep system of the analyzer to the state of the External Reference. If Normal is selected, data acquisition proceeds regardless of the state of the External Reference. When you select Ext Ref Out Of Range Stops Acquisition, the data acquisition (sweep or measurement) stops when either the "521, External ref out of range" or the "503, Frequency Reference unlocked" error message is asserted. Note that this will only take place if the Freq Ref In selection is External.

With the acquisition stopped, the data display will stop updating (even if this occurs in the middle of a sweep or measurement) and no data will be returned to a READ? or MEASure? query; that is, these queries will not complete because the analyzer will not respond to them. Furthermore, no response will be generated to a \*WAI? or \*OPC? query.

Proper SCPI sequences are shown below, which will always fail to return if the acquisition stops during the requested sweep or measurement. Note that, for predictable operation of this function, it is best to operate the analyzer in single measurement mode (INIT:CONT OFF), because if operating in continuous mode, the analyzer may respond to the above queries even after the acquisition stops, with data left over from the previous acquisition.

```
:INIT:CONT OFF
:INIT:IMM;*OPC?

--
:INIT:CONT OFF
:INIT:IMM;*WAI?

--
:INIT:CONT OFF
:READ?

--
:INIT:CONT OFF
:MEASure?
```

When the acquisition ceases, in addition to the error condition(s) described above, a popup error message will be generated informing you that the acquisition has ceased due to an invalid external reference. This message will stay on the screen while the acquisition is suspended.

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.

<b>Key Path</b>	Input/Output, Freq Ref In
<b>Mode</b>	All
<b>Remote Command</b>	[ :SENSe]:ROSCillator:COUpling NORMAL NACQuisition [ :SENSe]:ROSCillator:COUpling?
<b>Preset</b>	This setting is persistent: it survives power-cycling or a Preset and is reset with Restore Input/Output defaults.
<b>State Saved</b>	Not saved in instrument state
<b>Readback</b>	Normal Stop Acq
<b>Initial S/W Revision</b>	A.02.00

## Output Config

Accesses keys that configure various output settings, like the frequency reference output, trigger output and analog output.

<b>Key Path</b>	Input/Output
-----------------	--------------

Backwards Compatibility Notes	In ESA there was not a user interface to enable the Video Output (Analog Output), Trigger Output, or Gate Output. In the X-Series each of these physical connectors requires configuration, thus the user interface has been added for X-Series, along with the potential for an output you think is always on to be switched off.
Initial S/W Revision	Prior to A.02.00

## Trig Out (1 and 2)

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

Key Path	Input/Output, Output Config
<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	Input/Output, Output Config, Trig 1/2 Output
<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	Input/Output, Output Config, Trig 1/2 Output
<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	Input/Output, Output Config, Trig 1/2 Output
<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	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP MAIN
Readback	Main Trigger
Initial S/W Revision	Prior to A.02.00

### Gate Trigger

Selects the gate trigger signal to be output to the Trig 1 Out or Trig 2 Out connector. This is the source of the gate timing, not the actual gate signal.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP GTR
Readback	Gate Trigger
Initial S/W Revision	Prior to A.02.00

### Gate

Selects the gate signal to be output to the Trig 1 Out or Trig 2 Out connector. The gate signal has been delayed and its length determined by delay and length settings. When the polarity is positive, a high on the Trig 1 Out or Trig 2 Out represents the time the gate is configured to pass the signal.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	TRIG1:OUTP GATE
Readback	Gate
Initial S/W Revision	Prior to A.02.00

### 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 Trig2 Out automatically gets selected

Key Path	Input/Output, Output Config, Trig 1/2 Output
Example	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	Input/Output, Output Config, Trig 1/2 Output
<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 188](#)

Key Path	Input/Output, Output Config
<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.	Scale Factor	Notes
Off	0 V		
Screen Video	0 – 1 V open circuit	10%/division	8566 compatible
Log Video	0 – 1 V terminated	1/(192.66 dB/V)	dB referenced to mixer level, 1V out for –10 dBm at the mixer.
Linear Video	0 – 1 V terminated	100%/V	Linear referenced to Ref Level, 1 V out for RF envelope at the Ref Level.
Demod Audio	(varies with analyzer setting)		

## Auto

Selects the Auto state for the Analog Output menu. In this state, the Analog Output will automatically be set to the most sensible setting for the current mode or measurement.

If you make a selection manually from the Analog Out menu, this selection will remain in force until you change it (or re-select Auto), even if you go to a mode or measurement for which the selected output does not apply.

Key Path	Input/Output, Output Config, Analog Out
Remote Command	OUTPut:ANALog:AUTO OFF ON 0 1 OUTPut:ANALog:AUTO?
Example	OUTP:ANAL:AUTO ON
Preset	ON
State Saved	Saved in Input/Output State
Initial S/W Revision	A.04.00

## Off

Turns off the analog output.

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL OFF ! causes the analog output to be off
Readback Text	Off
Initial S/W Revision	A.04.00

**Screen Video**

Selects the analog output to be the screen video signal. In this mode, the pre-detector data is output to the Analog Out connector. The output looks very much like the trace displayed on the analyzer's screen, and depends on the Log/Lin display Scale, Reference Level, and dB per division, but is not influenced by the selected detector or any digital flatness corrections or trace post-processing (like Trace Averaging).

Note that this mode is similar to the Analog Output of the HP 8566 family and the Video Out (opt 124) capability of the Agilent PSA analyzer (E444x), although there are differences in the behavior.

Key Path	Input/Output, Output Config, Analog Out
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 189, 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	Input/Output, Output Config, Analog Out
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	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL DAUD
Dependencies	<p>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.</p> <p>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.</p>

---

	When Demod Audio is the selected Analog Output:
	<ul style="list-style-type: none"> <li>• all active traces are forced to use the same detector.</li> <li>• CISPR detectors (QPD, EMI Avg, RMS Avg) are unavailable</li> </ul>
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
Modified at S/W Revision	A.04.00

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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	Input/Output, Output Config, I/Q Cal Out
Readback	Off
Initial S/W Revision	Prior to A.02.00

## Aux IF Out

This menu controls the signals that appear on the SMA output on the rear panel labeled “AUX IF OUT”

The Aux IF Out functionality is only valid for RF and External Mixer inputs. When using the External Mixing path, the Aux IF Out levels (for all three Options CR3, CRP, and ALV) will be uncalibrated because the factory default Aux IF level was set to accommodate the expected IF levels for the RF path.

Key Path	Input/Output, Output Config
<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	Input/Output, Output Config, Aux IF Out
<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:

<b>IF Path Selected</b>	<b>Frequency of “Second IF” Output</b>
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.

<b>Key Path</b>	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.

<b>Key Path</b>	Input/Output, Output Config, Aux IF Out
<b>Example</b>	OUTP:AUX AIF

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	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

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Key Path	Input/Output, Output Config, Aux IF Out
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

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### 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 Agilent E4440A PSA Series, allowing you to characterize pulses with fast rise times using standard measurement suites on modern digital scopes.

---

Key Path	Input/Output, Output Config, Aux IF Out
<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

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## 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
Remote Command	:CALibration:IQ:ISOLation
Example	CAL:IQ:ISOL
Notes	All front panel I/Q ports must not be connected to anything.
Notes	All cables and probes should be disconnected from the I/Q ports before issuing the SCPI command.
State Saved	No.
Initial S/W Revision	Prior to A.02.00

### Exit

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

Key Path	Input/Output, I/Q, I/Q Cable Calibration
Notes	Using the Exit button 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 209 ).
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.

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

## 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

### Next

Perform the I port calibration.

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	<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 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

### 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 209 ).</p>
Initial S/W Revision	Prior to A.02.00

## 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	Input/Output, I/Q, I/Q Cable Calibration
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 I-bar port calibration.

Key Path	Input/Output, I/Q, I/Q Cable Calibrate...
Remote Command	:CALibration:IQ:FLATness:IBAR
Example	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

### 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 is to redo the calibration step.

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When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see "[Exit Confirmation](#)" on page 209 ).

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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	Input/Output, I/Q, I/Q Cable Calibrate...
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 port calibration.

---

Key Path	Input/Output, I/Q, I/Q Cable Calibrate...
Remote Command	:CALibration:IQ:FLATness:Q
Example	CAL:IQ:FLAT:Q
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 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 209 ).</p>
Initial S/W Revision	Prior to A.02.00

## 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	Input/Output, I/Q, I/Q Cable Calibrate...
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

### Next

Perform the Q-bar port calibration.

Key Path	Input/Output, I/Q, I/Q Cable Calibrate...
<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 209 ).</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.

## 4 Input/Output Functions

### Input/Output

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 209.

Key Path	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.

Key Path	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
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
<b>Notes</b>	The I 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>	Input/Output, I/Q, I Setup, I Probe, Calibrate
<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 209 ).
<b>Initial S/W Revision</b>	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 209.

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

**Back**

Return to the prior step in the calibration procedure.

Key Path	Input/Output, I/Q, I Setup, I Probe, Calibrate
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 I-bar port calibration.

Key Path	Input/Output, I/Q, I Setup, I Probe, Calibrate
<b>Remote Command</b>	:CALibration:IQ:PROBe:IBar
<b>Example</b>	CAL:IQ:PROB:IB
Notes	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.
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 Setup, I Probe, 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 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 209 ).
Initial S/W Revision	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 209.

---

Key Path	Input/Output, I/Q, Q Setup, Q 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.

---

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

---

## Next

Perform the Q port calibration.

---

Key Path	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
<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	Input/Output, I/Q, Q Setup, Q Probe, 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 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 209 ).
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 209.

---

Key Path	Input/Output, I/Q, Q Setup, Q 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.

---

Key Path	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
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	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
Remote Command	:CALibration:IQ:PROBe:QBar
Example	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 209 ).</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.

---

Remote Command	:CALibration:IQ:PROBe:I IBAR Q QBAR:TIME?
Example	:CAL:IQ:PROB:I:TIME?
Notes	This returns 6 integer values: year, month, day, hour, minute, second. When no calibration has been performed, all values 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

## 4 Input/Output Functions

### Input/Output

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.

---

For more information on Modes, preloading Modes, and memory requirements for Modes, see ["More Information" on page 213](#)

Key Path	Front-panel key
<b>Remote Command</b>	:INSTRument[:SElect] SA   SEQAN   EMI   BASIC   WCDMA   EDGEGSM   WIMAXOFDMA   VSA   PNOISE   NFIGure   ADEMOP   BTooth   TDSCDMA   CDMA2K   CDMA1XEV   LTE   LTETDD   MSR   DVB   DTMB   DCATV   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	Not affected by Preset. Set to SA following Restore System Defaults, if SA is the default mode.
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 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>	:INSTRument[:SElect] RECeiver provided for ESU compatibility. When this command is received, the analyzer aliases it to the following:

---

```
:INST:SEL EMI
:CONF FSC
```

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
Modified at S/W Revision	A.10.01

---

---

**Example** :INST 'SA'

**Notes** The query is not a quoted string. It is an enumeration as indicated in the Instrument Select table above.

The command must be sequential: i.e. continued parsing of commands cannot proceed until the instrument select is complete and the resultant SCPI trees are available.

---

**Backwards Compatibility SCPI** :INSTRument[:SElect] 'SA' | 'PNOISE' | 'EDGE' | 'GSM' | 'BASIC'

---

Initial S/W Revision Prior to A.02.00

## More Information

The Mode name appears on the banner after the word “Agilent” 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.

Agilent 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 with option BBA. Option 3FP WLAN has been discontinued.

N9064A honors existing 89601X licenses with all features and functionalities found on X-Series software versions prior to A.06.00. Specifically:

N9064A–1 is equivalent to 89601X–205

N9064A-2 is equivalent to 89601X-AYA

N9064A-3 is equivalent to 89601X-B7R

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
<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 ADEMOD INST:NSEL 234
Initial S/W Revision	Prior to A.02.00

## TD-SCDMA with HSPA/8PSK

Selects the TD-SCDMA mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
<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

## 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

## 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

## 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.

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

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## 89601 VSA

Selecting the 89601 VSA mode will start the 89600-Series VSA software application. The 89600 VSA software is powerful, PC-based software, offering the industry's most sophisticated general purpose and standards specific signal evaluation and troubleshooting tools for the R&D engineer. Reach deeper into signals, gather more data on signal problems, and gain greater insight.

- Over 30 general-purpose analog and digital demodulators ranging from 2FSK to 1024QAM
- Standards specific modulation analysis including:
- Cell: GSM, cdma2000, WCDMA, TD-SCDMA and more
- Wireless networking: 802.11a/b/g, 802.11n, 802.16 WiMAX (fixed/mobile), UWB
- RFID
- Digital satellite video and other satellite signals, radar, LMDS
- Up to 400K bin FFT, for the highest resolution spectrum analysis
- A full suite of time domain analysis tools, including signal capture and playback, time gating, and CCDF measurements
- Six simultaneous trace displays and the industry's most complete set of marker functions
- Easy-to-use Microsoft ® Windows ® graphical user interface

For more information see the Agilent 89600 Series VSA web site at [www.agilent.com/find/89600](http://www.agilent.com/find/89600)

To learn more about how to use the 89600 VSA running in the X-Series, after the 89600 VSA application is running, open the 89600 VSA Help and open the "About Agilent X-Series Signal Analyzers (MXA/EXA) with 89600-Series Software" help topic.

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Key Path	Mode
<b>Example</b>	INST:SEL VSA89601 INST:NSEL 101
Initial S/W Revision	Prior to A.02.00

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## 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 DCATV INST:NSEL 238
Initial S/W Revision	A.07.00

## MSR

Selects the MSR mode. The MSR mode makes several measurements for Cellular Communication devices that can be configured with multiple radio formats simultaneously following the 3GPP standard of Multi-Standard Radio, including GSM/EDGE, WCDMA/HSPA+ and LTE.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
<b>Example</b>	INST:SEL MSR INST:NSEL 106
Initial S/W Revision	A.10.01

## WLAN

Selects the WLAN mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
<b>Example</b>	INST:SEL WLAN INST:NSEL 217
Initial S/W Revision	A.10.01

## Application Mode Number Selection (Remote Command Only)

Select the measurement mode by its mode number. The actual available choices depend upon which applications are installed in your instrument. The modes appear in this table in the same order they appear in the Mode menu (if the order is not changed by the Configure Applications utility found in the System, Power On menu). See "Detailed List of Modes" on page 231 for Mode details.

The Mode Number is the parameter for use with the :INSTRument:NSELect command. The Mode Parameter is the parameter for use with the :INSTRument[:SElect] command.

Mode	Mode Number	Mode Parameter
Spectrum Analyzer	1	SA

Sequence Analyzer	400	SEQAN
EMI Receiver	141	EMI
I/Q Analyzer (Basic)	8	BASIC
WCDMA with HSPA+	9	WCDMA
GSM/EDGE/EDGE Evo	13	EDGEGSM
802.16 OFDMA (WiMAX/WiBro)	75	WIMAXOFDMA
Vector Signal Analyzer (VXA)	100	VSA
Phase Noise	14	PNOISE
Noise Figure	219	NFIGURE
Analog Demod	234	ADEMOM
Bluetooth	228	BTooth
TD-SCDMA with HSPA/8PSK	211	TDSCDMA
cdma2000	10	CDMA2K
1xEV-DO	15	CDMA1XEV
LTE	102	LTE
LTE TDD	105	LTETDD
MSR	106	MSR
DVB-T/H with T2	235	DVB
DTMB (CTTB)	236	DTMB
Digital Cable TV	238	DCATV
ISDB-T	239	ISDBT
CMMB	240	CMMB
WLAN	217	WLAN
Combined WLAN	19	CWLAN
Combined Fixed WiMAX	81	CWIMAXOFDM
802.16 OFDM (Fixed WiMAX)	104	WIMAXFIXED
iDEN/WiDEN/MotoTalk	103	IDEN
Remote Language Compatibility	266	RLC
SCPI Language Compatibility	270	SCPILC
89601 VSA	101	VSA89601

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**Remote Command**    :INSTRument:NSELect <integer>  
                           :INSTRument:NSELect?

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<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>Remot</b>	:INSTRument:CATalog?
e	
Comm	
and	
<b>Examp</b>	:INST:CAT?
e	
Notes	Query returns a quoted string of the installed and licensed modes separated with a comma. Example: "SA,PNOISE,WCDMA"
Backwa	VSA (E4406A) :INSTRument:CATalog? returned a list of installed INSTRument:SELECT items as a
rds	comma separated list of string values:
Compat	"BASIC","GSM","EDGE GSM","CDMA","NADC","PDC","WCDMA","CDMA2K","CDMA1XEV","ID
ibility	"EN","WIDEN","WLAN","SERVICE"
Notes	X-Series uses the ESA/PSA compatible query of a string contain comma separated values: "SA,PNOISE,NFIGURE,BASIC,CDMA,CDMA2K,WCDMA,CDMA1XEV,EDGE GSM,GSM,NADC, PDC,TDSCDMA,DMODULATION,WLAN"
Initial	Prior to A.02.00
S/W	
Revisio	
n	

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## 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 228](#)

["Current Application Revision" on page 228](#)

"Current Application Options" on page 228

### 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>	:SYSTem: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>	:SYSTem: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

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(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 229](#)

["Application Catalog Model Numbers" on page 229](#)

["Application Catalog Revision" on page 230](#)

["Application Catalog Options" on page 230](#)

### Application Catalog Number of Entries

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

<b>Remote Command</b>	:SYSTem:APPLication:CATalog[:NAME]:COUNT?
<b>Example</b>	:SYST:APPL:CAT:COUN?
Preset	Not affected by Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Application Catalog Model Numbers

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

<b>Remote Command</b>	:SYSTem:APPLication:CATalog[:NAME]?
<b>Example</b>	:SYST:APPL:CAT?
Notes	Returned value is a quoted string of a comma separated list of Model Numbers. Example, if SAMS and Phase Noise are installed and licensed: "N9060A,N9068A" String length is COUNT * 7 – 1. (7 = Model Number length + 1 for comma. –1 = no comma for the 1st entry.)

Preset	Not affected by a Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Application Catalog Revision

Returns the Revision of the provided Model Number.

<b>Remote Command</b>	:SYST:APPLication:CATalog:REVision? <model>
<b>Example</b>	: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 :SYSTem:OPTion?. If the provided Model Number is not installed and licensed a null-string ("") will be returned. Example, if SAMS is installed and licensed: "2FP" String length is a maximum of 255 characters.
Preset	Not affected by a Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Detailed List of Modes

This 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 it's 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-Series VSA software application. The 89600 VSA software is powerful, PC-based software, offering the industry's most sophisticated general purpose and standards specific signal evaluation and troubleshooting tools for the R&D engineer. Reach deeper into signals, gather more data on signal problems, and gain greater insight.

- Over 30 general-purpose analog and digital demodulators ranging from 2FSK to 1024QAM
- Standards specific modulation analysis including:
- Cell: GSM, cdma2000, WCDMA, TD-SCDMA and more
- Wireless networking: 802.11a/b/g, 802.11n, 802.16 WiMAX (fixed/mobile), UWB
- RFID
- Digital satellite video and other satellite signals, radar, LMDS
- Up to 400K bin FFT, for the highest resolution spectrum analysis
- A full suite of time domain analysis tools, including signal capture and playback, time gating, and CCDF measurements
- Six simultaneous trace displays and the industry's most complete set of marker functions
- Easy-to-use Microsoft ® Windows ® graphical user interface

For more information see the Agilent 89600 Series VSA web site at [www.agilent.com/find/89600](http://www.agilent.com/find/89600)

To learn more about how to use the 89600 VSA running in the X-Series, after the 89600 VSA application is running, open the 89600 VSA Help and open the "About Agilent X-Series Signal Analyzers (MXA/EXA) with 89600-Series 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.

## 5 Mode Functions

### 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 DCATV 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.10.01

## 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 with option BBA. Option 3FP WLAN has been discontinued.

N9064A honors existing 89601X licenses with all features and functionalities found on X-Series software versions prior to A.06.00. Specifically:

N9064A-1 is equivalent to 89601X-205

N9064A-2 is equivalent to 89601X-AYA

N9064A-3 is equivalent to 89601X-B7R

If you are using the Help feature, this mode must be currently active to access its detailed information. If it is not active, exit the Help feature (Esc key), select the mode, and re-access Help.

Key Path	Mode
<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.10.01

## 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>	:GLOBal:FREQuency:CENTER[:STATe] 1 0 ON OFF :GLOBal:FREQuency:CENTER[:STATe]?
Preset	Off
Initial S/W Revision	Prior to A.02.00

---

## Restore Defaults

This key resets all of the functions in the Global Settings menu to Off. This also occurs when System, Restore Defaults, All Modes is pressed.

---

Key Path	Mode Setup, Global Settings
<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

## IF Path

Enables you to select different IF Paths for the AIF/DIF boards.

The selections are 10 MHz, 25 MHz, 40 MHz, 85 MHz, 125 MHz, and 140 MHz paths. However, depending on the model or option, some of these paths might not be available.

Key Path	Mode Setup
Mode	BASIC
<b>Remote Command</b>	<code>[::SENSe] :IFPath B10M B25M B40M B85M B125M B140M B160M</code> <code>[::SENSe] :IFPath?</code>
<b>Example</b>	IFP B25M IFP?
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode. B10M = 10 MHz B25M = 25 MHz

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B40M = 40 MHz

B85M = 85 MHz

B125M = 125 MHz

B140M = 140 MHz

B160M = 160 MHz

In cases where the path is not available but is selected from SCPI, it generates an error –241, "Hardware missing; Option not installed."

#### Dependencies

The 25 MHz path is available only when 25 MHz or wider IF Bandwidth option is installed.

The 40 MHz path is available only when 40 MHz or wider IF Bandwidth option is installed.

The 85 MHz path is available only when 85 MHz or wider IF Bandwidth option is installed.

The 125 MHz path is available only when 125 MHz or wider IF Bandwidth option is installed.

The 140 MHz path is available only when Option B1X is installed.

The 160 MHz path is available only when Option B1Y is installed. There cannot be a B1Y option without a B1X option.

If Option B85 is installed, and also B1A or B1X is installed, the 85 MHz key does not show up and the B85M SCPI selection is disabled. When the B85M SCPI is selected in this case, the instrument generates an error –221, "Settings Conflict; Use wider bandwidth selection".

If Option B1A is installed, and also B1X is installed, the 125 MHz key does not show up and the B125M SCPI selection is disabled. When the B125M SCPI is selected in this case, the instrument generates an error –221, "Settings Conflict; Use wider bandwidth selection".

In cases where the path is not available but is selected from SCPI, it generates an error –241, "Hardware missing; Option not installed".

The preset value depends on the Digital IF BW setting of the default measurement.

---

Preset	If the 25 MHz path is not available, it presets to 10 MHz.
--------	--

State Saved	Saved in instrument state.
-------------	----------------------------

Range	B10M B25M B40M B85M B125M B140M B160M
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Readback text	Currently selected IF Path selection.
---------------	---------------------------------------

Initial S/W Revision	A.04.00, A.13.00
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## IF Path Auto

Automatically selects between the IF Paths based on the current measurements Digital IF Bandwidth setting.

When IF Path Auto is set to ON and the measurement tries to set a Digital IF Bandwidth between 10 and 25 MHz, the IF Path parameter automatically switches from 10 MHz to 25 MHz. When the measurement sets the Digital IF Bandwidth back to a value narrower than 10 MHz, then the IF Path automatically switches from 25 MHz to 10 MHz. This is the same for the other paths as well. If the instrument has options B25 and B1X

installed but not B40, when the IF Path Auto is set ON and the current measurement sets the IF Bandwidth from 14 MHz to 26 MHz, the IF Path automatically switches from 25 MHz to 140 MHz since the 40 MHz path is not available.

When reducing the Digital IF Bandwidth, the selected IF Path is the narrowest possible path applicable.

For example, an instrument with B25,B40 and B1X installed and the user currently has IF Path Auto set to ON and the Digital IF Bandwidth is 50 MHz, the IF Path selection will be 140 MHz. If the bandwidth decreases and the value is 40 MHz or narrower (but above 25 MHz), the IF Path will automatically change to 40 MHz. Similarly, for bandwidths equal to or narrower than 25 MHz (but above 10 MHz), the 25 MHz path is selected. For bandwidths equal to or narrower than 10 MHz, the 10 MHz path is selected.

These rules apply even for DIF configurations of Swept DIF + WBDIF.

Key Path	Mode Setup, IF Path
Mode	BASIC
Remote Command	<code>[::SENSe]:IFPath:AUTo ON OFF 1 0</code> <code>[::SENSe]:IFPath:AUTo?</code>
Example	<code>IFP:AUTo ON</code> <code>IFP:AUTo?</code>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use <code>INSTrument:SElect</code> to set the mode.
Dependencies	This feature automatically selects between the IF Paths available. If no analysis bandwidth option is installed, it will always select 10 MHz.
Preset	ON
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	A.04.00

## 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. This function will never cause a mode switch. This function performs a full preset for the currently active mode; whereas, Mode Preset performs a partial preset. Restore Mode Defaults does not affect any system settings. System settings are reset by the Restore System Defaults function. This function does reset mode data; as well as settings.

Key Path	Mode Setup
Remote Command	<code>:INSTrument:DEFault</code>
Example	<code>:INST:DEF</code>
Notes	Clears all pending OPC bits. The Status Byte is set to 0.

---

	A message comes up saying: "If you are sure, press key again".
Couplings	A Restore Mode Defaults will cause the currently running measurement to be aborted and causes the default measurement to be active. It gets the mode to a consistent state with all of the default couplings set.
Initial S/W Revision	Prior to A.02.00

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## Preset Type (Remote Command Only)

As stated in the Backward Compatibility section, to be compatible with ESA/PSA the PRESet:TYPE command will be implemented as a no-op.

---

Mode	All
<b>Remote Command</b>	:SYSTem:PRESet:TYPE FACTORY MODE USER :SYSTem:PRESet:TYPE?
<b>Example</b>	:SYST:PRES:TYPE FACT
Notes	This command is supported for backward compatibility only. It is a no-op which does not change the behavior of any preset operation.
Preset	This is unaffected by Preset but is set to Mode on a "Restore System Defaults->All"
State Saved	No
Initial S/W Revision	Prior to A.02.00

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## Global Settings

Opens a menu that allows you to switch certain Meas Global parameters to a Mode Global state.

See "[Global Settings](#)" on page 242 for more information.

## 5 Mode Functions

### Mode Setup

## 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

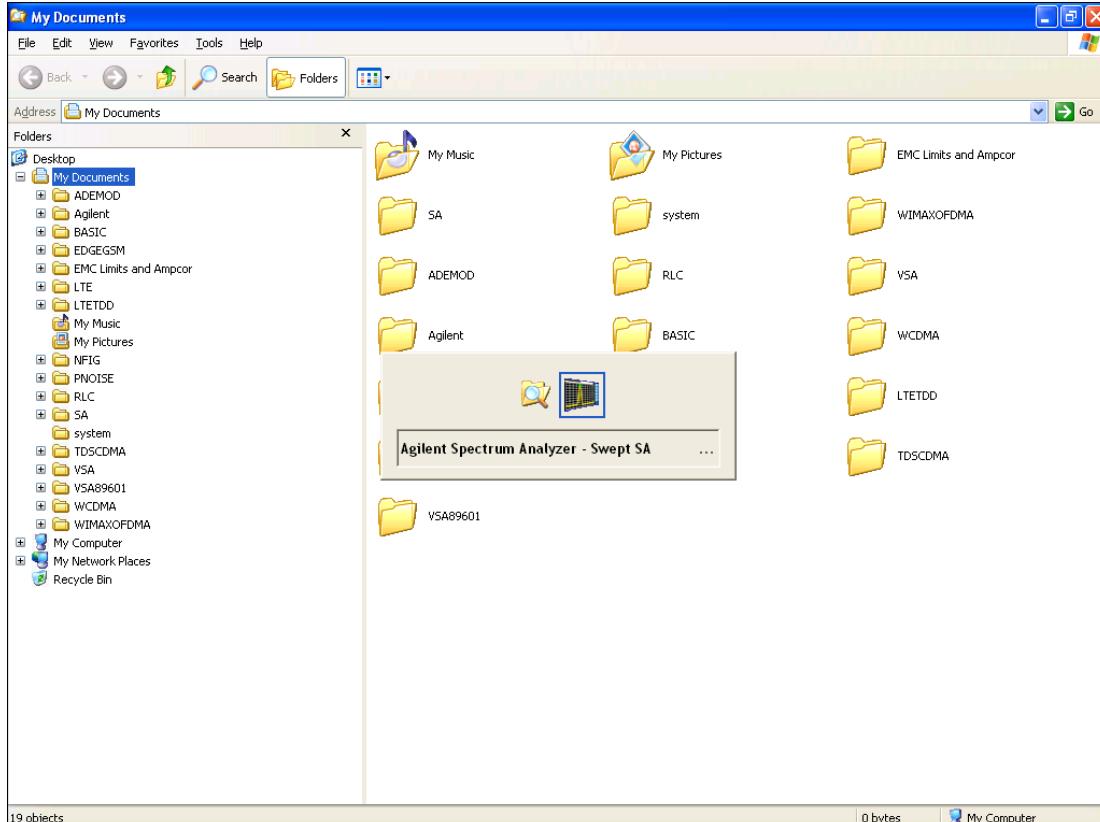
Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

## 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.

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.

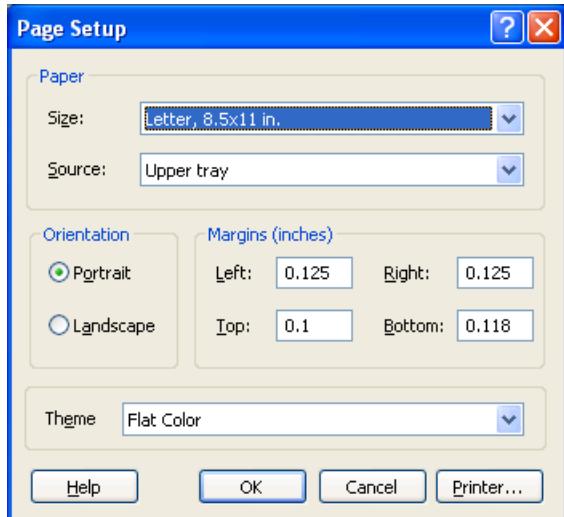
Key Path	File
Mode	All
Notes	No equivalent remote command for this key.
State Saved	No
Initial S/W Revision	A.05.01

## 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

## 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

## Minimize

The Minimize key causes the analyzer display to disappear down into the task bar, allowing you to see the

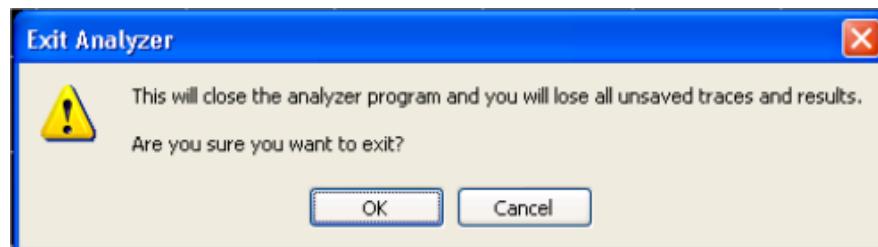


Windows Desktop. You can use Alt-Tab ( press and hold the Alt key and press and release the Tab key) to restore the analyzer display.

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

## Exit

This key, when pressed, will exit the Instrument Application. A dialog box is used to confirm that you intended to exit the application:



Key Path	File
Mode	All
Notes	The Instrument Application willclose. No further SCPI commands can be sent. Use with caution!
Initial S/W Revision	Prior to A.02.00



## 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
Remote Command	:SYST:SHOW OFF   ERRor   SYSTem   HARDware   LXI   HWSTatistics   ALIGNment   SOFTware   CAPplication :SYST:SHOW?
Example	:SYST:SHOW SYST
Notes	This command displays (or exits) the various System information screens.
Preset	OFF
State Saved	No
Range	OFF ERRor SYSTem HARDware LXI HWSTatistics ALIGNment SOFTware CAPplication
Initial S/W Revision	Prior to A.02.00

## Errors

There are two modes for the Errors selection, History and Status.

The list of errors displayed in the Errors screen does not automatically refresh. You must press the Refresh key or leave the screen and return to it to refresh it.

History brings up a screen displaying the event log in chronological order, with the newest event at the top. The history queue can hold up to 100 messages (if a message has a repeat count greater than 1 it only counts once against this number of 100). Note that this count bears no relation to the size of the SCPI queue. If the queue extends onto a second page, a scroll bar appears to allow scrolling with a mouse. Time is displayed to the second.

Status brings up a screen summarizing the status conditions currently in effect. Note that the time is displayed to the second.

The fields on the Errors display are:

Type (unlabeled) - Displays the icon identifying the event or condition as an error or warning.

ID - Displays the error number.

Message - Displays the message text.

Repeat (RPT) - This field shows the number of consecutive instances of the event, uninterrupted by other events. If an event occurs 5 times with no other intervening event, the value of repeat will be 5.

If the value of Repeat is 1 the field does not display. If the value of Repeat is >1, the time and date shown are those of the most recent occurrence. If the value of repeat reaches 999,999 it stops there.

Time - Shows the most recent time (including the date) at which the event occurred.

Key Path	System, Show
Mode	All
Remote Command	:SYST:ERRor [:NEXT] ?
Example	: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 259.](#)

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

**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:

## 6 System Functions

### System

Normal response to :SYST:ERR (using the Telnet window):

SCPI> SENS:BOGUS

SCPI> SYST:ERR?

-113,"Undefined header"

Now after turning on Verbose SCPI:

SCPI> SYST:BOGUS

SCPI> SYST:ERR?

-113,"Undefined header;SYST:BOGUS<Err>"

Key Path	System, Show, Errors
Mode	All
Remote Command	:SYSTem:ERRor:VERBose OFF ON 0 1 :SYSTem:ERRor:VERBose?
Example	:SYST:ERR:VERB ON
Preset	This is unaffected by Preset but is set to OFF on a "Restore System Defaults->Misc"
State Saved	No
Range	On   Off
Initial S/W Revision	Prior to A.02.00

### Refresh

When pressed, refreshes the Show Errors display.

Key Path	System, Show, Errors
Initial S/W Revision	Prior to A.02.00

### Clear Error Queue

This clears all errors in all error queues.

Note the following:

- Clear Error Queue does not affect the current status conditions.
- Mode Preset does not clear the error queue.
- Restore System Defaults will clear all error queues.
- \*CLS only clears the queue if it is sent remotely and \*RST does not affect any error queue.

- Switching modes does not affect any error queues.

Key Path	System, Show, Errors
Initial S/W Revision	Prior to A.02.00

## Status

See "[History](#)" on page [259](#).

### **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

## System

The System screen is formatted into three groupings: product descriptive information, options tied to the hardware, and software products:

## 6 System Functions

### System

<Product Name> <Product Description>	
Product Number: N9020A	
Serial Number: US46220924	
Firmware Revision: A.01.01	
Computer Name: <hostname>	
Host ID: N9020A,US44220924	
N9020A-503	Frequency Range to 3.6 GHz
N9020A-PFR	Precison Frequency Reference
N9020A-P03	Preamp 3.6 GHz
N9060A-2FP	Spectrum Analysis Measurement Suite
N9073A-1FP	WCDMA
N9073A-2FP	WCDMA with HSDPA
	1.0.0.0
	1.0.0.0
	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	System, Show
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:CONFigeR [ :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

## 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	System, Show
Initial S/W Revision	Prior to A.02.00

---

## System Remote Commands (Remote Commands Only)

The commands in this section have no front-panel key equivalent.

"System Powerdown (Remote Command Only)" on page 264

"List installed Options (Remote Command Only)" on page 264

"Lock the Front-panel keys (Remote Command Only)" on page 265

"List SCPI Commands (Remote Command Only)" on page 265

"SCPI Version Query (Remote Command Only)" on page 266

"Date (Remote Command Only)" on page 266

"Time (Remote Command Only)" on page 266

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Initial S/W Revision	Prior to A.02.00
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## System Powerdown (Remote Command Only)

---

<b>Remote Command</b>	SYSTem:PDOWn [NORMAl   FORCe]
-----------------------	-------------------------------

---

Notes	Shuts down the instrument in the normal way (NORMAl) or forced way (FORCe). In case there is another application with modified data pending for saving, the application prompt the user. The system waits until the user responds in the normal mode. It will go off after 20 seconds of wait in the force mode and all data will be lost.
-------	--

---

## List installed Options (Remote Command Only)

Lists the installed options that pertain to the instrument (signal analyzer).

---

Mode	All
------	-----

---

<b>Remote Command</b>	:SYSTem:OPTIONS?
-----------------------	------------------

---

<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

---

### 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)
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.

<b>Remote Command</b>	:SYSTem:VERSion?
<b>Example</b>	:SYST:VERS?
Initial S/W Revision	Prior to A.02.00

## Date (Remote Command Only)

The recommended access to the Date, Time, and Time zone of the instrument is through the Windows native control (Control Panel or accessing the Task Bar). You may also access this information remotely, as shown in this command and Time (below).

Sets or queries the date in the instrument.

Mode	All
<b>Remote Command</b>	:SYSTem:DATE "<year>,<month>,<day>" :SYSTem:DATE?
<b>Example</b>	:SYST:DATE "2006,05,26"
Notes	<year> is the four digit representation of year. (for example, 2006) <month> is the two digit representation of year. (for example. 01 to 12) <day> is the two digit representation of day. (for example, 01 to 28, 29, 30, or 31) depending on the month and year Unless the current account has Power User or Administrator privileges, an error will be generated by this command and no action will be taken.
Initial S/W Revision	Prior to A.02.00

## Time (Remote Command Only)

Sets or queries the time in the instrument.

Mode	All
<b>Remote Command</b>	:SYSTem:TIME "<hour>,<minute>,<second>" :SYSTem:TIME?
<b>Example</b>	:SYST:TIME "13,05,26"
Notes	<hour> is the two digit representation of the hour in 24 hour format <minute> is the two digit representation of minute

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<second> is the two digit representation of second  
Unless the current account has Power User or Adminstrator privileges, an error will be generated by this command and no action will be taken.

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

Enables you to select how the instrument should power on. The options are: Mode and Input/Output Defaults, User Preset and Last State.

---

Key Path	System
Mode	All
<b>Remote Command</b>	:SYSTem:PON:TYPE MODE   USER   LAST :SYSTem: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>	:SYSTem:PON:TYPE PRESet the “PRESet” parameter is supported for backward compatibility only and behaves the same as MODE.
Backwards Compatibility Notes	The Preset Type key in legacy analyzers has been removed, and the Power On toggle key has been replaced by this 1-of-N key in the System menu.
Initial S/W Revision	Prior to A.02.00

---

## Mode and Input/Output Defaults

When the analyzer is powered on in Mode and Input/Output Defaults, it performs a Restore Mode Defaults to all modes in the instrument and also performs a Restore Input/Output Defaults.

Persistent parameters (such as Amplitude Correction tables or Limit tables) are not affected at power on, even though they are normally cleared by Restore Input/Output Defaults and/or Restore Mode Defaults.

---

Key Path	System, Power On
Mode	All
<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
Example	SYST:PON:TYPE USER
Readback Text	User Preset
Backwards Compatibility Notes	Power On User Preset will cause the instrument to power up in the power-on mode, not the last mode the instrument was in prior to shut down. Also, Power On User Preset will User Preset all modes. This does not exactly match legacy behavior.
Initial S/W Revision	Prior to A.02.00

## Last State

Sets Power On to **Last**. When the analyzer is powered on, it will put all modes in the last state they were in prior to when the analyzer was put into Power Standby and it will wake up in the mode it was last in prior to powering off the instrument. The saving of the active mode prior to shutdown happens behind the scenes when a controlled shutdown is requested by using the front panel power Standby key or by using the remote command SYSTem:PDOWn. The non-active modes are saved as they are deactivated and recalled by Power On Last State.

**NOTE**

An instrument can never power up for the first time in Last.

If line power to the analyzer is interrupted, for example by pulling the line cord plug or by switching off power to a test rack, Power On Last State may not work properly. For proper operation, Power On Last State depends on you shutting down the instrument using the Standby key or the SYSTem:PDOWn SCPI command. This will ensure the last state of each mode is saved and can be recalled during a power up.

Key Path	System, Power On
Mode	All
Example	SYST:PON:TYPE LAST
Notes	Power on Last State only works if you have done a controlled shutdown prior to powering on in Last. If a controlled shutdown is not done when in Power On Last State, the instrument will power up in the last active mode, but it may not power up in the active mode's last state. If an invalid mode state is detected, a Mode Preset will occur. To control the shutdown under remote control use the :SYSTem:PDOWn command.
Readback Text	Last State

---

Backwards Compatibility Notes	It is no longer possible to power-up the analyzer in the last mode the analyzer was running with that mode in the preset state. (ESA/PSA SYST:PRESET:TYPE MODE with SYST:PON:PRESET) You can power-on the analyzer in the last mode the instrument was running in its last state (SYST:PON:TYPE LAST), or you can specify the mode to power-up in its preset state (SYST:PON:MODE <mode>).
Initial S/W Revision	Prior to A.02.00

---

## Power On Application

Accesses a menu that lists the available Modes and lets you select which Mode is to be the power-on application.

This application is used for Power On Type “Mode and Input/Output Defaults” and Restore System Defaults All.

---

Key Path	System, Power On
Mode	All
Remote Command	:SYSTem:PON:MODE SA   BASIC   ADEM0D   NFIGURE   PNOISE   CDMA2K   TDSCDMA   VSA   VSA89601   WCDMA   WIMAXOFDMA :SYSTem:PON:MODE?
Example	SYST:PON:MODE SA
Notes	The list of possible modes (and remote parameters) to choose from is dependent on which modes are installed in the instrument.
Preset	This is unaffected by a Preset but is set on a “Restore System Defaults->All” to SA.
State Saved	No
Initial S/W Revision	Prior to A.02.00

---

## Configure Applications

The Configure Applications utility can be used to:

- select applications for preload
- determine how many applications can fit in memory at one time
- specify the order of the Modes in the Mode menu.

This utility consists of a window with instructions, a set of “Select Application” checkboxes, a “fuel bar” style memory gauge, and keys that help you set up your configuration.

For more information, see the following topics:

["Preloading Applications" on page 270](#)

["Access to Configure Applications utility" on page 270](#)

"Virtual memory usage" on page 270

Key Path	System, Power On
<b>Example</b>	: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 Agilent. 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

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### Select/Deselect

Toggles the currently highlighted application in the list.

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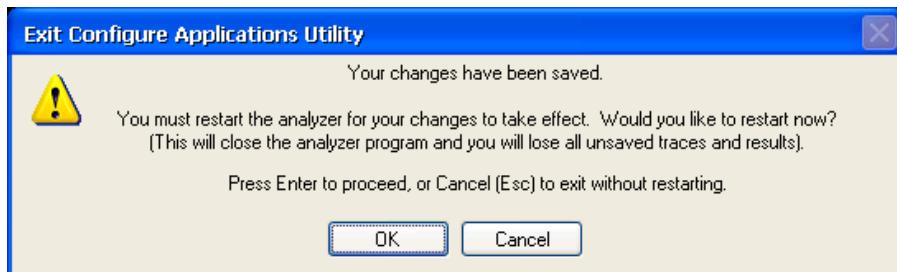
Key Path	System, Power On, Configure Applications
Initial S/W Revision	A.02.00

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### Save Changes and Exit

Applies the configuration of the applications list. The marked applications will be pre-loaded in memory the next time the instrument application is started, and the order of the applications in the list will be the order of the applications in the Mode Menu.

After saving your changes, the analyzer asks you if you would like it to restart so that your changes can take effect (see dialog box, below). If you choose not to restart, the changes will not take affect until the next time you shut down and restart the analyzer.



---

Key Path	System, Power On, Configure Applications
Remote Command	:SYSTem:PUP:PROcess
Example	:SYST:PUT: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

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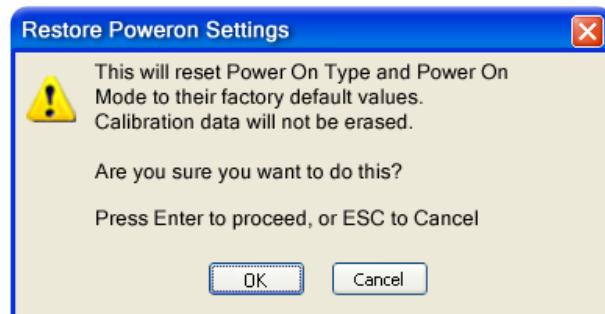
## Exit Without Saving

Pressing this key will exit the Configure Applications utility without saving your changes.

Key Path	System, Power On, Configure Applications
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.04.00

## Restore Power On Defaults

This selection causes the Power On Type and Power On Application settings to be a reset to their default values. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch. The Power On key, under the Restore System Defaults menu, causes the same action.



If you press any key other than OK or Enter, it is construed as a Cancel, because the only path that will actually cause the reset to be executed is through OK or Enter.

Key Path	System, Power On
Example	:SYST:DEF PON
Initial S/W Revision	Prior to A.02.00

## Configure Applications - 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 274](#)
- ["Configuration Memory Available \(Remote Command Only\)" on page 274](#)
- ["Configuration Memory Total \(Remote Command Only\)" on page 275](#)
- ["Configuration Memory Used \(Remote Command Only\)" on page 275](#)
- ["Configuration Application Memory \(Remote Command Only\)" on page 275](#)

### 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[:AVAILable]?
<b>Example</b>	:SYST:PON:APPL:VMEM?
Preset	Not affected by Preset
Initial S/W Revision	A.02.00

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### 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>	:SYSTem:PON:APPLICATION:VMEMORY:TOTal?
<b>Example</b>	:SYST:PON: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>	:SYSTem:PON:APPLICATION:VMEMORY:USED?
<b>Example</b>	:SYST:PON: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>	:SYSTem:PON:APPLICATION:VMEMORY:USED:NAME? <INSTRument:SElect name>
<b>Example</b>	:SYST:PON: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.



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

### Auto Align

Configures the method for which the automatic background alignment is run.

Automatic background alignments are run periodically between measurement acquisitions. The instrument's software determines when alignments are to be performed to maintain warranted operation. The recommended setting for Auto Align is Normal.

An Auto Align execution cannot be aborted with the Cancel (ESC) key. To interrupt an Auto Align execution, select Auto Align Off.

Key Path	System, Alignments
Mode	All
Remote Command	:CALibration:AUTO ON PARTIAL OFF :CALibration:AUTO?
Example	:CAL:AUTO ON
Notes	While Auto Align is executing, bit 0 of Status Operation register is set.
Couplings	Auto Align is set to Off if Restore Align Data is invoked.
Preset	This is unaffected by Preset but is set to ON upon a "Restore System Defaults->Align".
State Saved	No
Status Bits/OPC dependencies	When Auto Align is executing, bit 0 in the Status Operational register is set.
Backwards Compatibility SCPI	:CALibration:AUTO ALERT Parameter ALERT is for backward compatibility only and is mapped to PARTIAL
Backwards Compatibility Notes	1. ESA SCPI for Auto Align is :CALibration:AUTO <Boolean>. The command for X-Series is an enumeration. Thus the parameters of "0" and "1" are not possible in X-Series. 2. Similarly, the ESA SCPI for :CALibration:AUTO? returned the Boolean value 1 or 0, in X-Series it is an Enumeration (string). Thus, queries by customer applications into

- 
- numeric variables will result in an error
3. In PSA Auto Align OFF was not completely off, it is equivalent to PARTial in X-Series. In X-Series, OFF will be fully OFF. This means users of PSA SCPI who choose OFF may see degraded performance and should migrate their software to use PARTial.

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Initial S/W Revision	Prior to A.02.00
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## Normal

Auto Align, Normal turns on the automatic alignment of all measurement systems. The Auto Align, Normal selection maintains the instrument in warranted operation across varying temperature and over time.

If the condition “Align Now, All required” is set, transition to Auto Align, Normal will perform the required alignments and clear the “Align Now, All required” condition and then continue with further alignments as required to maintain the instrument adequately aligned for warranted operation.

When Auto Align, Normal is selected the Auto Align Off time is set to zero.

When Auto Align, Normal is selected the Settings Panel indicates ALIGN AUTO.

---

Key Path	System, Alignments, Auto Align
Mode	All
Example	:CAL:AUTO ON
Notes	<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

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## Partial

Auto Align, Partial disables the full automatic alignment and the maintenance of warranted operation for the benefit of improved measurement throughput. Accuracy is retained for the Resolution Bandwidth filters and the

IF Passband which is critical to FFT accuracy, demodulation, and many measurement applications. With Auto Align set to Partial, you are now responsible for maintaining warranted operation by updating the alignments when they expire. The Auto Align, Alert mechanism will notify you when alignments have expired. One solution to expired alignments is to perform the Align All, Now operation. Another is to return the Auto Align selection to Normal.

Auto Align, Partial is recommended for measurements where the throughput is so important that a few percent of improvement is more valued than an increase in the accuracy errors of a few tenths of a decibel. One good application of Auto Align, Partial would be an automated environment where the alignments can be called during overhead time when the device-under-test is exchanged.

When Auto Align, Partial is selected the elapsed time counter begins for Auto Align Off time.

When Auto Align, Partial is selected the Settings Panel indicates ALIGN PARTIAL with a warning icon. The warning icon is to inform the operator that they are responsible for maintaining the warranted operation of the instrument

Key Path	System, Alignments, Auto Align
Mode	All
Example	:CAL:AUTO PART
Notes	Auto Align Partial begins the elapsed time counter for Auto Align Off time.
Readback Text	Partial
Initial S/W Revision	Prior to A.02.00

## Off

Auto Align, Off disables automatic alignment and the maintenance of warranted operation, for the benefit of maximum measurement throughput. With Auto Align set to Off, you are now responsible for maintaining warranted operation by updating the alignments when they expire. The Auto Align, Alert mechanism will notify you when alignments have expired. One solution to expired alignments is to perform the Align All, Now operation. Another is to return the Auto Align selection to Normal.

The Auto Align, Off setting is rarely the best choice, because Partial gives almost the same improvement in throughput while maintaining the warranted performance for a much longer time. The choice is intended for unusual circumstances such as the measurement of radar pulses where you might like the revisit time to be as consistent as possible.

When Auto Align, Off is selected the Auto Align Off time is initialized and the elapsed time counter begins.

When Auto Align, Off is selected the Settings Panel indicates ALIGN OFF with a warning icon. The warning icon is to inform the operator that they are responsible for maintaining the warranted operation of the instrument:

Key Path	System, Alignments, Auto Align
Mode	All

<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
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:AUTO:ALERt TTEMperature DAY WEEK NONE :CALibration:AUTO:ALERt?
<b>Example</b>	:CAL:AUTO:ALER TTEM
<b>Notes</b>	The alert that alignment is needed is the setting of bit 14 in the Status Questionable Calibration register.
<b>Preset</b>	This is unaffected by Preset but is set to TTEMperature on a “Restore System Defaults->Align”.
<b>State Saved</b>	No
<b>Status Bits/OPC dependencies</b>	The alert is the Error Condition message “Align Now, All required” and bit 14 is set in the Status Questionable Calibration register.
<b>Initial S/W Revision</b>	Prior to A.02.00

### Time & Temperature

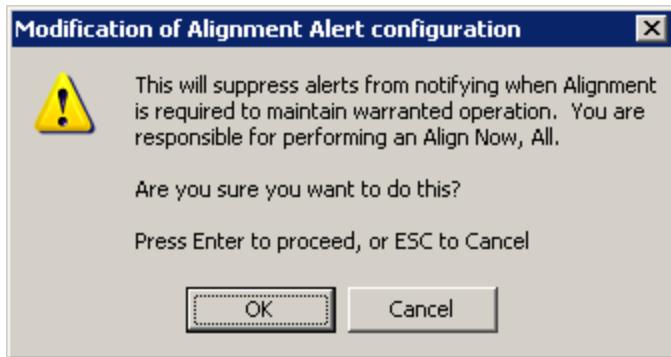
With Auto Align Alert set to Time & Temperature the instrument will signal an alert when alignments expire due to the combination of the passage of time and changes in temperature. The alert is the Error Condition message “Align Now, All required”. If this choice for Alert is selected, the absence of 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
<b>Mode</b>	All
<b>Example</b>	:CAL:AUTO:ALER TTEM
<b>Readback Text</b>	Time & Temp
<b>Status Bits/OPC dependencies</b>	Bit 14 is set in the Status Questionable Calibration register.
<b>Initial S/W Revision</b>	Prior to A.02.00

### 24 hours

With Auto Align Alert set to 24 Hours the instrument will signal an alert after a time span of 24 hours since the last successful full alignment (for example, Align Now, All or completion of a full Auto Align). You may choose this selection in an environment where the temperature is stable on a daily basis at a small risk of accuracy errors in excess of the warranted specifications. The alert is the Error Condition message “Align Now, All required”.

For front-panel operation , confirmation is required to transition into this setting of Alert. The confirmation dialog is:



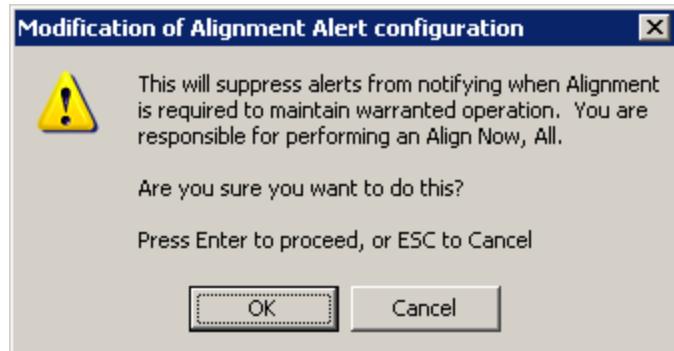
No confirmation is required when Alert is configured through a remote command.

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

### 7 days

With Auto Align Alert is set to 7 days the instrument will signal an alert after a time span of 168 hours since the last successful full alignment (for example, Align Now, All or completion of a full Auto Align). You may choose this selection in an environment where the temperature is stable on a weekly basis, at a modest risk of accuracy degradations in excess of warranted performance. The alert is the Error Condition message “Align Now, All required”.

For front panel operation, confirmation is required for the customer to transition into this setting of Alert. The confirmation dialog is:



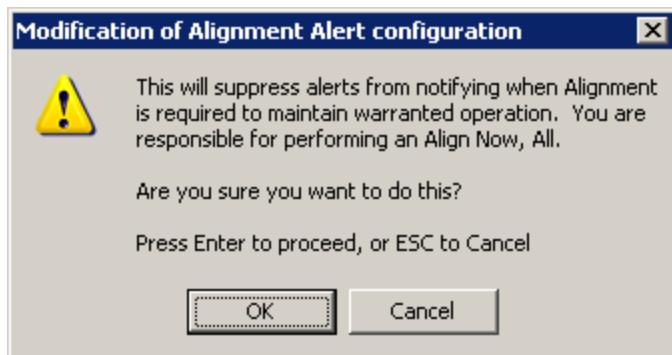
No confirmation is required when Alert is configured through a remote command.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
<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. Agilent does not recommends using this selection in any other circumstances, because of the risk of accuracy performance drifting well beyond expected levels without the operator being informed.

For front panel operation, confirmation is required to transition into this setting of Alert. The confirmation dialog is:



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

Key Path	System, Alignments, Auto Align, Alert
Mode	All
<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
Notes	<p>:CALibration[:ALL]? returns 0 if successful          :CALibration[:ALL]? returns 1 if failed          :CALibration[:ALL]? is the same as *CAL?</p> <p>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.</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.</p> <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.          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.</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
Remote Command	*CAL?
Example	*CAL?
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

**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.

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	:CALibration:NRF

	:CALibration:NRF?
<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.          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

## 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>	System, Alignments, Align Now
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:RF :CALibration:RF?
<b>Example</b>	:CAL:RF
<b>Notes</b>	<p>:CALibration:RF? returns 0 if successful</p> <p>: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>
<b>Couplings</b>	<p>Initializes the time for the Last Align Now, RF Time.</p> <p>Records the temperature for the Last Align Now, RF Temperature.</p>
<b>Status Bits/OPC dependencies</b>	Bits 11, 12, or 14 may be set in the Status Questionable Calibration register.
<b>Initial S/W Revision</b>	Prior to A.02.00

## 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:

## 6 System Functions

### System

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	:SYST:POW:TIME?
Example	:SYST:POW:TIME?
Notes	Value is the time since the most recent start-up in seconds.
State Saved	No
Initial S/W Revision	Prior to A.02.00

---

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	:CALibration:TEMPerature:CURREnt?

---

<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

<b>Key Path</b>	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

<b>Key Path</b>	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

<b>Key Path</b>	Visual annotation in the Show Alignment Statistics screen
Mode	All
<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

<b>Key Path</b>	Visual annotation in the Show Alignment Statistics screen
-----------------	---

## 6 System Functions

### System

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

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TIME:SOURce:LALL?
<b>Example</b>	:CAL:TIME:SOUR:LALL?
Notes	Value is the date and time of the last successful Align Now, Source was performed on the instrument.
State Saved	No
Initial S/W Revision	A.05.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TEMPerature:SOURce: LALL?
<b>Example</b>	:CAL:TEMP:SOUR:LALL?
Notes	Value is in degrees Centigrade at which the last successful Align Now, Source was performed on the instrument.
State Saved	No
Initial S/W Revision	A.05.00

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

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.
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
<b>Remote Command</b>	:CALibration:TIME:RFPSelctor: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
<b>Remote Command</b>	:CALibration:TEMPerature:RFPSelctor: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
<b>Remote Command</b>	:CALibration:TIME:RFPSelctor: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

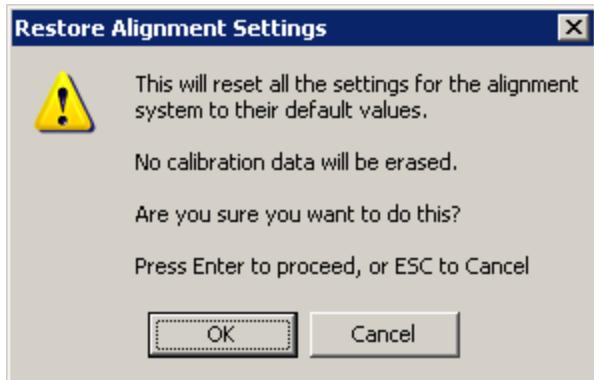
Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TEMPerature:RFPSelctor:LRADiated?
<b>Example</b>	:CAL:TEMP:RFPS:LRAD?
Notes	Value is in degrees Centigrade at which the last successful Align Now, 30 MHz – 3.6 GHz was executed.
State Saved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

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:RFPSelctor:SCHeduler:TIME:NEXT?
	This query returns data using the following format “YYYY/MM/DD; HH:MM:SS”
<b>Example</b>	:CAL:RFPS:SCH:TIME:NEXT?
Notes	<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> <p>For model N9038A only.</p>
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. Agilent uses high quality hard drives; however it is highly recommended the alignment data be backed-up to storage outside of the instrument. Additionally, for customers who use multiple CPU Assemblies or multiple disk drives, the alignment that pertains to the instrument must be transferred to the resident hard drive after a CPU or hard drive is replaced. This utility facilitates backing-up and restoring the alignment data.

**NOTE** This utility allows the operator to navigate to any location of the Windows file system. It is intended that the operator use a USB memory device or Mapped Network Drive to back up the alignment data to storage outside of the instrument.

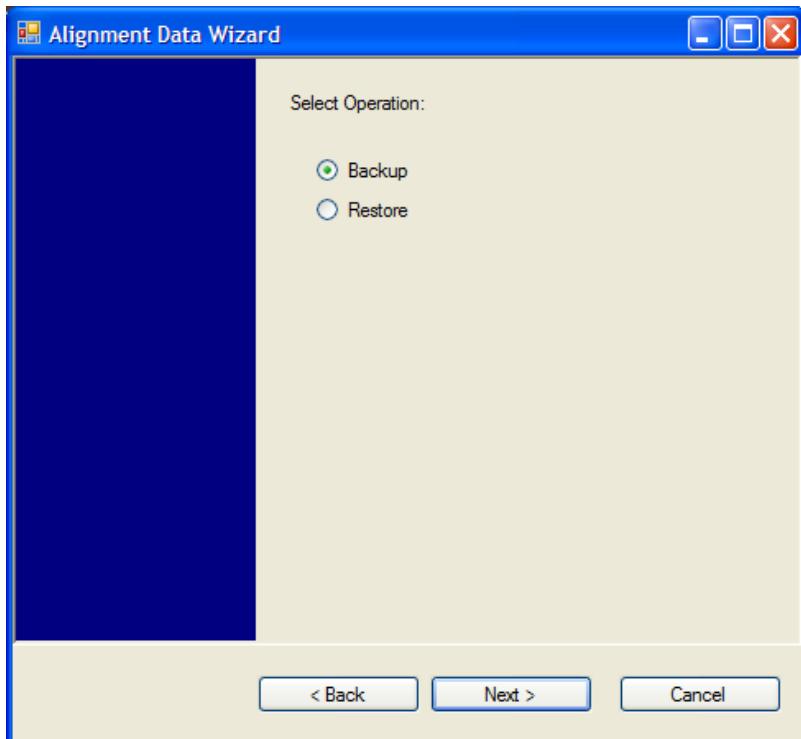
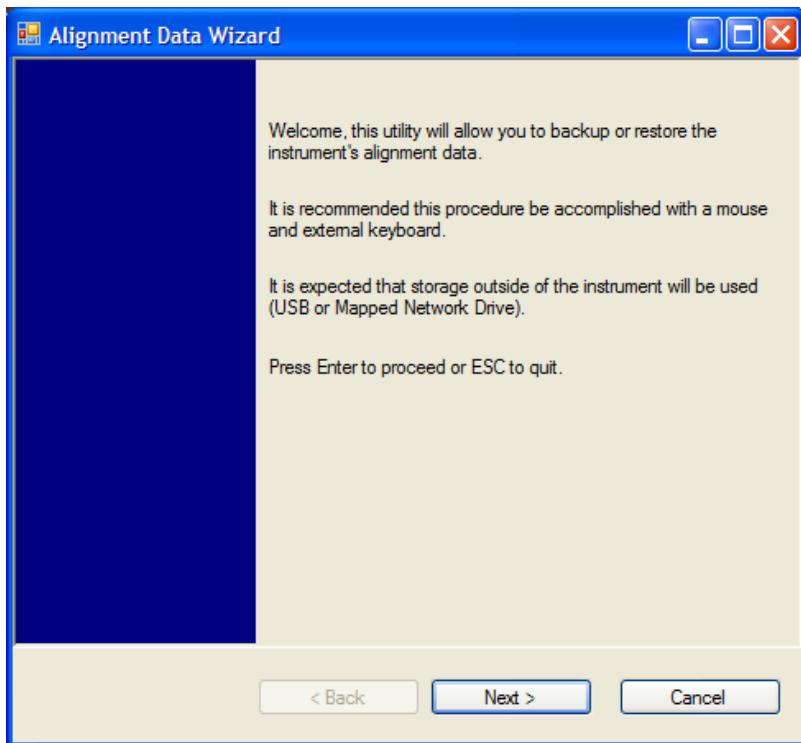
Key Path	System, Alignments
Initial S/W Revision	A.02.00

Key Path	System, Alignments
Mode	All
<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.

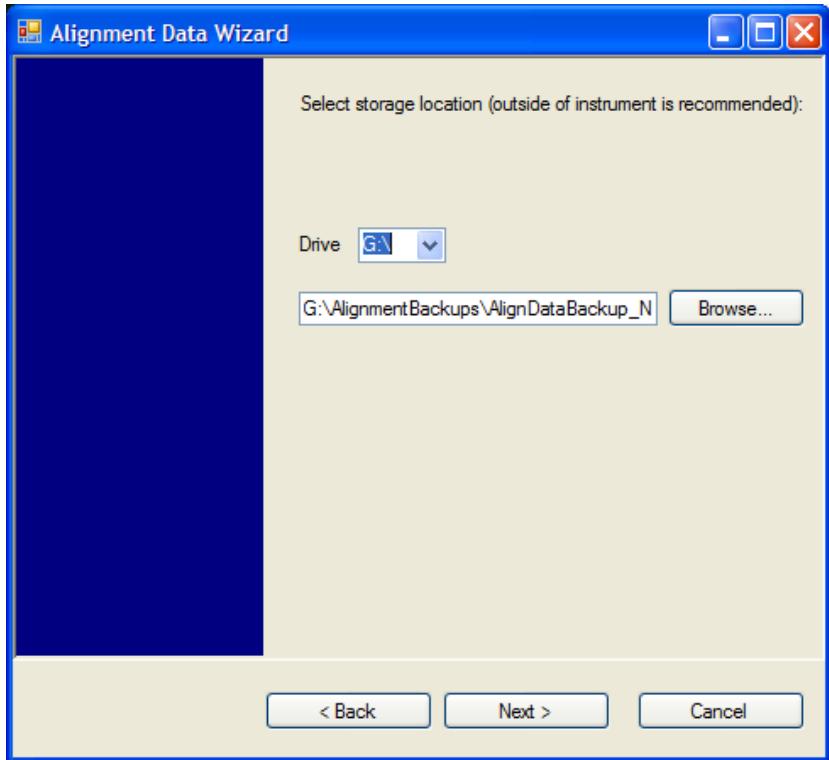
The following dialogue boxes operates without a mouse or external keyboard when you use the default file names.



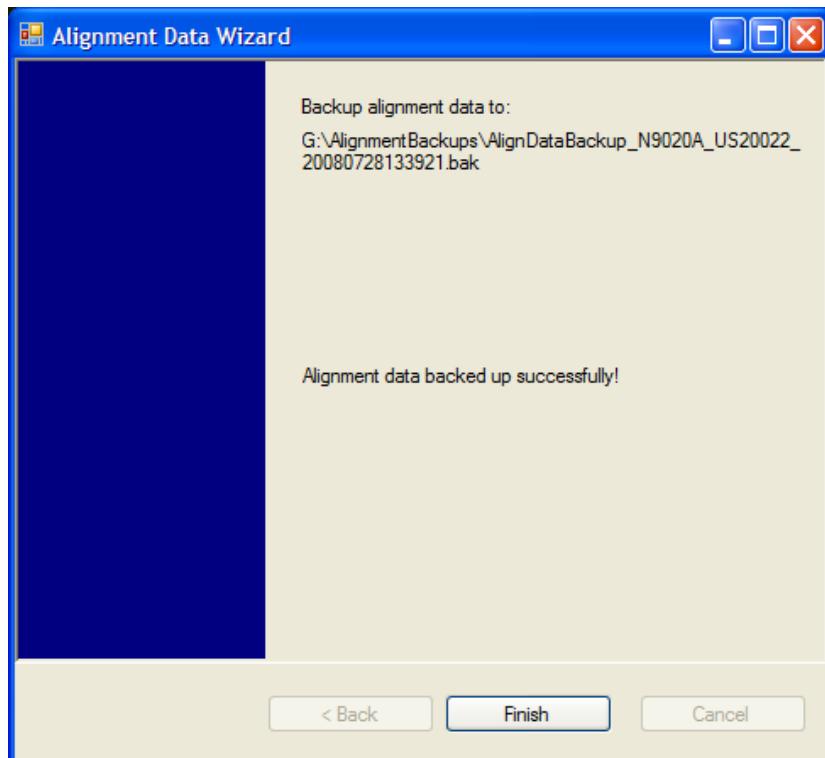
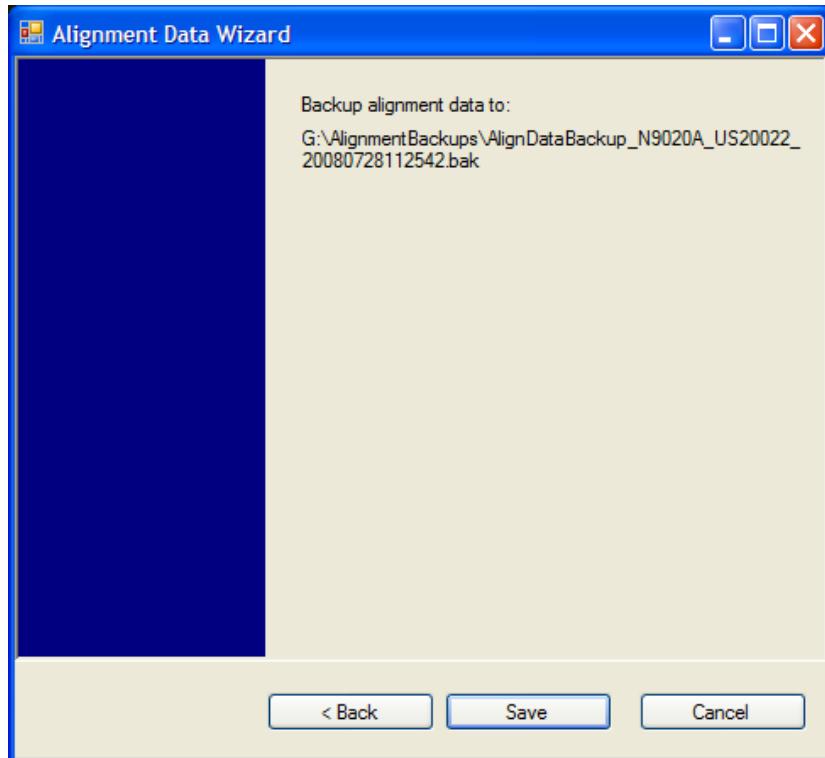
The backup screen indicates the approximate amount of space required to contain the backup file.

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

For the N9030A the default backup location will be the internal F: drive which is a solid-state memory device located internally on the instrument.

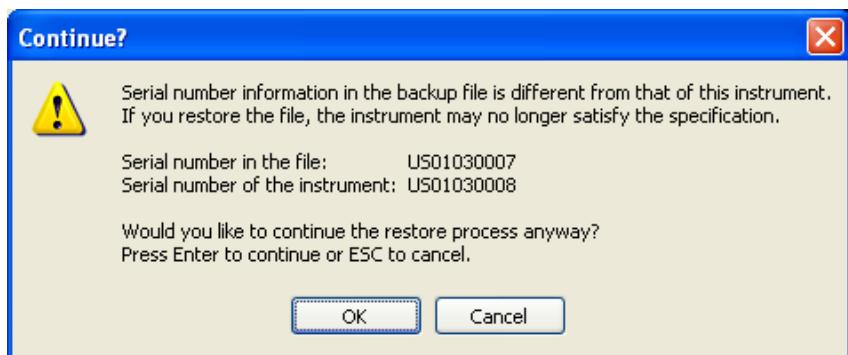


Changing the drive letter will also modify the path displayed in the box below. When this step is first loaded, the drive drop-down menu is populated with connected drives, which provide the user with write access. If there are many unreachable network drives connected to the instrument, this step can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

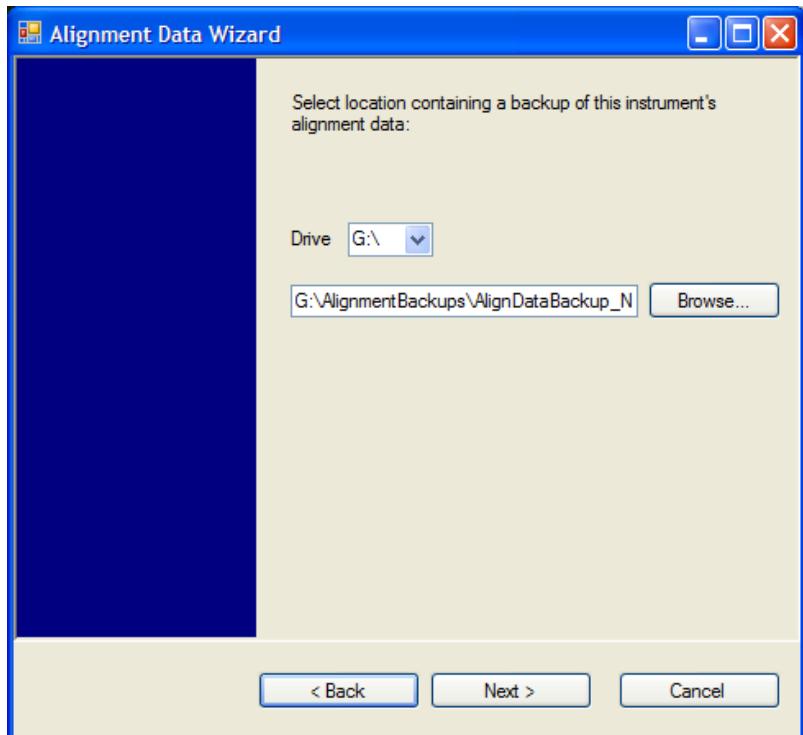


The restore operation checks the validity of the restore file using the database's built-in file validation. If the restore file is corrupt, the existing alignment data will remain in use.

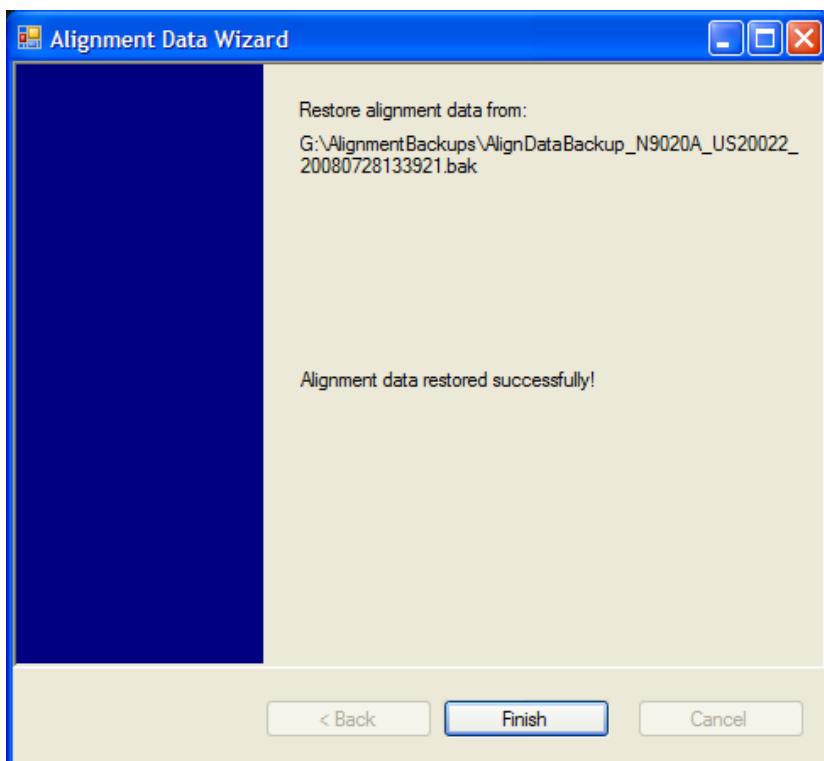
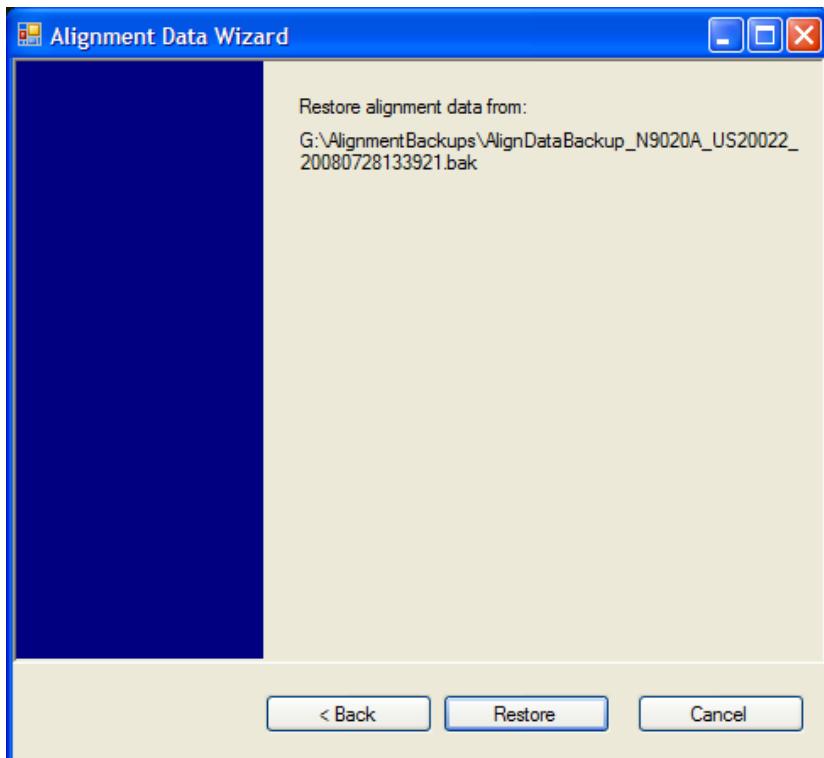
If the serial number information in the backup file being restored is different from that of the instrument, the following message appears (the serial number shown are examples):



For the N9030A, the default restore location is the internal F: drive, which is a solid-state memory device located internally on the instrument. The default restore file will be the most recent file that matches the default backup file name format: AlignDataBackup\_N9030A\_<serial number>\_<date>.bak



Changing the drive letter also modifies the path displayed in the box below. When this step is first loaded, the drive drop-down menu is populated with connected drives, which provide you with read access. The path defaults to the AlignBackups folder. The most recent \*.bak file in the folder will also be selected by default.



### Perform Backup (Remote Command Only)

Invokes an alignment data backup operation to the 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.

Agilent 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.

<b>Key Path</b>	System, Alignments, Advanced
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:YTF :CALibration:YTF?
<b>Example</b>	:CAL:YTF
<b>Notes</b>	:CALibration:YTF? returns 0 if successful :CALibration:YTF? returns 1 if failed (including interfering user signal) While Advanced, Characterize Preselector is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. Successful completion will clear bit 9 in the Status Questionable Calibration register. A failure encountered during alignment will generate the Error Condition message “Characterize Preselector failed” and set bit 9 in the Status Questionable Calibration register. For Options that support frequencies > 3.6 GHz only.
<b>Dependencies</b>	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.
<b>Couplings</b>	Initializes the time for the Last Characterize Preselector Time. Records the temperature for the Last Characterize Preselector Temperature.
<b>Initial S/W Revision</b>	Prior to A.02.00

## Timebase DAC

Allows control of the internal 10 MHz reference oscillator timebase. This may be used to adjust for minor frequency alignment between the signal and the internal frequency reference. This adjustment has no effect if the instrument is operating with an External Frequency Reference.

If the value of the Timebase DAC changes (by switching to Calibrated from User with User set to a different value, or in User with a new value entered) an alignment may be necessary. The alignment system will take appropriate action; which will either invoke an alignment or cause an Alert.

<b>Key Path</b>	System, Alignments
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:FREQuency:REFerence:MODE CALibrated USER :CALibration:FREQuency:REFerence:MODE?
<b>Example</b>	:CAL:FREQ:REF:MODE CAL
<b>Notes</b>	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.
<b>Preset</b>	This is unaffected by Preset but is set to CALibrated on a “Restore System Defaults->Align”.
<b>State Saved</b>	No
<b>Initial S/W Revision</b>	Prior to A.02.00

## Calibrated

Sets the Timebase DAC to the value established during factory or field calibration. The value displayed on the menu key is the calibrated value.

<b>Key Path</b>	System, Alignments, Timebase DAC
<b>Mode</b>	All
<b>Example</b>	:CAL:FREQ:REF:MODE CAL
<b>Readback Text</b>	[xxx] < where xxx is the calibrated value

## 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 304

See "Align Now, 30 MHz to 3.6 GHz" on page 305

See "Align Now, 20 Hz to 3.6 GHz" on page 306

See "Alert" on page 307

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
Remote Command	:CALibration:RFPreSelector:CONDucted :CALibration:RFPreSelector:CONDucted?
Example	:CAL:RFPS:COND
Notes	: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.

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	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.  For model N9038A only.
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

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### 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.

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Key Path	System, Alignments, RF Preselector, Align Now
Mode	All
Remote Command	:CALibration:RFPreSelector:RADiated :CALibration:RFPreSelector:RADiated?
Example	:CAL:RFPS:RAD
Notes	:CALibration:RFPreSelector:RADiated? Return 0 if successful :CALibration:RFPreSelector:RADiated? Return 1 if failed  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.  This command is sequential; it must complete before further SCPI commands are

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processed. 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.

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.

For model N9038A only.

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 Radiated Now, Radiated Time. Records the temperature for the Last Align Radiated Now, Radiated Temperature.
Status Bits/OPC Dependencies	Bit 8 or 9 may be set in the Status Questionable Calibration register. Bit 2 may be set in the Status Questionable Calibration Extended Needed register. Bit 1 may be set in the Status Questionable Calibration Extended Failure register.
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:RFPSelector: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.

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Key Path	System, Alignments, RF Preselector, Align Now
Mode	All
Remote Command	:CALibration:RFPSelector:FULL :CALibration:RFPSelector:FULL?

<b>Example</b>	:CAL:RFPS:FULL
Notes	<p>:CALibration:RFPSelector:FULL? Return 0 if successful      :CALibration:RFPSelector: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. 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> <p>For model N9038A only.</p>
Dependencies	This key only appears in N9038A models, setting or querying the SCPI in other models will generate an error.
Couplings	<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>
Status Bits/OPC Dependencies	<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>
Initial S/W Revision	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
Mode	All
<b>Remote Command</b>	<p>:CALibration:RFPSelector:ALERt ON OFF 0 1</p> <p>:CALibration:RFPSelector:ALERt?</p>
<b>Example</b>	:CAL:RFPS:ALER OFF
Notes	<p>For model N9038A only.</p> <p>Error Condition will be generated when the alert is On and any of the RF Preselector alignments has expired.</p>

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

## 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 task 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
Remote Command	:CALibration:RFPreSelector:SCHeduler:TASK T1 T2 T3 :CALibration:RFPreSelector:SCHeduler:TASK?
Example	: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

### 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.

<b>Key Path</b>	System, Alignments, RF Preselector, Schedule Setup
<b>Mode</b>	All
<b>Remote Command</b>	<pre>:CALibration:RFPSelector:SCHeduler:TIME:START "date","time" :CALibration:RFPSelector:SCHeduler:TIME:START?</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"
<b>Notes</b>	<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>
<b>Preset</b>	This is unaffected by Preset but is set to Current date and 00:00:00 on a "Restore System Defaults->Align".
<b>State Saved</b>	No
<b>Initial S/W Revision</b>	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.

<b>Key Path</b>	System, Alignments, RF Preselector, Schedule Setup, Date/Time
<b>Notes</b>	<p>See "<a href="#">Date/Time</a> " on page 308.</p> <p>For model N9038A only.</p>
<b>Preset</b>	This is unaffected by Preset but is set to Current date and 00:00:00 on a "Restore System Defaults->Align".
<b>State Saved</b>	No
<b>Initial S/W Revision</b>	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 " <a href="#">Date/Time</a> " on page 308 . 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
Remote Command	:CALibration:RFPreSelector:SCHeduler:RECurrence DAY WEEK OFF :CALibration:RFPreSelector:SCHeduler:RECurrence?
Example	: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.

<b>Key Path</b>	System, Alignments, RF Preselector, Schedule Setup, Recurrence, Every N Weeks
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:RFPSelector:SCHecluler:RECurrence:WEEK <integer> :CALibration:RFPSelector:SCHecluler:RECurrence:WEEK?
<b>Example</b>	:CAL:RFPS:SCH:REC:WEEK 2
<b>Notes</b>	New scheduled date to run the alignment task will get updated when this parameter is changed. For model N9038A only.
<b>Preset</b>	This is unaffected by Preset but is set to 1 on a "Restore System Defaults->Align".
<b>State Saved</b>	No
<b>Range</b>	1–52
<b>Min</b>	1
<b>Max</b>	52
<b>Initial S/W Revision</b>	A.08.00

**Day**

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

<b>Key Path</b>	System, Alignments, RF Preselector, Schedule Setup, Recurrence, Every N Weeks
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:RFPSelector:SCHecluler:RECurrence:DAY SUN   MON   TUE   WED   THU   FRI   SAT :CALibration:RFPSelector:SCHecluler:RECurrence:DAY?
<b>Example</b>	:CAL:RFPS:SCH:REC:DAY SUN
<b>Notes</b>	For model N9038A only.
<b>Preset</b>	This is unaffected by Preset but is set to SUN on a "Restore System Defaults->Align".
<b>State Saved</b>	No
<b>Range</b>	Sunday Monday Tuesday Wednesday Thursday Friday Saturday
<b>Initial S/W Revision</b>	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:RFPSelector:SCHeduler:STATE ON OFF 0 1 :CALibration:RFPSelector: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
<b>Remote Command</b>	:SYSTem:COMMunicate:GPIB[1] [:SELF] :ADDRess <integer> :SYSTem:COMMunicate:GPIB[1] [:SELF] :ADDRess?
<b>Example</b>	:SYST:COMM:GPIB:ADDR 17
Notes	Changing the Address on the GPIB port requires all further communication to use the new address.

Preset	This is unaffected by Preset but is set to 18 on a “Restore System Defaults->Misc”
State Saved	No
Range	0 to 30
Min	0
Max	30
Initial S/W Revision	Prior to A.02.00

### GPIB Controller

Sets the GPIB port into controller or device mode. In the normal state, GPIB controller is disabled, which allows the analyzer to be controlled by a remote computer. When GPIB Controller is enabled, the instrument can run software applications that use the instrument's computer as a GPIB controller; controlling devices connected to the instrument's GPIB port.

**NOTE**

When GPIB Controller is enabled, the analyzer application itself cannot be controlled over GPIB. In this case it can easily be controlled via LAN or USB. The GPIB port cannot be a controller and device at the same time. Only one controller can be active on the GPIB bus at any given time. If the analyzer is the controller, an external PC cannot be a controller.

To control the instrument from the software that is performing GPIB controller operation, you can use an internal TCP/IP connection to the analyzer application. Use the address TCPIP0:localhost:inst0:INSTR to send SCPI commands to the analyzer application.

Key Path	System, I/O Config, GPIB
Mode	All
Scope	Mode Global
<b>Remote Command</b>	:SYSTem:COMMunicate:GPIB[1] [:SELF]:CONTroller[:ENABLE] ON   OFF   0   1 :SYSTem:COMMunicate: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.

## 6 System Functions

### System

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:COMMunicate:LAN:SCPI:TELNet:ENABLE OFF ON 0 1 :SYST:COMMunicate:LAN:SCPI:TELNet:ENABLE?	
<b>Example</b>	:SYST:COMM:LAN:SCPI:TELN:ENAB OFF	
Preset	This is unaffected by Preset but is set to ON with a "Restore System Defaults->Misc"	
State Saved	No	
Range	On   Off	
Initial S/W Revision	Prior to A.02.00	

**SCPI Socket**

Turns the capability of establishing Socket LAN sessions On or Off. This allows you to limit SCPI access over LAN through socket sessions.

<b>Key Path</b>	System, I/O Config, SCPI LAN
<b>Mode</b>	All
<b>Remote Command</b>	:SYSTem:COMMunicate:LAN:SCPI:SOCKet:ENABLE OFF ON 0 1 :SYSTem:COMMunicate:LAN:SCPI:SOCKet:ENABLE?
<b>Example</b>	:SYST:COMM:LAN:SCPI:SOCK:ENAB OFF
Preset	This is unaffected by a Preset but is set to ON with a “Restore System Defaults->Misc”
State Saved	No
Range	On   Off
Initial S/W Revision	Prior to A.02.00

**SICL Server**

Turns the SICL server capability On or Off, enabling you to limit SCPI access over LAN through the SICL server. (SICL IEEE 488.2 protocol.)

Parameter	Description	Setting
Maximum Connections	The maximum number of connections that can be accessed simultaneously	5
Instrument Name	The name (same as the remote SICL address) of your analyzer	inst0
Instrument Logical Unit	The unique integer assigned to your analyzer when using SICL LAN	8
Emulated GPIB Name	The name (same as the remote SICL address) of the device used when communicating with your analyzer	gpib7
Emulated GPIB Logical Unit	The unique integer assigned to your device when it is being controlled using SICL LAN	8
Emulated GPIB Address	The emulated GPIB address assigned to your transmitter tester when it is a SICL server (the same as your GPIB address)	18

<b>Key Path</b>	System, I/O Config, SCPI LAN
<b>Mode</b>	All
<b>Remote Command</b>	:SYSTem:COMMunicate:LAN:SCPI:SICL:ENABLE OFF ON 0 1

---

:SYST:COMM:LAN:SCPI:SICL:ENABLE?

<b>Example</b>	:SYST:COMM:LAN:SCPI:SICL:ENAB OFF
Preset	This is unaffected by Preset, but is set to ON with a “Restore System Defaults->Misc”
State Saved	No
Range	On   Off
Initial S/W Revision	Prior to A.02.00

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## 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.

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<b>Key Path</b>	System, I/O Config, SCPI LAN
<b>Mode</b>	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:HISL:ENAB OFF
Preset	This is unaffected by Preset, but is set to ON with a “Restore System Defaults->Misc”
State Saved	No
Range	On   Off
Initial S/W Revision	A.11.00

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## 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>	:SYSTem: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
Initial S/W Revision	Prior to A.02.00

## Reset Web Password

The embedded web server contains certain capability which are password protected; modifying the LAN configuration of the instrument, and access to web pages that can change the settings of the instrument. The default password from the factory is ‘agilent’ (without the quotes). The control provided here is the means to set the web password as the user desires, or to reset the password to the factory default.

Selecting Reset web password brings up a control for resetting the password as the user desires, or to the factory default. A keyboard is required to change the password from the factory default of ‘agilent’ or to set a new password that contains alphabetic characters. The control is:



If this control is entered without an external keyboard or mouse connected, you can cancel the control by pressing the Cancel (ESC) front-panel key.

Key Path	System, I/O Config
Mode	All
Initial S/W Revision	Prior to A.02.00

## LXI

Opens a menu that allows you to access the various LXI configuration properties.

Key Path	System, I/O Config
Initial S/W Revision	Prior to A.02.00

## LAN Reset

Resets the LAN connection.

Key Path	System, I/O Config, LXI
Initial S/W Revision	Prior to A.02.00

## System IDN Response

This key allows you to specify a response to the \*IDN? query, or to return the analyzer to the Factory response if you have changed it.

To choose the factory-set response, press the Factory key.

To specify your own response, press the User key, and enter your desired response.

Key Path	System, I/O Config
Mode	All
Remote Command	:SYSTem:IDN <string> :SYSTem:IDN?
Notes	<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><li>• Null string as parameter restores the Factory setting</li></ul>
Preset	This is unaffected by Preset but is set to the original factory setting on a "Restore System Defaults->Misc"
State Saved	No
Initial S/W Revision	A.06.00

## Factory

This key selects the factory setting, for example:

“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 "" null string, restores the factory setting
Initial S/W Revision	A.06.0

## User

This key allows you to specify your own response to the \*IDN? query. You may enter your desired response with the Alpha Editor or a plugin PC keyboard.

When you press this key, the active function becomes the current User string with the cursor at the end. This makes it easy to edit the existing string.

If you enter a null string (for example, by clearing the User String while editing and then pressing Done) the analyzer automatically reverts to the Factory setting.

Key Path	System, I/O Config, IDN Response
<b>Example</b>	:SYST:IDN "XYZ Corp, Model 12, 012345, A.01.01" user specified response
Initial S/W Revision	A.06.00

## Query USB Connection (Remote Command Only)

Enables you to determine the speed of the USB connection.

Mode	All
<b>Remote Command</b>	:SYSTem:COMMunicate:USB:CONNECTION?
<b>Example</b>	:SYST:COMM:USB:CONN?
Notes	NONE – Indicates no USB connection has been made. LSPeed – Indicates a USB low speed connection (1.5 Mbps).  This is reserved for future use, the T+M488 protocol is not supported on low speed connections. HSPEED – Indicates that a USB high speed connection (480 Mbps) has been negotiated.

	FSpeed – Indicates that a USB full speed connection (12 Mbps) has been negotiated.
State Saved	No
Range	NONE LSSpeed 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>	:SYST:COMM:USB:STAT?
<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:COMM:USB:PACK?
<b>Example</b>	:SYST:COMM:USB:PACK?
Notes	<p>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.</p> <p>The packet count is initialized to 0,0 when the instrument application is started.</p>
State Saved	No
Initial S/W Revision	Prior to A.02.00

## Restore Defaults

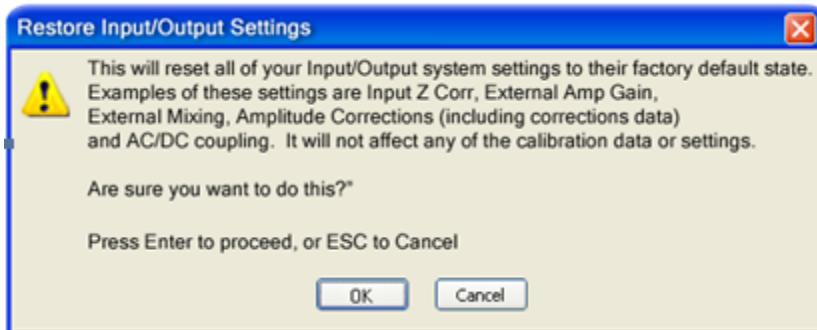
Provides incremental initialization of the system setting groups along with supporting a comprehensive reset of the entire instrument back to a factory default state. The menu selections are the groups of system settings and when one is selected, that particular group of system settings is reset back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

Key Path	System
Mode	All
<b>Remote Command</b>	:SYSTem: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:



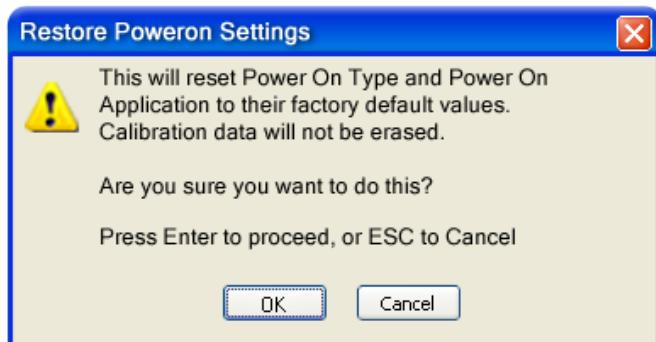
Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF INP
Initial S/W Revision	Prior to A.02.00

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

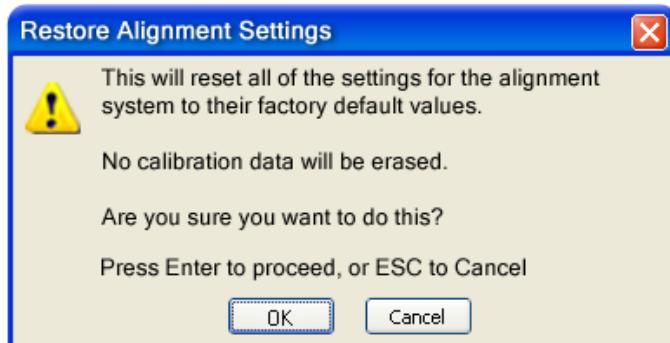
---

### Restore Align Defaults

This selection causes the Alignment system settings to be a reset to their default values. This does not affect any Alignment data stored in the system. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch.

After performing this function, it may impact the auto-alignment time of the instrument until a new alignment baseline has been established.

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



---

Key Path	System, Restore System Defaults
----------	---------------------------------

---

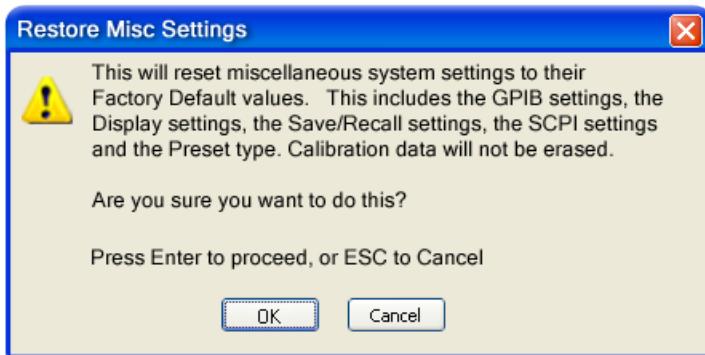
<b>Example</b>	:SYST:DEF ALIG
Initial S/W Revision	Prior to A.02.00

## 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
GPIB Address	18
Auto File Name Number	000
Save Type	State
State Save To	Register 1
Screen Save To	SCREEN000.png
DISP:ENABLE	ON
Full Screen	Off
SCPI Telnet	ON
SCPI Socket	ON
SICL Server	ON
Display Intensity	100
Display Backlight	ON
Display Theme	TDCOLOR
Softkey Language	English
System Annotation	ON
The SYST:PRES:TYPE	MODE

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



---

**Key Path** System, Restore System Defaults

**Example** :SYST:DEF MISC

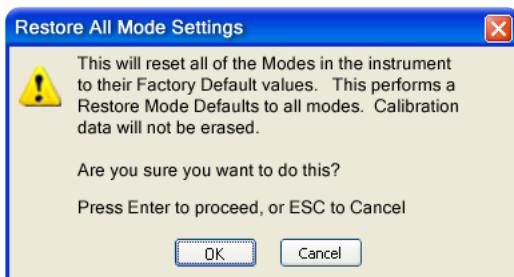
Initial S/W Revision Prior to A.02.00

---

### Restore Mode Defaults (All Modes)

This selection resets all of the modes in the instrument back to their default state just as a Restore Mode Defaults does and it switches the instrument to the power-on mode and causes the default measurement for the power-on mode to be active. This level of Restore System Defaults does not affect any system settings, but it does affect the state of all modes and does cause a mode switch unless the instrument was already in the power-on mode.

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



---

**Key Path** System, Restore System Defaults

**Example** :SYST:DEF MOD

**Couplings** An All Mode will cause the currently running measurement to be aborted, mode switch to the power-on mode and activate the default measurement for the power-on mode.. It gets the mode to a consistent state with all of the default couplings set.

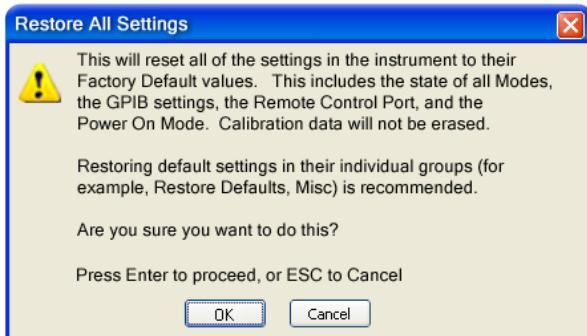
Initial S/W Revision Prior to A.02.00

---

## All

This performs a comprehensive reset of ALL analyzer settings to their factory default values. It resets all of the system setting groups, causes a Restore Mode Defaults for all modes in the instrument, and switches back to the power-on mode. It does not affect the User Preset file or any user saved files.

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



Key Path	System, Restore System Defaults
Example	:SYST:DEF ALL
Couplings	An All will cause the currently running measurement to be aborted and get all modes to a consistent state, so it is unnecessary to couple any settings.
Initial S/W Revision	Prior to A.02.00

## Control Panel...

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

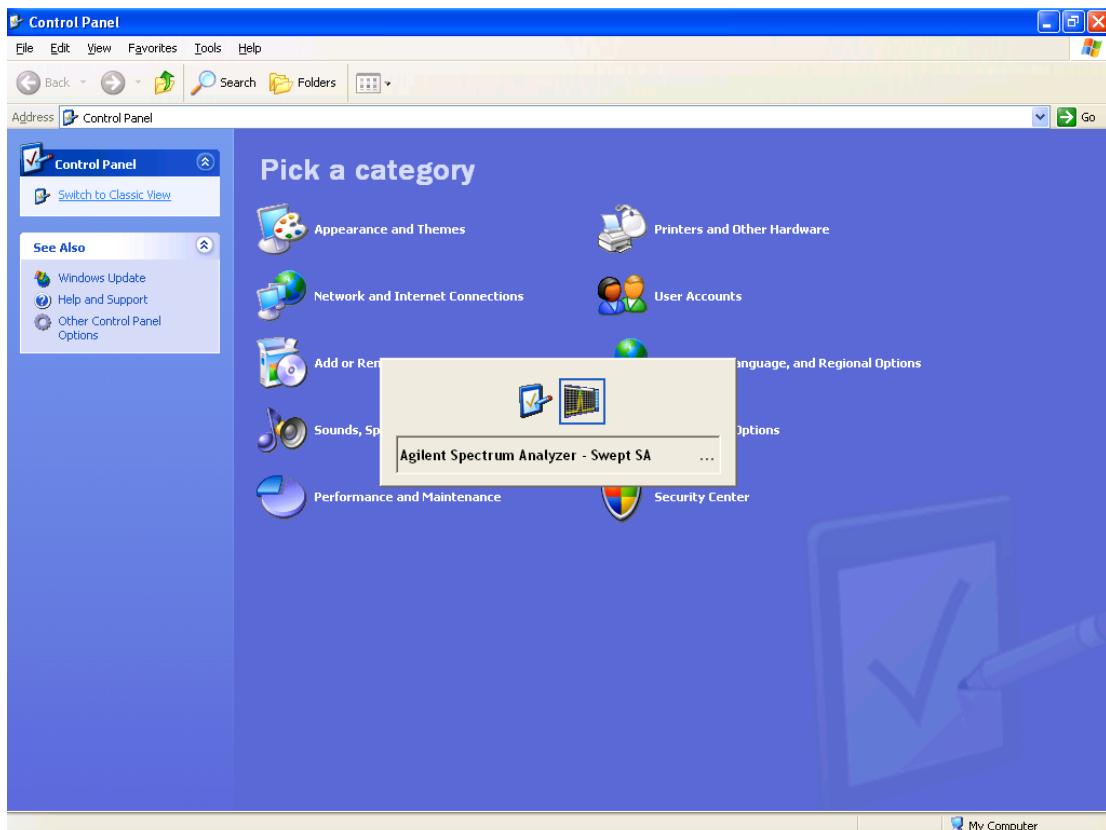
**NOTE** This feature is not available if option SF1 is installed.

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

## 6 System Functions

### System



Or use Alt-Tab: press and hold the Alt  key and press and release the Tab key until the Analyzer logo is showing in the window in the center of the screen, as above, then release the Alt key.

Key Path	System
Notes	No remote command for this key.
Initial S/W Revision	Prior to A.02.00

## Licensing...

Opens the license explorer.

**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	System
Notes	No equivalent remote command for this key.

---

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

---

<b>Remote Command</b>	:SYSTem:LKEY <"OptionInfo">, <"LicenseInfo">
<b>Example</b>	SYST:LKEY "N9073A-1FP", "027253AD27F83CDA5673A9BA5F427FDA5E4F25AEB1017638211AC9F60D9C639FE539735909 C551DE0A91"
Notes	<p>The &lt;"OptionInfo"&gt; 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.</p> <p>The &lt;"LicenseInfo"&gt; 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.</p>
Initial S/W Revision	Prior to A.02.00

---

<b>Remote Command</b>	:SYSTem:LKEY:DELet <"OptionInfo">,<"LicenseInfo">
<b>Example</b>	SYST:LKEY:DEL 'N9073A-1FP', "027253AD27F83CDA5673A9BA5F427FDA5E4F25AEB1017638211AC9F60D9C639FE539735909 C551DE0A91"
Notes	<p>The &lt;"OptionInfo"&gt; 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.</p> <p>The &lt;"LicenseInfo"&gt; 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.</p>
Initial S/W Revision	Prior to A.02.00

---

<b>Remote Command</b>	:SYSTem:LKEY:LIST?
Notes	

---

---

Return Value:  
An <arbitrary block data> of all the installed instrument licenses.  
The format of each license is as follows.  
<Feature>,<Version>,<Signature>,<Expiration Date>,<Serial Number for Transport>  
Return Value Example:  
#3136  
N9073A-1FP,1.000,B043920A51CA  
N9060A-2FP,1.000,4D1D1164BE64  
N9020A-508,1.000,389BC042F920  
N9073A-1F1,1.000,5D71E9BA814C,13-aug-2005  
<arbitrary block data> is:  
#NMMM<data>  
Where:  
N is the number of digits that describes the number of MMM characters. For example if the data was 55 bytes, N would be 2.  
MMM would be the ASCII representation of the number of bytes. In the previous example, N would be 55.  
<data> ASCII contents of the data

---

Initial S/W Revision	Prior to A.02.00
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<b>Remote Command</b>	:SYSTem:LKEY? <"OptionInfo">
<b>Example</b>	SYST:LKEY? "N9073A-1FP"
Notes	The <"OptionInfo"> contains the feature and the version. You must specify the feature but can omit the version. If you omit the version, the system regards it as the latest one. Return Value: <"LicenseInfo"> if the license is valid, null otherwise. <"LicenseInfo"> contains the signature, the expiration date, and serial number if transportable. Return Value Example: "B043920A51CA"
Initial S/W Revision	Prior to A.02.00

---

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

## Security

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

---

Key Path	System
Initial S/W Revision	A.04.00

---

## USB

The Windows operating system can be configured to disable write access to the USB ports for users who are in a secure environment where transferring data from the instrument is prohibited. This user interface is a convenient way for the customer to disable write access to USB.

---

Key Path	System, Security
Mode	All
Scope	Mode Global
<b>Remote Command</b>	:SYST:SECURITY:USB:WProtect[:ENABLE] ON OFF 0 1 :SYST:SECURITY:USB:WProtect[: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

---

## 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      Will set USB ports to Read-Write
Initial S/W Revision	A.04.00

---

## Read only

Selection for disabling write access to the USB ports.

Key Path	System, Security, USB
Example	:SYST:SEC:USB:WPR ON      Will set USB ports to Read only
Initial S/W Revision	A.04.00

## Diagnostics

The Diagnostics key in the System menu gives you access to basic diagnostic capabilities of the instrument.

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

## Show Hardware Statistics

Provides a display of various hardware statistics. The statistics include the following:

- Mechanical relay cycles
- High and Low temperature extremes
- Elapsed time that the instrument has been powered-on (odometer)

The display should appear listing the statistics, product number, serial number, and firmware revision.

**Hardware Statistical Information**

Agilent MXA Signal Analyzer  
 Product Number: N9020A  
 Serial Number: US00061145  
 Instrument S/W Revision: A.12.00  
 Revision Date: 7/11/2012 12:11:10 PM

Component Name	Value
MechAtten #1 Count Total	457304
Calibrator Switch Cycles	105953
AC/DC Switch Cycles	114240
2 dB #1 Mechanical Atten Cycles	112655
2 dB #2 Mechanical Atten Cycles	124456
MechAtten #2 Count Total	472265
6 dB Mechanical Atten Cycles	115302
10 dB Mechanical Atten Cycles	93602
20 dB Mechanical Atten Cycles	144781
30 dB Mechanical Atten Cycles	118580
Low Noise Path Switch	Only shown if LNP installed
Preselector Bypass Cycles	Only shown if MPB installed
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 which omit the mech atten fields are the N9000A-503/507 models.

The data will be updated only when the Show Hardware Statistics menu key is pressed, it will not be updated while the screen is displayed.

The tabular data should be directly printable.

Key Path	System, Diagnostics
Mode	All
Notes	The values displayed on the screen are only updated upon entry to the screen and not updated while the screen is being displayed.
Initial S/W Revision	Prior to A.02.00

**SCPI for Show Hardware Statistics ( Remote Commands Only)**

Each of the hardware statistic items can be queried via SCPI.

- "Query the Mechanical Relay Cycle Count" on page 332
- "Query the Operating Temperature Extremes" on page 332
- "Query the Elapsed Time since 1st power on" on page 333

### 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>	:SYSTem:MRELay: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>	:SYSTem: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>	:SYSTem: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.

<b>Remote Command</b>	:SYSTem:PON:ETIMe?
<b>Example</b>	:SYST:PON:ETIM?
Notes	Query Only
Initial S/W Revision	Prior to A.02.00

**Internet Explorer...**

This key launches Microsoft Internet Explorer. A mouse and external keyboard are highly desired for using Internet Explorer. When Internet Explorer is running, close Internet Explorer to return focus to the Instrument Application (or use Alt-Tab).

**NOTE** This feature is not available if option SF1 is installed.

<b>Key Path</b>	System
Mode	All
Notes	No equivalent remote command for this key.
Initial S/W Revision	A.05.01



## 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 337

See "RF Trigger Source" on page 341

See "I/Q Trigger Source" on page 342

See "More Information" on page 342

Key Path	Front-panel key
<b>Remote Command</b>	<pre>:TRIGger:&lt;measurement&gt;[:SEQUence]:SOURce EXTERNAL1   EXTERNAL2   IMMediate   LINE   FRAMe   RFBurst   VIDeo   IF   ALARm   LAN   IQMag   IDEMod   QDEMod   IINPut   QINPut   AIQMag   TV :TRIGger:&lt;measurement&gt;[:SEQUence]:SOURce?</pre> <p>where &lt;measurement&gt; is the measurement for which you wish to set the Source (blank for the Swept SA measurement)</p>
<b>Example</b>	<pre>TRIG:ACP:SOUR EXT1 Selects the external 1 trigger input for the ACP measurement and the selected input TRIG:SOUR VID Selects video triggering for the Swept SA (SANalyzer) measurement in the Spectrum Analyzer mode. For SAN, do not use the &lt;measurement&gt; keyword. Only send this form in the Spectrum Analyzer mode or you will get an Undefined Header error</pre>
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. See the "RF Trigger Source" on page 341 and "I/Q Trigger Source" on page 342 commands for detailed information on which trigger sources are available for each input.</p> <p>Other trigger-related commands are found in the INITiate and ABORT SCPI command subsystems.</p> <p>*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.</p>

	Available ranges and presets can vary from mode to mode.
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTerinal2 parameter will generate a "Hardware missing; Not available for this model number" message.
Preset	See table below
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:SOURCe EXTerinal
	For backward compatibility, the parameter EXTerinal is mapped to EXTerinal1
<b>Backwards Compatibility SCPI</b>	[SENSe]:<measurement>:TRIGger:SOURce
	This backwards compatibility alias command is provided for ESA/PSA compatibility
	This backwards compatibility command does not apply to the Swept SA measurement, for that just use :TRIGger:SOURCe
	This backwards compatibility command does not apply to the monitor spectrum, log plot and spot frequency measurements
<b>Backwards Compatibility SCPI</b>	[SENSe]:<measurement>:TRIGger:SOURce IF
	In earlier instruments, the parameter IF was used by apps for the video trigger, so using the IF parameter selects VIDeo triggering. Sending IF in the command causes VID to be returned to a query.
<b>Backwards Compatibility SCPI</b>	[SENSe]:ACPr:TRIGger:SOURce
	This backwards Compatibility SCPI command is provided to support the same functionality as [:SENSe]:ACPr:TRIGger:SOURce (PSA W-CDMA, PSA cdma2000 and PSA 1xEVDO) due to the fact that the ACPr node conflicts with the ACPower node.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Trigger Source Presets

Here are the Trigger Source Presets for the various measurements:

Meas	Mode	Preset for RF	Preset for IQ	Notes
Swept SA	SA	IMM	IQ not supported	
CHP	SA, WCDMA, C2K, WIMAX OFDMA, 1xEVDO, DVB-T/H, DTMB,	IMM	IQ not supported	

	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, Digital Cable TV, MSR	IMM	IQ not supported	
Tx Power	SA, GSM, TD- SCDMA	SA, GSM: RFBurst TD-SCDMA: EXTERNAL	IMM	TD-SCDMA doesn't support the Line and Periodic Timer parameters. When the mode is TD-SCDMA, if the Radio Device is switched to BTS, the value will be changed to External

			1 and if the Radio device is switched to MS, the value will be changed to RFBurst	
SPUR	SA, WCDMA, C2K, WIMAX OFDMA, TD-SCDMA, 1xEV-DO, DVB-T/H, LTE, LTETDD, MSR	IMM	IQ not supported	
SEM	SA, WCDMA, C2K, WIMAX OFDMA, TD-SCDMA, 1xEVDO, DVB-T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR	1xEVDO(BTS): EXTerinal1 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		LTETDD: BTS: External 1 MS: Periodic Timer GSM/EDGE: RFBurst All others: IMMediate	LTETDD: BTS: External 1 MS: Periodic Timer GSM/EDGE: IQMag All others: IMMMediate	
PVT	WIMAXOFDMA	RFB	IMM	
EVM	WIMAXOFDMA, DVB-T/H, DTMB, LTE, LTETDD,	All but CMMB: IMM CMMB: Periodic Timer	All but CMMB: IMM CMMB: External 1	LTE, LTETDD supports Free Run, Video and External 1 only.

	CMMB, ISDB-T, Digital Cable TV		
SPEC	BASIC	IMM	IMM
LOG Plot	PN	IMM	IQ not supported
Spot Freq	PN	IMM	IQ not supported
GMSK PVT	EDGE/GSM	RFB	IMM
GMSK PFER	EDGE/GSM	RFB	IQMag
GMSK ORFS	EDGE/GSM	RF Burst	IQ not supported
EDGE PVT	EDGE/GSM	RFB	IMM
EDGE EVM	EDGE/GSM	RFB	IQMag
EDGE ORFS	EDGE/GSM	Periodic Timer	IQ not supported
Combined WCDMA	WCDMA	IMM	IQ not supported
Combined GSM	EDGE/GSM	RFB	IQ not supported
List Power Step	WCDMA, EDGE/GSM	IMM	IQ not supported
Transmit On/Off Power	LTETDD	LTETDD: BTS: External 1 MS: Periodic Timer	LTETDD: BTS: External 1 MS: Periodic Timer
Transmit Analysis	BLUETOOTH	RFB	IQ not supported
Adjacent Channel Power	BLUETOOTH	IMM	IQ not supported
LE In-band Emissions	BLUETOOTH	IMM	IQ not supported
EDR In-band Spurious Emissions	BLUETOOTH	Periodic Timer	IQ not supported
Conformance EVM	LTE, LTETDD, MSR	IMM	IMM

## RF Trigger Source

The RF Trigger Source command selects the trigger to be used for the specified measurement when RF is the selected input. The RF trigger source can be queried and changed even while another input is selected, but it is inactive until RF becomes the selected input.

Note the inclusion of the <measurement> parameter in the command below. Because each measurement remembers its own Trigger Source, the command must be qualified with the measurement name. Note that for the Swept SA measurement this is not the case; for backwards compatibility, no <measurement> parameter is used when setting the Trigger Source for the Swept SA measurement.

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<b>Remote Command</b>	:TRIGger:<measurement>[:SEQUence]:RF:SOURce EXTerinal1   EXTerinal2   IMMEDIATE   LINE   FRAMe   RFBurst   VIDEo   IF   ALARM   LAN   TV :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>	<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 RF Trigger Source, 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> <li>-LINE - triggers on the power line signal</li> <li>-EXTerinal1 (or EXTerinal) - triggers on an externally connected trigger source marked "Trigger 1 In" on the rear panel</li> <li>-EXTerinal2 - 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 EXTerinal2 parameter will generate a "Hardware missing; Not available for this model number" message</li> <li>-RFBurst - triggers on the bursted frame</li> <li>-FRAMe - triggers on the periodic timer</li> <li>-IF (video) - same as video, for backwards compatibility only</li> </ul> <p>*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.</p> <p>Available ranges, and presets can vary from mode to mode.</p>
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

This command selects the trigger to be used for the specified measurement when I/Q (which requires option BBA) is the selected input. The I/Q trigger source can be queried and changed even while another input is selected, but it is inactive until I/Q becomes the selected input.

<b>Remote Command</b>	<code>:TRIGger:&lt;measurement&gt;[:SEQUence]:IQ:SOURce EXTernal1   EXTernal2   IMMEDIATE   IQMag   IDEMod   QDEMod   IINPut   QINPut   AIQMag</code> <code>:TRIGger:&lt;measurement&gt;[:SEQUence]:IQ:SOURce?</code>
<b>Example</b>	<code>TRIG:WAVEFORM:SOUR IQM</code> 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 I/Q Trigger Source, 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><li>-IQMag - triggers on the magnitude of the I/Q signal</li><li>-IDEMod - triggers on the I/Q signal's demodulated I voltage</li><li>-QDEMod - triggers on the I/Q signal's demodulated Q voltage</li><li>-IINPut - triggers on the I channel's ADC voltage</li><li>-QINPut - triggers on the Q channel's ADC voltage</li><li>-AIQMag - triggers on the magnitude of the auxiliary receiver channel I/Q signal</li></ul> <p>*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.</p> <p>Available ranges, and from mode to mode presets can vary</p>
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.

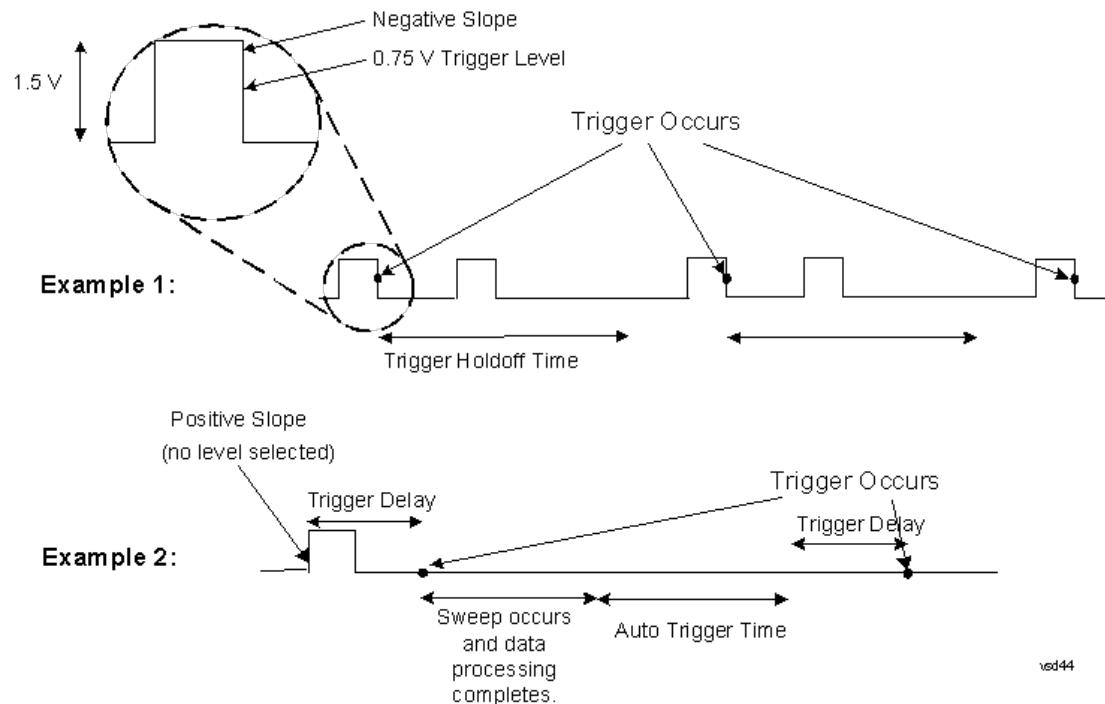
The settings setup menu can be accessed by pressing the key for the current trigger source a second time. For example, one press of Video selects the Video trigger as the source. The Video key becomes highlighted and the hollow arrow on the key turns black. Now a second press of the key takes you into 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.



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## 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

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	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

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## 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.

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Key Path	Trigger, Video
Remote Command	:TRIGger [:SEQUence]:VIDeo:LEVel <ampl> :TRIGger [:SEQUence]:VIDeo:LEVel?
Example	TRIG:VID:LEV -40 dBm
Notes	<p>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.</p> <p>Amplitude Corrections are not taken into account by the Video Trig Level. For example, if you have given yourself effective gain with an amplitude correction factor, the Video Trigger will not fire until you have dropped the trigger line that far below the displayed signal level, rather than simply dropping it down to the displayed signal level.</p> <p>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.</p>
Couplings	This same level is used for the Video trigger source in the Trigger menu and for the Video selection in the Gate Source menu.
Preset	Set the Video Trigger Level -25 dBm on Preset. When the Video Trigger Level becomes the active function, if the value is off screen, set it to either the top or bottom of screen, depending on which direction off screen it was.
State Saved	Saved in instrument state
Min	-170 dBm
Max	+30 dBm
Default Unit	Depends on the current selected Y axis unit
Backwards Compatibility SCPI	:TRIGger [:SEQUence]:IF:LEVel :TRIGger [:SEQUence]:IF:LEVel?

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Backwards Compatibility Notes	This alias is provided for backward compatibility with VSA/PSA comms apps.
Initial S/W Revision	Prior to A.02.00

## Trig Slope

Controls the trigger polarity. It is set positive to trigger on a rising edge and negative to trigger on a falling edge.

Key Path	Trigger, Video
<b>Remote Command</b>	:TRIGger[:SEQUence]:VIDeo:SLOPe POSitive NEGative :TRIGger[:SEQUence]:VIDeo:SLOPe?
<b>Example</b>	TRIG:VID:SLOP NEG
Preset	POSitive
State Saved	Saved in instrument state
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:IF:SLOPe NEGative POSitive :TRIGger[:SEQUence]:IF:SLOPe? For backward compatibility with VSA/PSA comms apps
Backwards Compatibility Notes	The legacy :TRIGger[:SEQUence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	:TRIGger[:SEQUence]:SLOPe POSitive NEGative :TRIGger[:SEQUence]:SLOPe?
<b>Example</b>	TRIG:SLOP NEG
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility Notes	In ESA/PSA, the Trigger Slope was global to all triggers. In the X-Series, the slope can be set individually for each Trigger Source. For backward compatibility, the global SLOPe command updates all instances of trigger slope (VID, LINE, EXT1, EXT2, TV, RFB). The query returns the trigger slope setting of the currently selected trigger source.
Initial S/W Revision	Prior to A.02.00

## Trig Delay

Controls a time delay during that the analyzer will wait to begin a sweep after meeting the trigger criteria. You can use negative delay to pre-trigger the instrument in the time domain or FFT, but not in swept spans.

<b>Key Path</b>	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>
<b>Notes</b>	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 :TRIGger [:SEQUence]:DELay:STATE?</pre>
<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>	:TRIGger[:SEQUence]:OFFSet <time> :TRIGger[:SEQUence]:OFFSet? :TRIGger[:SEQUence]:OFFSet:STATE OFF ON 0 1 :TRIGger[:SEQUence]:OFFSet:STATE?
<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, EXTERNAL1 or EXTERNAL2 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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## 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.

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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

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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.

<b>Key Path</b>	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.

<b>Key Path</b>	Trigger, Line
<b>Remote Command</b>	:TRIGger [:SEQUence]:LINE:DELay <time> :TRIGger [:SEQUence]:LINE:DELay? :TRIGger [:SEQUence]:LINE:DELay:STATe OFF ON 0 1 :TRIGger [:SEQUence]:LINE:DELay:STATe?
<b>Example</b>	TRIG:LINE:DEL:STAT ON TRIG:LINE:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us
State Saved	Saved in instrument state
Min	-150 ms
Max	500 ms
Default Unit	S
Backwards Compatibility Notes	The legacy :TRIGger[:SEQUence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers.

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The legacy :TRIGger[:SEQUence]:OFFSet command is supported for the VIDEO, LINE, EXT1, and EXT2 triggers.

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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>	<code>:TRIGger[:SEQUence]:EXTernal1:LEVel &lt;level&gt;</code> <code>:TRIGger[:SEQUence]:EXTernal1:LEVel?</code>
<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

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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>	:TRIGger [:SEQUence] :EXTernal1:DELay <time>

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:TRIGger[:SEQUence]:EXTernal1:DELay?
:TRIGger[:SEQUence]:EXTernal1:DELay:STATe OFF|ON|0|1
:TRIGger[:SEQUence]:EXTernal1:DELay:STATe?
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<b>Example</b>	TRIG:EXT1:DEL:STAT ON TRIG:EXT1:DEL 100 ms
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<b>Notes</b>	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.
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<b>Preset</b>	Off, 1.000 us
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<b>State Saved</b>	Saved in instrument state
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<b>Min</b>	-150 ms
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<b>Max</b>	+500 ms
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<b>Default Unit</b>	s
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<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEQUence]:EXTernal:DELay
	For backward compatibility, the parameter EXTernal is mapped to EXTernal1

<b>Backwards Compatibility Notes</b>	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.
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<b>Initial S/W Revision</b>	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.

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<b>Key Path</b>	Trigger
<b>Example</b>	TRIG:SOUR EXT2      Swept SA measurement TRIG:<meas>:SOUR EXT2 Measurements other than Swept SA
<b>Dependencies</b>	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.

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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

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	: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

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## 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.

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Key Path	Trigger, External 2
<b>Remote Command</b>	<pre>:TRIGger [:SEQUence] :EXTernal2:DELAY &lt;time&gt; :TRIGger [:SEQUence] :EXTernal2:DELAY? :TRIGger [:SEQUence] :EXTernal2:DELAY:STATE OFF ON 0 1 :TRIGger [:SEQUence] :EXTernal2:DELAY:STATE?</pre>
<b>Example</b>	TRIG:EXT2:DEL:STAT ON TRIG:EXT2:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us
State Saved	Saved in instrument state
Min	-150 ms
Max	500 ms
Default Unit	s
Backwards Compatibility Notes	The legacy :TRIGger[:SEQUence]:DElay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers. The legacy :TRIGger[:SEQUence]:OFFSet command is supported for the VIDeo, LINE, EXT1, and EXT2 triggers.
Initial S/W Revision	Prior to A.02.00

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## Baseband I/Q

Pressing this key when it is not selected selects Baseband I/Q as the trigger. Pressing the key when it is already selected accesses the Baseband I/Q trigger type selection menu. The key is annotated to display which of the Baseband I/Q trigger types is currently selected.

Key Path	Trigger
State Saved	Saved in instrument state
Readback	The Baseband I/Q trigger source that becomes active when this key is selected is displayed. The possible values are "I/Q Mag", "I", "Q", "Input I", "Input Q", and "Aux I/Q Mag".
Initial S/W Revision	Prior to A.02.00

## I/Q Mag

Pressing this key, when it is not selected, selects the I/Q magnitude signal as the trigger. The I/Q Magnitude trigger condition is met when the I/Q magnitude crosses the I/Q magnitude trigger level. The magnitude is measured at the output of the main I/Q digital receiver.

Key Path	Trigger, Baseband I/Q
Example	TRIG:<meas>:SOUR IQM
Readback Text	I/Q Mag
Initial S/W Revision	Prior to A.02.00

## Trigger Level

Sets a level for the I/Q magnitude trigger. When the signal crosses this level, with the chosen slope, the trigger occurs. If the specific Measurement displays the signal from the chosen sampling point a green line will be displayed to indicate the trigger level.

Key Path	Trigger, Baseband I/Q, I/Q Mag
Remote Command	:TRIGger [:SEQUence]:IQMag:LEVel <ampl> :TRIGger [:SEQUence]:IQMag:LEVel?
Example	TRIG:IQM:LEV -30 dBm
Notes	The I/Q reference impedance is used for converting between power and voltage.
Preset	-25 dBm

State Saved	Saved in instrument state
Range	-200 dBm to 100 dBm
Min	-200 dBm
Max	100 dBm
Readback Text	<level> dBm
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, Baseband I/Q, I/Q Mag
<b>Remote Command</b>	:TRIGger[:SEQUence]:IQMag:SLOPe POSitive   NEGative :TRIGger[:SEQUence]:IQMag:SLOPe?
<b>Example</b>	TRIG:IQM:SLOP POS
Preset	POSitive
State Saved	Saved in instrument state
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.

Key Path	Trigger, Baseband I/Q, I/Q Mag
<b>Remote Command</b>	:TRIGger[:SEQUence]:IQMag:DELay <time> :TRIGger[:SEQUence]:IQMag:DELay? :TRIGger[:SEQUence]:IQMag:DELay:STATE OFF ON 0 1 :TRIGger[:SEQUence]:IQMag:DELay:STATE?
<b>Example</b>	TRIG:IQM:DEL 10 ms TRIG:IQM:DEL:STAT ON
Preset	1 us OFF
State Saved	Saved in instrument state
Range	-2.5 s to +10 s
Min	-2.5 s

Max	+10 s
Initial S/W Revision	Prior to A.02.00

## I (Demodulated)

Pressing this key, when it is not selected, selects the main receiver's output I voltage as the trigger. The I (Demodulated) trigger condition is met when the I voltage crosses the I voltage trigger level.

Key Path	Trigger, Baseband I/Q
<b>Example</b>	TRIG:<meas>:SOUR IDEM
Readback Text	I
Initial S/W Revision	Prior to A.02.00

## Trigger Level

Sets a level for the I (Demodulated) trigger. When the signal crosses this level, with the chosen slope, the trigger occurs. If the specific Measurement displays the signal from the chosen sampling point a green line will be displayed to indicate the trigger level.

Key Path	Trigger, Baseband I/Q, I (Demodulated)
<b>Remote Command</b>	:TRIGger [:SEQUence]:IDEMod:LEVel <voltage> :TRIGger [:SEQUence]:IDEMod:LEVel?
<b>Example</b>	TRIG:IDEM:LEV 0.5 V
Preset	0.25 V
State Saved	Saved in instrument state
Range	-1 to 1 V
Min	-1 V
Max	1 V
Readback Text	0.1 of displayed unit (V, mV, etc.)
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.

<b>Key Path</b>	Trigger, Baseband I/Q, I (Demodulated)
<b>Remote Command</b>	:TRIGger[:SEQUence]:IDEMod:SLOPe POSitive   NEGative :TRIGger[:SEQUence]:IDEMod:SLOPe?
<b>Example</b>	TRIG:IDEM:SLOP POS
Preset	POSitive
State Saved	Saved in instrument state
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.

<b>Key Path</b>	Trigger, Baseband I/Q, I (Demodulated)
<b>Remote Command</b>	:TRIGger[:SEQUence]:IDEMod:DELay <time> :TRIGger[:SEQUence]:IDEMod:DELay? :TRIGger[:SEQUence]:IDEMod:DELay:STATE OFF ON 0 1 :TRIGger[:SEQUence]:IDEMod:DELay:STATE?
<b>Example</b>	TRIG:IDEM:DEL 10 ms TRIG:IDEM:DEL:STAT ON
Preset	1 us OFF
State Saved	Saved in instrument state
Range	-2.5 s to +10 s
Min	-2.5 s
Max	+10 s
Initial S/W Revision	Prior to A.02.00

### Q (Demodulated)

Pressing this key, when it is not selected, selects the main receiver's output Q voltage as the trigger. The Q (Demodulated) trigger condition is met when the Q voltage crosses the Q voltage trigger level.

<b>Key Path</b>	Trigger, Baseband I/Q
<b>Example</b>	TRIG:<meas>:SOUR QDEM
Readback Text	Q
Initial S/W Revision	Prior to A.02.00

## Trigger Level

Sets a level for the Q (Demodulated) trigger. When the signal crosses this level, with the chosen slope, the trigger occurs. If the specific Measurement displays the signal from the chosen sampling point a green line will be displayed to indicate the trigger level.

<b>Key Path</b>	Trigger, Baseband I/Q, Q (Demodulated)
<b>Remote Command</b>	:TRIGger [:SEQUence]:QDEMod:LEVel <voltage> :TRIGger [:SEQUence]:QDEMod:LEVel?
<b>Example</b>	TRIG:QDEM:LEV 0.5 V
Preset	0.25 V
State Saved	Saved in instrument state
Range	-1 to 1 V
Min	-1 V
Max	1 V
Readback Text	0.1 of displayed unit (V, mV, etc.)
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.

<b>Key Path</b>	Trigger, Baseband I/Q, Q (Demodulated)
<b>Remote Command</b>	:TRIGger [:SEQUence]:QDEMod:SLOPe POSitive   NEGative :TRIGger [:SEQUence]:QDEMod:SLOPe?
<b>Example</b>	TRIG:QDEM:SLOP POS
Preset	POSitive
State Saved	Saved in instrument state
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.

<b>Key Path</b>	Trigger, Baseband I/Q, Q (Demodulated)
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<b>Remote Command</b>	:TRIGger[:SEQUence]:QDEMod:DELay <time> :TRIGger[:SEQUence]:QDEMod:DELay? :TRIGger[:SEQUence]:QDEMod:DELay:STATe OFF ON 0 1 :TRIGger[:SEQUence]:QDEMod:DELay:STATe?
<b>Example</b>	TRIG:QDEM:DEL 10 ms TRIG:QDEM:DEL:STAT ON
Preset	1 us OFF
State Saved	Saved in instrument state
Range	-2.5 s to +10 s
Min	-2.5 s
Max	+10 s
Initial S/W Revision	Prior to A.02.00

## Input I

Pressing this key, when it is not selected, selects the I channel's ADC voltage as the trigger. The Input I trigger condition is met when the voltage crosses the trigger level.

Key Path	Trigger, Baseband I/Q
<b>Example</b>	TRIG:<meas>:SOUR IINP
Readback Text	Input I
Initial S/W Revision	Prior to A.02.00

## Trigger Level

Sets a level for the Input I trigger. When the signal crosses this level, with the chosen slope, the trigger occurs.

Key Path	Trigger, Baseband I/Q, Input I
<b>Remote Command</b>	:TRIGger[:SEQUence]:IINPut:LEVel <voltage> :TRIGger[:SEQUence]:IINPut:LEVel?
<b>Example</b>	TRIG:IINP:LEV 0.5 V
Preset	0.25 V
State Saved	Saved in instrument state
Range	-1 to 1 V
Min	-1 V

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Max	1 V
Readback Text	0.1 of displayed unit (V, mV, etc.)
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, Baseband I/Q, Input I
<b>Remote Command</b>	:TRIGger [:SEQUence]:IINPut:SLOPe POSitive   NEGative :TRIGger [:SEQUence]:IINPut:SLOPe?
<b>Example</b>	TRIG:IINP:SLOP POS
Preset	POSitive
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

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## 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.

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Key Path	Trigger, Baseband I/Q, Input I
<b>Remote Command</b>	:TRIGger [:SEQUence]:IINPut:DELay <time> :TRIGger [:SEQUence]:IINPut:DELay? :TRIGger [:SEQUence]:IINPut:DELay:STATE OFF ON 0 1 :TRIGger [:SEQUence]:IINPut:DELay:STATE?
<b>Example</b>	TRIG:IINP:DEL 10 ms TRIG:IINP:DEL:STAT ON
Preset	1 us OFF
State Saved	Saved in instrument state
Range	-2.5 s to +10 s
Min	-2.5 s
Max	+10 s
Initial S/W Revision	Prior to A.02.00

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## Input Q

Pressing this key, when it is not selected, selects the Q channel's ADC voltage as the trigger. The Input Q trigger condition is met when the voltage crosses the trigger level.

Key Path	Trigger, Baseband I/Q
<b>Example</b>	TRIG:<meas>:SOUR QINP
Readback Text	Input Q
Initial S/W Revision	Prior to A.02.00

## Trigger Level

Sets a level for the Input Q trigger. When the signal crosses this level, with the chosen slope, the trigger occurs.

Key Path	Trigger, Baseband I/Q, Input Q
<b>Remote Command</b>	:TRIGger[:SEQUence]:QINPut:LEVel <voltage> :TRIGger[:SEQUence]:QINPut:LEVel?
<b>Example</b>	TRIG:QINP:LEV 0.5 V
Preset	0.25 V
State Saved	Saved in instrument state
Range	-1 to 1 V
Min	-1 V
Max	1 V
Readback Text	0.1 of displayed unit (V, mV, etc.)
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, Baseband I/Q, Input Q
<b>Remote Command</b>	:TRIGger[:SEQUence]:QINPut:SLOPe POSitive   NEGative :TRIGger[:SEQUence]:QINPut:SLOPe?
<b>Example</b>	TRIG:QINP:SLOP POS
Preset	POSitive
State Saved	Saved in instrument state
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.

<b>Key Path</b>	Trigger, Baseband I/Q, Input Q
<b>Remote Command</b>	<pre>:TRIGger [:SEQUence]:QINPut:DELay &lt;time&gt; :TRIGger [:SEQUence]:QINPut:DELay? :TRIGger [:SEQUence]:QINPut:DELay:STATE OFF ON 0 1 :TRIGger [:SEQUence]:QINPut:DELay:STATE?</pre>
<b>Example</b>	<pre>TRIG:QINP:DEL 10 ms TRIG:QINP:DEL:STAT ON</pre>
Preset	1 us OFF
State Saved	Saved in instrument state
Range	-2.5 s to +10 s
Min	-2.5 s
Max	+10 s
Initial S/W Revision	Prior to A.02.00

**Auxiliary Channel I/Q Mag**

Pressing this key, when it is not selected, selects the Auxiliary Channel I/Q magnitude signal as the trigger. The Auxiliary Channel I/Q Magnitude trigger condition is met when the auxiliary receiver's I/Q magnitude output crosses the Auxiliary I/Q magnitude trigger level.

<b>Key Path</b>	Trigger, Baseband I/Q
<b>Example</b>	TRIG:<meas>:SOUR AIQM
Readback Text	Aux I/Q Mag
Initial S/W Revision	Prior to A.02.00

**Trigger Level**

Sets a level for the I/Q magnitude trigger. When the signal crosses this level, with the chosen slope, the trigger occurs.

<b>Key Path</b>	Trigger, Baseband I/Q, Aux Channel I/Q Mag
<b>Remote Command</b>	:TRIGger[:SEQUence]:AIQMag:LEVel <ampl> :TRIGger[:SEQUence]:AIQMag:LEVel?
<b>Example</b>	TRIG:AIQM:LEV -30 dBm
Notes	The I/Q reference impedance is used for converting between power and voltage.
Preset	-25 dBm
State Saved	Saved in instrument state
Range	-200 dBm to 100 dBm
Min	-200 dBm
Max	100 dBm
Readback Text	<level> dBm
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.

<b>Key Path</b>	Trigger, Baseband I/Q, Aux Channel I/Q Mag
<b>Remote Command</b>	:TRIGger[:SEQUence]:AIQMag:SLOPe POSitive   NEGative :TRIGger[:SEQUence]:AIQMag:SLOPe?
<b>Example</b>	TRIG:AIQM:SLOP POS
Preset	POSitive
State Saved	Saved in instrument state
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.

<b>Key Path</b>	Trigger, Baseband I/Q, Aux Channel I/Q Mag
<b>Remote Command</b>	:TRIGger[:SEQUence]:AIQMag:DELay <time> :TRIGger[:SEQUence]:AIQMag:DELay? :TRIGger[:SEQUence]:AIQMag:DELay:STATE OFF ON 0 1 :TRIGger[:SEQUence]:AIQMag:DELay:STATE?
<b>Example</b>	TRIG:AIQM:DEL 10 ms

TRIG:AIQM:DEL:STAT ON	
Preset	1 us OFF
State Saved	Saved in instrument state
Range	-2.5 s to +10 s
Min	-2.5 s
Max	+10 s
Initial S/W Revision	Prior to A.02.00

### Trigger Center Frequency

This key sets the center frequency to be used by the auxiliary receiver.

Key Path	Trigger, Baseband I/Q, Aux Channel I/Q Mag
<b>Remote Command</b>	:TRIGger [:SEQUence]:AIQMag:CENTER <freq> :TRIGger [:SEQUence]:AIQMag:CENTER?
<b>Example</b>	:TRIG:AIQM:CENT 10 MHz
Notes	Trigger CF + 1/2 Trigger BW < Max Trigger CF – 1/2 Trigger BW > Min
Preset	0 Hz
State Saved	Saved in instrument state
Range	-40 MHz to 40 MHz
Min	-40 MHz
Max	40 MHz
Initial S/W Revision	Prior to A.02.00

### Trigger Bandwidth

This key sets the information bandwidth used by the auxiliary receiver for the Auxiliary Channel I/Q Magnitude trigger.

Key Path	Trigger, Baseband I/Q, Aux Channel I/Q Mag
<b>Remote Command</b>	:TRIGger [:SEQUence]:AIQMag:BANDwidth <freq> :TRIGger [:SEQUence]:AIQMag:BANDwidth?
<b>Example</b>	:TRIG:AIQM:BAND 8 MHz
Notes	The combined sample rate for the main and auxiliary receivers cannot exceed 100 MSa/sec. The bandwidth available to the Trigger BW is limited to what is available after

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	the main receiver's bandwidth (Info BW, sometimes pre-FFT BW) is set. Because of this limitation, the Max is not always achievable.
	The combination of Trigger Center Freq and Trigger BW is also limited: Trigger CF + 1/2 Trigger BW < Max Trigger CF – 1/2 Trigger BW > Min
Preset	Bandwidth option dependent: No Opt: 10 MHz Opt B25: 25 MHz Opt S40: 40 MHz
State Saved	Saved in instrument state
Range	10 Hz to Maximum
Min	10 Hz
Max	Bandwidth option & I/Q input path dependent: No Opt, I or Q Only: 10 MHz, I+jQ: 20 MHz Opt B25, I or Q Only: 25 MHz, I+jQ: 50 MHz Opt S40, I or Q Only: 40 MHz, I+jQ: 80 MHz
Initial S/W Revision	Prior to A.02.00

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## 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.

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Key Path	Trigger
Example	TRIG:SOUR RFB      Swept SA measurement TRIG:<meas>:SOUR RFB      Measurements other than Swept SA
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Backwards Compatibility Notes	The legacy command:

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:TRIGger[:SEQUence]:RFBurst:FSELectivity[:STATe] OFF|ON|0|1  
is not supported in the X-Series, as the hardware to do Frequency Selective burst triggers does not exist in X-Series.

Initial S/W Revision	Prior to A.02.00
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Modified at S/W Revision	A.04.00
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## 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.

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<b>Key Path</b>	Trigger, RF Burst
<b>Scope</b>	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
<b>Notes</b>	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.
<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>	:TRIGger [:SEQUence] :FRAMe:RFBurst:LEVel:ABSolute
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.04.00

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<b>Key Path</b>	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:

1. The measurement starts with the absolute RF Burst trigger setting. If it cannot get a trigger with that level, auto trigger fires and the acquisition starts anyway. After the acquisition, the measurement searches for the peak in the acquired waveform and saves it.
2. Now, in the next cycle of the measurement, the measurement determines a new absolute RF Burst level based on the peak value from the first measurement and the Relative RF Burst Trigger Level (always 0 or negative dB) set by the user. The following formula is used:
3. absolute RF Burst level = peak level of the previous acquisition + relative RF Burst level
4. 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

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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

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## 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>	: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

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## Trig Delay

Controls a time delay during which the analyzer will wait to begin a sweep after meeting the trigger criteria. You can use negative delay to pre-trigger the instrument in time domain or FFT, but not in swept spans.

Key Path	Trigger, RF Burst
Remote Command	:TRIGger[:SEQUence]:RFBurst:DELay <time> :TRIGger[:SEQUence]:RFBurst:DELay? :TRIGger[:SEQUence]:RFBurst:DELay:STATe OFF ON 0 1 :TRIGger[:SEQUence]:RFBurst:DELay:STATe?
Example	TRIG:RFB:DEL:STAT ON TRIG:RFB:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us
State Saved	Saved in instrument state
Min	-150 ms
Max	500 ms
Default Unit	s
Backwards Compatibility Notes	The legacy :TRIGger[:SEQUence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

## Periodic Timer (Frame Trigger)

Pressing this key, when it is not selected, selects the internal periodic timer signal as the trigger. Triggering occurrences are set by the **Period** parameter, which is modified by the **Sync Source** and **Offset**. Pressing this key, when it is already selected, accesses the periodic timer trigger setup functions.

If you do not have a sync source selected (it is Off), then the internal timer will not be synchronized with any external timing events.

Key Path	Trigger
Example	TRIG:SOUR FRAM      Swept SA measurement TRIG:<meas>:SOUR FRAM    Measurements other than Swept SA

State Saved	Saved in instrument state
Readback	[Sync: <value of Sync Source>], for example, [Sync: External 1]
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

#### Periodic Timer Triggering:

This feature selects the internal periodic timer signal as the trigger. Trigger occurrences are set by the **Periodic Timer** parameter, which is modified by the **Sync Source** and **Offset**.

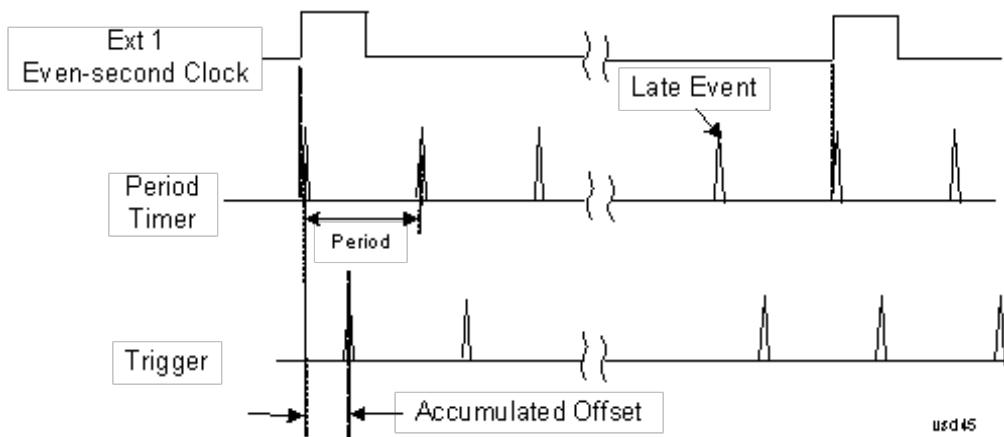
The figure below shows the action of the periodic timer trigger. Before reviewing the figure, we'll explain some uses for the periodic trigger.

A common application is measuring periodic burst RF signals for which a trigger signal is not easily available. For example, we might be measuring a TDMA radio which bursts every 20 ms. Let's assume that the 20 ms period is very consistent. Let's also assume that we do not have an external trigger source available that is synchronized with the period, and that the signal-to-noise ratio of the signal is not high enough to provide a clean RF burst trigger at all of the analysis frequencies. For example, we might want to measure spurious transmissions at an offset from the carrier that is larger than the bandwidth of the RF burst trigger. In this application, we can set the Periodic Timer to a 20.00 ms period and adjust the offset from that timer to position our trigger just where we want it. If we find that the 20.00 ms is not exactly right, we can adjust the period slightly to minimize the drift between the period timer and the signal to be measured.

A second way to use this feature would be to use **Sync Source** temporarily, instead of **Offset**. In this case, we might tune to the signal in a narrow span and use the RF Burst trigger to synchronize the periodic timer. Then we would turn the sync source off so that it would not mis-trigger. Mis-triggering can occur when we are tuned so far away from the RF burst trigger that it is no longer reliable.

A third example would be to synchronize to a signal that has a reference time element of much longer period than the period of interest. In some CDMA applications, it is useful to look at signals with a short periodicity, by synchronizing that periodicity to the "even-second clock" edge that happens every two seconds. Thus, we could connect the even-second clock trigger to Ext1 and use then Ext1 as the sync source for the periodic timer.

The figure below illustrates this third example. The top trace represents the even-second clock. It causes the periodic timer to synchronize with the leading edge shown. The analyzer trigger occurs at a time delayed by the accumulated offset from the period trigger event. The periodic timer continues to run, and triggers continue to occur, with a periodicity determined by the analyzer time base. The timer output (labeled "late event") will drift away from its ideal time due to imperfect matching between the time base of the signal being measured and the time base of the analyzer, and also because of imperfect setting of the period parameter. But the synchronization is restored on the next even-second clock event. ("Accumulated offset" is described in the in the **Offset** function section.)



## Period

Sets the period of the internal periodic timer clock. For digital communications signals, this is usually set to the frame period of your current input signal. In the case that sync source is not set to OFF, and the external sync source rate is changed for some reason, the periodic timer is synchronized at the every external synchronization pulse by resetting the internal state of the timer circuit.

Key Path	Trigger, Periodic Timer
Remote Command	:TRIGger[:SEQUence]:FRAMe:PERiod <time> :TRIGger[:SEQUence]:FRAMe:PERiod?
Example	TRIG:FRAM:PER 100 ms
Dependencies	The invalid data indicator turns on when the period is changed, until the next sweep/measurement completes.
Couplings	The same period is used in the Gate Source selection of the period timer.
Preset	20 ms GSM: 4.615383
State Saved	Saved in instrument state
Min	100.000 ns
Max	559.0000 ms
Default Unit	S
Initial S/W Revision	Prior to A.02.00

## Offset

Adjusts the accumulated offset between the periodic timer events and the trigger event. Adjusting the accumulated offset is different than setting an offset, and requires explanation.

The periodic timer is usually not synchronized with any external events, so the timing of its output events has no absolute meaning. Since the timing relative to external events (RF signals) is important, you need to be able to adjust (offset) it. However, you have no direct way to see when the periodic timer events occur. All that you can

see is the trigger timing. When you want to adjust the trigger timing, you will be changing the internal offset between the periodic timer events and the trigger event. Because the absolute value of that internal offset is unknown, we will just call that the accumulated offset. Whenever the Offset parameter is changed, you are changing that accumulated offset. You can reset the displayed offset using Reset Offset Display. Changing the display does not change the value of the accumulated offset, and you can still make additional changes to accumulated offset.

To avoid ambiguity, we define that an increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.

Key Path	Trigger, Periodic Timer
<b>Remote Command</b>	:TRIGger [:SEQUence] :FRAMe:OFFSet <time> :TRIGger [:SEQUence] :FRAMe:OFFSet?
<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 382</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

## 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.

<b>Remote Command</b>	:TRIGger [:SEQUence] :FRAMe:ADJust <time>
<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 382</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
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.

<b>Key Path</b>	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

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## 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.

---

<b>Key Path</b>	Trigger, Periodic Timer
<b>Remote Command</b>	:TRIGger [:SEQUence] :FRAMe:SYNC EXTernal1   EXTernal2   RFburst   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.
Preset	Off GSM/EDGE: RFburst
State Saved	Saved in instrument state
Readback	The current setting is read back to this key and it is also Readback to the previous Periodic Timer trigger key.
<b>Backwards Compatibility SCPI</b>	:TRIGger [:SEQUence] :FRAMe:SYNC EXTernal For backward compatibility, the parameter EXTernal is mapped to EXTemal1
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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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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<b>Key Path</b>	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 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>	<code>:TRIGger[:SEQUence]:EXTernal1:LEVel &lt;level&gt;</code> <code>:TRIGger[:SEQUence]:EXTernal1:LEVel?</code>
<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
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<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.

<b>Key Path</b>	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.

<b>Key Path</b>	Trigger, External 2
<b>Remote Command</b>	:TRIGger [:SEQUence] :EXTernal2:SLOPe POSitive NEGative :TRIGger [:SEQUence] :EXTernal2:SLOPe?
<b>Example</b>	TRIG:EXT2:SLOP NEG
<b>Couplings</b>	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).
<b>Preset</b>	POSitive
<b>State Saved</b>	Saved in instrument state
<b>Backwards Compatibility SCPI</b>	:TRIGger [:SEQUence] :FRAMe:EXTernal2:SLOPe
<b>Backwards Compatibility Notes</b>	The legacy :TRIGger[:SEQUence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
<b>Initial S/W Revision</b>	Prior to A.02.00

**RF Burst**

Pressing the key once selects the RF burst envelope signal to be used for the periodic timer trigger synchronization.

Press the key a second time to access the RF burst sync source setup menu.

<b>Key Path</b>	Trigger, Periodic Timer, Sync Source
<b>Example</b>	TRIG:FRAM:SYNC RFB
<b>Couplings</b>	Same as RF Burst trigger source.
<b>Readback</b>	RF Burst
<b>Initial S/W Revision</b>	Prior to A.02.00

**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
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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:

1. The measurement starts with the absolute RF Burst trigger setting. If it cannot get a trigger with that level, auto trigger fires and the acquisition starts anyway. After the acquisition, the measurement searches for the peak in the acquired waveform and saves it.
2. Now, in the next cycle of the measurement, the measurement determines a new absolute RF Burst level based on the peak value from the first measurement and the Relative RF Burst Trigger Level (always 0 or negative dB) set by the user. The following formula is used:
3. absolute RF Burst level = peak level of the previous acquisition + relative RF Burst level
4. 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
<b>Scope</b>	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
<b>Notes</b>	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.
<b>Dependencies</b>	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.
<b>Preset</b>	-6 dB GSM: -25 dB
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	-45 dB
<b>Max</b>	0 dB
<b>Default Unit</b>	dB or dBc
<b>Backwards</b>	:TRIGger[:SEQUence]:RFBurst:LEVel

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<b>Compatibility SCPI</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.

<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

## Auto/Holdoff

Opens up a menu that lets you adjust Auto Trigger and Trigger Holdoff parameters

Key Path	Trigger
Readback line	<p>Displays a summary of the Auto Trig and Holdoff settings, in square brackets</p> <p>First line: Auto Off or Auto On</p> <p>Second Line: "Hldf" followed by:</p> <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
Remote Command	<pre>:TRIGger [:SEQUence]:ATRigger &lt;time&gt; :TRIGger [:SEQUence]:ATRigger? :TRIGger [:SEQUence]:ATRigger:STATe OFF ON 0 1 :TRIGger [:SEQUence]:ATRigger:STATE?</pre>
Example	TRIG:ATR:STAT ON TRIG:ATR 100 ms
Notes	The "time that the analyzer will wait" starts when the analyzer is ready for a trigger, which may be hundreds of ms after the data acquisition for a sweep is done. The "time"

---

	ends when the trigger condition is satisfied, not when the delay ends.
Preset	Off, 100 ms
State Saved	Saved in instrument state
Min	1 ms
Max	100 s
Default Unit	s
Initial S/W Revision	Prior to A.02.00

---

## Trig Holdoff

Sets the holdoff time between triggers. When the trigger condition is satisfied, the trigger occurs, the delay begins, and the holdoff time begins. New trigger conditions will be ignored until the holdoff time expires. For a free-running trigger, the holdoff value is the minimum time between triggers.

---

Key Path	Trigger, Auto/Holdoff
<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

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## 8 Complex Spectrum Measurement

The complex spectrum measurement provides spectrum analysis capability for the instrument. The control of the measurement was designed to be familiar to those who are accustomed to using swept spectrum analyzers. For more details about this measurement, see the section "[Complex Spectrum Measurement Description](#)" on page 389 below.

This topic contains the following sections:

["Measurement Commands for Complex Spectrum"](#) on page 386

["Remote Command Results for Complex Spectrum"](#) on page 387



## Measurement Commands for Complex Spectrum

The general functionality of CONFigure, INITiate, FETCh, MEASure, and READ are described in the section ["Remote Measurement Functions" on page 626](#). See the SENSe subsystem commands for more measurement related commands.

```
:CONFigure:SPECTrum  
:CONFigure:SPECTrum:NDEFault  
:INITiate:SPECTrum  
:FETCh:SPECTrum[n] ?  
:MEASure:SPECTrum[n] ?  
:READ:SPECTrum[n] ?
```

## Remote Command Results for Complex Spectrum

The following table shows the returned results of the FETCh|MEASure|READ queries.

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.
not specified or n=1	<p>Returns the following comma-separated scalar results:</p> <ol style="list-style-type: none"> <li>1. FFT peak is the FFT peak amplitude.</li> <li>2. FFT frequency is the FFT frequency of the peak amplitude.</li> <li>3. FFT points is the Number of points in the FFT spectrum.</li> <li>4. First FFT frequency is the frequency of the first FFT point of the spectrum.</li> <li>5. FFT spacing is the frequency spacing between the FFT points of the spectrum.</li> <li>6. Time domain points is the number of points in the time domain trace used for the FFT. The number of points doubles if the data is complex instead of real. See the time domain scalar description below.</li> <li>7. First time point is the time of the first time domain point, where time zero is the trigger event.</li> <li>8. Time spacing is the time spacing between the time domain points. The time spacing value doubles if the data is complex instead of real. See the time domain scalar description below.</li> <li>9. Time domain returns a 1 if time domain is complex (I/Q) and complex data will be returned. It returns a 0 if the data is real. (raw ADC samples) When this value is 1 rather than 0 (complex vs. real data), the time domain points and the time spacing scalars both increase by a factor of two.</li> <li>10. Scan time is the total scan time of the time domain trace used for the FFT. The total scan time = (time spacing) x (time domain points – 1)</li> <li>11. Current average count is the current number of data measurements that have already been combined, in the averaging calculation.</li> </ol>
2	Returns the trace data of the log-magnitude versus time. (That is, the RF envelope.)
3	Returns the I and Q trace data. It is represented by I and Q pairs (in volts) versus time.
4	Returns spectrum trace data. That is, the trace of log-magnitude versus frequency. (The trace is computed using a FFT.)
5	Returns the averaged trace data of log-magnitude versus time. (That is, the RF envelope.)
6	Not used.
7	Returns the averaged spectrum trace data. That is, the trace of the averaged log-magnitude versus frequency.
8	Not used.
9	Returns a trace containing the shape of the FFT window.
10	Returns trace data of the phase of the FFT versus frequency.
11	Returns comma-separated linear spectrum trace data in Volts RMS.

n	Results Returned
12	Returns comma-separated averaged linear spectrum trace data in Volts RMS.
13	Returns the following comma-separated scalar results: 1. I/Q Magnitude and Phase Delta Results available (0 = not available, 1 = available). Results are available when the last measurement was made with I/Q Magnitude and Phase Delta Results enabled (SPEC:IQD:ENAB ON) and the setup was valid for generating the results (invalid setup when input is I/Q, I/Q Path is I+jQ, and Center Frequency is not 0 Hz) 2. Delta magnitude and phase trace (results 14 – 17) start frequency (0 when I/Q Magnitude and Phase Delta Results not available) 3. Delta magnitude and phase trace (results 14 – 17) number of points (1 when I/Q Magnitude and Phase Delta Results not available) 4. Delta magnitude and phase trace (results 14 – 17) frequency spacing between points (0 when I/Q Magnitude and Phase Delta Results not available) 5. Current average count (1 when I/Q Magnitude and Phase Delta Results not available) 6. Frequency of the FFT trace (result 4) peak magnitude in Hz (0 when I/Q Magnitude and Phase Delta Results not available) 7. Delta magnitude at the FFT trace peak magnitude frequency in dB (-999 when I/Q Magnitude and Phase Delta Results not available) 8. Delta phase at the FFT trace peak magnitude frequency in radians (-999 when I/Q Magnitude and Phase Delta Results not available) 9. Delta phase at the FFT trace peak magnitude frequency in degrees (-999 when I/Q Magnitude and Phase Delta Results not available or invalid setup) 10. Frequency of the averaged FFT trace (result 7) peak magnitude in Hz (0 when I/Q Magnitude and Phase Delta Results not available) 11. Averaged delta magnitude at the averaged FFT trace peak magnitude frequency in dB (-999 when I/Q Magnitude and Phase Delta Results not available) 12. Averaged delta phase at the averaged FFT trace peak magnitude frequency in radians (-999 when I/Q Magnitude and Phase Delta Results not available) 13. Averaged delta phase at the averaged FFT trace peak magnitude frequency in degrees (-999 when I/Q Magnitude and Phase Delta Results not available)
14	Current delta magnitude trace in dB (-999 when I/Q Magnitude and Phase Delta Results not available)
15	Current delta phase trace in radians (-999 when I/Q Magnitude and Phase Delta Results not available)
16	Averaged delta magnitude trace in dB (-999 when I/Q Magnitude and Phase Delta Results not available)
17	Averaged delta phase trace in radians (-999 when I/Q Magnitude and Phase Delta Results not available)

## Complex Spectrum Measurement Description

This measurement is FFT (Fast Fourier Transform) based. The FFT-specific parameters are located in the advanced menu. Also available under basic mode spectrum measurements is an I/Q window, which shows the I and Q signal waveforms in parameters of voltage versus time. The advantage of having an I/Q view available while in the spectrum measurement is that it allows you to view complex components of the same signal without changing settings or measurements.

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

## AMPTD Y Scale

Accesses the vertical scale parameters menu. The menu selection is dependent on the active window view.

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

### Ref Value

Enables you to adjust the absolute power reference value. Ref in the upper left corner of the display, indicates the current value. To change the reference level, use the front-panel step keys, knob, or numeric keypad.

This functionality depends on the selected window:

- ["Ref Value \(Spectrum window\)" on page 390](#)
- ["Ref Value \(I/Q Waveform window\)" on page 391](#)

#### Ref Value (Spectrum window)

Enables you to adjust the absolute power reference value in the spectrum view window. Ref in the upper left corner of the display, indicates the current value. To change the reference level, use the front-panel step keys, knob, or numeric keypad.

Key Path	AMPTD Y Scale
Mode	BASIC
Remote Command	:DISPlay:SPECTrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:RLEVel <ampl> :DISPlay:SPECTrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:RLEVel?
Example	DISP:SPEC:VIEW:WIND:TRAC:Y:RLEV 100 DISP:SPEC:VIEW:WIND:TRAC:Y:RLEV?
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Couplings	When Auto Scaling is turned on, this value is automatically determined by the measurement result. When this value is set, Auto Scaling is turned off. Attenuation is not coupled to Ref Value.
Preset	0.00 dBm
State Saved	Saved in instrument state.
Min	-250 dBm
Max	250 dBm
Initial S/W Revision	Prior to A.02.00

**Ref Value (I/Q Waveform window)**

Enables you to adjust the absolute voltage reference value in the waveform view window. Ref in the upper left corner of the display, indicates the current value. To change the reference level, use the front-panel step keys, knob, or numeric keypad.

<b>Key Path</b>	AMPTD Y Scale
<b>Mode</b>	BASIC
<b>Remote Command</b>	:DISPlay:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALe]:RLEVel <voltage> :DISPlay:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALe]:RLEVel?
<b>Example</b>	DISP:SPEC:VIEW:WIND2:TRAC:Y:RLEV 120 DISP:SPEC:VIEW:WIND2:TRAC:Y:RLEV?
<b>Notes</b>	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
<b>Couplings</b>	When Auto Scaling is turned on, this value is automatically determined by the measurement result. When this value is set, Auto Scaling is turned off.
<b>Preset</b>	0 V
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	-250 V
<b>Max</b>	250 V
<b>Initial S/W Revision</b>	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 392.

See "[Single Attenuator Configuration:](#)" on page 392

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.

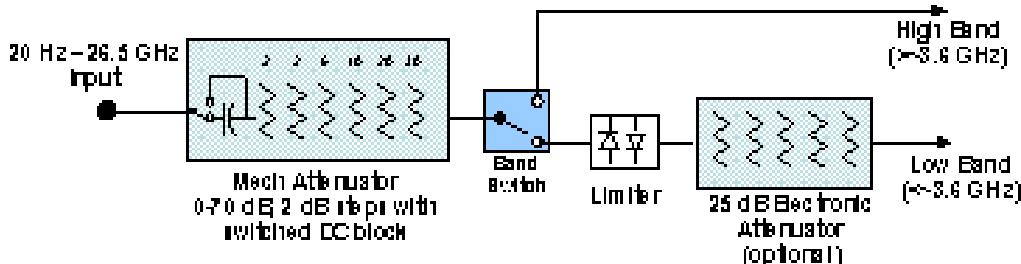
<b>Key Path</b>	AMPTD Y Scale
<b>Scope</b>	Meas Global
<b>Dependencies</b>	In measurements that support the I/Q inputs, this key is unavailable when I/Q is the

selected input, and is replaced by the Range key in that case.

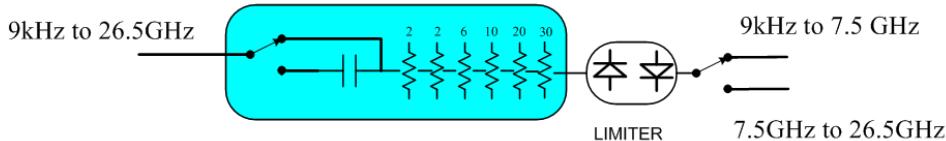
Readback Line	Contains a summary in [ ] brackets of the current total attenuation. See the descriptions of the "(Mech) Atten" on page 564, "Enable Elec Atten" on page 566, and "Elec Atten" on page 568 keys for more detail on the contributors to the total attenuation.  Note that when "Pre-Adjust for Min 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

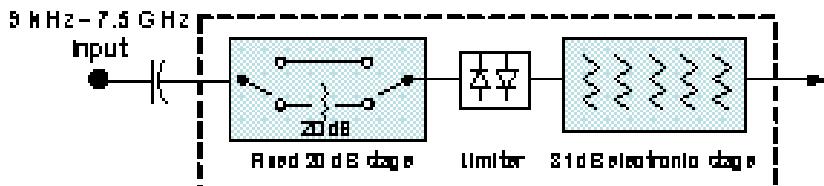


Configuration 2: Mechanical attenuator, no optional electronic attenuator

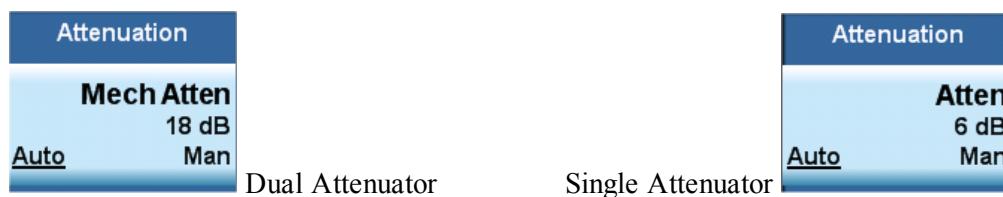


(note that Configuration 2 is not strictly speaking a dual-section attenuator, since there is no electronic section available. However, it behaves exactly like Configuration 1 without the Electronic Attenuator option EA3, therefore for the sake of this document it is grouped into the "Dual Attenuator" 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 395

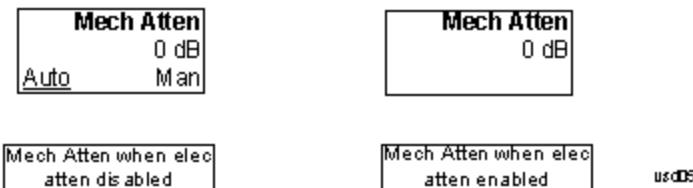
<b>Key Path</b>	AMPTD Y Scale, Attenuation
<b>Remote Command</b>	<pre>[ :SENSe] :POWeR[:RF] :ATTenuation &lt;rel_ampl&gt; [ :SENSe] :POWeR[:RF] :ATTenuation? [ :SENSe] :POWeR[:RF] :ATTenuation:AUTO OFF ON 0 1 [ :SENSe] :POWeR[:RF] :ATTenuation:AUTO?</pre>
<b>Example</b>	<p>POW:ATT 20</p> <p>Dual attenuator 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>
<b>Dependencies</b>	<p>Some measurements do not support the Auto setting of (Mech) Atten. In these measurements, the Auto/Man selection is not available, and the Auto/Man line on the key disappears.</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 566 key description.</p>

	<p>See "Attenuator Configurations and Auto/Man" on page 395 for more information on the Auto/Man functionality of Attenuation.</p>
Couplings	<p>When (Mech) Atten is in Auto, it uses the following algorithm to determine a value:</p> $\text{Atten} = \text{ReferenceLevel} + \text{PreAmpGain} + \text{ExternalGain} - \text{RefLevelOffset} - \text{MaxMixerLevel} + \text{IF Gain}.$ <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 (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.</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	<p>0 dB</p> <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 397](#) 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 566](#)

See ["More Information" on page 396](#)

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" on page 566</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</p>

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	<p>Frequency of the analyzer is &gt; 3.6 GHz then the Enable Elec Atten 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 Enable Elec Atten 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

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## More Information

### Mechanical Attenuator Transition Rules

When the Electronic Attenuator is enabled, the Mechanical Attenuator transitions to a state that has no Auto function. Below are the rules for transitioning the Mechanical Attenuator. NOTE that the information below ONLY applies to the dual attenuator configurations, and ONLY when the Electronic Attenuator is installed:

#### When the Electronic Attenuation is enabled from a disabled state:

- The Mechanical Attenuator is initialized to 10 dB (this is its optimal performance setting). You can then set it as desired with SCPI, numeric keypad, step keys, or knob, and it behaves as it normally would in manual mode
- The Auto/Man state of (Mech) Atten is saved
- The Auto/Man line on the (Mech) Atten key disappears and the auto rules are disabled
- The Electronic Attenuator is set to 10 dB less than the previous value of the Mechanical Attenuator, within the limitation that it must stay within the range of 0 to 24 dB of attenuation.

#### Examples in the dual attenuator configuration:

- Mech Atten at 20 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 10 dB. New total attenuation equals the value before Elec Atten enabled.

- Mech Atten at 0 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 0 dB. New total attenuation does not equal the value before Elec Atten enabled.
- Mech Atten at 40 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 24 dB. New total attenuation does not equal the value before Elec Atten enabled.

### **When the Electronic Attenuation is disabled from an enabled state:**

- The Elec Atten key is grayed out
- The Auto/Man state of (Mech) Atten is restored
- If now in Auto, (Mech) Atten recouples
- If now in Man, (Mech) Atten is set to the value of total attenuation that existed before the Elec Atten was disabled. The resulting value is rounded up to the smallest value possible given the (Mech) Atten Step setting - (That is, 57 dB changes to 58 dB when (Mech) Atten Step is 2 dB.)

### **Using the Electronic Attenuator: Pros and Cons**

The electronic attenuator offers finer steps than the mechanical attenuator, has no acoustical noise, is faster, and is less subject to wear.

The “finer steps” advantage of the electronic attenuator is beneficial in optimizing the alignment of the analyzer dynamic range to the signal power in the front panel as well as remote use. Thus, you can achieve improved relative signal measurement accuracy. Compared to a mechanical attenuator with 2 dB steps, the 1 dB resolution of the electronic attenuator only gives better resolution when the odd-decibel steps are used. Those odd-decibel steps are less accurately calibrated than the even-decibel steps, so one tradeoff for this superior relative accuracy is reduced absolute amplitude accuracy.

Another disadvantage of the electronic attenuator is that the spectrum analyzer loses its “Auto” setting, making operation less convenient.

Also, the relationship between the dynamic range specifications (TOI, SHI, compression and noise) and instrument performance are less well-known with the electrical attenuator. With the mechanical attenuator, TOI, SHI and compression threshold levels increase dB-for-dB with increasing attenuation, and the noise floor does as well. With the electronic attenuator, there is an excess attenuation of about 1 to 3 dB between 0 and 3.6 GHz, making the effective TOI, SHI, and so forth, less well known. Excess attenuation is the actual attenuation relative to stated attenuation. Excess attenuation is accounted for in the analyzer calibration

### **Elec Atten**

Controls the Electronic Attenuator in dual attenuator configurations. This key does not appear in single attenuator configurations, as the control of both the mechanical and electronic stages of the single attenuator is integrated into the single Atten key.

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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.

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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" on page 566</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 Enable Elec Atten is off or grayed out, the Elec Atten key is grayed out.
Preset	0 dB
State Saved	Saved in instrument state
Min	0 dB
Max	Dual attenuator configuration: 24 dB  Single attenuator configuration: the total of ATT and EATT cannot exceed 50 dB, so if the EATT is set to 24 dB first, the main attenuation cannot be greater than 26 dB and will be reduced accordingly; if the main attenuator is set to 40 dB first, EATT cannot be greater than 10 dB
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Adjust Atten for Min Clip

Sets the combination of mechanical and electronic attenuation based on the current measured signal level so that clipping will be at a minimum.

This is an "immediate action" function, that is, it executes once, when the key is pressed.

This key is grayed out in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	[ :SENSe] [:POWeR [:RF] ] :RANGE:OPTImize IMMEDIATE
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### (Mech) Atten Step

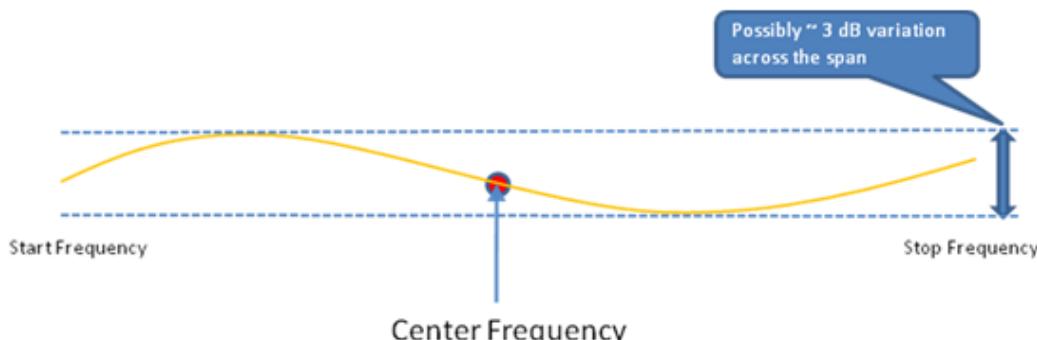
This controls the step size used when making adjustments to the input attenuation.

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.

<b>Key Path</b>	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

### Clipping Level (Remote Command Only)

The Clipping Level is the value only at the center frequency and not necessarily throughout the span. There can possibly be a few dB of fluctuation in the clipping level across the span, especially in wider bandwidths, due to non-ideal flatness.



Thus it is important to understand that this Clipping Level parameter is not the absolute clipping level for the entire signal but only for the center frequency point and you need to adjust your setup accordingly. Nevertheless, it should provide a good reference point.

Also, there needs to be at least one data acquisition with the setup parameters for the correct clipping level to be returned. In cases where the hardware settings have changed since the last data acquisition was performed, the value –999 will be returned. For example, if you set the measurement to Single and change the center frequency, the Clipping Level parameter will return the value –999.

This feature is available in both measurements in IQ Analyzer mode.

This parameter is SCPI only and query only.

<b>Remote Command</b>	<code>[SENSe] :POWer [:RF] :RANGE:CLIPping:LEVel?</code>
<b>Example</b>	<code>:POW:RANG:CLIP:LEV?</code>
Notes	Needs to do a data acquisition with the current parameter set before a valid value is returned.
Dependencies	The value will vary based on the current gain settings. If a hardware parameter is changed in the measurement, a data acquisition needs to be performed in order to get the current clipping level. If a hardware parameter is changed and no data acquisition is performed, the SCPI will return –999.
State Saved	No

## 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	When Range is Auto, "[Auto]" When Range is Man and I & Q are the same, "[<range value>]"

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When Range is Man and I & Q are different:

"[I: <I range value>  
Q: <Q range value>]"

See I Range and Q Range for the <range value> enumeration definition.

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Initial S/W Revision	Prior to A.02.00
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## 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>	[ :SENSe] :VOLTage:IQ:RANGE:AUTO OFF ON 0 1 [ :SENSe] :VOLTage:IQ:RANGE:AUTO?
<b>Example</b>	Put the I Range and Q Range in manual. VOLT:IQ:RANG:AUTO OFF
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: YMax = max (abs(top), abs(bottom)).  The I Range and Q Range are then set to YMax.
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>	[ :SENSe] :POWER:IQ:RANGE:AUTO OFF ON 0 1 [ :SENSe] :POWER:IQ:RANGE:AUTO?
<b>Example</b>	Put the I Range and Q Range in manual. POW:IQ:RANG:AUTO OFF

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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 VOLTTage forms of the command.
Preset	ON
Range	Auto   Man
Initial S/W Revision	Prior to A.02.00

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## 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 577](#)".

---

Key Path	AMPTD Y Scale, Range
<b>Remote Command</b>	<code>[::SENSe]:VOLTTage:IQ[:I]:RANGE[:UPPer] &lt;voltage&gt;</code> <code>[::SENSe]:VOLTTage: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 VOLTTage 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 VOLTTage form of the command. The power values of the 4 range states (1V Peak, 0.5V Peak, 0.25V Peak, and 0.125V Peak)

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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

## 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
Initial S/W Revision	Prior to A.02.00

## 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
Initial S/W Revision	Prior to A.02.00

## 0.125 V Peak

Set the channel gain state to 0.125 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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## Q Range

Accesses the Q Range menu.

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Key Path	AMPTD Y Scale, Range
Readback Text	Q Same as I   1 V Peak   0.5 V Peak   0.25 V Peak   0.125 V Peak When Q Same as I is On, the readback is "Q Same as I", otherwise it is the Q Range value.
Initial S/W Revision	Prior to A.02.00

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## 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
Remote Command	[ :SENSe] :VOLTage   POWer :IQ:MIRRored OFF   ON   0   1 [ :SENSe] :VOLTage   POWer :IQ:MIRRored?
Example	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

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## 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
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
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	AMPTD Y Scale, I Range   Q Range
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 577. 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.

---

Key Path	AMPTD Y Scale, Range
<b>Remote Command</b>	<code>[ :SENSe] :VOLTage:IQ:Q:RANGE [:UPPer] &lt;voltage&gt;</code> <code>[ :SENSe] :VOLTage:IQ:Q:RANGE [:UPPer]?</code>
<b>Example</b>	Set the Q Range to 0.5 V Peak <code>VOLT:IQ:Q:RANG 0.5 V</code>
<b>Notes</b>	The numeric entries are mapped to the smallest gain range whose break point is greater

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	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.
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
Max	1 V
Initial S/W Revision	Prior to A.02.00

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<b>Remote Command</b>	<code>[::SENSe]::POWer:IQ:Q:RANGE[:UPPer] &lt;ampl&gt;</code> <code>[::SENSe]::POWer:IQ:Q:RANGE[:UPPer]?</code>
<b>Example</b>	Will set the Q 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:Q: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 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: 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

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## I/Q Gain Ranges

See the following sections:

["1 V Peak" on page 576](#)

["0.5 V Peak" on page 576](#)

["0.25 V Peak" on page 575](#)

["0.125 V Peak" on page 575](#)

## Scale/Div

Sets the units per vertical graticule division on the display.

This functionality depends on the selected window:

- ["Scale/Div \(Spectrum\)" on page 407](#)
- ["Scale/Div \(I/Q Waveform\)" on page 407](#)

### Scale/Div (Spectrum)

Sets the vertical scale in spectrum view by changing the amplitude value per division.

Key Path	AMPTD Y Scale
Mode	BASIC
Remote Command	<pre>:DISPlay:SPECTrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:PDIVision &lt;rel_ampl&gt; :DISPlay:SPECTrum:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:PDIVision?</pre>
Example	<pre>DISP:SPEC:VIEW:WIND:TRAC:Y:PDIV 10 DISP:SPEC:VIEW:WIND:TRAC:Y:PDIV?</pre>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Couplings	When you set a value manually, Auto Scaling automatically changes to Off. When Auto Scaling is turned on, this value is automatically determined by the measurement result.
Preset	10 dB
State Saved	Saved in instrument state.
Min	0.10 dB
Max	20 dB
Initial S/W Revision	Prior to A.02.00

### Scale/Div (I/Q Waveform)

Sets the vertical scale in the waveform view by changing the amplitude value per division.

Key Path	AMPTD Y Scale
Mode	BASIC
Remote Command	<pre>:DISPlay:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALe]:PDIVision &lt;voltage&gt; :DISPlay:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALe]:PDIVision?</pre>

<b>Example</b>	DISP:SPEC:VIEW:WIND2:TRAC:Y:PDIV 10 DISP:SPEC:VIEW:WIND2:TRAC:Y:PDIV?
<b>Notes</b>	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
<b>Couplings</b>	When you set a value manually, Auto Scaling automatically changes to Off. When Auto Scaling is turned on, this value is automatically determined by the measurement result.
<b>Preset</b>	100.0 mV
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	1.00 nV
<b>Max</b>	20.0 V
<b>Initial S/W Revision</b>	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 409.

<b>Key Path</b>	AMPTD Y Scale
<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> </ul>

- 
- Grayed out in the Spectrogram View.

Couplings	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.
Status Bits/OPC dependencies	When centering the preselector, *OPC will not return true until the process is complete and a subsequent measurement has completed, nor will results be returned to a READ or MEASure command. The Measuring bit should remain set while this command is operating and should not go false until the subsequent sweep/measurement has completed.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Proper Preselector Operation

A number of considerations should be observed to ensure proper operation:

1. If the selected marker is off, the analyzer will turn on a marker, perform a peak search, and adjust the preselector using the selected marker's frequency. It uses the "highest peak" peak search method unqualified by threshold or excursion, so that there is no chance of a 'no peak found' error. It continues with that peak, even if it is the peak of just noise. Therefore, for this operation to work properly, there should be a signal on screen in a preselected range for the peak search to find.
2. If the selected marker is already on, the analyzer will attempt the centering at that marker's frequency. There is no preselector for signals below about 3.6 GHz, therefore if the marker is on a signal below 3.6 GHz, no centering will be attempted and an advisory message generated
3. In some models, the preselector can be bypassed. If it is bypassed, no centering will be attempted in that range and a message will be generated.

## Preselector Adjust

Allows you to manually adjust the preselector filter frequency to optimize its response to the signal of interest. This function is only available when "[Presel Center](#)" on page 579 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>	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 Presel Adjust value set by Presel Center, or by manually adjusting Presel Adjust, is not saved in instrument state, and does not survive a Preset or power cycle.
Min	-500 MHz
Max	500 MHz
Default Unit	Hz
<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   EXTernal</code> <code>[SENSe]:POWeR[:RF]:PADJust:PRESelector?</code>
Notes	<p>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.</p> <p>The command form has no effect, the query always returns MWAVE</p>
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.

---

<b>Key Path</b>	AMPTD Y Scale
<b>Mode</b>	SA, BASIC, PNOISE, VSA , LTE, LTETDD
<b>Scope</b>	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
<b>Notes</b>	If a Presel Center is performed, the analyzer will momentarily switch to the Standard Path, regardless of the setting of μW Path Control  The DC Block 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.
<b>Dependencies</b>	Unavailable in BBIQ and External Mixing
<b>Preset</b>	All modes other than IQ Analyzer mode and VXA: STD

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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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## 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.

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Key Path	AMPTD Y Scale, $\mu$ W Path Control
Example	:POW:MW:PATH STD
Readback Text	Standard Path
Initial S/W Revision	A.04.00

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## $\mu$ 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 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.

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Key Path	AMPTD Y Scale, $\mu$ W Path Control
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<b>Example</b>	:POW:MW:PATH MPB
Dependencies	<p>Key is blanked if current mode does not support it.</p> <p>Key is grayed out if mode supports it but current measurement does not support it.</p> <p>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.</p>
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	<p>The ON parameter sets the STD path (:POW:MW:PATH STD)</p> <p>The OFF parameter sets path MPB (:POW:MW:PATH MPB)</p>
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".

<b>Key Path</b>	AMPTD Y Scale
Scope	Meas Global
<b>Remote Command</b>	[ :SENSe] :POWeR [:RF] :GAIN [:STATe] OFF ON 0 1 [:SENSe] :POWeR [:RF] :GAIN [:STATe] ?
Dependencies	<p>Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown.</p> <p>The preamp is not available when the electronic/soft attenuator is enabled.</p>
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

Key Path	AMPTD Y Scale, Internal Preamp
Scope	Meas Global
<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>	<code>:POW:GAIN OFF</code>
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>	<code>:POW:GAIN ON</code> <code>:POW:GAIN:BAND LOW</code>
Readback	Low Band
Initial S/W Revision	Prior to A.02.00

## Full Range

Sets the internal preamp to use its full range. The low band (0–3.6 GHz or 0–3GHz, depending on the model) is supplied by the low band preamp and the frequencies above low band are supplied by the high band preamp.

The frequency range of the installed (optional) preamp is displayed in square brackets on the Full Range key label. If the high band option is not installed the Full Range key does not appear.

Key Path	AMPTD Y Scale, Internal Preamp
Example	:POW:GAIN ON :POW:GAIN:BAND FULL
Readback	Full Range
Initial S/W Revision	Prior to A.02.00

## Ref Position

Allows you to set the reference position to either Top, Ctr (center) or Bottom.

This functionality depends on the selected window:

- "Ref Position (Spectrum)" on page 415
- "Ref Position (IQ Waveform)" on page 416

### Ref Position (Spectrum)

Allows you to set the spectrum reference position to Top, Ctr (center) or Bottom.

Key Path	AMPTD Y Scale
Mode	BASIC
Remote Command	:DISPlay:SPECTrUm:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:RPOSITION TOP   CENTer   BOTTom :DISPlay:SPECTrUm:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALe]:RPOSITION?
Example	DISP:SPEC:VIEW:WIND2:TRAC:Y:RPOS CENT DISP:SPEC:VIEW:WIND2:TRAC:Y:RPOS?
Notes	You must be in the IQ Analyzer (Basic) mode 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

## Ref Position (IQ Waveform)

Allows you to set the spectrum reference position to Top, Ctr (center) or Bottom.

Key Path	AMPTD Y Scale
Mode	BASIC
Remote Command	:DISPlay:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALe]:RPOSITION TOP   CENTER   BOTTOM :DISPlay:SPECTrum:VIEW[1]:WINDOW2:TRACe:Y[:SCALe]:RPOSITION?
Example	DISP:SPEC:VIEW:WIND2:TRAC:Y:RPOS TOP DISP:SPEC:VIEW:WIND2:TRAC:Y:RPOS?
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Preset	CENTER
State Saved	Saved in instrument state.
Range	Top   Ctr   Bot
Initial S/W Revision	Prior to A.02.00

## Auto Scaling

Enables you to toggle the Auto Scaling function between On and Off. Upon pressing the Restart front-panel key or the Restart key under the Meas Control menu, the Auto Scaling function automatically determines the scale per division and reference values based on the measurement results.

Key Path	AMPTD Y Scale
Mode	BASIC
Remote Command	:DISPlay:SPECTrum:VIEW[1]:WINDOW[1]   2:TRACe:Y[:SCALe]:COUPle ON   OFF   1   0 :DISPlay:SPECTrum:VIEW[1]:WINDOW[1]   2:TRACe:Y[:SCALe]:COUPle?
Example	DISP:SPEC:VIEW:WIND2:TRAC:Y:COUP 0
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Couplings	When you set a value to either Scale/Div or Ref Value manually, Auto Scaling automatically changes to Off. When this value is turned on, Ref Value and Scale/Div are automatically determined by the measurement result.
Preset	OFF
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 418

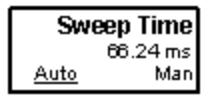
Key Path	Front-panel key
<b>Remote Command</b>	:COUPLE ALL NONE
<b>Example</b>	:COUP ALL
Notes	:COUPLE ALL puts all Auto/Man parameters in Auto mode (equivalent to pressing the Auto Couple key). :COUPLE NONE puts all Auto/Man parameters in manual mode. It decouples all the coupled instrument parameters and is not recommended for making measurements.
Initial S/W Revision	Prior to A.02.00

## More Information

There are two types of functions that have Auto/Manual modes.

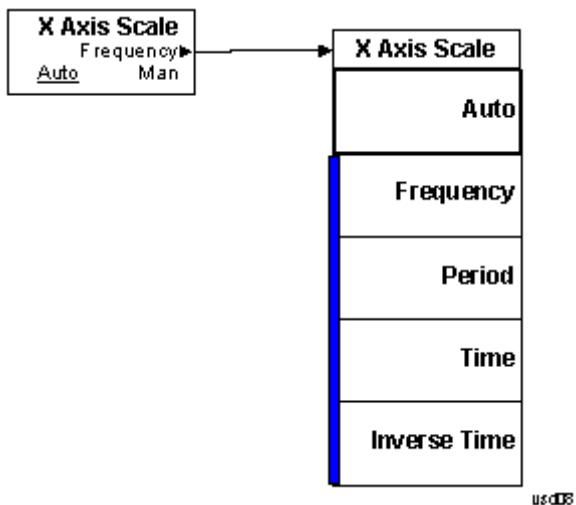
### Auto/Man Active Function keys

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.



### Auto/Man 1-of-N keys

An Auto/Man 1-of-N key allows you to manually pick from a list of parameter values, or place the function in Auto, in which case the value is automatically selected (and indicated) as shown below. If in Auto, Auto is underlined on the calling key. If in manual operation, manual is indicated on the calling key. But the calling key does not actually toggle the function, it simply opens the menu.



## BW

Opens the Bandwidth menu.

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

## Res BW

Enables you to set the resolution bandwidth setting. This is the resolution bandwidth of the FFT analysis. Changing this value changes the FFT Window size, FFT length and the sweep time (measurement capture length).

If FFT Length Ctrl in the FFT Size menu under Meas Setup, Advanced is set to Manual, the Res BW key is grayed out and shows the resolution bandwidth determined by the FFT Window size.

If the function is auto-coupled, the value setting is ignored.

Key Path	BW
Mode	BASIC
Remote Command	<pre>[::SENSe]:SPECTrum:BANDwidth[:RESolution] &lt;bandwidth&gt; [::SENSe]:SPECTrum:BANDwidth[:RESolution]? [::SENSe]:SPECTrum:BANDwidth[:RESolution]:AUTO ON OFF 1 0 [::SENSe]:SPECTrum:BANDwidth[:RESolution]:AUTO?</pre>
Example	<pre>SPEC:BAND 100 SPEC:BAND? SPEC:BAND:AUTO OFF SPEC:BAND:AUTO?</pre>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Preset	160 kHz
	ON
State Saved	Saved in instrument state.
Min	0.1 Hz
Max	3.0 MHz
Backwards Compatibility SCPI	<pre>[::SENSe]:SPECTrum:BWIDth[:RESolution]</pre>
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 Cont hardkey, instead there is a Sweep Single/Cont key. In these analyzers, switching the Sweep Single/Cont key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart Max Hold and Min Hold. The X-Series has Single and Cont keys in place of the SweepSingleCont key. In the X-Series, if in single measurement, the Cont key (and INIT:CONT ON ) switches to continuous measurement, but never restarts a measurement and never resets a sweep.
Initial S/W Revision	Prior to A.02.00

### In Swept SA Measurement (Spectrum Analysis Mode):

The analyzer takes repetitive sweeps, averages, measurements, etc., when in Continuous mode. When the average count reaches the Average/Hold Number the count stops incrementing, but the analyzer keeps sweeping. See the Trace/Detector section for the averaging formula used both before and after the Average/Hold Number is reached. The trigger condition must be met prior to each sweep. The type of trace processing for multiple sweeps, is set under the Trace/Detector key, with choices of Trace Average, Max Hold, or Min Hold.

### In Other Measurements/Modes:

With Avg/Hold Num (in the Meas Setup menu) set to Off or set to On with a value of 1, a sweep is taken after the trigger condition is met; and the analyzer continues to take new sweeps after the current sweep has completed and the trigger condition is again met. However, with Avg/Hold Num set to On with a value >1, multiple sweeps (data acquisitions) are taken for the measurement. The trigger condition must be met prior to each sweep. The sweep is not stopped when the average count k equals the number N set for Avg/Hold Num is reached, but the number k stops incrementing. A measurement average usually applies to all traces, marker results, and numeric results. But sometimes it only applies to the numeric results.

If the analyzer is in Single measurement, pressing the Cont key does not change k and does not cause the sweep to be reset; the only action is to put the analyzer into Continuous measurement operation.

If it is already in continuous sweep:

the INIT:CONT 1 command has no effect

## 8 Complex Spectrum Measurement Cont (Continuous Measurement/Sweep)

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 250

## Frequency/Channel

Opens a menu that enables you to control the Center Frequency of the instrument.

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

### Center Freq

Sets the frequency that corresponds to the horizontal center of the graticule (when frequency Scale Type is set to linear). While adjusting the Center Frequency the Span is held constant, which means that both Start Frequency and Stop Frequency will change.

Pressing Center Freq also sets the frequency entry mode to Center/Span. In Center/Span mode, the center frequency and span values are displayed below the graticule, and the default active function in the Frequency menu is Center Freq.

The center frequency setting is the same for all measurements within a mode, that is, it is Meas Global. Some modes are also able to share a Mode Global center frequency value. If this is the case, the Mode will have a Global Settings key in its Mode Setup menu.

The Center Freq function sets (and queries) the Center Frequency for the currently selected input. If your analyzer has multiple inputs, and you select another input, the Center Freq changes to the value for that input. SCPI commands are available to directly set the Center Freq for a specific input.

Center Freq is remembered as you go from input to input. Thus you can set a Center Freq of 10 GHz with the RF Input selected, change to BBIQ and set a Center Freq of 20 MHz, then switch to External Mixing and set a Center Freq of 60 GHz, and when you go back to the RF Input the Center Freq will go back to 10 GHz; back to BBIQ and it is 20 MHz; back to External Mixing and it is 60 GHz.

See "RF Center Freq" on page 427

See Ext Mix Center Freq

See "I/Q Center Freq" on page 429

See "Center Frequency Presets" on page 425

Key Path	FREQ Channel
Scope	Meas Global
Remote Command	<code>[::SENSe]:FREQuency:CENTER &lt;freq&gt;</code> <code>[::SENSe]:FREQuency:CENTER?</code>
Example	FREQ:CENT 50 MHz FREQ:CENT UP changes the center frequency to 150 MHz if you use FREQ:CENT:STEP 100 MHz to set the center frequency step size to 100 MHz

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	FREQ:CENT?
Notes	<p>This command sets either the RF or I/Q Center Frequency depending on the selected input.</p> <p>For RF input it is equivalent to FREQ:RF:CENT</p> <p>For I/Q input it is equivalent to FREQ:IQ:CENT</p> <p>Preset and Max values are dependent on Hardware Options (5xx)</p> <p>If no terminator (e.g. MHz) is sent the terminator Hz is used. If a terminator with unit other than Frequency is used, an invalid suffix error message is generated.</p>
Dependencies	The Center Frequency can be limited by Start or Stop Freq limits, if the Span is so large that Start or Stop reach their limit.
Couplings	When operating in “swept span”, any value of the Center Frequency or Span that is within the frequency range of the analyzer is allowed when the value is being set through the front panel numeric key pad or the SCPI command. The other parameter is forced to a different value if needed, to keep the Start and the Stop Frequencies within the analyzer’s frequency range
Preset	Depends on instrument maximum frequency, mode, measurement, and selected input. See "Center Frequency Presets" on page 425 and "RF Center Freq" on page 427 and <u>Ext Mix Center Freq</u> and " <u>I/Q Center Freq</u> " on page 429.
State Saved	Saved in instrument state
Min	Depends on instrument maximum frequency, mode, measurement, and selected input.. See "Center Frequency Presets" on page 425 and "RF Center Freq" on page 427 and " <u>I/Q Center Freq</u> " on page 429.
Max	Depends on instrument maximum frequency, mode, measurement, and selected input.. See "Center Frequency Presets" on page 425 and "RF Center Freq" on page 427 and " <u>I/Q Center Freq</u> " on page 429.
Default Unit	Hz
Status Bits/OPC Dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

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## Center Frequency Presets

The following table provides the Center Frequency Presets for the Spectrum Analyzer mode, and the Max Freq, for the various frequency options:

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Freq Option	CF after Mode Preset	Stop Freq after Mode Preset	Max Freq (can't tune above)
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## 8 Complex Spectrum Measurement

### Frequency/Channel

503 (all but N9000A)	1.805 GHz	3.6 GHz	3.7 GHz
503 (N9000A)	1.505 GHz	3.0 GHz	3.08 GHz
507 (all but N9000A)	3.505 GHz	7.0 GHz	7.1 GHz
507 (N9000A)	3.755 GHz	7.5 GHz	7.58 GHz
508 (all but N9038A)	1.805 GHz	3.6 GHz	8.5 GHz
508 (N9038A)	4.205 GHz	8.4 GHz	8.5 GHz
513	6.805 GHz	13.6 GHz	13.8 GHz
526 (all but N9000A and N9038A)	13.255 GHz	26.5 GHz	27.0 GHz
526 (N9000A)	13.255 GHz	26.5 GHz	26.55 GHz
526 (N9038A)	1.805 GHz	3.6 GHz	27.0 GHz
532	16.005 GHz	32.0 GHz	32.5 GHz
543	21.505 GHz	43.0 GHz	TBD
544	22.005 GHz	44.0 GHz	44.5 GHz
550	25.005 GHz	50.0 GHz	51 GHz

Input 2:

Model	CF after Mode Preset	Stop Freq after Mode Preset	Max Freq (can't tune above)
N9000A opt C75	0.7505GHz	1.5 GHz	1.58 GHz
N9038A	505 MHz	1 GHz	1.000025 GHz

Tracking Generator Frequency Limits (N9000A only):

Tracking	Min Freq (clips	If above this	Max Freq

Generator Option	to this freq when turn TG on and can't tune below while TG on)	Freq, Stop Freq clipped to this Freq when TG turned on	(can't tune above) while TG on
T03	9 kHz	3.0 GHz	3.08 GHz
T06	9 kHz	6.0 GHz	6.05 GHz

The following table shows the Center Frequency Presets for modes other than Spectrum Analyzer:

Mode	CF Preset for RF
WCDMA	1 GHz
WIMAXOFDMA,	1 GHz
BASIC	1 GHz
ADEMOM	1 GHz
VSA	1 GHz
TDSCDMA	1 GHz
PNOISE	1 GHz
LTE	1 GHz
LTETDD	1 GHz
MSR	1 GHz
GSM	935.2 MHz
NFIGURE	1.505 GHz

## RF Center Freq

SCPI command for specifying the RF Center Frequency. This command will set the Center Frequency to be used when the RF input is selected, even if the RF input is not the input that is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe] :FREQuency:RF:CENTER &lt;freq&gt;</code> <code>[ :SENSe] :FREQuency:RF:CENTER?</code>
<b>Example</b>	<code>FREQ:RF:CENT 30 MHz</code>
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Dependencies	If the electronic/soft attenuator is enabled, any attempt to set Center Frequency such

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that the Stop Frequency would be >3.6 GHz fails and results in an advisory message. If the equivalent SCPI command is sent, this same message is generated as part of a “–221, Settings conflict” warning.

If Source Mode is set to Tracking, and the Max or Min Center Freq is therefore limited by the limits of the source, a warning message is generated, “Data out of range;clipped to source max/min” if these limits are exceeded. Note that for an external source, these limits can be affected by the settings of Source Numerator, Source Denominator and Power Sweep.

Preset	See table above
State Saved	Saved in instrument state.
Min	–79.999995 MHz, unless Source Mode is set to Tracking, in which case it is limited by the minimum frequency of the Source
Max	See table above. Basically instrument maximum frequency – 5 Hz. Note that, if the Source Mode is set to Tracking, the effective instrument maximum frequency may be limited by the source maximum frequency. If the knob or step keys are being used, also depends on the value of the other three interdependent parameters Span, Start Frequency and Stop Frequency
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Ext Mix Center Freq

SCPI command for specifying the External Mixer Center Frequency. This command will set the Center Frequency to be used when the External Mixer is selected, even if the External Mixer input is not the input which is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

Scope	Meas Global
<b>Remote Command</b>	[ :SENSe] :FREQuency:EMIXer:CENTER <freq> [ :SENSe] :FREQuency:EMIXer:CENTER?
<b>Example</b>	:FREQ:EMIX:CENT 60 GHz :FREQ:EMIX:CENT?
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Couplings	When returning to External Mixing after having been switched to one of the other inputs (e.g., RF), you will come back into the settings that you had when you left External Mixing. So you will come back to the band you were in with the Center Frequency that you had. However, Span is not an input-dependent parameter, therefore you will bring the span over from the other input. Therefore, the analyzer comes back with the span from the previous input, limited as necessary by the current mixer setup.

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Preset	<p>When a Mode Preset is performed while in External Mixing, the Start frequency of the current Mode is set to the nominal Min Freq of the lowest harmonic range in the Harmonic Table for the current mixer setup. Similarly, the Stop frequency of the current Mode is set to the nominal Max Freq of the highest harmonic range in the Harmonic Table. The Center Freq thus presets to the point arithmetically equidistant from these two frequencies.</p> <p>If the current measurement has a limited Span available to it, and cannot achieve the Span shown in the table (Span=Stop Freq – Start Freq), the analyzer uses the maximum Span the measurement allows, and still sets the Center Freq to the midpoint of the Start and Stop Freq values in the Harmonic Table.</p> <p>When Restore Input/Output Defaults is performed, the mixer presets to the 11970A, whose Start and Stop frequencies are 26.5 and 40 GHz respectively. The center of these two frequencies is 33.25 GHz.</p> <p>Therefore, after a Restore Input/Output Defaults, if you go into External Mixing and do a Mode Preset while in the Spectrum Analyzer Mode, the resulting Center Freq is 33.25 GHz.</p>
State Saved	Saved in instrument state.
Min	The minimum frequency in the currently selected mixer band + 5 Hz
Max	<p>The maximum frequency in the currently selected mixer band – 5 Hz</p> <p>If the knob or step keys are being used, also depends on the value of the other three interdependent parameters Span, Start Frequency and Stop Frequency</p>
Initial S/W Revision	A.08.01

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## I/Q Center Freq

SCPI command for specifying the I/Q Center Frequency. This command will set the Center Frequency to be used when the I/Q input is selected, even if the I/Q input is not the input which is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

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Scope	Meas Global
<b>Remote Command</b>	<pre>[ :SENSe] :FREQuency:IQ:CENTER &lt;freq&gt; [ :SENSe] :FREQuency:IQ:CENTER?</pre>
<b>Example</b>	FREQ:IQ:CENT: 30 MHz
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Preset	0 Hz
State Saved	Saved in instrument state.
Min	-40.049995 MHz
Max	40.049995 MHz
Initial S/W Revision	Prior to A.02.00

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## 8 Complex Spectrum Measurement Frequency/Channel

## Input/Output

See "Input/Output" on page 118

## Marker

Accesses a menu that enables you to set the marker parameters.

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. All interactions and dependencies detailed under the key description are enforced when the remote command is sent.

Key Path	Marker
Mode	BASIC
Remote Command	:CALCulate:SPECTrum:MARKer[1] 2 ...12:MODE POSITION   DELTA   OFF :CALCulate:SPECTrum:MARKer[1] 2 ...12:MODE?
Example	CALC:SPEC:MARK:MODE OFF CALC:SPEC: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 Marker Trace rules. At the same time, Marker X Axis Value 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 the IQ Analyzer (Basic) mode 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

## Properties

Accesses a menu used to set certain properties of the selected marker.

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

## Select Marker

Displays 12 markers available for selection.

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

## Relative To

Selects the marker relative to its reference marker.

Key Path	Marker, Properties
Mode	BASIC
Remote Command	:CALCulate:SPECTrum:MARKer[1]   2   ... 12:REference <integer> :CALCulate:SPECTrumb:MARKer[1]   2   ... 12:REference?
Example	CALC:SPEC:MARK6:REF 8 CALC:SPEC: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).
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	Marker
Mode	BASIC
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1] 2 ...12:TRACe SPECTrum   ASpectrum   I   Q   IQ :CALCulate:SPECTrum:MARKer[1] 2 ...12:TRACe?
<b>Example</b>	CALC:SPEC:MARK:TRAC SPEC CALC:SPEC:MARK:TRAC?
Notes	<p>Assigns the specified marker to the designated trace.</p> <p>The IQ selection is for backward compatibility purposes. It is recommended that the users use the I and/or Q selection instead.</p> <p>You must be in a mode that includes the Complex Spectrum measurement to use this command. Use INSTRument:SElect to set the mode.</p>
Preset	SPECTrum
State Saved	Saved in instrument state.
Range	Spectrum   Spectrum Avg  I Q IQ
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	BASIC
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[:STATe] ON OFF 1 0 :CALCulate:SPECTrum:MARKer[:STATe]?
<b>Example</b>	CALC:SPEC:MARK:COUP ON CALC:SPEC:MARK:COUP?
Notes	You must be in the IQ Analyzer (Basic) mode 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

## All Markers Off

Turns off all markers.

Key Path	Marker
Mode	BASIC
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer:AOFF
<b>Example</b>	CALC:SPEC:MARK:AOFF
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
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	BASIC
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1 2 ...12]:X <freq> :CALCulate:SPECTrum:MARKer[1 2 ...12]:X?
<b>Example</b>	CALC:SPEC:MARK3:X 100 CALC:SPEC:MARK3:X?
Notes	If no suffix is sent it 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 Normal, or the offset from the marker's reference marker if the control mode is Delta. The query is returned in the fundamental units for the current marker X Axis scale: Hz for Frequency and Inverse Time, seconds for Period and Time. If the marker is Off the response is not a number.  You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query returns a not a number (NAN).
State Saved	No
Range	Depends on X axis range of selected Trace.
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	BASIC
Remote Command	:CALCulate:SPECTrum:MARKer[1 2 ...12]:X:POSITION <freq> :CALCulate:SPECTrum:MARKer[1 2 ...12]:X:POSITION?
Example	CALC:SPEC:MARK10:X:POS 500 CALC:SPEC:MARK10:X:POS?
Notes	The query returns the marker's absolute X Axis value in trace points if the control mode is Normal, or the offset from the marker's reference marker in trace points if the control mode is Delta. The value is returned as a real number, not an integer, corresponding to the translation from X Axis Scale units to trace points. If the marker is Off the response is not a number.  You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query returns a not a number (NAN).
State Saved	No
Range	Depends on length of selected Trace.
Min	-9.9E+37 (Depends on length of selected Trace.)
Max	9.9E+37 (Depends on length of selected Trace.)
Initial S/W Revision	Prior to A.02.00

## Marker Y Axis Value (Remote Command Only)

Returns the marker Y value. Query only.

Mode	BASIC
Remote Command	:CALCulate:SPECTrum:MARKer[1 2 ...12]:Y?
Example	CALC:SPEC:MARK11:Y?
Notes	When the marker is on and MarkerTrace is set to IQ, it returns I and Q values. Case #1 - MarkerTrace SPEC, I or Q: returns a single double value. >:CALC:SPEC:MARK1:Y? -2.402406506109E+001 Case #2 - MarkerTrace IQ: returns a double array of two values, the first is I, and the second is Q.

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>:CALC:SPEC: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 Complex Spectrum measurement to use this command. Use INSTRument:SElect to set the mode.	
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
Preset	Result dependent on markers setup and signal source
State Saved	No
<b>Backwards Compatibility SCPI</b>	:CALCulate:SPECTrum:MARKer[1 2 ...12]:FUNCTION:RESULT?
Initial S/W Revision	Prior to A.02.00

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## 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
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1 2 ...12]:STATE OFF ON 0 1 :CALCulate:SPECTrum:MARKer[1 2 ...12]:STATE?
<b>Example</b>	CALC:SPEC:MARK3:STAT ON CALC:SPEC:MARK3:STAT?
Notes	You must be in the IQ Analyzer (Basic) mode 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

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## Marker Function

Opens the Marker Function menu.

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 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.

Key Path	Marker Function
Mode	BASIC
Remote Command	:CALCulate:SPECTrum:MARKer[1] 2 ...12:FUNCTION NOISE   BPOWER   BDENsity   OFF :CALCulate:SPECTrum:MARKer[1] 2 ...12:FUNCTION?
Example	CALC:SPEC:MARK:FUNC NOISCALC:SPEC:MARK:FUNC?
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
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

Opens a menu of keys that allow you to modify the band.

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

## Band/Interval Span for Frequency Domain

Sets the width of the span for the selected marker.

Key Path	Marker Function, Band Adjust
Mode	BASIC
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1]  2 ...12:FUNCTION:BAND:SPAN <freq> :CALCulate:SPECTrum:MARKer[1]  2 ...12:FUNCTION:BAND:SPAN?
<b>Example</b>	CALC:SPEC:MARK12:FUNC:BAND:SPAN 20MHzCALC:SPEC:MARK12:FUNC:BAND:SPAN?
Notes	You must be in the IQ Analyzer (Basic) mode 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	10% of Span
State Saved	Saved in instrument state.
Min	0
Max	26.5GHz
Initial S/W Revision	Prior to A.02.00

## Band/Interval Left for Frequency Domain

Sets the left edge frequency or time for the band of the selected marker.

Key Path	Marker Function, Band Adjust
Mode	BASIC
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1]  2 ...12:FUNCTION:BAND:LEFT <freq> :CALCulate:SPECTrum:MARKer[1]  2 ...12:FUNCTION:BAND:LEFT?
<b>Example</b>	CALC:SPEC:MARK12:FUNC:BAND:LEFT 20GHz CALC:SPEC:MARK12:FUNC:BAND:LEFT?
Notes	You must be in the IQ Analyzer (Basic) mode 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	5% of Span
State Saved	Saved in instrument state.
Min	0
Max	26.5GHz
Initial S/W Revision	Prior to A.02.00

## Band/Interval Right for Frequency Domain

Sets the right edge frequency or time for the band of the selected marker.

Key Path	Marker Function, Band Adjust
Mode	BASIC
Remote Command	:CALCulate:SPECTrum:MARKer[1 2 ...12]:FUNCTION:BAND:RIGHT <freq> :CALCulate:SPECTrum:MARKer[1 2 ...12]:FUNCTION:BAND:RIGHT?
Example	CALC:SPEC:MARK12:FUNC:BAND:RIGH 20GHz CALC:SPEC:MARK12:FUNC:BAND:RIGH?
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Couplings	Changing the Band/Interval Right necessarily changes the Band/Interval Left and Band/Interval Span values
Preset	5% of Span
State Saved	Saved in instrument state.
Min	0
Max	26.5GHz
Initial S/W Revision	Prior to A.02.00

## Marker To

Accesses menu keys that can copy the current marker value into another instrument parameter (for example, Center Freq). If the currently selected marker is not on when you press this front panel key, it is turned on at the center of the screen as a normal marker.

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

## Mkr -> CF

Sets the center frequency to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display.

Key Path	Marker ->
Mode	BASIC
Remote Command	:CALCulate:SPECTrume:MARKer[1 2 ...12[:SET]:CENTER
Example	CALC:SPEC:MARK4:CENT
Notes	<p>In the delta marker mode, this function sets the center frequency to the x-axis value of the delta marker. If the currently selected marker is not on when this key is pressed, it is turned on at the center of the screen as a normal type marker.</p> <p>You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.</p>
Dependencies	This key is not available (grayed out) when the selected marker is not on the spectrum trace.
Initial S/W Revision	Prior to A.02.00

## Mkr -> Ref Lvl

Sets the reference level to the amplitude value of the selected marker, moving the marked point to the reference level (top line of the graticule).

Key Path	Marker ->
Mode	BASIC
Remote Command	:CALCulate:SPECTrume:MARKer[1 2 ...12[:SET]:RLevel
Example	CALC:SPEC:MARK4:RLEV
Notes	Make the Marker Y value to the display reference value.

---

If the currently selected marker is not on when this key is pressed, it is turned on at the center of the screen as a normal type marker, and its amplitude applied to the reference value.

You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.

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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.

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Key Path	Front-panel key
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## Remote Measurement Functions

This section contains the following topics:

["Measurement Group of Commands" on page 627](#)

["Current Measurement Query \(Remote Command Only\)" on page 629](#)

["Limit Test Current Results \(Remote Command Only\)" on page 629](#)

["Data Query \(Remote Command Only\)" on page 630](#)

["Calculate/Compress Trace Data Query \(Remote Command Only\)" on page 630](#)

["Calculate Peaks of Trace Data \(Remote Command Only\)" on page 635](#)

["Format Data: Numeric Data \(Remote Command Only\)" on page 636](#)

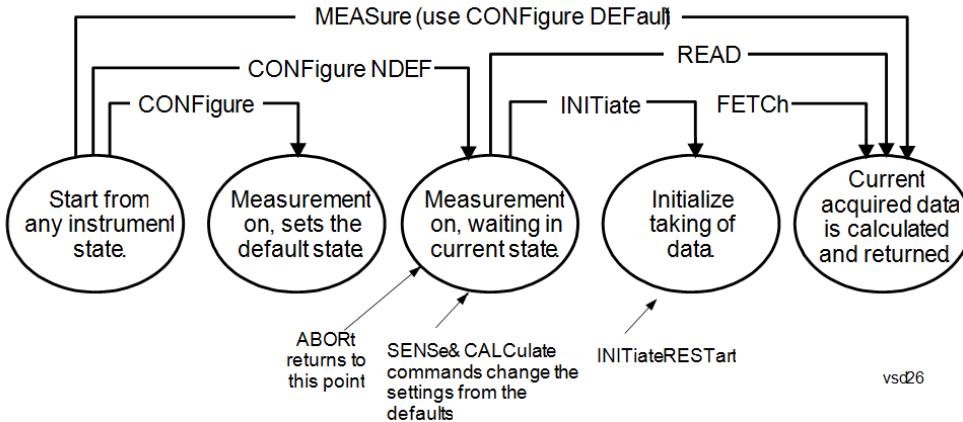
["Format Data: Byte Order \(Remote Command Only\)" on page 638](#)

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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 CONFfigure 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 CONFfigure 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,

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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)
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### Current Measurement Query (Remote Command Only)

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

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Remote Command      :CONFIGURE?

Example      CONF?

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### 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

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### 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

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### 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>	To query the mean power of a set of GSM bursts: Supply a signal that is a set of GSM bursts.

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	<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;offset&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;offset&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. <offset> 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)

$$\text{DME} = 10 \times \log_{10} \left( \frac{1}{n} \sum_{X_i \in \text{region}(s)} 10^{\frac{|X_i|}{10}} \right)$$

- 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)

$$\text{RMS} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i^2}$$

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)

$$\text{RMS} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i X_i^*}$$

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)

$$\text{SDEV} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} (X_i - \bar{X})^2}$$

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:

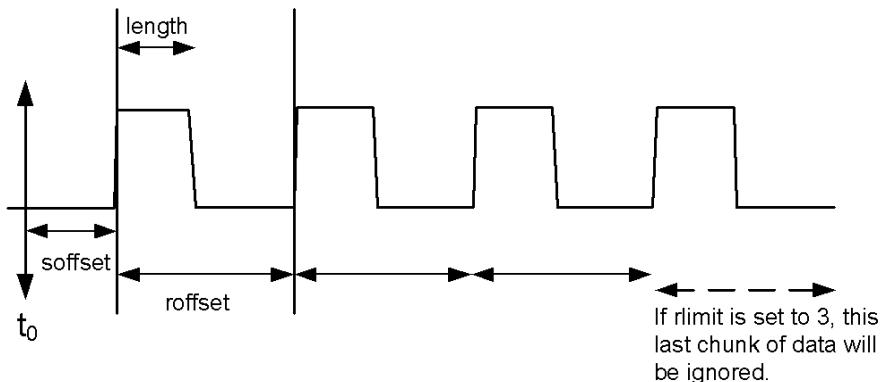
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

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.

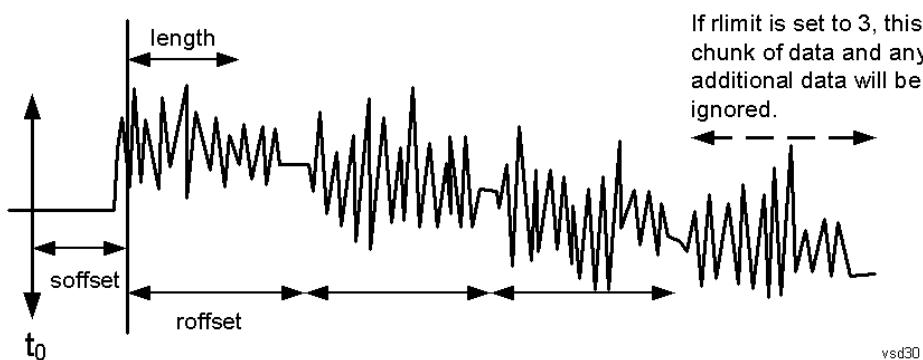
#### Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



#### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



<offset> - 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: <pre>:CALCulate:DATA[1]   2   ... 6:PEAKs? &lt;threshold&gt;, &lt;excursion&gt; [,AMPLitude   FREQuency   TIME [,ALL   GTDLine   LTDLine]]</pre> For most other measurements: <pre>:CALCulate:DATA[1]   2   ... 6:PEAKs? &lt;threshold&gt;, &lt;excursion&gt; [,AMPLitude   FREQuency   TIME]</pre>
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<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>
<b>Notes</b>	<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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## 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>
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 Block Data" and sending a definite block when ASCII data is expected generates message -121 "Invalid Character in Number".</p>
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.

<b>Remote Command</b>	:FORMat:BORDer NORMAL SWAPPED :FORMat:BORDer?
Preset	NORMAL
Initial S/W Revision	Prior to A.02.00

## Meas Setup

Opens the menu that allows you to set up the measurement parameters.

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

## Avg/Hold Num

Sets the number of ‘sweeps’ that are averaged. After the specified number of ‘sweeps’ (average counts), the averaging mode (terminal control) setting determines the averaging action.

Key Path	Meas Setup
Mode	BASIC
Remote Command	<code>[ :SENSe] :SPECTrum:AVERage:COUNt &lt;integer&gt;</code> <code>[ :SENSe] :SPECTrum:AVERage:COUNt?</code> <code>[ :SENSe] :SPECTrum:AVERage[:STATe] ON OFF 1 0</code> <code>[ :SENSe] :SPECTrum:AVERage[:STATe]?</code>
Example	<code>SPEC:AVER:COUN 10</code> <code>SPEC:AVER:COUN?</code> <code>SPEC:AVER 0</code> <code>SPEC:AVER?</code>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Preset	25 ON
State Saved	Saved in instrument state.
Min	1
Max	20001
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 sweeps (average count) is reached.

- EXPonential - Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.
- REPeat - After reaching the average count, the averaging is reset and a new average is started.

Key Path	Meas Setup
Mode	BASIC
<b>Remote Command</b>	<code>[SENSe]:SPECtrum:AVERage:TCONtrol EXPonential REPeat</code> <code>[SENSe]:SPECtrum:AVERage:TCONtrol?</code>
<b>Example</b>	SPEC:AVER:TCON REP SPEC:AVER:TCON?
Notes	You must be in the IQ Analyzer (Basic) mode 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

## Avg Type

Allows you to select the type of averaging.

- Pwr Avg (RMS) - The power is averaged, providing the rms of the voltage.LOG
- Log Pwr Avg (Video) - The log of the power is averaged.
- Voltage Avg - The voltage is averaged.
- Maximum - The maximum values are retained.
- Minimum - The minimum values are retained.

Key Path	Meas Setup
Mode	BASIC
<b>Remote Command</b>	<code>[SENSe]:SPECtrum:AVERage:TYPE RMS   LOG   SCALar   MAXimum   MINimum  </code> <code>[SENSe]:SPECtrum:AVERage:TYPE?</code>
<b>Example</b>	SPEC:AVER:TYPE MIN SPEC:AVER:TYPE?
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.  Pwr Avg (RMS) = RMS Log Pwr Avg (Video) = LOG Voltage Avg = SCALar Maximum = MAXimum Minimum = MINimum
Preset	LOG

State Saved	Saved in instrument state.
Range	Pwr Avg(RMS)   Log-Pwr Avg(Video)   Voltage Avg   Maximum   Minimum
Initial S/W Revision	Prior to A.02.00

## Time Avg Num

Sets the number of HW averages to be executed per data acquisition.

Key Path	Meas Setup
Mode	BASIC
<b>Remote Command</b>	<code>[::SENSe]:SPECtrum:AVERage:TACount &lt;integer&gt;</code> <code>[::SENSe]:SPECtrum:AVERage:TACount?</code>
<b>Example</b>	<code>SPEC:AVER:TAC 10SPEC:AVER:TAC?</code>
Notes	Not available when Option B25 is installed and DP2 is not installed.
Dependencies	This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.
Preset	1
State Saved	Saved in instrument state.
State Saved	Saved in state
Min	1
Max	65535
Default Unit	Enter
Modified at S/W Revision	A.13.00

## PhNoise Opt

Selects the LO (local oscillator) phase noise behavior for various desired operating conditions.

<b>Remote Command</b>	<code>[::SENSe]:SPECtrum:FREQuency:SYNthesis[:STATe] 1 2 3</code> <code>[::SENSe]:SPECtrum:FREQuency:SYNthesis[:STATe]?</code>
<b>Example</b>	<code>SPEC: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.

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	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 Span after preset > 400 kHz (see Auto rules, next section) the state of this function after Preset will be 2
State Saved	Saved in instrument state.
Min	1
Max	3
Initial S/W Revision	Prior to A.07.00
Modified at S/W Revision	A.07.00

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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:

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	Best Close in Phase Noise	Best Wide-offset Phase Noise
Span	$\leq 400$ kHz	$>400$ kHz

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In models with the medium-performance LO, Auto will choose:

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	Best Close in Phase Noise	Best Wide-offset Phase Noise
Span	$\leq 150$ kHz	$>150$ kHz

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Note that Fast Tuning will not be selected when in Auto.

<b>Key Path</b>	Meas Setup, PhNoise Opt
<b>Remote Command</b>	[ <b>:SENSe</b> ] :SPECTrum:FREQuency:SYNthesis:AUTO[:STATe] OFF   ON   0   1 [ <b>:SENSe</b> ] :SPECTrum:FREQuency:SYNthesis:AUTO[:STATe] ?
<b>Example</b>	SPEC: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.

<b>Key Path</b>	Meas Setup, PhNoise Opt
<b>Example</b>	SPEC:FREQ:SYNT 1
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	Close-in. If manually selected the “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 <140 kHz]
Initial S/W Revision	Prior to A.07.00

### 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.

<b>Key Path</b>	Meas Setup, PhNoise Opt
<b>Example</b>	SPEC: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]

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	PXA: [offset >400 kHz]
Readback	Wide-offset. If manually selected the “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 >160 kHz]
Initial S/W Revision	Prior to A.07.00

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## Advanced

Opens a menu of advanced settings for the complex spectrum measurement.

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

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## Digital IF BW

Allows you to select the type of IF filter (post ADC, digital filter) that is used. This is an advanced control that normally does not need to be changed.

The Digital IF bandwidth is determined from the Span. The Digital IF BW and Span relation is determined by the following formula.

$$\text{Digital IF BW} = \text{Span} \times 1.5$$

This equation holds except for the case when only the value is clipped to the max value. Furthermore, when Option DP2, B40, or wider IF Bandwidth option is installed, continuous bandwidth setting is possible. For any other configuration, only fixed bandwidth values are available and quantizing the bandwidth values becomes necessary.

(When Option DP2, B40, or wider IF Bandwidth option is installed)

Continuous bandwidth setting is available in this configuration. Hence the theoretical coupling equation above with span is used in all cases except when the bandwidth reaches the maximum value, which in this case, is clipped to the maximum value.

Note that if the Digital IF BW state is set to Man , any value greater than the Span is settable.

There are coupling dependencies with the IF Path Selection parameter. The IF Path Selection determines the maximum value and maximum resolution values. For instance, even with the B40 and B1X options installed on a PXA, if the IF Path Selection is set to 25 MHz with the IF Path Auto set OFF, the maximum bandwidth value will be clipped to 25 MHz.

(For all other configurations)

The Digital IF BW parameter directly sets the digital IF filter bandwidth, which can only be set to certain fixed discrete values. Thus, the theoretical value of the Digital IF bandwidth will be derived first. Then the closest

discrete bandwidth value will be selected from the filter table.. The exception is 25 MHz where, if the theoretical value exceeds 10 MHz, the 25 MHz bandwidth will automatically be selected.

For example, if you set the Span to 2.9 MHz and 3.0 MHz, the theoretical Digital IF BW value will be as follows.

$$\text{Digital IF Bw} = (2.9 \text{ MHz}) \times 1.5 = 4.35 \text{ MHz}$$

$$\text{Digital IF Bw} = (3.0 \text{ MHz}) \times 1.5 = 4.5 \text{ MHz}$$

If you have the Flattop filter selected, only 4 MHz and 5 MHz bandwidths are available. For in-between values, the next widest possible value is selected. In this case, both 4.35 MHz and 4.5 MHz are rounded to 5 MHz.

Key Path	Meas Setup, Advanced
Mode	BASIC
Remote Command	<pre>[::SENSe]:SPECTrum:DIF:BANDwidth &lt;freq&gt; [::SENSe]:SPECTrum:DIF:BANDwidth? [::SENSe]:SPECTrum:DIF:BANDwidth:AUTO ON OFF 1 0 [::SENSe]:SPECTrum:DIF:BANDwidth:AUTO?</pre>
Example	<pre>SPEC:DIF:BAND 1MHz SPEC:DIF:BAND? SPEC:DIF:BAND:AUTO 0 SPEC:DIF: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	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 path is 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, clearly the maximum available Digital IF BW of the instrument is 140 MHz. Thus if IF Path Auto is ON and IF Path selection is B25M, the maximum Digital IF BW is not limited to 25 MHz but is 140 MHz.
Couplings	<p>The bandwidth of the IF Filter is coupled to the span by the following equations.</p> <p>Digital IF BW = Span * 1.5 (When Option DP2, B40, or wider IF Bandwidth option is installed)</p> <p>Digital IF BW = Span * 1.5 is used as is, since continuous bandwidths are allowed. (For all other configurations)</p> <p>Since the Digital IF BW can only be set to discrete values, Digital IF BW is not always set by the exact value above.</p> <p>If the HW cannot set to the exact value of the requested Digital IF BW, it uses "the next</p>

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	wider bandwidth value" available. For instance, a Digital IF BW requested to be set at 3.01 MHz is quantized to 3.1 MHz in the UI and hardware.
Preset	Hardware Dependent: No Option = 10.0 MHz Option B25 = 25.0 MHz Option B40 or wider IF BW = 12.0 MHz
State Saved	Saved in instrument state.
Min	10 Hz
Max	Hardware Dependent: RF Input: No Option = 10 MHz Option B25 = 25 MHz Option B40 = 40.0 MHz Option B85 = 85.0 MHz Option B1A = 125.0 MHz Option B1X = 140.0 MHz Option B1Y = 160.0 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)
<b>Backwards Compatibility SCPI</b>	[ :SENSe]:SPECtrum:BANDwidth:PFFT[:SIZE] [ :SENSe]:SPECtrum:BWIDth:PFFT[:SIZE] [ :SENSe]:SPECtrum:BANDwidth BWIDth:IF[:SIZE]
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.13.00

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## Filter Type

This parameter allows you to select the type of IF filter (post ADC, digital filter) that is used. This is an advanced control that normally does not need to be changed.

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Key Path	Meas Setup, Advanced
Mode	BASIC
<b>Remote Command</b>	[ :SENSe]:SPECtrum:DIF:FILTter:TYPE GAUSSian FLATtop SNYQuist RSNYquist RCOSine RRCosine [ :SENSe]:SPECtrum:DIF:FILTter:TYPE?

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<b>Example</b>	SPEC:DIF:FILT:TYPE GAUS SPEC:DIF:FILT:TYPE?
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	FLAT
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 Nyquist Raised Cosine Root RaisedCosine
<b>Backwards Compatibility SCPI</b>	[:SENSe] :SPECTrum:BANDwidth:PFFT:TYPE [:SENSe] :SPECTrum:BWIDth:PFFT:TYPE [:SENSe] :SPECTrum:BANDwidth BWIDth:IF:SHApe
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.13.00

<b>Remote Command</b>	[:SENSe] :SPECTrum:WBIF:FILTer[:TYPE] GAUSSian  NONE NYQuist RNYQuist RCOSine RRCosine [:SENSe] :SPECTrum:WBIF:FILTer[:TYPE] ?
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### Filter Type

This parameter allows you to select the type of IF filter (post ADC, digital filter) that is used. This is an advanced control that normally does not need to be changed.

Key Path	Meas Setup, Advanced
Mode	BASIC
<b>Remote Command</b>	[:SENSe] :SPECTrum:DIF:FILTer:TYPE GAUSSian FLATtop SNYQuist RSNYquist RCOSine RRCosine [:SENSe] :SPECTrum:DIF:FILTer:TYPE? ?
<b>Example</b>	SPEC:DIF:FILT:TYPE GAUS SPEC:DIF:FILT:TYPE?
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

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installed.

Preset	FLAT
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 Nyquist Raised Cosine Root RaisedCosine
<b>Backwards Compatibility SCPI</b>	[ :SENSe]:SPECtrum:BANDwidth:PFFT:TYPE [ :SENSe]:SPECtrum:BWIDth:PFFT:TYPE [ :SENSe]:SPECtrum:BANDwidth BWIDth:IF:SHAPe
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.13.00

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<b>Remote Command</b>	[ :SENSe]:SPECtrum:WBIF:FILT <sub>E</sub> r[:TYPE] GAUSSian  NONE NYQuist RNYQuist RCOSine RRCosine [ :SENSe]:SPECtrum:WBIF:FILT <sub>E</sub> r[:TYPE]?
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### Sample Rate (Remote Command Only)

Sample rate is not arbitrarily configurable for the Complex Spectrum measurement since everything from Span, IF BW, Window length and FFT length is affected. Thus there is no soft key menu and SCPI is query only. If you need to set an arbitrary sample rate, you will need to use the Waveform measurement.

Mode	BASIC
<b>Remote Command</b>	[ :SENSe]:SPECtrum:SRATE?
<b>Example</b>	SPEC:SRAT?
Notes	SCPI only and query only.
Dependencies	Depends on the Digital IF BW value
State Saved	No
Min	12.5 Hz
Max	Default: 45 MHz Option B40: 50 MHz Option B85: 106.25 MHz Option B1A: 156.25 MHz

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Option B1X: 175 MHz  
Option B1Y: 200 MHz

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Modified at S/W                    A.13.00  
Revision

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### Channel Filter Bandwidth Bwcc (Remote Command Only)

This is the backward compatibility command for Filter Bandwidth.

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Mode	BASIC
<b>Remote Command</b>	<code>[::SENSe]::SPECTrum:WBIF:FILTER:BANDwidth &lt;real&gt;</code> <code>[::SENSe]::SPECTrum:WBIF:FILTER:BANDwidth?</code>
<b>Example</b>	<code>SPEC:WBIF:FILT:BAND 0.3</code> <code>SPEC: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
Modified at S/W	A.13.00
Revision	

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### Sample Rate (Remote Command Only)

Sample rate is not arbitrarily configurable for the Complex Spectrum measurement since everything from Span, IF BW, Window length and FFT length is affected. Thus there is no soft key menu and SCPI is query only. If you need to set an arbitrary sample rate, you will need to use the Waveform measurement.

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Mode	BASIC
<b>Remote Command</b>	<code>[::SENSe]::SPECTrum:SRATE?</code>
<b>Example</b>	<code>SPEC:SRAT?</code>
Notes	SCPI only and query only.

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Dependencies	Depends on the Digital IF BW value
State Saved	No
Min	12.5 Hz
Max	Default: 45 MHz Option B40: 50 MHz Option B85: 106.25 MHz Option B1A: 156.25 MHz Option B1X: 175 MHz Option B1Y: 200 MHz
Modified at S/W Revision	A.13.00

### Channel Filter Bandwidth Bwcc (Remote Command Only)

This is the backward compatibility command for Filter Bandwidth.

Mode	BASIC
<b>Remote Command</b>	<code>[ :SENSe] :SPECtrum:WBIF:FILTter:BANDwidth &lt;real&gt;</code> <code>[ :SENSe] :SPECtrum:WBIF:FILTter:BANDwidth?</code>
<b>Example</b>	<code>SPEC:WBIF:FILT:BAND 0.3</code> <code>SPEC: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
Modified at S/W Revision	A.13.00

### Filter Bandwidth

This is only available when Option DP2, B40, or wider IF Bandwidth option is installed.

<b>Key Path</b>	Meas Setup, Advanced
<b>Mode</b>	BASIC
<b>Remote Command</b>	<pre>[::SENSe]:SPECtrum:DIF:FILTer:BANDwidth &lt;freq&gt; [::SENSe]:SPECtrum:DIF:FILTer:BANDwidth? [::SENSe]:SPECtrum:DIF:FILTer:BANDwidth:AUTO ON OFF 1 0 [::SENSe]:SPECtrum:DIF:FILTer:BANDwidth:AUTO?</pre>
<b>Example</b>	<pre>SPEC:DIF:FILT:BAND 1MHz SPEC:DIF:FILT:BAND? SPEC:DIF:FILT:BAND:AUTO 0 SPEC:DIF:FILT:BAND:AUTO?</pre>
<b>Notes</b>	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
<b>Dependencies</b>	This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.
<b>Couplings</b>	Sets the same value as the current Digital IF BW value upon a preset or when Channel Filter Bandwidth Auto is ON.
<b>Preset</b>	Same value as Digital IF Bw ON
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	10 Hz
<b>Max</b>	Clipped to the current Digital IF Bw value.
<b>Modified at S/W Revision</b>	A.13.00

## Channel 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.

<b>Key Path</b>	Meas Setup, Advanced
<b>Mode</b>	BASIC
<b>Remote Command</b>	<pre>[::SENSe]:SPECtrum:DIF:FILTer:ALPHa &lt;real&gt; [::SENSe]:SPECtrum:DIF:FILTer:ALPHa?</pre>
<b>Example</b>	<pre>SPEC:DIF:FILT:ALPH 0.5 SPEC:DIF:FILT:ALPH?</pre>
<b>Notes</b>	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
<b>Dependencies</b>	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>	<code>[SENSe]:SPECtrum:WBIF:FILTer:ALPHA</code>
Modified at S/W Revision	A.13.00

## FFT Window

Opens a menu that enables you to choose one of the available FFT filtering windows.

Key Path	Meas Setup, Advanced
Mode	BASIC
<b>Remote Command</b>	<code>[SENSe]:SPECtrum:FFT:WINDOW[:TYPE]</code> FLATtop   UNIFORM   HANNing   HAMMING   GAUSSian   BLACKman   BH4Tap   KB70   KB90   KB110 <code>[SENSe]:SPECtrum:FFT:WINDOW[:TYPE]?</code>
<b>Example</b>	<code>SPEC:FFT:WIND KB90</code> <code>SPEC:FFT:WIND?</code>
Notes	This selection affects the acquisition point quantity and the FFT size, based on the resolution bandwidth selected. You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Preset	FLATtop
State Saved	Saved in instrument state.
Range	Flat Top (High AmptdAcc)   Uniform   Hanning   Hamming   Gaussian (Alpha3.5)   Blackman   Blackman-Harris   K-B 70 dB (Kaiser-Bessel)   K-B 90 dB (Kaiser-Bessel)   K-B 110 dB (Kaiser-Bessel)
Initial S/W Revision	Prior to A.02.00

## FFT Size

Opens a menu that enables you to set the FFT or window length parameters.

Key Path	Meas Setup, Advanced
Initial S/W Revision	Prior to A.02.00

## Length Ctrl

Length Ctrl (Man) enables control of the FFT window or length settings. Press Length Ctrl (Auto) to disable the FFT window or length settings. This setting is directly coupled to the Res BW as follows: Enabling Length Ctrl disables the Res BW, while disabling Length Ctrl allows Res BW control.

Key Path	Meas Setup, Advanced, FFT Size
Mode	BASIC
<b>Remote Command</b>	<code>[::SENSe]::SPECTrum::FFT::LENGTH::AUTO ON OFF 1 0</code> <code>[::SENSe]::SPECTrum::FFT::LENGTH::AUTO?</code>
<b>Example</b>	<code>SPEC:FFT:LENG:AUTO 0</code> <code>SPEC:FFT:LENG:AUTO?</code>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	Auto   Man
Initial S/W Revision	Prior to A.02.00

## Min Pnts/RBW

Sets the minimum number of data points that are used inside the resolution bandwidth. The value is ignored if the length control is set to manual. This is an advanced control that normally does not need to be changed.

Key Path	Meas Setup, Advanced, FFT Size
Mode	BASIC
<b>Remote Command</b>	<code>[::SENSe]::SPECTrum::FFT::RBWPoints &lt;real&gt;</code> <code>[::SENSe]::SPECTrum::FFT::RBWPoints?</code>
<b>Example</b>	<code>SPEC:FFT:RBWP 0.5</code> <code>SPEC:FFT:RBWP?</code>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
Preset	3.1
State Saved	Saved in instrument state.
Min	0.1
Max	100
Initial S/W Revision	Prior to A.02.00

## Window Length

Sets the FFT window length. This value is only used if the length control is set to manual. This is an advanced control that normally does not need to be changed.

The “points” is the number of points for IQ pairs. For example, if the Window Length is set to 10, it means the window length is for 10 I and 10 Q points. Not 5 I and 5 Q points.

<b>Key Path</b>	Meas Setup, Advanced, FFT Size
<b>Mode</b>	BASIC
<b>Remote Command</b>	<code>[ :SENSe]:SPECtrum:FFT:WINDOW:LENGth &lt;integer&gt;</code> <code>[ :SENSe]:SPECtrum:FFT:WINDOW:LENGth?</code>
<b>Example</b>	<code>SPEC:FFT:WIND:LENG 100</code> <code>SPEC:FFT:WIND:LENG?</code>
<b>Notes</b>	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
<b>Dependencies</b>	Grayed out when Length Ctrl is set to Man.
<b>Preset</b>	1694
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	8
<b>Max</b>	1048576
<b>Initial S/W Revision</b>	Prior to A.02.00

## FFT Length

Enables you to set the FFT length. This value is only used if the length control is set to manual. The value must be greater than or equal to the window length value. Any amount greater than the window length is implemented by zero padding. This is an advanced control that normally does not need to be changed.

The “points” is the number of points for IQ pairs. For example, if the Window Length is set to 10, it means the window length is for 10 I and 10 Q points. Not 5 I and 5 Q points.

<b>Key Path</b>	Meas Setup, Advanced, FFT Size
<b>Mode</b>	BASIC
<b>Remote Command</b>	<code>[ :SENSe]:SPECtrum:FFT:LENGth &lt;integer&gt;</code> <code>[ :SENSe]:SPECtrum:FFT:LENGth?</code>
<b>Example</b>	<code>SPEC:FFT:LENG 566</code> <code>SPEC:FFT:LENG?</code>
<b>Notes</b>	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.

Dependencies	Grayed out when Length Ctrl is set to Man.
Preset	2048
State Saved	Saved in instrument state.
Min	8
Max	131072
Initial S/W Revision	Prior to A.02.00

## ADC Dither Auto

Toggles automatic ADC dither on or off.

Key Path	Meas Setup, Advanced, ADC Dither
Mode	BASIC
Remote Command	<code>[::SENSe]::SPECtrum:ADC:DITHer:AUTO[:STATe]</code> ON OFF 1 0 <code>[::SENSe]::SPECtrum:ADC:DITHer:AUTO[:STATe]?</code>
Example	<code>SPEC:ADC:DITH:AUTO 0</code> <code>SPEC:ADC:DITH:AUTO?</code>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	Auto Man
Initial S/W Revision	Prior to A.02.00

## ADC Dither State

Turn the ADC dither on or off. The “ADC dither” function refers to the introduction of noise to the digitized steps of the analog-to-digital converter, to improve amplitude accuracy.

This is an advanced control that normally does not need to be changed.

Key Path	Meas Setup, Advanced, ADC Dither
Mode	BASIC
Remote Command	<code>[::SENSe]::SPECtrum:ADC:DITHer[:STATe]</code> ON OFF 1 0 <code>[::SENSe]::SPECtrum:ADC:DITHer[:STATe]?</code>
Example	<code>SPEC:ADC:DITH 0</code> <code>SPEC:ADC:DITH?</code>

Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On (Best Log Accy) Off (Best Noise)
Initial S/W Revision	Prior to A.02.00

## IF Gain Auto

Returns manually selected IF Gain settings to the auto (default) setting.

Key Path	Meas Setup, Advanced, IF Gain
Mode	BASIC
Remote Command	[ :SENSe]:SPECTrum:IF:GAIN:AUTO[:STATe] ON OFF 1 0 [ :SENSe]:SPECTrum:IF:GAIN:AUTO[:STATe]?
Example	SPEC:IF:GAIN:AUTO ON SPEC:IF:GAIN:AUTO?
Notes	This only applies to the RF input. It does not apply to baseband I/Q input. You must be in the IQ Analyzer (Basic) mode 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

## IF Gain Offset

Sets the IF Gain offset for the 40MHz, 140MHz, 160MHz IF Paths in 2 dB step from -6 dB to +6 dB. Increasing the gain can increase the amplitude of small signals as long as you don't 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 HW. If the user chooses to offset this value, they may do so with this parameter. Hence 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 +4dB = Total IF Gain of +4dB ( $0 + 4 = 4$ )

IF Gain High + IF Gain Offset +4 dB = Total IF Gain of +14dB ( $10 + 4 = 14$ )

IF Gain Low + IF Gain Offset -6dB = Total IF Gain of -6dB ( $0 - 6 = -6$ )

IF Gain High + IF Gain Offset  $-6\text{dB}$  = Total IF Gain of  $+6\text{dB}$  ( $10 - 6 = 4$ )

Thus the total IF Gain range when IF Gain Offset is available is a minimum of  $0 - 6 = -6\text{dB}$  and a maximum of  $10 + 6 = 16\text{dB}$ . 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>	<code>[::SENSe]::SPECTrum:IF:GAIN:OFFSet &lt;rel_ampl&gt;</code> <code>[::SENSe]::SPECTrum:IF:GAIN:OFFSet?</code>
<b>Example</b>	<code>SPEC:IF:GAIN:OFFS 2</code> Sets the IF Gain offset to 2
Preset	0
State Saved	Saved in instrument state
Min	-6
Max	+6
Default Unit	dB

## Meas Preset

Returns all measurement local parameters to the factory default values.

Key Path	Meas Setup
Mode	BASIC
<b>Remote Command</b>	<code>:CONFigure:SPECTrum</code>
<b>Example</b>	<code>CONF:SPEC</code>
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use <code>INSTrument:SELect</code> to set the mode.
Initial S/W Revision	Prior to A.02.00

## 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 spectrum 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 and its result is seen as the blue trace in this and other applications.

So it is possible to turn off the averaging within the application but still have the HW averaging set to a certain number. In another 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.

Since it is time averaging, a trigger source something other than Free Run should be used to avoid cancelling out the signal to be measured. It is most useful for a periodic signal with known periods.

## PhNoise Opt

Selects the LO (local oscillator) phase noise behavior for various desired operating conditions.

<b>Remote Command</b>	<code>[ :SENSe] :SPECTrum:FREQuency:SYNthesis[:STATe] 1 2 3</code> <code>[ :SENSe] :SPECTrum:FREQuency:SYNthesis[:STATe]?</code>
<b>Example</b>	<code>SPEC: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 Span after preset > 400 kHz (see Auto rules, next section) the state of this function after Preset will be 2
State Saved	Saved in instrument state.
Min	1
Max	3
Initial S/W Revision	Prior to A.07.00
Modified at S/W Revision	A.07.00

## Mode

See "Mode" on page 212

## 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 478 for more information.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:SYST:PRESet
<b>Example</b>	:SYST:PRES
<b>Notes</b>	<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>
<b>Couplings</b>	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.
<b>Backwards Compatibility Notes</b>	<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 in to preset the entire instrument is by using System, Restore System Defaults All, which behaves essentially the same way as restore System Defaults does on ESA and PSA.</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 Mode Preset and a white-with-green-letters User Preset front-panel key that does a User Preset. The old PRESet:TYPE command is ignored (without generating an error), and SYST:PRES without a parameter does a Mode Preset, which should cover most backward code compatibility issues.</p> <p>The settings and correction data under the Input/Output front-panel key (examples: Input</p>

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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
Restore All System	:SYSTem:DEFault [ALL]	System Menu; Restore

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Defaults	:SYSTem:PRESet:PERsistent	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 244

## Peak Search

Pressing the Peak Search key displays the Peak Search menu and places the selected marker on the trace point with the maximum y-axis value for that marker's trace. The Peak Search features allow you to define specific search criteria to determine which signals can be considered peaks, excluding unwanted signals from the search.

See "[More Information](#)" on page 481

Key Path	Front panel key
Mode	BASIC
Remote Command	:CALCulate:SPECTrume:MARKer[1]   2   ...   12:MAXimum
Example	CALC:SPEC:MARK2:MAX SYST:ERR? can be used to query the errors to determine if a peak is found. The message "No peak found" will be returned after an unsuccessful search.
Initial S/W Revision	Prior to A.02.00

## More Information

The behavior of a Peak Search is dependent on settings under the Peak Criteria softkey on the second page of the menu. If Same as "Next Peak" Criteria is selected, and either Pk Excursion or Pk Threshold are on, a signal must meet those criteria to be considered a peak. If no valid peak is found, a "No peak found" message is generated and the marker is not moved. When Highest Peak is on, or both Pk Excursion and Pk Threshold are off, the marker is always placed at the point on the trace with the maximum y-axis value, even if that point is on the very edge of the trace.

Pressing Peak Search with the selected marker off causes the selected marker to be set to Normal at the center of the screen, then a peak search is immediately performed.

Pressing the front panel Peak Search key always does a peak search. Occasionally, you may need to get to the Peak Search menu key functions without doing a peak search. You can do this by first accessing the Peak Search menu. Then go to the other menus that you need to access. Finally, you can get back to the Peak Search key menu by using the front panel Return key and pressing it as many times as required to navigate back through the previously accessed menus until you get back to the Peak Search menu.

## Next Peak

Pressing Next Peak moves the selected marker to the peak that has the next highest amplitude less than the marker's current value. Only peaks which meet all enabled peak criteria are considered. If there is no valid peak lower than the current marker position, a "No peak found" message is generated and the marker is not moved.

If the selected marker was off, then it is turned on as a normal marker and a peak search is performed.

Key Path	Peak Search
Mode	BASIC

<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1 2 ...12]:MAXimum:NEXT
<b>Example</b>	CALC:SPEC:MARK:MAX:NEXT
Initial S/W Revision	Prior to A.02.00

## Next Pk Right

Pressing Next Pk Right moves the selected marker to the nearest peak right of the current marker which meets all enabled peak criteria. If there is no valid peak to the right of the current marker position, a “No peak found” message is generated and the marker is not moved.

If the selected marker was off, then it is turned on as a normal marker and a peak search is performed.

Key Path	Peak Search
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1 2 ...12]:MAXimum:RIGHT
<b>Example</b>	CALC:SPEC:MARK2:MAX:RIGHT Selects marker 2 and moves it to the next peak to the right of the current marker position.
State Saved	Not part of saved state

## Next Pk Left

Pressing Next Pk Left moves the selected marker to the nearest peak left of the current marker which meets all enabled peak criteria. If there is no valid peak to the left of the current marker position, a “No peak found” message is generated and the marker is not moved.

If the selected marker was off, then it is turned on as a normal marker and a peak search is performed.

Key Path	Peak Search
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1 2 ...12]:MAXimum:LEFT
<b>Example</b>	CALC:SPEC:MARK2:MAX:LEFT Selects marker 2 and moves it to the next peak to the left of the current marker position.
State Saved	Not part of saved state

## Marker Delta

Performs the same function as the Delta 1-of-N selection key in the Marker menu. Basically, this sets the control mode for the selected marker to Delta mode. See the Marker section for details of delta markers. The key is duplicated here in the Peak Search Menu to allow you to conveniently perform a peak search and change the marker’s control mode to Delta without having to access two separate menus.

---

Key Path	Peak Search or Marker
Notes	Whenever the selected marker is in Delta mode and you are in the Peak Search menu, the Marker Delta key should be highlighted and the active function for setting its delta value turned on.
Initial S/W Revision	Prior to A.02.00

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## Mkr -> CF

Sets the center frequency to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display.

---

Key Path	Marker ->
Mode	BASIC
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1 2 ...12[:SET]:CENTER
<b>Example</b>	CALC:SPEC:MARK4:CENT
Notes	<p>In the delta marker mode, this function sets the center frequency to the x-axis value of the delta marker. If the currently selected marker is not on when this key is pressed, it is turned on at the center of the screen as a normal type marker.</p> <p>You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.</p>
Dependencies	This key is not available (grayed out) when the selected marker is not on the spectrum trace.
Initial S/W Revision	Prior to A.02.00

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## Mkr -> Ref Lvl

Sets the reference level to the amplitude value of the selected marker, moving the marked point to the reference level (top line of the graticule).

---

Key Path	Marker ->
Mode	BASIC
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1 2 ...12[:SET]:RLEVel
<b>Example</b>	CALC:SPEC:MARK4:RLEV
Notes	<p>Make the Marker Y value to the display reference value.</p> <p>If the currently selected marker is not on when this key is pressed, it is turned on at the center of the screen as a normal type marker, and its amplitude applied to the reference value.</p>

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You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SELect to set the mode.

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Initial S/W Revision      Prior to A.02.00

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## Peak Criteria

Pressing this key opens the Peak Criteria menu and allows you to adjust the Pk Threshold and Pk Excursion parameters used for peak search functions

For a signal to be identified as a peak it must meet certain criteria. Signals in the negative frequency range and signals very close to 0 Hz are ignored. If either the peak excursion or peak threshold functions are on, then the signal must satisfy those criteria before being identified as a peak. (Note that this does not apply when the input is base band I/Q)

When peak excursion and peak threshold are both off:

- Peak Search, Continuous Peak Search, and maximum part of Pk-Pk Search will search the trace for the point with the highest y-axis value which does not violate the LO feedthrough rules. A rising and falling slope are not required for these three peak search functions.
- The remaining search functions Next Peak, Next Pk Right, etc. will only consider trace points which have a rising and falling slope on the left and right respectively.

---

Key Path	Peak Search
Initial S/W Revision	Prior to A.09.00

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## “Peak Search” Criteria

This menu lets you decide what kind of search you want to do when the Peak Search key is pressed (or the equivalent SCPI command sent).

Note that there are two “types” of peak search functions. One type is the “Peak Search” type, the other type is the “Next Peak” type. “Next Peak” searches (for example, Next Peak, Next Pk Left, Next Pk Right) are always checked using the Excursion and Threshold criteria as long as these criteria are On. The “Peak Search” type of search, simply finds the highest point on the trace. However you can change the “Peak Search” type of search so that it also uses the Excursion and Threshold criteria. This allows you to find the Maximum point on the trace that also obeys the Excursion and/or Threshold criteria.

When Highest Peak is selected, pressing Peak Search simply finds the highest peak on the marker’s trace. If Same as “Next Peak” Criteria is selected, then the search is also forced to consider the Excursion and Threshold found under the “Next Peak” Criteria menu.

---

Key Path	Peak Search, Peak Criteria
Remote Command	:CALCulate:SPECTRUM:MARKer:PEAK:SEARCh:MODE MAXimum   PARameter

---

---

	:CALCulate:SPECTrum:MARKer:PEAK:SEARch:MODE?
Notes	MAXimum corresponds to the Highest Peak setting PARameter corresponds to the Same as "Next Peak" Criteria setting
Preset	MAXimum
State Saved	Saved in instrument state.
Readback line	Current state
Initial S/W Revision	Prior to A.09.00

---

### Highest Peak

When this key is selected, pressing the Peak Search key or issuing the equivalent SCPI command finds the maximum point on the trace, subject to the peak-search qualifications. This also affects the Peak Search half of Pk-Pk search and the Continuous Peak Search.

---

Key Path	Peak Search, Peak Criteria, "Peak Search" Criteria
<b>Example</b>	CALC:SPECTrum:MARK:PEAK:SEAR:MODE MAX
Readback	Highest Peak
Initial S/W Revision	Prior to A.09.00

---

### Same as "Next Peak" Criteria

When this key is selected, pressing the Peak Search key or issuing the equivalent SCPI command finds the maximum point on the trace, but subject to the Excursion and Threshold set under the Next Peak Criteria menu. The search is, of course, also subject to the peak-search qualifications. This also affects the Peak Search half of Pk-Pk search and the Continuous Peak Search.

---

Key Path	Peak Search, Peak Criteria, "Peak Search" Criteria
<b>Example</b>	CALC:SPECTrum:MARK:PEAK:SEAR:MODE PAR
Readback	Use Excurs & Thr
Initial S/W Revision	Prior to A.09.00

---

### "Next Peak" Criteria

This key opens up a menu which allows you to independently set the Peak Excursion and Peak Threshold and turn them on and off.

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Key Path	Peak Search, Peak Criteria
Initial S/W Revision	Prior to A.09.00

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## Pk Excursion

Turns the peak excursion requirement on/off and sets the excursion value. The value defines the minimum amplitude variation (rise and fall) required for a signal to be identified as peak. For example, if a value of 6 dB is selected, peak search functions like the marker Next Pk Right function move only to peaks that rise and fall 6 dB or more.

When both Pk Excursion and Pk Threshold are on, a signal must rise above the Pk Threshold value by at least the Peak Excursion value and then fall back from its local maximum by at least the Peak Excursion value to be considered a peak.

**NOTE** In the event that a sequence of trace points with precisely the same values represents the maximum, the leftmost point is found.

See "More Information" on page 486.

Key Path	Peak Search, Peak Criteria, "Next Peak" Criteria
Remote Command	:CALCulate:SPECTrum:MARKer:PEAK:EXCursion <rel_ampl> :CALCulate:SPECTrum:MARKer:PEAK:EXCursion? :CALCulate:SPECTrum:MARKer:PEAK:EXCursion:STATE OFF ON 0 1 :CALCulate:SPECTrum:MARKer:PEAK:EXCursion:STATE?
Example	:CALC:SPECTrum:MARK:PEAK:EXC:STAT ON :CALC:SPECTrum:MARK:PEAK:EXC 30 DB sets the minimum peak excursion requirement to 30 dB
Couplings	Whenever you adjust the value of Pk Excursion (with the knob, step keys, or by completing a numeric entry), and Peak Threshold is turned ON, the Peak Threshold Line and the Peak Excursion Region are displayed
Preset	6.0 dB ON
Preset	6.0 dB ON
State Saved	Saved in instrument state
Min	0.0 dB
Max	100.0 dB
Initial S/W Revision	Prior to A.09.00

## More Information

If two signals are very close together and the peak excursion and threshold criteria are met at the outside edges of the combined signals, this function finds the highest of these two signals as a peak (or next peak). However, if a signal appears near the edge of the screen such that the full extent of either the rising or falling edge cannot be

determined, and the portion that is on screen does not meet the excursion criteria, then the signal cannot be identified as a peak.

When measuring signals near the noise floor, you can reduce the excursion value even further to make these signals recognizable. To prevent the marker from identifying noise as signals, reduce the noise floor variations to a value less than the peak-excursion value by increasing the averaging count.

### Pk Threshold

Turns the peak threshold requirement on/off and sets the threshold value. The peak threshold value defines the minimum signal level (or min threshold) that the peak identification algorithm uses to recognize a peak.

When both Pk Excursion and Pk Threshold are on, a signal must rise above the Pk Threshold value by at least the Peak Excursion value and then fall back from its local maximum by at least the Peak Excursion value to be considered a peak.

For example, if a threshold value of –90 dBm is selected, the peak search algorithm will only consider signals with amplitude greater than the –90 dBm threshold. If a threshold value of –90 dBm is selected, and Peak Excursion is On and set to 6 dB, the peak search algorithm will only consider signals with amplitude greater than the –90 dBm threshold which rise 6 dB above the threshold and then fall back to the threshold.

---

Key Path	Peak Search, Peak Criteria, "Next Peak Criteria"
<b>Remote Command</b>	<pre>:CALCulate:SPECTrum:MARKer:PEAK:THreshold &lt;ampl&gt; :CALCulate:SPECTrum:MARKer:PEAK:THreshold? :CALCulate:SPECTrum:MARKer:PEAK:THreshold:STATE OFF ON 0 1 :CALCulate:SPECTrum:MARKer:PEAK:THreshold:STATE?</pre>
<b>Example</b>	CALC:SPECTrum:MARK:PEAK:THR:STAT ON turns on the threshold criterion. CALC:SPECTrum:MARK:PEAK:THR –60 dBm sets the threshold to –60 dBm.
Preset	–90.0 dBm ON
State Saved	Saved in instrument state.
Min	The current Ref Level – 200 dB.
Max	The current Ref Level.
Initial S/W Revision	Prior to A.09.00

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### Pk Threshold Line

Turns the peak threshold line on or off. Preset state is off. No equivalent SCPI command.

See "[More Information](#)" on page 488.

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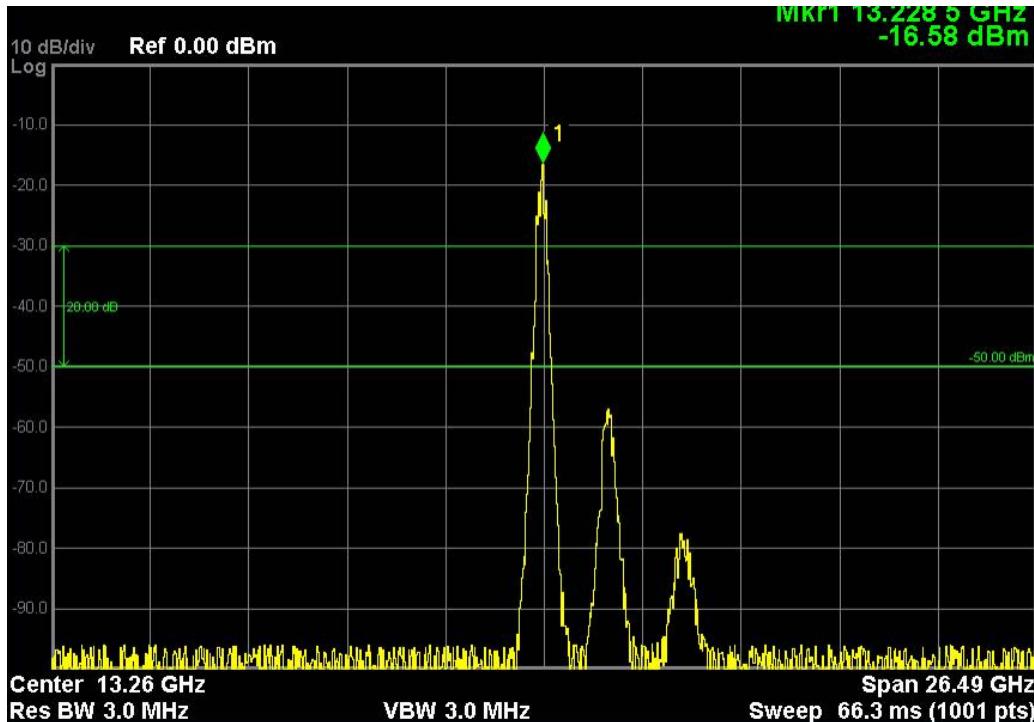
Dependencies	If Peak Threshold is Off and the Peak Threshold line is turned on, it should turn on Peak Threshold.
Initial S/W Revision	Prior to A.09.00

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## More Information

The Peak Threshold line is green and has the value of the peak threshold (for example, “-20.3 dBm”) written above its right side above the line itself. If Peak Excursion is ON it shows on the left side as a region above the Peak Threshold line. As with all such lines (Display Line, Trigger Level line, etc.) it is drawn on top of all traces.

TODO: Replace with Complex Spectrum screen shot



This function is automatically set to ON (thus turning on the Peak Threshold line) whenever the value of Peak Threshold or Peak Excursion becomes the active function, unless Peak Threshold is OFF. It is automatically set to OFF whenever Peak Threshold is set to OFF. Manually turning it ON automatically turns on Pk Threshold.

The Peak Excursion part is on whenever the Pk Threshold part is on, unless Peak Excursion is OFF.

## Continuous Peak Search

Turns Continuous Peak Search on or off. When Continuous Peak Search is on, a peak search is automatically performed for the selected marker after each sweep. The rules for finding the peak are exactly the same as for Peak Search including the use of the peak criteria rules. If no valid peak is found, a “No peak found” message is generated after each sweep.

<b>Key Path</b>	Peak Search
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1]   2   ...   12:CPSearch[:STATE] ON   OFF   1   0 :CALCulate:SPECTrum:MARKer[1]   2   ...   12:CPSearch[:STATE]?

<b>Example</b>	CALC:SPEC:MARK:CPS ON Turns on Continuous Peak Search.
Notes	Sending this command selects the subopcoded marker
Preset	Mode Preset
State Saved	Saved in instrument state.
Status Bits/OPC dependencies	The Measuring bit should remain set while this command is operating and should not go false until the marker position has been updated.
Initial S/W Revision	Prior to A.09.00

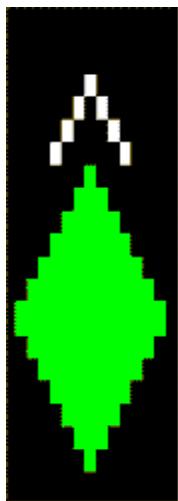
## More Information

When Continuous Peak Search is turned on a peak search is immediately performed and then is repeated after each sweep. If Continuous Peak Search is turned on with the selected marker off, the selected marker is set to Normal at the center of the screen, and then a peak search is immediately performed and subsequently repeated after each sweep.

When in Continuous Peak Search, \*OPC will not return true, nor will READ or MEASure return any data, until the sweep is complete and the marker has been re-peaked. Note further that if the analyzer is in a measurement such as averaging, and Continuous Peak Search is on, the entire measurement will be allowed to complete (i.e., all the averages taken up to the average number) before the repeat takes place, and only THEN will \*OPC go true and READ or MEASure return data.

Note that this function is not the “Continuous Peak” function found in some other instruments. That function was designed to track the signal; this function simply does a Peak Search after each sweep.

When Continuous Peak Search is turned on for a marker, a little “hat” is placed above the marker.



## Pk-Pk Search

Finds and displays the amplitude and frequency (or time, if the markers are on the I or Q trace) differences between the highest and lowest y-axis value. It places the selected marker on the minimum value on its selected trace. And it places that marker's reference marker on the peak of its selected trace.

## 8 Complex Spectrum Measurement

### Peak Search

The rules for finding the maximum peak are exactly the same as for Peak Search including the use of the peak criteria rules. However, the minimum trace value is not required to meet any criteria other than being the minimum y-axis value in the trace.

If the selected marker is off, a delta type marker is turned on and the peak-to-peak search is done. If the selected marker is on, but it is not a delta marker, then it is changed to delta which turns on the reference marker if needed, and then it performs the peak-to-peak function.

Key Path	Peak Search
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1]   2   ... 12:PTPeak
<b>Example</b>	CALC:SPEC:MARK:PTP CALC:SPEC:MARK:Y? queries the delta amplitude value for marker 1.
Notes	Turns on the Marker $\Delta$ active function.
Notes	Sending this command selects the subopcoded marker.
Dependencies	Pk-Pk Search is grayed out when Coupled Markers is on.
Couplings	The selected marker becomes a delta marker if not already in delta mode.
State Saved	Not part of saved state.
Initial S/W Revision	Prior to A.09.00

## Min Search

Moves the selected marker to the minimum y-axis value on the current trace. Minimum (negative) peak searches do not have to meet the peak search criteria. It just looks for the lowest y-axis value. If the selected marker is Off, it is turned on before the minimum search is performed.

Key Path	Peak Search
<b>Remote Command</b>	:CALCulate:SPECTrum:MARKer[1]   2   ... 12:MINimum
<b>Example</b>	CALC:SPEC:MARK:MIN selects marker 1 and moves it to the minimum amplitude value.
Notes	Sending this command selects the subopcoded marker.
State Saved	Not part of saved state.
Initial S/W Revision	Prior to A.09.00

## Print

See "Print" on page 256

## 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.

**NOTE**

If the filename you entered ends with \_dddd, where d=any number, making it look just like an auto file name, then the next auto file name picks up where you left off with the suffix being dddd + 1.

Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00

## Recall

The Recall menu lets you choose what you want to recall, and where you want to recall it from. Among the types of files you can recall are **States andTraces**. In addition, an Import (Data) option lets you recall a number of data types stored in CSV files (as used by Excel and other spreadsheet programs).

The default paths for Recall are data type dependent and are the same as for the Save key.

Key Path	Front-panel key
Notes	No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe <filename>. If you try to recall a State file for a mode that is not licensed or not available in the instrument, an error message will occur and the state will not change.
Backwards Compatibility Notes	In legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly (since User Preset is actually loading a state), it was possible to do a User Preset without affecting the trace data, limit lines or correction data.  In the X-Series, “state” always includes all of this data; so whenever state is loaded, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.
Backwards Compatibility Notes	Recall for the X-Series supports backward compatibility in the sense that you can recall a state file from any X-Series model number and any version of X-Series software. If you try to recall a state file onto an instrument with less capability than what was available on the instrument during the save, the recall will ignore the state it doesn't support and it will limit the recalled setting to what it allows.  Example: if the saved state includes preamp ON, but the recalling instrument does not have a preamp; the preamp is limited to OFF. Conversely, if you save a state without a preamp, the preamp is OFF in the state file. When this saved file is recalled on an instrument with a licensed preamp, the preamp is changed to OFF. Another example is if the saved state has center frequency set to 20 GHz, but the instrument recalling the saved state is a different model and only supports 13.5 GHz. In this case, the center frequency is limited along with any other frequency based settings. Since the center frequency can't be preserved in this case, the recall limiting tries to at least preserve span to keep the measurement setup as intact as possible.  Note that there is no state file compatibility outside of the X-Series. For example, you cannot recall a state file from ESA or PSA.
Initial S/W Revision	Prior to A.02.00

## State

The Recall State menu lets you choose a register or file from which to recall the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings that were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings

affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either a Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

Since each state file is only for one Mode, the settings for other Modes are unaffected when it is loaded. Recall State will cause a mode switch if the state being recalled is not from the current active mode.

After the recall completes, the message "File <filename> recalled" or "Recalled State Register <register number>" is displayed.

For rapid recalls, the State menu lists 16 registers that you can choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files is:

My Documents\<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

See "[More Information](#)" on page 496.

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> <p>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.</p> <p>After recalling the state, the Recall State function does the following:</p> <ul style="list-style-type: none"><li>• Makes the saved measurement for the mode the active measurement.</li><li>• Clears the input and output buffers.</li><li>• Status Byte is set to 0.</li></ul>

- 
- 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>	:MMEMory:LOAD:STATE 1,<filename>
	For backwards compatibility, the above syntax is supported. The "1" is simply ignored.
Initial S/W Revision	Prior to A.02.00

## More Information

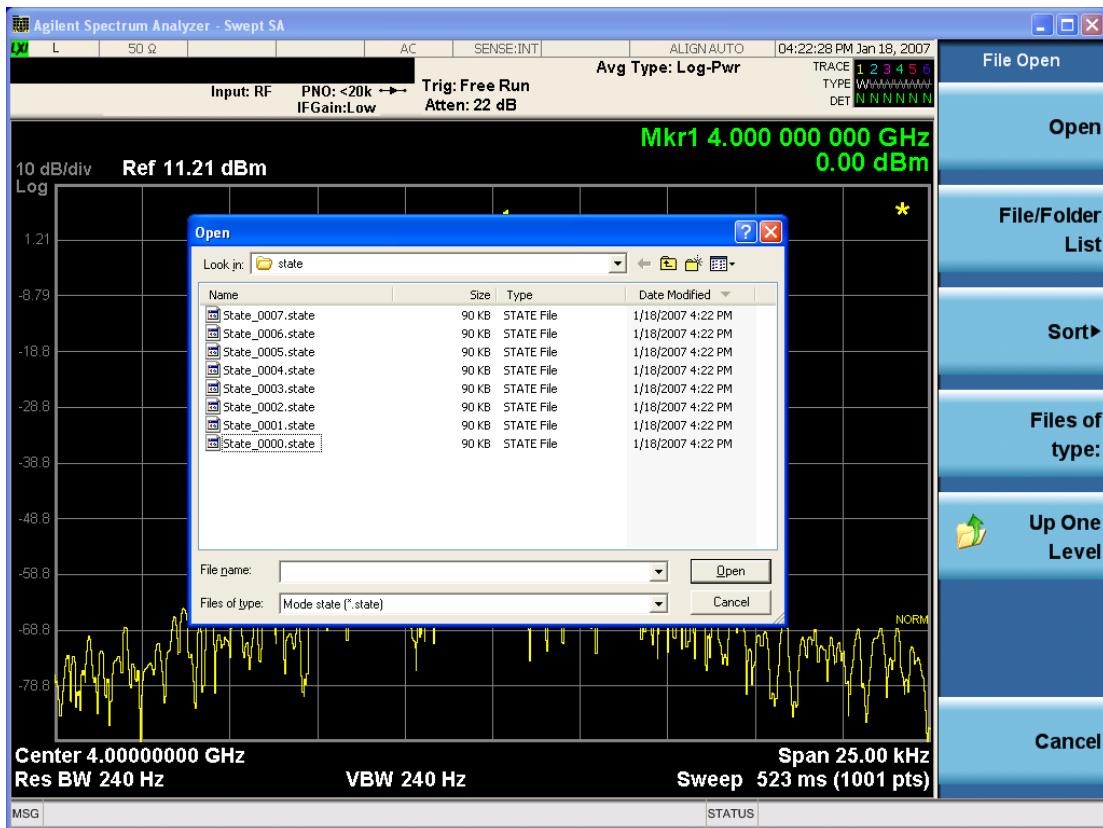
In measurements that support saving Traces, for example, Swept SA, the Trace data is saved along with the State in the State file. When recalling the State, the Trace data is recalled as well. Traces are recalled exactly as they were stored, including the writing mode and update and display modes. If a Trace was updating and visible when the State was saved, it will come back updating and visible, and its data will be rewritten right away. When you use State to save and recall traces, any trace whose data must be preserved should be placed in View or Blank mode before saving.

The following table describes the Trace Save and Recall possibilities:

You want to recall state and one trace's data, leaving other traces unaffected.	Save Trace+State from 1 trace. Make sure that no other traces are updating (they should all be in View or Blank mode) when the save is performed.	On Recall, specify the trace you want to load the one trace's data into. This trace will load in View. All other traces' data will be unaffected, although their trace mode will be as it was when the state save was performed.
You want to recall all traces	Save Trace+State from ALL traces.	On Recall, all traces will come back in View (or Blank if they were in Blank or Background when saved)
You want all traces to load exactly as they were when saved.	Save State	On recall, all traces' mode and data will be exactly as they were when saved. Any traces that were updating 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

## 8 Complex Spectrum Measurement

### Recall

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

#### Files of Type

This field shows the file suffix for the type of file you have selected to recall. For example, if you navigated here while recalling State, "Mode state (\*.state)" is in the field. If you navigated here while recalling Trace, ""Mode state (\*.trace)" is in the field. If you navigated here while importing a trace data file, "Trace Data (\*.csv)" is in the field. For some file types, there is more than one choice in the dropdown menu, which you can select by using the up and down arrow keys and Enter.

#### Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

#### Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Open** request to be cancelled. The ESC key does the same thing.

Key Path	Recall, State
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

## 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	Recall, State
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 available"
Initial S/W Revision	A.11.00

## Register 1 thru Register 16

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Each of the register keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key under Save, State to enter custom names for each register.

Registers are shared by all modes, so recalling from any one of the registers will cause a mode switch to the mode that was active when the save to the Register occurred.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the \*RCL command.

After the recall completes, the message "Register <register number> recalled" appears in the message bar. If you are in the Spectrum Analyzer Mode, and you are recalling a register that was saved in the Spectrum Analyzer Mode, then after the recall, you will still be in the Recall Register menu. If the Recall causes you to switch modes, then after the Recall, you will be in the Frequency menu.

If a requested register is empty an error is generated.

<b>Key Path</b>	Recall, State
<b>Example</b>	*RCL 1
<b>Range</b>	1–16 from front panel, 1–128 from SCPI
<b>Readback</b>	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Save, State,Edit Register Names key OR "(empty)" if no prior save operation has been performed to this register.
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	Prior to A.11.00

## Register 1 thru Register 16

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Each of the register keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key under Save, State to enter custom names for each register.

Registers are shared by all modes, so recalling from any one of the registers will cause a mode switch to the mode that was active when the save to the Register occurred.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the \*RCL command.

After the recall completes, the message "Register <register number> recalled" appears in the message bar. If you are in the Spectrum Analyzer Mode, and you are recalling a register that was saved in the Spectrum Analyzer Mode, then after the recall, you will still be in the Recall Register menu. If the Recall causes you to switch modes, then after the Recall, you will be in the Frequency menu.

If a requested register is empty an error is generated.

Key Path	Recall, State
Example	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Save, State,Edit Register Names key OR "(empty)" if no prior save operation has been performed to this register.
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.

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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.

Under this directory, the directory called Ampcor (Legacy Naming) contains a set of legacy corrections files, generally the same files that were supplied with older Agilent EMI analyzers, that use the legacy suffixes .ant, .oth, .usr, and .cbl, and the old 8-character file names. In the directory called Ampcor, the same files can be found, with the same suffixes, but with longer, more descriptive filenames.

When the Amplitude Correction is an Antenna correction and the Antenna Unit in the file is not None, the Y Axis Unit setting will change to match the Antenna Unit in the file.

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Key Path	Recall
Mode	SA EDGE GSM PN
Remote Command	:MMEMory:LOAD:CORRection 1 2 3 4 5 6, <filename>
Example	:MMEM:LOAD:CORR 2 "myAmpcor.csv" recalls the Amplitude Correction data from the file myAmpcor.csv in the current directory to the 2nd Amplitude Correction table, and turns on Correction 2.  The default path is My Documents\amplitudeCorrections.
Dependencies	Only the first correction array (Correction 1) supports antenna units. This means that a correction file with an Antenna Unit can only be loaded into the Corrections 1 register. Consequently only for Correction 1 does the dropdown in the Recall dialog include.ant, and if an attempt is made to load a correction file into any other Correction register which DOES contain an antenna unit, a Mass Storage error is generated.  Corrections are not supported by all Measurements. If in a Mode in which some Measurements support it, this key will be grayed out in measurements that do not. The key will not show at all if no measurements in the Mode support it.  Errors are reported if the file is empty or missing, or if the file type does not match, or if there is a mismatch between the file type and the destination data type. If any of these occur during manual operation, the analyzer returns to the Import Data menu and the File

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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>	:MMEMory:LOAD:CORRection ANTenna   CABLE   OTHer   USER, <filename> For backwards compatibility, ANTenna maps to 1, CABLE maps to 2, OTHer maps to 3 and USER maps to 4
Initial S/W Revision	A.02.00

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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	Recall, Data, Amplitude Correction
Notes	auto return
Dependencies	Only Correction 1 may be used to load a Correction that contains an Antenna Unit other than None
Preset	Not part of Preset, but is reset to Correction 1 by Restore Input/Output Defaults; survives shutdown.
State Saved	The current Correction number is saved in instrument state
Initial S/W Revision	A.02.00

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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 664 in Recall, State, for a full description of this dialog and menu.

Key Path	Recall, Data
Notes	The key location is mode-dependent and will vary. Brings up Open dialog for recalling a <mode specific> Save Type
Initial S/W Revision	Prior to A.02.00

## Restart

The Restart function restarts the current sweep, or measurement, or set of averaged/held sweeps or measurements. If you are Paused, pressing Restart does a Resume.

The Restart function is accessed in several ways:

- Pressing the Restart key
- Sending the remote command INIT:IMMEDIATE
- Sending the remote command INIT:RESTART

See "[More Information](#)" on page 504

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 Restart hardkey and the INITiate:RESTart command restart trace averages (displayed average count reset to 1) for a trace in Clear Write, but did not restart Max Hold and Min Hold. In the X-Series, the Restart hardkey and the INITiate:RESTart command restart not only Trace Average, but MaxHold and MinHold traces as well. For wireless comms modes in ESA and PSA, the Restart hardkey and the INITiate:RESTart command restart every measurement, which includes all traces and numeric results. There is no change to this operation.
Initial S/W Revision	Prior to A.02.00

## More Information

The **Restart** function first aborts the current sweep/measurement as quickly as possible. It then resets the sweep and trigger systems, sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met.

If the analyzer is in the process of aligning when **Restart** is executed, the alignment finishes before the restart function is performed.

Even when set for Single operation, multiple sweeps may be taken when Restart is pressed (for example, when averaging/holding is on). Thus when we say that **Restart** "restarts a measurement," we may mean:

- It restarts the current sweep
- It restarts the current measurement
- It restarts the current set of sweeps if any trace is in Trace Average, Max Hold or Min Hold
- It restarts the current set of measurements if Averaging, or Max Hold, or Min Hold is on for the measurement
- depending on the current settings.

With **Average/Hold Number** (in **Meas Setup** menu) set to 1, or Averaging off, or no trace in Trace Average or Hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met; and the analyzer stops sweeping once that sweep has completed. However, with **Average/Hold Number >1** and at least one trace set to **Trace Average, Max Hold, or Min Hold (SA Measurement)** or **Averaging on (most other measurements)**, multiple sweeps/data acquisitions are taken for a single measurement. The trigger condition must be met prior to each sweep. The sweep is stopped when the average count  $k$  equals the number  $N$  set for **Average/Hold Number**. A measurement average usually applies to all traces, marker results, and numeric results; but sometimes it only applies to the numeric results.

Once the full set of sweeps has been taken, the analyzer will go to idle state. To take one more sweep without resetting the average count, increment the average count by 1, by pressing the step up key while **Average/Hold Number** is the active function, or sending the remote command CALC:AVER:TCON UP.

## Save

The Save menu lets you choose what you want to save and where you want to save it. Among the types of files you can save are **States**, **Traces**, and **Screen Images**. In addition, an Export (Data) option lets you save a number of data types as CSV files for easy import into Excel and other spreadsheet programs.

Key Path	Front-panel key
Mode	All
Notes	No remote command for this key specifically, but the :MMEM:STORe command is available for specific file types. An example is :MMEM:STOR:STATE <filename>.
Initial S/W Revision	Prior to A.02.00

## State

The Save State menu lets you choose a register or file for saving the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings which were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

After the save completes, the message "File <filename> saved" or "State Register <register number> saved" is displayed.

For rapid saving, the State menu lists 16 registers to save to. Pressing a Register key initiates the save. You can also select a file to save to.

The default path for all State Files is:

My Documents\<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save
Mode	All
Remote Command	:MMEMory:STORE:STATE <filename>
Example	MMEM:STOR:STATE "MyStateFile.state" This stores the current instrument state data in the file MyStateFile.state in the default directory.
Notes	Both single and double quotes are supported for any filename parameter over remote.

---

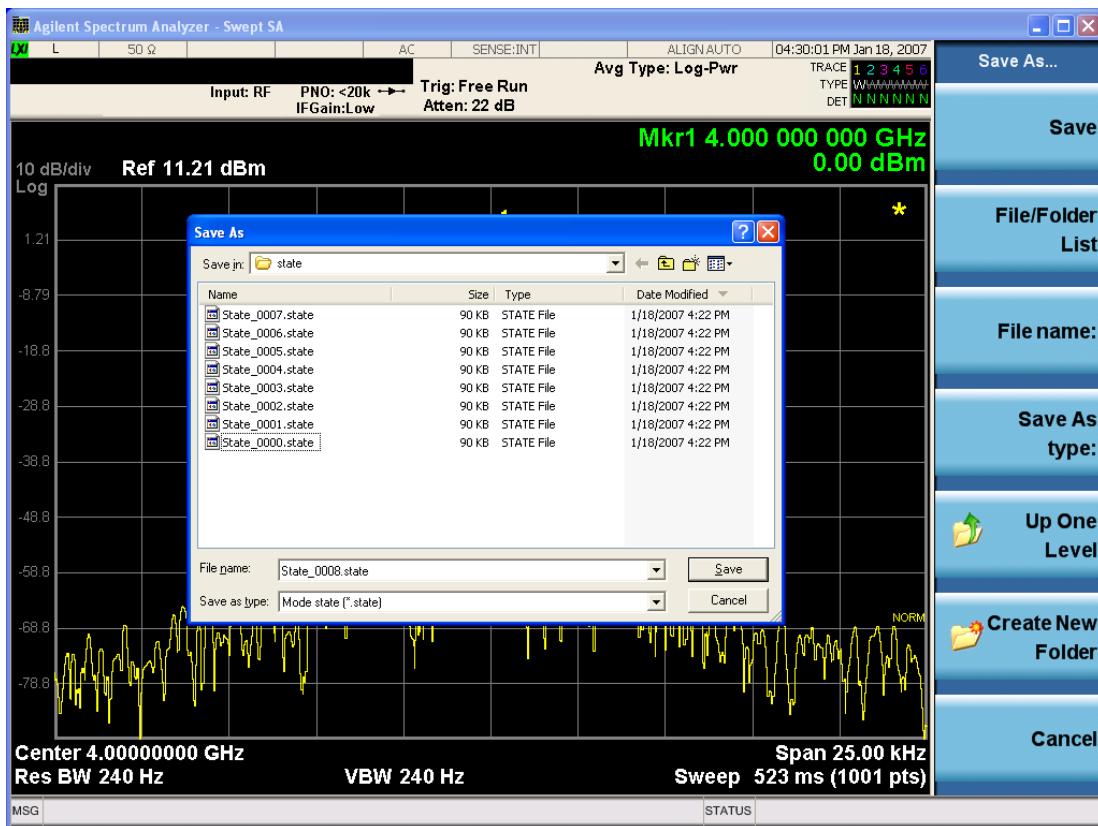
After saving to a register, that register's menu key is updated with the date the time, unless a custom label has been entered for that key.

After saving to a register, you remain in the Save State menu, so that you can see the Register key update. After saving to a file, the analyzer automatically returns to the previous menu and any Save As dialog goes away.

<b>Backwards Compatibility SCPI</b>	:MMEMory:STORe:STATE 1,<filename>
	For backwards compatibility, the above syntax is supported. The "1" is simply ignored. The command is sequential.
Initial S/W Revision	Prior to A.02.00

## To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “Save As.” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



The Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Save

Performs the save to the specified file of the selected type. If the file already exists, a dialog will appear that allows you to replace the existing file by selecting OK, or you can Cancel the request. If you select OK, the file

will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.

While the save is being performed, the floppy icon appears briefly in the Meas bar.

#### File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

#### Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

#### File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "["Quick Save " on page 660](#) documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

#### Save As Type

This field shows the file suffix for the type of file you have selected to save. For example, if you navigated here while saving State, "Mode state (\*.state)" is in the field. If you navigated here from saving Trace, ""Mode state (\*.trace)" is in the field. If you navigated here while exporting a trace data file, "Trace Data (\*.csv)" is in the field. For some file types, there is more than one choice in the dropdown, which you can select by using the up and down arrow keys and Enter.

#### Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

#### Create New Folder

This key corresponds to the icon of a folder with the "\*" that is in the tool bar of the dialog. When pressed, a new folder is created in the current directory with the name **New Folder** and you can enter a new folder name using the Alpha Editor.

#### Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State
Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

## 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 509](#)

Key Path	Save, State
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
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

### 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 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

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	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

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## 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 513](#)

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Key Path	Save
Remote Command	:MMEMory:STORe:CORRection 1 2 3 4 5 6, <filename>
Example	:MMEM:STOR:CORR 2 "myAmpcor.csv" saves Correction 2 to the file myAmpcor.csv on the current path.  The default path is My Documents\amplitudeCorrections.
Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten.  Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.  Both single and double quotes are supported for any filename parameter over SCPI.
Dependencies	Corrections are not supported by all Measurements. If in a Mode in which some Measurements support it, this key will be grayed out in measurements that do not. The key will not show at all if no measurements in the Mode support it.  This key will not appear unless you have the proper option installed in your instrument.
Readback	Selected Correction
Backwards Compatibility SCPI	:MMEMory:STORe:CORRection ANTenna   CABLe   OTHer   USER, <filename>  For backwards compatibility, ANTenna maps to 1, CABLe maps to 2, OTHer maps to 3 and USER maps to 4
Initial S/W Revision	A.02.00

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## Correction Data File

A Corrections Data File contains a copy of one of the analyzer correction tables. Corrections provide a way to adjust the trace display for predetermined gain curves (such as for cable loss).

Corrections files are text files in .csv (comma separated values) form, to make them importable into Excel or other spreadsheet programs. The format for Corrections files is as follows.

Line #	Type of field	Example	Notes
1	File type, must be "Amplitude Correction"	Amplitude Correction	May not be omitted
2	File Description (in quotes)	"Correction Factors for 11966E"	60 characters max; may be empty but may not be omitted. If exceeds 60 characters, error -233 Too much data reported
3	Comment (in quotes)	"Class B Radiated"	60 characters max; may be empty but may not be omitted. If exceeds 60 characters, error -233 Too much data reported
4	Instrument Version, Model #	A.02.06,N9020A	May be empty but may not be omitted
5	Option List, File Format Version	K03 LFE EXM ,01	May be empty but may not be omitted
6	Freq Unit to be used for all frequency values in the file	Frequency Unit,MHz	assumed to be Hz if omitted
7	Antenna Unit	Antenna Unit,None	If omitted leaves the Antenna unit unchanged. The amplitude unit in the Antenna Unit field is a conversion factor that is used to adjust the Y Axis Units of the current mode, if the mode supports Antenna Units. For more details on antenna correction data, refer to the Input/Output, Corrections key description. Allowable values: dBuv/m, dBuA/m, dBG, dBpT, None
8	Freq Interpolation	Frequency Interpolation,Linear	if omitted leaves the Freq Interpolation unchanged. Allowable values: Linear, Logarithmic
9	Bias value in mA	Bias,0.00	If omitted leaves the Bias value unchanged (added as of A.08.50)
10	Bias State	Bias State,On	If omitted leaves the Bias State unchanged. Allowable values: On, Off (added as of A.08.50)

Line #	Type of field	Example	Notes
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 516](#).

See ["Marker Table" on page 516](#).

See ["Peak Table" on page 519](#).

See [Spectrogram](#)

<b>Remote Command</b>	:MMEMory:STORe:RESUlt:sMTABle PTABle SPECTrogram <filename>
<b>Example</b>	: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

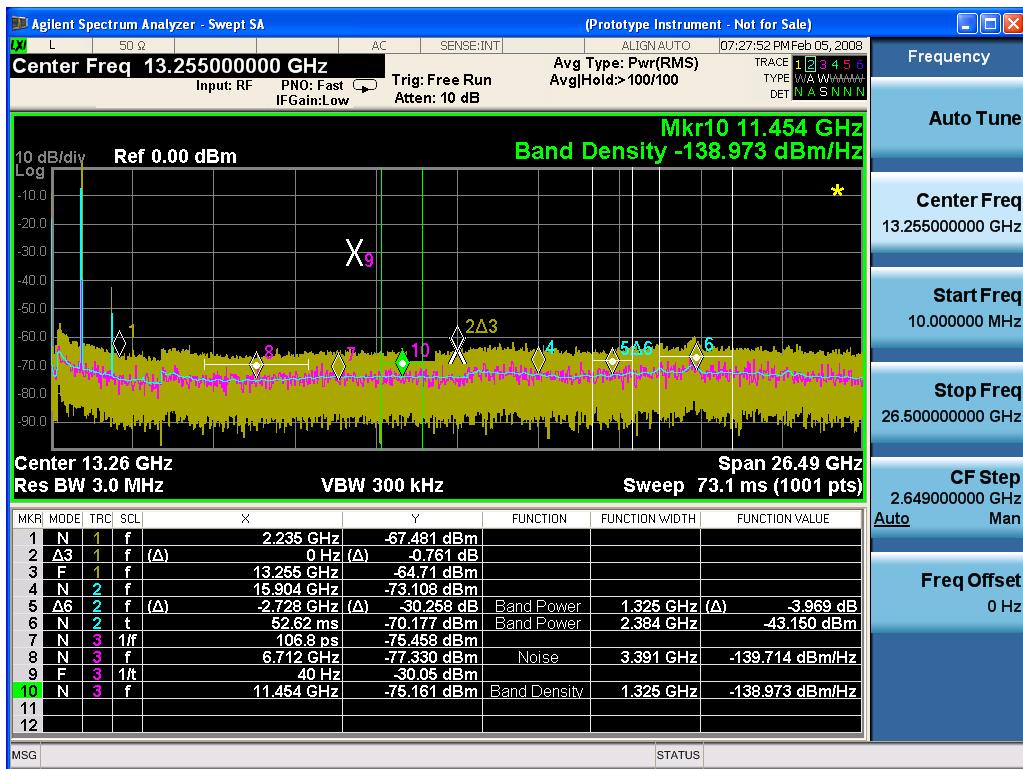
## Meas Results File Contents

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:

---

Measurement	
Result	
Swept SA	
A.01.40_	N9020A
R0017	
526 B25 PFR	1
P26 EA3	
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.06626 6667
Start Frequency	1000000 0
Stop Frequency	2650000 0000
Average Count	0
Average Type	LogPow

---

8 Complex Spectrum Measurement  
Save

er(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	1000000								
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 WIDTH	FUNCTION VALUE	FUNCTION UNIT
1	Normal	1	Frequency	2.2350 E+09	-67.	Off	0.0000 E+00	0	None

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2	Delta3	1	Frequency	0.0000 E+00	-0.761	Off	0.0000 E+00	0	None
3	Fixed	1	Frequency	1.3255 E+10	-64.71	Off	0.0000 E+00	0	None
4	Normal	2	Frequency	1.5904 E+10	-73.108	Off	0.0000 E+00	0	None
5	Delta7	2	Frequency	-2.7280 E+09	-30.258	Band Power	1.3250 E+06	-3.969	dB
6	Normal	2	Time	5.2620 E-02	-70.177	Band Power	2.3840 E+06	-43.15	dBm
7	Normal	3	Period	1.0680 E-10	-75.458	Off	0.0000 E+00	0	None
8	Normal	3	Frequency	6.7120 E+09	-77.33	Noise	3.3910 E+06	-139.714	dBm/Hz
9	Fixed	3	Inverse Time	4.0000 E+01	-30.05	Off	0.0000 E+00	0	None
10	Normal	3	Frequency	1.1454 E+10	-75.161	Band Density	1.3250 E+06	-138.973	dBm/Hz
11	Off	1	Frequency	0.0000 E+00	0	Off	0.0000 E+00	0	None
12	Off	1	Frequency	0.0000 E+00	0	Off	0.0000 E+00	0	None

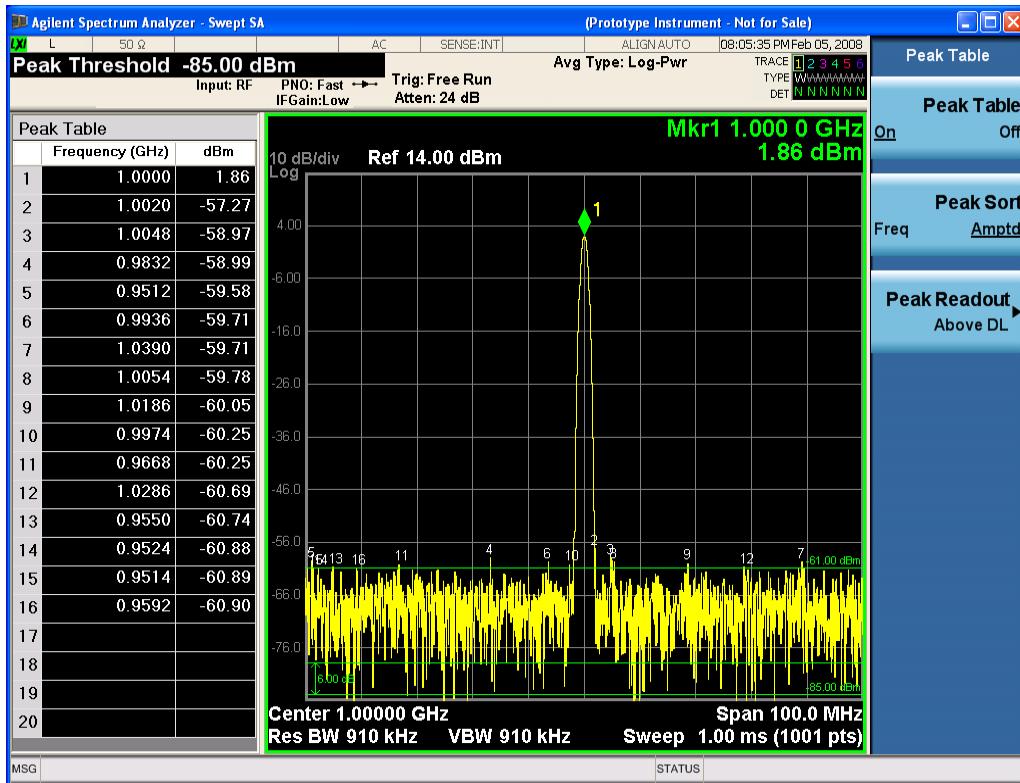
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

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:

---

#### MeasurementResult

Swept SA

A.01.40\_R0017 N9020A

526 B25 PFR P26 EA3 1

---

Result Type	Peak Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower (Video)
RBW	3000000
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	3000000
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	1.00E-06
Phase Noise Optimization	Fast
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF
RF Calibrator	Off
Attenuation	10
Ref Level Offset	0
External Gain	0
X Axis Units	Hz
Y Axis Units	dBm
Peak Threshold	-85
Peak Threshold State	On

## 8 Complex Spectrum Measurement

Save

Peak Excursion	6	
Peak Excursion State	On	
Display Line	-61	
Peak Readout	AboveDL	
Peak Sort	Amptd	
DATA		
Peak	Frequency	Amplitude
1	1.0000E+06	1.86
2	1.0020E+06	-57.27
3	1.0048E+06	-58.97
4	9.8320E+05	-58.99
5	9.5120E+05	-59.58
6	9.9360E+05	-59.71
7	1.0390E+06	-59.71
8	1.0054E+06	-59.78
9	1.1086E+06	-60.05
10	9.9740E+05	-60.25
11	9.6680E+05	-60.25
12	1.0286E+06	-60.69
13	9.5500E+05	-60.74
14	9.5240E+05	-60.88
15	9.5140E+05	-60.89
16	9.5920E+05	-60.90
17		
18		
19		
20		

## Spectrogram

This section discusses the Spectrogram Results file format. The Spectrogram choice only appears if option EDP is licensed.

The Spectrogram results are the same as a Trace data export, except that instead of having just one trace's data, all 300 traces appear one after the other.

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:

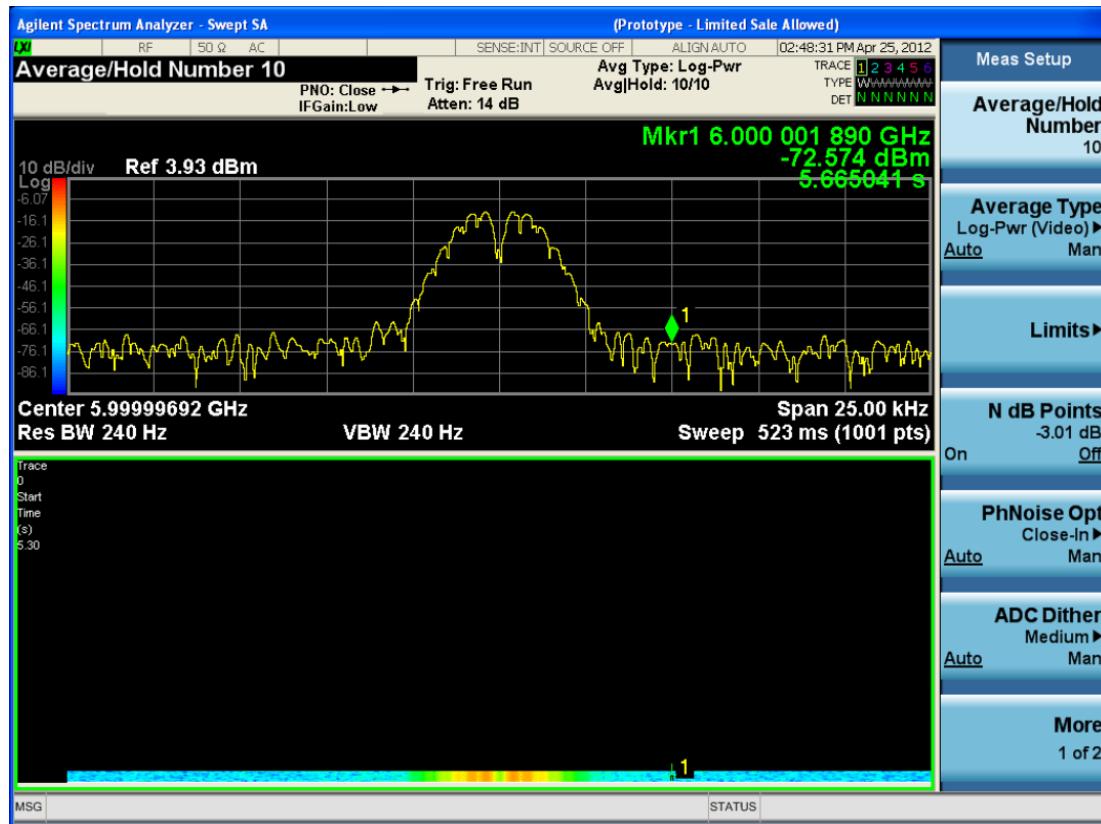
Start Time,20120130132345678

NOTE:

**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:



## 8 Complex Spectrum Measurement

Save

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 B1C	1
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

Result Type	Spectrogram
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
Trace Math Oper2	Trace6
Trace Math Offset	0
Trace Name	Trace1
X Axis Units	Hz
Y Axis Units	dBm
Start Time	20120425142808700
DATA	5.299231048
5999984415	-76.34749519
5999984440	-77.28097006
5999984465	-75.32317869
5999984490	-73.64417681
5999984515	-72.67154604

o  
o  
o

6000009315	-77.94423277
6000009340	-79.51829697
6000009365	-78.46108961
6000009390	-78.46108957
6000009415	-76.59570596
DATA2	4.708697055

## 8 Complex Spectrum Measurement Save

5999984415	-80.98197882
5999984440	-80.98197879
5999984465	-75.83142132
5999984490	-74.02712079
5999984515	-73.57213005

0

0

0

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

0

0

0

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 675 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

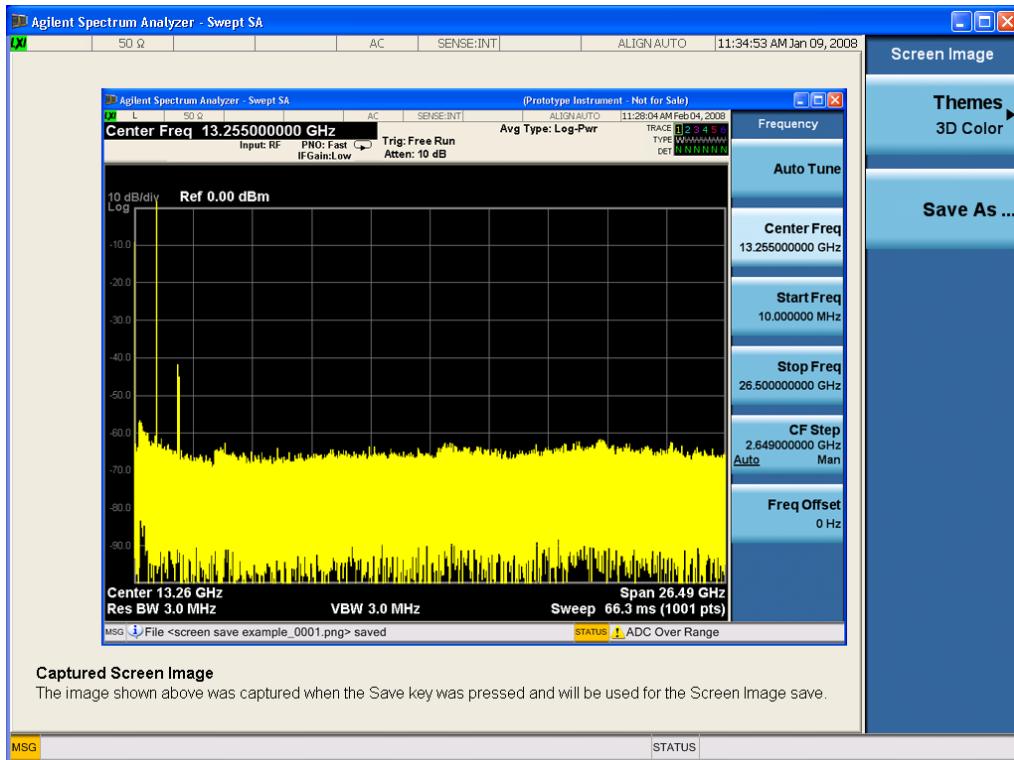
Key Path	Save, Data
Mode	All
Notes	<p>The key location is mode-dependent and will vary.</p> <p>Brings up the Save As dialog for saving a &lt;mode specific&gt; Save Type. The save is performed immediately and does not wait until the measurement is complete.</p>
Initial S/W Revision	Prior to A.02.00

## Screen Image

Pressing Screen Image accesses a menu of functions that enable you to specify a format and location for the saved screen image. It brings up a menu that allows you to specify the color scheme of the Screen Image (Themes) or navigate to the Save As dialog to perform the actual save.

Screen Image files contain an exact representation of the analyzer display. They cannot be loaded back onto the analyzer, but they can be loaded into your PC for use in many popular applications.

The image to be saved is actually captured when the Save front panel key is pressed, and kept in temporary storage to be used if you ask for a Screen Image save. When the Screen Image key is pressed, a "thumbnail" of the captured image is displayed, as shown below:



When you continue on into the Save As menu and complete the Screen Image save, the image depicted in the thumbnail is the one that gets saved, showing the menus that were on the screen before going into the Save menus. The save is performed immediately and does not wait until the measurement is complete.

After you have completed the save, the Quick Save front-panel key lets you quickly repeat the last save performed, using an auto-named file, with the current screen data.

**NOTE** For versions previous to A.01.55, if you initiate a screen image save by navigating through the Save menus, the image that is saved will contain the Save menu softkeys, not the menus and the active function that were on the screen when you first pressed the Save front panel key.

Key Path	Save
Mode	All
Remote Command	:MMEMory:STORe:SCReen <filename>
Example	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
Initial S/W Revision	Prior to A.02.00

## Themes

Accesses a menu of functions that enable you to choose the theme to be used when saving the screen image.

The **Themes** option is the same as the **Themes** option under the **Display** and **Page Setup** dialogs. It allows you to choose between themes to be used when saving the screen image.

<b>Key Path</b>	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 the user selected Reverse Bitmap AND a black&white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
Initial S/W Revision	Prior to A.02.00

### 3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

<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.

<b>Key Path</b>	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.

---

<b>Key Path</b>	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.

---

<b>Key Path</b>	Save, Screen Image, Themes
<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 675 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).

---

<b>Key Path</b>	Save, Screen Image
<b>Notes</b>	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

---

## Single (Single Measurement/Sweep)

Sets the analyzer for Single measurement operation. The single/continuous state is Meas Global, so the setting will affect all the measurements. If you are Paused, pressing Single does a Resume.

See "[More Information](#)" on page 531

Key Path	Front-panel key
<b>Example</b>	:INIT:CONT OFF
Notes	See Cont key description.
Backwards Compatibility Notes	<p>For Spectrum Analysis mode in ESA and PSA, the Single hardkey and the INITiate:IMM switched from continuous measurement to single measurement and restarted sweeps and averages (displayed average count reset to 1), but did not restart Max Hold and Min Hold. In the X-Series, the Single hardkey and the INITiate:IMM command initiate a sweep/ measurement/ average sequence/hold sequence including MaxHold and MinHold.</p> <p>For Spectrum Analysis mode in ESA and PSA, the Single hardkey restarted the sweep regardless of whether or not you were in an active sweep or sweep sequence. In the X-Series, Restart does this but Single only restarts the sweep or sweep sequence if you are in the idle state.</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 672 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

## Span X Scale

Accesses the frequency span menu when the spectrum view is active or the horizontal time menu when the waveform view is active.

---

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

---

## Span (Spectrum View)

This parameter allows you to modify the frequency span in spectrum view for the complex spectrum measurement. This is translated to the required Digital IF bandwidth for the FFT analysis. The analyzer's Digital IF bandwidth is always equal to or greater than this value. The maximum span is dependent upon the instrument type and the options that are installed. The maximum span is equal to the maximum bandwidths of the IF Paths.

---

Key Path	SPAN X Scale
Mode	BASIC
Remote Command	[ :SENSe]:SPECtrum:FREQuency:SPAN <freq> [ :SENSe]:SPECtrum:FREQuency:SPAN?
Example	SPEC:FREQ:SPAN 10 SPEC:FREQ:SPAN?
Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTRument:SElect to set the mode.
Couplings	Changing the span causes the resolution bandwidth to change automatically, and affects data acquisition time.
Preset	8 MHz
State Saved	Saved in instrument state.
Min	10 Hz
Max	Hardware Dependent: RF Input: No Option = 8.0 MHz Option B25 = 25.0 MHz Option B40 = 40.0 MHz Option B85 = 85.0 MHz Option B1A = 125.0 MHz Option B1X = 140.0 MHz Option B1Y = 160.0 MHz I/Q Input: No Option = 10.0 MHz per channel (20.0 MHz for I+jQ)

---

## 8 Complex Spectrum Measurement Span X Scale

---

Option B25 = 25 MHz per channel (50 MHz for I+jQ)  
Option S40 = 40 MHz per channel (80 MHz for I+jQ)

---

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

---

## Pause/Resume

Pauses a measurement after the current data acquisition is complete.

When Paused, the label on the key changes to Resume. Pressing Resume un-pauses the measurement. When you are Paused, pressing Restart, Single or Cont does a Resume.

---

Key Path	Sweep/Control
<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

---

## 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	<p>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.</p> <p>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.</p>
Dependencies	<p>For continuous measurement, ABORT is equivalent to the Restart key.</p> <p>Not all measurements support the abort command.</p>
Status Bits/OPC dependencies	<p>The STATus:OPERation register bits 0 through 8 are cleared.</p> <p>The STATus:QUESTIONable register bit 9 (INTEGRITY sum) is cleared.</p> <p>Since all the bits that feed into OPC are cleared by the ABORT, the ABORT will cause the *OPC query to return true.</p>
Initial S/W Revision	Prior to A.02.00

## System

See "System" on page 257

## Trace/Detector

Toggles the instantaneous trace display between On and Off.

This is a display only feature and the actual Spectrum trace still exists even when the Spectrum Trace State is OFF. It is just invisible. Hence it is possible to set Spectrum Trace State to OFF and put a marker on Spectrum trace.

Key Path	Front-panel key
Remote Command	:TRACe:SPECTrum:STRace[:STATe] OFF ON 0 1 :TRACe:SPECTrum:STRace[:STATe] ?
Example	TRAC:SPEC:STR OFF TRAC:SPEC:STR?
Preset	ON
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	Prior to A.09.00

## Trigger

See "Trigger" on page 336

### Free Run

See "Free Run" on page 344

### Video

See "Video (IF Envelope)" on page 344

### Trigger Level

See "Trigger Level" on page 345

### Trig Slope

See "Trig Slope" on page 346

### Trig Delay

See "Trig Delay" on page 346

### Line

See "Line" on page 348

### Trig Slope

See "Trig Slope" on page 349

### Trig Delay

See "Trig Delay" on page 349

### External 1

See "External 1" on page 376

### Trigger Level

See "Trigger Level" on page 376

### Trig Slope

See "Trig Slope" on page 377

### Trig Delay

See "Trig Delay" on page 351

### External 2

See "External 2" on page 377

## **Trigger Level**

See "[Trigger Level](#)" on page 378

## **Trig Slope**

See "[Trig Slope](#)" on page 379

## **Trig Delay**

See "[Trig Delay](#)" on page 354

## **Baseband I/Q**

See "[Baseband I/Q](#)" on page 355

## **I/Q Mag**

See "[I/Q Mag](#)" on page 355

## **Trigger Level**

See "[Trigger Level](#)" on page 355

## **Trig Slope**

See "[Trig Slope](#)" on page 356

## **Trig Delay**

See "[Trig Delay](#)" on page 356

## **I**

See "[I \(Demodulated\)](#)" on page 357

## **Trigger Level**

See "[Trigger Level](#)" on page 357

## **Trig Slope**

See "[Trig Slope](#)" on page 357

## **Trig Delay**

See "[Trig Delay](#)" on page 358

## **Q**

See "[Q \(Demodulated\)](#)" on page 358

## **Trigger Level**

See "[Trigger Level](#)" on page 359

## **Trig Slope**

See "[Trig Slope](#)" on page 359

**Trig Delay**

See "Trig Delay" on page 359

**Input I**

See "Input I" on page 360

**Trigger Level**

See "Trigger Level" on page 360

**Trig Slope**

See "Trig Slope" on page 361

**Trig Delay**

See "Trig Delay" on page 361

**Input Q**

See "Input Q" on page 362

**Trigger Level**

See "Trigger Level" on page 362

**Trig Slope**

See "Trig Slope" on page 362

**Trig Delay**

See "Trig Delay" on page 363

**Aux Channel Center Freq**

See "Auxiliary Channel I/Q Mag" on page 363

**Trigger Level**

See "Trigger Level" on page 363

**Trig Slope**

See "Trig Slope" on page 364

**Trig Delay**

See "Trig Delay" on page 364

**Trigger Center Freq**

See "Trigger Center Frequency" on page 365

**Trigger BW**

See "Trigger Bandwidth" on page 365

## RF Burst

See "RF Burst " on page 366

## Absolute Trigger

See "Absolute Trigger Level" on page 379

## Relative Trigger

See "Relative Trigger Level" on page 381

## Trig Slope

See "Trigger Slope " on page 382

## Trig Delay

See "Trig Delay " on page 370

## Periodic Timer

See "Periodic Timer (Frame Trigger)" on page 370

## Period

See "Period " on page 372

## Offset

See "Offset " on page 372

## Offset Adjust (Remote Command Only)

See "Offset Adjust (Remote Command Only)" on page 374

## Reset Offset Display

See "Reset Offset Display " on page 374

## Sync Source

See "Sync Source " on page 375

## Off

See "Off " on page 375

## External 1

See "External 1" on page 376

## Trigger Level

See "Trigger Level " on page 376

## Trig Slope

See "Trig Slope " on page 377

## **External 2**

See "External 2" on page 377

## **Trigger Level**

See "Trigger Level " on page 378

## **Trig Slope**

See "Trig Slope " on page 379

## **RF Burst**

See "RF Burst" on page 379

## **Absolute Trigger**

See "Absolute Trigger Level" on page 379

## **Relative Trigger**

See "Relative Trigger Level" on page 381

## **Trig Slope**

See "Trigger Slope " on page 382

## **Trig Delay**

See "Trig Delay" on page 382

## **Auto/Holdoff**

See "Auto/Holdoff" on page 383

## **Auto Trig**

See "Auto Trig " on page 383

## **Trig Holdoff**

See "Trig Holdoff " on page 384

## 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>	:SYSTem: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>	:SYSTem: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.

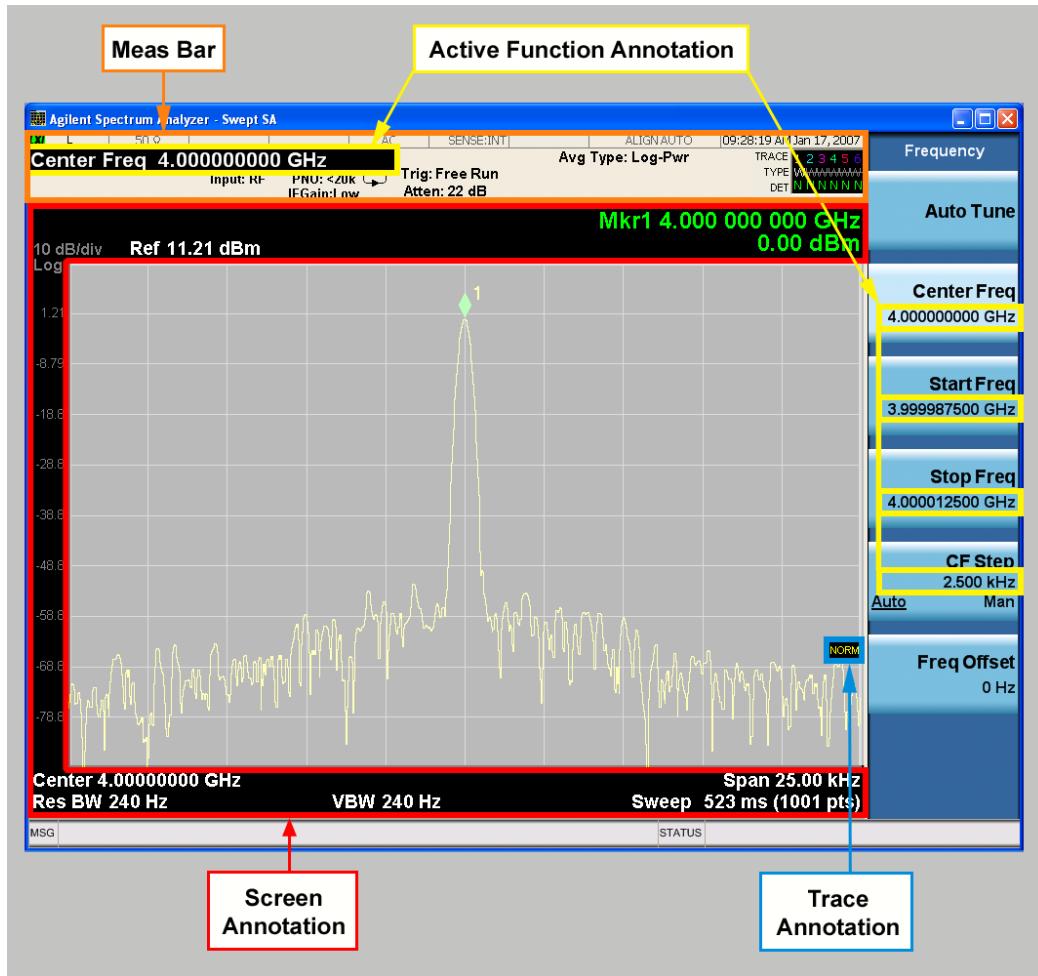
Key Path	Display
Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

## Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

1. Meas Bar: This is the measurement bar at the top of the screen. It does not include the settings panel or the Active Function. Turning off the Meas Bar turns off the settings panel and the Active Function. When the Meas Bar is off, the graticule area expands to fill the area formerly occupied by the Meas Bar.
2. Screen Annotation: this is the annotation and annunciation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) This does NOT include the marker number or the N dB result. When off, the graticule expands to fill the entire graticule area.
3. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).
4. Active Function annotation: this is the active function display in the meas bar, and all of the active function values displayed on softkeys.

See the figure below. Each type of annotation can be turned on and off individually.




---

Key Path	View/Display, Display
----------	-----------------------

Initial S/W Revision	Prior to A.02.00
----------------------	------------------

---

### Meas Bar On/Off

This function turns the Measurement Bar on and off, including the settings panel. When off, the graticule area expands to fill the area formerly occupied by the Measurement Bar.

---

Key Path	View/Display, Display, Annotation
----------	-----------------------------------

Remote Command	:DISPlay:ANNotation:MBAR[:STATE] OFF ON 0 1 :DISPlay:ANNotation:MBAR[:STATE]?
----------------	--

Example	DISP:ANN:MBAR OFF
---------	-------------------

Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
--------------	--

---

---

Preset	On
	This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

---

## Screen

This controls the display of the annunciation and annotation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) and the y-axis annotation. This does NOT include marker annotation (or the N dB result). When off, the graticule expands to fill the entire graticule area, leaving only the 1.5% gap above the graticule as described in the Trace/Detector chapter.

---

Key Path	View/Display, Display, Annotation
<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 System Display Settings, Annotation is set to Off.
Preset	On
	This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

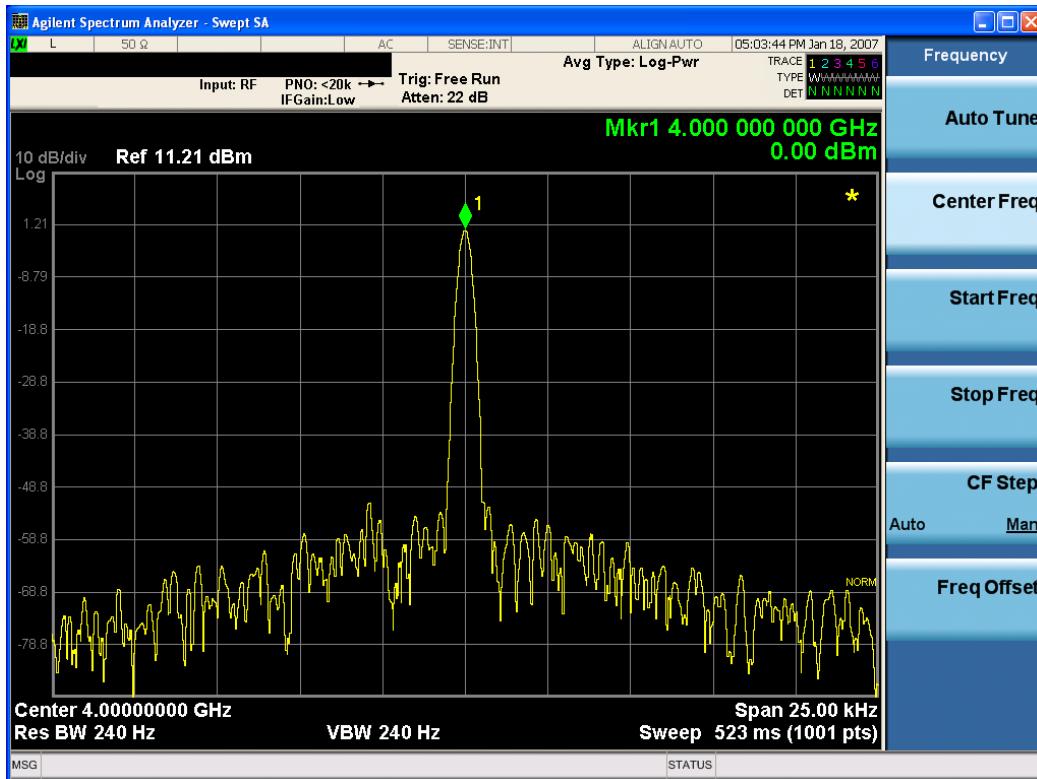
---

## 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..

## 8 Complex Spectrum 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
<b>Dependencies</b>	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
<b>Preset</b>	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
<b>State Saved</b>	Saved in instrument state.
<b>Initial S/W Revision</b>	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
<b>Initial S/W Revision</b>	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	<pre>DISP:ANN:TITL:DATA "This Is My Title" This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer &lt;measurement&gt; 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</pre>
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
Example	The following commands clear the title and restore the measurement's original title: DISP:ANN:TITL:DATA ""

---

This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer <measurement> name is not used.

**DISP:ACP:ANN:TITL:DATA ""**

This example is for ACP; in measurements other than Swept SA the measurement name is required.

---

Notes	Uses the :DISPlay:<measurement>:ANNotation:TITLE:DATA <string> command with an empty string (in the Swept SA, the <measurement> is omitted).
Preset	Performed on Preset.
Initial S/W Revision	Prior to A.02.00

---

## Graticule

Pressing Graticule turns the display graticule On or Off. It also turns the graticule y-axis annotation on and off.

---

Key Path	View/Display, Display
Remote Command	:DISPlay:WINDOW[1]:TRACe:GRATICule:GRID[:STATE] OFF ON 0 1 :DISPlay:WINDOW[1]:TRACe:GRATICule:GRID[:STATE]?
Example	DISP:WIND:TRAC:GRAT:GRID OFF
Notes	The graticule is the set of horizontal and vertical lines that make up the grid/divisions for the x-axis and y-axis.
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

---

## 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: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 the user selected Reverse Bitmap AND a black&white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
Initial S/W Revision	Prior to A.02.00

## 3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

Key Path	Save, Screen Image, Themes
<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.

<b>Key Path</b>	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight ON OFF :DISPlay:BACKlight?
<b>Preset</b>	ON (Set by Restore Misc Defaults)
<b>Initial S/W Revision</b>	Prior to A.02.00

### Backlight Intensity

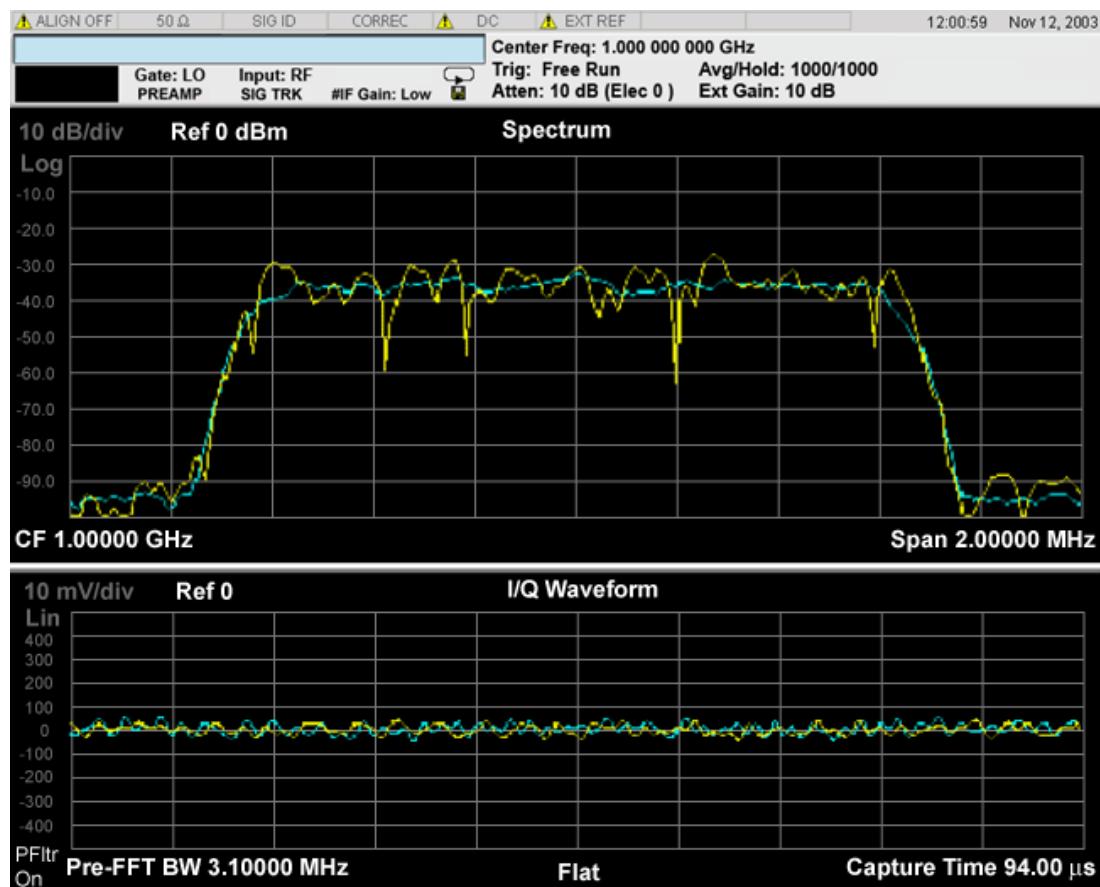
An active function used to set the backlight intensity. It goes from 0 to 100 where 100 is full on and 0 is off. This value is independent of the values set under the Backlight on/off key.

<b>Key Path</b>	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50
<b>Preset</b>	100 (Set by Restore Misc Defaults)
<b>Min</b>	0
<b>Max</b>	100
<b>Initial S/W Revision</b>	Prior to A.02.00

## Measurement Results View

The figure below shows an example of the view for the Complex Spectrum Measurement.

- The upper Spectrum Window shows the trace of the signal and its average in the frequency domain. For details, see [Spectrum Window](#).
- The lower I/Q Spectrum Window shows the traces of the I and Q of the input signal. For details, see [I/Q Waveform Window](#).
- The measured values for the mean power and peak-to-mean power are shown in the text window.



## 9 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 560](#) below.

This topic contains the following sections:

["Measurement Commands for Waveform" on page 558](#)

["Remote Command Results for the Waveform Measurement" on page 559](#)



## Measurement Commands for Waveform

The general functionality of CONFigure, INITiate, FETCh, MEASure, and READ are described at this section.

```
:CONFigure:WAVeform  
:CONFigure:WAVeform:NDFault  
: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 626](#).

## Remote Command Results for the Waveform Measurement

The following table describes the returned results from the FETCh|MEASure|READ queries:

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

### Ref Value

Sets the absolute power reference value. However, since Auto Scaling is defaulted to On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.

This functionality depends on the selected view:

- ["Ref Value \(RF Envelope View\)" on page 561](#)
- ["Ref Value \(I/Q Waveform View\)" on page 562](#)

#### 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	AMPTD Y Scale
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	:DISPlay:WAVEform:VIEW[1]:WINDOW[1]:TRACE:Y[:SCALE]:RLEVel <ampl> :DISPlay:WAVEform:VIEW[1]:WINDOW[1]:TRACE:Y[:SCALE]:RLEVel?
Example	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	AMPTD Y Scale
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDB-T, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	:DISPlay:WAVeform:VIEW2:WINDOW[1]:TRACe:Y[:SCALe]:RLEVel <voltage> :DISPlay:WAVeform:VIEW2:WINDOW[1]:TRACe:Y[:SCALe]:RLEVel?
Example	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 563.

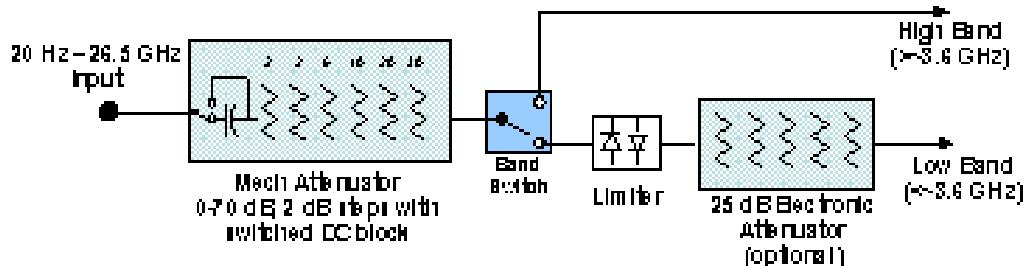
See "[Single Attenuator Configuration:](#)" on page 564

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.

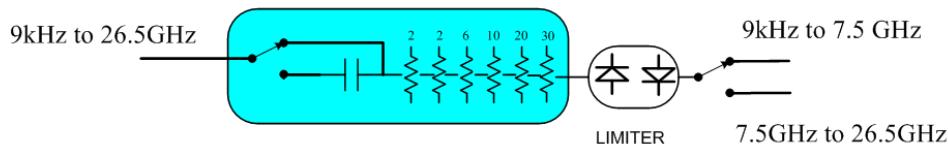
Key Path	AMPTD Y Scale
Scope	Meas Global
Dependencies	In measurements that support the I/Q inputs, this key is unavailable when I/Q is the selected input, and is replaced by the Range key in that case.
Readback Line	Contains a summary in [ ] brackets of the current total attenuation. See the descriptions of the "(Mech) Atten" on page 564, "Enable Elec Atten" on page 566, and "Elec Atten" on page 568 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

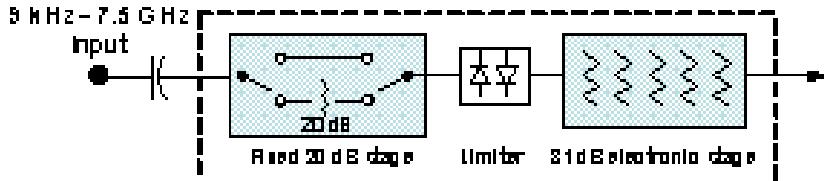


Configuration 2: Mechanical attenuator, no optional electronic attenuator



(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.

Attenuation	Attenuation
<b>Mech Atten</b>	<b>Atten</b>
18 dB	6 dB
<u>Auto</u>	<u>Auto</u>
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 566

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>

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Dependencies	<p>Some measurements do not support the Auto setting of (Mech) Atten. In these measurements, the Auto/Man selection is not available, and the Auto/Man line on the key disappears.</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" on page 566</a> key description.</p> <p>See "<a href="#">Attenuator Configurations and Auto/Man</a>" on page 566 for more information on the Auto/Man functionality of Attenuation.</p>
Couplings	<p>When (Mech) Atten is in Auto, it uses the following algorithm to determine a value:</p> $\text{Atten} = \text{ReferenceLevel} + \text{PreAmpGain} + \text{ExternalGain} - \text{RefLevelOffset} - \text{MaxMixerLevel} + \text{IF Gain}.$ <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 (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.</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	<p>0 dB</p> <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>

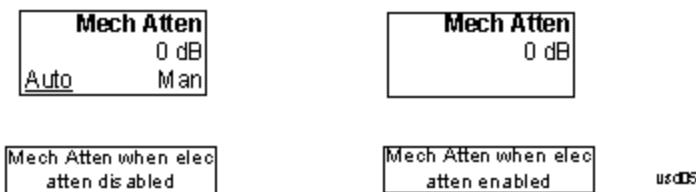
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Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## 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 568](#) 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 566](#)

See ["More Information" on page 567](#)

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	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

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integrated attenuator (which has both a mechanical and electronic stage). However, in the single attenuator configuration, EATT SCPI commands are accepted for compatibility with other X-series instruments and set a “soft” attenuation as described in [“Attenuator Configurations and Auto/Man” on page 566](#)

The electronic attenuator (and the “soft” attenuation function provided in single attenuator configurations) is unavailable above 3.6 GHz. Therefore, if the Stop Frequency of the analyzer is > 3.6 GHz then the Enable Elec Atten key will be OFF and grayed out.

If the Internal Preamp is on, meaning it is set to Low Band or Full, the electronic attenuator (and the “soft” attenuation function provided in single attenuator configurations) is unavailable. In this case the Enable Elec Atten key will be OFF and grayed out.

If either of the above is true, if the SCPI command is sent, an error indicating that the electronic attenuator is unavailable will be sent.

If the electronic/soft Attenuator is enabled, then the Stop Freq of the analyzer is limited to 3.6 GHz and the Internal Preamp is unavailable.

The SCPI-only “soft” electronic attenuation for the single-attenuator configuration is not available in all measurements; in particular, it is not available in the Swept SA measurement.

---

Couplings	Enabling and disabling the Electronic Attenuator affects the setting of the Mechanical Attenuator (in dual attenuator configurations). This is described in more detail below this table.
Preset	OFF for Swept SA measurement; ON for all other measurements that support the electronic attenuator
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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## More Information

### Mechanical Attenuator Transition Rules

When the Electronic Attenuator is enabled, the Mechanical Attenuator transitions to a state that has no Auto function. Below are the rules for transitioning the Mechanical Attenuator. NOTE that the information below ONLY applies to the dual attenuator configurations, and ONLY when the Electronic Attenuator is installed:

#### When the Electronic Attenuation is enabled from a disabled state:

- The Mechanical Attenuator is initialized to 10 dB (this is its optimal performance setting). You can then set it as desired with SCPI, numeric keypad, step keys, or knob, and it behaves as it normally would in manual mode
- The Auto/Man state of (Mech) Atten is saved
- The Auto/Man line on the (Mech) Atten key disappears and the auto rules are disabled

- The Electronic Attenuator is set to 10 dB less than the previous value of the Mechanical Attenuator, within the limitation that it must stay within the range of 0 to 24 dB of attenuation.

#### Examples in the dual attenuator configuration:

- Mech Atten at 20 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 10 dB. New total attenuation equals the value before Elec Atten enabled.
- Mech Atten at 0 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 0 dB. New total attenuation does not equal the value before Elec Atten enabled.
- Mech Atten at 40 dB. Elec Atten enabled, Mech Atten set to 10 dB, and Elec Atten set to 24 dB. New total attenuation does not equal the value before Elec Atten enabled.

#### When the Electronic Attenuation is disabled from an enabled state:

- The Elec Atten key is grayed out
- The Auto/Man state of (Mech) Atten is restored
- If now in Auto, (Mech) Atten recouples
- If now in Man, (Mech) Atten is set to the value of total attenuation that existed before the Elec Atten was disabled. The resulting value is rounded up to the smallest value possible given the (Mech) Atten Step setting - (That is, 57 dB changes to 58 dB when (Mech) Atten Step is 2 dB.)

#### Using the Electronic Attenuator: Pros and Cons

The electronic attenuator offers finer steps than the mechanical attenuator, has no acoustical noise, is faster, and is less subject to wear.

The “finer steps” advantage of the electronic attenuator is beneficial in optimizing the alignment of the analyzer dynamic range to the signal power in the front panel as well as remote use. Thus, you can achieve improved relative signal measurement accuracy. Compared to a mechanical attenuator with 2 dB steps, the 1 dB resolution of the electronic attenuator only gives better resolution when the odd-decibel steps are used. Those odd-decibel steps are less accurately calibrated than the even-decibel steps, so one tradeoff for this superior relative accuracy is reduced absolute amplitude accuracy.

Another disadvantage of the electronic attenuator is that the spectrum analyzer loses its “Auto” setting, making operation less convenient.

Also, the relationship between the dynamic range specifications (TOI, SHI, compression and noise) and instrument performance are less well-known with the electrical attenuator. With the mechanical attenuator, TOI, SHI and compression threshold levels increase dB-for-dB with increasing attenuation, and the noise floor does as well. With the electronic attenuator, there is an excess attenuation of about 1 to 3 dB between 0 and 3.6 GHz, making the effective TOI, SHI, and so forth, less well known. Excess attenuation is the actual attenuation relative to stated attenuation. Excess attenuation is accounted for in the analyzer calibration

#### Elec Atten

Controls the Electronic Attenuator in dual attenuator configurations. This key does not appear in single attenuator configurations, as the control of both the mechanical and electronic stages of the single attenuator is integrated into the single Atten key.

Key Path	AMPTD Y Scale, Attenuation
Remote Command	<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 566</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 Enable Elec Atten is off or grayed out, the Elec Atten key is grayed out.
Preset	0 dB
State Saved	Saved in instrument state
Min	0 dB
Max	Dual attenuator configuration: 24 dB  Single attenuator configuration: the total of ATT and EATT cannot exceed 50 dB, so if the EATT is set to 24 dB first, the main attenuation cannot be greater than 26 dB and will be reduced accordingly; if the main attenuator is set to 40 dB first, EATT cannot be greater than 10 dB
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### (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	<code>[SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement] 10 dB   2 dB</code> <code>[SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement]?</code>
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

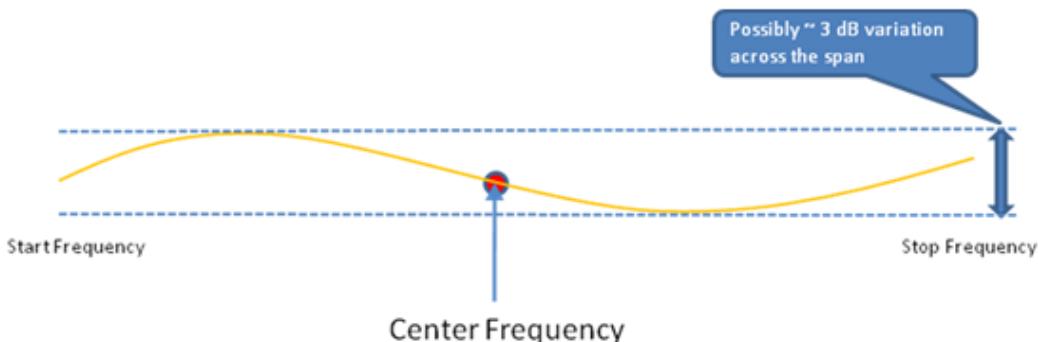
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	to set it via SCPI will yield an error.
Couplings	When the attenuation step size changes, the current mechanical attenuation value is adjusted (if necessary) to be quantized to the new step size. That is, if step is set to 10 dB, mech atten is increased 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

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### Clipping Level (Remote Command Only)

The Clipping Level is the value only at the center frequency and not necessarily throughout the span. There can possibly be a few dB of fluctuation in the clipping level across the span, especially in wider bandwidths, due to non-ideal flatness.



Thus it is important to understand that this Clipping Level parameter is not the absolute clipping level for the entire signal but only for the center frequency point and you need to adjust your setup accordingly. Nevertheless, it should provide a good reference point.

Also, there needs to be at least one data acquisition with the setup parameters for the correct clipping level to be returned. In cases where the hardware settings have changed since the last data acquisition was performed, the value -999 will be returned. For example, if you set the measurement to Single and change the center frequency, the Clipping Level parameter will return the value -999.

This feature is available in both measurements in IQ Analyzer mode.

This parameter is SCPI only and query only.

---

**Remote Command** [:SENSe] [:POWeR [:RF] :RANGE:CLIPping:LEVel?

**Example** :POW:RANG:CLIP:LEV?

---

Notes	Needs to do a data acquisition with the current parameter set before a valid value is returned.
Dependencies	The value will vary based on the current gain settings. If a hardware parameter is changed in the measurement, a data acquisition needs to be performed in order to get the current clipping level. If a hardware parameter is changed and no data acquisition is performed, the SCPI will return -999.
State Saved	No

## 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	When Range is Auto, "[Auto]" When Range is Man and I & Q are the same, "[<range value>]" When Range is Man and I & Q are different: "[I: <I range value> Q: <Q range value>]" See I Range and Q Range for the <range value> enumeration definition.
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>	Put the I Range and Q Range in manual. <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: YMax = max (abs(top), abs(bottom)). The I Range and Q Range are then set to YMax.
Preset	ON
State Saved	Saved in instrument state
Range	Auto   Man
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	<code>[::SENSe] :POWer:IQ:RANGE:AUTO OFF ON 0 1</code> <code>[::SENSe] :POWer:IQ:RANGE:AUTO?</code>
<b>Example</b>	Put the I Range and Q Range in manual. <code>POW:IQ:RANG:AUTO OFF</code>
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.
Preset	ON
Range	Auto   Man
Initial S/W Revision	Prior to A.02.00

## 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 577](#)".

<b>Key Path</b>	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>
<b>Notes</b>	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.
<b>Couplings</b>	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.
<b>Preset</b>	1 V Peak
<b>State Saved</b>	Saved in instrument state
<b>Range</b>	1 V Peak   0.5 V Peak   0.25 V Peak   0.125 V Peak
<b>Min</b>	0.125 V
<b>Max</b>	1 V
<b>Initial S/W Revision</b>	Prior to A.02.00

<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>
<b>Notes</b>	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
<b>Preset</b>	10.0 dBm
<b>Range</b>	-20 dBm to 10 dBm
<b>Min</b>	-20 dBm
<b>Max</b>	10 dBm
<b>Initial S/W Revision</b>	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.

---

Key Path	AMPTD Y Scale, I Range   Q Range
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.

---

Key Path	AMPTD Y Scale, I Range   Q Range
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
Initial S/W Revision	Prior to A.02.00

---

## Q Range

Accesses the Q Range menu.

---

Key Path	AMPTD Y Scale, Range
Readback Text	Q Same as I   1 V Peak   0.5 V Peak   0.25 V Peak   0.125 V Peak

---

---

When Q Same as I is On, the readback is "Q Same as I", otherwise it is the Q Range value.

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Initial S/W Revision	Prior to A.02.00
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### 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>	<code>[ :SENSe]:VOLTage POWer:IQ:MIRRored OFF ON 0 1</code> <code>[ :SENSe]:VOLTage POWer:IQ:MIRRored?</code>
<b>Example</b>	Turn off the mirroring of I Range to Q Range.  <code>VOLT:IQ:MIRR OFF</code> <code>POW:IQ:MIRR OFF</code>
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

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### 0.25 V Peak

Set the channel gain state to 0.25 Volt Peak.

---

Key Path	AMPTD Y Scale, I Range   Q Range
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
Initial S/W Revision	Prior to A.02.00

---

## 0.5 V Peak

Set the channel gain state to 0.5 Volt Peak.

Key Path	AMPTD Y Scale, I Range   Q Range
Initial S/W Revision	Prior to A.02.00

## 1 V Peak

Set the channel gain state to 1 Volt Peak.

Key Path	AMPTD Y Scale, I Range   Q Range
Initial S/W Revision	Prior to A.02.00

## Q Range Value

This is the internal gain range for the Q channel. See "[I/Q Gain Ranges](#)" on page 577. 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.

Key Path	AMPTD Y Scale, Range
Remote Command	<code>[::SENSe] :VOLTage:IQ:Q:RANGE[:UPPer] &lt;voltage&gt;</code> <code>[::SENSe] :VOLTage:IQ:Q:RANGE[:UPPer]?</code>
Example	Set the Q Range to 0.5 V Peak <code>VOLT:IQ:Q: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. 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.
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
Max	1 V
Initial S/W Revision	Prior to A.02.00

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<b>Remote Command</b>	<code>[ :SENSe]:POWer:IQ:Q:RANGE[:UPPer] &lt;ampl&gt;</code> <code>[ :SENSe]:POWer:IQ:Q:RANGE[:UPPer]?</code>
<b>Example</b>	Will set the Q 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:Q: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 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: 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

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## I/Q Gain Ranges

See the following sections:

["1 V Peak" on page 576](#)

["0.5 V Peak" on page 576](#)

["0.25 V Peak" on page 575](#)

["0.125 V Peak" on page 575](#)

## Scale/Div

Sets the units per division of vertical scale in the logarithmic display. However, since Auto Scaling is defaulted to On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.

This functionality depends on the selected view:

- ["Scale/Div \(RF Envelope View\)" on page 578](#)
- ["Scale/Div \(I/Q Waveform View\)" on page 578](#)

## Scale/Div (RF Envelope View)

Sets the scale per division for the RF Envelope result waveform (time domain) measurements in the graph window.

<b>Key Path</b>	AMPTD Y Scale
<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<b>Remote Command</b>	:DISPlay:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision <rel_ampl> :DISPlay:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:Y:PDIV 5 DISP:WAV:VIEW:WIND:TRAC:Y:PDIV?
<b>Notes</b>	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
<b>Couplings</b>	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.
<b>Preset</b>	10.00 dB
<b>State Saved</b>	Saved in instrument state.
<b>Range</b>	0.10 dB to 20.00 dB
<b>Min</b>	0.10 dB
<b>Max</b>	20.00 dB
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.03.00

## Scale/Div (I/Q Waveform View)

Sets the scale per division for the I/Q signal waveform graph.

<b>Key Path</b>	AMPTD Y Scale
<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<b>Remote Command</b>	:DISPlay:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision <voltage> :DISPlay:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALE]:PDIVision?
<b>Example</b>	DISP:WAV:VIEW2:WIND:TRAC:Y:PDIV 25mV DISP:WAV:VIEW2:WIND:TRAC:Y:PDIV?
<b>Notes</b>	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 580.

Key Path	AMPTD Y Scale
Remote Command	[ :SENSe] :POWer [:RF] :PCENTER
Example	POW:PCEN
Notes	Note that the rules outlined above under the key description apply for the remote command as well as the key. The result of the command is dependent on marker position, and so forth. Any message shown by the key press is also shown in response to the remote command.
Dependencies	<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	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.
Status Bits/OPC dependencies	When centering the preselector, *OPC will not return true until the process is complete and a subsequent measurement has completed, nor will results be returned to a READ or MEASure command. The Measuring bit should remain set while this command is operating and should not go false until the subsequent sweep/measurement has completed.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Proper Preselector Operation

A number of considerations should be observed to ensure proper operation:

1. If the selected marker is off, the analyzer will turn on a marker, perform a peak search, and adjust the preselector using the selected marker's frequency. It uses the "highest peak" peak search method unqualified by threshold or excursion, so that there is no chance of a 'no peak found' error. It continues with that peak, even if it is the peak of just noise. Therefore, for this operation to work properly, there should be a signal on screen in a preselected range for the peak search to find.
2. If the selected marker is already on, the analyzer will attempt the centering at that marker's frequency. There is no preselector for signals below about 3.6 GHz, therefore if the marker is on a signal below 3.6 GHz, no centering will be attempted and an advisory message generated
3. In some models, the preselector can be bypassed. If it is bypassed, no centering will be attempted in that range and a message will be generated.

## Preselector Adjust

Allows you to manually adjust the preselector filter frequency to optimize its response to the signal of interest. This function is only available when "[Presel Center](#)" on page 579 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	<code>[ :SENSe] :POWeR [ :RF] :PADJust &lt;freq&gt;</code> <code>[ :SENSe] :POWeR [ :RF] :PADJust?</code>

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<b>Example</b>	POW:PADJ 100KHz POW:PADJ?
<b>Notes</b>	
	The value on the key reads out to 0.1 MHz resolution.
<b>Dependencies</b>	<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>
<b>Preset</b>	0 MHz
<b>State Saved</b>	The Presel Adjust value set by Presel Center, or by manually adjusting Presel Adjust, is not saved in instrument state, and does not survive a Preset or power cycle.
<b>Min</b>	-500 MHz
<b>Max</b>	500 MHz
<b>Default Unit</b>	Hz
<b>Backwards Compatibility SCPI</b>	<p>[ :SENSe] :POWeR [ :RF ] :MW:PADJust [ :SENSe] :POWeR [ :RF ] :MMW:PADJust</p> <p>PSA had multiple preselectors, but the X-Series has only one. These commands simply alias to [:SENSe]:POWeR[:RF]:PADJust</p>
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.03.00

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<b>Remote Command</b>	[ :SENSe] :POWeR [ :RF ] :PADJust:PRESelector MWAVE   MMWave   EXTernal [ :SENSe] :POWeR [ :RF ] :PADJust:PRESelector?
<b>Notes</b>	<p>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.</p> <p>The command form has no effect, the query always returns MWAVE</p>
<b>Initial S/W Revision</b>	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  $\mu$ W 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  $\mu$ W Preselector Bypass path, if option MPB is present. This is because, when using a wideband IF such as the 140 MHz IF, the  $\mu$ W 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.

<b>Key Path</b>	AMPTD Y Scale
<b>Mode</b>	SA, BASIC, PNOISE, VSA , LTE, LTETDD
<b>Scope</b>	Meas Global
<b>Remote Command</b>	<pre>[ :SENSe] :POWeR [:RF] :MW:PATH STD   LNPPath   MPBypass   FULL [:SENSe] :POWeR [:RF] :MW:PATH?</pre>
<b>Example</b>	:POW:MW:PATH LNP Enables the Low Noise path
<b>Notes</b>	<p>If a Presel Center is performed, the analyzer will momentarily switch to the Standard Path, regardless of the setting of <math>\mu</math>W Path Control</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 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.</p> <p>Alignment switching ignores the settings in this menu, and restores them when finished.</p>
<b>Dependencies</b>	Unavailable in BBIQ and External Mixing
<b>Preset</b>	<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>
<b>State Saved</b>	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, $\mu$ W Path Control
<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 unpreselected input mixer path for certain X-Series signal analyzers with frequency ranges above 3.6 GHz. This signal path allows a wider bandwidth and less amplitude variability, which is an advantage when doing modulation analysis and broadband signal analysis. The disadvantage is that, without the preselector, image signals will be displayed. Another disadvantage of bypassing the preselector is increased LO emission levels at the front panel input port.

Key Path	AMPTD Y Scale, $\mu$ 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

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	MPB not present, error –241, "Hardware missing; Option not installed" is generated.
Readback Text	μW Preselector Bypass
Initial S/W Revision	A.04.00

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<b>Remote Command</b>	<code>[::SENSe]::POWeR[:RF]:MW:PRESelector[:STATE] ON OFF 0 1</code> <code>[::SENSe]::POWeR[:RF]:MW:PRESelector[:STATE]? </code>
<b>Example</b>	<code>:POW:MW:PRES OFF</code> 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 Preamplifier

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.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

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<b>Key Path</b>	AMPTD Y Scale, Internal Preamp
<b>Scope</b>	Meas Global
<b>Remote Command</b>	<code>[ :SENSe] :POWeR [:RF] :GAIN:BAND LOW FULL</code> <code>[ :SENSe] :POWeR [:RF] :GAIN:BAND?</code>
<b>Dependencies</b>	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.
<b>Preset</b>	LOW
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	Prior to A.02.00

## Off

Turns the internal preamp off

<b>Key Path</b>	AMPTD Y Scale, Internal Preamp
<b>Example</b>	<code>:POW:GAIN OFF</code>
<b>Readback</b>	Off
<b>Initial S/W Revision</b>	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.

<b>Key Path</b>	AMPTD Y Scale, Internal Preamp
<b>Example</b>	<code>:POW:GAIN ON</code> <code>:POW:GAIN:BAND LOW</code>
<b>Readback</b>	Low Band
<b>Initial S/W Revision</b>	Prior to A.02.00

## Full Range

Sets the internal preamp to use its full range. The low band (0–3.6 GHz or 0–3GHz, depending on the model) is supplied by the low band preamp and the frequencies above low band are supplied by the high band preamp.

The frequency range of the installed (optional) preamp is displayed in square brackets on the Full Range key label. If the high band option is not installed the Full Range key does not appear.

Key Path	AMPTD Y Scale, Internal Preamp
Example	:POW:GAIN ON :POW:GAIN:BAND FULL
Readback	Full Range
Initial S/W Revision	Prior to A.02.00

## 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.

This functionality depends on the selected view:

- "Ref Position (RF Envelope View)" on page 586
- "Ref Position (I/Q Waveform View)" on page 587

### 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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	:DISPlay:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION TOP   CENTER   BOTTOM :DISPlay:WAVEform:VIEW[1]:WINDOW[1]:TRACe:Y[:SCALE]:RPOSITION?
Example	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

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Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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## 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.

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Key Path	AMPTD Y Scale
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	:DISPlay:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALe]:RPOSITION TOP   CENTER   BOTTom :DISPlay:WAVEform:VIEW2:WINDOW[1]:TRACe:Y[:SCALe]:RPOSITION?
Example	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
Modified at S/W Revision	A.03.00

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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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	: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?
Example	DISP:WAV:VIEW:WIND:TRAC:Y:COUP OFF

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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

## 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 589

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 Auto Couple key). :COUPLE NONE puts all Auto/Man parameters in manual mode. It decouples all the coupled instrument parameters and is not recommended for making measurements.
Initial S/W Revision	Prior to A.02.00

## More Information

There are two types of functions that have Auto/Manual modes.

### Auto/Man Active Function keys

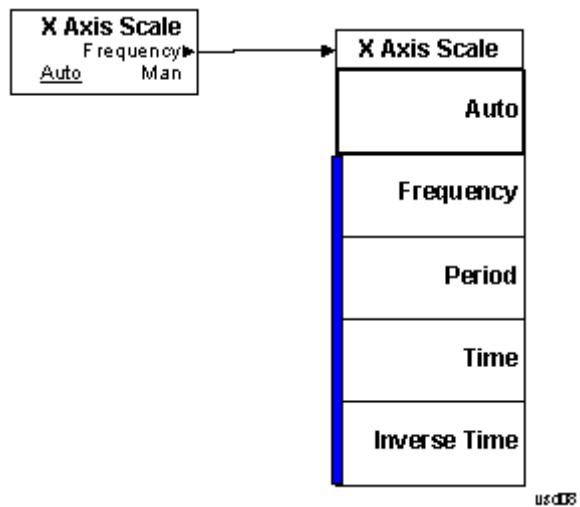
An Auto/Man toggle key controls the binary state associated with an instrument parameter by toggling between Auto (where the parameter is automatically coupled to the other parameters it is dependent upon) and Man (where the parameter is controlled independent of the other parameters), as well as making the parameter the active function. The current mode is indicated on the softkey with either Auto or Man underlined as illustrated below.



### Auto/Man 1-of-N keys

An Auto/Man 1-of-N key allows you to manually pick from a list of parameter values, or place the function in Auto, in which case the value is automatically selected (and indicated) as shown below. If in Auto, Auto is underlined on the calling key. If in manual operation, manual is indicated on the calling key. But the calling key does not actually toggle the function, it simply opens the menu.

## 9 Waveform Measurement Auto Couple



## 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	BW
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TD-SCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
Remote Command	<code>[ :SENSe]:WAveform:DIF:BANDwidth &lt;freq&gt;</code> <code>[ :SENSe]:WAveform:DIF:BANDwidth?</code>
Example	WAveform:DIF:BAND 1kHz WAveform: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

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Digital Cable TV: 8 MHz	
WLAN: Hardware Dependent	
No option = 10 MHz	
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	
Option B1X:	
if Radio Std is 802.11ac(80MHz) = 80 MHz	
Option B1Y:	
if Radio Std is 802.11ac(160MHz) = 160 MHz	
State Saved	Saved in instrument state.
Min	10 Hz
Max	<p>Hardware Dependent:</p> <p>RF Input:</p> <p>    No Option = 10 MHz</p> <p>    Option B25 = 25 MHz</p> <p>    Option B40 = 40 MHz</p> <p>    Option B85 = 85.0 MHz</p> <p>    Option B1A = 125.0 MHz</p> <p>    Option B1X = 140 MHz</p> <p>    Option B1Y = 160 MHz</p> <p>I/Q Input:</p> <p>    No Option = 10 MHz per channel (20 MHz for I+jQ)</p> <p>    Option B25 = 25 MHz per channel (50 MHz for I+jQ)</p> <p>    Option S40 = 40 MHz per channel (80 MHz for I+jQ)</p>
<b>Backwards Compatibility SCPI</b>	<pre>[::SENSe]:WAVEform:BANDwidth[:RESolution] [::SENSe]:WAVEform:BWIDth[:RESolution]</pre>
Initial S/W Revision	Prior to A.02.00
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>	BW
<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	<pre>[ :SENSe]:WAVEform:DIF:FILTer: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>
<b>Remote Command Notes</b>	You must be in a mode that includes the Waveform measurements to use this command. Use INSTRument:SELect to set the mode.
<b>Dependencies</b>	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.
<b>Preset</b>	BASIC with DP2, B40, or wider IF Bandwidth option: FLATtop All other apps: GAUSSian
<b>State Saved</b>	Saved in instrument state.
<b>Range</b>	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>
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.03.00, A.13.00

## Filter BW

This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.

<b>Key Path</b>	BW
<b>Mode</b>	BASIC
<b>Remote Command</b>	<pre>[ :SENSe]:WAVEform:DIF:FILTter:BANDwidth &lt;freq&gt; [ :SENSe]:WAVEform:DIF:FILTter:BANDwidth?</pre>

---

	<pre>[::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

---

## 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	BW
Mode	BASIC
<b>Remote Command</b>	<pre>[::SENSe] :WAVeform:DIF:FILTer:ALPHA &lt;real&gt; [::SENSe] :WAVeform:DIF:FILTer:ALPHA?</pre>
<b>Example</b>	<pre>WAV:DIF:FILT:ALPH 0.5 WAV:DIF:FILT:ALPH?</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.
Preset	0.2
State Saved	Saved in instrument state.
Min	0.01
Max	1.00

---

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**Backwards Compatibility SCPI** [:SENSe]:WAVEform:WBIF:FILTter:ALPHA

---

Modified at S/W A.13.00  
Revision

---

## Filter Type Bwcc

This parameter is strictly for Bwcc purposes.

---

**Remote Command** [:SENSe]:WAVEform:WBIF:FILTter[:TYPE] GAUSSian | NONE | NYQuist |

RNYQuist | RCOSine | RRCosine

[:SENSe]:WAVEform:WBIF:FILTter[:TYPE]?

---

**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 kHz	49.8 kHz	69.6 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 MHz	3.18 MHz	4.22 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 table in the section "[Flattop Filters](#)" on page 600 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		

## Channel Filter Bandwidth Bwcc (Remote Command Only)

This is the backward compatibility command for Channel Filter Bandwidth.

Mode	BASIC
Remote Command	[ :SENSe]:WAVEform:WBIF:FILTer:BANDwidth <real> [ :SENSe]:WAVEform:WBIF:FILTer:BANDwidth?
Example	WAV:WBIF:FILT:BAND 0.3 WAV:WBIF:FILT:BAND?
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

## 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 Cont hardkey, instead there is a Sweep Single/Cont key. In these analyzers, switching the Sweep Single/Cont key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart Max Hold and Min Hold. The X-Series has Single and Cont keys in place of the SweepSingleCont key. In the X-Series, if in single measurement, the Cont key (and INIT:CONT ON ) switches to continuous measurement, but never restarts a measurement and never resets a sweep.
Initial S/W Revision	Prior to A.02.00

In Swept SA Measurement (Spectrum Analysis Mode):

The analyzer takes repetitive sweeps, averages, measurements, etc., when in Continuous mode. When the average count reaches the Average/Hold Number the count stops incrementing, but the analyzer keeps sweeping. See the Trace/Detector section for the averaging formula used both before and after the Average/Hold Number is reached. The trigger condition must be met prior to each sweep. The type of trace processing for multiple sweeps, is set under the Trace/Detector key, with choices of Trace Average, Max Hold, or Min Hold.

In Other Measurements/Modes:

With Avg/Hold Num (in the Meas Setup menu) set to Off or set to On with a value of 1, a sweep is taken after the trigger condition is met; and the analyzer continues to take new sweeps after the current sweep has completed and the trigger condition is again met. However, with Avg/Hold Num set to On with a value >1, multiple sweeps (data acquisitions) are taken for the measurement. The trigger condition must be met prior to each sweep. The sweep is not stopped when the average count k equals the number N set for Avg/Hold Num is reached, but the number k stops incrementing. A measurement average usually applies to all traces, marker results, and numeric results. But sometimes it only applies to the numeric results.

If the analyzer is in Single measurement, pressing the Cont key does not change k and does not cause the sweep to be reset; the only action is to put the analyzer into Continuous measurement operation.

If it is already in continuous sweep:

the INIT:CONT 1 command has no effect

## 9 Waveform Measurement

### Cont (Continuous Measurement/Sweep)

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 250

## Frequency/Channel

Opens a menu that enables you to control the Center Frequency of the instrument.

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

### Center Freq

Sets the frequency that corresponds to the horizontal center of the graticule (when frequency Scale Type is set to linear). While adjusting the Center Frequency the Span is held constant, which means that both Start Frequency and Stop Frequency will change.

Pressing Center Freq also sets the frequency entry mode to Center/Span. In Center/Span mode, the center frequency and span values are displayed below the graticule, and the default active function in the Frequency menu is Center Freq.

The center frequency setting is the same for all measurements within a mode, that is, it is Meas Global. Some modes are also able to share a Mode Global center frequency value. If this is the case, the Mode will have a Global Settings key in its Mode Setup menu.

The Center Freq function sets (and queries) the Center Frequency for the currently selected input. If your analyzer has multiple inputs, and you select another input, the Center Freq changes to the value for that input. SCPI commands are available to directly set the Center Freq for a specific input.

Center Freq is remembered as you go from input to input. Thus you can set a Center Freq of 10 GHz with the RF Input selected, change to BBIQ and set a Center Freq of 20 MHz, then switch to External Mixing and set a Center Freq of 60 GHz, and when you go back to the RF Input the Center Freq will go back to 10 GHz; back to BBIQ and it is 20 MHz; back to External Mixing and it is 60 GHz.

See "RF Center Freq" on page 609

See Ext Mix Center Freq

See "I/Q Center Freq" on page 611

See "Center Frequency Presets" on page 607

Key Path	FREQ Channel
Scope	Meas Global
Remote Command	<code>[::SENSe]:FREQuency:CENTER &lt;freq&gt;</code> <code>[::SENSe]:FREQuency:CENTER?</code>
Example	FREQ:CENT 50 MHz FREQ:CENT UP changes the center frequency to 150 MHz if you use FREQ:CENT:STEP 100 MHz to set the center frequency step size to 100 MHz

FREQ:CENT?	
Notes	<p>This command sets either the RF or I/Q Center Frequency depending on the selected input.</p> <p>For RF input it is equivalent to FREQ:RF:CENT</p> <p>For I/Q input it is equivalent to FREQ:IQ:CENT</p> <p>Preset and Max values are dependent on Hardware Options (5xx)</p> <p>If no terminator (e.g. MHz) is sent the terminator Hz is used. If a terminator with unit other than Frequency is used, an invalid suffix error message is generated.</p>
Dependencies	The Center Frequency can be limited by Start or Stop Freq limits, if the Span is so large that Start or Stop reach their limit.
Couplings	When operating in “swept span”, any value of the Center Frequency or Span that is within the frequency range of the analyzer is allowed when the value is being set through the front panel numeric key pad or the SCPI command. The other parameter is forced to a different value if needed, to keep the Start and the Stop Frequencies within the analyzer’s frequency range
Preset	Depends on instrument maximum frequency, mode, measurement, and selected input. See "Center Frequency Presets" on page 607 and "RF Center Freq" on page 609 and <u>Ext Mix Center Freq</u> and " <u>I/Q Center Freq</u> " on page 611.
State Saved	Saved in instrument state
Min	Depends on instrument maximum frequency, mode, measurement, and selected input.. See "Center Frequency Presets" on page 607 and "RF Center Freq" on page 609 and " <u>I/Q Center Freq</u> " on page 611.
Max	Depends on instrument maximum frequency, mode, measurement, and selected input.. See "Center Frequency Presets" on page 607 and "RF Center Freq" on page 609 and " <u>I/Q Center Freq</u> " on page 611.
Default Unit	Hz
Status Bits/OPC Dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

## Center Frequency Presets

The following table provides the Center Frequency Presets for the Spectrum Analyzer mode, and the Max Freq, for the various frequency options:

Freq Option	CF after Mode Preset	Stop Freq after Mode Preset	Max Freq (can't tune above)

## 9 Waveform Measurement

### Frequency/Channel

503 (all but N9000A)	1.805 GHz	3.6 GHz	3.7 GHz
503 (N9000A)	1.505 GHz	3.0 GHz	3.08 GHz
507 (all but N9000A)	3.505 GHz	7.0 GHz	7.1 GHz
507 (N9000A)	3.755 GHz	7.5 GHz	7.58 GHz
508 (all but N9038A)	1.805 GHz	3.6 GHz	8.5 GHz
508 (N9038A)	4.205 GHz	8.4 GHz	8.5 GHz
513	6.805 GHz	13.6 GHz	13.8 GHz
526 (all but N9000A and N9038A)	13.255 GHz	26.5 GHz	27.0 GHz
526 (N9000A)	13.255 GHz	26.5 GHz	26.55 GHz
526 (N9038A)	1.805 GHz	3.6 GHz	27.0 GHz
532	16.005 GHz	32.0 GHz	32.5 GHz
543	21.505 GHz	43.0 GHz	TBD
544	22.005 GHz	44.0 GHz	44.5 GHz
550	25.005 GHz	50.0 GHz	51 GHz

Input 2:

Model	CF after Mode Preset	Stop Freq after Mode Preset	Max Freq (can't tune above)
N9000A opt C75	0.7505GHz	1.5 GHz	1.58 GHz
N9038A	505 MHz	1 GHz	1.000025 GHz

Tracking Generator Frequency Limits (N9000A only):

Tracking	Min Freq (clips	If above this	Max Freq

Generator Option	to this freq when turn TG on and can't tune below while TG on)	Freq, Stop Freq clipped to this Freq when TG turned on	(can't tune above) while TG on
T03	9 kHz	3.0 GHz	3.08 GHz
T06	9 kHz	6.0 GHz	6.05 GHz

The following table shows the Center Frequency Presets for modes other than Spectrum Analyzer:

Mode	CF Preset for RF
WCDMA	1 GHz
WIMAXOFDMA,	1 GHz
BASIC	1 GHz
ADEMOM	1 GHz
VSA	1 GHz
TDSCDMA	1 GHz
PNOISE	1 GHz
LTE	1 GHz
LTETDD	1 GHz
MSR	1 GHz
GSM	935.2 MHz
NFIGURE	1.505 GHz

## RF Center Freq

SCPI command for specifying the RF Center Frequency. This command will set the Center Frequency to be used when the RF input is selected, even if the RF input is not the input that is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe] :FREQuency:RF:CENTER &lt;freq&gt;</code> <code>[ :SENSe] :FREQuency:RF:CENTER?</code>
<b>Example</b>	<code>FREQ:RF:CENT 30 MHz</code>
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Dependencies	If the electronic/soft attenuator is enabled, any attempt to set Center Frequency such

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that the Stop Frequency would be >3.6 GHz fails and results in an advisory message. If the equivalent SCPI command is sent, this same message is generated as part of a “–221, Settings conflict” warning.

If Source Mode is set to Tracking, and the Max or Min Center Freq is therefore limited by the limits of the source, a warning message is generated, “Data out of range;clipped to source max/min” if these limits are exceeded. Note that for an external source, these limits can be affected by the settings of Source Numerator, Source Denominator and Power Sweep.

Preset	See table above
State Saved	Saved in instrument state.
Min	–79.999995 MHz, unless Source Mode is set to Tracking, in which case it is limited by the minimum frequency of the Source
Max	See table above. Basically instrument maximum frequency – 5 Hz. Note that, if the Source Mode is set to Tracking, the effective instrument maximum frequency may be limited by the source maximum frequency. If the knob or step keys are being used, also depends on the value of the other three interdependent parameters Span, Start Frequency and Stop Frequency
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Ext Mix Center Freq

SCPI command for specifying the External Mixer Center Frequency. This command will set the Center Frequency to be used when the External Mixer is selected, even if the External Mixer input is not the input which is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

Scope	Meas Global
<b>Remote Command</b>	[ :SENSe] :FREQuency:EMIXer:CENTER <freq> [ :SENSe] :FREQuency:EMIXer:CENTER?
<b>Example</b>	:FREQ:EMIX:CENT 60 GHz :FREQ:EMIX:CENT?
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Couplings	When returning to External Mixing after having been switched to one of the other inputs (e.g., RF), you will come back into the settings that you had when you left External Mixing. So you will come back to the band you were in with the Center Frequency that you had. However, Span is not an input-dependent parameter, therefore you will bring the span over from the other input. Therefore, the analyzer comes back with the span from the previous input, limited as necessary by the current mixer setup.

---

Preset	<p>When a Mode Preset is performed while in External Mixing, the Start frequency of the current Mode is set to the nominal Min Freq of the lowest harmonic range in the Harmonic Table for the current mixer setup. Similarly, the Stop frequency of the current Mode is set to the nominal Max Freq of the highest harmonic range in the Harmonic Table. The Center Freq thus presets to the point arithmetically equidistant from these two frequencies.</p> <p>If the current measurement has a limited Span available to it, and cannot achieve the Span shown in the table (Span=Stop Freq – Start Freq), the analyzer uses the maximum Span the measurement allows, and still sets the Center Freq to the midpoint of the Start and Stop Freq values in the Harmonic Table.</p> <p>When Restore Input/Output Defaults is performed, the mixer presets to the 11970A, whose Start and Stop frequencies are 26.5 and 40 GHz respectively. The center of these two frequencies is 33.25 GHz.</p> <p>Therefore, after a Restore Input/Output Defaults, if you go into External Mixing and do a Mode Preset while in the Spectrum Analyzer Mode, the resulting Center Freq is 33.25 GHz.</p>
State Saved	Saved in instrument state.
Min	The minimum frequency in the currently selected mixer band + 5 Hz
Max	<p>The maximum frequency in the currently selected mixer band – 5 Hz</p> <p>If the knob or step keys are being used, also depends on the value of the other three interdependent parameters Span, Start Frequency and Stop Frequency</p>
Initial S/W Revision	A.08.01

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## I/Q Center Freq

SCPI command for specifying the I/Q Center Frequency. This command will set the Center Frequency to be used when the I/Q input is selected, even if the I/Q input is not the input which is selected at the time the command is sent. Note that the Center Freq function in the Frequency menu on the front panel always applies to the currently selected input.

---

Scope	Meas Global
<b>Remote Command</b>	<pre>[ :SENSe] :FREQuency:IQ:CENTER &lt;freq&gt; [ :SENSe] :FREQuency:IQ:CENTER?</pre>
<b>Example</b>	FREQ:IQ:CENT: 30 MHz
Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Preset	0 Hz
State Saved	Saved in instrument state.
Min	-40.049995 MHz
Max	40.049995 MHz
Initial S/W Revision	Prior to A.02.00

---

## 9 Waveform Measurement Frequency/Channel

## Input/Output

See "Input/Output" on page 118

## 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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	:CALCulate:WAVEform:MARKer[1]   2   ... 12:MODE POSITION   DELTA   OFF :CALCulate:WAVEform:MARKer[1]   2   ... 12:MODE?
Example	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 Marker Trace rules. At the same time, Marker X Axis Value 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

---

## 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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	:CALCulate:WAVEform:MARKer[1] 2 ...12:REference <integer> :CALCulate:WAVEform:MARKer[1] 2 ...12:REference?
Example	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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	:CALCulate:WAVEform:MARKer[1] 2 ...12:TRACe RFENvelope   I   Q   IQ :CALCulate:WAVEform:MARKer[1] 2 ...12:TRACe?
Example	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

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## 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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<b>Remote Command</b>	:CALCulate:WAVEform:MARKer:COUPLE[:STATE] ON OFF 1 0 :CALCulate:WAVEform:MARKer:COUPLE[: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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<b>Remote Command</b>	:CALCulate:WAVEform:MARKer:AOFF
<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

## 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.

<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<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?
<b>Notes</b>	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 Normal, or the offset from the marker's reference marker if the control mode is Delta. The query is returned in the fundamental units for the current marker X Axis scale: Hz for Frequency and Inverse Time, seconds for Period and Time. If the marker is Off the response is not a number.  You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
<b>Preset</b>	0
<b>Preset</b>	After a preset, all markers are turned OFF, so Marker X Axis Value query returns a not a number (NAN).
<b>State Saved</b>	No
<b>Min</b>	(9.9E+37
<b>Max</b>	9.9E+37
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	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.

<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<b>Remote Command</b>	:CALCulate:WAVEform:MARKer[1]  2 ...12:X:POSITION <real> :CALCulate:WAVEform:MARKer[1]  2 ...12:X:POSITION?
<b>Example</b>	CALC:WAV:MARK:X:POS 500 CALC:WAV:MARK:X:POS?
<b>Notes</b>	The query returns the marker's absolute X Axis value in trace points if the control mode

---

is Normal or the offset from the marker's reference marker in trace points if the control mode is Delta. The value is returned as a real number, not an integer, corresponding to the translation from X Axis Scale units to trace points.

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

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## Marker Y Axis Value (Remote Command Only)

Queries the marker Y Axis value in the current marker Y Axis unit.

Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<b>Remote Command</b>	:CALCulate:WAVEform:MARKer[1]   2   ... 12:Y?
<b>Example</b>	CALC:WAV:MARK1:Y?
Notes	<p>When the marker is on, IQ waveform returns I and Q values.</p> <p>Case #1 - Trace RF, I or Q: returns a single double value.</p> <pre>&gt;:CALC:WAV:MARK1:Y? -2.402406506109E+001</pre> <p>Case #2 - Trace IQ: returns a double array of two values, the first is I, and the second is Q.</p> <pre>&gt;:CALC:WAV:MARK1:Y? -3.006944493834E-003,+9.9870666467354E-004</pre> <p>The IQ selection is for backward compatibility purposes. It is recommended that the users use the I and/or Q selection instead.</p> <p>You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.</p>
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?

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Initial S/W Revision Prior to A.02.00

Modified at S/W Revision A.03.00

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## 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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA,  
CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN

**Remote Command** :CALCulate:WAVeform:MARKer[1] |2|...12:STATe OFF|ON|0|1  
:CALCulate:WAVeform:MARKer[1] |2|...12:STATe?

**Example** 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

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## 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
- BandInterval 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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
Remote Command	:CALCulate:WAVEform:MARKer[1] 2 ...12:FUNCTION BPOwer   BDENsity   OFF :CALCulate:WAVEform:MARKer[1] 2 ...12:FUNCTION?
Example	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	Marker Function
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	Marker Function
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<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	Prior to A.02.00
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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN
<b>Remote Command</b>	:CALCulate:WAVEform:MARKer[1]   2   ... 12:FUNCTION:BAND:LEFT <time> :CALCulate:WAVEform:MARKer[1]   2   ... 12:FUNCTION:BAND:LEFT?
<b>Example</b>	CALC:WAV:MARK12:FUNC:BAND:LEFT 1 s CALC:WAV:MARK12:FUNC:BAND:LEFT?
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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN

<b>Remote Command</b>	:CALCulate:WAVEform:MARKer[1]  2 ...12:FUNCTION:BAND:RIGHT <time> :CALCulate:WAVEform:MARKer[1]  2 ...12:FUNCTION:BAND:RIGHT?
<b>Example</b>	CALC:WAV:MARK12:FUNC:BAND:RIGH 1 s CALC:WAV:MARK12:FUNC:BAND:RIGH?
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

## 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 627](#)

["Current Measurement Query \(Remote Command Only\)" on page 629](#)

["Limit Test Current Results \(Remote Command Only\)" on page 629](#)

["Data Query \(Remote Command Only\)" on page 630](#)

["Calculate/Compress Trace Data Query \(Remote Command Only\)" on page 630](#)

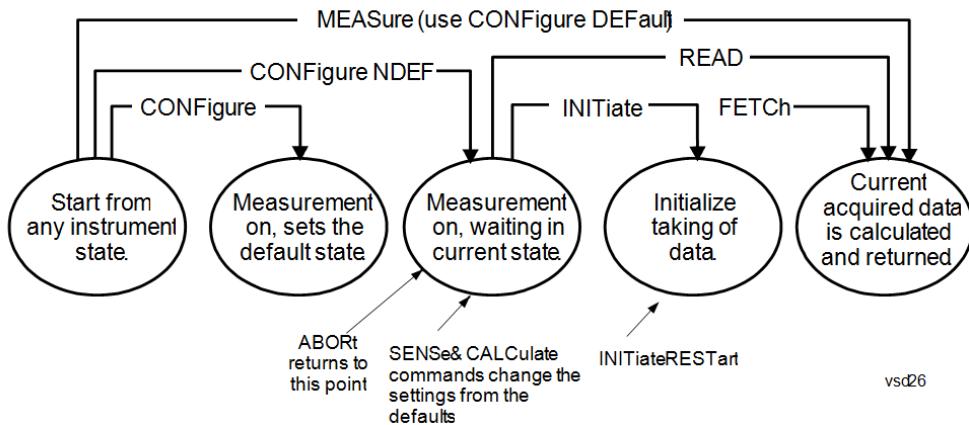
["Calculate Peaks of Trace Data \(Remote Command Only\)" on page 635](#)

["Format Data: Numeric Data \(Remote Command Only\)" on page 636](#)

["Format Data: Byte Order \(Remote Command Only\)" on page 638](#)

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 CONFfigure 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 CONFfigure 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 CONFfigure? query returns the current measurement name.

The CONFfigure: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:

: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)
- 

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Initial S/W Revision      Prior to A.02.00

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### Current Measurement Query (Remote Command Only)

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

---

**Remote Command**      :CONFigure?

**Example**      CONF?

---

Initial S/W Revision      Prior to A.02.00

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### 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   SAMPlle   SDEViation   PPHase [,<soffset>[,<length>[,<roffset>[,<rlimit>]]]]
<b>Example</b>	To query the mean power of a set of GSM bursts: Supply a signal that is a set of GSM bursts.

---

Select the IQ Waveform measurement (in IQ Analyzer Mode).  
 Set the sweep time to acquire at least one burst.  
 Set the triggers such that acquisition happens at a known position relative to a burst.  
 Then query the mean burst levels using, CALC:DATA2:COMP? MEAN, 24e-6, 526e-6  
 (These parameter values correspond to GSM signals, where 526e-6 is the length of the burst in the slot and you just want 1 burst.)

Notes	The command supports 5 parameters. Note that the last 4 (<soffset>,<length>,<roffset>,<rlimit>) are optional. But these optional parameters must be entered in the specified order. For example, if you want to specify <length>, then you must also specify <soffset>. See details below for a definition of each of these parameters.  This command uses the data in the format specified by FORMat:DATA, returning either binary or ASCII data.
Initial S/W Revision	Prior to A.02.00

- 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)

$$\text{DME} = 10 \times \log_{10} \left( \frac{1}{n} \sum_{X_i \in \text{region}(s)} 10^{\frac{X_i}{10}} \right)$$

- 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)

$$\text{RMS} = \sqrt[n]{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i^2}$$

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)

$$\text{RMS} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i X_i^*}$$

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)

$$\text{SDEV} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} (X_i - \bar{X})^2}$$

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:

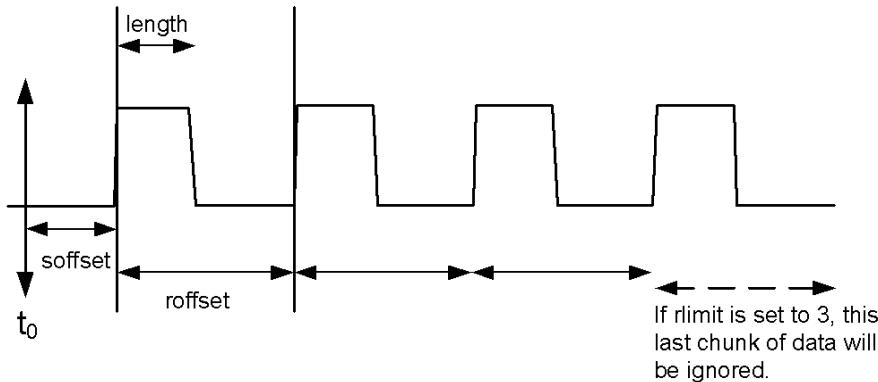
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

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.

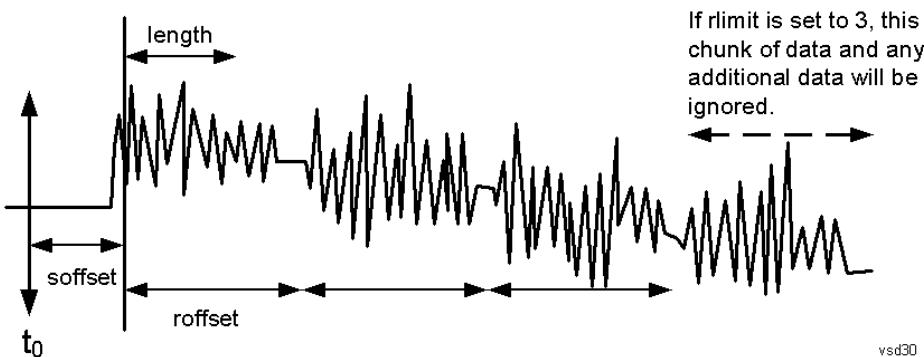
#### Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



#### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



vsd30

<offset> - 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]
```

---

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

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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>	:FORMat:BORDer NORMAl   SWAPped :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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
Remote Command	<pre>[ :SENSe]:WAVEform:AVERage:COUNt &lt;integer&gt; [ :SENSe]:WAVEform:AVERage:COUNt? [ :SENSe]:WAVEform:AVERage[:STATe] OFF ON 0 1 [ :SENSe]:WAVEform:AVERage[:STATe]?</pre>
Example	<pre>WAV:AVER:COUN 1001 WAV:AVER:COUN? WAV:AVER ON WAV:AVER?</pre>
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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	[::SENSe]:WAVEform:AVERage:TYPE LOG   MAXimum   MINimum   RMS   SCALar [::SENSe]:WAVEform:AVERage:TYPE?
<b>Example</b>	WAV:AVER:TYPE MAX 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

## Time Avg Num

Sets the number of HW averages to be executed per each data acquisition.

Key Path	Meas Setup
Mode	BASIC
<b>Remote Command</b>	[ :SENSe]:WAVEform:AVERage:TACount <integer> [ :SENSe]:WAVEform:AVERage:TACount?
<b>Example</b>	WAV:AVER:TAC 10WAV:AVER:TAC?
Notes	This feature is only available when Option DP2, B40, or wider IF Bandwidth option is installed.
Preset	1
State Saved	Saved in instrument state
Min	1
Max	65535
Default Unit	Enter

## Meas Time

Sets how long the measurement is performed. X Scale only changes the representation of the display.

Key Path	Meas Setup
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	[ :SENSe]:WAVEform:SWEep:TIME <time> [ :SENSe]:WAVEform:SWEep:TIME?
<b>Example</b>	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.

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	Use INSTRument:SElect to set the mode.
Preset	2.000000 ms
State Saved	Saved in instrument state.
Range	1.000 (s to 100.00 s)
Min	1.000 us
Max	100.0 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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## Sample Rate

Enables you to set an arbitrary sample rate for the acquired data to be processed.

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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	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> <li>• Option B1A 125 MHz path: 156.25 MHz</li> <li>• Option B1X 140 MHz path: 175 MHz</li> <li>• Option B1Y 160 MHz path: 200 MHz</li> <li>• (For all other configuration)</li> <li>• 10 MHz path: 15 MHz</li> <li>• Option B25 25 MHz path: 45 MHz</li> </ul>
Modified at S/W Revision	13.00

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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 Revision	A.07.00

## Auto

Selects the LO (local oscillator) phase noise behavior to optimize dynamic range and speed for various instrument operating conditions.

The X-Series has 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:

	<b>Best Close in Phase Noise</b>	<b>Best Wide-offset Phase Noise</b>
Filter BW	$\leq 400$ kHz	$> 400$ kHz

In models with the medium-performance LO, Auto will choose:

	<b>Best Close in Phase Noise</b>	<b>Best Wide-offset Phase Noise</b>
Filter BW	$\leq 150$ kHz	$>150$ kHz

Note that Fast Tuning will not be selected when in Auto.

<b>Key Path</b>	Meas Setup, PhNoise Opt
<b>Remote Command</b>	<code>[::SENSe] :WAVEform:FREQuency:SYNthesis:AUTO[:STATe]</code> OFF   ON   0   1 <code>[::SENSe] :WAVEform:FREQuency:SYNthesis:AUTO[:STATe]?</code>
<b>Example</b>	<code>WAV:FREQ:SYNT:AUTO ON</code>
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.

<b>Key Path</b>	Meas Setup, PhNoise Opt
<b>Example</b>	<code>WAV:FREQ:SYNT 1</code>
Couplings	The frequency below which the phase noise is optimized is model dependent: <ul style="list-style-type: none"> <li>• <b>CXA</b>: n/a</li> <li>• <b>EXA</b>: [offset <math>\leq 150</math> kHz]</li> <li>• <b>MXA</b>: [offset <math>\leq 150</math> kHz]</li> <li>• <b>PXA</b>: [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

**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	Meas Setup, PhNoise Opt
<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

**Advanced**

Accesses a menu of advanced functions that are used for specific applications. These settings should not be changed for most measurements.

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

**ADC Dither**

Accesses the ADC Dither control menu.

Key Path	Meas Setup, Advanced
Initial S/W Revision	Prior to A.02.00

**ADC Dither Auto**

Sets ADC dithering to automatically select whether dithering is needed.

<b>Key Path</b>	Meas Setup, Advanced, ADC Dither
<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	<code>[::SENSe] :WAVeform:ADC:DITHer:AUTo[:STATe] OFF ON 0 1</code> <code>[::SENSe] :WAVeform:ADC:DITHer:AUTo[:STATe]?</code>
<b>Example</b>	WAV:ADC:DITH:AUTo ON WAV:ADC:DITH:AUTo?
<b>Notes</b>	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.
<b>Preset</b>	OFF
<b>State Saved</b>	Saved in instrument state.
<b>Range</b>	On Off
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	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.

<b>Key Path</b>	Meas Setup, Advanced, ADC Dither
<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	<code>[::SENSe] :WAVeform:ADC:DITHer[:STATe] OFF ON 0 1</code> <code>[::SENSe] :WAVeform:ADC:DITHer[:STATe]?</code>
<b>Example</b>	WAV:ADC:DITH ON WAV:ADC:DITH?
<b>Notes</b>	The dither function improves linearity for low level signals, at the expense of a higher noise floor..

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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 Compatibility SCPI</b>	[ :SENSe] :WAVEform:WBIF:ADC:DITHer [ :SENSe] :WAVEform:PDITHer
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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## 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

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## IF Gain Auto

Activates the auto rules for IF Gain

Key Path	Meas Setup, Advanced, IF Gain
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	[ :SENSe] :WAVEform:IF:GAIN:AUTO[:STATe] ON OFF 1 0

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	<code>[ :SENSe] :WAVeform:IF:GAIN:AUTO [:STATe] ?</code>
<b>Example</b>	<code>WAV:IF:GAIN:AUTO ON</code> <code>WAV:IF:GAIN:AUTO?</code>
<b>Notes</b>	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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	<code>[ :SENSe] :WAVeform:IF:GAIN [:STATe] AUTOrange   LOW   HIGH</code> <code>[ :SENSe] :WAVeform:IF:GAIN [:STATe] ?</code>
<b>Example</b>	<code>WAV:IF:GAIN HIGH</code> <code>WAV:IF:GAIN?</code>
<b>Notes</b>	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

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Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

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## 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:

$$\text{IF Gain Low} + \text{IF Gain Offset} + 4 \text{ dB} = \text{Total IF Gain of } +4 \text{ dB } (0 + 4 = 4)$$

$$\text{IF Gain High} + \text{IF Gain Offset} + 4 \text{ dB} = \text{Total IF Gain of } +14 \text{ dB } (10 + 4 = 14)$$

$$\text{IF Gain Low} + \text{IF Gain Offset} - 6 \text{ dB} = \text{Total IF Gain of } -6 \text{ dB } (0 - 6 = -6)$$

$$\text{IF Gain High} + \text{IF Gain Offset} - 6 \text{ dB} = \text{Total IF Gain of } +6 \text{ dB } (10 - 6 = 4)$$

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.

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Key Path	Meas Setup, Advanced
<b>Remote Command</b>	<code>[ :SENSe]:WAVEform:IF:GAIN:OFFSet &lt;rel_ampl &gt;</code> <code>[ :SENSe]:WAVEform:IF:GAIN:OFFSet?</code>
<b>Example</b>	<code>WAV:IF:GAIN:OFFS 2</code> Sets the IF Gain offset to 2
Preset	0
State Saved	Saved in instrument state.
Min	–6
Max	+6
Default Unit	dB

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## Meas Preset

Restores all the measurement parameters to their default values.

Key Path	Meas Setup
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	:CONFigure:WAVEform
<b>Example</b>	CONF:WAV
Notes	<p>Restore default values of all parameters.</p> <p>You must be in a mode that includes the Waveform measurement to use this command.</p> <p>Use INSTRument:SElect to set the mode.</p>
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 spectrum 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 and its result is seen as the blue trace in this and other applications.

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.

Since it is time averaging, a trigger source something other than Free Run should be used to avoid cancelling out the signal to be measured. It is most useful for a periodic signal with known periods.

## Sample Period (Aperture) Setting (Remote Command Only)

Returns the time between samples (sample period or aperture).

Mode	BASIC
<b>Remote Command</b>	[:SENSe] :WAVEform:APERture?
<b>Example</b>	WAV:APER?
Notes	Query only.
Couplings	<p>Coupled to Sample Rate by the following equation.</p> <p>Sample Period = 1/(Sample Rate)</p>

Preset	1/(Sample Rate Default)
Min	1/(Max Sample Rate)
Max	1/(Min Sample Rate)

## Mode

See "Mode" on page 212

## 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 [654](#) for more information.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:SYST:PRESet
<b>Example</b>	:SYST:PRES
<b>Notes</b>	<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>
<b>Couplings</b>	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.
<b>Backwards Compatibility Notes</b>	<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 in to preset the entire instrument is by using System, Restore System Defaults All, which behaves essentially the same way as restore System Defaults does on ESA and PSA.</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 Mode Preset and a white-with-green-letters User Preset front-panel key that does a User Preset. The old PRESet:TYPE command is ignored (without generating an error), and SYST:PRES without a parameter does a Mode Preset, which should cover most backward code compatibility issues.</p> <p>The settings and correction data under the Input/Output front-panel key (examples: Input</p>

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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
Restore All System	:SYSTem:DEFault [ALL]	System Menu; Restore

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Defaults	:SYSTem:PRESet:PERSistent	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 244

## 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.

<b>Key Path</b>	Front-panel key
<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	:CALCulate:WAVEform:MARKer[1]  2 ...12:MAXimum
<b>Example</b>	CALC:WAV:MARK2:MAX
<b>Notes</b>	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	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.

<b>Key Path</b>	Peak Search
<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	:CALCulate:WAVEform:MARKer[1]  2 ...12:MAXimum:NEXT
<b>Example</b>	CALC:WAV:MARK:MAX:NEXT
<b>Notes</b>	You must be in a mode that includes the Waveform measurement to use this command. Use INSTRument:SElect to set the mode.
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.03.00

## Min Search

Moves the selected marker to the minimum y-axis value on the current trace.

<b>Key Path</b>	Peak Search
<b>Mode</b>	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA,

	CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	:CALCulate:WAVeform:MARKer[1]  2 ...12:MINimum
<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.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Print

See "Print" on page 256

## 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.

**NOTE** If the filename you entered ends with \_dddd, where d=any number, making it look just like an auto file name, then the next auto file name picks up where you left off with the suffix being dddd + 1.

Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00

## Recall

The Recall menu lets you choose what you want to recall, and where you want to recall it from. Among the types of files you can recall are **States andTraces**. In addition, an Import (Data) option lets you recall a number of data types stored in CSV files (as used by Excel and other spreadsheet programs).

The default paths for Recall are data type dependent and are the same as for the Save key.

Key Path	Front-panel key
Notes	No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe <filename>. If you try to recall a State file for a mode that is not licensed or not available in the instrument, an error message will occur and the state will not change.
Backwards Compatibility Notes	In legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly (since User Preset is actually loading a state), it was possible to do a User Preset without affecting the trace data, limit lines or correction data.  In the X-Series, “state” always includes all of this data; so whenever state is loaded, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.
Backwards Compatibility Notes	Recall for the X-Series supports backward compatibility in the sense that you can recall a state file from any X-Series model number and any version of X-Series software. If you try to recall a state file onto an instrument with less capability than what was available on the instrument during the save, the recall will ignore the state it doesn't support and it will limit the recalled setting to what it allows.  Example: if the saved state includes preamp ON, but the recalling instrument does not have a preamp; the preamp is limited to OFF. Conversely, if you save a state without a preamp, the preamp is OFF in the state file. When this saved file is recalled on an instrument with a licensed preamp, the preamp is changed to OFF. Another example is if the saved state has center frequency set to 20 GHz, but the instrument recalling the saved state is a different model and only supports 13.5 GHz. In this case, the center frequency is limited along with any other frequency based settings. Since the center frequency can't be preserved in this case, the recall limiting tries to at least preserve span to keep the measurement setup as intact as possible.  Note that there is no state file compatibility outside of the X-Series. For example, you cannot recall a state file from ESA or PSA.
Initial S/W Revision	Prior to A.02.00

## State

The Recall State menu lets you choose a register or file from which to recall the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings that were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings

affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either a Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

Since each state file is only for one Mode, the settings for other Modes are unaffected when it is loaded. Recall State will cause a mode switch if the state being recalled is not from the current active mode.

After the recall completes, the message "File <filename> recalled" or "Recalled State Register <register number>" is displayed.

For rapid recalls, the State menu lists 16 registers that you can choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files is:

My Documents\<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

See "[More Information](#)" on page 664.

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> <p>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.</p> <p>After recalling the state, the Recall State function does the following:</p> <ul style="list-style-type: none"><li>• Makes the saved measurement for the mode the active measurement.</li><li>• Clears the input and output buffers.</li><li>• Status Byte is set to 0.</li></ul>

- 
- 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>	:MMEMory:LOAD:STATE 1,<filename>
	For backwards compatibility, the above syntax is supported. The "1" is simply ignored.
Initial S/W Revision	Prior to A.02.00

## More Information

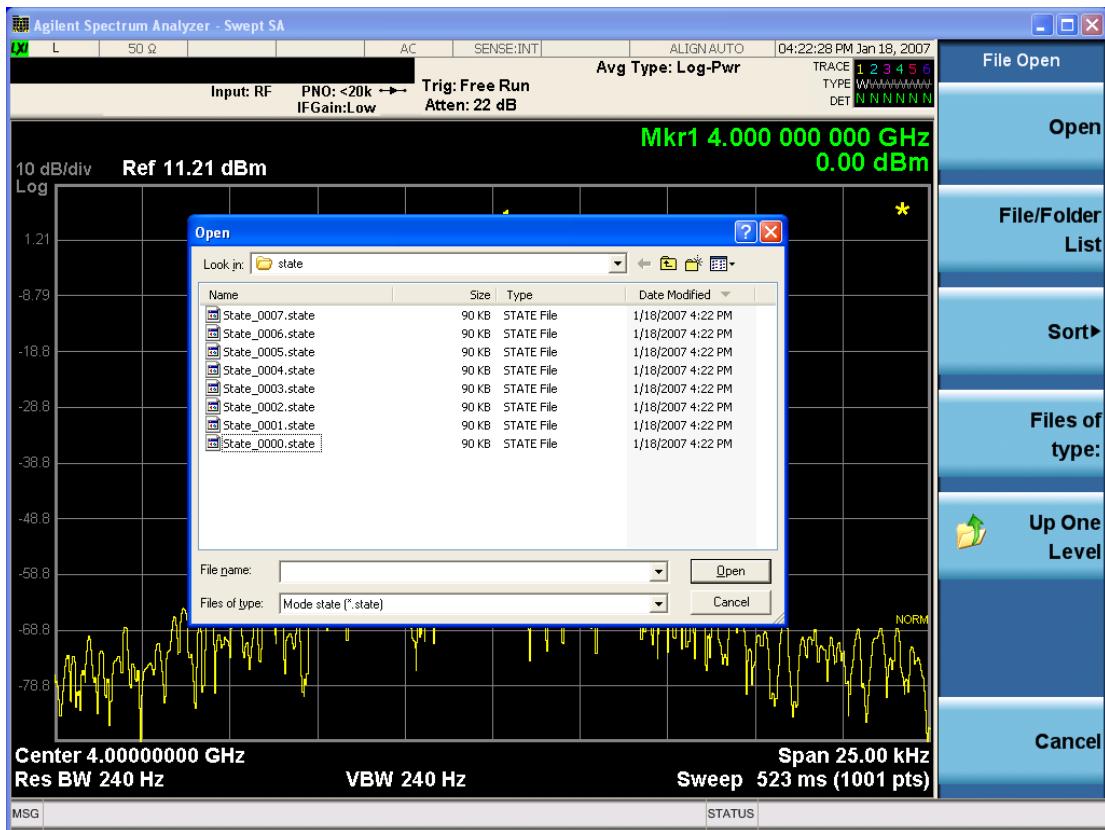
In measurements that support saving Traces, for example, Swept SA, the Trace data is saved along with the State in the State file. When recalling the State, the Trace data is recalled as well. Traces are recalled exactly as they were stored, including the writing mode and update and display modes. If a Trace was updating and visible when the State was saved, it will come back updating and visible, and its data will be rewritten right away. When you use State to save and recall traces, any trace whose data must be preserved should be placed in View or Blank mode before saving.

The following table describes the Trace Save and Recall possibilities:

You want to recall state and one trace's data, leaving other traces unaffected.	Save Trace+State from 1 trace. Make sure that no other traces are updating (they should all be in View or Blank mode) when the save is performed.	On Recall, specify the trace you want to load the one trace's data into. This trace will load in View. All other traces' data will be unaffected, although their trace mode will be as it was when the state save was performed.
You want to recall all traces	Save Trace+State from ALL traces.	On Recall, all traces will come back in View (or Blank if they were in Blank or Background when saved)
You want all traces to load exactly as they were when saved.	Save State	On recall, all traces' mode and data will be exactly as they were when saved. Any traces that were updating 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

## 9 Waveform Measurement

### Recall

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

#### Files of Type

This field shows the file suffix for the type of file you have selected to recall. For example, if you navigated here while recalling State, "Mode state (\*.state)" is in the field. If you navigated here while recalling Trace, ""Mode state (\*.trace)" is in the field. If you navigated here while importing a trace data file, "Trace Data (\*.csv)" is in the field. For some file types, there is more than one choice in the dropdown menu, which you can select by using the up and down arrow keys and Enter.

#### Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

#### Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Open** request to be cancelled. The ESC key does the same thing.

Key Path	Recall, State
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

## 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	Recall, State
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 available"
Initial S/W Revision	A.11.00

## Register 1 thru Register 16

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Each of the register keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key under Save, State to enter custom names for each register.

Registers are shared by all modes, so recalling from any one of the registers will cause a mode switch to the mode that was active when the save to the Register occurred.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the \*RCL command.

After the recall completes, the message "Register <register number> recalled" appears in the message bar. If you are in the Spectrum Analyzer Mode, and you are recalling a register that was saved in the Spectrum Analyzer Mode, then after the recall, you will still be in the Recall Register menu. If the Recall causes you to switch modes, then after the Recall, you will be in the Frequency menu.

If a requested register is empty an error is generated.

<b>Key Path</b>	Recall, State
<b>Example</b>	*RCL 1
<b>Range</b>	1–16 from front panel, 1–128 from SCPI
<b>Readback</b>	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Save, State,Edit Register Names key OR "(empty)" if no prior save operation has been performed to this register.
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	Prior to A.11.00

## Register 1 thru Register 16

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Each of the register keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key under Save, State to enter custom names for each register.

Registers are shared by all modes, so recalling from any one of the registers will cause a mode switch to the mode that was active when the save to the Register occurred.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the \*RCL command.

After the recall completes, the message "Register <register number> recalled" appears in the message bar. If you are in the Spectrum Analyzer Mode, and you are recalling a register that was saved in the Spectrum Analyzer Mode, then after the recall, you will still be in the Recall Register menu. If the Recall causes you to switch modes, then after the Recall, you will be in the Frequency menu.

If a requested register is empty an error is generated.

Key Path	Recall, State
Example	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Save, State,Edit Register Names key OR "(empty)" if no prior save operation has been performed to this register.
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.

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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.

Under this directory, the directory called Ampcor (Legacy Naming) contains a set of legacy corrections files, generally the same files that were supplied with older Agilent EMI analyzers, that use the legacy suffixes .ant, .oth, .usr, and .cbl, and the old 8-character file names. In the directory called Ampcor, the same files can be found, with the same suffixes, but with longer, more descriptive filenames.

When the Amplitude Correction is an Antenna correction and the Antenna Unit in the file is not None, the Y Axis Unit setting will change to match the Antenna Unit in the file.

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Key Path	Recall
Mode	SA EDGE GSM PN
Remote Command	:MMEMory:LOAD:CORRection 1 2 3 4 5 6, <filename>
Example	:MMEM:LOAD:CORR 2 "myAmpcor.csv" recalls the Amplitude Correction data from the file myAmpcor.csv in the current directory to the 2nd Amplitude Correction table, and turns on Correction 2.  The default path is My Documents\amplitudeCorrections.
Dependencies	Only the first correction array (Correction 1) supports antenna units. This means that a correction file with an Antenna Unit can only be loaded into the Corrections 1 register. Consequently only for Correction 1 does the dropdown in the Recall dialog include.ant, and if an attempt is made to load a correction file into any other Correction register which DOES contain an antenna unit, a Mass Storage error is generated.  Corrections are not supported by all Measurements. If in a Mode in which some Measurements support it, this key will be grayed out in measurements that do not. The key will not show at all if no measurements in the Mode support it.  Errors are reported if the file is empty or missing, or if the file type does not match, or if there is a mismatch between the file type and the destination data type. If any of these occur during manual operation, the analyzer returns to the Import Data menu and the File

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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>	:MMEMory:LOAD:CORRection ANTenna   CABLE   OTHer   USER, <filename> For backwards compatibility, ANTenna maps to 1, CABLE maps to 2, OTHer maps to 3 and USER maps to 4
Initial S/W Revision	A.02.00

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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.

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Key Path	Recall, Data, Amplitude Correction
Notes	auto return
Dependencies	Only Correction 1 may be used to load a Correction that contains an Antenna Unit other than None
Preset	Not part of Preset, but is reset to Correction 1 by Restore Input/Output Defaults; survives shutdown.
State Saved	The current Correction number is saved in instrument state
Initial S/W Revision	A.02.00

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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 664 in Recall, State, for a full description of this dialog and menu.

Key Path	Recall, Data
Notes	The key location is mode-dependent and will vary. Brings up Open dialog for recalling a <mode specific> Save Type
Initial S/W Revision	Prior to A.02.00

## Restart

The Restart function restarts the current sweep, or measurement, or set of averaged/held sweeps or measurements. If you are Paused, pressing Restart does a Resume.

The Restart function is accessed in several ways:

- Pressing the Restart key
- Sending the remote command INIT:IMMEDIATE
- Sending the remote command INIT:RESTART

See "[More Information](#)" on page 672

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 Restart hardkey and the INITiate:RESTART command restart trace averages (displayed average count reset to 1) for a trace in Clear Write, but did not restart Max Hold and Min Hold. In the X-Series, the Restart hardkey and the INITiate:RESTART command restart not only Trace Average, but MaxHold and MinHold traces as well. For wireless comms modes in ESA and PSA, the Restart hardkey and the INITiate:RESTART command restart every measurement, which includes all traces and numeric results. There is no change to this operation.
Initial S/W Revision	Prior to A.02.00

## More Information

The **Restart** function first aborts the current sweep/measurement as quickly as possible. It then resets the sweep and trigger systems, sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met.

If the analyzer is in the process of aligning when **Restart** is executed, the alignment finishes before the restart function is performed.

Even when set for Single operation, multiple sweeps may be taken when Restart is pressed (for example, when averaging/holding is on). Thus when we say that **Restart** "restarts a measurement," we may mean:

- It restarts the current sweep
- It restarts the current measurement
- It restarts the current set of sweeps if any trace is in Trace Average, Max Hold or Min Hold
- It restarts the current set of measurements if Averaging, or Max Hold, or Min Hold is on for the measurement
- depending on the current settings.

With **Average/Hold Number** (in **Meas Setup** menu) set to 1, or Averaging off, or no trace in Trace Average or Hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met; and the analyzer stops sweeping once that sweep has completed. However, with **Average/Hold Number >1** and at least one trace set to **Trace Average, Max Hold, or Min Hold (SA Measurement)** or **Averaging on (most other measurements)**, multiple sweeps/data acquisitions are taken for a single measurement. The trigger condition must be met prior to each sweep. The sweep is stopped when the average count k equals the number N set for **Average/Hold Number**. A measurement average usually applies to all traces, marker results, and numeric results; but sometimes it only applies to the numeric results.

Once the full set of sweeps has been taken, the analyzer will go to idle state. To take one more sweep without resetting the average count, increment the average count by 1, by pressing the step up key while **Average/Hold Number** is the active function, or sending the remote command CALC:AVER:TCON UP.

## Save

The Save menu lets you choose what you want to save and where you want to save it. Among the types of files you can save are **States**, **Traces**, and **Screen Images**. In addition, an Export (Data) option lets you save a number of data types as CSV files for easy import into Excel and other spreadsheet programs.

Key Path	Front-panel key
Mode	All
Notes	No remote command for this key specifically, but the :MMEM:STORe command is available for specific file types. An example is :MMEM:STOR:STATE <filename>.
Initial S/W Revision	Prior to A.02.00

## State

The Save State menu lets you choose a register or file for saving the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings which were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

After the save completes, the message "File <filename> saved" or "State Register <register number> saved" is displayed.

For rapid saving, the State menu lists 16 registers to save to. Pressing a Register key initiates the save. You can also select a file to save to.

The default path for all State Files is:

My Documents\<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save
Mode	All
Remote Command	:MMEMory:STORE:STATE <filename>
Example	MMEM:STOR:STATE "MyStateFile.state" This stores the current instrument state data in the file MyStateFile.state in the default directory.
Notes	Both single and double quotes are supported for any filename parameter over remote.

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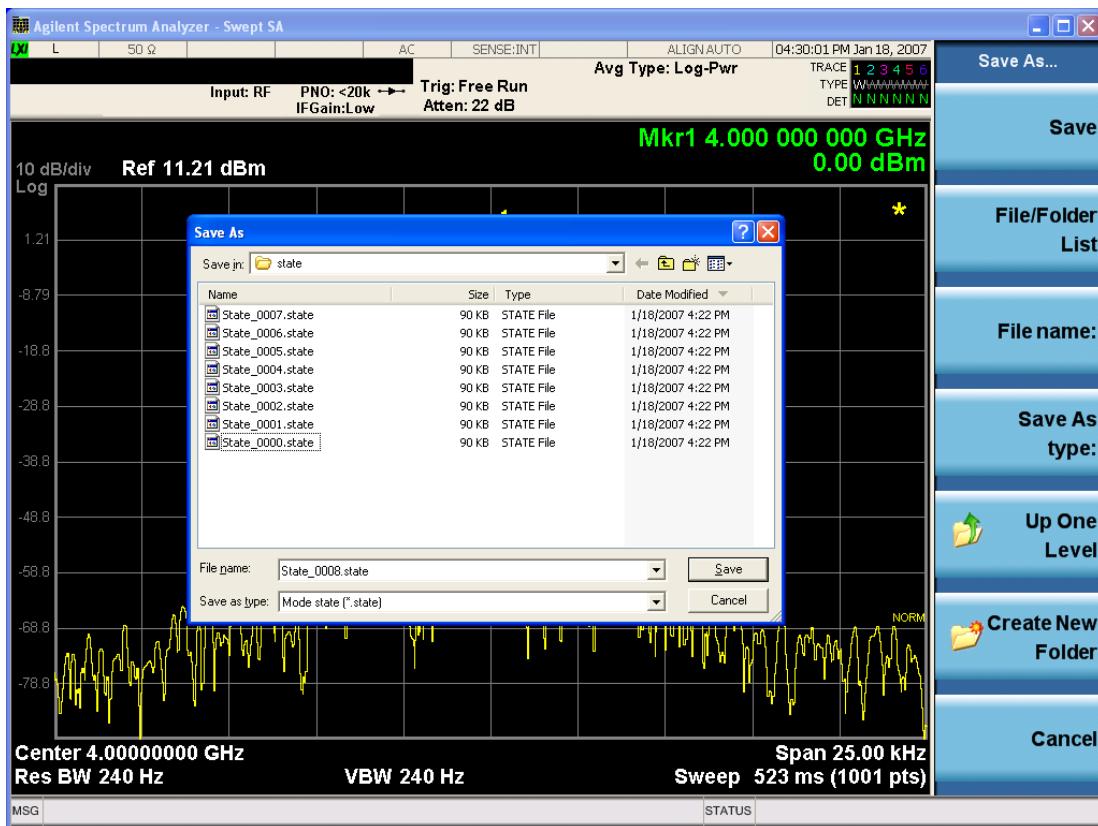
After saving to a register, that register's menu key is updated with the date the time, unless a custom label has been entered for that key.

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.

<b>Backwards Compatibility SCPI</b>	:MMEMory:STORe:STATE 1,<filename>
	For backwards compatibility, the above syntax is supported. The "1" is simply ignored. The command is sequential.
Initial S/W Revision	Prior to A.02.00

## To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “Save As.” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



The Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

Save

Performs the save to the specified file of the selected type. If the file already exists, a dialog will appear that allows you to replace the existing file by selecting OK, or you can Cancel the request. If you select OK, the file

will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.

While the save is being performed, the floppy icon appears briefly in the Meas bar.

#### File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

#### Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

#### File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the "["Quick Save " on page 660](#) documentation for more on the automatic file naming algorithm.

When you press the File Name key the analyzer displays the Alpha Editor. Use the knob to choose the letter to add and the front-panel Enter key to add the letter to the file name. The BK character moves you back and the FW character moves you forward in the filename. The Select key on the front panel generates a space character. When you are done entering the filename press the Done softkey. This returns back to the **File Open** dialog and menu, but does not cause the save to occur.

#### Save As Type

This field shows the file suffix for the type of file you have selected to save. For example, if you navigated here while saving State, "Mode state (\*.state)" is in the field. If you navigated here from saving Trace, ""Mode state (\*.trace)" is in the field. If you navigated here while exporting a trace data file, "Trace Data (\*.csv)" is in the field. For some file types, there is more than one choice in the dropdown, which you can select by using the up and down arrow keys and Enter.

#### Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

#### Create New Folder

This key corresponds to the icon of a folder with the "\*" that is in the tool bar of the dialog. When pressed, a new folder is created in the current directory with the name **New Folder** and you can enter a new folder name using the Alpha Editor.

#### Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Save As** request to be cancelled. The ESC key does the same thing.

Key Path	Save, State
Mode	All
Notes	Brings up Save As dialog for saving a State Save Type
Initial S/W Revision	Prior to A.02.00

## 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 677

Key Path	Save, State
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
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

### 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 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

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	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

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## 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 681

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Key Path	Save
<b>Remote Command</b>	:MMEMory:STORe:CORRection 1 2 3 4 5 6, <filename>
<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

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## Correction Data File

A Corrections Data File contains a copy of one of the analyzer correction tables. Corrections provide a way to adjust the trace display for predetermined gain curves (such as for cable loss).

Corrections files are text files in .csv (comma separated values) form, to make them importable into Excel or other spreadsheet programs. The format for Corrections files is as follows.

Line #	Type of field	Example	Notes
1	File type, must be "Amplitude Correction"	Amplitude Correction	May not be omitted
2	File Description (in quotes)	"Correction Factors for 11966E"	60 characters max; may be empty but may not be omitted. If exceeds 60 characters, error -233 Too much data reported
3	Comment (in quotes)	"Class B Radiated"	60 characters max; may be empty but may not be omitted. If exceeds 60 characters, error -233 Too much data reported
4	Instrument Version, Model #	A.02.06,N9020A	May be empty but may not be omitted
5	Option List, File Format Version	K03 LFE EXM ,01	May be empty but may not be omitted
6	Freq Unit to be used for all frequency values in the file	Frequency Unit,MHz	assumed to be Hz if omitted
7	Antenna Unit	Antenna Unit,None	If omitted leaves the Antenna unit unchanged. The amplitude unit in the Antenna Unit field is a conversion factor that is used to adjust the Y Axis Units of the current mode, if the mode supports Antenna Units. For more details on antenna correction data, refer to the Input/Output, Corrections key description. Allowable values: dBuv/m, dBuA/m, dBG, dBpT, None
8	Freq Interpolation	Frequency Interpolation,Linear	If omitted leaves the Freq Interpolation unchanged. Allowable values: Linear, Logarithmic
9	Bias value in mA	Bias,0.00	If omitted leaves the Bias value unchanged (added as of A.08.50)
10	Bias State	Bias State,On	If omitted leaves the Bias State unchanged. Allowable values: On, Off (added as of A.08.50)

Line #	Type of field	Example	Notes
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 684](#).

See ["Marker Table" on page 684](#).

See ["Peak Table" on page 687](#).

See [Spectrogram](#)

<b>Remote Command</b>	:MMEMory:STORe:RESUlt:sMTABle PTABle SPECTrogram <filename>
<b>Example</b>	: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

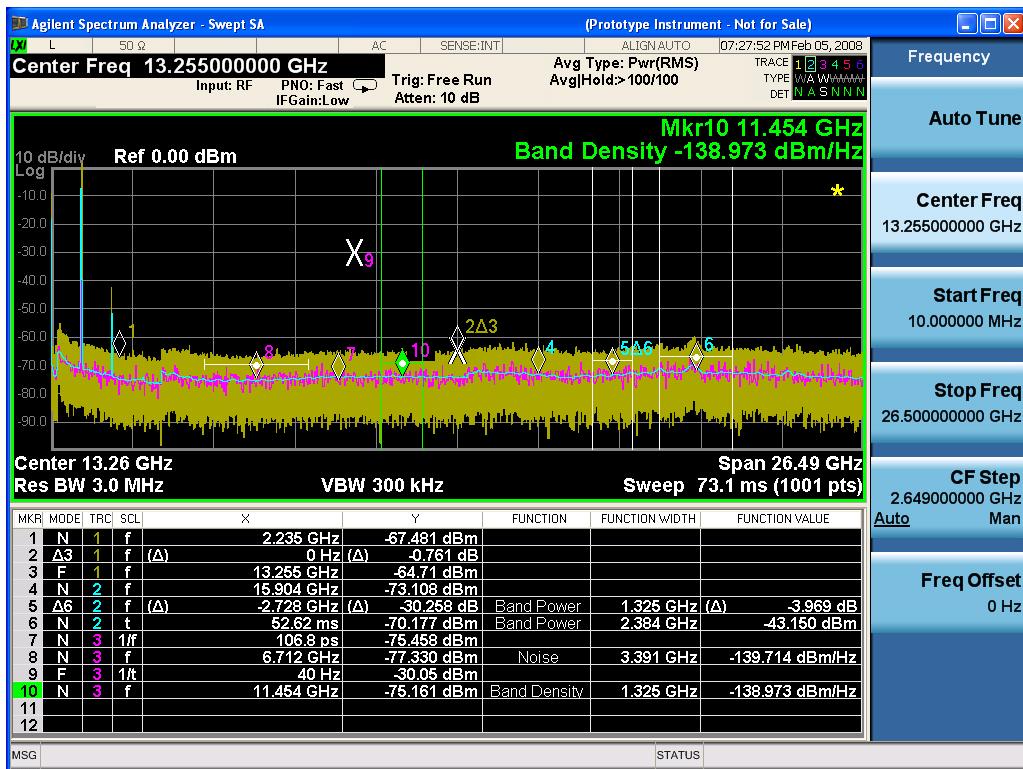
## Meas Results File Contents

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:

Measurement	
Result	
<b>Swept SA</b>	
A.01.40_	N9020A
R0017	
526 B25 PFR	1
P26 EA3	
Result Type	Marker Table
Ref Level	0
Number of Points	1001
Sweep Time	0.06626 6667
Start Frequency	1000000 0
Stop Frequency	2650000 0000
Average Count	0
Average Type	LogPow

9 Waveform Measurement  
Save

er(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	1000000								
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 WIDTH	FUNCTION VALUE	FUNCTION UNIT
1	Normal	1	Frequency	2.2350 E+09	-67.	Off	0.0000 E+00	0	None

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2	Delta3	1	Frequency	0.0000 E+00	-0.761	Off	0.0000 E+00	0	None
3	Fixed	1	Frequency	1.3255 E+10	-64.71	Off	0.0000 E+00	0	None
4	Normal	2	Frequency	1.5904 E+10	-73.108	Off	0.0000 E+00	0	None
5	Delta7	2	Frequency	-2.7280 E+09	-30.258	Band Power	1.3250 E+06	-3.969	dB
6	Normal	2	Time	5.2620 E-02	-70.177	Band Power	2.3840 E+06	-43.15	dBm
7	Normal	3	Period	1.0680 E-10	-75.458	Off	0.0000 E+00	0	None
8	Normal	3	Frequency	6.7120 E+09	-77.33	Noise	3.3910 E+06	-139.714	dBm/Hz
9	Fixed	3	Inverse Time	4.0000 E+01	-30.05	Off	0.0000 E+00	0	None
10	Normal	3	Frequency	1.1454 E+10	-75.161	Band Density	1.3250 E+06	-138.973	dBm/Hz
11	Off	1	Frequency	0.0000 E+00	0	Off	0.0000 E+00	0	None
12	Off	1	Frequency	0.0000 E+00	0	Off	0.0000 E+00	0	None

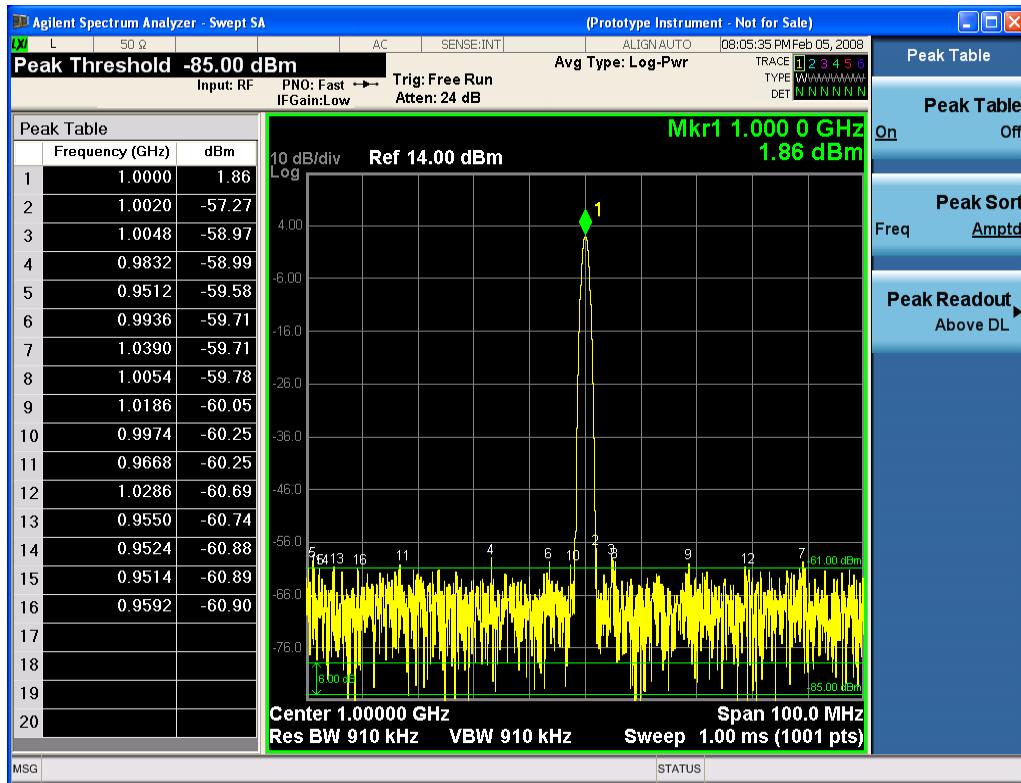
The numbers appear in the file exactly as they appear onscreen. If it says 11.454 GHz onscreen, then in the file it is 11.454E+09.

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:

---

### MeasurementResult

Swept SA

A.01.40\_R0017 N9020A

526 B25 PFR P26 EA3 1

---

Result Type	Peak Table
Ref Level	0
Number of Points	1001
Sweep Time	0.066266667
Start Frequency	10000000
Stop Frequency	26500000000
Average Count	0
Average Type	LogPower (Video)
RBW	3000000
RBW Filter	Gaussian
RBW Filter BW	3dB
VBW	3000000
Sweep Type	Swept
X Axis Scale	Lin
PreAmp State	Off
PreAmp Band	Low
Trigger Source	Free
Trigger Level	1.2
Trigger Slope	Positive
Trigger Delay	1.00E-06
Phase Noise Optimization	Fast
Swept If Gain	Low
FFT If Gain	Autorange
RF Coupling	AC
FFT Width	411900
Ext Ref	10000000
Input	RF
RF Calibrator	Off
Attenuation	10
Ref Level Offset	0
External Gain	0
X Axis Units	Hz
Y Axis Units	dBm
Peak Threshold	-85
Peak Threshold State	On

Peak Excursion	6	
Peak Excursion State	On	
Display Line	-61	
Peak Readout	AboveDL	
Peak Sort	Amptd	
DATA		
Peak	Frequency	Amplitude
1	1.0000E+06	1.86
2	1.0020E+06	-57.27
3	1.0048E+06	-58.97
4	9.8320E+05	-58.99
5	9.5120E+05	-59.58
6	9.9360E+05	-59.71
7	1.0390E+06	-59.71
8	1.0054E+06	-59.78
9	1.1086E+06	-60.05
10	9.9740E+05	-60.25
11	9.6680E+05	-60.25
12	1.0286E+06	-60.69
13	9.5500E+05	-60.74
14	9.5240E+05	-60.88
15	9.5140E+05	-60.89
16	9.5920E+05	-60.90
17		
18		
19		
20		

## Spectrogram

This section discusses the Spectrogram Results file format. The Spectrogram choice only appears if option EDP is licensed.

The Spectrogram results are the same as a Trace data export, except that instead of having just one trace's data, all 300 traces appear one after the other.

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:

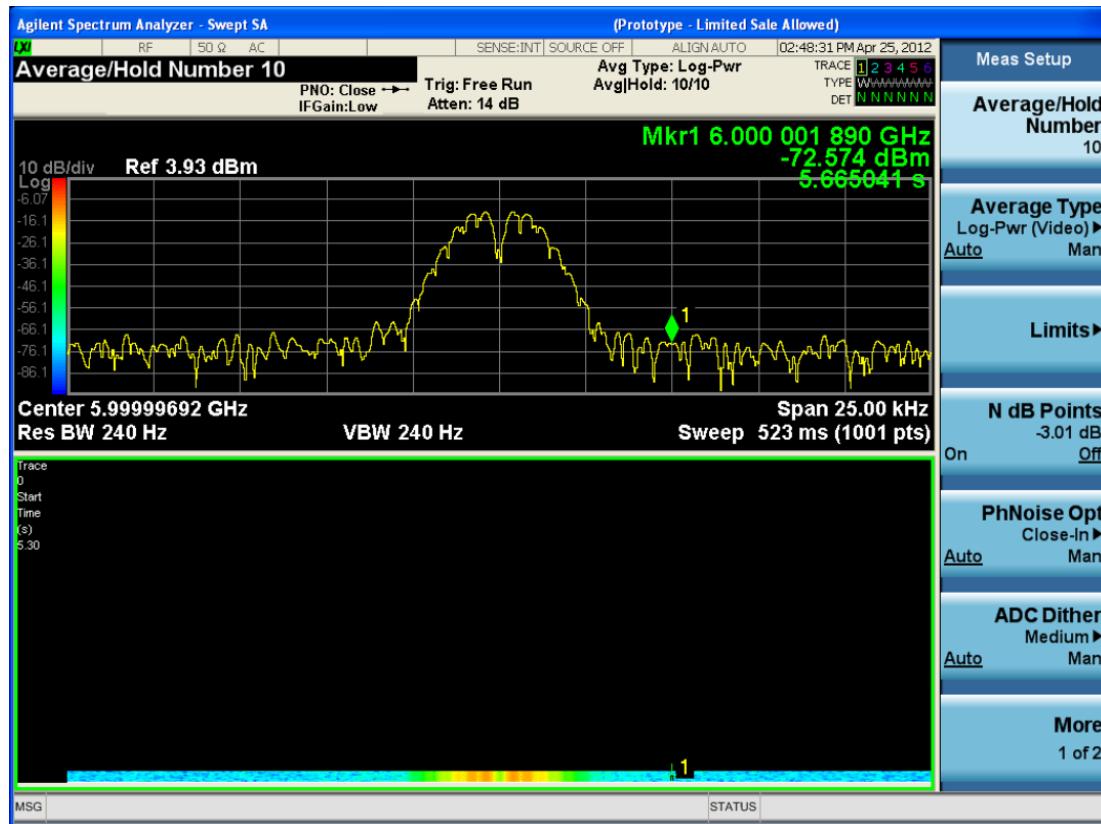
Start Time,20120130132345678

NOTE:

**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 B1C	1
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

Result Type	Spectrogram
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
Trace Math Oper2	Trace6
Trace Math Offset	0
Trace Name	Trace1
X Axis Units	Hz
Y Axis Units	dBm
Start Time	20120425142808700
DATA	5.299231048
5999984415	-76.34749519
5999984440	-77.28097006
5999984465	-75.32317869
5999984490	-73.64417681
5999984515	-72.67154604

o  
o  
o

6000009315	-77.94423277
6000009340	-79.51829697
6000009365	-78.46108961
6000009390	-78.46108957
6000009415	-76.59570596
DATA2	4.708697055

5999984415	-80.98197882
5999984440	-80.98197879
5999984465	-75.83142132
5999984490	-74.02712079
5999984515	-73.57213005

o  
o  
o

6000009315	-75.9183103
6000009340	-79.53787488
6000009365	-78.82602191
6000009390	-78.82602188
6000009415	-76.37486709
DATA10	0
5999984415	-75.56751112
5999984440	-75.76485645
5999984465	-76.67718717
5999984490	-78.79238489
5999984515	-83.72680212

o  
o  
o

6000009315	-71.3942461
6000009340	-72.28308332
6000009365	-73.92684489
6000009390	-75.45548832
6000009415	-75.17904815

## 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 675 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

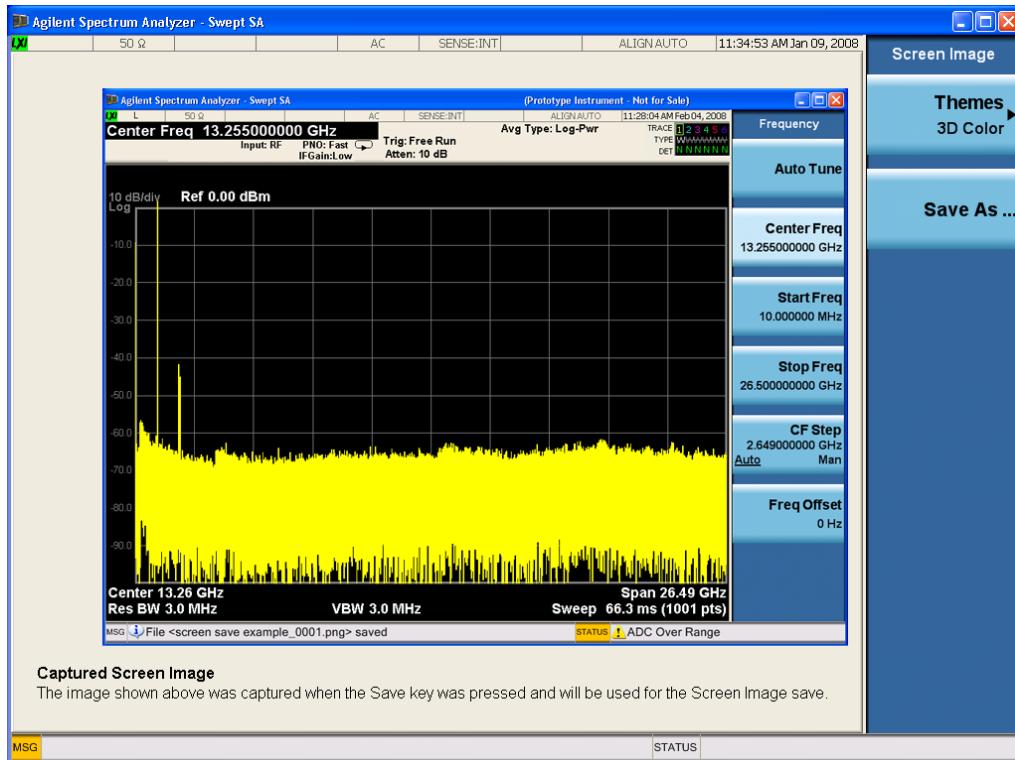
Key Path	Save, Data
Mode	All
Notes	<p>The key location is mode-dependent and will vary.</p> <p>Brings up the Save As dialog for saving a &lt;mode specific&gt; Save Type. The save is performed immediately and does not wait until the measurement is complete.</p>
Initial S/W Revision	Prior to A.02.00

## Screen Image

Pressing Screen Image accesses a menu of functions that enable you to specify a format and location for the saved screen image. It brings up a menu that allows you to specify the color scheme of the Screen Image (Themes) or navigate to the Save As dialog to perform the actual save.

Screen Image files contain an exact representation of the analyzer display. They cannot be loaded back onto the analyzer, but they can be loaded into your PC for use in many popular applications.

The image to be saved is actually captured when the Save front panel key is pressed, and kept in temporary storage to be used if you ask for a Screen Image save. When the Screen Image key is pressed, a "thumbnail" of the captured image is displayed, as shown below:



When you continue on into the Save As menu and complete the Screen Image save, the image depicted in the thumbnail is the one that gets saved, showing the menus that were on the screen before going into the Save menus. The save is performed immediately and does not wait until the measurement is complete.

After you have completed the save, the Quick Save front-panel key lets you quickly repeat the last save performed, using an auto-named file, with the current screen data.

**NOTE** For versions previous to A.01.55, if you initiate a screen image save by navigating through the Save menus, the image that is saved will contain the Save menu softkeys, not the menus and the active function that were on the screen when you first pressed the Save front panel key.

Key Path	Save
Mode	All
Remote Command	:MMEMory:STORe:SCReen <filename>
Example	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
Initial S/W Revision	Prior to A.02.00

## Themes

Accesses a menu of functions that enable you to choose the theme to be used when saving the screen image.

The **Themes** option is the same as the **Themes** option under the **Display** and **Page Setup** dialogs. It allows you to choose between themes to be used when saving the screen image.

<b>Key Path</b>	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 the user selected Reverse Bitmap AND a black&white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
Initial S/W Revision	Prior to A.02.00

### 3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

<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.

<b>Key Path</b>	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

---

### 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 675 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\<mode name>\screen.

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

---

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

---

## 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 699

Key Path	Front-panel key
<b>Example</b>	:INIT:CONT OFF
Notes	See Cont key description.
Backwards Compatibility Notes	<p>For Spectrum Analysis mode in ESA and PSA, the Single hardkey and the INITiate:IMM switched from continuous measurement to single measurement and restarted sweeps and averages (displayed average count reset to 1), but did not restart Max Hold and Min Hold. In the X-Series, the Single hardkey and the INITiate:IMM command initiate a sweep/ measurement/ average sequence/hold sequence including MaxHold and MinHold.</p> <p>For Spectrum Analysis mode in ESA and PSA, the Single hardkey restarted the sweep regardless of whether or not you were in an active sweep or sweep sequence. In the X-Series, Restart does this but Single only restarts the sweep or sweep sequence if you are in the idle state.</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 672 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
----------	-----------------

## 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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
Remote Command	:DISPlay:WAVEform:VIEW[1]   2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel <time> :DISPlay:WAVEform:VIEW[1]   2:WINDOW[1]:TRACe:X[:SCALE]:RLEVel?
Example	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, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA,

	CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</b>	:DISPlay:WAVeform:VIEW[1]   2:WINDOW[1]:TRACe:X[:SCALe]:PDIVison <time> :DISPlay:WAVeform:VIEW[1]   2:WINDOW[1]:TRACe:X[:SCALe]:PDIVison?
<b>Example</b>	DISP:WAV:VIEW:WIND:TRAC:X:PDIV 500 us DISP:WAV:VIEW:WIND:TRAC:X: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	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	200.0 us
State Saved	Saved in instrument state.
Min	1.000 ns
Max	1.000 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Ref Position

Sets the reference position for the X axis to Left, Center or Right.

Key Path	SPAN X Scale
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
<b>Remote Command</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>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

## Auto Scaling

Toggles the scale coupling function between On and Off.

Key Path	SPAN X Scale
Mode	BASIC, PNOISE, WCDMA, CDMA2K, EDGEGSM, WIMAXOFDMA, TDSCDMA, CDMA1XEV, DVB, DTMB, ISDBT, CMMB, LTE, LTETDD, DCATV, WLAN, MSR
Remote Command	:DISPlay:WAVEform:VIEW[1]   2:WINDOW[1]:TRACe:X[:SCALE]:COUPLE 0   1   OFF   ON :DISPlay:WAVEform:VIEW[1]   2:WINDOW[1]:TRACe:X[:SCALE]:COUPLE?
Example	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 un-pauses 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

## 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.
Initial S/W Revision	Prior to A.02.00

## System

See "System" on page 257

## 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 336

### Free Run

See "Free Run" on page 344

### Video

See "Video (IF Envelope)" on page 344

### Trigger Level

See "Trigger Level" on page 345

### Trig Slope

See "Trig Slope" on page 346

### Trig Delay

See "Trig Delay" on page 346

### Line

See "Line" on page 348

### Trig Slope

See "Trig Slope" on page 349

### Trig Delay

See "Trig Delay" on page 349

### External 1

See "External 1" on page 376

### Trigger Level

See "Trigger Level" on page 376

### Trig Slope

See "Trig Slope" on page 377

### Trig Delay

See "Trig Delay" on page 351

### External 2

See "External 2" on page 377

## **Trigger Level**

See "Trigger Level " on page 378

## **Trig Slope**

See "Trig Slope " on page 379

## **Trig Delay**

See "Trig Delay " on page 354

## **RF Burst**

See "RF Burst " on page 366

## **Absolute Trigger**

See "Absolute Trigger Level" on page 379

## **Relative Trigger**

See "Relative Trigger Level" on page 381

## **Trig Slope**

See "Trigger Slope " on page 382

## **Trig Delay**

See "Trig Delay " on page 370

## **Periodic Timer**

See "Periodic Timer (Frame Trigger)" on page 370

## **Period**

See "Period " on page 372

## **Offset**

See "Offset " on page 372

## **Offset Adjust (Remote Command Only)**

See "Offset Adjust (Remote Command Only)" on page 374

## **Reset Offset Display**

See "Reset Offset Display " on page 374

## **Sync Source**

See "Sync Source " on page 375

**Off**

See "Off" on page 375

**External 1**

See "External 1" on page 376

**Trigger Level**

See "Trigger Level" on page 376

**Trig Slope**

See "Trig Slope" on page 377

**External 2**

See "External 2" on page 377

**Trigger Level**

See "Trigger Level" on page 378

**Trig Slope**

See "Trig Slope" on page 379

**RF Burst**

See "RF Burst" on page 379

**Absolute Trigger**

See "Absolute Trigger Level" on page 379

**Relative Trigger**

See "Relative Trigger Level" on page 381

**Trig Slope**

See "Trigger Slope" on page 382

**Trig Delay**

See "Trig Delay" on page 382

**Baseband I/Q**

See "Baseband I/Q" on page 355

**I/Q Mag**

See "I/Q Mag" on page 355

**Trigger Level**

See "Trigger Level" on page 355

## **Trig Slope**

See "Trig Slope" on page 356

## **Trig Delay**

See "Trig Delay" on page 356

## **I**

See "I (Demodulated)" on page 357

## **Trigger Level**

See "Trigger Level" on page 357

## **Trig Slope**

See "Trig Slope" on page 357

## **Trig Delay**

See "Trig Delay" on page 358

## **Q**

See "Q (Demodulated)" on page 358

## **Trigger Level**

See "Trigger Level" on page 359

## **Trig Slope**

See "Trig Slope" on page 359

## **Trig Delay**

See "Trig Delay" on page 359

## **Input I**

See "Input I" on page 360

## **Trigger Level**

See "Trigger Level" on page 360

## **Trig Slope**

See "Trig Slope" on page 361

## **Trig Delay**

See "Trig Delay" on page 361

## **Input Q**

See "Input Q" on page 362

## **Trigger Level**

See "Trigger Level" on page 362

## **Trig Slope**

See "Trig Slope" on page 362

## **Trig Delay**

See "Trig Delay" on page 363

## **Aux Channel Center Freq**

See "Auxiliary Channel I/Q Mag" on page 363

## **Trigger Level**

See "Trigger Level" on page 363

## **Trig Slope**

See "Trig Slope" on page 364

## **Trig Delay**

See "Trig Delay" on page 364

## **Trigger Center Freq**

See "Trigger Center Frequency" on page 365

## **Trigger BW**

See "Trigger Bandwidth" on page 365

## **Auto/Holdoff**

See "Auto/Holdoff" on page 383

## **Auto Trig**

See "Auto Trig" on page 383

## **Trig Holdoff**

See "Trig Holdoff" on page 384

## 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
Remote Command	:SYST:PRESet:USER
Example	:SYST:PRES:USER:SAVE:SYST:PRES:USER
Notes	<p>:SYST:PRES:USER:SAVE is used to save the current state as the user preset state.</p> <p>Clears all pending OPC bits. The Status Byte is set to 0.</p> <p>Pressing the User Preset front-panel key while already in the User Preset menu will cause the User Preset to get executed</p>
Couplings	A user preset will cause the currently running measurement to be aborted and cause the saved measurement to be active. Recalling a User Preset file has the same issues that recalling a Save State file has. Some settings may need to be limited and therefore re-coupled, since the capabilities of the mode may have changes when the User Preset file was last saved.
Initial S/W Revision	Prior to A.02.00

## User Preset All Modes

Recalls all of the User Preset files for each mode, switches to the power-on mode, and activates the saved measurement from the power-on mode User Preset file.

**NOTE** When the instrument is secured, all of the user preset files are converted back to their default user preset files.

The User Preset function does the following:

- Aborts the currently running measurement.
- Switches the Mode to the power-on mode.
- Restores the User Preset files for each mode.
- Makes the saved measurement for the power-on mode the active measurement.
- Brings up the saved menu for the power-on mode.
- Clears the input and output buffers.
- Sets the Status Byte to 0.

Key Path	User Preset
Remote Command	: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>	:SYSTem: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.

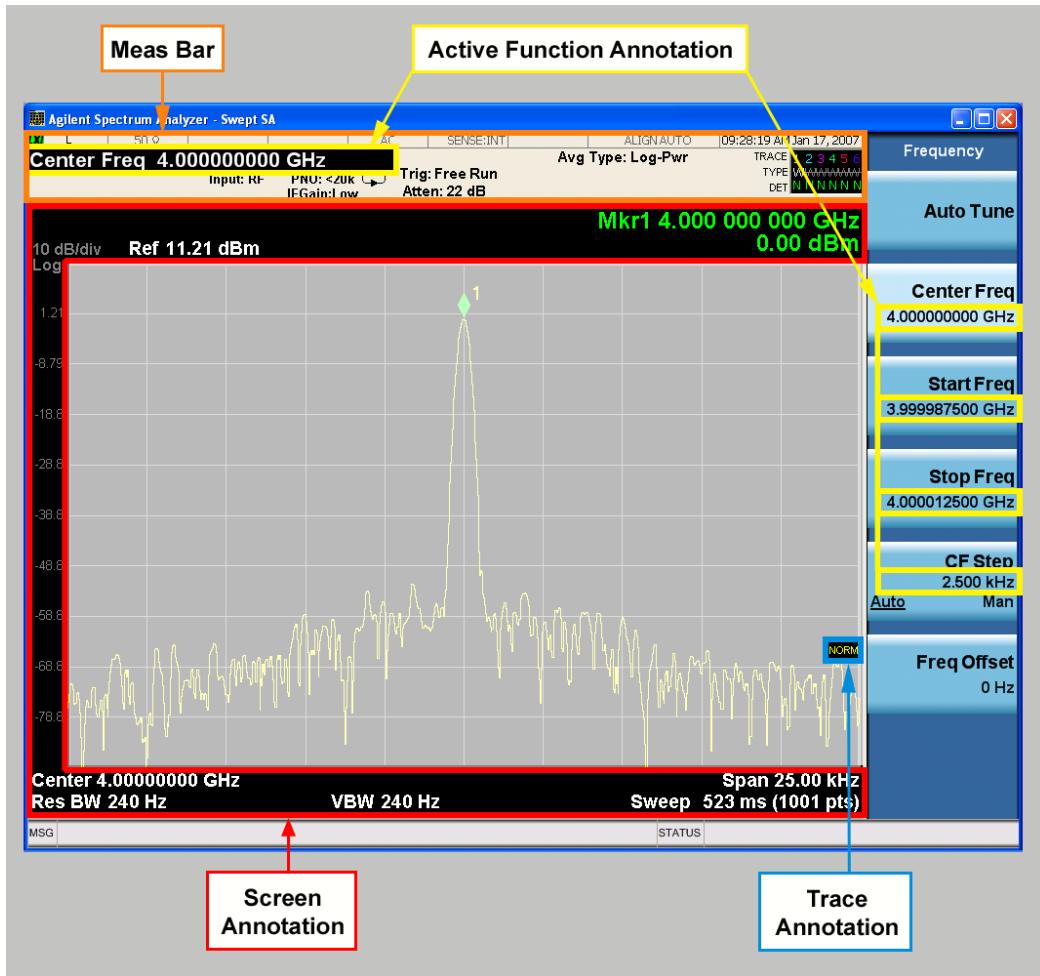
Key Path	Display
Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

## Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

1. Meas Bar: This is the measurement bar at the top of the screen. It does not include the settings panel or the Active Function. Turning off the Meas Bar turns off the settings panel and the Active Function. When the Meas Bar is off, the graticule area expands to fill the area formerly occupied by the Meas Bar.
2. Screen Annotation: this is the annotation and annunciation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) This does NOT include the marker number or the N dB result. When off, the graticule expands to fill the entire graticule area.
3. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).
4. Active Function annotation: this is the active function display in the meas bar, and all of the active function values displayed on softkeys.

See the figure below. Each type of annotation can be turned on and off individually.




---

**Key Path** View/Display, Display

**Initial S/W Revision** Prior to A.02.00

---

### Meas Bar On/Off

This function turns the Measurement Bar on and off, including the settings panel. When off, the graticule area expands to fill the area formerly occupied by the Measurement Bar.

---

**Key Path** View/Display, Display, Annotation

**Remote Command**

```
:DISPLAY:ANNOTATION:MBAR[:STATE] OFF|ON|0|1
:DISPLAY:ANNOTATION:MBAR[:STATE]?
```

**Example** DISP:ANN:MBAR OFF

**Dependencies** Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.

---

Preset	On
	This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Screen

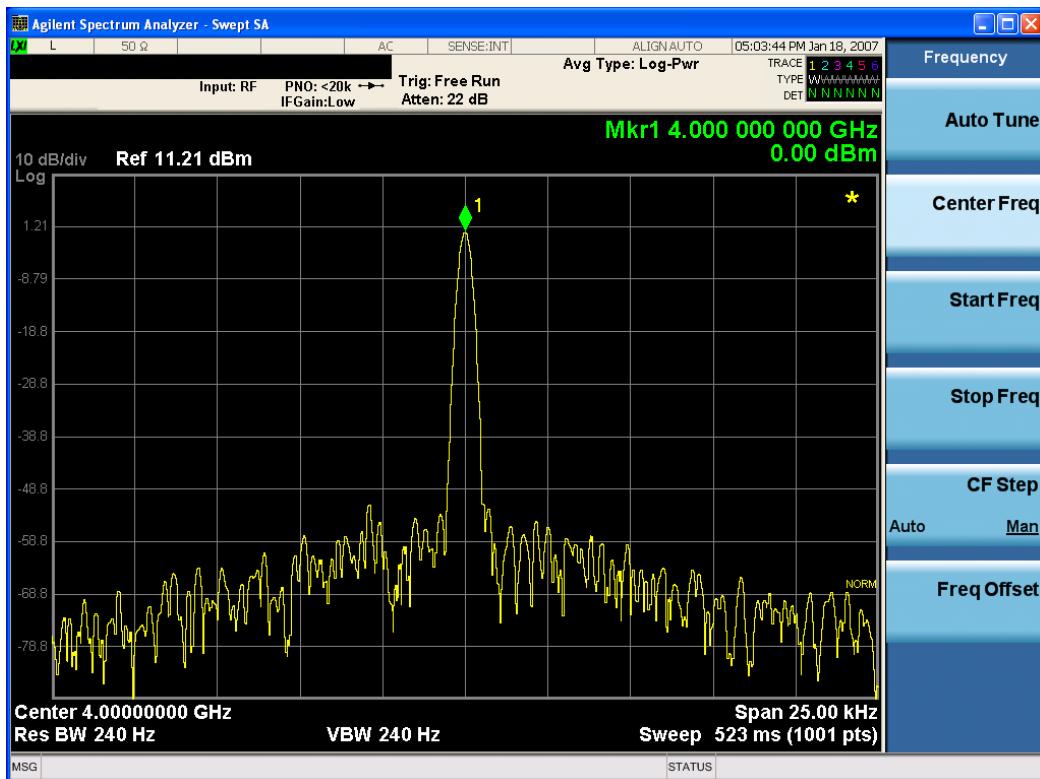
This controls the display of the annunciation and annotation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) and the y-axis annotation. This does NOT include marker annotation (or the N dB result). When off, the graticule expands to fill the entire graticule area, leaving only the 1.5% gap above the graticule as described in the Trace/Detector chapter.

Key Path	View/Display, Display, Annotation
<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 System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## 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..




---

<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
<b>Dependencies</b>	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
<b>Preset</b>	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
<b>State Saved</b>	Saved in instrument state.
<b>Initial S/W Revision</b>	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
<b>Initial S/W Revision</b>	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 ""

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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.

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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.
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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
Remote Command	:DISPlay:WINDOW[1]:TRACe:GRATICule:GRID[:STATe] OFF ON 0 1 :DISPlay:WINDOW[1]:TRACe:GRATICule:GRID[:STATe]?
Example	DISP:WIND:TRAC:GRAT:GRID OFF
Notes	The graticule is the set of horizontal and vertical lines that make up the grid/divisions for the x-axis and y-axis.
Preset	On
State Saved	Saved in instrument state
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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
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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.

## 9 Waveform Measurement View/Display

When it is All Off, the Screen, Meas Bar, Trace, and Active Function Values keys under the Display, Annotation menu are grayed out and forced to Off. When Local Settings is selected, you are able to set the local annotation settings on a measurement by measurement basis.

Key Path	View/Display, Display, System Display Settings
Remote Command	:DISPlay:WINDOW[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDOW[1]:ANNotation[:ALL]?
Example	:DISP:WIND:ANN OFF
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	The WINDOW parameter and optional subopcode is included for backwards compatibility but ignored – all windows are equally affected.
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## Themes

Accesses a menu of functions that enable you to choose the theme to be used when saving the screen image.

The **Themes** option is the same as the **Themes** option under the **Display** and **Page Setup** dialogs. It allows you to choose between themes to be used when saving the screen image.

Key Path	Save, Screen Image
Remote Command	:MMEMory:STORe:SCReen:THEMe TDColor   TDMonochrome   FCOLOR   FMONochrome :MMEMory:STORe:SCReen:THEMe?
Example	:MMEM:STOR:SCR:THEM TDM
Preset	3D Color; Is not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.
Readback	3D Color   3D Mono   Flat Color   Flat Mono
Backwards Compatibility Notes	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if the user selected Reverse Bitmap AND a black&white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
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## 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
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**3D Monochrome**

Selects a format that is like 3D color but shades of gray are used instead of colors.

<b>Key Path</b>	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.

<b>Key Path</b>	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
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**Flat Monochrome**

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

<b>Key Path</b>	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)
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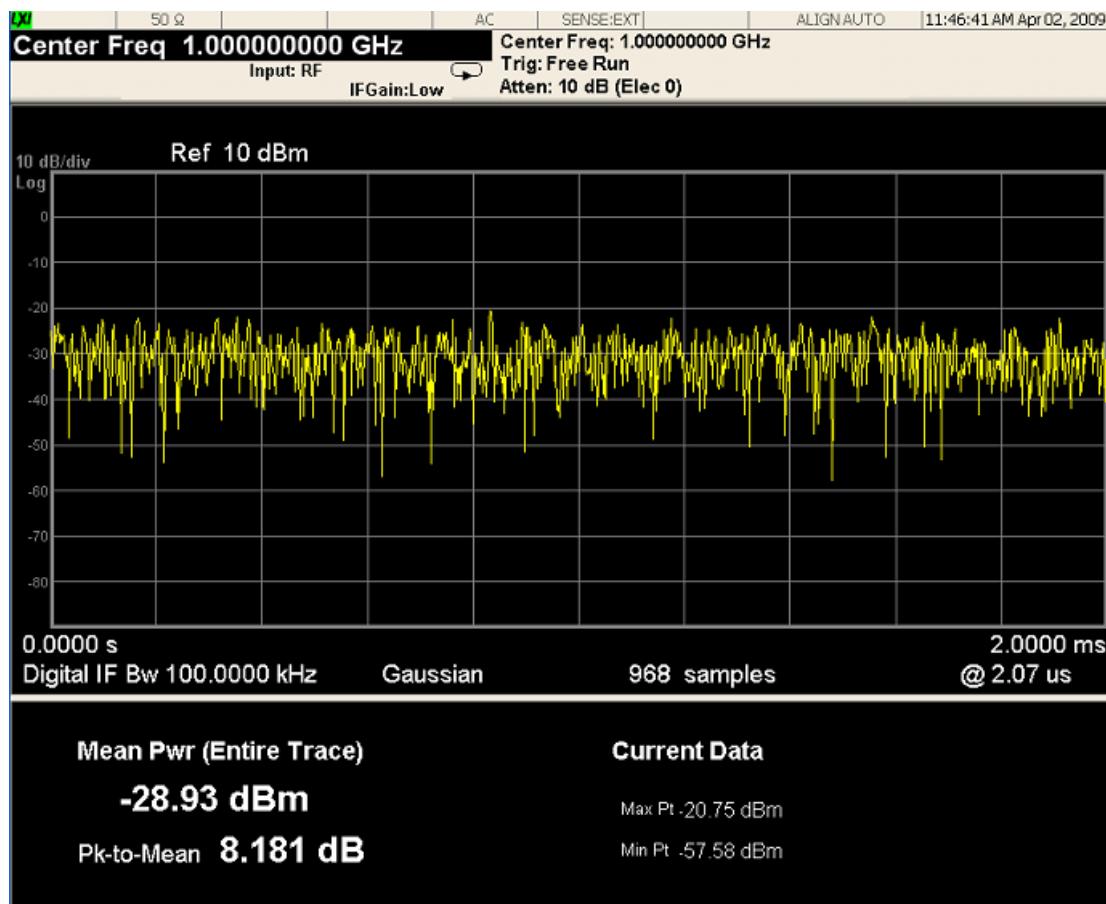
## Backlight Intensity

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
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## 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.



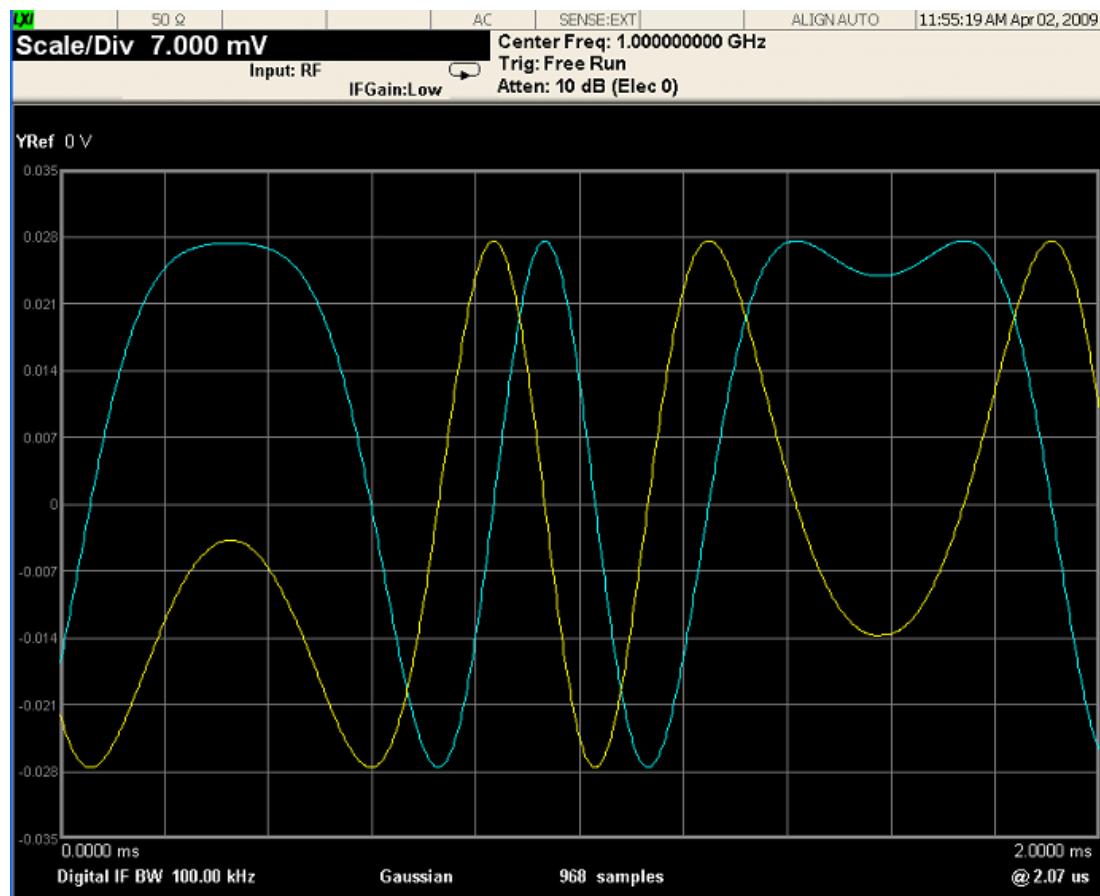
### Numeric Results

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
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## I/Q Waveform

This view shows the I and Q signal waveforms in parameters of voltage versus time.



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

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