

# Keysight X-Series Signal Analyzer

This manual provides documentation for the following

X-Series Analyzers:

PXA Signal Analyzer N9030A

MXA Signal Analyzer N9020A

EXA Signal Analyzer N9010A

CXA Signal Analyzer N9000A

MXE EMI Receiver N9038A

N9063A & W9063A  
Analog Demod  
Measurement  
Application User's  
and Programmer's  
Guide

## Notices

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## Manual Part Number

N9063-90005

## Edition

August 2014

Printed in USA

Keysight Technologies, Inc.  
1400 Fountaingrove Parkway  
Santa Rosa, CA 95403

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## 1 About the Analyzer

The X-Series signal analyzer measures and monitors complex RF and microwave signals. Analog baseband analysis is available on MXA. The analyzer integrates traditional spectrum measurements with advanced vector signal analysis to optimize speed, accuracy, and dynamic range. The analyzer has Windows 7<sup>®</sup> 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 Keysight 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 Keysight Technologies service or sales office for assistance.

### Obtaining and Installing a License Key

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

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

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

C:\Programming Files\Agilent\Licensing

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

### Updating Measurement Application Software

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

any improvements and expanded functionality.

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

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

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

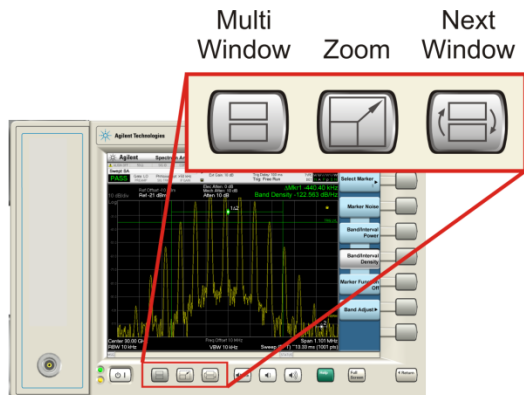
The instrument's Rear-panel features are fully detailed in the section "Rear-Panel Features" (under the chapter "Front and Rear Panel Features") of the document:

### [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.

---

Remote Command	:DISPlay:WINDow:FORMat:ZOOM
----------------	-----------------------------

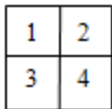
---

<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

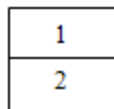
## Next Window

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**

## RTSA measurements:

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

<b>Remote Command</b>	:DISPlay:WINDow[:SElect] <number> :DISPlay:WINDow[:SElect]?
<b>Example</b>	:DISP:WIND 1
Preset	1
Min	1
Max	If <number> is greater than the number of windows, limit to <number of windows>
Initial S/W Revision	Prior to A.02.00

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

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

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

**NOTE**

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

## Full Screen

When Full Screen is pressed the measurement window expands horizontally over the entire instrument display. The screen graticule area expands to fill the available display area.

It turns off the display of the softkey labels, however the menus and active functions still work. (Though it would obviously be very hard to navigate without the key labels displayed.) Pressing Full Screen again while Full Screen is in effect cancels Full Screen.

Note that the banner and status lines are unaffected. You can get even more screen area for your data display by turning off the Meas Bar (in the Display menu) which also turns off the settings panel.

Full Screen is a Meas Global function. Therefore it is cancelled by the Preset key.

Key Path	Display
<b>Remote Command</b>	:DISPlay:FSCReen[:STAtE] OFF ON 0 1 :DISPlay:FSCReen[:STAtE] ?
Preset	Unaffected by Preset but set to Off by Restore Misc Defaults or shutdown and restart
State Saved	Not saved in instrument state.
<b>Backwards Compatibility SCPI</b>	:DISPlay:MENU[:STAtE] OFF ON 0 1 This emulates ESA full screen functionality, which is the same as the FSCReen command in PSA except that the sense of on/off is reversed (that is, OFF means the menus are OFF, so Fullscreen is ON) and the default is ON (meaning Fullscreen is OFF).
Backwards Compatibility Notes	In ESA/PSA, Full Screen was turned on with a softkey, so pressing any other key turned Full Screen off. In the X-Series, because a hardkey is provided to turn this function on and off, pressing any other key no longer turns off Full Screen
Initial S/W Revision	Prior to A.02.00

## Display Enable (Remote Command Only)

Turns the display on/off, including the display drive circuitry. The backlight stays lit so you can tell that the instrument is on. The display enable setting is mode global. The reasons for turning the display off are three:

- To increase speed as much as possible by freeing the instrument from having to update the display
- To reduce emissions from the display, drive circuitry
- For security purposes

If you have turned off the display:

- and you are in local operation, the display can be turned back on by pressing any key or by sending the SYSTem:DEFaults MISC command or the DISPlay:ENABle ON (neither \*RST nor SYSTem:PRESet enable the display.)
- and you are in remote operation, the display can be turned back on by pressing the Local or Esc keys or by sending the SYSTem:DEFaults MISC command or the DISPlay:ENABle ON (neither \*RST nor SYSTem:PRESet enable the display.)

and you are using either the SYSTem:KLOCK command or GPIB local lockout, then no front-panel key press will turn the display back on. You must turn it back on remotely.

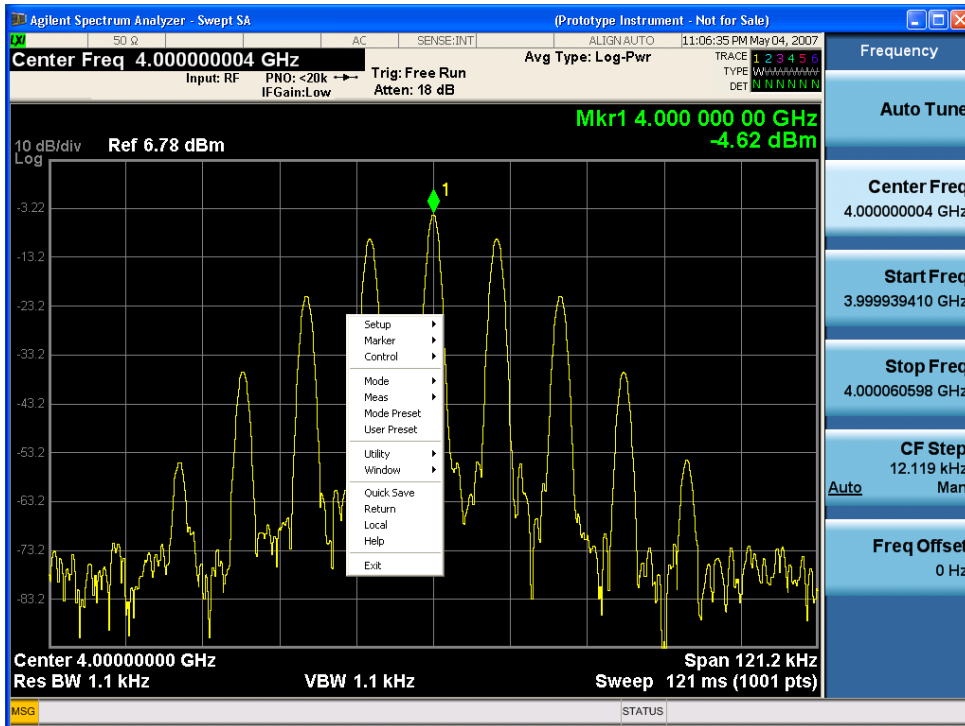
<b>Remote Command</b>	:DISPlay:ENABle OFF ON 0 1 :DISPlay:ENABle?
<b>Example</b>	DISP:ENAB OFF
<b>Couplings</b>	DISP:ENAB OFF turns Backlight OFF and DISP:ENAB ON turns Backlight ON. However, settings of Backlight do not change the state of DISP:ENAB
<b>Preset</b>	On Set by SYST:DEF MISC, but Not affected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

## Mouse and Keyboard Control

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

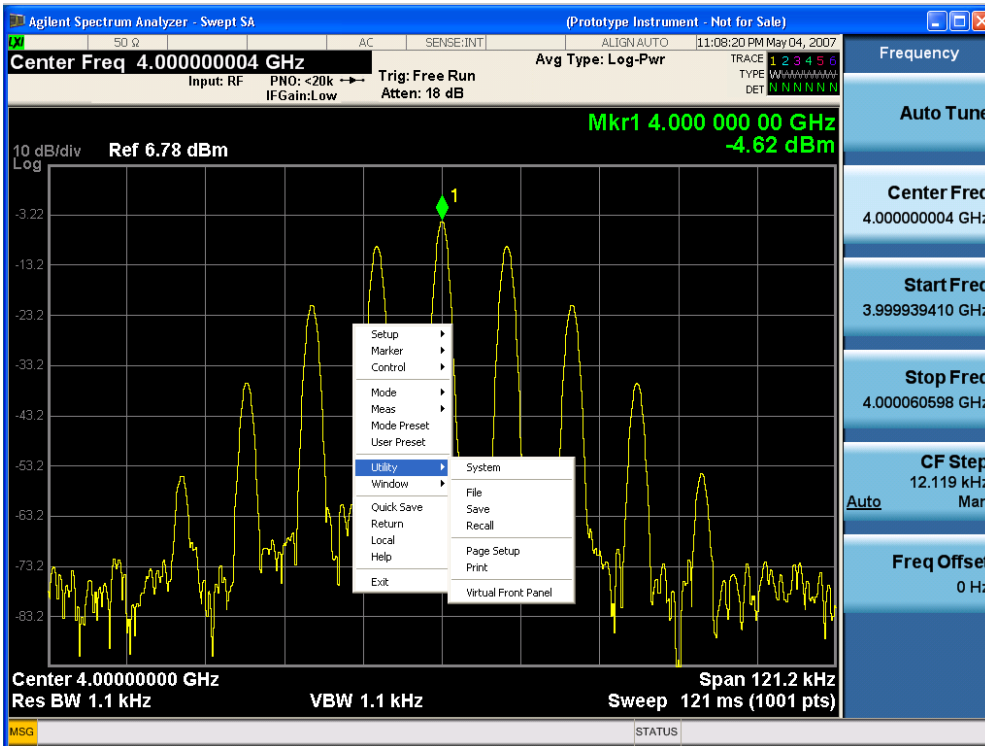
### Right-Click

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



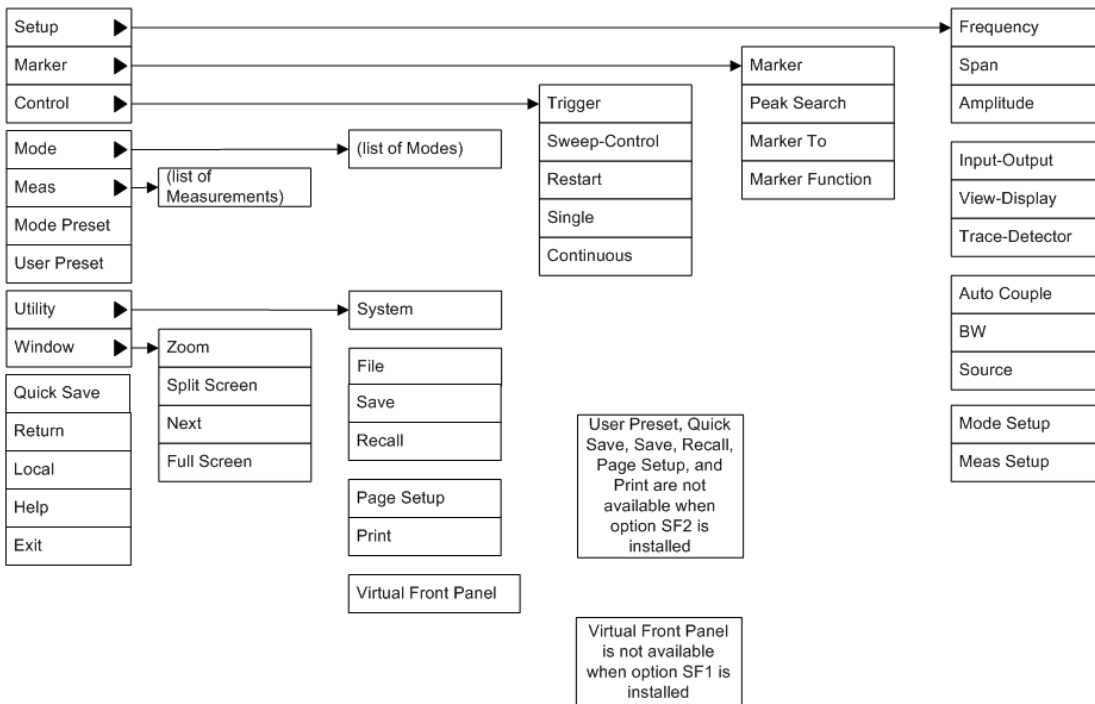
Placing the mouse on one of the rows marked with a right arrow symbol will cause that row to expand, as for example below where the mouse is hovered over the “Utility” row:





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

The array of keys thus available is shown below:



## PC Keyboard

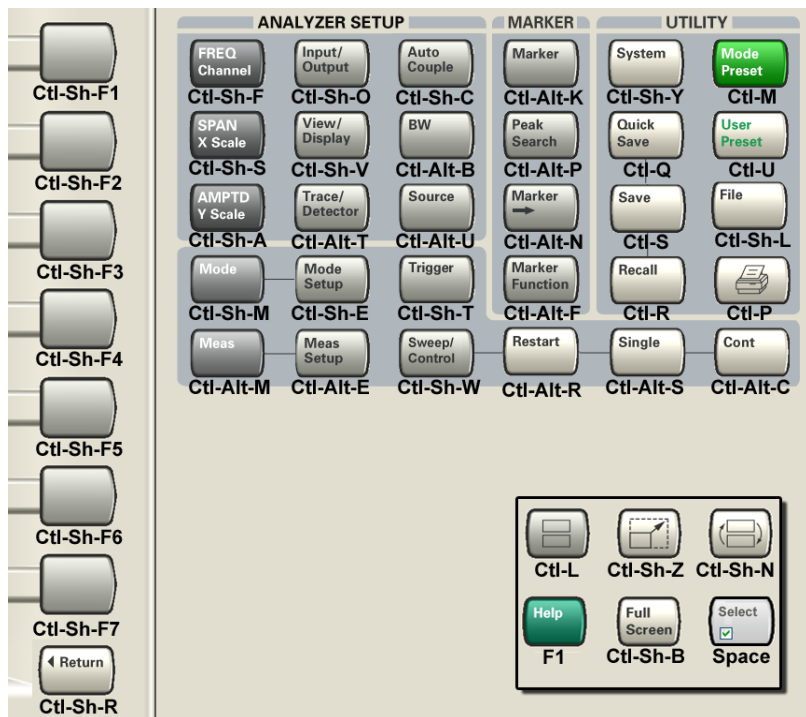
If you have a PC keyboard plugged in (or via Remote Desktop), certain key codes on the PC keyboard map to front-panel keys on the GPSA front panel. These key codes are shown below:

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

Front-panel key	Key code
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
9	9
0	0

1 About the Analyzer  
 Mouse and Keyboard Control

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 Keysight's web site.

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

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

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



## 2 About the Analog Demod Measurement Application

The analog demodulation measurements provide the capability of demodulating Amplitude, Frequency, Phase, or Stereo modulated signals (AM, FM, PM, FM Stereo). These measurements provide functionality that can be generally categorized as follows:

- Demodulating a modulated carrier and playing the modulating signal over a speaker (sometimes referred to as tune and listen)
- Displaying demodulated signals in both time and frequency domain
- Displaying modulation metrics

Each measurement has four basic windows in which to display demodulated data. The primary view displays all four of these windows. In all views, the display is split into signal display windows and a numeric results (metrics) window. The metrics window displays carrier and modulation metrics.

These views are designed such that you can identify analog modulated carriers, determine whether the carrier is a commercial or other broadcast station, and analyze the modulating signal.





### 3 Programming the Analyzer

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

- ["What Programming Information is Available?" on page 58](#)
- ["STATus Subsystem " on page 74](#)
- ["IEEE 488.2 Common Commands" on page 116](#)

## What Programming Information is Available?

The X-Series Documentation can be accessed through the Additional Documentation page in the instrument Help system and is included on the Documentation DVD shipped with the instrument. It can also be found online at: [http://www.agilent.com/find/mxa\\_manuals](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 not 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 instrument's Help (the Help that you see for a key is identical to what you see in this manual).</li></ul>
Embedded Help in your instrument	<p>Describes all front-panel keys and softkeys, including SCPI commands, for a measurement application. Note that the content that you see in Help when you press a key is identical to what you see in the User's and Programmer's Reference.</p>
X-Series Getting Started Guide	<p>Provides valuable sections related to programming including:</p> <ul style="list-style-type: none"><li>• Licensing New Measurement Application Software - After Initial Purchase</li><li>• Configuring instrument LAN Hostname, IP Address, and Gateway Address</li><li>• Using the Windows 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>
Keysight Application Notes	<p>Printable PDF versions of pertinent application notes.</p>
Keysight VISA User's Guide	<p>Describes the Keysight Virtual Instrument Software Architecture (VISA) library and shows how to use it to develop I/O applications and instrument drivers on Windows PCs.</p>

## List of SCPI Commands

```

*CAL?
*CLS
*ESE <integer>
*ESE?
*ESR?
*IDN?
*OPC
*OPC?
*OPT?
*RCL <register#>
*RST
*SAV <register#>
*SRE <integer>
*SRE?
*STB?
*TRG
*TST?
*WAI
CALCulate:AM|FM|PM|FMSTereo:MARKer:AOff
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:LINEs[:STATE] OFF | ON | 0
| 1
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:LINEs[:STATE]?
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:MAXimum
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:MAXimum:NEXT
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:MINimum
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:MODE POSition | DELTa |
FIXed | OFF
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:MODE?
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:PTPeak
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:REFerence <int>
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:REFerence?
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12[:SET]:CENTer
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:TRACe:AUTO OFF | ON | 0 | 1
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:TRACe:AUTO?
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:X <time> | <freq>
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:X?
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:Y <real>
CALCulate:AM|FM|PM|FMSTereo:MARKer[1]|2|...|12:Y?
CALCulate:AM|FM|PM:MARKer:TABLE[:STATE] OFF | ON | 0 | 1
CALCulate:AM|FM|PM:MARKer:TABLE[:STATE]?
CALCulate:AM|FM|PM:MARKer[1]|2|...|12:TRACe RFSpectrum | AFSPpectrum |
DEMod | DAVerage | DMAXimum | DMINimum | RFENvelope | DRAW
CALCulate:AM|FM|PM:MARKer[1]|2|...|12:TRACe?
CALCulate:AM|FM|PM:SINad:BANDwidth <freq>
CALCulate:AM|FM|PM:SINad:BANDwidth?
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]?

```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
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:FM:LLINE:ALL:DELeTe  
CALCulate:FM:LLINE[1]|2|...|6:CONTRol[:DATA] <x>, <x>, ...  
CALCulate:FM:LLINE[1]|2|...|6:CONTRol[:DATA]?  
CALCulate:FM:LLINE[1]|2|...|6:CONTRol:POINTs?  
CALCulate:FM:LLINE[1]|2|...|6:DELeTe  
CALCulate:FM:LLINE[1]|2|...|6:DISPlay ON | OFF | 1 | 0  
CALCulate:FM:LLINE[1]|2|...|6:DISPlay?  
CALCulate:FM:LLINE[1]|2|...|6:UPPer[:DATA] <ampl>, <ampl>, ...  
CALCulate:FM:LLINE[1]|2|...|6:UPPer[:DATA]?  
CALCulate:FM:LLINE[1]|2|...|6:UPPer:POINTs?  
CALCulate:FMSTereo:MARKer[1]|2|...|12:TRACe RFSpectrum | AFSpectrum |  
DEMod | DAVerage | DMAXimum | DMINimum | MDEMod | MDAVerage | MMAXimum |  
MMINimum | MSpectrum | SDEMod | SDAVerage | SMAXimum | SMINimum |  
SSpectrum | LDEMod | LDAVerage | LMAXimum | LMINimum | LSpectrum | RDEMod  
| RDAVerage | RMAXimum | RMINimum | RSpectrum  
CALCulate:FMSTereo:MARKer[1]|2|...|12:TRACe?  
CALCulate:FMSTereo:MONO[:BANDwidth] <freq>  
CALCulate:FMSTereo:MONO[:BANDwidth]?  
CALCulate:FMSTereo:MPX[:BANDwidth] <freq>  
CALCulate:FMSTereo:MPX[:BANDwidth]?  
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 <integer>  
CALibration:FREQuency:REFerence:COARse  
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:NFLoor
CALibration:NFLoor?
CALibration:NRF
CALibration:NRF?
CALibration:REFeRence:CLOCK?
CALibration:REFeRence:CLOCK:END?
CALibration:REFeRence:CLOCK:INITialize?
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>
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:NFLoor?
CALibration:TEMPerature:RFPSelector:LCONDUCTed?
CALibration:TEMPerature:RFPSelector:LRADiated?
CALibration:TIME:ELAPsed:NFLoor?
CALibration:TIME:LALL?
CALibration:TIME:LPreselector?
CALibration:TIME:LRF?
CALibration:TIME:NFLoor?
CALibration:TIME:REFeRence:CLOCK?
CALibration:TIME:RFPSelector:LCONDUCTed?
```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
CALibration:TIME:RFPSelector:LRADiated?
CALibration:YTF
CALibration:YTF?
CONF FSC
CONFigure?
CONFigure?
CONFigure?
CONFigure?
CONFigure:AM
CONFigure:AM:NDEFault
CONFigure:FM
CONFigure:FM:NDEFault
CONFigure:FMSTereo
CONFigure:FMSTereo:NDEFault
CONFigure:PM
CONFigure:PM:NDEFault
DISPlay:<measurement>:ANNotation:TITLe:DATA <string>
DISPlay:<measurement>:ANNotation:TITLe:DATA?
DISPlay:ACTivefunc[:STATe] ON | OFF | 1 | 0
DISPlay:ACTivefunc[:STATe]?
DISPlay:AM|FM|PM:VIEW:CARRier:POWER:UNIT DBM | W
DISPlay:AM|FM|PM:VIEW:CARRier:POWER:UNIT?
DISPlay:AM|FM|PM:VIEW:DISToRtion:UNIT DB | PCT
DISPlay:AM|FM|PM:VIEW:DISToRtion:UNIT?
DISPlay:AM|FM|PM:VIEW:METRics:DISToRtion[:STATe] ON | OFF | 1 | 0
DISPlay:AM|FM|PM:VIEW:METRics:DISToRtion[:STATe]?
DISPlay:AM|FM|PM:VIEW:METRics:MMAGnitude ALL | PPK | PNPk | RMS | RMSRatio
DISPlay:AM|FM|PM:VIEW:METRics:MMAGnitude?
DISPlay:AM|FM|PM:VIEW:METRics:MMAGnitude:REFErence <real>
DISPlay:AM|FM|PM:VIEW:METRics:MMAGnitude:REFErence?
DISPlay:AM|FM|PM:VIEW:METRics:MMAGnitude:REFErence:AUTO ON | OFF | 1 | 0
DISPlay:AM|FM|PM:VIEW:METRics:MMAGnitude:REFErence:AUTO?
DISPlay:AM|FM|PM:VIEW:METRics:MRATE[:STATe] ON | OFF | 1 | 0
DISPlay:AM|FM|PM:VIEW:METRics:MRATE[:STATe]?
DISPlay:AM|FM|PM:VIEW[:SELEct] QUAD | RFSpectrum | DEMod | AFSpectrum |
ARTime
DISPlay:AM|FM|PM:VIEW[:SELEct]?
DISPlay:AM|FM|PM:WINDow3:TRACe:Y[:SCALE]:SPACing LINear | LOGarithmic
DISPlay:AM|FM|PM:WINDow3:TRACe:Y[:SCALE]:SPACing?
DISPlay:AM|PM|FMSTereo:WINDow[1]|2|3:TRACe:Y[:SCALE]:RPOSition TOP |
CENTer | BOTTom
DISPlay:AM|PM|FMSTereo:WINDow[1]|2|3:TRACe:Y[:SCALE]:RPOSition?
DISPlay:AM:WINDow[1]|2|3:TRACe:Y[:SCALE]:PDIVision <real>
DISPlay:AM:WINDow[1]|2|3:TRACe:Y[:SCALE]:PDIVision?
DISPlay:AM:WINDow[1]|2|3:TRACe:Y[:SCALE]:RLEVel <real>
DISPlay:AM:WINDow[1]|2|3:TRACe:Y[:SCALE]:RLEVel?
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:ENABLE OFF | ON | 0 | 1
DISPlay:ENABLE?
DISPlay:FMSTereo:VIEW:DISTortion:UNIT DB | PCT
DISPlay:FMSTereo:VIEW:DISTortion:UNIT?
DISPlay:FMSTereo:VIEW:METRics:DISTortion [:STATE]?
DISPlay:FMSTereo:VIEW:METRics:DISTortion[:STATE] ON | OFF | 1 | 0
DISPlay:FMSTereo:VIEW:METRics:MRATE[:STATE] ON | OFF | 1 | 0
DISPlay:FMSTereo:VIEW:METRics:MRATE[:STATE]?
DISPlay:FMSTereo:VIEW[:SElect] MPX | MONO | STEReo | LEFT | RIGHT | RDS |
NRESults
DISPlay:FMSTereo:VIEW[:SElect]?
DISPlay:FMSTereo:WINDow[1]|2|3:TRACe:Y[:SCALe]:PDIVision <real>
DISPlay:FMSTereo:WINDow[1]|2|3:TRACe:Y[:SCALe]:PDIVision?
DISPlay:FMSTereo:WINDow[1]|2|3:TRACe:Y[:SCALe]:RLEVel <real>
DISPlay:FMSTereo:WINDow[1]|2|3:TRACe:Y[:SCALe]:RLEVel?
DISPlay:FM:WINDow4|5:TRACe:X[:SCALe]:COUPle ON | OFF | 1 | 0
DISPlay:FM:WINDow4|5:TRACe:X[:SCALe]:COUPle?
DISPlay:FM:WINDow4|5:TRACe:X[:SCALe]:PDIVision <time>
DISPlay:FM:WINDow4|5:TRACe:X[:SCALe]:PDIVision?
DISPlay:FM:WINDow4|5:TRACe:X[:SCALe]:RLEVel <time>
DISPlay:FM:WINDow4|5:TRACe:X[:SCALe]:RLEVel?
DISPlay:FM:WINDow4|5:TRACe:X[:SCALe]:RPOStion LEFT | CENTER | RIGHT
DISPlay:FM:WINDow4|5:TRACe:X[:SCALe]:RPOStion?
DISPlay:FM:WINDow[1]|2|...|5:TRACe:Y[:SCALe]:PDIVision <real>
DISPlay:FM:WINDow[1]|2|...|5:TRACe:Y[:SCALe]:PDIVision?
DISPlay:FM:WINDow[1]|2|...|5:TRACe:Y[:SCALe]:RLEVel <real>
DISPlay:FM:WINDow[1]|2|...|5:TRACe:Y[:SCALe]:RLEVel?
DISPlay:FM:WINDow[1]|2|...|5:TRACe:Y[:SCALe]:RPOStion TOP | CENTER |
BOTTOm
DISPlay:FM:WINDow[1]|2|...|5:TRACe:Y[:SCALe]:RPOStion?
DISPlay:FSCreen[:STATE] OFF | ON | 0 | 1
DISPlay:FSCreen[:STATE]?
DISPlay:MENU[:STATE] OFF | ON | 0 | 1
DISPlay:PM:WINDow[1]|2|3:TRACe:Y[:SCALe]:PDIVision <real>
DISPlay:PM:WINDow[1]|2|3:TRACe:Y[:SCALe]:PDIVision?
DISPlay:PM:WINDow[1]|2|3:TRACe:Y[:SCALe]:RLEVel <real>
DISPlay:PM:WINDow[1]|2|3:TRACe:Y[:SCALe]:RLEVel?
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:AM[n]?
FETCh:FM[n]?
FETCh:FMSTereo[n]?
FETCh:PM[n]?
FORMat:BORDER NORMAl | SWAPped
FORMat:BORDER?
FORMat[:TRACe][:DATA] ASCii | INTeger, 32 | REAL, 32 | REAL, 64

```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
FORMat[:TRACe][:DATA]?
GLOBal:DEFault
GLOBal:FREQuency:CENTer[:STATE] 1 | 0 | ON | OFF
GLOBal:FREQuency:CENTer[:STATE]?
HCOpy:ABORT
HCOpy[:IMMEdiate]
INITiate:AM
INITiate:CONTinuous OFF | ON | 0 | 1
INITiate:CONTinuous?
INITiate:FM
INITiate:FMSTereo
INITiate[:IMMEdiate]
INITiate:PM
INITiate:REStart
INPut<1|2>:TYPE INPUT1 | INPUT2
INPut<1|2>:TYPE?
INPut:COUPling AC | DC
INPut:COUPling?
INPut:COUPling:I|Q DC | LFR1 | LFR2
INPut:COUPling:I|Q?
INPut:IMPedance:REFerence <integer>
INPut:IMPedance:REFerence?
INPut[1]:IQ:BAALanced[:STATE] OFF | ON | 0 | 1
INPut[1]:IQ:BAALanced[: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?
INST:NSEL 102
INST:NSEL 105
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] GSM
```



```

INSTrument[:SElect] SA | RTSA | SEQAN | EMI | BASIC | WCDMA | EDGE GSM |
WIMAXOFDMA | VSA | PNOISE | NFIGure | ADEMOD | BTooth | TDSCDMA | CDMA2K |
CDMA1XEV | LTE | LTETDD | LTEAFDD | LTEATDD | MSR | DVB | DTMB | DCATV |
ISDBT | CMMB | WLAN | C WLAN | CWIMAXOFDM | WIMAXFIXED | IDEN | RLC |
SCPILC | VSA89601
INSTrument[:SElect]?
INST:SEL EMI
INST:SEL LTE
INST:SEL SCPILC
INST:SEL LTETDD
MEASure:AM[n]?
MEASure:FM[n]?
MEASure:FMSTereo[n]?
MEASure:PM[n]?
MMEMory:CATalog? [<directory_name>]
MMEMory:CDIRectory [<directory_name>]
MMEMory:CDIRectory?
MMEMory:COPY <string>, <string>[, <string>, <string>]
MMEMory:COPY:DEVIce <source_string>, <dest_string>
MMEMory:DATA <file_name>, <data>
MMEMory:DATA? <file_name>
MMEMory:DELeTe <file_name>[, <directory_name>]
MMEMory:LOAD:LIMit LLINE1 | LLINE2 | LLINE3 | LLINE4 | LLINE5 | LLINE6,
<filename>
MMEMory:LOAD:STATe <filename>
MMEMory:LOAD:STATe 1, <filename>
MMEMory:MDIRectory <directory_name>
MMEMory:MOVE <string>, <string>[, <string>, <string>]
MMEMory:RDIRectory <directory_name>
MMEMory:REGister:STATe:LABel <regnumber>, "label"
MMEMory:REGister:STATe:LABel? <regnumber>
MMEMory:STORe:RESults <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>
MMEMory:STORe:TRACe:DATA
MMEMory:STORe:TRACe:DATA
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:AM[n]?

```

### 3 Programming the Analyzer

#### List of SCPI Commands

```

READ:FM[n]?
READ:FMSTereo[n]?
READ:PM[n]?
[:SENSe]:<measurement>:TRIGger:SOURce IF
[:SENSe]:<measurement>:TRIGger:SOURce
[:SENSe]:ACPR:TRIGger:SOURce
[:SENSe]:AM|FM|PM}|FMSTereo:AFSPectrum:BANDwidth <freq>
[:SENSe]:AM|FM|PM:BANDwidth[:RESolution]:AUTO OFF | ON | 0 | 1
[:SENSe]:AM|FM|PM:BANDwidth[:RESolution]:AUTO?
[:SENSe]:AM|FM|PM:BPFilter OFF | CCITT | AWEighting | CWEighting |
CMESsage | CCIR1k | CCIR2k | CUNWeighting
[:SENSe]:AM|FM|PM:BPFilter?
[:SENSe]:AM|FM|PM:DEMod:TIME:AUTO OFF | ON | 0 | 1
[:SENSe]:AM|FM|PM:DEMod:TIME:AUTO?
[:SENSe]:AM|FM|PM|FM:LPFfilter:MANual[:FREQuency] <freq>
[:SENSe]:AM|FM|PM|FM:LPFfilter:MANual[:FREQuency]?
[:SENSe]:AM|FM|PM|FMSTereo:AFSPectrum:BANDwidth?
[:SENSe]:AM|FM|PM|FMSTereo:AFSPectrum:BANDwidth:AUTO OFF | ON | 0 | 1
[:SENSe]:AM|FM|PM|FMSTereo:AFSPectrum:BANDwidth:AUTO?
[:SENSe]:AM|FM|PM|FMSTereo:AFSPectrum:FREQuency:START <freq>
[:SENSe]:AM|FM|PM|FMSTereo:AFSPectrum:FREQuency:START?
[:SENSe]:AM|FM|PM|FMSTereo:AFSPectrum:FREQuency:STOP <freq>
[:SENSe]:AM|FM|PM|FMSTereo:AFSPectrum:FREQuency:STOP?
[:SENSe]:AM|FM|PM|FMSTereo:AVERage:COUNT <integer>
[:SENSe]:AM|FM|PM|FMSTereo:AVERage:COUNT?
[:SENSe]:AM|FM|PM|FMSTereo:AVERage[:STATE] ON | OFF | 1 | 0
[:SENSe]:AM|FM|PM|FMSTereo:AVERage[:STATE]?
[:SENSe]:AM|FM|PM|FMSTereo:BANDwidth:CHANnel <freq>
[:SENSe]:AM|FM|PM|FMSTereo:BANDwidth:CHANnel?
[:SENSe]:AM|FM|PM|FMSTereo:BANDwidth[:RESolution] <freq>
[:SENSe]:AM|FM|PM|FMSTereo:BANDwidth[:RESolution]?
[:SENSe]:AM|FM|PM|FMSTereo:DEMod:TIME <time>
[:SENSe]:AM|FM|PM|FMSTereo:DEMod:TIME?
[:SENSe]:AM|FM|PM|FMSTereo:DWSweep:TIME <time>
[:SENSe]:AM|FM|PM|FMSTereo:DWSweep:TIME?
[:SENSe]:AM|FM|PM|FMSTereo:FREQuency:SPAN <freq>
[:SENSe]:AM|FM|PM|FMSTereo:FREQuency:SPAN?
[:SENSe]:AM|FM|PM|FMSTereo:PERIodic[:STATE] ON | OFF | 1 | 0
[:SENSe]:AM|FM|PM|FMSTereo:PERIodic[:STATE]?
[:SENSe]:AM|FM|PM:HPFilter OFF | HPF20 | HPF50 | HPF300 | HPF400
[:SENSe]:AM|FM|PM:HPFilter?
[:SENSe]:AM|FM|PM:LPFilter OFF | LPF300 | LPF3K | LPF15K | LPF30K | LPF80K
| LPF300K | LPF100K | MANual
[:SENSe]:AM|FM|PM:LPFilter?
[:SENSe]:AUToscale
[: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: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 RF | AIQ | EMIXer
[:SENSE]:FEED AREFERENCE
[:SENSE]:FEED IQ | IONLy | QONLy
[:SENSE]:FEED?
[:SENSE]:FEED?
[:SENSE]:FEED:AREFERENCE REF50 | REF4800 | OFF
[:SENSE]:FEED:AREFERENCE?
[:SENSE]:FEED:IQ:TYPE IQ | IONLy | QONLy
[:SENSE]:FEED:IQ:TYPE?
[:SENSE]:FEED:RF:PORT[:INPut] RFIN | RFIN2 | RFIO1 | RFIO2 | RFIO3 | RFIO4
[:SENSE]:FEED:RF:PORT[:INPut]?
[:SENSE]:FM:ANALog:OUTPut[:SCALe]:ADJust <real>
[:SENSE]:FM:ANALog:OUTPut[:SCALe]:ADJust?
[:SENSE]:FM|FMSTereo:DEEMphasis OFF | US25 | US50 | US75 | US750
[:SENSE]:FM|FMSTereo:DEEMphasis?
[:SENSE]:FM|PM:CARRier:FREQuency:AUTO OFF | ON | 0 | 1
[:SENSE]:FM|PM:CARRier:FREQuency:AUTO?
[:SENSE]:FM:SIGNaling:NOTCh:FREQuency <freq>
[:SENSE]:FM:SIGNaling:NOTCh:FREQuency?
[:SENSE]:FM:SIGNaling:NOTCh[:STATE] ON | OFF | 1 | 0
[:SENSE]:FM:SIGNaling:NOTCh[:STATE]?
[:SENSE]:FMSTereo:BLER:COUNT <real>
[:SENSE]:FMSTereo:BLER:COUNT?
[:SENSE]:FMSTereo:BPFfilter OFF | CCITT | AWAudio
[:SENSE]:FMSTereo:BPFfilter?
[:SENSE]:FMSTereo:HPFilter OFF | HPF20 | HPF50 | HPF300
[:SENSE]:FMSTereo:HPFilter?
[:SENSE]:FMSTereo:LPFfilter OFF | LPF300 | LPF3K | LPF15K | LPF30K | LPF80K
| LPF300K
[:SENSE]:FMSTereo:LPFfilter?
[:SENSE]:FMSTereo:RDEVIation <freq>
[:SENSE]:FMSTereo:RDEVIation?
[:SENSE]:FREQuency:CENTer <freq>
[:SENSE]:FREQuency:CENTer?
[:SENSE]:FREQuency:CENTer:STEP:AUTO OFF | ON | 0 | 1
[:SENSE]:FREQuency:CENTer:STEP:AUTO?

```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
[ :SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>
[ :SENSe]:FREQuency:CENTer:STEP[:INCRement]?
[ :SENSe]:MIXer:BAND A | Q | U | V | W | NA | ND | NE | NF | NG | NJ | NK |
NQ | NU | NV | NW | NY | NEXT | DD | DF | DG | DJ | DK | DQ | DV | DW | DY
| DEXT | MA | ME | MU | MCOAX | USB
[ :SENSe]:MIXer:BAND?
[ :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]:MIXer:HARMonic <integer>
[ :SENSe]:MIXer:HARMonic?
[ :SENSe]:MIXer:LODoubler ON | OFF | 0 | 1
[ :SENSe]:MIXer:LODoubler?
[ :SENSe]:MIXer:TTYpe SINGLE | HARMonic | DOUBLer
[ :SENSe]:MIXer:TTYpe?
[ :SENSe]:PM:CARRier:PHASe:AUTO OFF | ON | 0 | 1
[ :SENSe]:PM:CARRier:PHASe:AUTO?
[ :SENSe]:PM:UNIT:POWer RADian | DEGree
[ :SENSe]:PM:UNIT:POWer?
[ :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]:MW:PATH STD | LNPath | MPBypass | FULL
[ :SENSe]:POWer[:RF]:MW:PATH?
[ :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 | PULSe
[ :SENSe]:ROSCillator:SOURce:TYpe?
[ :SENSe]:SIDentify:MODE ISUPpress | ISHift
[ :SENSe]:SIDentify:MODE?
[ :SENSe]:SIDentify[:STATe] OFF | ON | 0 | 1
[ :SENSe]:SIDentify[:STATe]?
[ :SENSe]:SPEaker[:STATe] ON | OFF | 1 | 0
[ :SENSe]:SPEaker[:STATe]?
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 <integer>
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 <integer>
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]:ADDRes <integer>
SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRes?
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:VMEMory[:AVAILable]?
SYSTEM:PON:APPLication:VMEMory:TOTAL?
SYSTEM:PON:APPLication:VMEMory:USED?
SYSTEM:PON:APPLication:VMEMory:USED:NAME? <INSTrument:SElectname>
SYSTEM:PON:ETIME?
SYSTEM:PON:MODE SA | BASIC | ADEMOD | 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 | ERRor | SYSTem | HARDWare | LXI | HWSTATistics |
ALIGNment | SOFTWare | CAPPLication

```

### 3 Programming the Analyzer

#### List of SCPI Commands

```
SYSTem:SHOW?
SYSTem:TEMPerature:HEXTreme?
SYSTem:TEMPerature:LEXTreme?
SYSTem:TIME "<hour>, <minute>, <second>"
SYSTem:TIME?
SYSTem:VERSion?
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]:ATRigger <time>
TRIGger[:SEQuence]:ATRigger?
TRIGger[:SEQuence]:ATRigger:STATe OFF | ON | 0 | 1
TRIGger[:SEQuence]:ATRigger:STATe?
TRIGger[:SEQuence]:EXTernal2:DELay <time>
TRIGger[:SEQuence]:EXTernal:DELay
TRIGger[:SEQuence]:EXTernal1:DELay <time>
TRIGger[:SEQuence]:EXTernal2:DELay?
TRIGger[:SEQuence]:EXTernal1:DELay?
TRIGger[:SEQuence]:EXTernal2:DELay:STATe OFF | ON | 0 | 1
TRIGger[:SEQuence]:EXTernal1:DELay:STATe OFF | ON | 0 | 1
TRIGger[:SEQuence]:EXTernal2:DELay:STATe?
TRIGger[:SEQuence]:EXTernal1:DELay:STATe?
TRIGger[:SEQuence]:EXTernal2:LEVel
TRIGger[:SEQuence]:EXTernal1:LEVel <level>
TRIGger[:SEQuence]:EXTernal:LEVel
TRIGger[:SEQuence]:EXTernal2:LEVel?
TRIGger[:SEQuence]:EXTernal1:LEVel?
TRIGger[:SEQuence]:EXTernal:SLOPe
TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive | NEGative
TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive | NEGative
TRIGger[:SEQuence]:EXTernal2:SLOPe?
TRIGger[:SEQuence]:EXTernal1: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:EXTernal2:LEVel
TRIGger[:SEQuence]:FRAME:EXTernal1:LEVel
TRIGger[:SEQuence]:FRAME:EXTernal2:SLOPe
TRIGger[:SEQuence]:FRAME:EXTernal1: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:RFBurst:LEVel:ABSolute
TRIGger[:SEquence]:FRAMe:RFBurst:SLOPe
TRIGger[:SEquence]:FRAMe:SYNC EXTernal
TRIGger[:SEquence]:FRAMe:SYNC EXTernal1 | EXTernal2 | RFBurst | 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]: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]:SOURCe EXTernal
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?

```

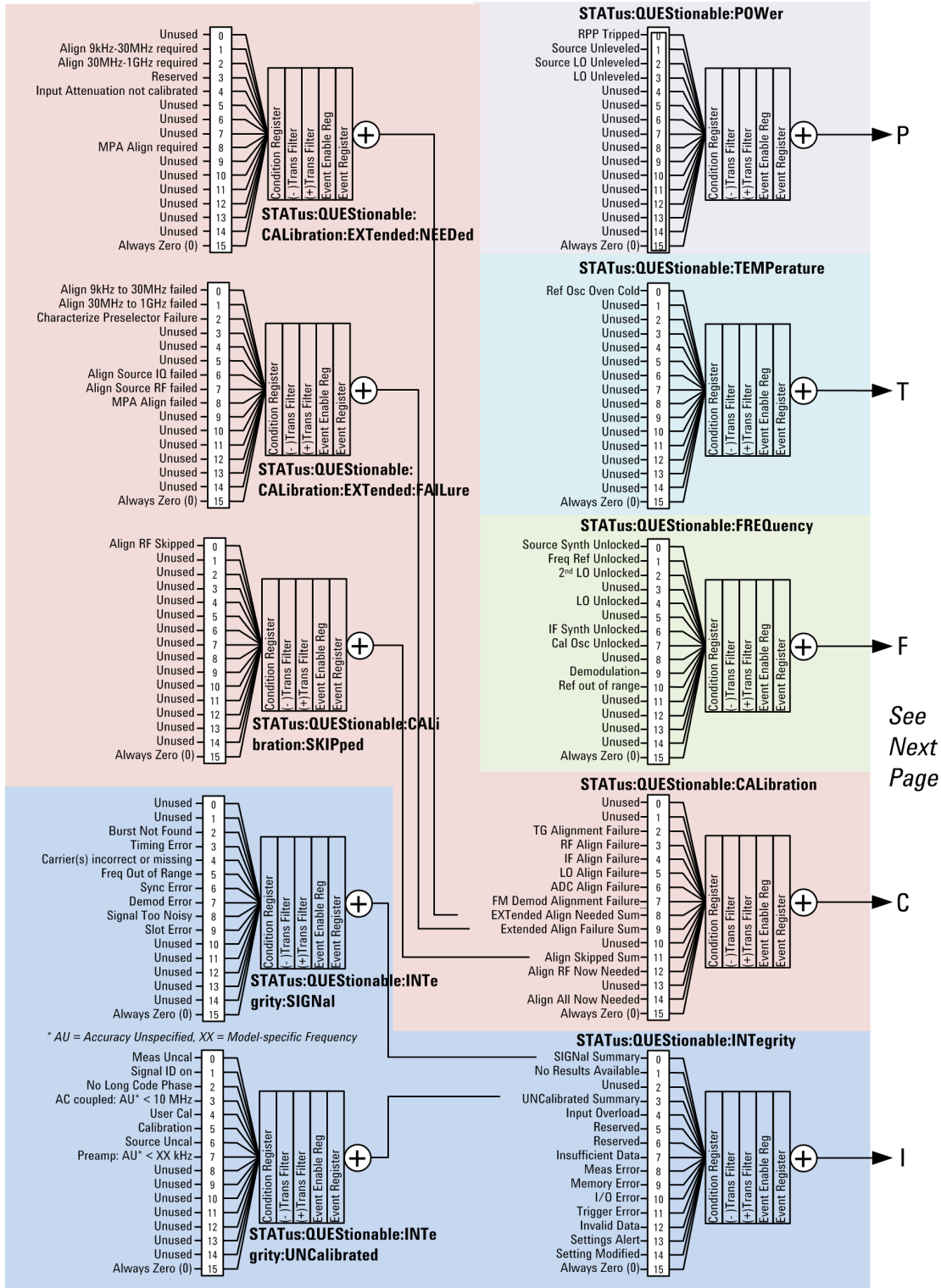
## STATus Subsystem

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 75](#)
- ["X-Series Status Register System \(2\) " on page 76](#)

X-Series Status Register System (1)

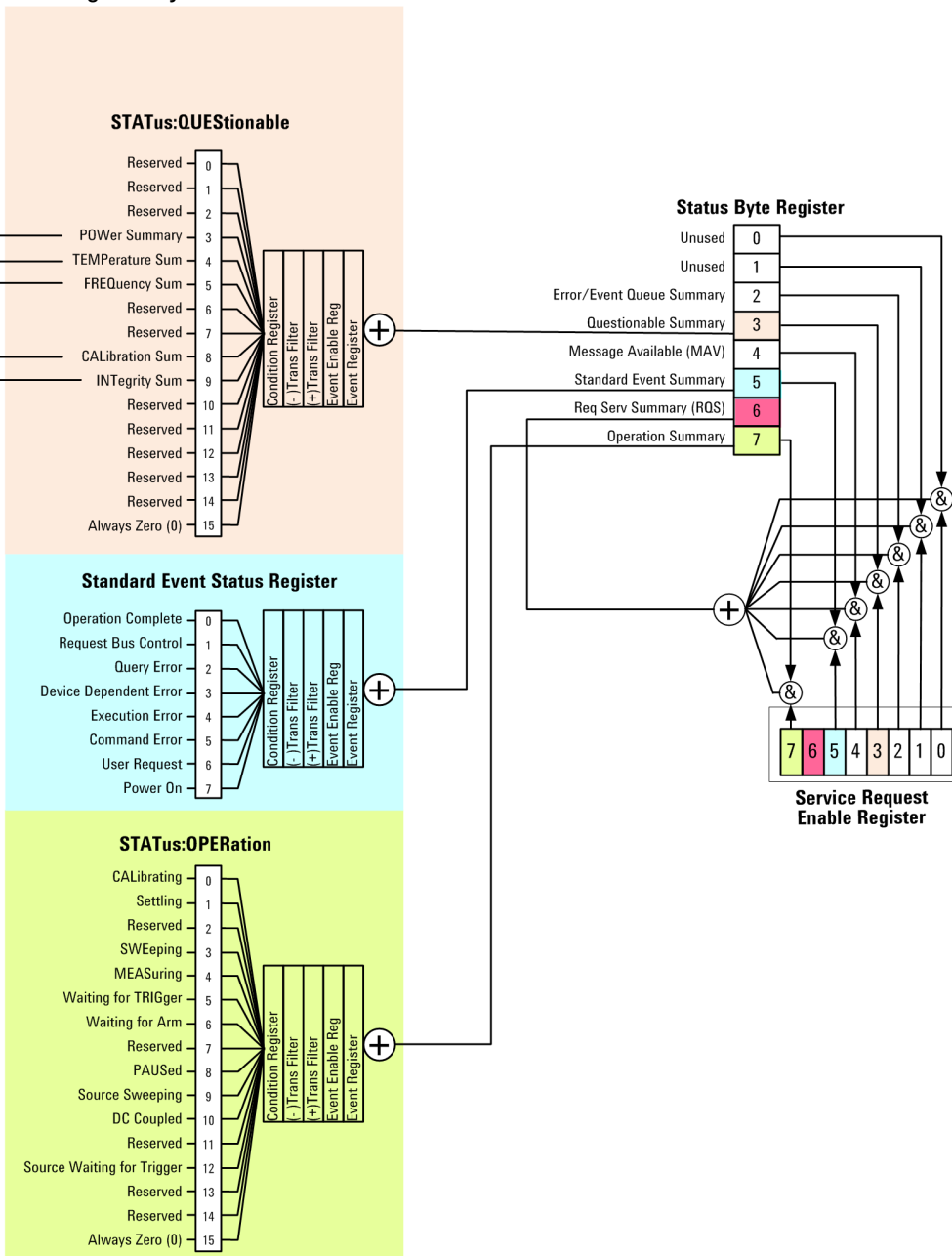


See  
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Page

### X-Series Status Register System (2)

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### Detailed Description

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

**NOTE**

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

## What Are Status Registers

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

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

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

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

1. The summary outputs from the six STATus:QUEStionable:<keyword> detail registers are inputs to the STATus:QUEStionable register.
2. The summary output from the STATus:QUEStionable register is an input to the Status Byte Register. See the overall system in Figure at the beginning of this section.

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

## What Are Status Register SCPI Commands

Most monitoring of the instrument conditions is done at the highest level using the IEEE common commands indicated below. Complete command descriptions are available in the IEEE commands section at the beginning of the language reference. Individual status registers can be set and queried using the commands in the STATus subsystem of the language reference.

- \*CLS (clear status) clears the status byte by emptying the error queue and clearing all the event registers.
- \*ESE, \*ESE? (event status enable) sets and queries the bits in the enable register part of the standard event status register.
- \*ESR? (event status register) queries and clears the event register part of the standard event status register.

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

### How to Use the Status Registers

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

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

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

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

Use the SRQ method when:

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

Use polling when:

- your programming language/development environment does not support SRQ interrupts
- you want to write a simple, single-purpose program and don't want the added complexity of setting up an SRQ handler
- To monitor a condition:
  - a. Determine which register contains the bit that reports the condition.
  - b. Send the unique SCPI query that reads that register.
  - c. Examine the bit to see if the condition has changed.

You can monitor conditions in different ways.

- Check the current instrument hardware and firmware status.

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

- Monitor a particular condition (bit).

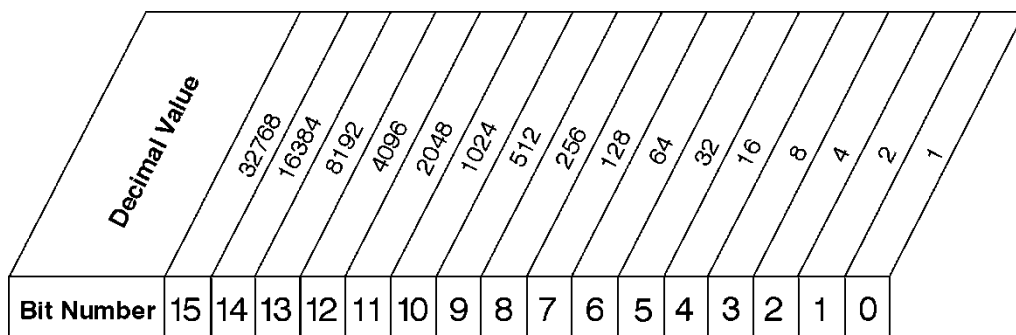
You can enable a particular bit(s), using the event enable register. The instrument will then monitor that particular condition(s). If the bit becomes true (0 to 1 transition) in the event register, it will stay set until the event register is cleared. Querying the event register allows you to detect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

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

### Using a Status Register

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

Figure: Status Register Bit Values



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 whose 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.

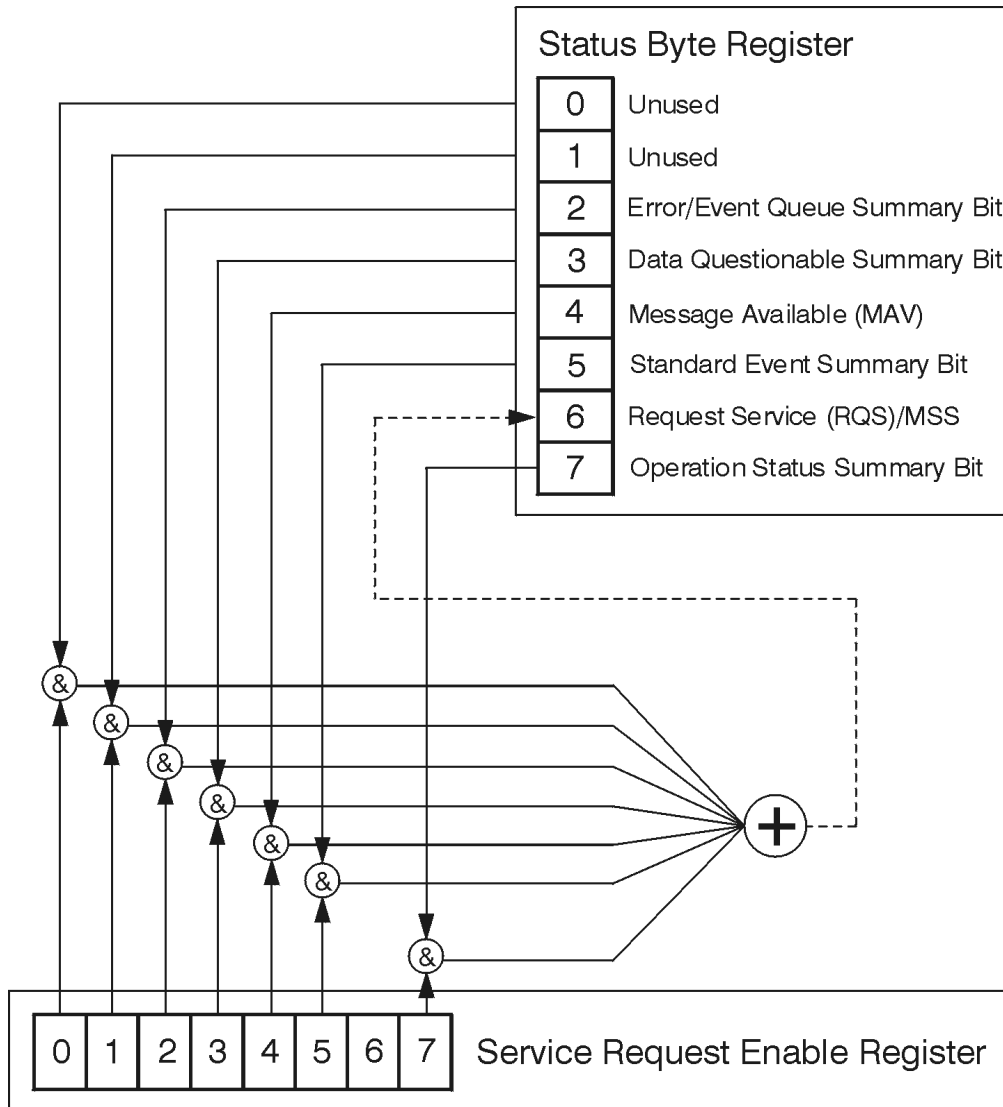
If the status register is configured to SRQ on end-of-measurement and the measurement is in continuous mode, then restarting a measurement (INIT command) can cause the measuring bit to pulse low. This causes an SRQ when you have not actually reached the "end-of-measurement" condition. To avoid this:

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.

	<b>Description</b>								
	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	
<b>Bit Number</b>	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.

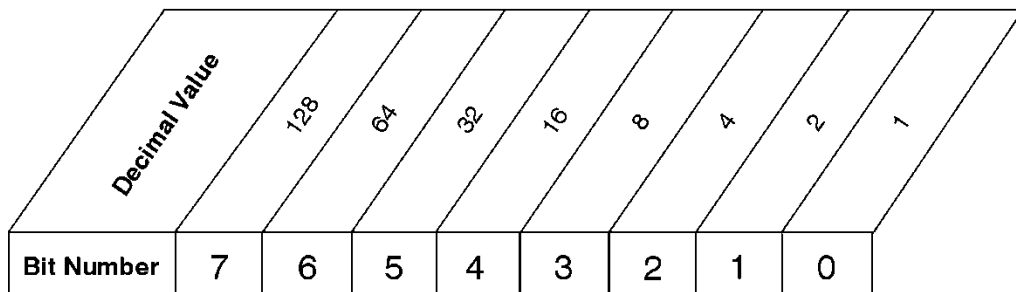
To query the status byte register, send the command \*STB?. The response will be the decimal sum of the bits which are set to 1. For example, if bit number 7 and bit number 3 are set to 1, the decimal sum of the 2 bits is 128 plus 8. So the decimal value 136 is returned. The \*STB command does not clear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

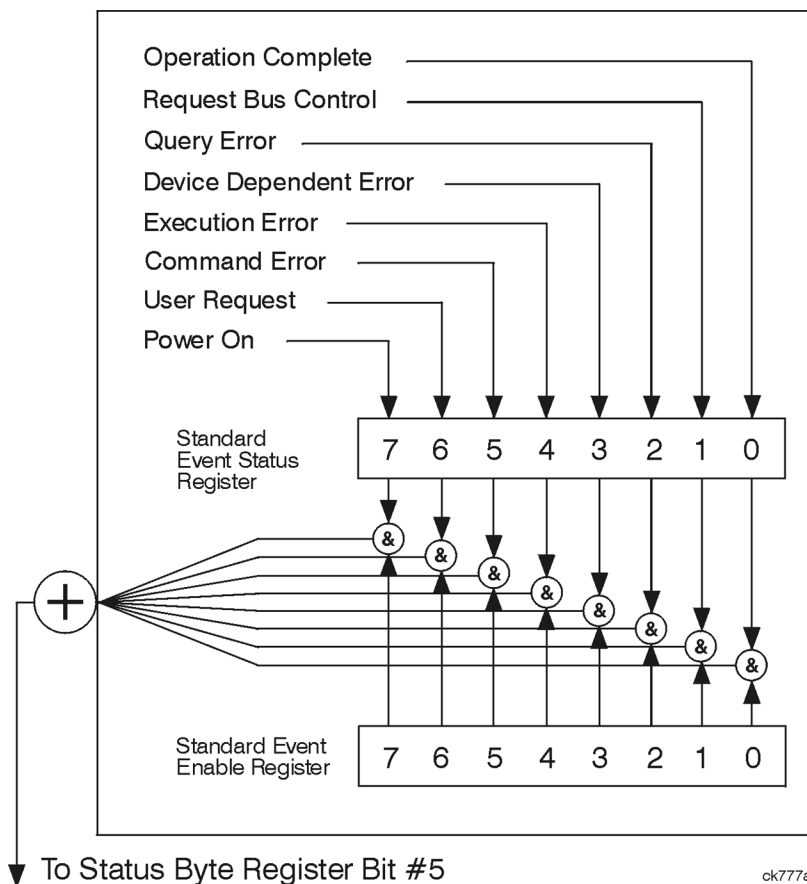


\*SRE <num>  
 \*SRE?

**Service Request Enable Register**

ck726a

**Standard Event Status Register**



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The standard event status register contains the following bits:

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

\*ESR?

### Standard Event Status Register

ck727a

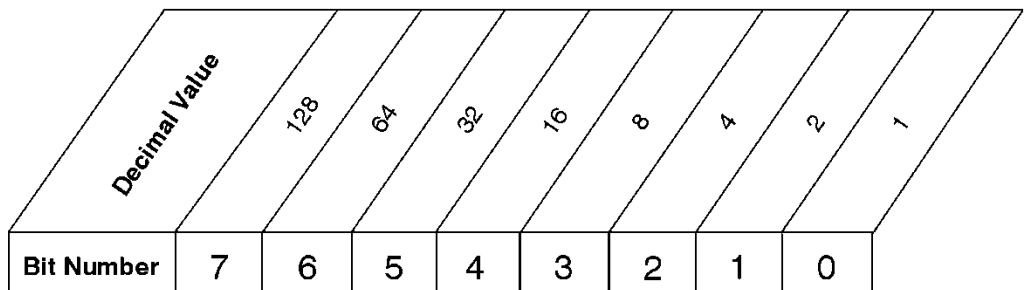
Bit	Description
0	A 1 in this bit position indicates that all pending operations were completed following execution of the *OPC command.
1	This bit is for GPIB handshaking to request control. Currently it is set to 0 because there are no implementations where the spectrum analyzer controls another instrument.
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).



\*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 unlevelled 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, 111111111111111) See the SCPI Basics information about using bit patterns for variable parameters.

### Operation Register

"Operation Condition Query" on page 87

"Operation Enable" on page 88

"Operation Event Query" on page 88

"Operation Negative Transition" on page 88

"Operation Positive Transition" on page 89

### 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.

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

## Questionable Register

"Questionable Condition " on page 90

"Questionable Enable " on page 90

"Questionable Event Query " on page 91

"Questionable Negative Transition " on page 91

"Questionable Positive Transition" on page 91

### Questionable Condition

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

**NOTE**

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

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

### Questionable Enable

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

**NOTE**

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

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

## Questionable Event Query

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

**NOTE**

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

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

## Questionable Negative Transition

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

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

## Questionable Positive Transition

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

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

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

### Questionable Calibration Register

"Questionable Calibration Condition " on page 92

"Questionable Calibration Enable " on page 92

"Questionable Calibration Event Query " on page 93

"Questionable Calibration Negative Transition " on page 93

"Questionable Calibration Positive Transition " on page 94

### 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 " on page 94

"Questionable Calibration Skipped Enable " on page 95

"Questionable Calibration Skipped Event Query " on page 95

"Questionable Calibration Skipped Negative Transition " on page 96

"Questionable Calibration Skipped Positive Transition " on page 96

### 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 " on page 97
- "Questionable Calibration Extended Failure Enable " on page 97
- "Questionable Calibration Extended Failure Event Query " on page 97
- "Questionable Calibration Extended Failure Negative Transition " on page 98



"Questionable Calibration Extended Failure Positive Transition " on page 98

### 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 " on page 99

"Questionable Calibration Extended Needed Enable " on page 99

"Questionable Calibration Extended Needed Event Query " on page 100

"Questionable Calibration Extended Needed Negative Transition " on page 100

"Questionable Calibration Extended Needed Positive Transition " on page 101

### 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 " on page 101

"Questionable Frequency Enable " on page 102

"Questionable Frequency Event Query " on page 102

"Questionable Frequency Negative Transition " on page 102

"Questionable Frequency Positive Transition " on page 103

### 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 " on page 103

"Questionable Integrity Enable " on page 104

"Questionable Integrity Event Query " on page 104

"Questionable Integrity Negative Transition " on page 105

"Questionable Integrity Positive Transition " on page 105

### Questionable Integrity Condition

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

**NOTE**

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

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

### Questionable Integrity Enable

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

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

### Questionable Integrity Event Query

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

**NOTE**

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

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



### Questionable Integrity Negative Transition

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

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

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

### Questionable Integrity Positive Transition

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

Mode	All
<b>Remote Command</b>	: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

### Questionable Integrity Signal Register

"Questionable Integrity Signal Condition" on page 106

"Questionable Integrity Signal Enable" on page 106

"Questionable Integrity Signal Event Query" on page 107

"Questionable Integrity Signal Negative Transition" on page 107

"Questionable Integrity Signal Positive Transition" on page 107

### Questionable Integrity Signal Condition

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

**NOTE**

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

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

### Questionable Integrity Signal Enable

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

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

### Questionable Integrity Signal Event Query

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

**NOTE**

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

Mode	All
<b>Remote Command</b>	:STATus:QUESTionable:INTEgrity:SIGNal[:EVENT]?
<b>Example</b>	STAT:QUES:INT:SIGN?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

### Questionable Integrity Signal Negative Transition

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

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

### Questionable Integrity Signal Positive Transition

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

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

### Questionable Integrity Uncalibrated Register

"Questionable Integrity Uncalibrated Condition " on page 108

"Questionable Integrity Uncalibrated Enable " on page 108

"Questionable Integrity Uncalibrated Event Query " on page 109

"Questionable Integrity Uncalibrated Negative Transition " on page 109

"Questionable Integrity Uncalibrated Positive Transition " on page 110

### Questionable Integrity Uncalibrated Condition

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

**NOTE**

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

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

### Questionable Integrity Uncalibrated Enable

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

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

### Questionable Integrity Uncalibrated Event Query

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

#### NOTE

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

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

### Questionable Integrity Uncalibrated Negative Transition

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

Mode	All
<b>Remote Command</b>	:STATus:QUEStionable:INTEgrity:UNCalibrated:NTRansition <integer> :STATus:QUEStionable:INTEgrity:UNCalibrated:NTRansition?
<b>Example</b>	STAT:QUES:INT:UNC:NTR 1 Oversweep cleared will be reported to the Integrity Summary of the Status Questionable register.

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

### Questionable Integrity Uncalibrated Positive Transition

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

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

### Questionable Power Register

"Questionable Power Condition " on page 110

"Questionable Power Enable " on page 111

"Questionable Power Event Query " on page 111

"Questionable Power Negative Transition " on page 112

"Questionable Power Positive Transition " on page 112

### 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" on page 113



"Questionable Temperature Enable" on page 113

"Questionable Temperature Event Query" on page 113

"Questionable Temperature Negative Transition" on page 114

"Questionable Temperature Positive Transition" on page 114

### 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

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## IEEE 488.2 Common Commands

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

Command	Description
*CAL?	Align Now "All " on page 264
*CLS	"Clear Status " on page 118
*ESE	"Standard Event Status Enable " on page 118
*ESE?	
*ESR?	"Standard Event Status Register Query " on page 119
*IDN?	"Identification Query " on page 119
*OPC	"Operation Complete " on page 120
*OPC?	
*OPT?	"Query Instrument Options " on page 121
*RCL	"Recall Instrument State " on page 121
*RST	"*RST (Remote Command Only)" on page 122
*SAV	"Save Instrument State " on page 122
*SRE	"Service Request Enable " on page 122
*SRE?	
*STB?	"Status Byte Query " on page 123
*TRG	"Trigger " on page 123
*TST?	"Self Test Query " on page 123
*WAI	"Wait-to-Continue " on page 124

### 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.

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

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

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

## Clear Status

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

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

## Standard Event Status Enable

Selects the desired bits from the standard event status enable register. This register monitors I/O errors and synchronization conditions such as operation complete, request control, query error, device

dependent error, status execution error, command error, and power on. The selected bits are OR'd to become a summary bit (bit 5) in the byte register which can be queried.

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

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

## Standard Event Status Register Query

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

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

## Identification Query

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

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

- Manufacturer

- Model
- Serial number
- Firmware version

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

### Operation Complete

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

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

Remote Command	*OPC *OPC?
Example	INIT:CONT 0 Selects single sweeping. INIT:IMM Initiates a sweep. *OPC? Holds off any further commands until the sweep is complete.
Status Bits/OPC dependencies	Not global to all remote ports or front panel. *OPC only considers operation that was initiated on the same port as the *OPC command was issued from. *OPC is an overlapped command, but *OPC? is sequential.
Backwards Compatibility Notes	<ol style="list-style-type: none"> <li>1. The ESA/PSA/VSA products do not meet all the requirements for the *OPC command specified by IEEE 488.2. This is corrected for X-Series. This will sometimes cause behavior that is not backward compatible, but it will work as customers expect.</li> <li>2. Commands such as, *OPC/*OPC?/*WAI/*RST used to be global. They considered front panel operation in conjunction with the GPIB functionality. Now they are evaluated on a per channel basis. That is, the various rear panel remote ports and the front panel i/o are all considered separately. Only the functionality initiated on the port where the *OPC was sent, is considered for its operation.</li> <li>3. *OPC used to hold off until the operation bits were cleared. Now it holds off until all overlapping commands are completed. Also, earlier instruments did not wait for completion of all processes, only the ones identified here (in the STATus:OPERation register): Calibrating: monitored by PSA, ESA, VSA (E4406A) Sweeping: monitored by PSA, ESA, VSA (E4406A) Waiting for Trigger: monitored by PSA, ESA, VSA (E4406A)</li> </ol>



	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.

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

## Recall Instrument State

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

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

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

### \*RST (Remote Command Only)

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

<b>Remote Command</b>	*RST
<b>Example</b>	*RST
<b>Notes</b>	Sequential Clears all pending OPC bits and the Status Byte is set to 0.
<b>Couplings</b>	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.
<b>Backwards Compatibility Notes</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

### Save Instrument State

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

<b>Remote Command</b>	*SAV <register #>
<b>Example</b>	*SAV 9 Saves the instrument state in register 9.
<b>Notes</b>	Registers 0 through 6 are accessible from the front panel in menu keys for Save Registers.
<b>Min</b>	0
<b>Max</b>	127
<b>Status Bits/OPC dependencies</b>	The command is sequential.
<b>Initial S/W Revision</b>	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]? commands.
Preset	0
Min	0
Max	255
Status Bits/OPC dependencies	Service Request Enable Register (all bits, 0 - 7).
Initial S/W Revision	Prior to A.02.00

## Status Byte Query

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

<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.
<b>Status Bits/OPC dependencies</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

## 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 127](#)

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>
<b>Couplings</b>	The <code>[ :SENSe ] :FEED RF</code> command turns the calibrator OFF
<b>Preset</b>	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"
<b>State Saved</b>	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 <code>:FEED</code> 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> The parameters <code>IQ   IONLy   QONLy</code> are supported for backwards compatibility with the E44406A. <code>[ :SENSe ] :FEED IQ</code> aliases to <code>[ :SENSe ] :FEED :IQ :TYPE IQ</code> <code>[ :SENSe ] :FEED IONLy</code> aliases to <code>[ :SENSe ] :FEED :IQ :TYPE IONLy</code>

	<p>[;SENSe]:FEED QONLy aliases to [;SENSe]:FEED:IQ:TYPE QONLy</p> <p>The query [;SENSe]:FEED? will always returns 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>	<p>:INPut:MIXer EXTernal INTernal</p> <p>:INPut:MIXer?</p>
<b>Example</b>	<p>INP:MIX INT</p> <p>INP:MIX?</p>
Notes	<p>In legacy analyzers you choose between the Internal mixer or an External Mixer. In the X-Series, the External Mixer is one of the choices for the Input and is selected using the FEED command (:SENSe:FEED EXTMIxer).</p> <p>For compatibility, the INPut:MIXer EXTernal INTernal legacy command is mapped as follows:</p> <ol style="list-style-type: none"> <li>1. When INPut:MIXer EXTernal is received, SENSe:FEED EMIXer is executed.</li> <li>2. When INPut:MIXer INTernal is received, SENSe:FEED RF is executed.</li> <li>3. When INPut:MIXer? is received, the response will be INT if any input other than the external mixer is selected and EXT if the external mixer is selected</li> </ol>
Preset	INT
Backwards Compatibility Notes	<p>PSA supports the following SCPI Command :</p> <p>:INPut:MIXer:TYPE PRESelected 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
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Input to automatically switch to the RF Input. If the RF Calibrator is on, it is turned off. Subsequently disconnecting the USB Preamp from USB does not change the Input selection nor restore the previous selection.
Readback	The RF input port, RF coupling, and current input impedance settings appear on this key as: "XX, YY, ZZ" where XX is RF, RF2, RFIO1, RFIO2, depending on what input is selected (only appears on analyzers with multiple RF inputs) YY is AC or DC ZZ is 50Ω or 75Ω
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Input Z Correction

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

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



Key Path	Input/Output, RF Input
Remote Command	[ :SENSe ] :CORRection:IMPedance [ :INPut ] [ :MAGNitude ] 50   75 [ :SENSe ] :CORRection:IMPedance [ :INPut ] [ :MAGNitude ] ?
Example	CORR:IMP 75 sets the input impedance correction to 75 ohms. CORR:IMP?
Couplings	In the N9000A option C75, when RF Input 2 is selected, the Input Z Correction will automatically change to 75 ohms. You may then change it to whatever is desired. When the main RF Input is selected, the Input Z Correction will automatically change to 50 ohms. You may then change it to whatever is desired.
Preset	This is unaffected by a Preset but is set to 50 ohms on a "Restore Input/Output Defaults" or "Restore System Defaults->All" Some instruments/options may have 75 ohms available.
State Saved	Saved in instrument state
Readback	50 $\Omega$ or 75 $\Omega$ . Current setting reads back to the RF key.
Initial S/W Revision	Prior to A.02.00

## RF Coupling

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

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

X-Series Model	Lowest Freq for meeting specs when AC coupled	Lowest Freq for meeting specs when DC coupled
N9000A-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).

<b>Key Path</b>	Input/Output, RF Input
<b>Remote Command</b>	:INPut:COUPling AC DC :INPut:COUPling?
<b>Example</b>	INP:COUP DC
<b>Dependencies</b>	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.
<b>Preset</b>	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.
<b>State Saved</b>	Saved in instrument state.
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.03.00

## RF Input Port

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

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

<b>Key Path</b>	Input/Output, RF Input
<b>Remote Command</b>	[ :SENSe ] :FEED:RF:PORT [ :INPut ] RFIN   RFIN2   RFIO1   RFIO2   RFIO3   RFIO4  [ :SENSe ] :FEED:RF:PORT [ :INPut ] ?
<b>Example</b>	:FEED:RF:PORT RFIN
<b>Dependencies</b>	This key only appears in models that support multiple inputs. If the SCPI command is sent with unsupported parameters in any other model, an error is generated, -221.1900, "Settings conflict;option not installed"  When any input is selected in a measurement that does not support it, the "No result; Meas invalid with this input" error condition occurs, and the measurement returns invalid data when queried.
<b>Preset</b>	This is unaffected by Mode Preset but is set to RF on a "Restore Input/Output Defaults" or "Restore System Defaults -> All"
<b>State Saved</b>	Saved in instrument state
<b>Readback</b>	The current RF Input Port selected is read back to this key
<b>Backwards</b>	INPut<1 2>:TYPE INPUT1   INPUT2

<b>Compatibility SCPI</b>	INPut<1   2>:TYPE?
	Included for R&S ESU compatibility. In the MXE, the INPUT1 parameter is aliased to RFIN and the INPUT2 parameter is aliased to RFIN2
Initial S/W Revision	A.05.01
Modified at S/W Revision	A.14.00

## RF Input

Specifies using the main RF port for the current measurement

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

## RF Input 2

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

See "[More Information](#)" on page 131

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

## More Information

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

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

## 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.

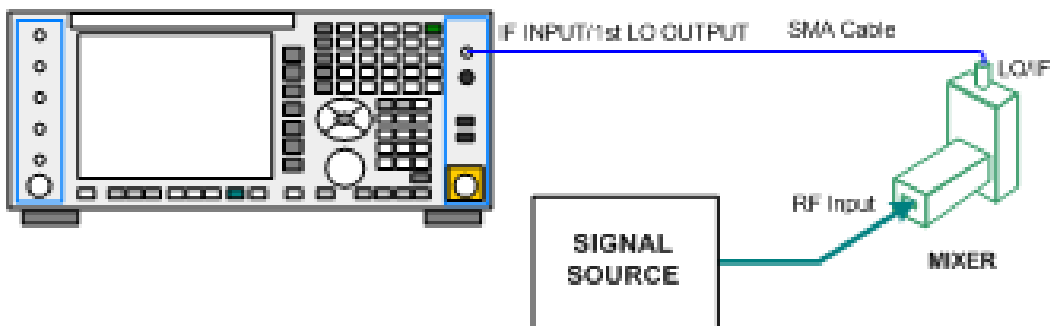
See ["More Information" on page 133](#)

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

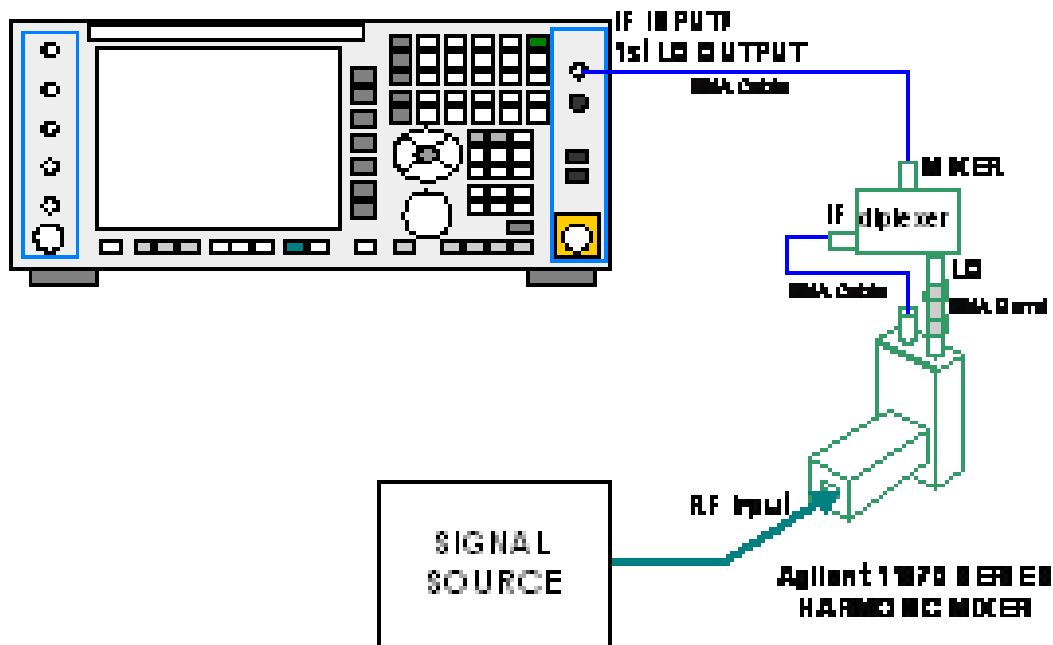
### More Information

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.



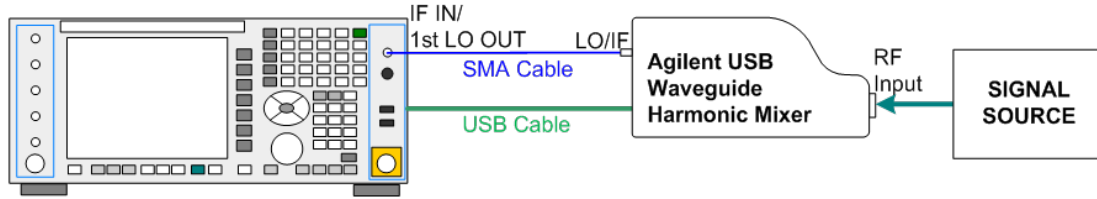
Legacy HP/Agilent and some third party mixers have separate LO In and IF out connections. This requires you to use an external diplexer to connect these mixers. A diplexer can easily be purchased for this purpose (for example, Diplexer Model # DPL.26 or # DPL.313B from OML Inc., Morgan Hill CA)

The connection diagram for such a legacy mixer is:



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
Log Plot		Y
Spot Frequency		N
Waveform		N
I/Q Analyzer	Complex Spectrum	N
	Waveform	N
Vector Signal Analyzer	Vector Analysis	N
	Analog Demod	N
	Digital Demod	N

\* the Swept SA measurement also supports Image Shift

## Ext Mix Setup

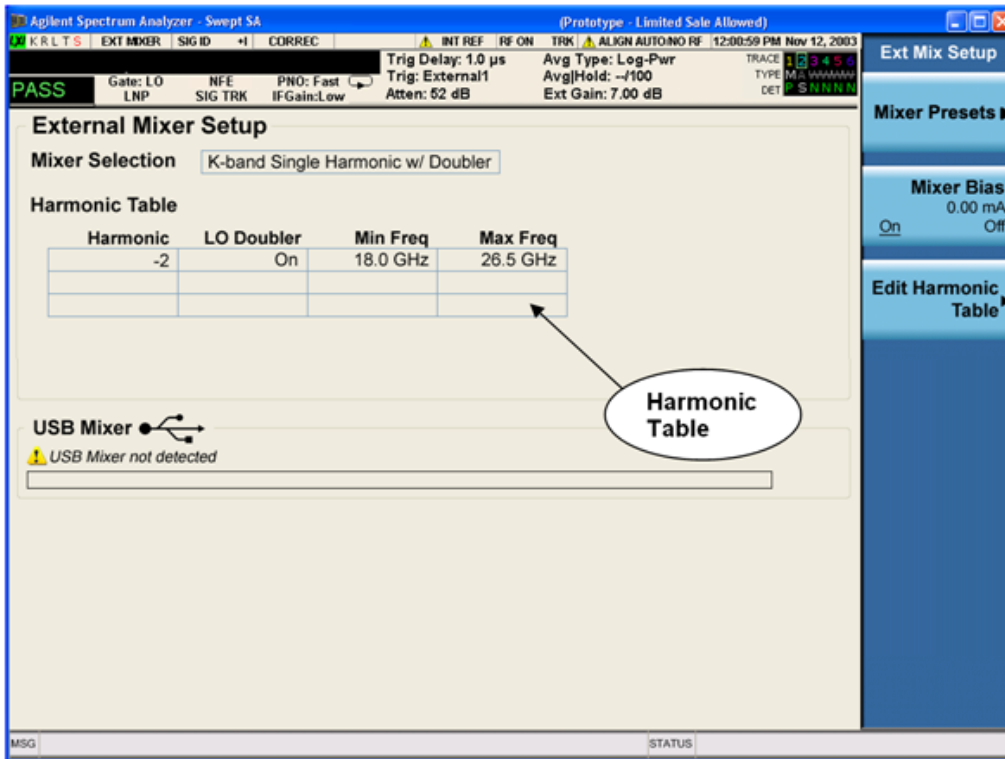
This menu lets you select the mixer type, and lets you configure your mixer (if necessary). While in this menu, and any of its submenus, the External Mixer Setup screen appears, showing you the current settings for the selected mixer. These settings may be dependent on which IF path is currently in use,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

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

### NOTE

The 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



The External Mixer Setup screen looks like this

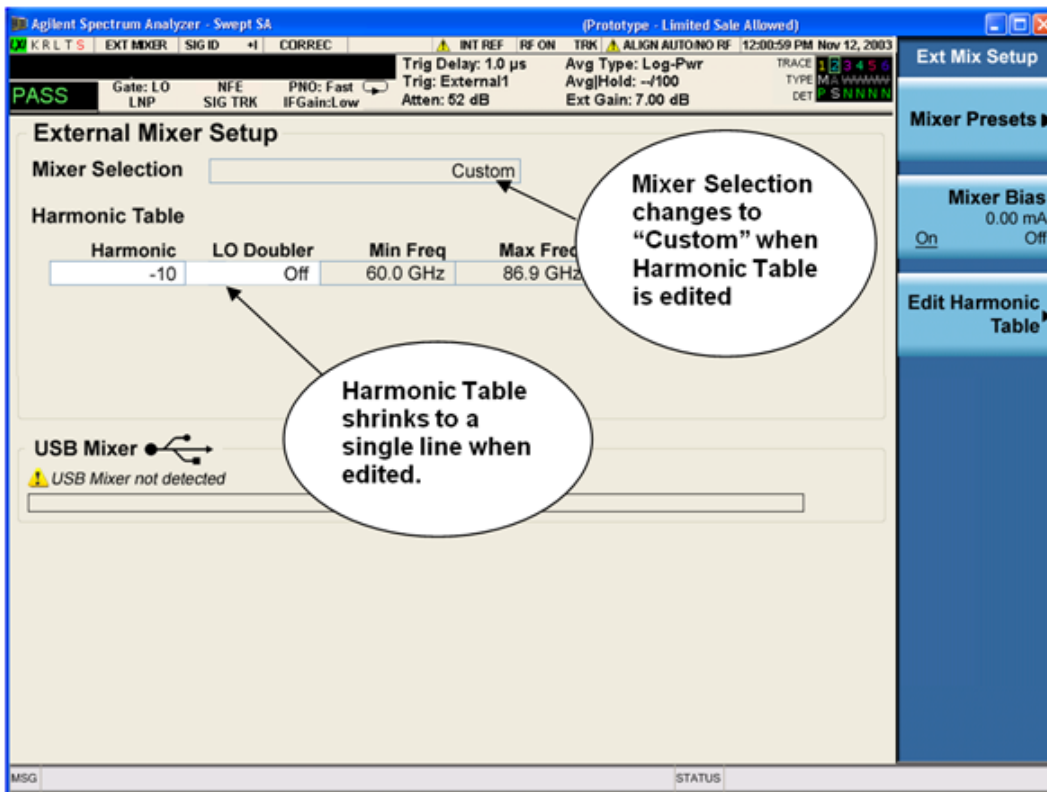
The current Mixer selection (the current or most recently connected USB Mixer, or the most recent Mixer Preset, or “Custom” if the user has modified the setup) reads out at the top of this screen.

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.

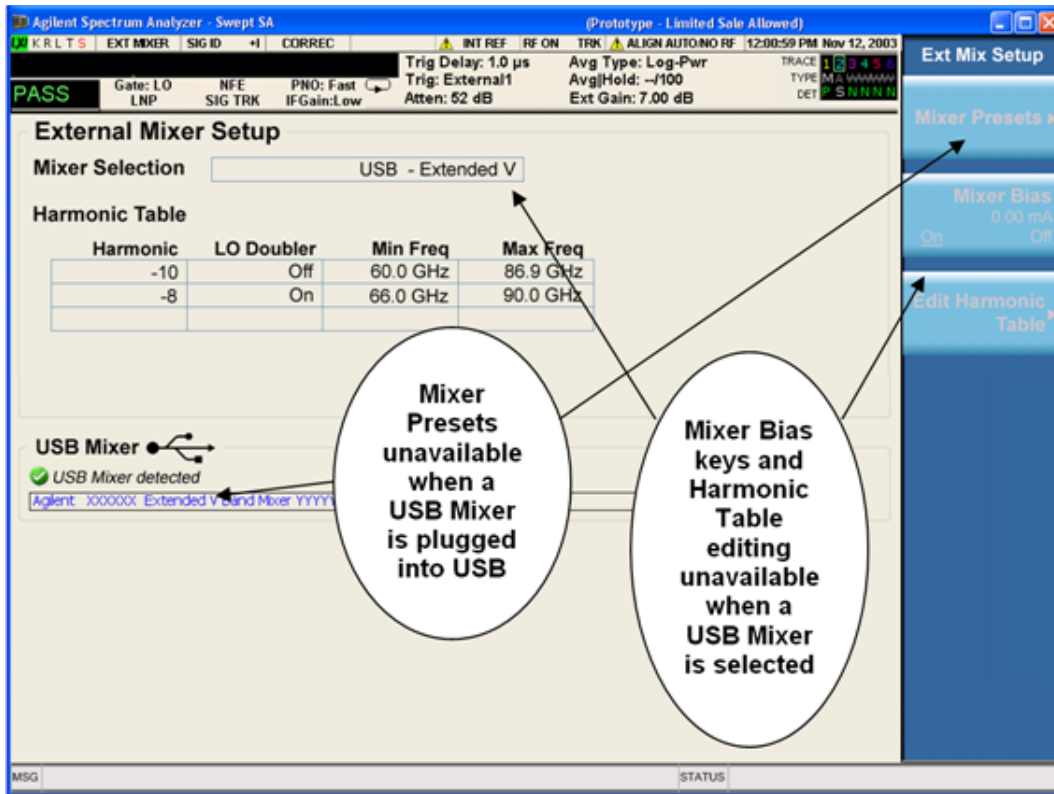
The analyzer supports the Agilent M1970 Series Harmonic Mixers with USB connection. While in External Mixing, if one of these mixers is plugged in to a USB port, it is automatically detected and displayed in the “USB Mixer” area of the setup screen, including its model number and serial number.

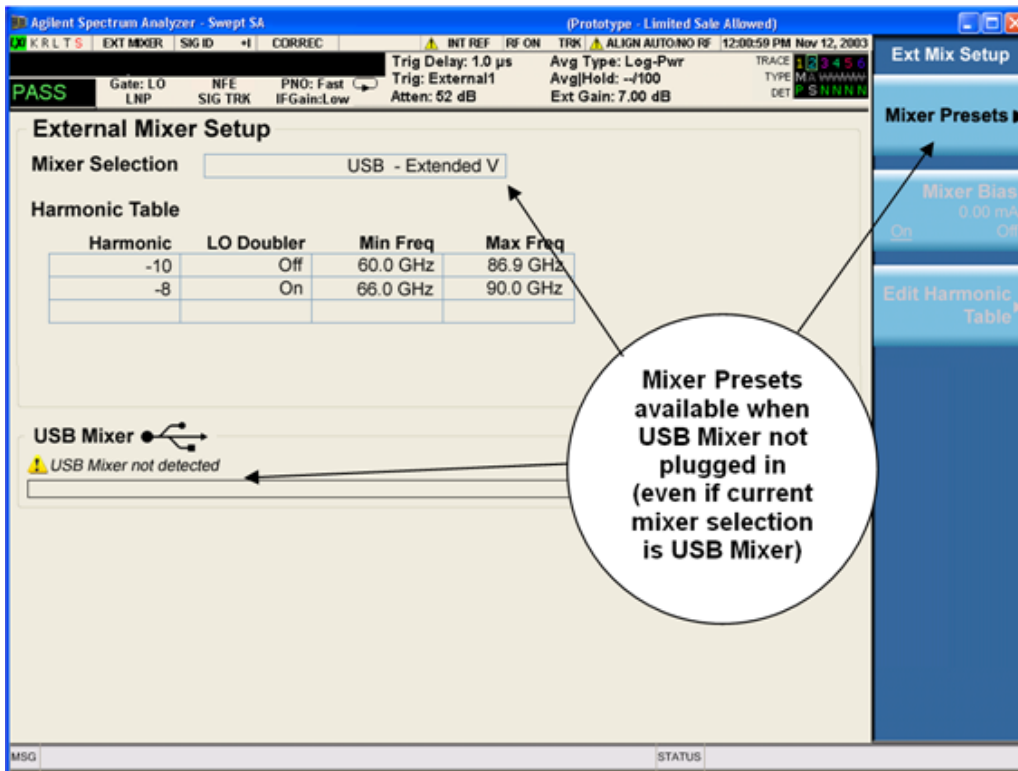
The analyzer assumes that if you plug a mixer into the USB, that is the mixer you want to use. Therefore:

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 Waveguide Harmonic Mixer	USB - M1970E E-Band	USB Mixer E-Band
Agilent M1970V Option 001: 50 to 75 GHz Waveguide Harmonic Mixer	USB - M1970V-001 V-Band	USB Mixer V-Band
Agilent M1970V Option 002: 50 to 80 GHz Waveguide Harmonic Mixer	USB - M1970V-002 Extended V-Band	USB Mixer Extended V
Agilent M1970W: 75 to 110 GHz Waveguide Harmonic Mixer	USB - M1970W W-Band	USB 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>	[:SENSe]:MIXer:BAND A   Q   U   V   W   NA   ND   NE   NF   NG   NJ   NK   NQ   NU   NV   NW   NY   NEXT   DD   DF   DG   DJ   DK   DQ   DV   DW   DY   DEXT   MA   ME   MU   MCOAX   USB  [:SENSe]:MIXer:BAND?
<b>Example</b>	:MIX:BAND A :MIX:BAND?
<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 command USB will refresh the USB mixer connection and automatically detect the mixer band. The query form of this command returns the following if an Agilent USB Mixer is plugged into the analyzer’s USB port: USB E Agilent E-Band USB Mixer USB V Agilent V-Band USB Mixer USB VEXT Agilent Extended V-Band USB Mixer USB W Agilent W-Band USB Mixer Note that the parameters CUSTOM, USB V, USB VEXT, and USB W are query responses only, and cannot be sent TO the analyzer.

	<p>The following cross-reference matches the mixer band designators used by Agilent to the EIA waveguide designations:</p> <p>EIAAgilentFreq Range</p> <p>WR-28 A26.5 – 40 GHz</p> <p>WR-22 Q33 – 50 GHz</p> <p>WR-19 U40 – 60 GHz</p> <p>WR-15 V50 – 75 GHz</p> <p>WR-12 E60 – 90 GHz</p> <p>WR-10 W75 – 110 GHz</p> <p>WR-8 F90 – 140 GHz</p> <p>WR-6 D110 – 170 GHz</p> <p>WR-5 G140 – 220 GHz</p> <p>WR-3 J220 – 325 GHz</p>
Preset	<p>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.</p> <p>When using Agilent USB Mixers, if a Restore All Defaults (SCPI command SYSTem:DEFault) has been performed, either remove and reinsert the USB cable or press the Refresh USB Mixer Connection softkey.</p>
Backwards Compatibility Notes	<p>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.</p>
Initial S/W Revision	A.08.01
Modified at S/W Revision	A.14.00

### 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 142](#)

Key Path	Input/Output, External Mixer, Ext Mix Setup, Mixer Presets
Example	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 LOx1 K-band	-4	18	26.5	22.25
A-band	A-band Single Harmonic, no doubler	Sngl harm LOx1 A-band	-6	26.5	40	33.25
D-band	D-band Single Harmonic, no doubler	Sngl harm LOx1 D-band	-20	110	170	140
E-band	E-band Single Harmonic, no doubler	Sngl harm LOx1 E-band	-12	60	90	75
F-band	F-band Single Harmonic, no doubler	Sngl harm LOx1	-18	90	140	115

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

#### Single Harmonic w/doubler

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

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

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

Mixer	Readout in setup screen	Readback on softkeys	Harm #	RF start	RF stop	RF center
D-band	D-band Single Harmonic w/doubler	Sngl harm LOx2 K-band	-14	110	170	140
F-band	F-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-10	90	140	115
G-band	G-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-16	140	220	180
J-band	J-band Single	Sngl harm LOx2	-24	220	325	272.5

Mixer	Readout in setup screen	Readback on softkeys	Harm #	RF start	RF stop	RF center
	Harmonic w/doubler	A-band				
K-band	K-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-2	18	26.5	22.25
Q-band	Q-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-4	33	50	41.5
V-band	V-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-6	50	75	62.5
W-band	W-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-8	75	110	92.5
Y-band	Y-band Single Harmonic w/doubler	Sngl harm LOx2 A-band	-20	170	260	215
Extended	Extended Single Harmonic w/doubler	Sngl harm LOx2 A-band	-28	245	390	317.5

### Multiple Harmonics

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

Key Path	Input/Output, External Mixer, Ext Mix Setup, Mixer Presets
<b>Example</b>	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 Multiple Harmonic	Multi harm A-band	1	-4	N	26.5	34.1	30.3
			2	-4	Y	33.1	40	36.55
E-band	E-band Multiple Harmonic	Multi harm E-band	1	-6	Y	60	83	71.5
			2	-8	Y	65	90	77.5
U-band	U-band Multiple Harmonic	Multi harm U-band	1	-6	N	40	51.5	45.75
			2	-6	Y	49.5	60	54.75
Coaxial	Coaxial Multiple Harmonic	Multi harm Coaxial	1	-4	N	26.5	34	30.25
			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).

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

## Edit Harmonic Table

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

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

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

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

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

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

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

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

### Table Type

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

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

### Single Row

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

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

### Harmonic Switching

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

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

### Doubler Switching

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

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

### Harmonic

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

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

Key Path	Input/Output, External Mixer, Ext Mix Setup, Edit Harmonic Table
<b>Remote Command</b>	[ :SENSe ] :MIXer:HARMonic <integer> [ :SENSe ] :MIXer:HARMonic?
<b>Example</b>	:MIX:HARM -28 :MIX:HARM?
Notes	The query returns the harmonic value of the first row of the harmonic table.

Couplings	When you set a value for the Harmonic via SCPI, the Mixer Selection changes to "Custom"
Preset	This is unaffected by Mode Preset, but on a "Restore Input/Output Defaults" editing is turned off, the Harmonic Table returns to normal, and the Mixer is preset to 11970A, which has -6 in the first row of its Harmonic Table
State Saved	Saved in instrument state
Min	-400
Max	400
Initial S/W Revision	A.08.01
Modified at S/W Revision	A.09.491

### LO Doubler

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

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

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

### Refresh USB Mixer Connection

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

Key Path	Input/Output, External Mixer, Ext Mix Setup
<b>Example</b>	<code>:MIX:BAND USB</code>

Notes	When using Agilent USB Mixers, if a Restore All Defaults (SCPI command SYSTEM:DEFAult) has been perform, either remove and reinsert the USB cable or press the Refresh USB Mixer Connection softkey.
Initial S/W Revision	A.14.00

## Signal ID On/Off

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

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

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

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

Key Path	Input/Output, External Mixer
Remote Command	[ :SENSe ] :SIDentify [ :STATe ] OFF   ON   0   1 [ :SENSe ] :SIDentify [ :STATe ] ?
Example	:SID 0 :SID?
Notes	Signal ID uses data from two successive sweeps. Therefore, if the analyzer is in single sweep mode, two sweep triggers are used to generate the data needed for signal identification.
Dependencies	Signal ID is not available in some measurements. If the Signal ID key does not appear or is grayed out while in your measurement, then it is not available. Because Signal ID uses data from two successive sweeps, several trace and sweep functions are grayed out in Signal ID. See the documentation for your measurement for details on which trace keys are grayed out. Signal ID is not available with Signal Track so Signal ID will be grayed out if in Signal Track. Signal ID will be turned off when External Mixer is turned off. Signal ID cannot be turned on when using internal mixing. Rules for auto coupling of the Sweep and FFT keys are changed with Signal ID on. For both the dynamic range case and the speed case, swept is chosen whenever any form of Signal ID is on. If Manual FFT is selected, the Signal ID key is grayed out. Whenever Signal ID is on, a warning message will be generated If Signal ID is selected in a measurement that does not support it, a warning message is generated
Couplings	The Auto Rules for detector selection select Normal for all active traces when Signal ID is turned on.

Preset	This is unaffected by Preset but is set to OFF on a "Restore Input/Output Defaults"
Initial S/W Revision	A.08.01

## Signal ID Mode

Lets you set which Signal ID mode you will use, either Image Suppress or Image Shift.

Key Path	Input/Output, External Mixer
Remote Command	[ :SENSe ] :SIDentify:MODE ISUPpress ISHift [ :SENSe ] :SIDentify:MODE?
Example	:SID:MODE ISUP :SID:MODE?
Preset	This is unaffected by Preset but is set to ISUPpress on a "Restore Input/Output Defaults"
State Saved	Saved in instrument state
Initial S/W Revision	A.08.01

## Image Suppress

The Image Suppress mode of Signal ID mathematically removes all image and multiple responses of signals present at the mixer input. Two hidden sweeps are taken in succession. The second sweep is offset in LO frequency by  $2*IF/N$ . For each point in each trace, the smaller amplitude from the two traces is taken and placed in that point in Trace 1. Responses of each trace that lie on top of one another will remain and are valid signals, others are images and are suppressed. The action of taking the smaller of the two traces will make the average noise level lower in all points that do not have an image, thus reducing the accuracy of the measurement of noise and noise-like signals.

### NOTE

This function takes control of and uses Trace 1. Any data in Trace 1 prior to activating Image Suppress will be lost.

Key Path	Input/Output, External Mixer, Signal ID Mode
Example	:SID:MODE ISUP
Notes	In Image Suppress Mode, synchronization is ensured by first turning off Signal ID, initiating a single sweep, then turning on Signal ID followed by two single sweeps.
Couplings	In Image Suppress the Peak detector is auto-selected to improve the image suppression effectiveness.
Initial S/W Revision	A.08.01
Modified at S/W Revision	A.09.491

## Image Shift

Like the Image Suppress mode, Image Shift is a two sweep sequence. The data from the first sweep is placed in Trace 1 and the data from the second (LO frequency shifted by  $2*IF/N$ ) sweep is placed in Trace 2.

On alternate sweeps, the alternate trace (trace 2) is placed in front of trace 1. This way, you can see a signal at the same place on alternate sweeps, showing in yellow (trace1) and blue (trace2). Signal responses of Trace 1 and Trace 2 that have the same horizontal position are considered to be in the current band and therefore can be analyzed with the amplitude and frequency measurement systems of the SA. All other responses are invalid and should be ignored.

**NOTE**

This function takes control of and uses Trace 1 and Trace 2. Any data in these traces prior to activating Image Shift will be lost.

Key Path	Input/Output, External Mixer, Signal ID Mode
Example	:SID:MODE ISH
Notes	To synchronize in Image Shift Mode, turn off Signal ID and then initiate a single sweep. Then turn on Signal ID and initiate two single sweeps. The results of the first sweep after Signal ID is turned on are available in Trace 1. The next sweep is shifted and the data from that sweep is available in Trace 2. The unshifted and shifted data can then be compared.
Couplings	Trace 2 is turned off when Image Shift is turned Off.
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
Remote Command	[ :SENSe ] :MIXer :CIFLoss <rel_ampl> [ :SENSe ] :MIXer :CIFLoss?
Example	:MIX:CIFL 0.23 DB :MIX:CIFL?
Preset	0.26 dB
State Saved	Saved in instrument state
Min	-100
Max	100
Initial S/W Revision	A.08.01

## I/Q

This feature is not available unless the ["Baseband I/Q \(Option BBA\)" on page 152](#) is installed.

Selects the front-panel I/Q input ports to be the analyzer signal input. If I/Q is already selected, pressing this key accesses the I/Q setup menu.

Key Path	Input/Output
Mode	BASIC, CDMA2K, EDGE GSM, TDSCDMA, VSA89601, WIMAX OFDMA, LTE, LTE TDD, LTE FDD, LTE TDD, DCATV, DTMB (CTTB), DVB-T/H with T2, CMMB, ISDBT, WCDMA, VXA, CDMA1XEV
Example	FEED AIQ
Notes	Not all measurements support the use of the I/Q signal input. When I/Q is selected in a measurement that does not support it, the "No Result; Meas invalid with I/Q inputs" error condition message appears. This is error 135
Initial S/W Revision	Prior to A.02.00

## Baseband I/Q (Option BBA)

The Baseband I/Q functionality is a hardware option. It is option BBA. If the option is not installed, none of the I/Q functionality is enabled.

The Baseband I/Q has four input ports and one output port. The input ports are I, I-bar, Q, and Q-bar. The I and I-bar together compose the I channel and the Q and Q-bar together compose the Q channel. Each channel has two modes of operation, Single-Ended (also called "unbalanced") and Differential Input (also called "balanced"). When in Single-Ended operation, only the main port (I or Q) is used and the complementary port (I-bar or Q-bar) is ignored. When in Differential Input mode, both main and complementary ports are used.

The input settings (range, attenuation, skew, impedance, external gain) apply to the channels, not the individual ports.

The system supports a variety of 1 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  $\Omega$  single ended and the probe power is supplied through the Infinimax interface. The probe can be configured for a variety of input coupling and low frequency rejection modes. In addition, a wide range of offset voltages and probe attenuation accessories are supported at the probe interface. The active probe has the advantage that it does not significantly load the circuit under test, even with unity gain probing.

With passive 1 M $\Omega$  probes, the probe will introduce a capacitive load on the circuit, unless higher attenuation is used at the probe interface. Higher attenuation reduces the signal level and degrades the signal-to-noise-ratio of the measurement. Passive probes are available with a variety of attenuation values for a moderate cost. Most 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|I|Q]" node. If the specific context is omitted, the command acts on the current input context's value. Here are the parameters that are input context sensitive:

- Center Frequency
- Trigger Source

It is important to distinguish between the I and Q input ports and the displayed I and Q data values. The I and Q input ports feed into a digital receiver that does digital tuning and filtering. The I and Q data seen by the user (either on the display or through SCPI) corresponds to the real ("I") and the imaginary ("Q") output from the digital receiver. When the input path is I+jQ or I Only and the center frequency is 0 Hz the I input ends up in as the real output from the receiver and appears as "I" data. Likewise, when the input path is I+jQ and the center frequency is 0 Hz, the Q input ends up as the imaginary output from the receiver and appears as "Q" data. However, when the input path is Q Only, the Q input is sent to the receiver as  $Q+j0$ , so

the receiver output has the Q input coming out on the real output, and so in Q Only, the signal from the Q input port appears as the "I" data. Another situation where the I and Q data do not necessarily correspond directly to the I and Q inputs is when the center frequency is non-zero. The digital processing involved in the tuning is a complex operation. This will result in I Only data appearing as both "I" and "Q" data, the same as that signal would appear if seen through the RF input port.

### Baseband I/Q Remote Language Compatibility

For the 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-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.

Key Path	Input/Output, I/Q
Remote Command	[ :SENSe ] :FEED:IQ:TYPE IQ IONLy QONLy [ :SENSe ] :FEED:IQ:TYPE?
Example	Set the input to be both the I and Q channels, combined as I + j * Q. FEED:IQ:TYPE IQ
Preset	IQ
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	I+jQ   I Only   Q Only
Readback Text	I+jQ   I Only   Q Only
Initial S/W Revision	Prior to A.02.00

Remote Command	:INPut [1] :IQ:TYPE IQ I Q
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	:INPut [1] :IQ:TYPE?
Notes	For R&S FSQ-B71 compatibility
Preset	IQ
Initial S/W Revision	Prior to A.02.00

### I+jQ

Sets the signal input to be both the I and Q channels. The I and Q channel data will be combined as  $I + j * Q$ .

Key Path	Input/Output, I/Q, I/Q Path
<b>Example</b>	Set the input to be both the I and Q channels, combined as $I + j * Q$ . FEED:IQ:TYPE IQ
Initial S/W Revision	Prior to A.02.00

### I Only

Sets the signal input to be only the I channel. The Q channel will be ignored. The data collected is still complex. When the center frequency is 0 the imaginary part will always be zero, but for any other center frequency both the real and imaginary parts will be significant.

Key Path	Input/Output, I/Q, I/Q Path
<b>Example</b>	Set the input to be only the I channel. FEED:IQ:TYPE IONL
Initial S/W Revision	Prior to A.02.00

### Q Only

Sets the signal input to be only the Q channel. The I channel will be ignored. The Q channel will be sent to the digital receiver block as  $Q+j0$ . The receiver's output is still complex. When the center frequency is 0 the imaginary part will always be zero, but for any other center frequency both the real and imaginary parts will be significant. Note that since the receiver's real output is displayed as the "I" data, when the center frequency is 0, the Q Only input appears as the "I" data.

Key Path	Input/Output, I/Q, I/Q Path
<b>Example</b>	Set the input to be only the Q channel. FEED:IQ:TYPE QONL
Initial S/W Revision	Prior to A.02.00

### I Setup

Access the channel setup parameters for the I channel.

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

## I Differential Input

Selects differential input on or off for the I channel. For differential input (also called balanced input), the analyzer uses both main and complementary ports. When differential input is off (also called single-ended or unbalanced input), the analyzer uses only the main port.

Key Path	Input/Output, I/Q, I Setup
<b>Remote Command</b>	:INPut:IQ[:I]:DIFFerential OFF ON 0 1 :INPut:IQ[:I]:DIFFerential?
<b>Example</b>	Put the I channel in Differential Input mode INP:IQ:DIFF ON
Notes	When I Differential Input = On, the analyzer will check for attenuation mismatches between the I and I-bar ports. If the difference in attenuation values exceeds 0.5 dB a Settings Alert error condition, error 159 will be set. When I Differential Input = On, and IQ Path is I+jQ, the Q Differential input must also be On. Similarly, when I Differential Input = Off, and IQ Path is I+jQ, the Q Differential input must also be Off. If the states of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Differential.
Couplings	Some active probes include built-in differential capability. When one of these probes is sensed, this key is disabled. Since the differential capability is handled in the probe, the Analyzer will use only the main port and the key will show that the Analyzer's Differential Input mode is Off (indicating that the complementary port is not in use). When Q Same as I is On, the value set for I will also be copied to Q.
Preset	Off
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	Off   On
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	:INPut [1] :IQ:BALanced[:STATe] OFF ON 0 1 :INPut [1] :IQ:BALanced[:STATe] ?
Notes	For R&S FSQ-B71 compatibility, with no independent settings for the I and Q channels. Therefore, it is tied only to the I channel and does not provide an equivalent for the Q channel. For proper operation of the backwards compatibility command Q Same as I should be set to On.
Preset	OFF
Initial S/W Revision	Prior to A.02.00

## I Input Z

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

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

Key Path	Input/Output, I/Q, I Setup
Remote Command	:INPut [1]:IQ[:I]:IMPedance LOW HIGH :INPut [1]:IQ[:I]:IMPedance?
Example	Set the I channel input impedance to 1 MΩ INP:IQ:IMP HIGH
Notes	LOW = 50 Ω, HIGH = 1 MΩ When IQ Path is I+jQ, the I Input Z setting must be the same as the Q Input Z setting. If the settings of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Input Z.
Couplings	Input impedance is a built-in characteristic of a probe. Therefore, whenever a probe is sensed, this key is disabled and the value is set to match the probe. When no probe is sensed on Q and Q Same as I is On, the value set for I will also be copied to Q.
Preset	LOW
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	50 Ω   1 MΩ
Initial S/W Revision	Prior to A.02.00

## I Skew

Sets the skew factor for the I channel. The skew will shift the channel's data in time. Use this to compensate for differences in the electrical lengths of the input paths due to cabling.

Key Path	Input/Output, I/Q, I Setup
Remote Command	[:SENSe]:CORRection:IQ[:I]:SKEW <seconds> [:SENSe]:CORRection:IQ[:I]:SKEW?
Example	Delay the data for the I channel by 10 ns. CORR:IQ:SKEW 10 ns
Preset	0
State Saved	Yes This is unaffected by Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	0 s to 100 ns

Min	0 s
Max	+100 ns
Initial S/W Revision	Prior to A.02.00

## I Probe

Access the probe setup parameters for the I channel. See "[I/Q Probe Setup](#)" on page 167.

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

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

<b>Remote Command</b>	<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>
<b>Range</b>	-60 dB to +80 dB
<b>Min</b>	-60 dB
<b>Max</b>	+80 dB
<b>Initial S/W Revision</b>	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 195.

<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 1:02:49 PM
<b>Initial S/W Revision</b>	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.

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

## 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.

Key Path	Input/Output, I/Q, Q Setup
Remote Command	:INPut:IQ:Q:DIFFerential OFF ON 0 1 :INPut:IQ:Q:DIFFerential?
Example	Put the Q channel in Differential Input mode INP:IQ:Q:DIFF ON
Notes	When Differential Input = On, the analyzer will check for attenuation mismatches between the Q and Q-bar ports. If the difference in attenuation values exceeds 0.5 dB a Settings Alert error condition, error 159 will be set. When Q Differential Input = On, and IQ Path is I+jQ, the I Differential input must also be On. Similarly, when Q Differential Input = Off, and IQ Path is I+jQ, the I Differential input must also be Off. If the states of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Differential.
Couplings	Some active probes include built-in differential capability. When one of these probes is sensed, this key is disabled. Since the differential capability is handled in the probe, the Analyzer will use only the main port and the key will show that the Analyzer's Differential Input mode is Off (indicating that the complementary port not in use). When a differential probe is not sensed and Q Same as I is On, the value set for I will be copied to Q. This key is disabled when Q Same as I is On.
Preset	Off
State Saved	Yes This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	Off On
Initial S/W Revision	Prior to A.02.00

## Q Input Z

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

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

Key Path	Input/Output, I/Q, Q Setup
Remote Command	:INPut [1] :IQ:Q:IMPedance LOW HIGH :INPut [1] :IQ:Q:IMPedance?
Example	Set the Q channel input impedance to 1 M $\Omega$ INP:IQ:Q:IMP HIGH
Notes	LOW = 50 $\Omega$ , HIGH = 1 M $\Omega$ 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 $\Omega$   1 M $\Omega$
Initial S/W Revision	Prior to A.02.00

### Q Skew

Sets the skew factor for the Q channel. The skew will shift the channel's data in time. Use this to compensate for differences in the electrical lengths of the input paths due to cabling and probes.

Key Path	Input/Output, I/Q, Q Setup
<b>Remote Command</b>	<code>[ :SENSe ] :CORRection:IQ:Q:SKEW &lt;seconds&gt;</code> <code>[ :SENSe ] :CORRection:IQ:Q:SKEW?</code>
<b>Example</b>	Delay the data for the Q channel by 10 ns. <code>CORR:IQ:Q:SKEW 10 ns</code>
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 167.

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.

<b>Key Path</b>	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
<b>Remote Command</b>	<code>[ :SENSe ] :CORRection:IQ:I Q:ATTenuation:RATio &lt;real&gt;</code> <code>[ :SENSe ] :CORRection:IQ:I Q:ATTenuation:RATio?</code>
<b>Example</b>	Set the attenuation for the current I probe to 100.00:1. CORR:IQ:I:ATT:RAT 100
<b>Notes</b>	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.
<b>Preset</b>	Each probe type has its own default. The default for the "Unknown" probe type is 1:1.
<b>State Saved</b>	Saved with probe calibration data. It survives a power cycle and is not affected by a Preset or Restore.
<b>Range</b>	0.001 to 10000
<b>Min</b>	0.001
<b>Max</b>	10000
<b>Initial S/W Revision</b>	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. CORR:IQ:I:ATT 20 dB
<b>Range</b>	-60 dB to +80 dB
<b>Min</b>	-60 dB
<b>Max</b>	+80 dB
<b>Initial S/W Revision</b>	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 195.

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

### Clear Calibration

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

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

### 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 158).

Key Path	Input/Output, I/Q
Remote Command	:INPut:IMPedance:REFerence <integer> :INPut:IMPedance:REFerence?
Example	Set the I/Q reference impedance to 50 $\Omega$ INP:IMP:REF 50
Preset	50 $\Omega$
State Saved	Yes

	This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	1 $\Omega$ to 1 M $\Omega$
Min	1 $\Omega$
Max	1 M $\Omega$
Initial S/W Revision	Prior to A.02.00

### I/Q Cable Calibrate...

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

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

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

The instrument state remains as it was prior to entering the calibration procedure except while a port is actually being calibrated. Once a port is calibrated it returns to the prior state. A port calibration is in process only from the time the "Next" button is pressed until the next screen is shown. For SCPI, this corresponds to the time from issuing the CAL:IQ:FLAT:I|B|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 195).

### 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.

<b>Key Path</b>	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
<b>Remote Command</b>	[ :SENSe ] :CORRection:IQ:I Q:ATTenuation:RATio <real> [ :SENSe ] :CORRection:IQ:I Q:ATTenuation:RATio?
<b>Example</b>	Set the attenuation for the current I probe to 100.00:1. CORR:IQ:I:ATT:RAT 100
<b>Notes</b>	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.
<b>Preset</b>	Each probe type has its own default. The default for the "Unknown" probe type is 1:1.
<b>State Saved</b>	Saved with probe calibration data. It survives a power cycle and is not affected by a Preset or Restore.
<b>Range</b>	0.001 to 10000
<b>Min</b>	0.001
<b>Max</b>	10000
<b>Initial S/W Revision</b>	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. CORR:IQ:I:ATT 20 dB
<b>Range</b>	-60 dB to +80 dB
<b>Min</b>	-60 dB
<b>Max</b>	+80 dB
<b>Initial S/W Revision</b>	Prior to A.02.00

### Offset

Some active probes have DC offset capability. When one of these probes is connected this control will be visible. The signal is adjusted for the DC offset before entering the analyzer's port. This allows for removal of a DC offset before reaching the analyzer's input port voltage limits. For example, a signal that varies 1 V peak-to-peak with a DC offset equal to the analyzer's max input voltage would exceed the input limits of the analyzer for half its cycle. Removing the DC offset allows the analyzer to correctly process the entire signal.

<b>Key Path</b>	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe
<b>Remote Command</b>	<code>:INPut:OFFSet:I Q &lt;voltage&gt;</code> <code>:INPut:OFFSet:I Q?</code>
<b>Example</b>	Remove a DC offset of -0.5 V from the I channel input. INP:OFFS:I -0.5
<b>Notes</b>	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.
<b>Preset</b>	0 V
<b>State Saved</b>	Saved with probe calibration data. It survives power cycle and is not affected by Preset or Restore.
<b>Range</b>	-18 V to +18 V
<b>Min</b>	-18 V
<b>Max</b>	+18 V
<b>Initial S/W Revision</b>	Prior to A.02.00

### Coupling

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



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

#### DC

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

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling
<b>Example</b>	Turn off low frequency rejection on the I channel INP:COUP:I DC
Initial S/W Revision	Prior to A.02.00

#### LFR1

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

Key Path	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

#### LFR2

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

Key Path	Input/Output, I/Q, I Setup   Q Setup, I Probe   Q Probe, Coupling
<b>Example</b>	Turn on low frequency rejection on the I channel for frequencies lower than 0.14 Hz INP:COUP:I LFR2
Initial S/W Revision	Prior to A.02.00

## Calibrate

Invokes the guided probe calibration. The guided probe calibration is context sensitive and depends on the channel (I or Q) and the Differential Input state. The calibration is only performed on the selected channel. When Differential Input is on, both the probe attached to the main port and the probe attached to the complementary port are calibrated. When Differential Input is off, only the probe attached to the main port is calibrated. See "[I/Q Guided Calibration](#)" on page 195.

<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 1:02:49 PM
<b>Initial S/W Revision</b>	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.

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

## RF Calibrator

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

<b>Key Path</b>	Input/Output
<b>Remote Command</b>	[ :SENSe ] :FEED:AREFeRence REF50 REF4800 OFF [ :SENSe ] :FEED:AREFeRence?

<b>Example</b>	FEED:AREF REF50 selects the 50 MHz amplitude reference as the signal input. FEED:AREF REF4800 selects the 4.8 GHz amplitude reference as the signal input FEED:AREF OFF turns the calibrator "off" (switches back to the selected input – RF or I/Q)
Dependencies	Selecting an input (RF or I/Q) turns the Calibrator OFF. This is true whether the input is selected by the keys or with the [:SENSe]:FEED command.  The 4.8 GHz internal reference is only available in some models and frequency range options. If the 4.8 GHz reference is not present, the 4.8 GHz softkey will be blanked, and if the REF4800 parameter is sent, the analyzer will generate an error.
Couplings	When one of the calibrator signals is selected, the analyzer routes that signal (an internal amplitude reference) to the analyzer, and changes the main input selection to RF so the calibrator signal can be seen. When you turn the calibrator off it does not switch back to the previously selected input.
Preset	OFF
State Saved	Saved in instrument state
Readback	Off, 50 MHz, 4.8 GHz
Initial S/W Revision	Prior to A.02.00

<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

## 50 MHz

Selects the 50 MHz internal reference as the input signal.

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

## 4.8 GHz

Selects the 4.8 GHz internal reference as the input signal.

Key Path	Input/Output, RF Calibrator
<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, and if the REF4800 parameter is sent, the analyzer will generate an error.
Readback	4.8 GHz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Off

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

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

## External Gain

Compensates for gain or loss in the measurement system outside the spectrum analyzer. The External Gain is subtracted from the amplitude readout (or the loss is added to the amplitude readout). So, the displayed signal level represents the signal level at the output of the device-under-test, which can be the input of an external device that provides gain or loss.

Entering an External Gain value does not affect the Reference Level, therefore the trace position on screen changes, as do all of the values represented by the trace data. Thus, the values of exported trace data, queried trace data, marker amplitudes, trace data used in calculations such as N dB points, trace math, peak threshold, etc., are all affected by External Gain. Changing the External Gain, even on a trace that is not updating, will immediately change all of the above, without new data needing to be taken.

### NOTE

Changing the External Gain causes the analyzer to immediately stop the current sweep and prepare to begin a new sweep. The data will not change until the trace data updates because the offset is applied to the data as it is taken. If a trace is exported with a nonzero External Gain, the exported data will contain the trace data with the offset applied.

In the Spectrum Analyzer mode, a Preamp is the common external device providing gain or loss. In a measurement application mode like GSM or W-CDMA, the gain or loss could be from a BTS (Base Transceiver Station) or an MS (Mobile Station). So in the Spectrum Analyzer mode MS and BTS would be

grayed out and the only choice would be Ext Preamp. Similarly in some of the digital communications applications, Ext Preamp will be grayed out and you would have a choice of MS or BTS.

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

## Ext Preamp

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

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

["More Information" on page 174](#)

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

	Preamp   MS   BTS for backwards compatibility.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

### More Information

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

While the USB Preamplifier is plugged into one of the analyzer's USB ports, the analyzer will consider it to be in the signal path of the RF Input and will apply the calibration data from the USB Preamp to measurements taken at the RF Input (on 2 input boxes, it will be considered to be in the signal path of RF Input 1; it is not supported for RF Input 2).

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

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

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

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

### MS

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

<b>Key Path</b>	Input/Output, External Gain
<b>Remote Command</b>	[ :SENSe ] :CORRection:MS[:RF]:GAIN <rel_amp> [ :SENSe ] :CORRection:MS[:RF]:GAIN?
<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.)
<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 MS.
<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"
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
<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

## 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"

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

<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>	<code>CORR:BTS:LOSS 10</code> sets the Ext Gain value to -10 dB, and subsequently querying <code>:LOSS</code> will give 10 dB <code>CORR:BTS:LOSS -10</code> sets the Ext Gain value to 10 dB, and subsequently querying <code>:LOSS</code> 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 <code>:LOSS</code> is set it sets <code>:GAIN</code> to the negative value of the parameter sent. Anytime <code>:LOSS</code> is queried it gives the negative of <code>:GAIN</code>
Preset	This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Min	100 dB
Max	-100 dB
Initial S/W Revision	Prior to A.02.00

## I Ext Gain

This function affects the I channel input. However, when Q Gain in I+jQ is set to Same as I Gain, this value is applied to both I and Q channel inputs.

Key Path	Input/Output, External Gain
<b>Remote Command</b>	<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>
Dependencies	Not available unless option BBA is installed
Preset	0 dB This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"



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

## Q Ext Gain

This function affects the Q channel input.

Key Path	Input/Output, External Gain
<b>Remote Command</b>	<code>[ :SENSe ] :CORRection:IQ:Q:GAIN &lt;rel_amp1&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>
Dependencies	Not available unless option BBA is installed.
Preset	0 dB This is unaffected by a Preset but is set to 0 dB on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Min	-100 dB
Max	100 dB
Readback Text	Q Gain, <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>	<code>:SYST:DEF INP</code> 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

## Freq Ref In

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

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

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

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

If Sense is selected, the instrument checks whether a signal is present at the external reference connector. If it senses a signal within 5 ppm of the External Ref Freq (as set on the External Ref Freq softkey), it will automatically switch to the external reference. If it senses a 1 pulse per second signal, it enters Pulse mode, wherein the signal is used to adjust the internal reference. When no signal is present, it automatically switches to the internal reference. No message is generated as the reference switches between pulse, external and internal. The monitoring of the external reference occurs approximately on 1 millisecond intervals, and never occurs in the middle of a measurement acquisition, only at the end of the measurement (end of the request).

If for any reason the instrument's frequency reference is not able to obtain lock, Status bit 1 in the Questionable Frequency register will be true and a condition error message is generated. When lock is regained, Status bit 1 in the Questionable Frequency register will be cleared and the condition error will be cleared.

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

Key Path	Input/Output
<b>Remote Command</b>	<code>[ :SENSe ] :ROSCillator :SOURce :TYPE INternal   EXTernal   SENSE   PULSe</code> <code>[ :SENSe ] :ROSCillator :SOURce :TYPE?</code>
Dependencies	The PULSe parameter, and support of the 1 pps signal at the EXT REF IN input, are not available in firmware prior to A.13.00. They are also not available in some model numbers. If not available, the Pulse key will be blank, and sending the PULSe parameter via SCPI will generate an error:
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	STATus:QUESTionable:FREQuency bit 1 set if unlocked.

dependencies	
Backwards Compatibility Notes	Freq Ref In was not saved in state in the legacy instruments. It is a part of state in the X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

<b>Remote Command</b>	<code>[:SENSe]:ROSCillator:SOURce?</code>
Notes	<p>The query <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 <code>SENSe</code> but there is no external reference nor 1 pps signal so the instrument is actually using the internal reference, then this query returns <code>INTernal</code> and not <code>SENSe</code>.</li> <li>2. If it was set to <code>SENSe</code> and there is an external reference present, the query returns <code>EXTernal</code> and not <code>SENSe</code>.</li> <li>3. If it was set to <code>SENSe</code> and there is a 1 pps signal present, the query returns <code>PULSe</code> and not <code>SENSe</code>.</li> <li>4. If it was set to <code>EXTernal</code>, then the query returns "EXTernal"</li> <li>5. If it was set to <code>INTernal</code>, then the query returns "INTernal".</li> <li>6. If it was set to <code>PULSe</code>, then the query returns "PULSe"</li> </ol>
Preset	<code>SENSe</code>
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

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

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

### Internal

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

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

### External

The external reference is used.

Key Path	Input/Output, Freq Ref In
<b>Example</b>	:ROSC:SOUR:TYPE EXT
Readback	External
Initial S/W Revision	Prior to A.02.00

### Ext Ref Freq

This key tells the analyzer the frequency of the external reference. When the external reference is in use (either because the reference has been switched to External or because the Reference has been switched to Sense and there is a valid external reference present) this information is used by the analyzer to determine the internal settings needed to lock to that particular external reference signal.

For the instrument to stay locked, the value entered must be within 5 ppm of the actual external reference frequency. So it is important to get it close, or you risk an unlock condition.

Note that this value only affects the instrument's ability to lock. It does not affect any calculations or measurement results. See "Freq Offset" in the Frequency section for information on how to offset frequency values.

Key Path	Input/Output, Freq Ref In
Remote Command	[ :SENSe ] :ROSCillator:EXTernal:FREQuency <freq> [ :SENSe ] :ROSCillator:EXTernal:FREQuency?
Example	ROSC:EXT:FREQ 20 MHz sets the external reference frequency to 20 MHz, but does not select the external reference. ROSC:SOUR:TYPE EXT selects the external reference.
Dependencies	Still available with Internal or Pulse selected, to allow setup for when External is in use. However, the setting has no effect if the Internal Reference is in use (Freq Ref In set to Internal, Pulse, or SENSE:INT or SENSE:PULSE).
Preset	This is unaffected by a Preset but is set to 10 MHz on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Min	CXA: 10 MHz EXA: 10 MHz MXA: 1 MHz PXA: 1 MHz N8973B, N8974B, N8975B, or N8976B: 10 MHz
Max	CXA: 10 MHz EXA: 10 MHz EXA with option R13: 20 MHz MXA: 50 MHz PXA: 50 MHz N8973B, N8974B, N8975B, or N8976B: 10 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## External Reference Lock BW

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

The PXA variable reference loop bandwidth allows an external reference to be used and have the analyzer close-in phase noise improved to match that of the reference. This could result in an improvement of tens of decibels. The choice of "Wide" or "Narrow" affects the phase noise at low offset frequencies, especially 4 to 400 Hz offset. When using an external reference with superior phase noise, we recommend setting the

external reference phase-locked-loop bandwidth to wide (60 Hz), to take advantage of that superior performance. When using an external reference with inferior phase noise performance, we recommend setting that bandwidth to narrow (15 Hz). In these relationships, inferior and superior phase noise are with respect to  $-134$  dBc/Hz at 30 Hz offset from a 10 MHz reference. Because most reference sources have phase noise behavior that falls off at a rate of 30 dB/decade, this is usually equivalent to  $-120$  dBc/Hz at 10 Hz offset.

<b>Key Path</b>	Input/Output, Freq Ref In
<b>Scope</b>	Mode Global
<b>Remote Command</b>	<code>[ :SENSe ] :ROSCillator :BANDwidth WIDE   NARROW</code> <code>[ :SENSe ] :ROSCillator :BANDwidth ?</code>
<b>Example</b>	ROSC:BAND WIDE
<b>Dependencies</b>	Still available with Internal or Pulse selected, to allow setup for when External is in use. However, the setting has no effect if the Internal Reference is in use (Freq Ref In set to Internal, Pulse, or SENSE:INT or SENSE:PULSE). This key only appears in analyzers equipped with the required hardware.
<b>Preset</b>	This is unaffected by a Preset but is set to Narrow on a "Restore Input/Output Defaults" or "Restore System Defaults -> All"
<b>State Saved</b>	Saved in Input/Output state.
<b>Initial S/W Revision</b>	A.04.00
<b>Modified at S/W Revision</b>	A.14.00

## External Ref Coupling

Only appears with option ERC installed and licensed.

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

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

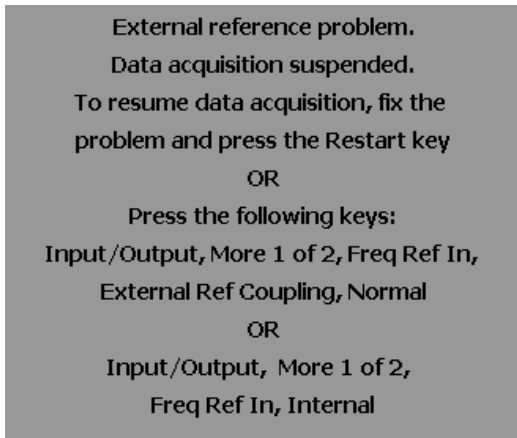
Proper SCPI sequences are shown below, which will always fail to return if the acquisition stops during the requested sweep or measurement. Note that, for predictable operation of this function, it is best to operate the analyzer in single measurement mode (INIT:CONT OFF), because if operating in continuous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

```
:INIT:CONT OFF
```

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

```
--
:INIT:CONT OFF
:INIT:IMM;*WAI?
--
:INIT:CONT OFF
:READ?
--
:INIT:CONT OFF
:MEASure?
```

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



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?

Preset	This setting is persistent: it survives power-cycling or a Preset and is reset with Restore Input/Output defaults.
State Saved	Not saved in instrument state
Readback	Normal Stop Acq
Initial S/W Revision	A.02.00

## Output Config

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

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

## Trig Out

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

Key Path	Input/Output, Output Config
<b>Remote Command</b>	:TRIGger TRIGger1 TRIGger2[:SEquence]:OUTPut HSWP   MEASuring   MAIN   GATE   GTRigger   OEVen   SPOint   SSweep   SSETtled   S1Marker   S2Marker   S3Marker   S4Marker   OFF  :TRIGger TRIGger1 TRIGger2[:SEquence]:OUTPut?
<b>Example</b>	TRIG:OUTP HSWP TRIG2:OUTP GATE
Dependencies	The second Trigger output (Trig 2 Out) does not appear in all models; in models that do not support it, the Trig 2 Out key is blanked, and sending the SCPI command for this output generates an error, "Hardware missing; Not available for this model number" In models that do not support the Trigger 2 output, this error is returned if trying to set Trig 2 Out and a query of Trig 2 Out returns OFF.
Preset	Trigger 1: Sweeping (HSWP) Trigger 2: Gate  This is unaffected by a Preset but is preset to the above values on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00



## Polarity

Sets the output to the Trig 1 Out, or Trig 2 Out, connector to trigger on either the positive or negative polarity.

Key Path	Input/Output, Output Config, Trig 1/2 Output
Remote Command	:TRIGger TRIGger1 TRIGger2[:SEquence]:OUTPut:POLarity POSitive   NEGative  :TRIGger TRIGger1 TRIGger2[:SEquence]:OUTPut:POLarity?
Example	TRIG1:OUTP:POL POS
Preset	This is unaffected by a Preset but is set to POSitive on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Off

Selects no signal to be output to the Trig 1 Out, or Trig 2 Out, connector.

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

## Sweeping (HSWP)

Selects the Sweeping Trigger signal to be output to the Trig 1 Out, or Trig 2 Out, connector when a measurement is made. This signal has historically been known as "HSWP" (High = Sweeping), and is 5 V TTL level with 50 ohm output impedance.

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

## Measuring

Selects the Measuring trigger signal to be output to the Trig 1 Out, or Trig 2 Out, connector. This signal is true while the Measuring status bit is true.

Key Path	Input/Output, Output Config, Trig 1/2 Output
----------	--

<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
<b>Example</b>	TRIG1:OUTP MAIN
Readback	Main Trigger
Initial S/W Revision	Prior to A.02.00

### Gate Trigger

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

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

### Gate

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

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

### Source Point Trigger

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

Trigger 2 is selected as the Point Trigger under Source, the Source Point Trigger key under Trig 2 Out automatically gets selected

Key Path	Input/Output, Output Config, Trig 1/2 Output
<b>Example</b>	TRIG1:OUTP SPO
Readback	Source Point
Initial S/W Revision	Prior to A.02.00

### Odd/Even Trace Point

Selects either the odd or even trace points as the signal to be output to the Trig 1 Out, or Trig 2 Out, connector when performing swept spectrum analysis. When the polarity is positive, this output goes high during the time the analyzer is sweeping past the first point (Point 0) and every other following trace point. The opposite is true if the polarity is negative.

Key Path	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.

<b>Analog Out</b>	<b>Nominal Range exc. (10% overrange)</b>	<b>Scale Factor</b>	<b>Notes</b>
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.

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

## Off

Turns off the analog output.

<b>Key Path</b>	Input/Output, Output Config, Analog Out
<b>Example</b>	OUTP:ANAL OFF ! causes the analog output to be off
<b>Readback Text</b>	Off
<b>Initial S/W Revision</b>	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	Because the Linear Video output uses one of the two IF processing channels, only one detector is

	<p>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> <p>When Demod Audio is the selected Analog Output:</p> <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
Remote Command	:OUTPut:DBUS[1][:STATe] ON OFF 1 0 :OUTPut:DBUS[1][:STATe]?
Example	OUTP:DBUS ON
Preset	This is unaffected by a Preset but is set to Off on a "Restore Input/Output Defaults" or "Restore System Defaults -> All"
State Saved	Saved in Input/Output State
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

## I/Q Cal Out

The Baseband I/Q "Cal Out" port can be turned on with either a 1 kHz or a 250 kHz square wave. This can be turned on independent of the input selection. A Preset will reset this to Off.

Key Path	Input/Output, Output Config
Remote Command	:OUTPut:IQ:OUTPut IQ1 IQ250 OFF :OUTPut:IQ:OUTPut?
Example	OUTP:IQ:OUTP IQ1
Couplings	An I/Q Cable Calibration or an I/Q Probe Calibration will change the state of the Cal Out port as needed by the calibration routine. When the calibration is finished the I/Q Cal Out is restored to the pre-calibration state.



Preset	Off
State Saved	Saved in instrument state
Range	1 kHz Square Wave 250 kHz Square Wave Off
Readback Text	1 kHz 250 kHz Off
Initial S/W Revision	Prior to A.02.00

## 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:

IF Path Selected	Frequency of "Second IF" Output
10 MHz	322.5 MHz
25 MHz	322.5 MHz
40 MHz	250 MHz
140 MHz	300 MHz

The signal quality, such as signal to noise ratio and phase noise, are excellent in this mode.

Key Path	Input/Output, Output Config, Aux IF Out
<b>Example</b>	OUTP:AUX SIF causes the aux output type to be Second IF
Dependencies	Does not appear unless Option CR3 is installed.
Readback Text	Second IF
Initial S/W Revision	A.04.00

## Arbitrary IF

In this mode the 2nd IF output is mixed with a local oscillator and mixer to produce an arbitrary IF output between 10 MHz and 75 MHz with 500 kHz resolution. The phase noise in this mode will not be as good as in Second IF mode.

The IF output frequency is adjustable, through an active function which appears on the Arbitrary IF selection key, from 10 MHz to 75 MHz with 500 kHz resolution.

The bandwidth of this IF output varies with band and center frequency, but is about 40 MHz at the -3 dB width. When the output is centered at lower frequencies in its range, signal frequencies at the bottom of the bandwidth will "fold". For example, with a 40 MHz bandwidth (20 MHz half-bandwidth), and a 15 MHz IF center, a signal -20 MHz relative to the spectrum analyzer center frequency will have a relative response of about -3 dB with a frequency 20 MHz below the 15 MHz IF center. This -5 MHz frequency will fold to become a +5 MHz signal at the IF output. Therefore, lower IF output frequencies are only useful with known band-limited signals.

Key Path	Input/Output, Output Config, Aux IF Out
<b>Example</b>	OUTP:AUX AIF causes the aux output type to be the Arbitrary IF
Dependencies	Does not appear unless Option CRP is installed.
Readback Text	Arbitrary IF
Initial S/W Revision	A.04.00

Key Path	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

### 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

### 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 207 ).
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.

Remote Command	:CALibration:IQ:ISOLation:TIME?
Example	:CAL:IQ:ISOL:TIME?
Notes	This returns 6 integer values: year, month, day, hour, minute, second. When no calibration has been performed, all values will be 0.
Initial S/W Revision	A.02.00

## 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|B|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...
Remote Command	:CALibration:IQ:FLATness:I
Example	CAL:IQ:FLAT:I
Notes	The recommended procedure is to use the same BNC cable to calibrate all I/Q ports. All I/Q ports should be calibrated sequentially during the procedure. The calibration data is saved as soon as the port is calibrated and will survive power cycles. It is not reset by any preset or restore data commands.
Notes	The I port must be connected to the Cal Out port before issuing the SCPI command.
State Saved	No.
Initial S/W Revision	Prior to A.02.00

### 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. When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see " <a href="#">Exit Confirmation</a> " on page 207 ).
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...
<b>Remote Command</b>	:CALibration:IQ:FLATness:IBAR
<b>Example</b>	CAL:IQ:FLAT:IBAR
Notes	The recommended procedure is to use the same BNC cable to calibrate all I/Q ports. All I/Q ports should be calibrated sequentially during the procedure. The calibration data is saved as soon as the port is calibrated and will survive power cycles. It is not reset by any preset or restore data commands.
Notes	The I-bar port must be connected to the Cal Out port before issuing the SCPI command.
State Saved	No
Initial S/W Revision	Prior to A.02.00

### 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. When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see <a href="#">"Exit Confirmation" on page 207</a> ).
Initial S/W Revision	Prior to A.02.00

### 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	The recommended procedure is to use the same BNC cable to calibrate all I/Q ports. All I/Q ports should be calibrated sequentially during the procedure. The calibration data is saved as soon as the port is calibrated and will survive power cycles. It is not reset by any preset or restore data commands.
Notes	The Q port must be connected to the Cal Out port before issuing the SCPI command.
State Saved	No
Initial S/W Revision	Prior to A.02.00

### Exit

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

Key Path	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. When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see " <a href="#">Exit Confirmation</a> " on page 207 ).
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	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.

<b>Key Path</b>	Input/Output, I/Q, I/Q Cable Calibrate...
<b>Remote Command</b>	:CALibration:IQ:FLATness:QBAR
<b>Example</b>	CAL:IQ:FLAT:QBAR
<b>Notes</b>	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.
<b>Notes</b>	The Q-bar port must be connected to the Cal Out port before issuing the SCPI command.
<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/Q Cable 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" on page 207</a> ).
<b>Initial S/W Revision</b>	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?
<b>Notes</b>	This returns 6 integer values: year, month, day, hour, minute, second. When no calibration has been performed, all values will be 0.
<b>Initial S/W Revision</b>	A.02.00

**I/Q Probe Calibration**

The I/Q probe calibration creates correction data for one of the front panel I/Q channels. When the probe has EEPROM identification, the data is unique to that specific probe. When the probe does not have

EEPROM identification, the data will be used for all probes of the same type. The data is also unique to the channel, so calibration data for the I channel will not be used for the Q channel and vice versa.

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

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

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

The instrument state remains as it was prior to entering the calibration procedure except while a port is actually being calibrated. Once a port is calibrated it returns to the prior state. A port calibration is in process only from the time the "Next" button is pressed until the next screen is shown. For SCPI, this corresponds to the time from issuing the CAL:IQ:PROB:I|B|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 207](#).

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.

Key Path	Input/Output, I/Q, I Setup, I Probe, Calibrate
<b>Remote Command</b>	:CALibration:IQ:PROBe:I
<b>Example</b>	CAL:IQ:PROB:I
Notes	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.
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" on page 207</a> ).
Initial S/W Revision	Prior to A.02.00

**I-bar Port**

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

**Show Adapter**

Show a connection diagram and instructions for the probe and adapter. See ["Show Adapter Screen" on page 207](#).

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, 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" on page 207</a> ).
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 207](#).

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 ["Exit Confirmation" on page 207](#) ).

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 207](#).

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
<b>Remote Command</b>	:CALibration:IQ:PROBE:QBar
<b>Example</b>	CAL:IQ:PROB:QB
Notes	The Q-bar port must be connected to the Cal Out port before issuing the SCPI command. The calibration data is saved as soon as the port is calibrated and will survive power cycles. It is not reset by any preset or restore data commands.
State Saved	No
Initial S/W Revision	Prior to A.02.00

## Exit

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

Key Path	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
Notes	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" on page 207</a> ).
Initial S/W Revision	Prior to A.02.00

## Show Adapter Screen

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

## I/Q Probe Calibration Time (Remote Command Only)

Return the last date and time that the I/Q Probe Calibration was performed for a specific port. This is a remote query command only.

<b>Remote Command</b>	:CALibration:IQ:PROBe:I IBAR Q QBAR:TIME?
<b>Example</b>	:CAL:IQ:PROB:I:TIME?
Notes	This returns 6 integer values: year, month, day, hour, minute, second. When no calibration has been performed, all values will be 0. The value is specific to both the port and probe, so the value will change as probes are connected or disconnected.
Initial S/W Revision	A.02.00

## Exit Confirmation

When Exit is pressed during one of the calibration routines, the calibration may be in an inconsistent state with some of the ports having newly measured calibration data and others with old data. If this is the case, a dialog box will appear to confirm that the user really wants to exit. A "Yes" answer will exit the calibration procedure, leaving potentially inconsistent calibration data in place. A "No" answer will return to the calibration procedure.





## 5 Mode Functions

## Mode

The Mode key allows you to select the available measurement applications or “Modes”. Modes are a collection of measurement capabilities packaged together to provide an instrument personality that is specific to your measurement needs. Each application software product is ordered separately by Model Number and must be licensed to be available. Once an instrument mode is selected, only the commands that are valid for that mode can be executed.

**NOTE**

Key operation can be different between modes. The information displayed in Help is about the current mode.

To access Help for a different Mode you must first exit Help (by pressing the Cancel (Esc) key). Then select the desired mode and re-access Help.

For more information on Modes, preloading Modes, and memory requirements for Modes, see ["More Information" on page 211](#)

Key Path	Front-panel key
<b>Remote Command</b>	:INSTrument[:SElect] SA   RTSA   SEQAN   EMI   BASIC   WCDMA   EDGE GSM   WIMAXOFDMA   VSA   PNOISE   NFIGure   ADEMOD   BTooth   TDSCDMA   CDMA2K   CDMA1XEV   LTE   LTETDD   LTEAFDD   LTEATDD   MSR   DVB   DTMB   DCATV   ISDBT   CM MB   WLAN   CWLAN   CWIMAXOFDM   WIMAXFIXED   IDEN   RLC   SCPI LC   VSA89601  :INSTrument[:SElect]?
<b>Example</b>	:INST SA
<b>Notes</b>	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.
<b>Preset</b>	This is unaffected by a Preset but is set on a “Restore System Defaults->All” to: For N9038A: EMI For N8973B, N8974B, N8975B, or N8976B: NFIG For all other models: SA
<b>State Saved</b>	Saved in instrument state
<b>Backwards Compatibility SCPI</b>	:INSTrument[:SElect] GSM provided for backwards compatibility. Mapped to EDGE GSM.
<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 SCPI LC  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.13.00

<b>Example</b>	: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.
<b>Backwards Compatibility SCPI</b>	: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.

### 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 217](#) for Mode details.

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

Mode	Mode Number	Mode Parameter
Spectrum Analyzer	1	SA
Real Time Spectrum Analyzer	107	RTSA
Sequence Analyzer	400	SEQAN
EMI Receiver	141	EMI
I/Q Analyzer (Basic)	8	BASIC
WCDMA with HSPA+	9	WCDMA

GSM/EDGE/EDGE Evo	13	EDGE GSM
802.16 OFDMA (WiMAX/WiBro)	75	WIMAX OFDMA
Vector Signal Analyzer (VSA)	100	VSA
Phase Noise	14	PNOISE
Noise Figure	219	NFIGure
Analog Demod	234	ADEM0D
Bluetooth	228	BT00th
TD-SCDMA with HSPA/8PSK	211	TDSCDMA
cdma2000	10	CDMA2K
1xEV-DO	15	CDMA1XEV
LTE	102	LTE
LTE TDD	105	LTETDD
LTE-Advanced FDD	107	LTEAFDD
LTE-Advanced TDD	108	LTEATDD
MSR	106	MSR
DVB-T/H with T2	235	DVB
DTMB (CTTB)	236	DTMB
Digital Cable TV	238	DCATV
ISDB-T	239	ISDBT
CMMB	240	CMMB
WLAN	217	WLAN
Combined WLAN	19	CWLAN
Combined Fixed WiMAX	81	CWIMAXOFDM
802.16 OFDM (Fixed WiMAX)	104	WIMAXFIXED
iDEN/WiDEN/MotoTalk	103	IDEN
Remote Language Compatibility	266	RLC
SCPI Language Compatibility	270	SCPILC
89601 VSA	101	VSA89601

---

**Remote Command** :INSTRument:NSElect <integer>

:INSTRument:NSElect?

---

**Example** :INST:NSEL 1

---

**Notes** SA mode is 1

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

---

Preset	Not affected by Preset. Set to default mode (1 for SA mode) following Restore System Defaults.
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

### Application Mode Catalog Query (Remote Command Only)

Returns a string containing a comma separated list of names of all the installed and licensed measurement modes (applications). These names can only be used with the :INSTrument[:SElect] command.

<b>Remote Command</b>	:INSTrument:CATalog?
<b>Example</b>	:INST:CAT?
<b>Notes</b>	Query returns a quoted string of the installed and licensed modes separated with a comma. Example: "SA,PNOISE,WCDMA"
<b>Backwards Compatibility Notes</b>	VSA (E4406A) :INSTrument:CATalog? returned a list of installed INSTrument:SELECT items as a comma separated list of string values: "BASIC","GSM","EDGEgsm","CDMA","NADC","PDC","WCDMA","CDMA2K","CDMA1XEV","IDEN","WIDEN","WLAN","SERVICE" X-Series uses the ESA/PSA compatible query of a string contain comma separated values: "SA,PNOISE,NFIGURE,BASIC,CDMA,CDMA2K,WCDMA,CDMA1XEV,EDGEgsm,GSM,NADC,PDC,TDSCDMA,DMODULATION,WLAN"
<b>Initial S/W Revision</b>	Prior to A.02.00

### Application Identification (Remote Commands Only)

Each entry in the Mode Menu will have a Model Number and associated information: Version, and Options. This information is displayed in the Show System screen. The corresponding SCPI remote commands are defined here.

["Current Application Model " on page 214](#)

["Current Application Revision" on page 215](#)

["Current Application Options" on page 215](#)

#### 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?
<b>Notes</b>	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 (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 216

"Application Catalog Model Numbers" on page 216

"Application Catalog Revision" on page 216

"Application Catalog Options" on page 217

### 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?
<b>Preset</b>	Not affected by Preset
<b>State Saved</b>	Not saved in instrument state.
<b>Initial S/W Revision</b>	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?
<b>Notes</b>	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.)
<b>Preset</b>	Not affected by a Preset
<b>State Saved</b>	Not saved in instrument state.
<b>Initial S/W Revision</b>	Prior to A.02.00

### Application Catalog Revision

Returns the Revision of the provided Model Number.

<b>Remote Command</b>	:SYSTem:APPLication:CATalog:REVision? <model>
<b>Example</b>	:SYST:APPL:CAT:REV? 'N9060A'
<b>Notes</b>	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>	:SYSTem: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 VSA software. The 89600 VSA software is powerful, PC-based software, offering the industry's most sophisticated general purpose and standards specific signal evaluation and troubleshooting tools for R&D engineers. Even for proprietary and non-standard signals in SATCOM or MILCOM applications, you can make signal quality measurements with customized IQ constellation. Reach deeper into signals, gather more data on signal problems, and gain greater insight.

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

- Wireless networking: 802.11a/b/g, 802.11n, 802.ac, 802.16 WiMAX (fixed/mobile), WiSUN (MR-FSK PHY)
- RFID
- Digital satellite video and other satellite signals, radar, LMDS
- Up to 400K bin FFT, for the highest resolution spectrum analysis
- A full suite of time domain analysis tools, including signal capture and playback, time gating, and CCDF measurements
- 20 simultaneous trace displays and the industry's most complete set of marker functions
- Easy-to-use Microsoft ® Windows ® graphical user interface

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

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

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

## Analog Demod

Selects the Analog Demod mode for making measurements of AM, FM and phase modulated signals.

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

Key Path	Mode
<b>Example</b>	INST:SEL ADEMODO INST:NSEL 234
Initial S/W Revision	Prior to A.02.00

## Bluetooth

Selects the Bluetooth mode for Bluetooth specific measurements. There are several measurements available in this mode.

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

Key Path	Mode
<b>Example</b>	INST:SEL BT

---

	INST:NSEL 228
Initial S/W Revision	A.06.01

---

### cdma2000

Selects the cdma2000 mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

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

---

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

---

### CMMB

Selects the CMMB mode for measurements of digital video signals using this format. There are several power and demod measurements available in this mode.

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

---

Key Path	Mode
<b>Example</b>	INST:SEL CMMB INST:NSEL 240
Initial S/W Revision	A.03.00

---

### Combined WLAN

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

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

---

Key Path	Mode
<b>Example</b>	INST:SEL CWLAN INST:NSEL 19
Initial S/W Revision	A.02.00

---

### Combined Fixed WiMAX

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

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

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

### Digital Cable TV

Selects the Digital Cable TV mode for measurements of digital cable television systems. There are several power and demod measurements available in this mode.

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

Key Path	Mode
<b>Example</b>	INST:SEL 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 EDGE GSM 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

### LTE-Advanced FDD

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

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

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

### LTE-Advanced TDD

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



Advanced TDD are distinguished by the licenses.

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

Key Path	Mode
<b>Example</b>	INST:SEL LTEATDD INST:NSEL 108
Notes	When the N9082A/82B-1FP exists, the display mode name is LTE TDD. When the N9082A/82B-1FP and N9082B-2FP all exist, the display mode name is LTE TDD & LTE-A TDD.
<b>Backwards Compatibility SCPI</b>	INST:SEL LTETDD INST:NSEL 105
Initial S/W Revision	A.14.00
Modified at S/W Revision	A.14.50

## MSR

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

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

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

## Noise Figure

The Noise Figure mode provides pre-configured measurements for making general purpose measurements of device noise figure.

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

Key Path	Mode
<b>Example</b>	INST:SEL NFIGURE INST:NSEL 219
Initial S/W Revision	Prior to A.02.00

### Phase Noise

The Phase Noise mode provides pre-configured measurements for making general purpose measurements of device phase noise.

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

Key Path	Mode
<b>Example</b>	INST:SEL PNOISE or INST:NSEL 14
Initial S/W Revision	Prior to A.02.00

### Real Time Spectrum Analyzer

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

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

Key Path	Mode
<b>Example</b>	INST:SEL RTSA or INST:NSEL 107
Initial S/W Revision	A.13.00

### 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 SCPI LC Or INST:NSEL 270
Initial S/W Revision	A.06.00

## Spectrum Analyzer

Selects the Spectrum Analyzer mode for general purpose measurements. There are several measurements available in this mode. General spectrum analysis measurements, in swept and zero span, can be done using the first key in the Meas menu, labeled Swept SA. Other measurements in the Meas Menu are designed to perform specialized measurement tasks, including power and demod measurements.

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

Key Path	Mode
<b>Example</b>	INST:SEL SA INST:NSEL 1
Initial S/W Revision	Prior to A.02.00

## TD-SCDMA with HSPA/8PSK

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

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

Key Path	Mode
<b>Example</b>	INST:SEL TDSCDMA INST:NSEL 211
Initial S/W Revision	Prior to A.02.00

### Vector Signal Analyzer (VXA)

The N9064A (formerly 89601X) VXA Vector signal and WLAN modulation analysis application provides solutions for basic vector signal analysis, analog demodulation, and digital demodulation. The digital demodulation portion of N9064A allows you to perform measurements on standard-based formats such as cellular, wireless networking and digital video as well as general purpose flexible modulation analysis for wide range of digital formats, FSK to 1024QAM, with easy-to-use measurements and display tools such as constellation and eye diagram, EVM traces and up to four simultaneous displays. Analog baseband analysis is available using the MXA and PXA with option BBA. Option 3FP WLAN has been discontinued.

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

N9064A-1 is equivalent to 89601X-205

N9064A-2 is equivalent to 89601X-AYA

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

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

### W-CDMA with HSPA+

Selects the W-CDMA with HSPA+ mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

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

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

### WLAN

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

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

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

## Global Settings

Opens a menu that allows you to switch certain Meas Global parameters to a Mode Global state. These switches apply to all Modes that support global settings. No matter what Mode you are in when you set the “Global Center Frequency” switch to on, it applies to all Modes that support Global Settings.

<b>Key Path</b>	<b>Mode Setup</b>
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.

<b>Key Path</b>	<b>Mode Setup, Global Settings</b>
<b>Scope</b>	<b>Mode Global</b>
<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?
<b>Preset</b>	Set to Off on Global Settings, Restore Defaults and System, Restore Defaults, All Modes
<b>Range</b>	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

### 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
<b>Remote Command</b>	:INSTrument:DEFault
<b>Example</b>	:INST:DEF
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

### 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
Remote Command	:SYSTem:PRESet:TYPE FACTory MODE USER :SYSTem:PRESet:TYPE?
Example	:SYST:PRESet: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

### 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



## 6 System Functions

## File

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

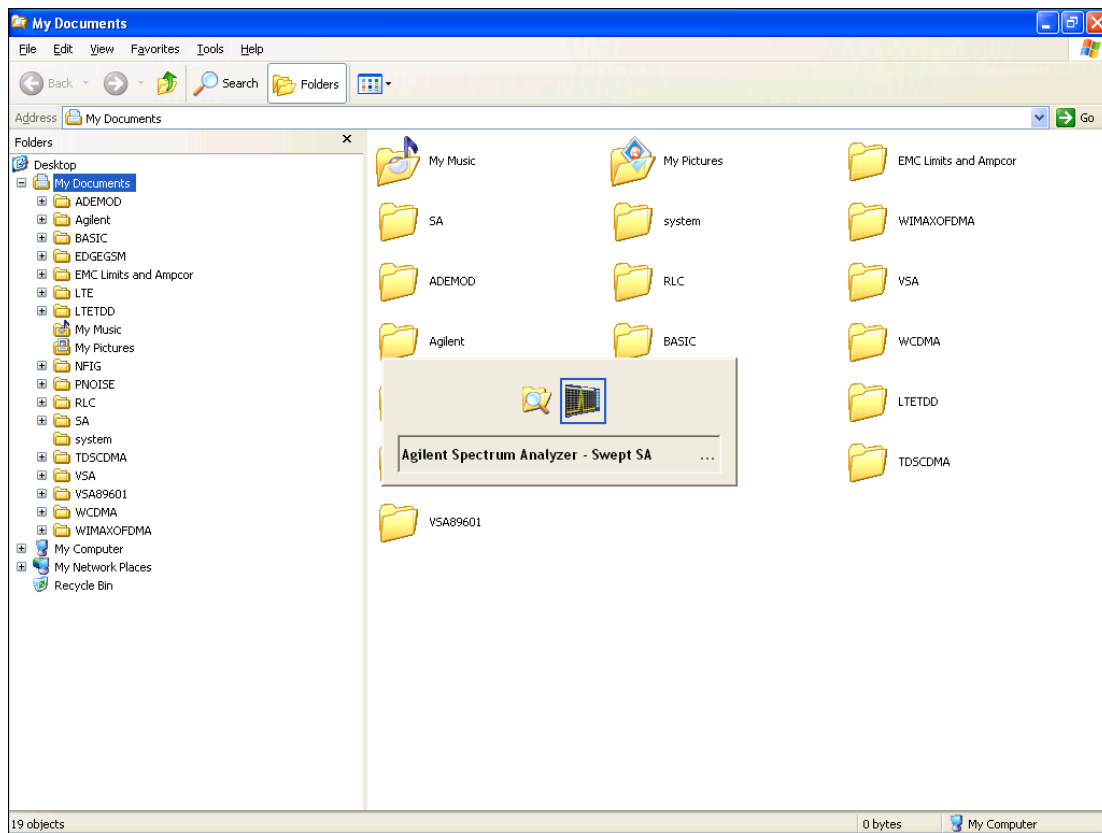
Key Path	Front-panel key
Initial S/W Revision	Prior to A.02.00

## File Explorer

Opens the standard Windows File Explorer. The File Explorer opens in the My Documents directory for the current user.

The File Explorer is a separate Windows application, so to return to the analyzer once you are in the File Explorer, you may either:

Exit the File Explorer by clicking on the red X in the upper right corner, with a mouse



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

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

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

## Print

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

## Maximize/Restore Down

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

### Maximize

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

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

### Restore Down

This key allows you to Restore Down the Instrument Application and reverses the action taken by Maximize. This key is only visible when the application has been maximized, and after the Restore Down action has been completed this key is replaced by the Maximize key.

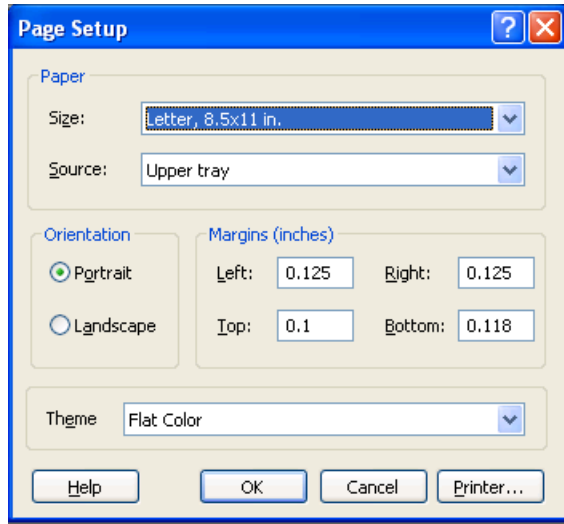
Key Path	File
Mode	All
Notes	No equivalent remote command for this key.
State Saved	No
Initial S/W Revision	A.05.01

## Page Setup

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

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

Paper size, the printer paper source, the page orientation and the margins are all settable. Just like any standard Windows dialog, you may navigate the dialog using the front-panel keys, or a mouse. There are no SCPI commands for controlling these parameters.



Also contained in this dialog is a drop-down control that lets you select the Theme to use when printing. For more on Themes, see information under View/Display, Display, System Display Settings, Theme. The Theme control has a corresponding SCPI command.

Parameter Name	Print Themes
Parameter Type	Enum
Mode	All
Remote Command	:SYSTem:PRINt:THEMe TDCOLOR TDMONochrome FCOLOR FMONochrome :SYSTem:PRINt:THEMe?
Example	:SYST:PRIN:THEM FCOL
Setup	:SYSTem:DEFault MISC
Preset	FCOL; not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.
State Saved	No
Initial S/W Revision	Prior to A.02.00

## Print

This front-panel key is equivalent to performing a File, Print, OK. It immediately performs the currently configured Print to the Default printer.

The :HCOPY command is equivalent to pressing the PRINT key. The HCOPY:ABORT command can be used to abort a print which is already in progress. Sending HCOPY:ABORT will cause the analyzer to stop sending data to the printer, although the printer may continue or even complete the print, depending on how much data was sent to the printer before the user sent the ABORT command.

Key Path	Front-panel key
<b>Remote Command</b>	:HCOPY[:IMMEDIATE]
Initial S/W Revision	Prior to A.02.00

Key Path	SCPI command only
<b>Remote Command</b>	:HCOPY:ABORT
Initial S/W Revision	Prior to A.02.00


## Restore Down

This key allows you to Restore Down the Instrument Application and reverses the action taken by Maximize. This key is only visible when the application has been maximized, and after the Restore Down action has been completed this key is replaced by the Maximize key.

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

## Minimize

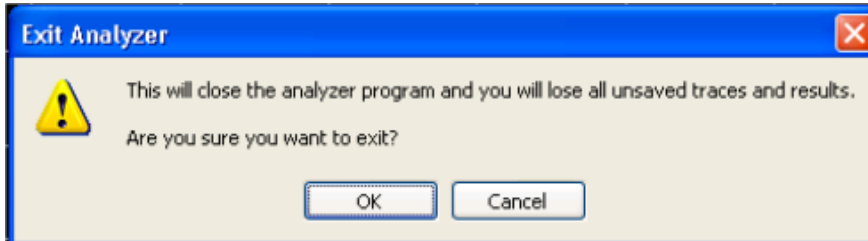
The Minimize key causes the analyzer display to disappear down into the task bar, allowing you to see the

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

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

## Exit

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



---

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

---



## Print

This front-panel key is equivalent to performing a File, Print, OK. It immediately performs the currently configured Print to the Default printer.

The :HCOPY command is equivalent to pressing the PRINT key. The HCOPY:ABORT command can be used to abort a print which is already in progress. Sending HCOPY:ABORT will cause the analyzer to stop sending data to the printer, although the printer may continue or even complete the print, depending on how much data was sent to the printer before the user sent the ABORT command.

---

Key Path	Front-panel key
<b>Remote Command</b>	:HCOPY[:IMMEDIATE]
Initial S/W Revision	Prior to A.02.00

---

---

Key Path	SCPI command only
<b>Remote Command</b>	:HCOPY:ABORT
Initial S/W Revision	Prior to A.02.00

---

## System

Opens a menu of keys that access various configuration menus and dialogs.

Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00

## Show

Accesses a menu of choices that enable you to select the information window you want to view.

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

## Errors

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

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

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

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

The fields on the Errors display are:

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

ID - Displays the error number.

Message - Displays the message text.

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

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

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

Key Path	System, Show
Mode	All
Remote Command	:SYSTem:ERRor[:NEXT]?
Example	:SYST:ERR?
Notes	The return string has the format: “<Error Number>,<Error>” Where <Error Number> and <Error> are those shown on the Show Errors screen
Backwards Compatibility Notes	In some legacy analyzers, the Repeat field shows the number of times the message has repeated since the last time the error queue was cleared. In the X-Series, the Repeat field shows the number of times the error has repeated since the last intervening error. So the count may very well be different than in the past even for identical signal conditions  Unlike previous analyzers, in the X-Series all errors are reported through the Message or Status lines and are logged to the event queue. They never appear as text in the graticule area (as they sometimes do in previous analyzers) and they are never displayed in the settings panel at the top of the screen (as they sometimes do, by changing color, in previous analyzers).  As a consequence of the above, the user can only see one status condition (the most recently generated) without looking at the queue. In the past, at least in the Spectrum Analyzer, multiple status conditions might display on the right side of the graticule.  In general, there is no backwards compatibility specified or guaranteed between the error numbers in the X-Series and those of earlier products. Error, event, and status processing code in customers' software will probably need to be rewritten to work with X-Series.  In the legacy analyzers, some conditions report as errors and others simply turn on status bits. Conditions that report as errors often report over and over as long as the condition exists. In the X-series, all conditions report as start and stop events. Consequently, software that repeatedly queries for a condition error until it stops reporting will have to be rewritten for the X-series.
Initial S/W Revision	Prior to A.02.00

## Previous Page

See ["Next Page" on page 244.](#)

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:

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
<b>Remote Command</b>	:SYSTem:ERRor:VERBose OFF ON 0 1 :SYSTem:ERRor:VERBose?
<b>Example</b>	: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 244.

### 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
Remote Command	:SYSTem:ERRor:OVERload[:STATe] 0 1 OFF ON
Example	:SYST:ERR:OVER 1 Enable overload errors
Preset	Set to OFF by Restore Misc Defaults (no Overload errors go to SCPI)
State Saved	Saved in instrument state.
Initial S/W Revision	A.10.01

## System

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

```

<Product Name> <Product Description>
Product Number: N9020A
Serial Number: US46220924
Firmware Revision: A.01.01
Computer Name: <hostname>
Host ID: N9020A,US44220924

N9020A-503      Frequency Range to 3.6 GHz
N9020A-PFR     Precision Frequency Reference
N9020A-P03     Preamp 3.6 GHz

N9060A-2FP     Spectrum Analysis Measurement Suite 1.0.0.0
N9073A-1FP     WCDMA 1.0.0.0
N9073A-2FP     WCDMA with HSDPA 1.0.0.0
    
```

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page menu key is grayed-out if the last page is 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:CONFigure[:SYSTem]?
<b>Example</b>	:SYST:CONF?
Notes	The output is an IEEE Block format of the Show System contents. Each line is separated with a new-line character.
Initial S/W Revision	Prior to A.02.00

### 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:





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
<b>Example</b>	SYST:PON:TYPE USER
Readback Text	User Preset

Backwards Compatibility Notes	Power On User Preset will cause the instrument to power up in the power-on mode, not the last mode the instrument was in prior to shut down. Also, Power On User Preset will User Preset all modes. This does not exactly match legacy behavior.
Initial S/W Revision	Prior to A.02.00

## Last State

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

### NOTE

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

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

Key Path	System, Power On
Mode	All
<b>Example</b>	SYST:PON:TYPE LAST
Notes	Power on Last State only works if you have done a controlled shutdown prior to powering on in Last. If a controlled shutdown is not done when in Power On Last State, the instrument will power up in the last active mode, but it may not power up in the active mode's last state. If an invalid mode state is detected, a Mode Preset will occur. To control the shutdown under remote control use the :SYSTem:PDOWn command.
Readback Text	Last State
Backwards Compatibility Notes	It is no longer possible to power-up the analyzer in the last mode the analyzer was running with that mode in the preset state. (ESA/PSA SYST:PRESET:TYPE MODE with SYST:PON:PRESET) You can power-on the analyzer in the last mode the instrument was running in its last state (SYST:PON:TYPE LAST), or you can specify the mode to power-up in its preset state (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
<b>Remote Command</b>	:SYSTem:PON:MODE SA   BASIC   ADEMOD   NFIGURE   PNOISE   CDMA2K   TDSCDMA   VSA   VSA89601   WCDMA   WIMAXOFDMA  :SYSTem:PON:MODE?
<b>Example</b>	SYST:PON:MODE SA
Notes	The list of possible modes (and remote parameters) to choose from is dependent on which modes are installed in the instrument.
Preset	This is unaffected by a Preset but is set on a "Restore System Defaults->All" to: For N9038A: EMI For N8973B, N8974B, N8975B, or N8976B: NFIG For all other models: SA
State Saved	No
Initial S/W Revision	Prior to A.02.00

## 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 252](#)

["Access to Configure Applications utility" on page 252](#)

["Virtual memory usage" on page 252](#)

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

### Select/Deselect

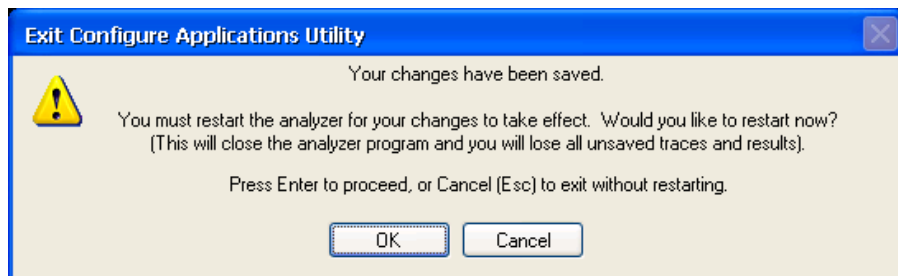
Toggles the currently highlighted application in the list.

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

### Save Changes and Exit

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

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



<b>Key Path</b>	System, Power On, Configure Applications
<b>Remote Command</b>	:SYSTem:PUP:PROcess
<b>Example</b>	:SYST:PUP:PROC This is the SCPI command for restarting the analyzer. You must Wait after this command for the instrument application to restart
<b>Notes</b>	The softkey will be grayed-out when the virtual memory of the selected applications exceeds 100% of the limit.
<b>Notes</b>	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.
<b>Initial S/W Revision</b>	A.02.00
<b>Modified at S/W Revision</b>	A.04.00

### Exit Without Saving

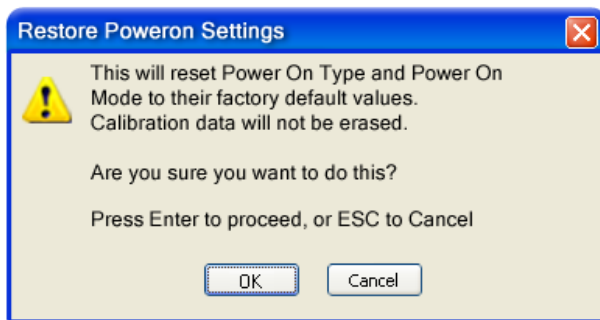
Pressing this key will exit the Configure Applications utility without saving your changes.

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

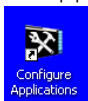
Key Path	System, Power On
Example	:SYST:DEF PON
Initial S/W Revision	Prior to A.02.00

## 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 256](#)
- ["Configuration Memory Available \(Remote Command Only\)" on page 256](#)
- ["Configuration Memory Total \(Remote Command Only\)" on page 256](#)
- ["Configuration Memory Used \(Remote Command Only\)" on page 256](#)

- "Configuration Application Memory (Remote Command Only)" on page 257

### 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"
<b>Notes</b>	<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.
<b>Preset</b>	Not affected by Preset
<b>State Saved</b>	Not saved in instrument state
<b>Initial S/W Revision</b>	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?
<b>Preset</b>	Not affected by Preset
<b>Initial S/W Revision</b>	A.02.00

### Configuration Memory Total (Remote Command Only)

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

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

### 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

### 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

### 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
<b>Remote Command</b>	:CALibration:AUTO ON PARTial OFF :CALibration:AUTO?
<b>Example</b>	:CAL:AUTO ON

Notes	While Auto Align is executing, bit 0 of Status Operation register is set.
Couplings	Auto Align is set to Off if Restore Align Data is invoked.
Preset	This is unaffected by Preset but is set to ON upon a “Restore System Defaults->Align”.
State Saved	No
Status Bits/OPC dependencies	When Auto Align is executing, bit 0 in the Status Operational register is set.
<b>Backwards Compatibility SCPI</b>	:CALibration:AUTO ALERt
	Parameter ALERt is for backward compatibility only and is mapped to PARTial
Backwards Compatibility Notes	<ol style="list-style-type: none"> <li>1. ESA SCPI for Auto Align is :CALibration:AUTO &lt;Boolean&gt;. The command for X-Series is an enumeration. Thus the parameters of “0” and “1” are not possible in X-Series.</li> <li>2. Similarly, the ESA SCPI for :CALibration:AUTO? returned the Boolean value 1 or 0, in X-Series it is an Enumeration (string). Thus, queries by customer applications into numeric variables will result in an error</li> <li>3. In PSA Auto Align OFF was not completely off, it is equivalent to PARTial in X-Series. In X-Series, OFF will be fully OFF. This means users of PSA SCPI who choose OFF may see degraded performance and should migrate their software to use PARTial.</li> </ol>
Initial S/W Revision	Prior to A.02.00

## Normal

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

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

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

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

Key Path	System, Alignments, Auto Align
Mode	All
<b>Example</b>	:CAL:AUTO ON
Notes	<p>Alignment processing as a result of the transition to Normal will be executed sequentially. Thus, *OPC? or *WAI following CAL:AUTO ON will return when the alignment processing is complete.</p> <p>The presence of an external signal may interfere with the RF portion of the alignment. If so, the Error Condition message “Align skipped: 50 MHz interference” or “Align skipped: 4.8 GHz interference” is reported, and bit 11 is set in the Status Questionable Calibration register. After the interfering signal is removed, subsequent alignment of the RF will clear the condition, and clear bit 11 in the Status Questionable Calibration register.</p>
Readback Text	Normal
Status Bits/OPC dependencies	An interfering user signal may prevent automatic alignment of the RF subsystem. If this occurs, the Error Condition message “Align skipped: 50 MHz interference” or “Align skipped: 4.8 GHz

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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.

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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
<b>Example</b>	:CAL:AUTO PART
Notes	Auto Align Partial begins the elapsed time counter for Auto Align Off time.
Readback Text	Partial
Initial S/W Revision	Prior to A.02.00

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## Off

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

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

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

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

Key Path	System, Alignments, Auto Align
Mode	All
Example	:CAL:AUTO OFF
Notes	Auto Align Off begins the elapsed time counter for Auto Align Off time.
Couplings	Auto Align is set to Off if Restore Align Data is invoked.
Readback Text	Off
Initial S/W Revision	Prior to A.02.00

### All but RF

Auto Align, All but RF, configures automatic alignment to include or exclude the RF subsystem. (Eliminating the automatic alignment of the RF subsystem prevents the input impedance from changing. The normal input impedance of 50 ohms can change to an open circuit when alignments are being used. Some devices under test do not behave acceptably under such circumstances, for example by showing instability.) When Auto Align, All but RF ON is selected, the operator is responsible for performing an Align Now, RF when RF-related alignments expire. The Auto Align, Alert mechanism will notify the operator to perform an Align Now, All when the combination of time and temperature variation is exceeded.

When Auto Align, All but RF ON is selected the Settings Panel indicates ALIGN AUTO/NO RF with a warning icon (warning icon is intended to inform the operator they are responsible for the maintaining the RF alignment of the instrument):

Key Path	System, Alignments, Auto Align
Mode	All
Remote Command	:CALibration:AUTO:MODE ALL NRF :CALibration:AUTO:MODE?
Example	:CAL:AUTO:MODE NRF
Preset	This is unaffected by Preset but is set to ALL on a "Restore System Defaults->Align".
State Saved	No
Readback Text	RF or NRF
Initial S/W Revision	Prior to A.02.00

### Alert

The instrument will signal an Alert when conditions exist such that you will need to perform a full alignment (for example, Align Now, All). The Alert can be configured in one of four settings; Time & Temperature, 24 hours, 7 days, or None. A confirmation is required when a selection other than Time & Temperature is chosen. This prevents accidental deactivation of alerts.

With Auto Align set to Normal, the configuration of Alert is not relevant because the instrument's software maintains the instrument in warranted operation.

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

### Time & Temperature

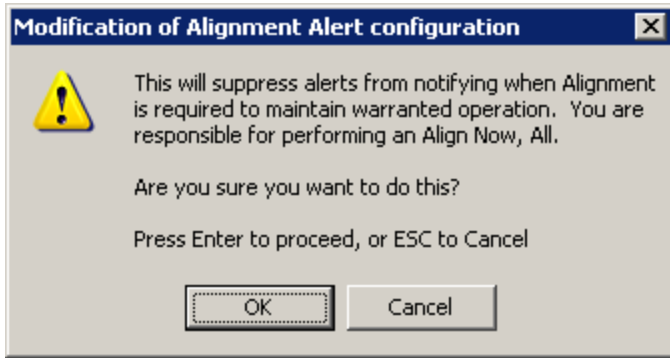
With Auto Align Alert set to Time & Temperature the instrument will signal an alert when alignments expire due to the combination of the passage of time and changes in temperature. The alert is the Error Condition message "Align Now, All required". If this choice for Alert is selected, the absence of an alert means that the analyzer alignment is sufficiently up-to-date to maintain warranted accuracy.

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

### 24 hours

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

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



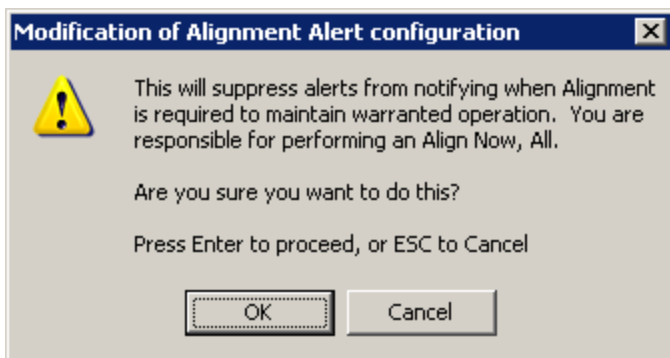
No confirmation is required when Alert is configured through a remote command.

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

### 7 days

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

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



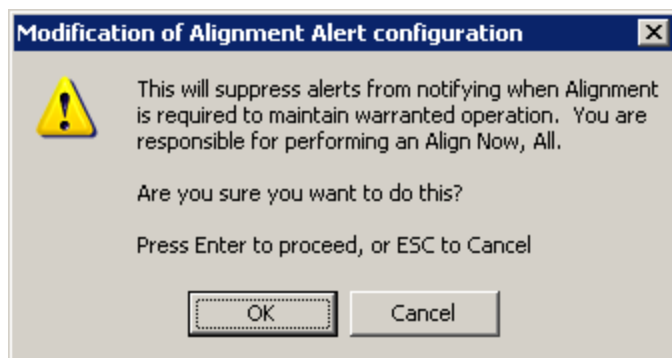
No confirmation is required when Alert is configured through a remote command.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
<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
Remote Command	:CALibration:EXPIred?
Example	:CAL:EXP?
Notes	:CALibration:EXPIred? returns 0 if successful :CALibration:EXPIred? returns 1 if failed
Initial S/W Revision	Prior to A.02.00

## Align Now

Accesses alignment processes that are immediate action operations. They perform complete operations and run until they are complete.

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

### All

(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.

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

<b>Mode</b>	All
<b>Remote Command</b>	*CAL?
<b>Example</b>	*CAL?
<b>Notes</b>	*CAL? returns 0 if successful

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

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### All but RF

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

Immediately executes an alignment of all subsystems except the RF subsystem . The instrument will stop any measurement currently underway, perform the alignment, and then restart the measurement from the beginning (similar to pressing the Restart key). This can be used to align portions of the instrument that are not impacted by an interfering user input signal.

This operation might be chosen instead of All if you do not want the device under test to experience a large change in input impedance, such as a temporary open circuit at the analyzer input.

The query form of the remote commands (:CALibration:NRF?) will invoke the alignment and return a success or failure value.

Successful completion of Align Now, All but RF will clear the “Align Now, All required” Error Condition, and clear bit 14 in the Status Questionable Calibration register. If “Align Now, All required” was in effect prior to executing the All but RF, the Error Condition message “Align Now, RF required” is generated and bit 12 in the Status Questionable Calibration register is set. It will also begin the elapsed time counter for Last Align Now, All Time, and capture the Last Align Now, All Temperature.

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

In models with the RF Preselector, such as the N9038A, the “All but RF” alignment will execute an alignment of all subsystems except the RF subsystem of the Spectrum Analyzer, as well as the system gain of the RF Preselector.

---

<b>Key Path</b>	System, Alignments, Align Now
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:NRF :CALibration:NRF?
<b>Example</b>	:CAL:NRF
<b>Notes</b>	:CALibration:NRF? returns 0 if successful :CALibration:NRF? returns 1 if failed While Align Now, All but RF is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register.

---

	<p>This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command.</p> <p>Successful completion will clear bit 14 in the Status Questionable Calibration register and set bit 12 if invoked with “Align Now, All required”.</p>
Couplings	<p>Initializes the time for the Last Align Now, All Time.</p> <p>Records the temperature for the Last Align Now, All Temperature.</p>
Status Bits/OPC dependencies	Bits 12 or 14 may be set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

## 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.

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	:CALibration:RF :CALibration:RF?
Example	:CAL:RF
Notes	:CALibration:RF? returns 0 if successful

---

	<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>
Couplings	<p>Initializes the time for the Last Align Now, RF Time.</p> <p>Records the temperature for the Last Align Now, RF Temperature.</p>
Status Bits/OPC dependencies	<p>Bits 11, 12, or 14 may be set in the Status Questionable Calibration register.</p>
Initial S/W Revision	<p>Prior to A.02.00</p>

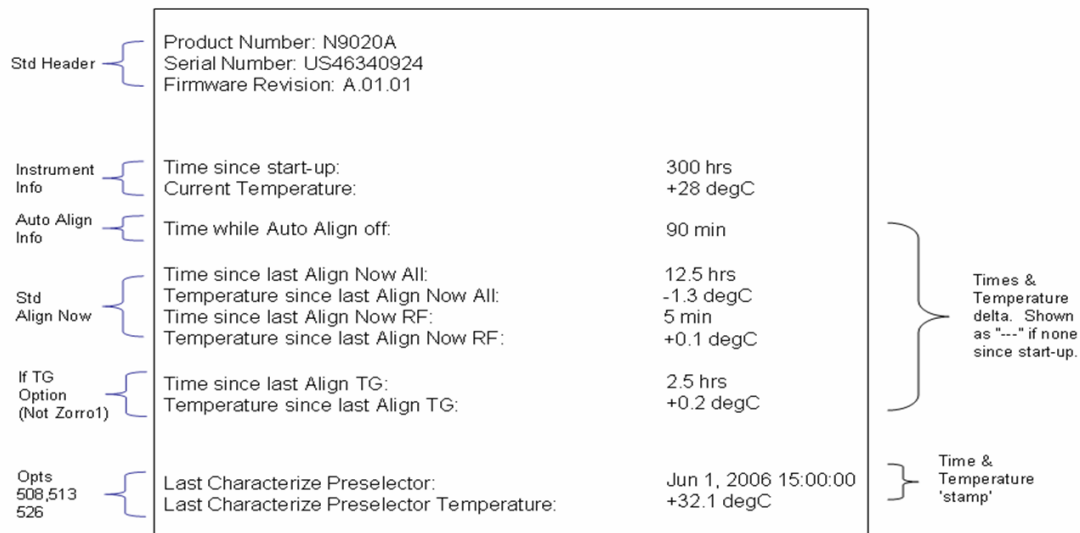
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### Show Alignment Statistics

Shows alignment information you can use to ensure that the instrument is operating in a specific manner. The Show Alignment Statistics screen is where you can view time and temperature information.

Values which are displayed are only updated when the Show Alignment Statistics screen is invoked, they are not updated while the Show Alignment Statistics screen is being displayed. The remote commands that access this information obtain current values.

An example of the Show Alignment Statistics screen would be similar to:



A successful Align Now, RF will set the Last Align RF temperature to the current temperature, and reset the Last Align RF time. A successful Align Now, All or Align Now, All but RF will set the Last Align Now All temperature to the current temperature, and reset the Last Align Now All time. A successful Align Now, All will also reset the Last Align RF items if the RF portion of the Align Now succeeded.

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

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	:SYSTem:PON:TIME?
Example	:SYST:PON:TIME?
Notes	Value is the time since the most recent start-up in seconds.
State Saved	No
Initial S/W Revision	Prior to A.02.00

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

Notes	Value is in degrees Centigrade. Value is invalid if using default alignment data (Align Now, All required)
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TIME:LALL?
<b>Example</b>	:CAL:TIME:LALL?
Notes	Value is the elapsed time, in seconds, since the last successful Align Now, All or Align Now, All but RF was executed.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TEMPerature:LALL?
<b>Example</b>	:CAL:TEMP:LALL?
Notes	Value is in degrees Centigrade at which the last successful Align Now, All or Align Now, All but RF was executed.
State Saved	No
Initial S/W Revision	Prior to A.02.00

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

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All

<b>Remote Command</b>	:CALibration:TEMPerature:LRF?
<b>Example</b>	:CAL:TEMP:LRF?
Notes	Value is in degrees Centigrade at which the last successful Align Now, RF was executed, either individually or as a component of Align Now, All.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
<b>Remote Command</b>	:CALibration:TIME:LPreselector?
<b>Example</b>	:CAL:TIME:LPR?
Notes	Value is the date and time the last successful Characterize Preselector was executed. The date is separated from the time by a space character. Returns "" if no Characterize Preselector has ever been performed on the instrument.
Dependencies	In models that do not include preselectors, this command is not enabled and any attempt to set or query will yield an error.
State Saved	No
Initial S/W Revision	Prior to A.02.00

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:RFPSselector: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:RFPSselector: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:RFPSselector: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:RFPSselector: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
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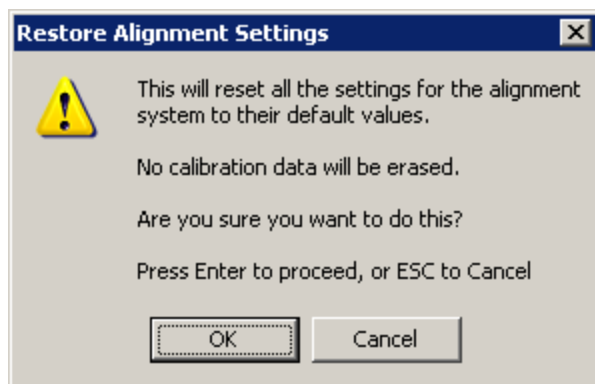


Mode	All
<b>Remote Command</b>	:CALibration:RFPSelector:SCHeuler:TIME:NEXT?
	This query returns data using the following format “YYYY/MM/DD; HH:MM:SS”
<b>Example</b>	:CAL:RFPS:SCH:TIME:NEXT?
Notes	<p>The next run time will be updated based on the start date/time and recurrence set by the users.</p> <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
<b>Example</b>	: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.

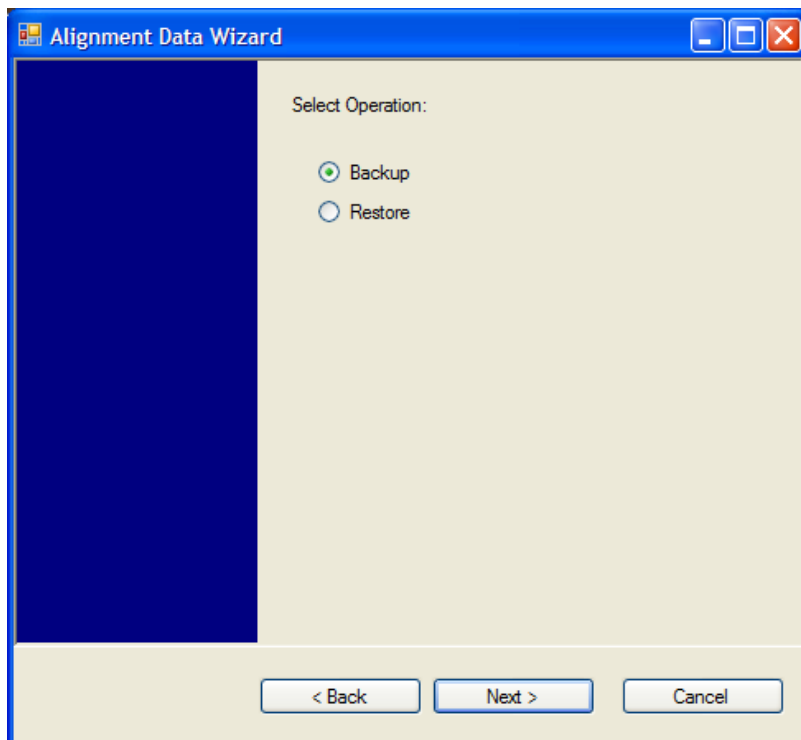
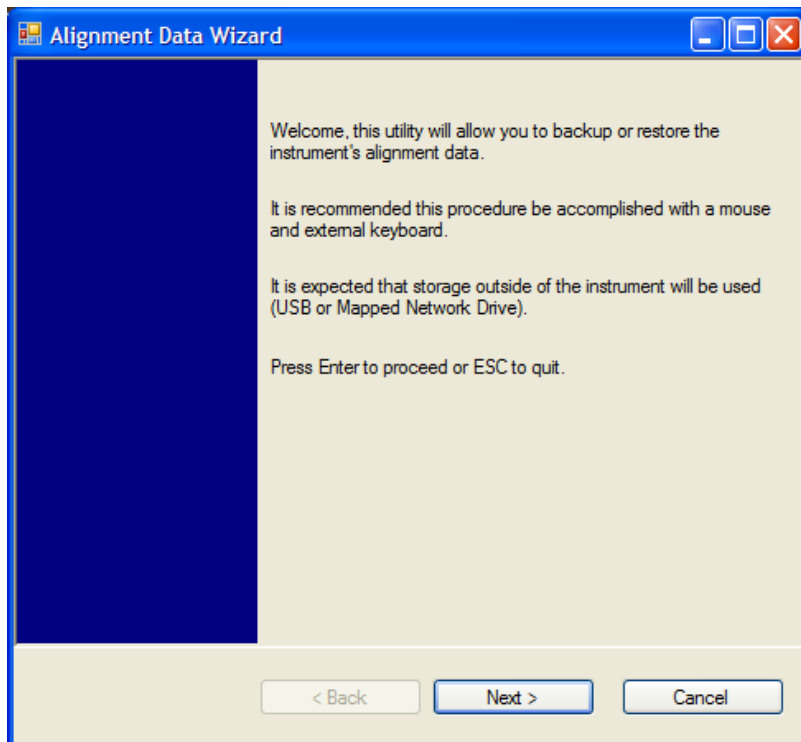
Key Path	System, Alignments
Initial S/W Revision	A.02.00

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.

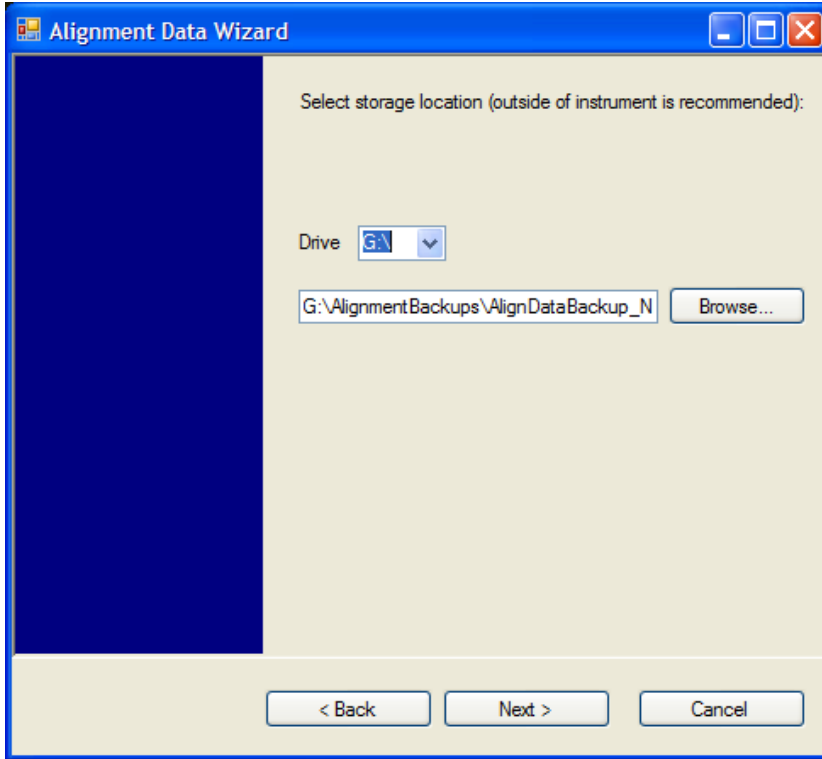
The following dialogue boxes operates without a mouse or external keyboard when you use the default file names.



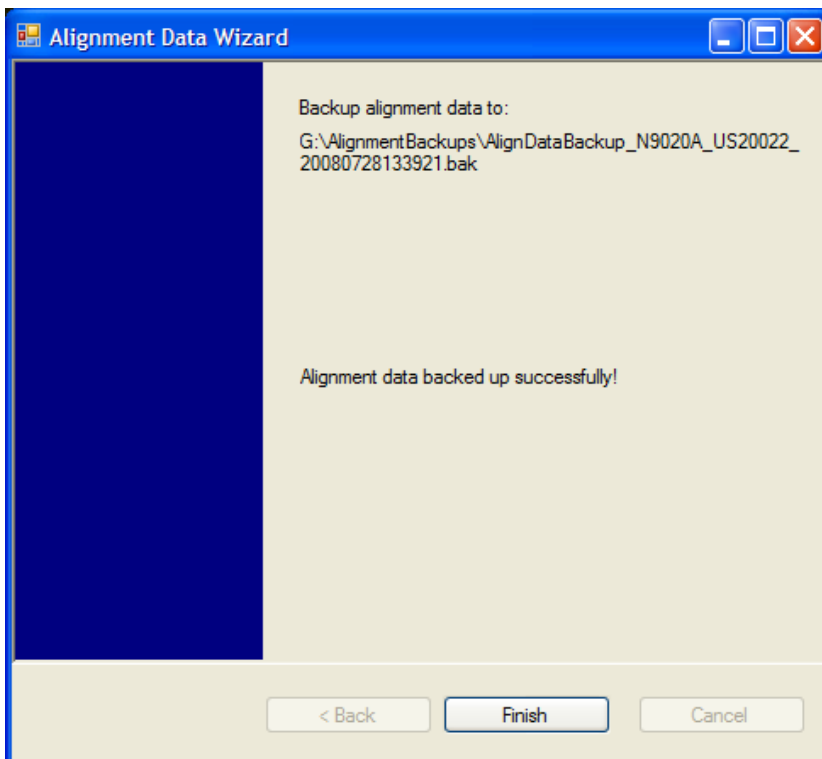
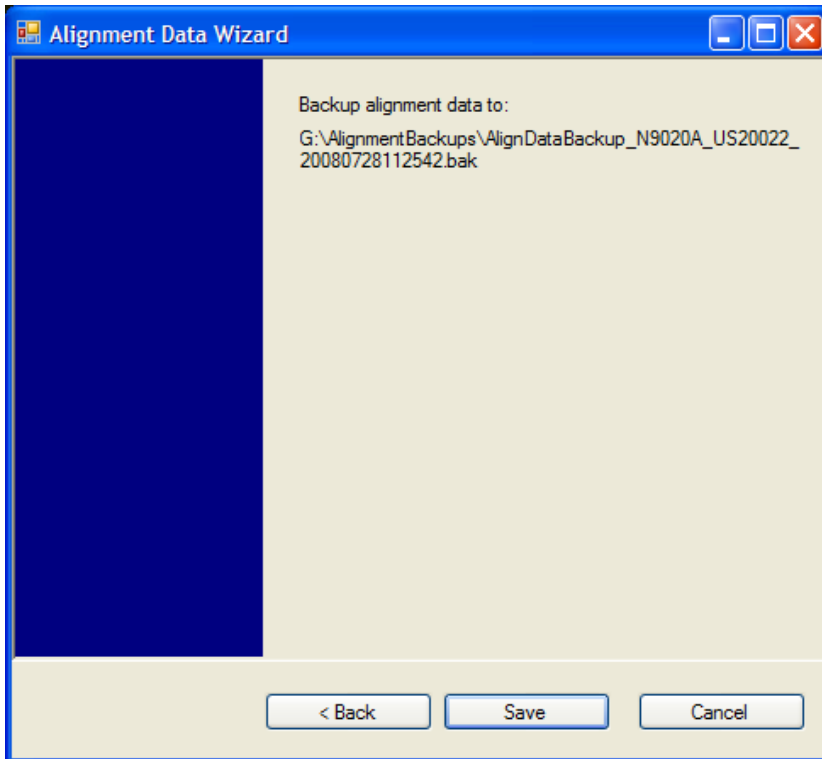
The backup screen indicates the approximate amount of space required to contain the backup file.

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

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

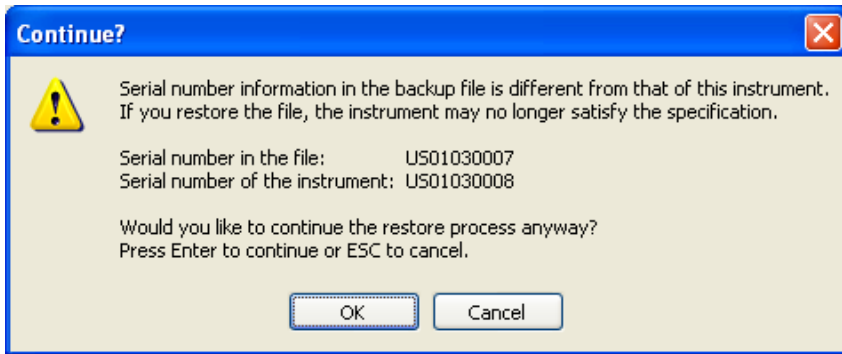


Changing the drive letter will also modify the path displayed in the box below. When this step is first loaded, the drive drop-down menu is populated with connected drives, which provide the user with write access. If there are many unreachable network drives connected to the instrument, this step can take a few seconds. If a USB drive is present, it will be selected by default. The path defaults to the AlignmentBackups folder, and a filename is automatically created in the form of AlignDataBackup\_<model>\_<serial number>\_<date>\_<time>. When the "Next >" button is pressed, you will be prompted to create a new folder if the chosen path does not yet exist.

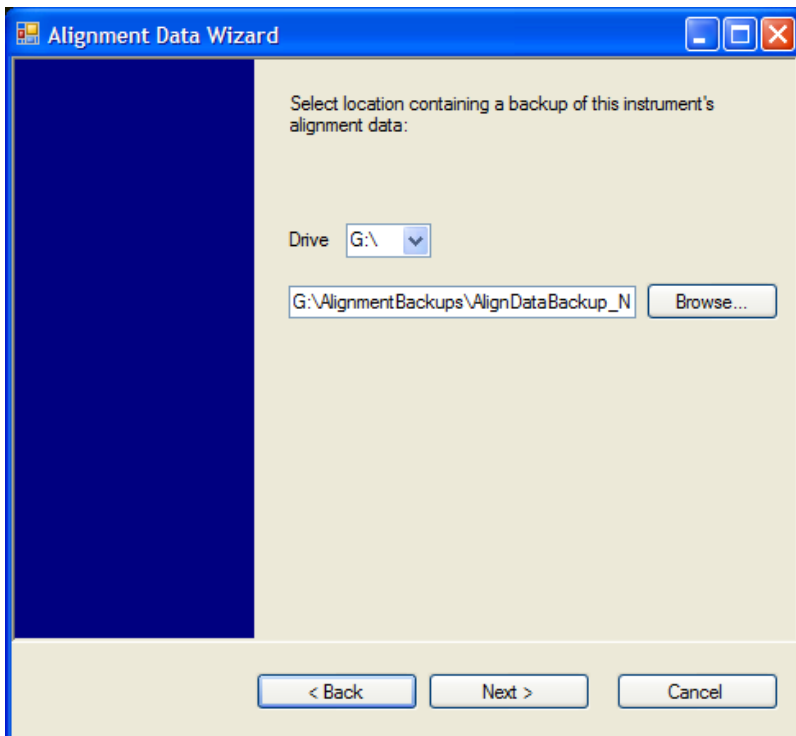


The restore operation checks the validity of the restore file using the database's built-in file validation. If the restore file is corrupt, the existing alignment data will remain in use.

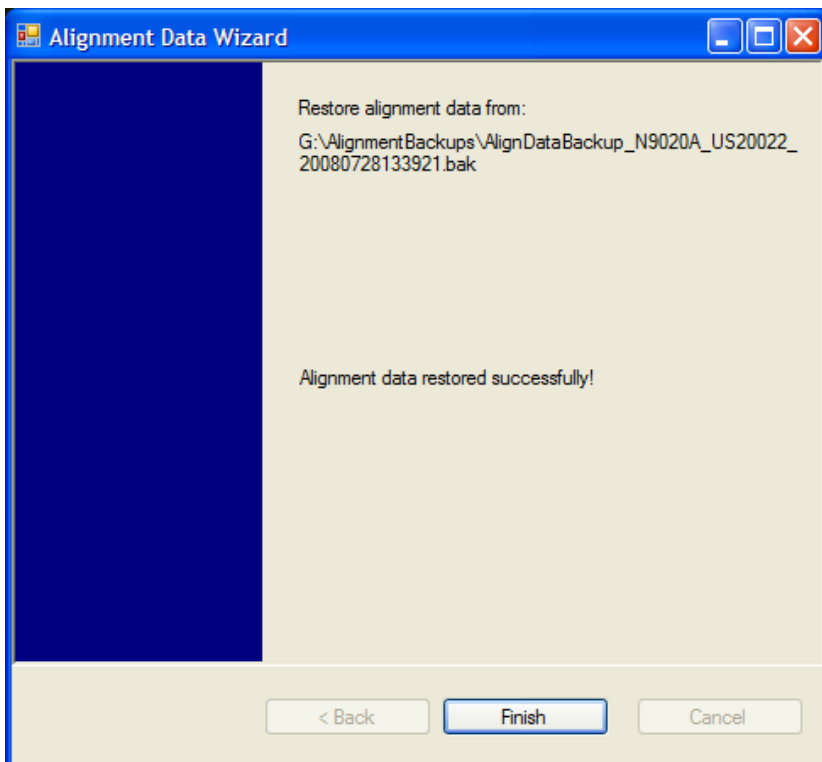
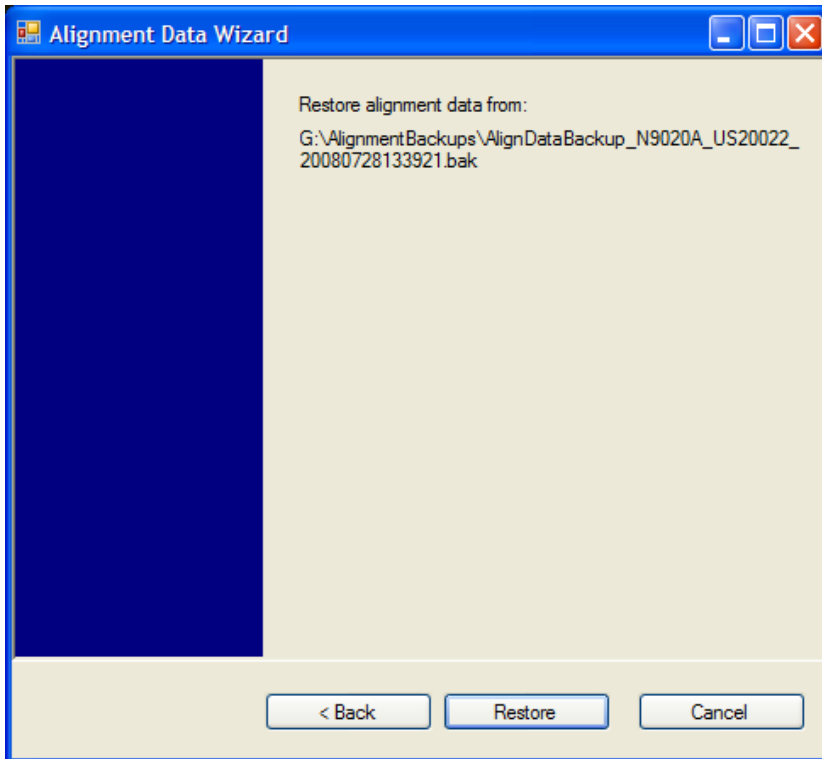
If the serial number information in the backup file being restored is different from that of the instrument, the following message appears (the serial number shown are examples):



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



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



### Perform Backup (Remote Command Only)

Invokes an alignment data backup operation to the provided Folder.

**NOTE**

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

<b>Remote Command</b>	:CALibration:DATA:BACKup <filename>
<b>Example</b>	:CAL:DATA:BACK "F:\AlignDataBackup_N9020A_US00000001_2008140100.bak"
<b>Initial S/W Revision</b>	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 "
<b>Initial S/W Revision</b>	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
<b>Initial S/W Revision</b>	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.

Key Path	System, Alignments, Advanced
Mode	All
Remote Command	:CALibration:YTF :CALibration:YTF?
Example	:CAL:YTF
Notes	:CALibration:YTF? returns 0 if successful :CALibration:YTF? returns 1 if failed (including interfering user signal) While Advanced, Characterize Preselector is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. Successful completion will clear bit 9 in the Status Questionable Calibration register. A failure encountered during alignment will generate the Error Condition message "Characterize Preselector failed" and set bit 9 in the Status Questionable Calibration register. For Options that support frequencies > 3.6 GHz only.
Dependencies	This key does not appear in models that do not contain preselectors. In these models the SCPI command is accepted without error but no action is taken.
Couplings	Initializes the time for the Last Characterize Preselector Time. Records the temperature for the Last Characterize Preselector Temperature.
Initial S/W Revision	Prior to A.02.00

### Characterize Reference Clock

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

See ["Front panel guided calibration sequence" on page 283](#)

Key Path	System, Alignments, Advanced
Mode	All

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

<b>Parameter Name</b>	Characterize Reference Clock Initialization
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:REference:CLOCK:INITialize?
<b>Example</b>	:CAL:REF:CLOC:INIT?
<b>Notes</b>	:CALibration:REference:CLOCK:INIT? returns 0 if successful :CALibration:REference:CLOCK:INIT? returns 1 if failed
<b>Dependencies</b>	Option DP2 or B40
<b>Couplings</b>	Expected to be run before sending the :CAL:REF:CLOC? command. This will stop the current measurement when it has completed (does not abort the current data acquisition), and it will prepare the instrument for the expected cabling.
<b>Force Restart</b>	Yes
<b>Initial S/W Revision</b>	A.12.00

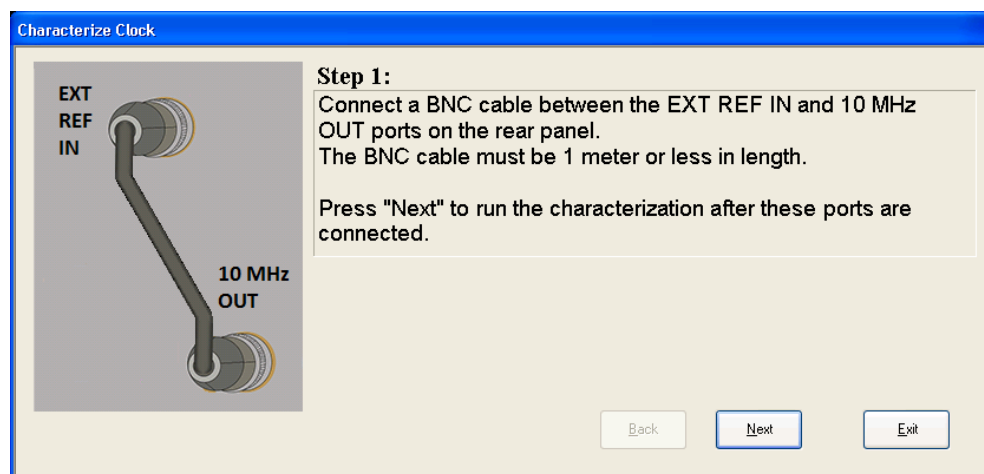
<b>Parameter Name</b>	Characterize Reference Clock End
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:REference:CLOCK:END?
<b>Example</b>	:CAL:REF:CLOC:END?
<b>Notes</b>	:CALibration:REference:CLOCK:END? returns 0 if successful :CALibration:REference:CLOCK:END? returns 1 if failed
<b>Dependencies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

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

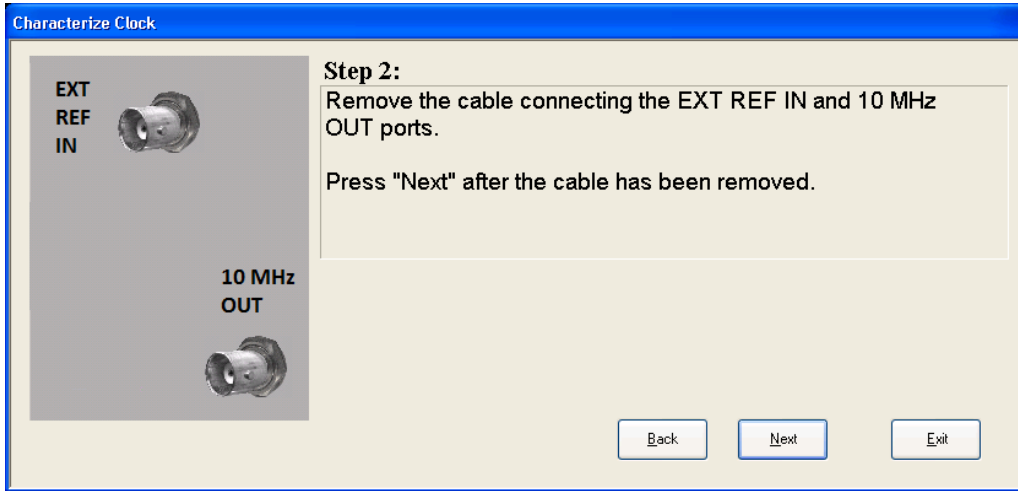
#### Front panel guided calibration sequence

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

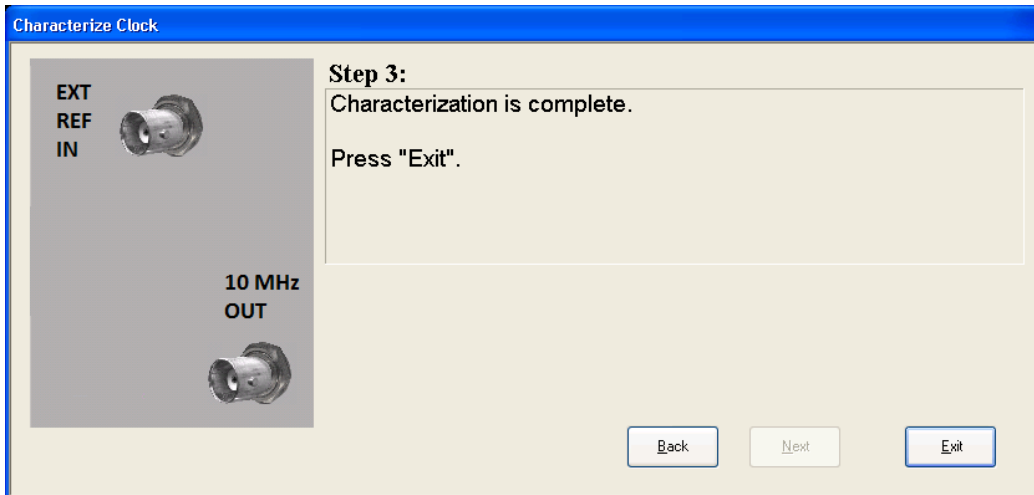
Step 1 of the guided calibration sequence:



Step 2 of the guided calibration sequence:



Step 3 of the guided calibration sequence:



### Characterize Noise Floor

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

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

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

The noise floor model used by NFE includes an estimation of the temperature behavior of the noise floor, but this is only an estimation. The noise floor changes little with the age of the components. However, even small changes in the estimated level of the noise floor can make large changes in the effective noise floor, because the effective noise floor is the error in the estimation of the noise floor. Agilent recommends that

the Characterize Noise Floor operation be performed when the analyzer is operating at an ambient temperature that is significantly different than the ambient temperature at which this alignment was last run. In addition, Agilent recommends that the Characterize Noise Floor operation be performed after the first 500 hours of operation, and once every calendar year.

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

**NOTE**

The Characterize Noise Floor function can be interrupted by pressing the Cancel (ESC) front-panel key or remotely with Device Clear followed by the :ABORt SCPI command. None of the new characterization data is then used. However, since the old characterization data is purged at the beginning of the characterization, you now have an uncharacterized noise floor. You should re-execute this function and allow it to finish before making any further measurements with NFE. Until you do, the analyzer will display a “Characterize Noise Floor required” message and set bit 12 in the Status Questionable Calibration register (STATus:QUEStionable:CALibration:EXTended:NEEded).

Key Path	System, Alignments, Advanced
Mode	All
Remote Command	:CALibration:NFLoor :CALibration:NFLoor?
Example	:CAL:NFL
Notes	:CALibration:NFLoor? returns 0 if successful :CALibration:NFLoor? returns 1 if failed (including interfering user signal) While Characterize Noise Floor is performing the alignment, bit ? in the Status Operation register is set. Completion, or termination, will clear bit ? in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command. A failure encountered during characterization will generate the Error Condition message “Characterize Noise Floor failed” message and set bit ? in the Status Questionable Calibration register. Successful completion will clear bit ? in the Status Questionable Calibration register.
Dependencies	This key does not appear in models that do not contain NFE. In these models the SCPI command is accepted without error but no action is taken.
Couplings	Successful completion of Characterize Noise Floor will begin the elapsed time counter or the Last Characterize Noise Floor Time.
Initial S/W Revision	A.14.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	:CALibration:TIME:NFLoor?
Example	:CAL:TIME:NFL?
Notes	Value is the date and time the last successful Characterize Noise Floor was executed. The date is separated from the time by a space character. Returns "" if no Characterize Noise Floor has ever been performed on the instrument.

Dependencies	In models that do not include NFE, this command is not enabled and any attempt to set or query will yield an error.
State Saved	No
Initial S/W Revision	A.14.00

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

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

## Timebase DAC

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

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

Key Path	System, Alignments
Mode	All
<b>Remote Command</b>	:CALibration:FREQuency:REFeRence:MODE CALibrated USER :CALibration:FREQuency:REFeRence:MODE?
<b>Example</b>	:CAL:FREQ:REF:MODE CAL
Notes	If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due. If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due.
Preset	This is unaffected by Preset but is set to CALibrated on a "Restore System Defaults->Align".
State Saved	No
Initial S/W Revision	Prior to A.02.00

### Calibrated

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

Key Path	System, Alignments, Timebase DAC
Mode	All
<b>Example</b>	:CAL:FREQ:REF:MODE CAL
Readback Text	[xxx] < where xxx is the calibrated value
Initial S/W Revision	Prior to A.02.00

### 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 289](#)

See ["Align Now, 30 MHz to 3.6 GHz" on page 290](#)

See ["Align Now, 20 Hz to 3.6 GHz" on page 291](#)

See ["Alert" on page 292](#)

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:RFPSelector: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:RFPSelector:CONDUCTed :CALibration:RFPSelector:CONDUCTed?
Example	:CAL:RFPS:COND
Notes	For model N9038A only. :CALibration:RFPSelector:CONDUCTed? Return 0 if successful :CALibration:RFPSelector:CONDUCTed? Return 1 if failed When Align 20 Hz to 30 MHz is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORT command. Successful completion will clear bit 1 in the Status Questionable Calibration Extended Needed register and bit 0 in Status Questionable Calibration Extended Failure register. A failure encountered during alignment will set the Error Condition “20 Hz to 30 MHz Alignment Failure” and set both bit 1 in the Status Questionable Calibration Extended Needed register and bit 9 in Status Questionable Calibration register.
Dependencies	This key does not appear in other than N9038A models, setting or querying the SCPI will generate an error.
Couplings	Initializes the time for the Last Align Conducted Now, Conducted Time. Records the temperature for the Last Align Conducted Now, Conducted Temperature.
Status Bits/OPC Dependencies	Bit 8 or 9 may be set in the Status Questionable Calibration register. Bit 1 may be set in the Status Questionable Calibration Extended Needed register. Bit 0 may be set in the Status Questionable Calibration Extended Failure register.
Initial S/W Revision	A.08.00

### Align Now, 30 MHz to 3.6 GHz

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

The query form of the remote commands (:CALibration:RFPSelector: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.

<b>Key Path</b>	System, Alignments, RF Preselector, Align Now
<b>Mode</b>	All
<b>Remote Command</b>	:CALibration:RFPSelector:RADiated :CALibration:RFPSelector:RADiated?
<b>Example</b>	:CAL:RFPS:RAD
<b>Notes</b>	For model N9038A only. :CALibration:RFPSelector:RADiated? Return 0 if successful :CALibration:RFPSelector: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 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.
<b>Dependencies</b>	This key does not appear in other than N9038A models, setting or querying the SCPI will generate an error.
<b>Couplings</b>	Initializes the time for the Last Align Radiated Now, Radiated Time. Records the temperature for the Last Align Radiated Now, Radiated Temperature.
<b>Status Bits/OPC Dependencies</b>	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.
<b>Initial S/W Revision</b>	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.

Key Path	System, Alignments, RF Preselector, Align Now
Mode	All
Remote Command	:CALibration:RFPSelector:FULL :CALibration:RFPSelector:FULL?
Example	:CAL:RFPS:FULL
Notes	For model N9038A only. :CALibration:RFPSelector:FULL? Return 0 if successful :CALibration:RFPSelector:FULL? Return 1 if failed 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. 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. 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.
Dependencies	This key only appears in N9038A models, setting or querying the SCPI in other models will generate an error.
Couplings	Initializes the time for the Last Align Conducted Now, Conducted Time. Initializes the time for the Last Align Radiated Now, Radiated Time. Records the temperature for the Last Align Conducted Now, Conducted Temperature.

	Records the temperature for the Last Align Radiated Now, Radiated Temperature.
Status Bits/OPC	Bit 8 or 9 may be set in the Status Questionable Calibration register.
Dependencies	Bit 1 and 2 may be set in the Status Questionable Calibration Extended Needed register. Bit 0 and 1 may be set in the Status Questionable Calibration Extended Failure register.
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.

Key Path	System, Alignments, RF Preselector
Mode	All
Remote Command	:CALibration:RFPSselector:ALERT ON OFF 0 1 :CALibration:RFPSselector:ALERT?
Example	:CAL:RFPS:ALER OFF
Notes	For model N9038A only. Error Condition will be generated when the alert is On and any of the RF Preselector alignments has expired.
Preset	This is unaffected by Preset, but is set to ON on a "Restore System Defaults->Align".
State Saved	No
Initial S/W Revision	A.08.00

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

### Date/Time

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

Key Path	System, Alignments, RF Preselector, Schedule Setup
Mode	All
<b>Remote Command</b>	:CALibration:RFPSelector:SCHeduler:TIME:STARt "date","time" :CALibration:RFPSelector:SCHeduler:TIME:STARt?  This query returns data using the following format "YYYY/MM/DD; HH:MM:SS"
<b>Example</b>	:CAL:RFPS:SCH:TIME:STAR "2009/8/20", "12:00:00"
Notes	"date" is representation of the date the task will run in the form of "YYYY/MM/DD" where: <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> "time" is a representation of the time of day the task will run in the form of "HH:MM:SS" where: <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> 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

### Date

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

Key Path	System, Alignments, RF Preselector, Schedule Setup, Date/Time
Notes	See " <a href="#">Date/Time</a> " on page 293. 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

### 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 293 . For model N9038A only.
Preset	This is unaffected by Preset but is set to Current date and 00:00:00 on a "Restore System Defaults->Align".
State Saved	No
Initial S/W Revision	A.08.00

### Recurrence

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

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

### Every N Weeks

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

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

### N of Weeks

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

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

### Day

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

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

## Scheduler

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

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

## I/O Config

Activates a menu for identifying and changing the I/O configuration for remote control.

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

## GPIB

Activates a menu for configuring the GPIB I/O port.

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

## GPIB Address

Select the GPIB remote address.

Key Path	System, I/O Config, GPIB
Mode	All
Remote Command	:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess <integer> :SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess?
Example	:SYST:COMM:GPIB:ADDR 17
Notes	Changing the Address on the GPIB port requires all further communication to use the new address.



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

## GPIB Controller

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

### NOTE

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

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

Key Path	System, I/O Config, GPIB
Mode	All
Scope	Mode Global
<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.

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>	:SYSTem:COMMunicate:LAN:SCPI:TELNet:ENABle OFF ON 0 1 :SYSTem: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.

Key Path	System, I/O Config, SCPI LAN
Mode	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

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

### HiSLIP Server

Turns the HiSLIP server capability On or Off, enabling you to limit SCPI access over LAN through the HiSLIP server.

HiSLIP stands for High Speed LAN Instrument Protocol and is part of the IVI-6.1 specification.

Here is an example of a VISA connection string used to connect to the HiSLIP Server on an X-Series Spectrum Analyzer:

```
TCPIP0::a-n9030a-93016::hislip0::INSTR
```

In the example above, hislip0 is the HiSLIP device name that VISA users must include in their HiSLIP VISA Address strings. Your HiSLIP device name may be different depending on your VISA settings.

Key Path	System, I/O Config, SCPI LAN
Mode	All
Remote Command	:SYSTem:COMMunicate:LAN:SCPI:HISLip:ENABle OFF ON 0 1 :SYSTem:COMMunicate:LAN:SCPI:HISLip:ENABle?
Example	:SYST:COMM:LAN:SCPI:HISL:ENAB OFF
Preset	This is unaffected by Preset, but is set to ON with a “Restore System Defaults->Misc”
State Saved	No
Range	On   Off
Initial S/W Revision	A.11.00

### SCPI Socket Control Port (Remote Command Only)

Returns the TCP/IP port number of the control socket associated with the SCPI socket session. This query enables you to obtain the unique port number to open when a device clear is to be sent to the instrument. Every time a connection is made to the SCPI socket, the instrument creates a peer control socket. The port number for this socket is random. 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
Remote Command	:SYSTem:COMMunicate:LAN:SCPI:SOCKet:CONTRol?
Example	:SYST:COMM:LAN:SCPI:SOCK:CONT?
Preset	This is unaffected by Preset or “Restore System Defaults->Misc”.
State Saved	No
Range	0 to 65534
Min	0
Max	65534
Initial S/W Revision	Prior to A.02.00

## Reset Web Password

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

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

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

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

## LXI

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

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

## LAN Reset

Resets the LAN connection.

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

## System IDN Response

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

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

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

Key Path	System, I/O Config
Mode	All
Remote Command	:SYSTem:IDN <string> :SYSTem:IDN?
Notes	<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
Example	:SYST:IDN "" null string, restores the factory setting
Initial S/W Revision	A.06.0

## User

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

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

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

Key Path	System, I/O Config, IDN Response
<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 LSPeed HSPeed FSPeed
Initial S/W Revision	Prior to A.02.00

### USB Connection Status (Remote Command Only)

Enables you to determine the current status of the USB connection.

Mode	All
<b>Remote Command</b>	:SYSTem:COMMunicate:USB:STATus?
<b>Example</b>	:SYST:COMM:USB:STAT?
Notes	SUSPended – Indicates that the USB bus is currently in its suspended state. The bus is in the suspended state when: <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> When in the suspended state, no USB activity, including start of frame packets are received. 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.
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>	:SYSTem:COMMunicate:USB:PACKets?
<b>Example</b>	:SYST:COMM:USB:PACK?
Notes	Two integers are returned. The first is the number of packets received since application invocation, the second is the number of packets transmitted since application invocation. If no packets have been received or transmitted the response is 0,0. The packet count is initialized to 0,0 when the instrument application is started.
State Saved	No
Initial S/W Revision	Prior to A.02.00

## 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.

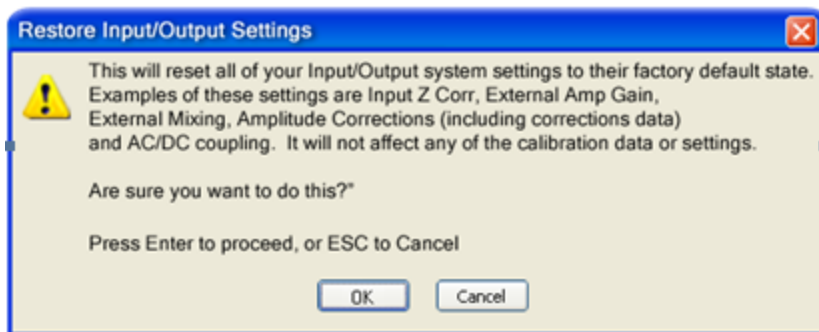
Key Path	System
Mode	All
<b>Remote Command</b>	:SYSTem:DEFault [ALL]   ALIGn   INPut   MISC   MODes   PON
<b>Example</b>	SYST:DEF
State Saved	No
Initial S/W Revision	Prior to A.02.00

## 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:



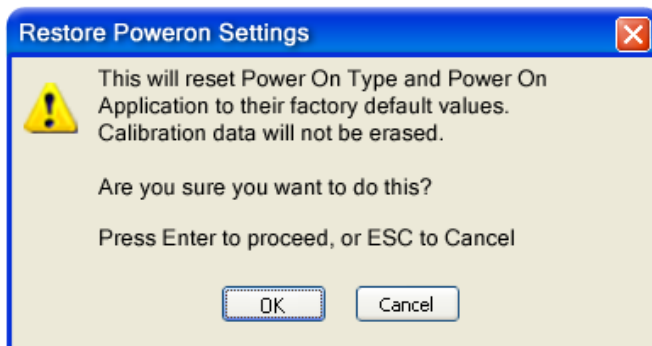


Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF INP
Initial S/W Revision	Prior to A.02.00

### 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:



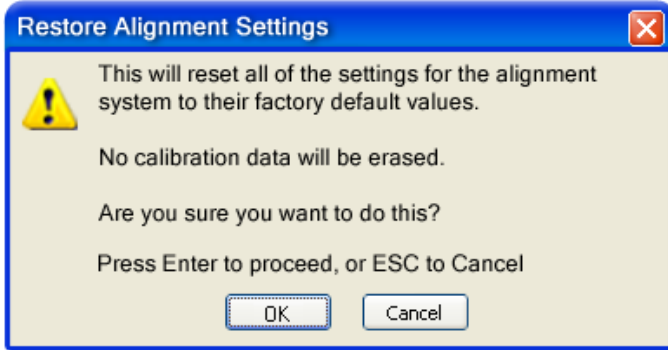
Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF PON
Initial S/W Revision	Prior to A.02.00

### Restore Align Defaults

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

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

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



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

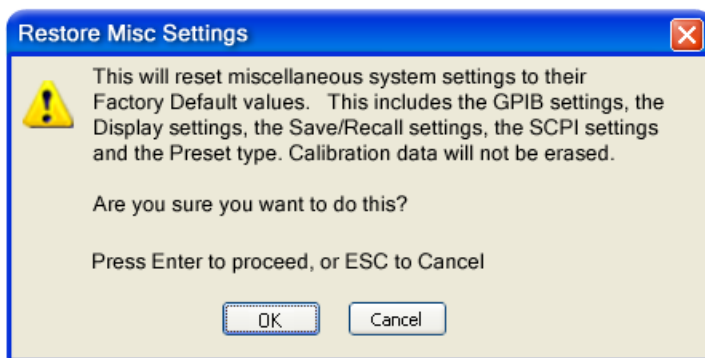
### Restore Misc Defaults

This selection causes miscellaneous system settings to be reset to their default values. With this reset, you lose the GPIB address and it is reset to 18, so this should be used with caution. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch. This miscellaneous group contains the rest of the settings that have not been part of the other Restore System Defaults groups. The following table is a complete list of settings associated with this group:

Miscellaneous Setting	Default Value
Verbose SCPI	Off
The SYST:PRES:TYPE	MODE
Auto File Name Number	000
Save Type	State
State Save To	Register 1
Screen Save To	SCREEN000.png
DISP:ENABLe	ON
Full Screen	Off
SCPI Telnet	ON
SCPI Socket	ON
SICL Server	ON
Softkey Language	English

Miscellaneous Setting	Default Value
System Annotation	ON
Display Theme	TDColor
System IDN Response	Factory result of *IDN?
Display Intensity	100
Display Backlight	ON
GPIB Address	18

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

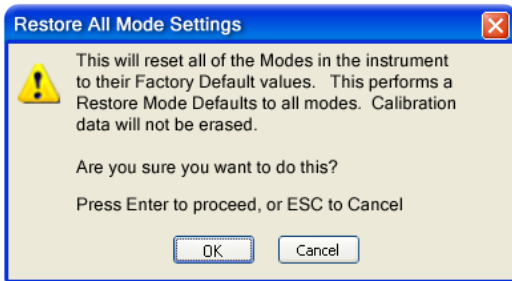


Key Path	System, Restore System Defaults
<b>Example</b>	:SYST:DEF MISC
Initial S/W Revision	Prior to A.02.00

### 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:

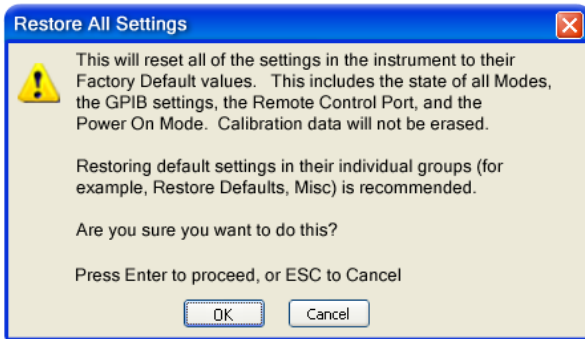


Key Path	System, Restore System Defaults
Example	:SYST:DEF MOD
Couplings	An All Mode will cause the currently running measurement to be aborted, mode switch to the power-on mode and activate the default measurement for the power-on mode.. It gets the mode to a consistent state with all of the default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



### NOTE

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

Key Path	System, Restore System Defaults
Example	:SYST:DEF ALL
Notes	If using Agilent USB External Mixer, perform a Refresh USB Mixer Connection (SCPI command :MIX:BAND USB) following a Restore All Defaults.
Couplings	An All will cause the currently running measurement to be aborted and get all modes to a consistent state, so it is unnecessary to couple any settings.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

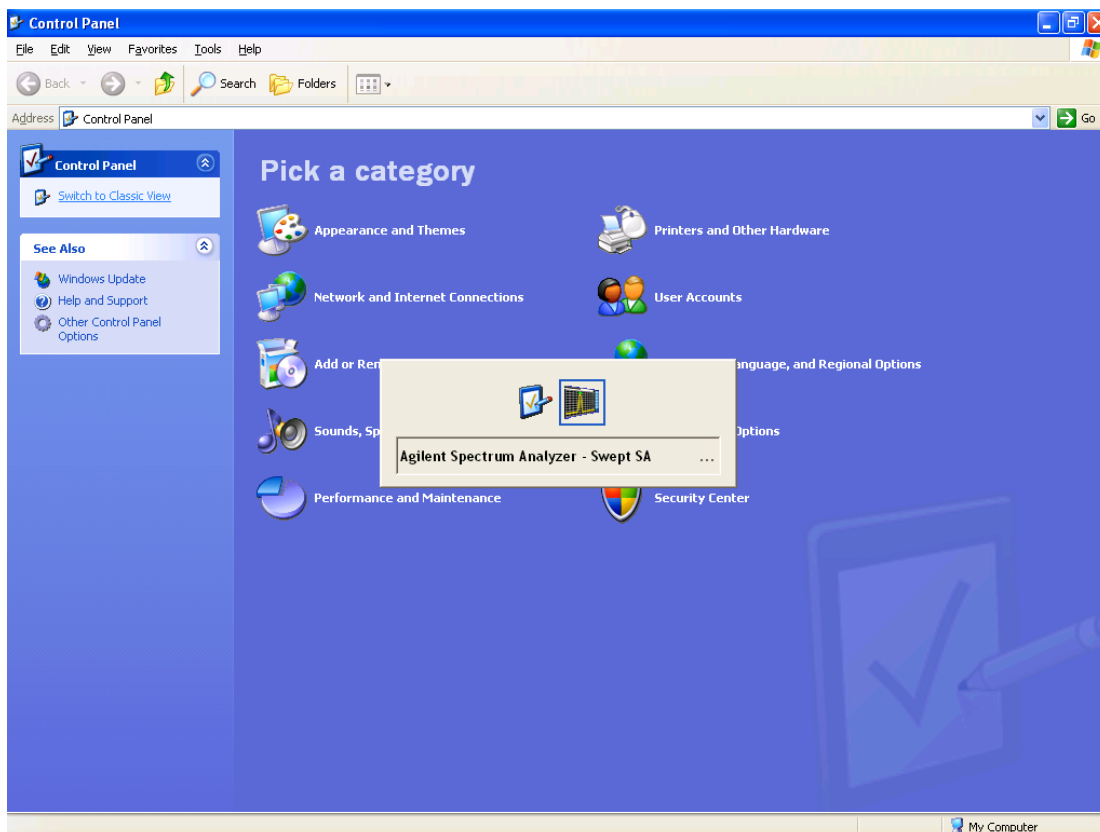
## Control Panel...

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

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

The Control Panel is a separate Windows application, so to return to the analyzer once you are in the Control Panel, you may either:

Exit the Control Panel by clicking on the red X in the upper right hand corner, with a mouse



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

Key Path	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", "027253AD27F83CDA5673A9BA5F427FDA5E4F25AEB1017638211AC9F60D9C639FE539735909C551DE0A91"
Notes	The <"OptionInfo"> contains the feature and the version. You must specify the feature but can omit the version. If you omit the version, the system regards it as the latest one, since the system knows which version is supported for each feature.  The <"LicenseInfo"> contains the signature, the expiration date, and serial number for transport if transportable. You must specify the signature, but you can omit the other information. If you omit the expiration date, the system regards it as permanent. If you omit the serial number, the system regards it as non-transportable. As a result, this supports reverse compatibility.
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	:SYSTem:LKEY:DELeTe <"OptionInfo">,<"LicenseInfo">
<b>Example</b>	SYST:LKEY:DEL 'N9073A-1FP', "027253AD27F83CDA5673A9BA5F427FDA5E4F25AEB1017638211AC9F60D9C639FE539735909C551DE0A91"
Notes	The <"OptionInfo"> contains the feature and the version. You must specify the feature but can omit the version. If you omit the version, the system regards it as the latest one, if more than one version is installed.  The <"LicenseInfo"> contains the signature, the expiration date, and whether or not be transportable. You must specify the signature, but you can omit the other information. If you omit the expiration date, the system regards it as permanent. If you omit the transportability, the system regards it as non-transportable. As a result, this supports reverse compatibility.
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	:SYSTem:LKEY:LIST?
Notes	<p>Return Value:</p> <p>An &lt;arbitrary block data&gt; of all the installed instrument licenses.</p> <p>The format of each license is as follows.</p> <p>&lt;Feature&gt;,&lt;Version&gt;,&lt;Signature&gt;,&lt;Expiration Date&gt;,&lt;Serial Number for Transport&gt;</p> <p>Return Value Example:</p> <p>#3136</p> <p>N9073A-1FP,1.000,B043920A51CA</p> <p>N9060A-2FP,1.000,4D1D1164BE64</p> <p>N9020A-508,1.000,389BC042F920</p> <p>N9073A-1F1,1.000,5D71E9BA814C,13-aug-2005</p> <p>&lt;arbitrary block data&gt; is:</p> <p>#NMMM&lt;data&gt;</p> <p>Where:</p> <p>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.</p> <p>MMM would be the ASCII representation of the number of bytes. In the previous example, N would be 55.</p> <p>&lt;data&gt; ASCII contents of the data</p>
Initial S/W Revision	Prior to A.02.00

<b>Remote Command</b>	:SYSTem:LKEY? <"OptionInfo">
<b>Example</b>	SYST:LKEY? "N9073A-1FP"
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.</p> <p>Return Value:</p> <p>&lt;"LicenseInfo"&gt; if the license is valid, null otherwise.</p> <p>&lt;"LicenseInfo"&gt; contains the signature, the expiration date, and serial number if transportable.</p> <p>Return Value Example:</p> <p>"B043920A51CA"</p>
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>	:SYSTem:SECurity:USB:WPRotect[:ENABLE] ON OFF 0 1 :SYSTem: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	
<b>Example</b>	:SYST:SEC:USB:WPR ON	Will set USB ports to Read only
Initial S/W Revision	A.04.00	

---

## Diagnostics

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

---

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

---

## Show Hardware Statistics

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

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

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

Hardware Statistical Information	
Agilent MXA Signal Analyzer	
Product Number: N9020A	
Serial Number: US00061145	
Instrument S/W Revision: A.12.00	
Revision Date: 7/11/2012 12:11:10 PM	
Component Name	Value
MechAtten #1 Count Total	457304
Calibrator Switch Cycles	105953
AC/DC Switch Cycles	114240
2 dB #1 Mechanical Atten Cycles	112655
2 dB #2 Mechanical Atten Cycles	124456
MechAtten #2 Count Total	472265
6 dB Mechanical Atten Cycles	115302
10 dB Mechanical Atten Cycles	93602
20 dB Mechanical Atten Cycles	144781
30 dB Mechanical Atten Cycles	118580
Low Noise Path Switch	45668
Preselector Bypass Cycles	31133
High temperature operating extreme	45.75
Low temperature operating extreme	-23.9375
Elapsed Time (On-Time)(hours)	134164

In some CXA models this field is called "Fixed Atten"

Some CXA models omit these fields

Only shown if LNP installed

Only shown if MPB installed

The CXA models in which the AC/DC Switch field is called Fixed Atten and that omit the mechanical attenuation fields are the N9000A-503/507 models.

Modular HWs only have time and temperature information in Show Hardware Statistics.

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

The tabular data should be directly printable.

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

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

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

- "Query the Mechanical Relay Cycle Count" on page 315
- "Query the Operating Temperature Extremes" on page 315
- "Query the Elapsed Time since 1st power on" on page 315

### 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:MREL:COUN?
<b>Notes</b>	<p>Query Only</p> <p>The return value is a comma separated list of the individual counts for each mechanical relay. The position of the relays in the list is:</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>
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	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.

<b>Mode</b>	All
<b>Remote Command</b>	:SYSTem:TEMPerature:LEXTreme?
<b>Example</b>	:SYST:TEMP:LEXT?
<b>Notes</b>	Value is in degrees Celsius at which the lowest operating temperature has been recorded since 1st power-up.
<b>State Saved</b>	No
<b>Initial S/W Revision</b>	Prior to A.02.00

<b>Mode</b>	All
<b>Remote Command</b>	:SYSTem:TEMPerature:HEXTreme?
<b>Example</b>	:SYST:TEMP:HEXT?
<b>Notes</b>	Value is in degrees Celsius at which the highest operating temperature has been recorded since 1st power-up.
<b>State Saved</b>	No
<b>Initial S/W Revision</b>	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?
<b>Notes</b>	Query Only
<b>Initial S/W Revision</b>	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
<b>Mode</b>	All
<b>Notes</b>	No equivalent remote command for this key.
<b>Initial S/W Revision</b>	A.05.01

### System Remote Commands (Remote Commands Only)

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

- "System Powerdown (Remote Command Only)" on page 316
- "List installed Options (Remote Command Only)" on page 317
- "Lock the Front-panel keys (Remote Command Only)" on page 317
- "List SCPI Commands (Remote Command Only)" on page 317
- "SCPI Version Query (Remote Command Only)" on page 318
- "Date (Remote Command Only)" on page 318
- "Time (Remote Command Only)" on page 318

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

<b>Remote Command</b>	SYSTem:PDOWn [NORMal   FORCe]
<b>Notes</b>	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

### 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"

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Notes	<hour> is the two digit representation of the hour in 24 hour format <minute> is the two digit representation of minute <second> is the two digit representation of second Unless the current account has Power User or Administrator privileges, an error will be generated by this command and no action will be taken.
Initial S/W Revision	Prior to A.02.00

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## 7 Trigger Functions

## Trigger

Accesses a menu of keys to control the selection of the trigger source and the setup of each of the trigger sources. The analyzer is designed to allow triggering from a number of different sources, for example, Free Run, Video, External, RF Burst, and so forth.

The TRIG:SOURCe command (below) will specify the trigger source for the currently selected input (RF or I/Q). If you change inputs, the new input remembers the trigger source it was last programmed to for the current measurement, and uses that trigger source. You can directly set the trigger source for each input using the TRIGger:RF:SOURce and TRIGger:IQ:SOURce commands (later in this section). When in External Mixing, the analyzer uses the RF trigger source.

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

See ["Trigger Source Presets" on page 323](#)

See ["RF Trigger Source" on page 326](#)

See ["I/Q Trigger Source" on page 327](#)

See ["More Information" on page 328](#)

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</pre> <p>Selects the external 1 trigger input for the ACP measurement and the selected input</p> <pre>TRIG:SOUR VID</pre> <p>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</p>
<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. See the <a href="#">"RF Trigger Source" on page 326</a> and <a href="#">"I/Q Trigger Source" on page 327</a> 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> <p>Available ranges and presets can vary from mode to mode.</p>
<b>Dependencies</b>	<p>In some models, there is no second External input. In these models, the External 2 key is blanked and</p>

	the EXternal2 parameter will generate a "Hardware missing; Not available for this model number" message.
Preset	See table below
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:SOURce EXTernal For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<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, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR	IMM	IQ not supported	
OBW	SA, WCDMA, C2K, WIMAX OFDMA,	1xEVDO: EXT1 others: IMM	IQ not supported	For 1xEVDO mode, the trigger source is coupled with the gate state, as well as the gate

	TD-SCDMA, 1xEVDO, LTE, LTETDD, CMMB, ISDB-T, MSR			source. When the trigger source changes to RFBurst, External1 or External2, the gate state is set to on, and the gate source is set identically with the trigger source. When the trigger source changes to IMMEDIATE, VIDEO, LINE, FRAME or IF, the gate state is set to off.
CCDF	SA, WCDMA, C2K, WIMAX OFDMA, TD-SCDMA, 1xEV-DO, DVB-T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR	WIMAX OFDMA: 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-	1xEVDO(BTS): EXTERNAL1 All others: IMMEDIATE	IQ not supported	

	T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV, MSR			
CDP	WCDMA	IMM	IMM	
RHO	WCDMA	IMM	IMM	
PCON	WCDMA	IMM	IMM	
QPSK	WCDMA, C2K, 1xEVDO	All except CDMA1xEVDO: IMMmediate 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: IMMmediate	LTETDD: BTS: External 1 MS: Periodic Timer GSM/EDGE: IQMag All others: IMMmediate	
PVT	WIMAXOFDMA	RFB	IMM	
EVM	WIMAXOFDMA, DVB-T/H, DTMB, LTE, LTETDD, CMMB, ISDB-T, Digital Cable TV	All but CMMB: IMM CMMB: Periodic Timer	All but CMMB: IMM CMMB: External 1	LTE, LTETDD supports Free Run, Video and External 1 only.
SPEC	BASIC	IMM	IMM	
LOG Plot	PN	IMM	IQ not supported	
Spot Freq	PN	IMM	IQ not supported	
GMSK PVT	EDGE/GSM	RFB	IMM	
GMSK PFER	EDGE/GSM	RFB	IQMag	
GMSK ORFS	EDGE/GSM	RF Burst	IQ not supported	
EDGE PVT	EDGE/GSM	RFB	IMM	

EDGE EVM	EDGE/GSM	RFB	IQMag
EDGE ORFS	EDGE/GSM	Periodic Timer	IQ not supported
Combined WCDMA	WCDMA	IMM	IQ not supported
Combined GSM	EDGE/GSM	RFB	IQ not supported
List Power Step	WCDMA, EDGE/GSM	IMM	IQ not supported
Transmit On/Off Power	LTETDD	LTETDD: BTS: External 1 MS: Periodic Timer	LTETDD: BTS: External 1 MS: Periodic Timer
Transmit Analysis	BLUETOOTH	RFB	IQ not supported
Adjacent Channel Power	BLUETOOTH	IMM	IQ not supported
LE In-band Emissions	BLUETOOTH	IMM	IQ not supported
EDR In-band Spurious Emissions	BLUETOOTH	Periodic Timer	IQ not supported
Conformance EVM	LTE, LTETDD, MSR	IMM	IMM

## RF Trigger Source

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

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

<b>Remote Command</b>	<code>:TRIGger:&lt;measurement&gt;[:SEquence]:RF:SOURce EXTernal1   EXTernal2   IMMEDIATE   LINE   FRAME   RFBurst   VIDEO   IF   ALARm   LAN   TV</code> <code>:TRIGger:&lt;measurement&gt;[:SEquence]:RF:SOURce?</code>
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<b>Example</b>	<code>TRIG:ACP:RF:SOUR EXT1</code> Selects the external 1 trigger input for the ACP measurement and the RF input
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	<p>TRIG:RF:SOUR VID</p> <p>Selects video triggering for the SANalyzer measurement and the RF input. For SAN, do not use the &lt;measurement&gt; keyword.</p>
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 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>–EXTernal1 (or EXTernal) - triggers on an externally connected trigger source marked “Trigger 1 In” on the rear panel</li> <li>–EXTernal2 - triggers on an externally connected trigger source marked “Trigger 2 In” on the front panel. In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a “Hardware missing; Not available for this model number” message</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	<p>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.</p>
Initial S/W Revision	Prior to A.02.00

## I/Q Trigger Source

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

<b>Remote Command</b>	<pre> :TRIGger:&lt;measurement&gt;[:SEquence]:IQ:SOURce EXTernal1   EXTernal2   IMMediate   IQMag   IDEMod   QDEMod   IINPut   QINPut   AIQMag  :TRIGger:&lt;measurement&gt;[:SEquence]:IQ:SOURce? </pre>
<b>Example</b>	<p>TRIG:WAVeform:SOUR IQM</p> <p>Selects I/Q magnitude triggering for the IQ Waveform measurement and the I/Q input</p>
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>

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	<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

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## More Information

The trigger menus let you select the trigger source and trigger settings for a sweep or measurement. In triggered operation (basically, any trigger source other than Free Run), the analyzer will begin a sweep or measurement only with the selected trigger conditions are met, generally when your trigger source signal meets the specified trigger level and polarity requirements. (In FFT measurements, the trigger controls when the data acquisition begins for FFT conversion.)

For each of the trigger sources, you may define a set of operational parameters or settings which will be applied when that source is selected as the current trigger source. Examples of these settings are Trigger Level, Trigger Delay, and Trigger Slope. You may apply different settings for each source; so, for example, you could have a Trigger Level of 1v for External 1 trigger and –10 dBm for Video trigger.

Once you have established the settings for a given trigger source, they generally will remain unchanged for that trigger source as you go from measurement to measurement within a Mode (although the settings do change as you go from Mode to Mode). Furthermore, the trigger settings within a Mode are the same for the **Trigger** menu, the **Gate Source** menu, and the **Sync Source** menu that is part of the **Periodic Timer Trigger Setup** menu. That is, if **Ext1** trigger level is set to 1v in the **Trigger** menu, it will appear as 1v in both the **Gate Source** and the **Sync Source** menus. For these reasons the trigger settings commands are not qualified with the measurement name, the way the trigger source commands are.

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

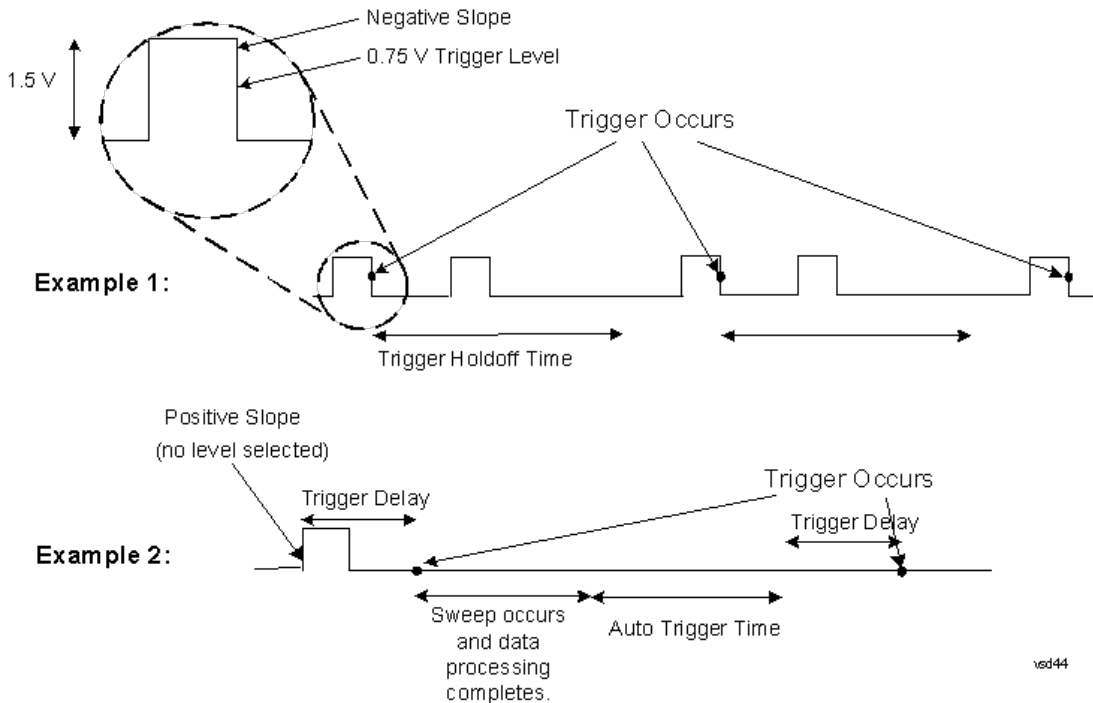
Trigger Setup Parameters:



The following examples show trigger setup parameters using an external trigger source.

Example 1 illustrates the trigger conditions with negative slope and no trigger occurs during trigger Holdoff time.

Example 2 illustrates the trigger conditions with positive slope, trigger delay, and auto trigger time.



## Free Run

Pressing this key, when it is not selected, selects free-run triggering. Free run triggering occurs immediately after the sweep/measurement is initiated.

Key Path	Trigger
<b>Example</b>	TRIG:SOUR IMM Swept SA measurement TRIG:<meas>:SOUR IMM Measurements other than Swept SA
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

## External 1

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 1 input connector on the rear panel.

Pressing this key, when it is already selected, accesses the external 1 trigger setup menu.

Key Path	Trigger
<b>Example</b>	TRIG:SOUR EXT1 Swept SA measurement TRIG:<meas>:SOUR EXT1 Measurements other than Swept SA
Dependencies	Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 1.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

## Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 1
<b>Remote Command</b>	:TRIGger[:SEquence]:EXTernal1:LEVel <level> :TRIGger[:SEquence]:EXTernal1:LEVel?
<b>Example</b>	TRIG:EXT1:LEV 0.4 V
Couplings	This same level is used for the Ext1 trigger source in the Trigger menu, for the Ext1 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext1 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	-5 V
Max	5 V
Default Unit	V
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:EXTernal:LEVel For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:FRAME:EXTernal1:LEVel
Initial S/W Revision	Prior to A.02.00

## Trig Slope

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

Key Path	Trigger, External 1
Remote Command	:TRIGger[:SEquence]:EXTernal1:SLOPe POSitive NEGative :TRIGger[:SEquence]:EXTernal1:SLOPe?
Example	TRIG:EXT1:SLOP NEG
Couplings	This same slope is used in the Ext1 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRIGger[:SEquence]:EXTernal:SLOPe For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	:TRIGger[:SEquence]:FRAME:EXTernal1:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEquence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

## Trig Delay

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

Key Path	Trigger, External 1
Remote Command	:TRIGger[:SEquence]:EXTernal1:DELay <time> :TRIGger[:SEquence]:EXTernal1:DELay? :TRIGger[:SEquence]:EXTernal1:DELay:STATe OFF ON 0 1 :TRIGger[:SEquence]:EXTernal1:DELay:STATe?
Example	TRIG:EXT1:DEL:STAT ON TRIG:EXT1:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us

State Saved	Saved in instrument state
Min	-150 ms
Max	+500 ms
Default Unit	s
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:EXTernal:DElay
Backwards Compatibility Notes	For backward compatibility, the parameter EXTernal is mapped to EXTernal1 The legacy :TRIGger[:SEquence]:DElay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers. The legacy :TRIGger[:SEquence]:OFFSet command is supported for the VIDEo, LINE, EXT1, and EXT2 triggers.
Initial S/W Revision	Prior to A.02.00

## External 2

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 2 input connector. The external trigger 2 input connector is on the rear panel.

Pressing this key, when it is already selected, accesses the external 2 trigger setup menu.

Key Path	Trigger
<b>Example</b>	TRIG:SOUR EXT2 Swept SA measurement TRIG:<meas>:SOUR EXT2 Measurements other than Swept SA
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a "Hardware missing; Not available for this model number" message. Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 2.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Trigger Level

Sets the value where the external 2 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 2
<b>Remote Command</b>	:TRIGger[:SEquence]:EXTernal2:LEVel :TRIGger[:SEquence]:EXTernal2:LEVel?
<b>Example</b>	TRIG:EXT2:LEV 1.1 V
Couplings	This same level is used for the Ext2 trigger source in the Trigger menu, for the Ext2 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext2 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	-5 V
Max	5 V
Default Unit	V
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:FRAMe:EXTernal2:LEVel
Initial S/W Revision	Prior to A.02.00

## Trig Slope

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

Key Path	Trigger, External 2
<b>Remote Command</b>	:TRIGger[:SEquence]:EXTernal2:SLOPe POSitive NEGative :TRIGger[:SEquence]:EXTernal2:SLOPe?
<b>Example</b>	TRIG:EXT2:SLOP NEG
Couplings	This same slope is used in the Ext2 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:FRAMe:EXTernal2:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEquence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

## Trig Delay

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

Key Path	Trigger, External 2
Remote Command	:TRIGger[:SEquence]:EXTErnal2:DELay <time> :TRIGger[:SEquence]:EXTErnal2:DELay? :TRIGger[:SEquence]:EXTErnal2:DELay:STATe OFF ON 0 1 :TRIGger[:SEquence]:EXTErnal2:DELay:STATe?
Example	TRIG:EXT2:DEL:STAT ON TRIG:EXT2:DEL 100 ms
Notes	Video trigger delay may be set to negative values, in time domain, FFT and even swept. It makes intuitive sense in time domain and works well in FFT mode where the bandwidth of the filter before the video trigger is about 1.25 span. In swept spans, negative settings of Trig Delay are treated as a zero setting within the internal hardware and the advisory message "Neg. Trig Delay unavailable in Swept Mode, zero delay used." is generated when such a delay is set.
Preset	Off, 1.000 us
State Saved	Saved in instrument state
Min	-150 ms
Max	500 ms
Default Unit	s
Backwards Compatibility Notes	The legacy :TRIGger[:SEquence]:DELay command affects the delay for the VID, LINE, EXT1, EXT2, and RFB triggers. The legacy :TRIGger[:SEquence]:OFFSet command is supported for the VIDEo, LINE, EXT1, and EXT2 triggers.
Initial S/W Revision	Prior to A.02.00

## RF Burst

Pressing this key, when it is not selected, selects the RF Burst as the trigger. A new sweep/measurement will start when an RF burst envelope signal is identified from the signal at the RF Input connector. Pressing this key, when it is already selected, accesses the RF Burst trigger setup menu.

In some models, a variety of burst trigger circuitry is available, resulting in various available burst trigger bandwidths. The analyzer automatically chooses the appropriate trigger path based on the hardware configuration and other settings of the analyzer.

Key Path	Trigger
Example	TRIG:SOUR RFB      Swept SA measurement TRIG:<meas>:SOUR RFB    Measurements other than Swept SA
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This

	message goes away when a trigger signal appears.
Backwards Compatibility Notes	The legacy command: :TRIGger[:SEquence]:RFBurst:FSElectivity[:STATe] OFF ON 0 1 is not supported in the X-Series, as the hardware to do Frequency Selective burst triggers does not exist in X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

## Absolute Trigger Level

Sets the absolute trigger level for the RF burst envelope.

When using the External Mixing path, the Absolute Trigger Level is uncalibrated because the factory default was set to accommodate the expected IF levels for the RF path.

Key Path	Trigger, RF Burst
Scope	Meas Global
<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
Remote Command	:TRIGger[:SEquence]:RFBurst:LEVel:TYPE ABSolute RELative :TRIGger[:SEquence]:RFBurst:LEVel:TYPE?
Example	TRIG:RFB:LEV:TYPE REL sets the trigger level type of the RF burst trigger to Relative.
Preset	ABSolute
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

### Relative Trigger Level

Sets the relative trigger level for the RF burst envelope.

In some models, the relative burst trigger function is implemented in hardware. In other models, without the advanced triggering hardware required, the relative burst trigger function is implemented in software in some measurements, and is unavailable in other measurements.

When implemented in software, the relative RF Burst trigger function is implemented as follows:

1. The measurement starts with the absolute RF Burst trigger setting. If it cannot get a trigger with that level, auto trigger fires and the acquisition starts anyway. After the acquisition, the measurement searches for the peak in the acquired waveform and saves it.
2. Now, in the next cycle of the measurement, the measurement determines a new absolute RF Burst level based on the peak value from the first measurement and the Relative RF Burst Trigger Level (always 0 or negative dB) set by the user. The following formula is used:
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.

Key Path	Trigger, RF Burst
Scope	Meas Global
Remote Command	:TRIGger[:SEquence]:RFBurst:LEVel:RELative <rel_ampl> :TRIGger[:SEquence]:RFBurst:LEVel:RELative?
Example	TRIG:RFB:LEV:REL -10 dB sets the trigger level of the RF burst envelope signal to the relative level of -10 dB
Notes	Sending this command does not switch the setting from absolute to relative; to switch it you need to send the :TRIGger[:SEquence]:RFBurst:LEVel:TYPE command, above. The relative trigger level is not available in some measurements. In those measurements the RELative parameter, and the :TRIGger[:SEquence]:RFBurst:LEVel:TYPE



	command (above), will generate an error if sent.
Dependencies	This key is grayed out and Absolute Trigger Level selected if the required hardware is not present in your analyzer and the current measurement does not support Relative triggering.
Preset	-6 dB GSM: -25 dB
State Saved	Saved in instrument state
Min	-45 dB
Max	0 dB
Default Unit	dB or dBc
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:RFBurst:LEVel
	This legacy command is aliased to :TRIGger[:SEquence]:RFBurst:LEVel:RELative because the PSA had ONLY relative burst triggering
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

## Trigger Slope

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

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

## 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**.

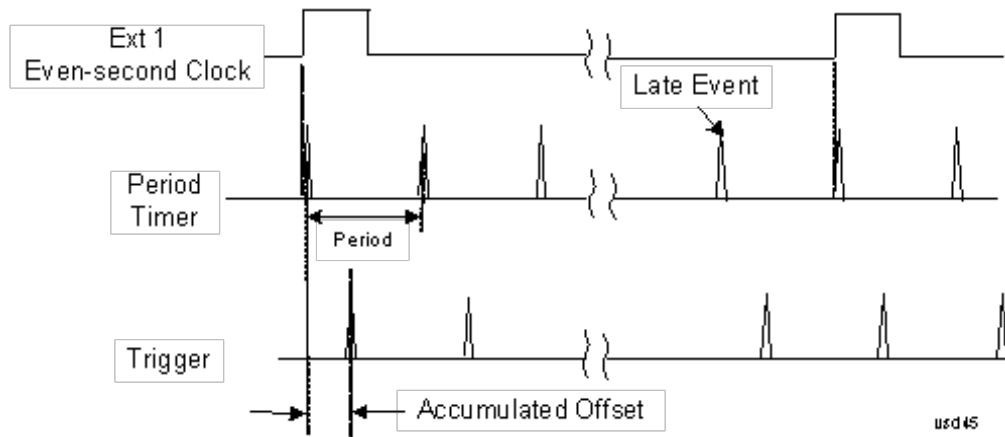
The figure below shows the action of the periodic timer trigger. Before reviewing the figure, we'll explain some uses for the periodic trigger.

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 miss-trigger. Miss-triggering can occur when we are tuned so far away from the RF burst trigger that it is no longer reliable.

A third example would be to synchronize to a signal that has a reference time element of much longer period than the period of interest. In some CDMA applications, it is useful to look at signals with a short periodicity, by synchronizing that periodicity to the "even-second clock" edge that happens every two seconds. Thus, we could connect the even-second clock trigger to Ext1 and use then Ext1 as the sync source for the periodic timer.

The figure below illustrates this third example. The top trace represents the even-second clock. It causes the periodic timer to synchronize with the leading edge shown. The analyzer trigger occurs at a time delayed by the accumulated offset from the period trigger event. The periodic timer continues to run, and triggers continue to occur, with a periodicity determined by the analyzer time base. The timer output (labeled "late event") will drift away from its ideal time due to imperfect matching between the time base of the signal being measured and the time base of the analyzer, and also because of imperfect setting of the period parameter. But the synchronization is restored on the next even-second clock event. ("Accumulated offset" is described in the in the **Offset** function section.)



### Period

Sets the period of the internal periodic timer clock. For digital communications signals, this is usually set to the frame period of your current input signal. In the case that sync source is not set to OFF, and the external sync source rate is changed for some reason, the periodic timer is synchronized at the every external synchronization pulse by resetting the internal state of the timer circuit.

Key Path	Trigger, Periodic Timer
Remote Command	:TRIGger[:SEquence]:FRAMe:PERiod <time> :TRIGger[:SEquence]:FRAMe:PERiod?
Example	TRIG:FRAM:PER 100 ms
Dependencies	The invalid data indicator turns on when the period is changed, until the next sweep/measurement completes.
Couplings	The same period is used in the Gate Source selection of the period timer.
Preset	20 ms GSM: 4.615383
State Saved	Saved in instrument state
Min	100.000 ns
Max	559.0000 ms
Default Unit	S
Initial S/W Revision	Prior to A.02.00

### Offset

Adjusts the accumulated offset between the periodic timer events and the trigger event. Adjusting the accumulated offset is different than setting an offset, and requires explanation.

The periodic timer is usually not synchronized with any external events, so the timing of its output events has no absolute meaning. Since the timing relative to external events (RF signals) is important, you need to be able to adjust (offset) it. However, you have no direct way to see when the periodic timer events occur. All that you can see is the trigger timing. When you want to adjust the trigger timing, you will be changing

the internal offset between the periodic timer events and the trigger event. Because the absolute value of that internal offset is unknown, we will just call that the accumulated offset. Whenever the Offset parameter is changed, you are changing that accumulated offset. You can reset the displayed offset using Reset Offset Display. Changing the display does not change the value of the accumulated offset, and you can still make additional changes to accumulated offset.

To avoid ambiguity, we define that an increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.

Key Path	Trigger, Periodic Timer
Remote Command	:TRIGger[:SEquence]:FRAMe:OFFSet <time> :TRIGger[:SEquence]:FRAMe:OFFSet?
Example	TRIG:FRAM:OFFS 1.2 ms
Notes	<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 349</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>	<code>:TRIGger[:SEquence]:FRAMe:ADJust &lt;time&gt;</code>
<b>Example</b>	TRIG:FRAM:ADJ 1.2 ms
<b>Notes</b>	Note also that Offset is used only when the sync source is set to OFF, otherwise delay is used, see section "Trig Delay" on page 349 An increase in the "offset" parameter, either from the knob or the SCPI adjust command, serves to delay the timing of the trigger event.
<b>Notes</b>	The front panel interface (for example, the knob) and the :TRIG:FRAM:OFFS command adjust the accumulated offset, which is shown on the active function display. However, the actual amount sent to the hardware is the delta value, that is, the current offset value minus the previous offset value. When the SCPI command is sent the value shown on the key (and the Active Function, if this happens to be the active function) is updated by increasing it (or decreasing it if the value sent is negative) by the amount specified in the SCPI command. This is a "command only" SCPI command, with no query.
<b>Dependencies</b>	The invalid data indicator turns on when the offset is changed, until the next sweep/measurement completes.
<b>Couplings</b>	The same offset is used in the Gate Source selection of the period timer.
<b>Preset</b>	0 s
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	-10.000 s
<b>Max</b>	10.000 s
<b>Default Unit</b>	S
<b>Initial S/W Revision</b>	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>	<code>:TRIGger[:SEquence]:FRAMe:OFFSet:DISPlay:RESet</code>
<b>Example</b>	TRIG:FRAM:OFFS:DISP:RES
<b>Initial S/W Revision</b>	Prior to A.02.00

## Sync Source

Selects a signal source for you to synchronize your periodic timer trigger to, otherwise you are triggering at some arbitrary location in the frame. Synchronization reduces the precision requirements on the setting of

the period.

For convenience you may adjust the level and slope of the selected sync source in a conditional branch setup menu accessed from the Sync Source menu. Note that these settings match those in the **Trigger** and **Gate Source** menus; that is, each trigger source has only one value of level and slope, regardless of which menu it is accessed from.

<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
<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.
<b>Preset</b>	Off GSM/EDGE, MSR,LTE,LTETDD: RFBurst
<b>State Saved</b>	Saved in instrument state
<b>Readback</b>	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 EXTernal1
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.03.00, A.14.00

## Off

Turns off the sync source for your periodic trigger. With the sync source off, the timing will drift unless the signal source frequency is locked to the analyzer frequency reference.

<b>Key Path</b>	Trigger, Periodic Timer, Sync Source
<b>Example</b>	TRIG:FRAM:SYNC OFF
<b>Readback</b>	Off
<b>Initial S/W Revision</b>	Prior to A.02.00

## External 1

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 1 input connector on the rear panel.

Pressing this key, when it is already selected, accesses the external 1 trigger setup menu.

Key Path	Trigger
<b>Example</b>	TRIG:SOUR EXT1 Swept SA measurement TRIG:<meas>:SOUR EXT1 Measurements other than Swept SA
Dependencies	Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 1.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00

### Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 1
<b>Remote Command</b>	:TRIGger[:SEquence]:EXTernal1:LEVel <level> :TRIGger[:SEquence]:EXTernal1:LEVel?
<b>Example</b>	TRIG:EXT1:LEV 0.4 V
Couplings	This same level is used for the Ext1 trigger source in the Trigger menu, for the Ext1 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext1 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	-5 V
Max	5 V
Default Unit	V
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:EXTernal:LEVel For backward compatibility, the parameter EXTernal is mapped to EXTernal1
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:FRAME:EXTernal1:LEVel
Initial S/W Revision	Prior to A.02.00

### Trig Slope

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



Key Path	Trigger, External 1
Remote Command	:TRIGger[:SEquence]:EXTernal1:SLOPe POSitive NEGative :TRIGger[:SEquence]:EXTernal1:SLOPe?
Example	TRIG:EXT1:SLOP NEG
Couplings	This same slope is used in the Ext1 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRIGger[:SEquence]:EXTernal:SLOPe For backward compatibility, the parameter EXTernal is mapped to EXTernal1
Backwards Compatibility SCPI	:TRIGger[:SEquence]:FRAMe:EXTernal1:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEquence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

## External 2

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 2 input connector. The external trigger 2 input connector is on the rear panel.

Pressing this key, when it is already selected, accesses the external 2 trigger setup menu.

Key Path	Trigger
Example	TRIG:SOUR EXT2      Swept SA measurement TRIG:<meas>:SOUR EXT2    Measurements other than Swept SA
Dependencies	In some models, there is no second External input. In these models, the External 2 key is blanked and the EXTernal2 parameter will generate a "Hardware missing; Not available for this model number" message.  Grayed out if in use by Point Trigger in the Source Setup menu. Forced to Free Run if already selected and Point Trigger is set to External 2.
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

### Trigger Level

Sets the value where the external 2 trigger input will trigger a new sweep/measurement.

Key Path	Trigger, External 2
<b>Remote Command</b>	:TRIGger[:SEquence]:EXTernal2:LEVel :TRIGger[:SEquence]:EXTernal2:LEVel?
<b>Example</b>	TRIG:EXT2:LEV 1.1 V
Couplings	This same level is used for the Ext2 trigger source in the Trigger menu, for the Ext2 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext2 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Saved in instrument state
Min	-5 V
Max	5 V
Default Unit	V
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:FRAMe:EXTernal2:LEVel
Initial S/W Revision	Prior to A.02.00

### Trig Slope

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

Key Path	Trigger, External 2
<b>Remote Command</b>	:TRIGger[:SEquence]:EXTernal2:SLOPe POSitive NEGative :TRIGger[:SEquence]:EXTernal2:SLOPe?
<b>Example</b>	TRIG:EXT2:SLOP NEG
Couplings	This same slope is used in the Ext2 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Saved in instrument state
<b>Backwards Compatibility SCPI</b>	:TRIGger[:SEquence]:FRAMe:EXTernal2:SLOPe
Backwards Compatibility Notes	The legacy :TRIGger[:SEquence]:SLOPe command affects the slopes for the VID, LINE, EXT1, EXT2, and RFB triggers.
Initial S/W Revision	Prior to A.02.00

## RF Burst

Pressing this key, when it is not selected, selects the RF Burst as the trigger. A new sweep/measurement will start when an RF burst envelope signal is identified from the signal at the RF Input connector. Pressing this key, when it is already selected, accesses the RF Burst trigger setup menu.

In some models, a variety of burst trigger circuitry is available, resulting in various available burst trigger bandwidths. The analyzer automatically chooses the appropriate trigger path based on the hardware configuration and other settings of the analyzer.

Key Path	Trigger
<b>Example</b>	TRIG:SOUR RFB Swept SA measurement TRIG:<meas>:SOUR RFB Measurements other than Swept SA
State Saved	Saved in instrument state
Status Bits/OPC dependencies	The Status Operation Register bit 5 "Waiting for Trigger" is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met). A corresponding pop-up message ("Waiting for trigger") is generated if no trigger signal appears after approximately 2 sec. This message goes away when a trigger signal appears.
Backwards Compatibility Notes	The legacy command: :TRIGger[:SEQuence]:RFBurst:FSElectivity[:STATe] OFF ON 0 1 is not supported in the X-Series, as the hardware to do Frequency Selective burst triggers does not exist in X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

## Absolute Trigger Level

Sets the absolute trigger level for the RF burst envelope.

When using the External Mixing path, the Absolute Trigger Level is uncalibrated because the factory default was set to accommodate the expected IF levels for the RF path.

Key Path	Trigger, RF Burst
Scope	Meas Global
<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

### 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

## Trig Delay

This setting delays the measurement timing relative to the Periodic Timer.

Key Path	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	Displays a summary of the Auto Trig and Holdoff settings, in square brackets First line: Auto Off or Auto On Second Line: "Hld?" followed by: <ul style="list-style-type: none"> <li>• If Holdoff is Off, readback Off</li> <li>• If Holdoff On and Type = Normal, readback value</li> <li>• If Holdoff On and Type = Above, readback value followed by AL</li> <li>• If Holdoff On and Type = Below, readback value followed by BL</li> <li>• If Holdoff Type selection is not supported by the current measurement, Holdoff Type is always Normal</li> </ul>
Initial S/W Revision	A.02.00

## Auto Trig

Sets the time that the analyzer will wait for the trigger conditions to be met. If they are not met after that much time, then the analyzer is triggered anyway.

Key Path	Trigger, Auto/Holdoff
Remote Command	:TRIGger[:SEquence]:ATRigger <time> :TRIGger[:SEquence]:ATRigger? :TRIGger[:SEquence]:ATRigger:STATe OFF ON 0 1 :TRIGger[:SEquence]:ATRigger:STATe?
Example	TRIG:ATR:STAT ON TRIG:ATR 100 ms
Notes	The "time that the analyzer will wait" starts when the analyzer is ready for a trigger, which may be hundreds of ms after the data acquisition for a sweep is done. The "time" ends when the trigger condition is satisfied, not when the delay ends.
Preset	Off, 100 ms
State Saved	Saved in instrument state
Min	1 ms
Max	100 s
Default Unit	s
Initial S/W Revision	Prior to A.02.00

## Trig Holdoff

Sets the holdoff time between triggers. When the trigger condition is satisfied, the trigger occurs, the delay begins, and the holdoff time begins. New trigger conditions will be ignored until the holdoff time expires. For a free-running trigger, the holdoff value is the minimum time between triggers.

Key Path	Trigger, Auto/Holdoff
Remote Command	:TRIGger[:SEquence]:HOLDoff <time> :TRIGger[:SEquence]:HOLDoff? :TRIGger[:SEquence]:HOLDoff:STATe OFF ON 0 1 :TRIGger[:SEquence]:HOLDoff:STATe?
Example	TRIG:HOLD:STAT ON TRIG:HOLD 100 ms
Dependencies	Unavailable if the selected Input is BBIQ. If this is the case, the key is grayed out if it is pressed the informational message "Feature not supported for this Input" is displayed. If the SCPI command is sent, the error "Settings conflict; Feature not supported for this Input" is generated.
Preset	Off, 100 ms
State Saved	Saved in instrument state
Min	0 s

Max	0.5 s
Default Unit	s
Initial S/W Revision	Prior to A.02.00





## 8 AM Demod Measurement

For the AM Demod measurement, the analyzer will return the metrics results, such as AM depth, modulation rate, SINAD, total harmonic distortion and carrier power. The analyzer can display trace data of the RF spectrum, the AF spectrum, or the demod waveform.

If the Demod Min trace, Demod Max trace or Demod Average trace is queried using a Meas, Read or Fetch command when the Average/Hold feature is turned off, the resulting data will be default values.

For more measurement related commands, see the SENSE subsystem, and the ["Remote Measurement Functions" on page 795](#).

This topic contains the following sections:

["Measurement Commands for AM Demod" on page 354](#)

["Remote Command Results for AM Demod" on page 355](#)

## Measurement Commands for AM Demod

Parameter Name	AM Meas/Read/Fetch Query Results
SCPI Command	:MEASure READ FETCh:AM[1] 0 2 3 4 5 6?
SCPI Example	MEAS:AM? FETCh:AM0? READ:AM5?
Setup	[COMPARE OFF]
Post Setup	[COMPARE ON]

## Remote Command Results for AM Demod

Command	n	Return Value
:INITiate:AM	n/a	n/a
:CONFigure?	n/a	name of current measurement: "AM"
:CONFigure:AM	n/a	n/a (selects AM measurement in Meas Preset state)
:CONFigure:AM:NDEFault	n/a	n/a (selects AM measurement without affecting settings)
:FETCh:AM[n]? :MEASure:AM[n]? :READ:AM[n]?	0	This query returns the RF Spectrum trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view.
	not specified or n=1	Returns the following comma-separated results. All modulation depth numbers are in units of percent. <ol style="list-style-type: none"> <li>1. The RF Spectrum window's center frequency</li> <li>2. Carrier Power</li> <li>3. 0</li> <li>4. Modulation Rate</li> <li>5. SINAD value</li> <li>6. Distortion/Total Vrms (% - not ratio - or dB)</li> <li>7. Total Harmonic Distortion (% - not ratio - or dB)</li> <li>8. Modulation Depth (Peak+)</li> <li>9. Modulation Depth (Peak-)</li> <li>10. Modulation Depth (Pk-Pk)/2</li> <li>11. Modulation Depth (RMS)</li> <li>12. Modulation Depth (Peak+) Max Hold</li> <li>13. Modulation Depth (Peak-) Max Hold</li> <li>14. Modulation Depth (Pk-Pk)/2 Max Hold</li> <li>15. Modulation Depth (RMS) Max Hold</li> <li>16. SNR</li> </ol>
	2	This query returns the Demod Min Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all values are 10,000..
	3	This query returns the Demod Max Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -100.
	4	This query returns the Demod Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view
	5	This query returns the Demod Average Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view

Command	n	Return Value
		If Aver/Hold is off, all y-values are -100.
	6	This query returns the AF Spectrum Trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	7	Returns the following comma-separated results: 1. Mod Depth (RMS) 2. Mod Depth (RMS) Ratio 3. Ratio Reference
	8	<b>Returns the Demod Waveform Trace data (without interpolation), as a series of floating trace point values, in %.</b> The number of samples and the sample interval can be queried when n=10.
	9	Reserved.
	10	Returns the following scalar results: 1. Sample Interval is a floating point number representing the time between samples when using the trace queries (n=8). 2. Number of samples is the number of data points in the Demod Waveform Trace (without interpolation). This number is useful when performing a query on the signal (when n=8).
	11	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. The number of samples and the sample interval can be queried when n=12.
	12	Returns the following scalar results: 1. Sample Interval is a floating point number representing the time between samples when using the trace queries (n=11). 2. Number of samples is the number of data points in the captured signal. This number is useful when performing a query on the signal (when n=11).
Key Path	Meas	
Initial S/W Revision	Prior to A.02.00	

## AMPTD Y Scale

Accesses a menu that enables you to set the reference level, attenuation, scale per division, reference position, and internal pre-amplifier parameters for your measurement.

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

### Ref Value (AM)

The reference value specifies the amplitude of a signal displayed on the reference graticule line. The reference line is at the top, center, or bottom of the graticule, depending on the value of the Ref Position function.

Changing the reference value does not restart a measurement, but changes all displayed traces and markers to the new value. If a change to the reference value changes an auto-coupled attenuation value, the measurement restarts.

The Ref Value key applies only to the window with the focus. If the focus is on the Metrics window, the Ref Value key is unavailable.

Key Path	AMPTD Y Scale
Remote Command	:DISPlay:AM:WINDow[1]   2   3:TRACe:Y[:SCALe]:RLEVel <real> :DISPlay:AM:WINDow[1]   2   3:TRACe:Y[:SCALe]:RLEVel?
Example	DISP:AM:WIND:TRAC:Y:RLEV 20 dBm Sets the reference value in window 1 to 20 dBm.
Remote Command Notes	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 1. Demod Waveform 2. AF Spectrum 3. Metrics
Couplings	The value is constrained within the MAX and MIN values, but is otherwise generally not adjusted. In window 3, this value depends on Scale Type. If Scale Type is Log, the value will be expressed in decibel units. For example, x % will be expressed as y dBam, where $y = 20 * \log(x)$ .
Preset	RF Spectrum 0 dBm Demod Waveform 0% AF Spectrum Scale Type is "Lin": 100 % Scale Type is "Log": 40 dBam
State Saved	Saved in instrument state
Min	RF Spectrum -170 dBm - Ext Gain Demod Waveform -100% AF Spectrum Scale Type is "Lin": 1 m%

	Scale Type is "Log": -60 dBam
Max	RF Spectrum N9030A: 30 dBm N9020A: 30 dBm N9010A: 23 dBm N9000A: 23 dBm Demod Waveform 100% AF Spectrum Scale Type is "Lin": 10 k% Scale Type is "Log": 80 dBam
Default Unit	depends on the current view
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## 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 358](#)

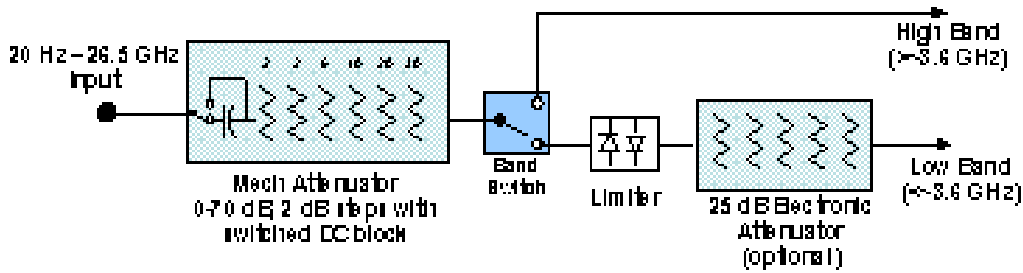
See ["Single Attenuator Configuration:" on page 359](#)

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.

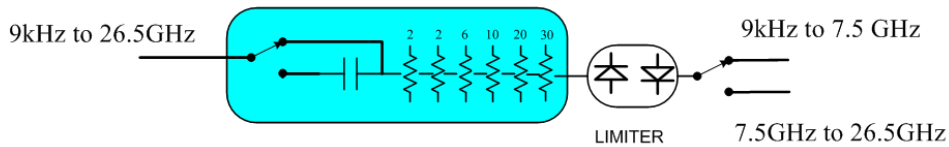
Key Path	AMPTD Y Scale
Scope	Meas Global
Dependencies	In measurements that support the I/Q inputs, this key is unavailable when I/Q is the selected input, and is replaced by the Range key in that case.
Readback Line	Contains a summary in [ ] brackets of the current total attenuation. See the descriptions of the , (Mech) Atten , and Enable Elec Atten keys for more detail on the contributors to the total attenuation. Note that when "Pre-Adjust for Min Clip" is on, this value can change at the start of every measurement.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Dual Attenuator Configurations:

Configuration 1: Mechanical attenuator + optional electronic attenuator

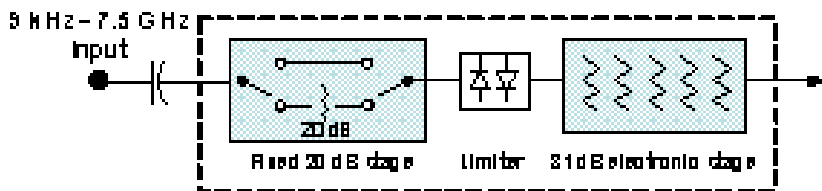


Configuration 2: Mechanical attenuator, no optional electronic attenuator

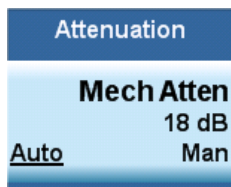


(note that Configuration 2 is not strictly speaking a dual-section attenuator, since there is no electronic section available. However, it behaves exactly like Configuration 1 without the Electronic Attenuator option EA3, therefore for the sake of this document it is grouped into the “Dual Attenuator” configuration)

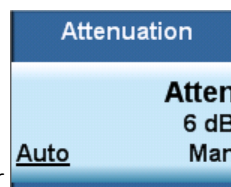
### Single Attenuator Configuration:



You can tell which attenuator configuration you have by pressing the Attenuation key, which (in most Modes) opens the Attenuation menu. If the first key in the Attenuation menu says Mech Atten you have the dual attenuator configuration. If the first key says Atten you have the single attenuator configuration.



Dual Attenuator



Single Attenuator

In the single attenuator configuration, you control the attenuation with a single control, as the fixed stage has only two states. In the dual attenuator configuration, both stages have significant range so you are given separate control of the mechanical and electronic attenuator stages.

When you have the dual attenuator configuration, you may still have only a single attenuator, because unless option EA3 (the Electronic Attenuator option) is available, and you purchase it, you will have only the mechanical attenuator.

### Scale / Div (AM)

Sets the units per vertical graticule division on the display.

The Scale/Div key applies only to the window with the focus. If the focus is on the Metrics window, the Scale/Div key is unavailable.

Key Path	AMPTD Y Scale
Remote Command	:DISPlay:AM:WINDow[1]   2   3:TRACe:Y[:SCALE]:PDIVision <real> :DISPlay:AM:WINDow[1]   2   3:TRACe:Y[:SCALE]:PDIVision?
Example	DISP:AM:WIND:TRAC:Y:PDIV 5 DB
Remote Command Notes	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 1. Demod Waveform 2. AF Spectrum 3. Metrics
Preset	RF Spectrum 10 dB Demod Waveform 20 % AF Spectrum 10 dB
State Saved	Saved in State
Min	RF Spectrum 0.1 dB Demod Waveform 1% AF Spectrum 0.1 dB
Max	RF Spectrum 20 dB Demod Waveform 1 kHz AF Spectrum 20 dB
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Scale Type

Chooses whether to display Y axis in decibel units in the AF spectrum window. No matter what the Scale Type value is, Log or Lin, the vertical graticule divisions are always scaled in logarithmic units.

**NOTE**

This key applies only to the AF Spectrum window in AM, FM and PM measurement. The following table describes the parameters that will be affected by Scale Type in the AF spectrum window.

Y axis unit,	AM: dBam	AM: %
Marker Y value,	FM: dBHz	FM: Hz
Refer Value	PM: dBrad	PM rad
	dBdeg	deg

Key Path	AMPTD Y Scale
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<b>Remote Command</b>	<code>:DISPlay:AM FM PM:WINDow3:TRACe:Y[:SCALe]:SPACing LINear   LOGarithmic</code> <code>:DISPlay:AM FM PM:WINDow3:TRACe:Y[:SCALe]:SPACing?</code>
<b>Example</b>	<code>DISP:AM:WIND:TRAC:Y:SPAC LOG</code> <code>DISP:AM:WIND:TRAC:Y:SPAC?</code>
<b>Dependencies</b>	This feature is available only when Option N9063A-AFP is installed.
<b>Couplings</b>	Changing the Scale Type always sets the Y axis unit to the last unit specified for the current amplitude scale. In other words, we restore the Y axis unit setting appropriate per log/lin.
<b>Preset</b>	LOG
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	A.14.00

## Ref Position

Positions the reference value at the top, center, or bottom of the Y Scale display. Changing the reference position does not change the reference value.

The Ref Position key applies only to the window with the focus. If the focus is on the Metrics window, the Ref Position key is unavailable.

<b>Key Path</b>	AMPTD Y Scale
<b>Remote Command</b>	AM/PM/FM Stereo: <code>:DISPlay:AM PM FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALe]:RPOSition TOP   CENTER   BOTTom</code> <code>:DISPlay:AM PM FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALe]:RPOSition?</code>  FM: <code>:DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALe]:RPOSition TOP   CENTER   BOTTom</code> <code>:DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALe]:RPOSition?</code>
<b>Example</b>	<code>DISP:AM:WIND:TRAC:Y:RPOS BOTT</code>
<b>Remote Command Notes</b>	AM/PM/FM Stereo: Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. Metrics FM: Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. RF Envelope (Attack/Release Time view)

	5. FM Demod Waveform (Attack/Release Time view) 6. Metrics
Preset	RF Spectrum window: Top Demod Waveform window: Center AF Spectrum window: Top
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Internal Preamp

Accesses a menu of keys that control the internal preamps. Turning on the preamp gives a better noise figure, but a poorer TOI to noise floor dynamic range. You can optimize this setting for your particular measurement.

The instrument takes the preamp gain into account as it sweeps. If you sweep outside of the range of the preamp the instrument will also account for that. The displayed result will always reflect the correct gain.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the status line. For example, for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

Key Path	AMPTD Y Scale
Scope	Meas Global
Remote Command	<code>[ :SENSe ] :POWeR [ :RF ] :GAIN [ :STATe ] OFF   ON   0   1</code> <code>[ :SENSe ] :POWeR [ :RF ] :GAIN [ :STATe ] ?</code>
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown. The preamp is not available when the electronic/soft attenuator is enabled.
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be switched On, to Full Range. Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected. Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.
Preset	OFF
State Saved	Saved in instrument state

Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00
<b>Key Path</b>	AMPTD Y Scale, Internal Preamp
<b>Scope</b>	Meas Global
<b>Remote Command</b>	[ :SENSe] :POWer [ :RF] :GAIN:BAND LOW FULL [ :SENSe] :POWer [ :RF] :GAIN:BAND?
<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
Initial S/W Revision	Prior to A.02.00

## Off

Turns the internal preamp off

<b>Key Path</b>	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN OFF
<b>Readback</b>	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.

<b>Key Path</b>	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND LOW
<b>Readback</b>	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.

<b>Key Path</b>	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND FULL
<b>Readback</b>	Full Range
<b>Initial S/W Revision</b>	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>	[ :SENSe ] :POWer [ :RF ] :MW:PATH STD LNPath MPBypass FULL [ :SENSe ] :POWer [ :RF ] :MW:PATH?

<b>Example</b>	:POW:MW:PATH LNP Enables the Low Noise path
Notes	<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>
Dependencies	Unavailable in BBIQ and External Mixing
Preset	<p>All modes other than IQ Analyzer mode and VXA: STD</p> <p>IQ Analyzer, VXA and WLAN mode:</p> <p>MPB option present and licensed: MPB</p> <p>MPB option not present and licensed: STD</p>
State Saved	Save in instrument state
Readback	Value selected in the submenu
Initial S/W Revision	A.04.00
Modified at S/W Revision	A.10.00

## 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 which 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.

For Analog Demod, these parameters are:

- RF Res BW
- AF Res BW
- CF Step

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

## BW

Opens a menu of keys that enable you to control the bandwidth functions of the application.

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

### RF Res BW

Activates the RF Res BW function, which enables you to manually set the resolution bandwidth used in the RF Spectrum window.

Normally, the RF Res BW (Auto) key selects automatic coupling of the resolution bandwidth. To decouple the resolution bandwidth, press the RF Res BW key until Man is underlined, or enter a different value for the resolution bandwidth.

When the resolution bandwidth is manually selected, it may be returned to the coupled state by pressing the RF Res BW key until Auto is underlined. This may also be done by pressing the Auto Couple key or by performing a preset.

Only the Gaussian filter type is used.

Key Path	BW
<b>Remote Command</b>	<pre>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth[:RESolution] &lt;freq&gt; [ :SENSe ] :AM FM PM FMSTereo:BANDwidth[:RESolution]? [ :SENSe ] :AM FM PM:BANDwidth[:RESolution]:AUTO OFF ON 0 1 [ :SENSe ] :AM FM PM:BANDwidth[:RESolution]:AUTO?</pre>
<b>Example</b>	<pre>AM:BAND 1 KHZ AM:BAND? AM:BAND:AUTO ON AM:BAND:AUTO?</pre>
Notes	Only certain discrete resolution bandwidths are available. For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Couplings	<p>AM/FM/PM: In Auto, the 3 dB RBW of the desired filter is the closest possible choice to that given by Span divided by 106 (the Span: 3 dB RBW parameter), except that the range for auto-coupling is restricted to not exceed 3 MHz.</p> <p>FMST: In Auto, RBW is coupled to Span in the following ways: <math>RBW = Span / 500</math> ( Span &gt; 500 kHz )  <math>RBW = 1 \text{ kHz}</math> ( 100kHz &lt;= Span &lt;= 500 kHz )  <math>RBW = Span / 100</math> ( Span &lt; 100 kHz )</p>
Preset	<p>AM/FM/PM: Preset is Auto, which results in a 680 Hz value since the preset span is 75 kHz and the Span/RBW ratio is 106</p> <p>FMST: Preset is Auto, which results in a 1 kHz value since the preset span is 500 kHz</p>
State Saved	Saved in Instrument state

Min	1 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Channel BW

The Channel BW variable is used to determine the bandwidth used for the demodulation. The flat top filter type must be used for demodulation.

This parameter also controls the RBW hardware setting for the demodulation fed to the speaker.

Key Path	BW
<b>Remote Command</b>	<code>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth:CHANnel &lt;freq&gt;</code> <code>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth:CHANnel?</code>
<b>Example</b>	AM:BAND:CHAN 200 kHz
Notes	If the Channel BW is greater than 8 MHz, gives a warning message "Settings Alert; Analog Output Undefined".
Dependencies	The maximum value will be the maximum IF BW available in the instrument. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available IF BW of the instrument is 140 MHz. Thus, the maximum Channel BW is not limited to 25 MHz but is 140 MHz.
Preset	= AM/FM/PM = 25 kHz = FMST = 400 kHz
State Saved	Saved in instrument state
Min	390 Hz
Max	When Option N9063A-AFP is installed, it depends on hardware: No Option = 10 MHz Option B25 = 25 MHz Option B40 = 40 MHz  Option B1X = 140 MHz Option B1Y = 160 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00



## AF Res BW

In the AF Spectrum window, the AF Res BW key is used to set the Resolution bandwidth of the FFT of the demodulated waveform.

The data acquisition uses the Channel BW value for hardware control during data acquisition, just as it does in the Demod Waveform window.

AF Res BW (Auto) selects automatic coupling of the AF Res BW to the AF Span (defined as AF Stop Freq – AF Start Freq) using the same factor of 106 used by the RF Res BW. To decouple the resolution bandwidth, press the AF Res BW key until Man is underlined, or enter a different value for the AF resolution bandwidth.

When the AF resolution bandwidth is manually selected, it may be returned to the coupled state by pressing the AF Res BW key until Auto is underlined. This may also be done by pressing the Auto Couple key or by performing a Preset.

Only the Gaussian filter type is used.

Key Path	BW
<b>Remote Command</b>	<pre>[ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth &lt;freq&gt; [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth? [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth:AUTO OFF   ON   0   1 [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth:AUTO?</pre>
<b>Example</b>	<pre>AM:AFSP:BAND 1 KHZ AM:AFSP:BAND?</pre>
Notes	Only certain discrete resolution bandwidths are available. For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Notes	For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Remote Command Notes	The setting and querying of values depends on the current bandwidth type.
Couplings	In Auto, the 3 dB RBW of the desired filter is the closest possible choice to that given by Span divided by 106 (the Span: 3 dB RBW parameter), except that the range for auto-coupling is restricted to not exceed 3 MHz.
Preset	Preset is Auto, which results in a 180 Hz value since the preset span is 20 kHz and the Span/RBW ratio is 106
State Saved	Saved in Instrument State
Min	1 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## 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.

<b>Key Path</b>	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
<b>Preset</b>	ON (Note that SYST:PRESet sets INIT:CONT to ON but *RST sets INIT:CONT to OFF)
<b>State Saved</b>	Saved in instrument state
<b>Backwards Compatibility Notes</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

In Swept SA Measurement (Spectrum Analysis Mode):

The analyzer takes repetitive sweeps, averages, measurements, etc., when in Continuous mode. When the average count reaches the Average/Hold Number the count stops incrementing, but the analyzer keeps sweeping. See the Trace/Detector section for the averaging formula used both before and after the Average/Hold Number is reached. The trigger condition must be met prior to each sweep. The type of trace processing for multiple sweeps, is set under the Trace/Detector key, with choices of Trace Average, Max Hold, or Min Hold.

In Other Measurements/Modes:

With Avg/Hold Num (in the Meas Setup menu) set to Off or set to On with a value of 1, a sweep is taken after the trigger condition is met; and the analyzer continues to take new sweeps after the current sweep has completed and the trigger condition is again met. However, with Avg/Hold Num set to On with a value >1, multiple sweeps (data acquisitions) are taken for the measurement. The trigger condition must be met prior to each sweep. The sweep is not stopped when the average count k equals the number N set for Avg/Hold Num is reached, but the number k stops incrementing. A measurement average usually applies to all traces, marker results, and numeric results. But sometimes it only applies to the numeric results.

If the analyzer is in Single measurement, pressing the Cont key does not change k and does not cause the sweep to be reset; the only action is to put the analyzer into Continuous measurement operation.

If it is already in continuous sweep:

the INIT:CONT 1 command has no effect

the INIT:CONT 0 command will place the analyzer in Single Sweep but will have no effect on the current sequence until  $k = N$ , at which point the current sequence will stop and the instrument will go to the idle state.

8 AM Demod Measurement  
File

File

See "File" on page 236

## FREQ Channel

Accesses a menu of keys that enable you to control the Frequency parameters of the instrument.

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

### Center Frequency

Sets the frequency that corresponds to the horizontal center of the RF Spectrum window. While adjusting the Center Frequency the Span is held constant, this means that both the start frequency and the stop frequency will change.

The Center Frequency is retained as you go from measurement to measurement.

Key Path	FREQ Channel
<b>Remote Command</b>	<code>[ :SENSe ] :FREQuency:CENTer &lt;freq&gt;</code> <code>[ :SENSe ] :FREQuency:CENTer?</code>
<b>Example</b>	FREQ:CENT 50MHz FREQ:CENT UP changes the center frequency to 150 MHz if you use FREQ:CENT:STEP 100MHz sets the center frequency step size to 100 MHz FREQ:CENT?
Dependencies	The Center Frequency can be limited by Start or Stop Freq limits, In addition, the Center Frequency can be limited if the Span is so large that Start or Stop hit 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 frequency range
Preset	1.000 GHz
State Saved	Saved in instrument state
Min	Depends on instrument minimum frequency and the 10 Hz minimum span. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters.
Max	Depends on the instrument’s maximum frequency and the 10 Hz minimum span. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

## CF Step

Changes the step size for the center frequency function. Once a step size has been selected and the center frequency function is active, the step keys (and the UP|DOWN parameters for the Center Frequency from remote commands) change the center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the analyzer.

<b>Key Path</b>	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :FREQuency:CENTer:STEP [ :INCRement ] <freq> [ :SENSe ] :FREQuency:CENTer:STEP [ :INCRement ] ? [ :SENSe ] :FREQuency:CENTer:STEP:AUTO OFF   ON   0   1 [ :SENSe ] :FREQuency:CENTer:STEP:AUTO ?
<b>Example</b>	FREQ:CENT:STEP:AUTO ON FREQ:CENT:STEP 500MHz FREQ:CENT UP increases the current center frequency value by 500 MHz FREQ:CENT:STEP? FREQ:CENT:STEP:AUTO?
<b>Remote Command Notes</b>	Preset and Max values are dependent on Hardware Options (503, 508, 513, 526)
<b>Dependencies</b>	Span, RBW, Center frequency
<b>Couplings</b>	When auto-coupled in a non-zero span, the center frequency step size is set to 10% of the span. When auto-coupled in zero span, the center frequency step size is set to the equivalent -3 dB RBW value.
<b>Preset</b>	Auto
<b>State Saved</b>	Saved in State
<b>Min</b>	- (the maximum frequency of the instrument). For example, a 27 GHz max frequency instrument has a CF step range of +/- 27 GHz.
<b>Max</b>	The maximum frequency of the instrument. For example, 27 GHz max freq instrument has a CF step range of +/- 27 GHz.
<b>Default Unit</b>	Hz
<b>Status Bits/OPC dependencies</b>	Non-overlapped
<b>Initial S/W Revision</b>	Prior to A.02.00

## AF Start Freq

Sets the frequency at the left side of the graticule in the AF Spectrum window. While adjusting the AF start frequency the AF stop frequency is held constant.

The AF Start Frequency is retained as you go from measurement to measurement.

<b>Key Path</b>	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :AM   FM   PM   FMSTereo:AFSPectrum:FREQuency:START <freq> [ :SENSe ] :AM   FM   PM   FMSTereo:AFSPectrum:FREQuency:START ?

<b>Example</b>	AM:AFSP:FREQ:STAR 0 Hz
Dependencies	You cannot set the Start frequency > the Stop frequency. You cannot set the Start frequency = Stop frequency. You cannot set the Start Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, Stop Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	0 Hz
State Saved	Saved in instrument state
Min	0 Hz
Max	99.999990 MHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## AF Stop Freq

Sets the frequency at the right side of the graticule in the AF Spectrum window. While adjusting the AF Stop Frequency the AF Start Frequency is held constant.

Key Path	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:STOP <freq> [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:STOP?
<b>Example</b>	AM:AFSP:FREQ:STOP 20 kHz
Dependencies	You cannot set the Stop frequency < the Start frequency. You cannot set the Start frequency = Stop frequency. You cannot set the Stop Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, the Start Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	20 kHz
State Saved	Saved in instrument state
Min	10 Hz
Max	100 MHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

8 AM Demod Measurement  
Input/Output

Input/Output

See "[Input/Output](#)" on page 126



## Marker

Accesses the Marker menu. A marker can be placed on a trace to allow the value of the trace at the marker point to be determined precisely. The functions in this menu include a 1-of-N selection of the control mode Normal, Delta, Fixed, or Off for the selected marker.

If the selected marker is Off, pressing the Marker key sets it to the selected window. If the metrics window is selected, the marker will appear in the first visible window (RF Spectrum if Quad View is selected).

The units of Delta Marker are window dependent. In the Spectrum windows they are dB, in the Demod Waveform window they are the same as the Y-Axis Unit. In this window, the delta marker is a linear difference rather than a ratio. For example, in FM, in the Demod Waveform window, the units of delta marker are Hz.

### Control Mode

Key Path	Front-panel key
Remote Command	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MODE POSition   DELTa   FIXed   OFF :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MODE?
Example	CALC:AM:MARK:MODE POS turns on marker 1 in Normal mode
Remote Command Notes	This command (not the query) causes the specified marker to become selected.
Preset	OFF (all markers)
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Select Marker

Displays a menu with 12 markers available for selection for the current measurement.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is initiated.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Normal

Sets the control mode for the selected marker to Normal and turns on the active function for setting its value. If the selected marker was off, it is placed at the center of the screen on the trace specified by the marker's Trace attribute.

A Normal mode (POSition type) marker can be moved to any point on the X Axis by specifying its X Axis value. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker
<b>Example</b>	: CALC: MARK: MODE POS sets Marker 1 to Normal.
Remote Command Notes	See the description under the " <b>Marker</b> " on page 779 key.
Couplings	The marker addressed by this command becomes the selected marker on the front panel.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Delta

Sets the control mode for the selected marker to Delta and turns on the active function for setting its delta value. If the selected marker is off, the marker is placed at the center of the screen on the trace specified by the marker's Trace attribute.

In Delta mode the marker result shows the relative result between the selected (Delta) marker and its reference marker. A delta marker can be moved to any point on the X Axis by specifying its X Axis offset from a reference marker. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker
<b>Example</b>	:CALC:MARK:MODE DELT sets marker 1 to Delta.
Remote Command Notes	See the description under the " <b>Marker</b> " on page 779 key.
Couplings	Coupled to fix absolute X when turned On.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Fixed

Sets the control mode for the selected marker to Fixed. A fixed marker is fixed in the sense that it stays where you place it. It can be directly moved in both X and Y. It can be moved with a Peak Search. It can also be indirectly moved by re-zeroing the delta if it is a relative marker. If it is moved, it again becomes fixed at the X Axis point it moved to and it has a Y-axis result that it took on when it moved there. If a Normal or Delta marker is changed to Fixed it becomes fixed at the X Axis point it was at, and with the Y-axis result it had when it was set to Fixed.

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

## Marker X

Sets and queries a marker's X value.

Key Path	Marker, Fixed
----------	---------------

<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:X <time>   <freq> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:X?
Remote Command Notes	The query is returned in the fundamental units for the current marker X Axis scale. This command (not the query) causes the specified marker to become selected.
Preset	After a preset, all Markers are turned off, so a Marker X Axis Value query will return not a number (9.91 e37). When a Marker is on, the default value of the Marker X value is the center of the appropriate window.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Marker Y

Sets and queries a marker's Y axis value.

Key Path	Marker, Fixed
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:Y <real> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:Y?
Remote Command Notes	The query is returned in the fundamental units for the current marker Y Axis scale. This command (not the query) causes the specified marker to become selected.
Preset	Defaults to the measurement result at the default X value, or not a number (9.91 e37) if off or if off screen is Fixed.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Off

Turns off the selected marker. Turning the marker off does not affect which marker is selected.

Key Path	Marker
<b>Example</b>	: CALC: MARK: MODE OFF sets Marker 1 to Off.
Remote Command Notes	See the description under the " <a href="#">Marker</a> " on page 779 key.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Properties

Accesses a menu used to assign properties to the selected marker.

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

## Select Marker

Displays a menu with 12 markers available for selection for the current measurement.

Key Path	Marker, Properties
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is initiated.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Relative To

Selects the reference marker for a marker in Delta mode.

If a delta marker has a reference marker in a different window, the delta marker's mode changes to POS (for example, it becomes a normal marker).

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:REFerence <int> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:REFerence?
<b>Example</b>	CALC:AM:MARK1:REF 2 Sets marker 1's reference marker to 2 and turns marker 1 on as a delta marker.
Remote Command Notes	This command (not the query) causes the specified marker to become selected.
Preset	By default, marker X is relative to marker X + 1 except for marker 12, which is relative to marker 1.
Min	1
Max	12
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## AM/FM/ΦM Marker Trace

Selects the trace on which to place the marker. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an

associated trace, even Fixed markers. It is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

In the AM/ $\Phi$ M measurements, there are five named traces, and in the FM measurement, there are seven named traces. The RF Spectrum trace is the trace in the RF Spectrum window, and the AF Spectrum trace is the trace in the AF Spectrum window. There are four traces in the Demod Waveform window: Demod, Demod Avg, Demod Max, and Demod Min. The RF Envelope trace and the Demod Raw trace are from Attack/Release Time view which is only available in the FM measurement. The RF Envelope trace is in the RF Envelope window and the Demod Raw trace is in the FM Demod Waveform window. When Auto Init is on, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta, or Fixed) from an off state. The marker goes to the trace in the window that has the focus, or onto the RF spectrum window if the Metrics window has the focus. If in the Demod Waveform window, it goes to the Demod trace.

This command associates the marker with the specified trace. Setting the Marker Trace directly (whether the marker is on or off) will turn off Auto Init.

If the marker is not off, it moves the marker from the trace it was on to the new trace. If the new trace is in the same window, the marker goes to the same data point on the new trace. If the marker changes windows, it retains its relative horizontal positions in the new window. If it is a fixed marker, it will retain both relative horizontal and vertical position.

If the marker is off it stays off, but is now associated with the specified trace.

The query returns the name of the trace on which the marker is currently placed.

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM:MARKer[1] 2 ... 12:TRACe RFSpectrum   AFSPpectrum   DEMod   DAVerage   DMAXimum   DMINimum   RFENvelope   DRAW :CALCulate:AM FM PM:MARKer[1] 2 ... 12:TRACe?
<b>Example</b>	:CALC:AM:MARK1:TRAC DEM places marker 1 on the Demod trace
<b>Couplings</b>	This is not affected by Auto Coupling. Sending the remote command causes the addressed marker to become selected. If ever a delta marker has a reference marker in a different window, the delta marker's mode changes to POS (for example, it becomes a normal marker). When Marker Trace Auto Init State is on, the marker trace will automatically be set whenever the marker is turned on.
<b>Preset</b>	RF Spectrum on a Preset or All Markers Off
<b>State Saved</b>	The Marker Trace for each marker is saved in instrument state.
<b>Readback line</b>	[Trace name, Auto Init] or [Trace Name, Manual]
<b>Initial S/W Revision</b>	Prior to A.02.00

## RF Spectrum

Selects the input RF signal in the RF Spectrum window as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

---

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC RFSP
Initial S/W Revision	Prior to A.02.00

---

### Demod

Selects the current demodulated signal in the Demod Waveform window, shown in yellow, as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

---

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DEM
Initial S/W Revision	Prior to A.02.00

---

### Demod Average

Selects the averaged demodulation signal in the Demod Waveform window, shown in green, as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

---

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DAV
Initial S/W Revision	Prior to A.02.00

---

### Demod Max

Selects the Demod Max trace in the Demod Waveform window, shown in cyan, as the trace on which you want to place your marker. This trace shows the maximum hold value for each data point since the last restart.

---

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DMAX
Initial S/W Revision	Prior to A.02.00

---

### Demod Min

Selects the Demod Min trace in the Demod Waveform window, shown in magenta, as the trace on which you want to place your marker. This trace shows the minimum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DMIN
Initial S/W Revision	Prior to A.02.00

## AF Spectrum

Selects the demodulated signal in the AF Spectrum window as the trace on which you want to place your marker.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC AFSP
Initial S/W Revision	Prior to A.02.00

## Trace Auto Init

Selects whether the marker trace is automatically reset to the selected window when the marker is turned on or not.

Key Path	Marker, Properties, Trace
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:TRACe:AUTO OFF   ON   0   1  :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:TRACe:AUTO?
<b>Example</b>	:CALC:AM:MARK1:TRAC:AUTO 0 turns off auto-initialization of marker trace.
Preset	On
State Saved	Saved in instrument state.
Readback line	Trace name
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Lines

When on, displays a vertical line of graticule height and a horizontal line of graticule width, intersecting at the indicator point of the marker (that is, the center of the X or the bottom tip of the diamond). The lines are blue in color.

If the marker is off screen, the lines should be extended from the marker so that they go through the screen area if possible. This is really useful for off screen Fixed markers as it lets you see their amplitude even though they are off the X Axis.

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:LINEs[:STATE] OFF   ON

	0   1 :CALCulate:AM FM PM FMSTereo:MARKer [1]  2 ...  12:LINEs [:STATE] ?
<b>Example</b>	CALC:AM:MARK2:LIN ON turns Lines on for marker 2.
<b>Couplings</b>	Sending the remote command causes the addressed marker to become selected.
<b>Preset</b>	OFF
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### All Markers Off

Turns off all markers.

<b>Key Path</b>	Marker
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer:AOFF
<b>Example</b>	CALC:AM:MARK:AOFF turns off all markers for the AM measurement
<b>Couplings</b>	Sets the selected marker to 1.
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00



## Marker Function

There are no menus or marker functions under this key in the Analog Demod mode.

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

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## Marker To

Accesses a menu that contains only the marker center frequency key.

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

### Mkr->CF

Sets the center frequency of the RF Spectrum window to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display.

In delta marker mode, this function sets the center frequency to the x-axis value of the delta marker.

Key Path	Marker ->
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12[:SET]:CENTer
<b>Example</b>	CALC:AM:MARK2:CENT sets the CF of the analyzer to the value of marker 2.
Remote Command Notes	Sending this command selects the sub-op coded marker. If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the RF Spectrum trace as a normal type marker.
Dependencies	This function is unavailable (key is grayed out) unless the selected marker's trace is off, or on the RF Spectrum trace.
Couplings	All the usual couplings associated with setting Center Frequency apply (see " <a href="#">Center Frequency</a> " on <a href="#">page 775</a> ).
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## 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.

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

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### Remote Measurement Functions

This section contains the following topics:

"Measurement Group of Commands" on page 796

"Current Measurement Query (Remote Command Only)" on page 798

"Limit Test Current Results (Remote Command Only)" on page 798

"Data Query (Remote Command Only)" on page 798

"Calculate/Compress Trace Data Query (Remote Command Only)" on page 799

"Calculate Peaks of Trace Data (Remote Command Only)" on page 804

Hardware-Accelerated Fast Power Measurement (Remote Command Only)

"Format Data: Numeric Data (Remote Command Only)" on page 805

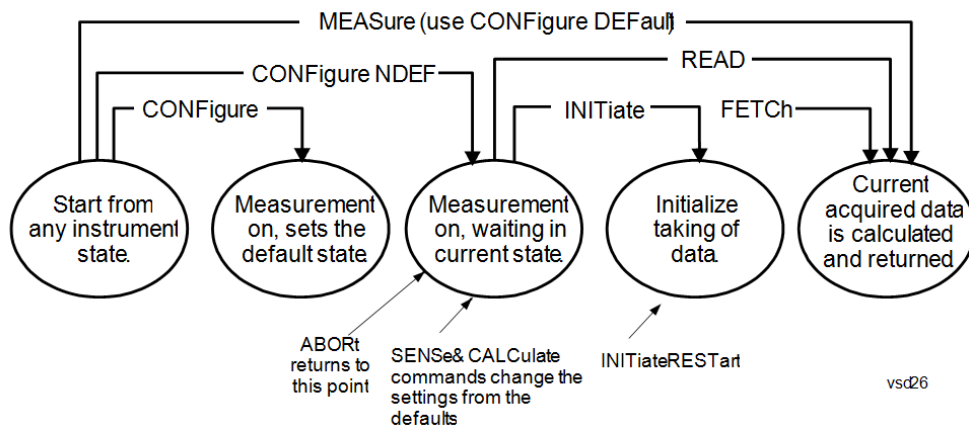
"Format Data: Byte Order (Remote Command Only)" on page 806

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## Measurement Group of Commands




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### 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>?.

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### Configure Commands:

:CONFigure:<measurement>

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using

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the factory default instrument settings. It does not initiate the taking of measurement data unless INIT:CONTInuous is ON. If you change any measurement settings after using the CONFigure command, the READ command can be used to initiate a measurement without changing the settings back to their defaults.

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

:CONFigure: <measurement>: NDEFault stops the current measurement and changes to the specified measurement. It does not change the settings to the defaults. It does not initiate the taking of measurement data unless INIT:CONTInuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query returns a quoted string of all licensed measurement names in the current mode. For example, "SAN, CHP, OBW, ACP, PST, TXP, SPUR, SEM, LIST".

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#### Fetch Commands:

:FETCh:<measurement>[n]?

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

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

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

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

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#### INITiate Commands:

:INITiate:<measurement>

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

- Initiates a trigger cycle for the specified measurement, but does not output any data. You must then use the FETCh<meas> command to return data. If a measurement other than the current one is specified, the instrument will switch to that measurement and then initiate it.
- For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. If you send INIT:ACP? it will change from channel power to ACP and will initiate an ACP measurement.
- Does not change any of the measurement settings. For example, if you have previously started the ACP measurement and you send INIT:ACP? it will initiate a new ACP measurement using the same instrument settings as the last time ACP was run.
- If your selected measurement is currently active (in the idle state) it triggers the measurement, assuming the trigger conditions are met. Then it completes one trigger cycle. Depending upon the measurement and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle. It also holds off additional commands on GPIB until the acquisition is complete.

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#### READ Commands:

:READ:<measurement>[n]?

- Does not preset the measurement to the factory default settings. For example, if you have previously initiated the ACP
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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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<b>Remote Command</b>	:CONFigure?
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<b>Example</b>	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.

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<b>Remote Command</b>	:CALCulate:CLIMits:FAIL?
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<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.
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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]?
<b>Notes</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

## Calculate/Compress Trace Data Query (Remote Command Only)

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

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

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

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

<b>Remote Command</b>	:CALCulate:DATA<n>:COMPRESS? BLOCK   CFIT   MAXimum   MINimum   MEAN   DMEan   RMS   RMSCubed   SAMPLE   SDEVIation   PPHase [,<soffset> [,<length>[,<roffset>[,<rlimit>]]]]
<b>Example</b>	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.)
<b>Notes</b>	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.
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- BLOCK or block data - returns all the data points from the region of the trace data that you specify. For example, it could be used to return the data points of an input signal over several timeslots, excluding the portions of the trace data that you do not want. (This is x,y pairs for trace data and I,Q pairs for complex data.)

- CFIT or curve fit - applies curve fitting routines to the data. <soffset> and <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.

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**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)

$$MEAN = \frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i$$

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)

$$MEAN = \frac{1}{n} \sum_{X_i \in \text{region}(s)} |X_i|$$

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:

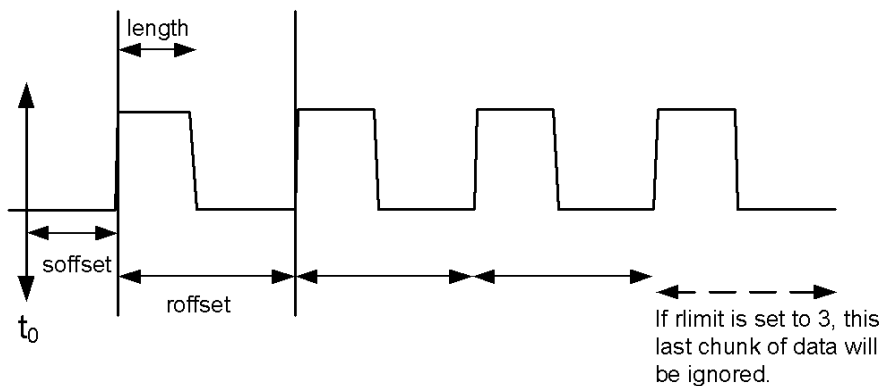
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

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.

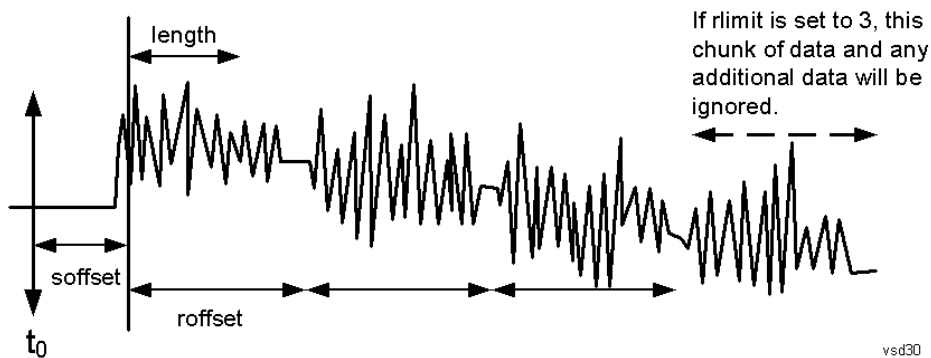
Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



<soffset> - start offset is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It specifies the amount of data at the beginning of the trace that will be ignored before the decimation process starts. It is the time or frequency change from the start of the trace to the point where you want to start using the data. The default value is zero.

<length> - is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It defines how much data will be compressed into one value. This parameter has a default value equal to the current trace length.

<roffset> - repeat offset is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It defines the beginning of the next field of trace elements to be compressed. This is relative to the beginning of the previous field. This parameter has a default value equal to the <length> variable. Note that this parameter is used for a completely different purpose when curve fitting (see CFIT above).

<rlimit> - repeat limit is an optional integer. It specifies the number of data items that you want returned. It will ignore any additional items beyond that number. You can use the Start offset and the Repeat limit to pick out exactly what part of the data you want to use. The default value is all the data.

## Calculate Peaks of Trace Data (Remote Command Only)

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

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

The command can only be used with specific sub-opcodes with measurement results that are trace data. Both real and complex traces can be searched, but complex traces are converted to magnitude in dBm. In many measurements the sub-opcode n=0, is the raw trace data which cannot be searched for peaks. And Sub-opcode n=1, is often calculated results values which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDER and FORMat:DATA commands and can return real or ASCII data. If the format is set to INT,32, it returns REAL,32 data.

The command has four types of parameters:

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

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<b>Remote Command</b>	<p>For Swept SA measurement:</p> <pre>:CALCulate:DATA[1] 2 ... 6:PEAKs? &lt;threshold&gt;,&lt;excursion&gt;[,AMPLitude   FREQuency   TIME[,ALL   GTDLine   LTDLine]]</pre> <p>For most other measurements:</p> <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>
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<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</p>
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excursion value stored under the Peak Criteria menu.

Values must be provided for threshold and excursion. The sorting and display line parameters are optional (defaults are AMPLitude and ALL).

Note that there is always a Y-axis value for the display line, regardless of whether the display line state is on or off. It is the current Y-axis value of the display line which is used by this command to determine whether a peak should be reported

Sorting order:

AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)

FREQUency - lists the peaks in order of occurrence, left to right across the x-axis.

TIME - lists the peaks in order of occurrence, left to right across the x-axis.

Peaks vs. Display Line:

ALL - lists all of the peaks found (default if optional parameter not sent).

GTDLine (greater than display line) - lists all of the peaks found above the display line.

LTDLine (less than display line) - lists all of the peaks found below the display line.

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### Format Data: Numeric Data (Remote Command Only)

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

---

**Remote Command**      :FORMat[:TRACe][:DATA] ASCii|INTeger,32|REAL,32 |REAL,64  
:FORMat[:TRACe][:DATA]?

---

**Notes**      The query response is:  
ASCii: ASC,8  
REAL,32: REAL,32  
REAL,64: REAL,64  
INTeger,32: INT,32

When the numeric data format is REAL or ASCii, data is output in the current Y Axis unit. When the data format is INTeger, data is output in units of m dBm (.001 dBm).

The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.

---

**Dependencies**      Sending a data format spec with an invalid number (for example, INT,48) generates no error. The analyzer simply uses the default (8 for ASCii, 32 for INTeger, 32 for REAL).

Sending data to the analyzer which does not conform to the current FORMat specified, results in an error. Sending ASCII data when a definite block is expected generates message -161 "Invalid Block Data" and sending a definite block when ASCII data is expected generates message -121 "Invalid Character in Number".

---

**Preset**      ASCii

---

**Backwards Compatibility Notes**      Note that the INT,32 format is only applicable to the command, TRACe:DATA. This preserves backwards compatibility for the Swept SA measurement. For all other commands/queries which honor FORMat:DATA, if INT,32 is sent the analyzer will behave as though it were set to REAL,32.

---

Initial S/W Revision      Prior to A.02.00

---

The specs for each output type follow:

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

SX.YYYYYEsZZ

Where:

S = sign (+ or -)

X = one digit to left of decimal point

Y = 5 digits to right of decimal point

E = E, exponent header

s = sign of exponent (+ or -)

ZZ = two digit exponent

REAL,32 - Binary 32-bit real values in the current Y Axis Unit, in a definite length block.

REAL,64 - Binary 64-bit real values in the current Y Axis Unit, in a definite length block.

### Format Data: Byte Order (Remote Command Only)

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

By definition any command that 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?
<b>Preset</b>	NORMal
<b>Initial S/W Revision</b>	Prior to A.02.00

---

## Meas Setup

Accesses a menu of keys that enable you to control specific parameters for the current measurement.

["Overview" on page 399](#)

["Set Parameters " on page 399](#)

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

### Overview

This section describes the measurement setup features of the Analog Demod measurements.

### Set Parameters

The following parameters are set as indicated and are not settable by the user, therefore they do not appear in any menus:

FFT IF Gain	Low (0 dB)
ADC Dither	On
Avg Mode	Exponential
Phase Noise Optimization	Auto

### Auto Rules for Phase Noise Optimization:

Use "Optimize for  $f < 20$  kHz" when the Channel BW  $< 120$  kHz, otherwise use "Optimize for  $f > 30$  kHz".

["Optimizing Measurement Speed" on page 399](#)

["Channel Bandwidth" on page 400](#)

["RF Spectrum Span " on page 400](#)

["RF Spectrum RBW / AF Spectrum RBW" on page 400](#)

["AF Waveform Sweep Time" on page 400](#)

["Filters and Annotation" on page 400](#)

### Optimizing Measurement Speed

The speed of the analog demodulation measurements is driven largely by how much data must be acquired to satisfy the selected configuration.

Each measurement cycle generates all of the metrics and traces from a single acquisition, so there are several different settings which can affect the overall speed. Note that even though you may not be

viewing a particular result on the display, the result is available and its configuration and constraints are used to determine the acquisition settings.

### Channel Bandwidth

This setting determines the sampling rate used by the measurement, higher bandwidths will result in larger data sets being acquired and processed. This should be set to the lowest value possible which allows your signal to be fully captured.

### RF Spectrum Span

This setting is used in a similar way as the Channel Bandwidth in that it determines the sampling rate. As with channel bandwidth, it should be set as narrow as possible to capture the signal of interest.

### RF Spectrum RBW / AF Spectrum RBW

These settings dictate a minimum acquisition time for the measurement. The Auto setting is recommended for optimal performance while maintaining measurement integrity. Narrower resolution bandwidths (RBWs) require longer acquisitions to achieve the resolution improvements.

### AF Waveform Sweep Time

This setting sets another minimum acquisition time for the measurement. In many uses, the AF Spectrum RBW will dominate the determination of the data acquisition duration, but if the AF waveform view is not needed keeping its sweep time low will ensure that it does not negatively impact the throughput.

### Filters and Annotation

You may choose to filter by frequency – choosing an optional low-pass filter and an optional high-pass filter – or may filter using a standard published band-pass filter (CCITT). Turning on a band-pass filter will automatically turn off the high-pass and low-pass filters; similarly, the band-pass filter will automatically turn off if you request either a high-pass or a low-pass filter.

### Average/Hold Num

When turned on, the RF Spectrum and AF spectrum traces are averaged, and the Demod window shows an Average trace, a Max Hold trace, and a Min Hold trace in addition to the current trace. All metrics are averaged, and the metrics show an “Average” column and a “Max Hold” column.

The average feature for the Analog Demod measurement differs from other measurements in that the average type is fixed depending on the window as shown in the following table:

Window	Average Type
RF Spectrum	Pwr Average
Demod Waveform	Arithmetic Average
AF Spectrum	Log Average

For more details, see ["Average/Hold On/Off Functionality" on page 401](#).

---

Key Path	Meas Setup
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---



<b>Remote Command</b>	[:SENSe]:AM FM PM FMSTereo:AVERage:COUNT <integer> [:SENSe]:AM FM PM FMSTereo:AVERage:COUNT? [:SENSe]:AM FM PM FMSTereo:AVERage[:STATe] ON OFF 1 0 [:SENSe]:AM FM PM FMSTereo:AVERage[:STATe]?
<b>Example</b>	AM:AVER:COUN 10
<b>Preset</b>	10 ON
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	1
<b>Max</b>	9999
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

## Average/Hold On/Off Functionality

Average, Minhold, and Maxhold are coupled.

When Average/Hold is on:

- The RF Spectrum and AF Spectrum traces are averaged.
- The Demod Waveform window will display a current trace, an Average trace, a Max Hold trace, and a Min Hold trace.
- The Metrics window will display an “Average” column and a “Max Hold” column.
- Metrics will display to four significant digits.
- The Meas Bar will display the Average/Hold number (along with how many of those sweeps have been captured).
- Demod Min trace, Demod Max trace, and Demod Avg trace are maintained.
- The Max Hold column shows the maximum value the un-averaged metric has attained since the last Restart.

When Average/Max Hold is off:

- The RF Spectrum and AF Spectrum traces are not averaged.
- The Demod Waveform window will display only the demod trace.
- The Metrics window will display only a “Current” column.
- Metrics will display to two significant digits.
- The Meas Bar will not display the Average/Hold number.
- Max Hold metrics over SCPI will return SCPI not a number.

- Demod Min trace, Demod Max trace and Demod Avg trace will return default values in a Meas?, Read?, and Fetch? and when exported to a .csv file
- Max Hold column is blank.

### Modulation Rate Periodic

The algorithms used by the instrument for demodulation have an improved speed/accuracy tradeoff when the modulation is both periodic (such as a sinusoidal test signal) and assumed to be periodic by the analysis system. Thus, “Yes” is best for periodic signals. When the modulation is aperiodic, such as voice or music or even multiple nonharmonically related tones, “No” gives better results.

Key Path	Meas Setup
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:PERIodic[:STATe] ON   OFF   1   0 [ :SENSe ] :AM FM PM FMSTereo:PERIodic[:STATe] ?
<b>Example</b>	FM:PERI OFF
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	A.12.00

### Filters

Pressing this key displays the Filters menu, allowing you to control the post demodulation and de-emphasis filters.

If any filters are turned on and the filters cannot be applied, the error “161 Setting Modified; Filters not applied” will appear.

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

### High Pass Filter (Post Demod)

This parameter allows you to adjust the post demodulation high pass filters. This filter allows you to remove unwanted low-frequency components from the modulated signal..

Key Path	Meas Setup
<b>Remote Command</b>	AM FM PM: [ :SENSe ] :AM FM PM:HPFilter OFF HPF20 HPF50 HPF300 HPF400 [ :SENSe ] :AM FM PM:HPFilter?  FM Stereo: [ :SENSe ] :FMSTereo:HPFilter OFF HPF20 HPF50 HPF300 [ :SENSe ] :FMSTereo:HPFilter?

<b>Example</b>	FM:HPF HPF20
Remote Command Notes	<p>AM FM PM:  Off = No filtering  HPF20 = Use 20 Hz high pass filter  HPF50 = Use 50 Hz high pass filter  HPF300 = Use 300 Hz high pass filter  HPF400 = Use 400 Hz high pass filter</p> <p>FM Stereo:  Off = No filtering  HPF20 = Use 20 Hz high pass filter  HPF50 = Use 50 Hz high pass filter  HPF300 = Use 300 Hz high pass filter</p>
Dependencies	The HPF400 is available only when Option N9063A-AFP is installed in AM/FM/PM.
Couplings	<p>AM/FM/PM:  Turning on any high-pass filter will turn off bandpass filters.  If a band-pass filter is turned off, the following advisory message is displayed:  “Band-pass filter set to OFF”.  If the band-pass filter was already off, no advisory message is displayed.</p> <p>FM Stereo:  None</p>
Preset	Off (AM/FM/FM Stereo, HPF20 (PM))
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Off

This selection turns the post demodulation high pass filter off.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF OFF
Notes	Annotation line (DC Coupled) appears in the Meas Bar, except if in the AM measurement.
Readback	Off
Initial S/W Revision	Prior to A.02.00

### 20 Hz

Sets the post demodulation high pass filter to 20 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 20 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF20
Readback	20 Hz
Initial S/W Revision	Prior to A.02.00

### 50 Hz

Sets the post demodulation high pass filter to 50 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 50 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF50
Readback	50 Hz
Initial S/W Revision	Prior to A.02.00

### 300 Hz

Sets the post demodulation high pass filter to 300 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 300 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF300
Readback	300 Hz
Initial S/W Revision	Prior to A.02.00

### 400 Hz

Sets the post demodulation high pass filter to 400 Hz. It is a 10-pole Butterworth filter, its 3 dB cutoff frequency is 430 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF400
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	400 Hz
Initial S/W Revision	A.14.00

## Lowpass Filter (Post Demod)

This parameter allows you to adjust the post demodulation low pass filter. The filter is useful in removing unwanted high frequency components of the modulating signal.

Key Path	Meas Setup
<b>Remote Command</b>	<b>AM FM PM:</b> <pre>[ :SENSe]:AM FM PM:LPFilter OFF   LPF300   LPF3K   LPF15K   LPF30K   LPF80K   LPF300K   LPF100K   MANual</pre> <pre>[ :SENSe]:AM FM PM:LPFilter?</pre> <b>FM Stereo:</b> <pre>[ :SENSe]:FMSTereo:LPFilter OFF   LPF300   LPF3K   LPF15K   LPF30K   LPF80K   LPF300K</pre> <pre>[ :SENSe]:FMSTereo:LPFilter?</pre>
<b>Example</b>	FM:LPF LPF3K
<b>Remote Command Notes</b>	<b>AM FM PM:</b> Off = No filtering LPF300 = Use 300 Hz low pass filter LPF3K = Use 3 kHz low pass filter LPF15K = Use 15 kHz low pass filter LPF30K = Use 30 kHz low pass filter LPF80K = Use 80 kHz low pass filter LPF300K = Use 300 kHz low pass filter LPF100K = Use >20 kHz low pass filter MANual=Use user-defined low pass filter <b>FM Stereo:</b> Off = No filtering LPF300 = Use 300 Hz low pass filter LPF3K = Use 3 kHz low pass filter LPF15K = Use 15 kHz low pass filter LPF30K = Use 30 kHz low pass filter LPF80K = Use 80 kHz low pass filter LPF300K = Use 300 kHz low pass filter
<b>Dependencies</b>	LPF key is unavailable (grayed out) when the band pass filter is not OFF. The following filters are available only when Option N9063A-AFP is installed in AM/FM/PM: LPF100K and MANual.
<b>Couplings</b>	<b>AM/FM/PM:</b> Turning on any low-pass filter will turn off band-pass filters. If a band-pass filter is turned off, the following advisory message is displayed: “Band-pass filter set to OFF”. If the band-pass filter was already off, no advisory message is displayed.

---

	FM Stereo: None
Preset	Off
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

---

### Off

Turns the post demodulation low pass filter off.

---

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

---

### 300 Hz

Sets the post demodulation low pass filter to 300 Hz. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 300 Hz.

---

Key Path	Meas Setup, HPF/LPF
<b>Example</b>	AM:HPBP LPF300
Readback	300 Hz
Initial S/W Revision	Prior to A.02.00

---

### 3 kHz

Selects the 3 kHz post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 3 kHz.

---

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF3K
Readback	3 kHz
Initial S/W Revision	Prior to A.02.00

---

### 15 kHz

Selects the 15 kHz post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 15 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF15K
Readback	15 kHz
Initial S/W Revision	Prior to A.02.00

### 30 kHz

Selects the 30 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 30 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF30K
Readback	30 kHz
Initial S/W Revision	Prior to A.02.00

### 80 kHz

Selects the 80 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 80 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF80K
Readback	80 kHz
Initial S/W Revision	Prior to A.02.00

### 100 kHz

Selects the 100 kHz (“>20 kHz”) post demodulation low pass filter. It is a 9-pole Bessel filter designed for minimum overshoot (<1% nom) on square wave modulation, its 3 dB cutoff frequency is 100 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF100K
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	>20 kHz
Initial S/W Revision	A.14.00

### 300 kHz

Selects the 300 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 300 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF300K
Readback	300 kHz
Initial S/W Revision	Prior to A.02.00

### Manual

Selects the user-defined post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency can be changed through “[:SENSe]:AM|FM|PM|FM:LPFilter:MANual[:FREQuency] <freq>” command.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF MAN
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	MAN
Initial S/W Revision	A.14.00

### User-defined Lowpass Filter

Allows user to set up a post demodulation low pass filter by manual.

Key Path	Meas Setup, Post Demod LPF
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FM:LPFilter:MANual [ :FREQuency ] <freq> [ :SENSe ] :AM FM PM FM:LPFilter:MANual [ :FREQuency ] ?
<b>Example</b>	AM:LPF:MAN 500kHz AM:LPF:MAN?
Notes	Adjusts the cutoff frequency of the user-defined low pass filter.
Dependencies	This feature is available only when Option N9063A-AFP is installed. Only active when Lowpass filter type is Manual.
Preset	300 Hz
State Saved	Saved in instrument state
Min	300 Hz
Max	Half of the maximum DIF BW.
Initial S/W Revision	A.14.00



## Band Pass Filter (Post Demod)

This parameter enables you to choose the post demodulation band pass filters, allowing you to apply industry-defined filters.

Key Path	Meas Setup
<b>Remote Command</b>	<p>AM FM PM:</p> <pre>[[:SENSe]:AM FM PM:BPFilter OFF   CCITT   AWEighting   CWEighting   CMESsage   CCIR1k   CCIR2k   CUNWeighting</pre> <p>[[:SENSe]:AM FM PM:BPFilter?</p> <p>FM Stereo:</p> <pre>[[:SENSe]:FMSTereo:BPFilter OFF CCITT AWAudio</pre> <p>[[:SENSe]:FMSTereo:BPFilter?</p>
<b>Example</b>	FM:BPf CCITT
Remote Command Notes	<p>AM FM PM:</p> <p>Off = No filtering</p> <p>CCITT = Use CCITT filter</p> <p>AWEighting = Use A-Weighted Audio filter</p> <p>CWEighting = Use C-Weighted audio filter</p> <p>CMESsage = Use C-Message audio filter</p> <p>CCIR1k = Use CCIR-1k Weighted audio filter</p> <p>CCIR2k = Use CCIR-2k Weighted audio filter</p> <p>CUNWeighting = Use CCIR Un-weighted audio filter</p> <p>FM Stereo:</p> <p>Off = No filtering</p> <p>CCITT = Use CCITT filter</p> <p>AWAudio = Use A-Weighted Audio filter</p>
Dependencies	The following filters are available only when Option N9063A-AFP is installed in AM/FM/PM: AWEighting, CWEighting, CMESsage, CCIR1k, CCIR2k and CUNWeighting.
Couplings	<p>AM/FM/PM:</p> <p>Turning on any bandpass filter will turn off high-pass and low-pass filters.</p> <p>If a high-pass filter is turned off, the following advisory message is displayed: "High-pass filter set to OFF".</p> <p>If a low-pass filter is turned off, the following advisory message is displayed: "Low-pass filter set to OFF".</p> <p>If both are turned off, the following advisory message is displayed: "High-pass and Low-pass filters set to OFF".</p> <p>If both high-pass and low-pass filters were already off, no advisory message is displayed.</p> <p>FM Stereo:</p> <p>None</p>
Preset	Off

State Saved	Saved in instrument state
Readback	1-of-N
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

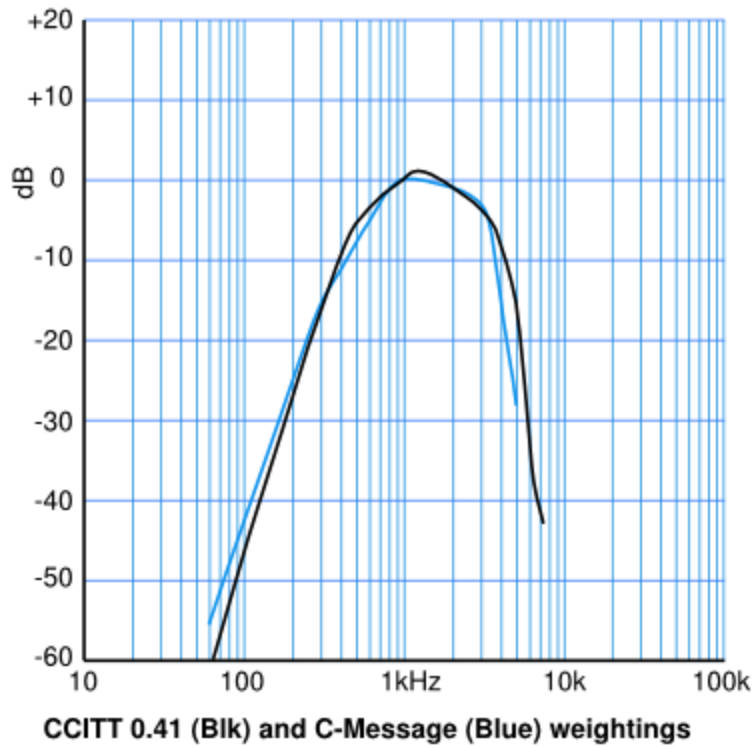
### Off

Turns the post demodulation band-pass filter off.

Key Path	Meas Setup, BPF
<b>Example</b>	AM:BPF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

### CCITT

Sets the post demodulation band-pass filter to CCITT.



Key Path	Meas Setup, BPF
----------	-----------------

<b>Example</b>	AM:BPF CCITT
Readback	CCITT
Initial S/W Revision	Prior to A.02.00

### A-Weighted

Sets the post demodulation band-pass filter to A-Weighted Audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF AWE
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	A-Weighted
Initial S/W Revision	A.14.00

### C-Weighted

Sets the post demodulation band-pass filter to C-Weighted audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CWE
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	C-Weighted
Initial S/W Revision	A.14.00

### C-Message

Sets the post demodulation band-pass filter to C-Message audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CMES
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	C-Message
Initial S/W Revision	A.14.00

### CCIR 1k Weighted

Sets the post demodulation band-pass filter to CCIR-1k weighted filter.

**NOTE**

The CCIR 1k Weighted filter is implemented in the N9063A with an RMS detector, and not the quasi-peak detector (QPD) called for in the ITU standards. A compensation factor is included to yield similar results. This implementation is valid when measuring amplitude of Gaussian noise, or SINAD of a single continuous sine tone (e.g. 1 kHz) in the presence of harmonics and Gaussian noise. The results may not comply with the standard if the input signal is bursty, clicky or impulsive; contains multiple tones; or contains other distortion products (intermodulation, spurs) above the noise level. Use the AF Spectrum results to validate these assumptions. Consider using Agilent U8903A Audio Analyzer if true QPD is required.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CCIR1
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-1k
Initial S/W Revision	A.14.00

### CCIR 2k Weighted

Sets the post demodulation band-pass filter to CCIR-2k weighted filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CCIR2
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-2k
Initial S/W Revision	A.14.00

### CCIR Un-weighted

Sets the post demodulation band-pass filter to CCIR un-weighted filter.

The CCIR Un-weighted filter is implemented in the N9063A with an RMS detector, and not the quasi-peak detector (QPD) called for in the ITU standards. A compensation factor is included to yield similar results. This implementation is valid when measuring amplitude of Gaussian noise, or SINAD of a single continuous sine tone (e.g. 1 kHz) in the presence of harmonics and Gaussian noise. The results may not comply with the standard if the input signal is bursty, clicky or impulsive; contains multiple tones; or contains other distortion products (intermodulation, spurs) above the noise level. Use the AF Spectrum results to validate these assumptions. Consider using Agilent U8903A Audio Analyzer if true QPD is required.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CUNW
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-Unweighted
Initial S/W Revision	A.14.00

## Demod to Speaker

Controls whether a demodulated audio signal is connected to the speaker or not. This allows the demodulated audio to be turned off without completely disabling (muting) the instrument speaker. When the Analog Demod application is running, the demodulated signal can be heard from the speaker as long as the “Demod to Speaker” function is set to On.

**NOTE** The Windows controls for speaker volume and mute must also be properly set.

This function is shared among all measurements in the mode, but not across other modes.

Key Path	Meas Setup
<b>Remote Command</b>	[ :SENSe ] :SPEaker [ :STATe ] ON OFF 1 0 [ :SENSe ] :SPEaker [ :STATe ] ?
<b>Example</b>	SPE OFF Disconnects demodulated audio from speaker circuit.
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Auto BW & Scale

Automatically sets many measurement parameters by pressing one button, based upon the current signal under test. The feature requires that the center frequency be set to the signal of interest, and works best on stable periodic signals. The measurement is preset at the beginning of the Auto BW & Scale operation, with the exception that the user’s Center Frequency and audio Filters are maintained.

The signal is analyzed using an Occupied Bandwidth measurement to automatically set the RF Spectrum Span and Channel Bandwidth to good values. And then it sets the combination of mechanical and electronic attenuation based on the current measured signal level so that clipping will be at a minimum. Once these two steps are done, the software examines the demodulated signal and appropriately sets the Sweep Time and Demod Waveform Scale/Div.

There are no configurable parameters for Auto BW & Scale. The function is pre-configured to work with most real-world use cases.

Key Path	Meas Setup
<b>Remote Command</b>	[ :SENSe ] :AUToscale
<b>Example</b>	AUT
Initial S/W Revision	Prior to A.02.00

## SINAD BW

Sets the bandwidth of the signal to calculate SINAD and THD.

Key Path	Meas Setup, More
<b>Remote Command</b>	CALCulate:AM FM PM:SINad:BANDwidth <freq> CALCulate:AM FM PM:SINad:BANDwidth?
<b>Example</b>	CALC:AM:SIN:BAND 50e3 CALC:AM:SIN:BAND?
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Couplings	Changing the Channel BW always sets the SINAD BW to the half of the Channel BW you entered.
Preset	12.5 kHz
State Saved	Saved in instrument state.
Min	1 Hz
Max	The half of the Channel BW.
Initial S/W Revision	A.14.00

## Meas Preset

Returns the variables in the current measurement to their preset values.

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

## Mode

See "Mode" on page 210

## 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 417 for more information.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:SYSTem:PRESet
<b>Example</b>	:SYST:PRES
<b>Notes</b>	*RST is preferred over :SYST:PRES for remote operation. *RST does a Mode Preset, as done by the :SYST:PRES command, and it sets the measurement mode to Single measurement rather than Continuous for optimal remote control throughput. Clears all pending OPC bits. The Status Byte is set to 0.
<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>	In the X-Series, the legacy "Factory Preset" has been replaced with Mode Preset, which only presets the currently active mode, not the entire instrument. In the X-Series, the way to preset the entire instrument is by using System, Restore System Defaults All, which behaves essentially the same way as restore System Defaults does on ESA and PSA. There is also no "Preset Type" as there is on the PSA. There is a green Mode Preset front-panel key that does a Mode Preset and a white-with-green-letters User Preset front-panel key that does a User Preset. The old PRESet:TYPE command is ignored (without generating an error), and SYST:PRES without a parameter does a Mode Preset, which should cover most backward code compatibility issues. The settings and correction data under the Input/Output front-panel key (examples: Input Z Corr, Ext Amp Gain, etc.) are no longer part of any Mode, so they will not be preset by a Mode Preset. They are preset using Restore Input/Output Defaults, Restore System Defaults All. Note that because User Preset does a Recall State, and all of these settings are saved in State, they ARE recalled when using



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

## How-To Preset

The table below shows all possible presets, their corresponding SCPI commands and front-panel access (key paths). Instrument settings depend on the current measurement context. Some settings are local to the current measurement, some are global (common) across all the measurements in the current mode, and some are global to all the available modes. In a similar way, restoring the settings to their preset state can be done within the different contexts.

Auto Couple - is a measurement local key. It sets all Auto/Man parameter couplings in the measurement to Auto. Any Auto/Man selection that is local to other measurements in the mode will not be affected.

Meas Preset - is a measurement local key. Meas Preset resets all the variables local to the current measurement except the persistent ones.

Mode Preset - resets all the current mode's measurement local and measurement global variables except the persistent ones.

Restore Mode Defaults - resets ALL the Mode variables (and all the Meas global and Meas local variables), including the persistent ones.

Type Of Preset	SCPI Command	Front Panel Access
Auto Couple	:COUPlE ALL	Auto Couple front-panel key
Meas Preset	:CONFIgure:<Measurement>	Meas Setup Menu
Mode Preset	:SYSTem:PRESet	Mode Preset (green key)
Restore Mode Defaults	:INSTrument:DEFault	Mode Setup Menu
Restore All Mode Defaults	:SYSTem:DEFault MODEs	System Menu; Restore System Default Menu
*RST	*RST	not possible (Mode Preset with Single)
Restore Input/Output Defaults	:SYSTem:DEFault INPut	System Menu; Restore System Default Menu
Restore Power On Defaults	:SYSTem:DEFault PON	System Menu; Restore System Default Menu
Restore Alignment Defaults	:SYSTem:DEFault ALIGn	System Menu; Restore System Default Menu
Restore Miscellaneous Defaults	:SYSTem:DEFault MISC	System Menu; Restore System Default Menu
Restore All System Defaults	:SYSTem:DEFault [ALL] :SYSTem:PRESet:PERSistent	System Menu; Restore System Default Menu
User Preset	:SYSTem:PRESet:USER	User Preset Menu
User Preset All Modes	:SYSTem:PRESet:USER:ALL	User Preset Menu

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Mode Preset

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 231](#)

## Peak Search

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.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MAXimum
<b>Example</b>	CALC:AM:MARK2:MAX
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Next Peak

Moves the selected marker to the peak that has the next highest amplitude less than the current marker value. If there is no valid peak lower than the current marker position, an error 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. In Analog Demod, the Peak Threshold and Peak Excursion functions are both OFF. If there is no valid peak, an error 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.

<b>Key Path</b>	Peak Search
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MAXimum:NEXT
<b>Example</b>	CALC:AM:MARK2:MAX:NEXT Selects marker 2 and moves it to the peak that is closest in amplitude to the current peak, but the next lower value.
<b>Remote Command Notes</b>	Sending this command selects the specified marker
<b>State Saved</b>	Not part of instrument saved state
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Pk-Pk Search

Finds and displays the amplitude and frequency (or time, if on a time domain 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. This function turns on the reference marker and sets its mode to Fixed if it is not already on. (These markers may be on two different traces.)

When peak-to-peak search is successful, a message is displayed on the message line.

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. It then performs the peak-to-peak function.

Key Path	Peak Search
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:PTPeak
<b>Example</b>	CALC:AM:MARK:PTP CALC:AM:MARK:Y? Queries the delta amplitude value for marker 1.
Notes	Turns on the Marker $\Delta$ active function.
Remote Command Notes	Sending this command selects the specified marker.
Couplings	Selected marker becomes a delta marker if not already in delta mode..
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Min Search

Moves the selected marker to the minimum y-axis value on the current trace. 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:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MINimum
<b>Example</b>	CALC:AM:MARK:MIN selects marker 1 and moves it to the minimum amplitude value.
Remote Command Notes	Sending this command selects the specified marker.
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

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Print

Print

See "Print" on page 241

## Quick Save

The Quick Save front-panel key repeats the most recent save that was performed from the Save menu, with the following exceptions:

- Register saves are not remembered as Saves for the purpose of the Quick Save function
- If the current measurement does not support the last non-register save that was performed, an informational message is generated, “File type not supported for this measurement”

Quick Save repeats the last type of qualified save (that is, a save qualified by the above criteria) in the last save directory by creating a unique filename using the Auto File Naming algorithm described below.

If Quick Save is pressed after startup and before any qualified Save has been performed, the Quick Save function performs a Screen Image save using the current settings for Screen Image saves (current theme, current directory), which then becomes the “last save” for the purpose of subsequent Quick Saves.

The Auto File Naming feature automatically generates a file name for use when saving a file. The filename consists of a prefix and suffix separated by a dot, as is standard for the Windows® file system. A default prefix exists for each of the available file types:

Type	Default Prefix	Menu
State	State_	(Save/Recall)
Trace + State	State_	(Save/Recall)
Screen	Screen_	(Save/Recall)
Amplitude Corrections	Ampcor_	(Import/Export)
Traces	Trace_	(Import/Export)
Limit Lines	LLine_	(Import/Export)
Measurement Result	MeasR_	(Import/Export)
Capture Buffer	CapBuf_	(Import/Export)

A four digit number is appended to the prefix to create a unique file name. The numbering sequence starts at 0000 within each Mode for each file type and updates incrementally to 9999, then wraps to 0000 again. It remembers where it was through a Mode Preset and when leaving and returning to the Mode. It is reset by Restore Misc Defaults and Restore System Defaults and subsequent running of the instrument application. So, for example, the first auto file name generated for State files is State\_0000.state. The next is State\_0001, and so forth.

One of the key features of Auto File Name is that we guarantee that the Auto File Name will never conflict with an existing file. The algorithm looks for the next available number. If it gets to 9999, then it looks for holes. If it find no holes, that is no more numbers are available, it gives an error.

For example, if when we get to State\_0010.state there is already a State\_0010.state file in the current directory, it advances the counter to State\_0011.state to ensure that no conflict will exist (and then it verifies that State\_0011.state also does not exist in the current directory and advances again if it does, and so forth).

If you enter a file name for a given file type, then the prefix becomes the filename you entered instead of the default prefix, followed by an underscore. The last four letters (the suffix) are the 4-digit number.

For example, if you save a measurement results file as “fred.csv”, then the next auto file name chosen for a measurement results save will be fred\_0000.csv.

**NOTE**

Although 0000 is used in the example above, the number that is used is actually the current number in the Meas Results sequence, that is, the number that would have been used if you had not entered your own file name.

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**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.

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Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00



## Recall

The Recall menu lets you choose what you want to recall, and where you want to recall it from. Among the types of files you can recall are **States and Traces**. In addition, an Import (Data) option lets you recall a number of data types stored in CSV files (as used by Excel and other spreadsheet programs).

The default paths for Recall are data type dependent and are the same as for the Save key.

Key Path	Front-panel key
Notes	<p>No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe &lt;filename&gt;.</p> <p>If you try to recall a State file for a mode that is not licensed or not available in the instrument, an error message will occur and the state will not change.</p>
Backwards Compatibility Notes	<p>In legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly (since User Preset is actually loading a state), it was possible to do a User Preset without affecting the trace data, limit lines or correction data.</p> <p>In the X-Series, “state” always includes all of this data; so whenever state is loaded, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.</p>
Backwards Compatibility Notes	<p>Recall for the X-Series supports backward compatibility in the sense that you can recall a state file from any X-Series model number and any version of X-Series software. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. If you try to recall a state file onto an instrument with less capability than what was available on the instrument during the save, the recall will ignore the state it doesn't support and it will limit the recalled setting to what it allows.</p> <p>Example: if the saved state includes preamp ON, but the recalling instrument does not have a preamp; the preamp is limited to OFF. Conversely, if you save a state without a preamp, the preamp is OFF in the state file. When this saved file is recalled on an instrument with a licensed preamp, the preamp is changed to OFF. Another example is if the saved state has center frequency set to 20 GHz, but the instrument recalling the saved state is a different model and only supports 13.5 GHz. In this case, the center frequency is limited along with any other frequency based settings. Since the center frequency can't be preserved in this case, the recall limiting tries to at least preserve span to keep the measurement setup as intact as possible.</p> <p>It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user.</p> <p>Note that there is no state file compatibility outside of the X-Series. For example, you cannot recall a state file from ESA or PSA.</p>
Initial S/W Revision	Prior to A.02.00

## State

The Recall State menu lets you choose a register or file from which to recall the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings that were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the

additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either a Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

Since each state file is only for one Mode, the settings for other Modes are unaffected when it is loaded. Recall State will cause a mode switch if the state being recalled is not from the current active mode.

After the recall completes, the message "File <filename> recalled" or "Recalled State Register <register number>" is displayed.

For rapid recalls, the State menu lists 16 registers that you can choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files is:

My Documents\<<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

See "[More Information](#)" on page 427.

<b>Key Path</b>	Recall
<b>Mode</b>	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.
<b>Notes</b>	<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> <li>• Executes a *CLS</li> </ul> <p>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</p>

	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

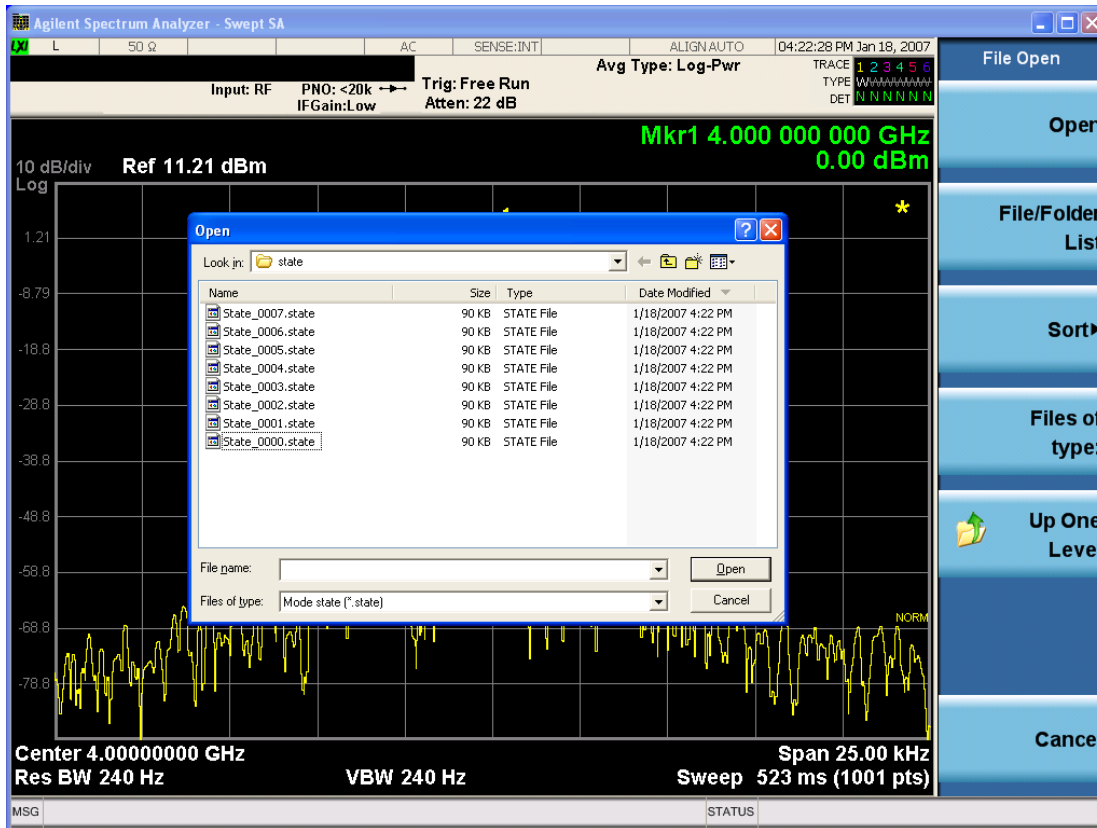
In measurements that support saving Traces, for example, Swept SA, the Trace data is saved along with the State in the State file. When recalling the State, the Trace data is recalled as well. Traces are recalled exactly as they were stored, including the writing mode and update and display modes. If 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

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.

Key Path	Recall, State
<b>Example</b>	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the 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

## Register 1 thru Register 16

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Each of the register keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key under Save, State to enter custom names for each register.

Registers are shared by all modes, so recalling from any one of the registers will cause a mode switch to the mode that was active when the save to the Register occurred.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the \*RCL command.

After the recall completes, the message "Register <register number> recalled" appears in the message bar. If you are in the Spectrum Analyzer Mode, and you are recalling a register that was saved in the Spectrum Analyzer Mode, then after the recall, you will still be in the Recall Register menu. If the Recall causes you to switch modes, then after the Recall, you will be in the Frequency menu.

If a requested register is empty an error is generated.

Key Path	Recall, State
<b>Example</b>	*RCL 1
Range	1-16 from front panel, 1-128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the 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

## 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 432

Key Path	Front-panel key
Remote Command	:INITiate[:IMMEDIATE] :INITiate:RESTART
Example	:INIT:IMM :INIT:REST
Notes	:INITiate:RESTART and :INITiate:IMMEDIATE perform exactly the same function.
Couplings	Resets average/hold count k. For the first sweep overwrites all active (update=on) traces with new current data. For application modes, it resets other parameters as required by the measurement.
Status Bits/OPC dependencies	This is an Overlapped command. The STATus:OPERation register bits 0 through 8 are cleared. The STATus:QUESTionable register bit 9 (INTegrity sum) is cleared. The SWEEPING bit is set. The MEASURING bit is set.
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, the Restart hardkey and the INITiate:RESTART command restart trace averages (displayed average count reset to 1) for a trace in Clear Write, but did not restart Max Hold and Min Hold.  In the X-Series, the Restart hardkey and the INITiate:RESTART command restart not only Trace Average, but MaxHold and MinHold traces as well.  For wireless comms modes in ESA and PSA, the Restart hardkey and the INITiate:RESTART command restart every measurement, which includes all traces and numeric results. There is no change to this operation.
Initial S/W Revision	Prior to A.02.00

### More Information

The **Restart** function first aborts the current sweep/measurement as quickly as possible. It then resets the sweep and trigger systems, sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met.

If the analyzer is in the process of aligning when **Restart** is executed, the alignment finishes before the restart function is performed.



Even when set for Single operation, multiple sweeps may be taken when Restart is pressed (for example, when averaging/holding is on). Thus when we say that **Restart** "restarts a measurement," we may mean:

- It restarts the current sweep
- It restarts the current measurement
- It restarts the current set of sweeps if any trace is in Trace Average, Max Hold or Min Hold
- It restarts the current set of measurements if Averaging, or Max Hold, or Min Hold is on for the measurement
- depending on the current settings.

With **Average/Hold Number** (in **Meas Setup** menu) set to 1, or Averaging off, or no trace in Trace Average or Hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met; and the analyzer stops sweeping once that sweep has completed. However, with **Average/Hold Number** >1 and at least one trace set to **Trace Average, Max Hold, or Min Hold (SA Measurement)** or **Averaging on (most other measurements)**, multiple sweeps/data acquisitions are taken for a single measurement. The trigger condition must be met prior to each sweep. The sweep is stopped when the average count  $k$  equals the number  $N$  set for **Average/Hold Number**. A measurement average usually applies to all traces, marker results, and numeric results; but sometimes it only applies to the numeric results.

Once the full set of sweeps has been taken, the analyzer will go to idle state. To take one more sweep without resetting the average count, increment the average count by 1, by pressing the step up key while **Average/Hold Number** is the active function, or sending the remote command `CALC:AVER:TCON UP`.

## Save

The Save menu lets you choose what you want to save and where you want to save it. Among the types of files you can save are **States**, **Traces**, and **Screen Images**. In addition, an Export (Data) option lets you save a number of data types as CSV files for easy import into Excel and other spreadsheet programs.

Key Path	Front-panel key
Mode	All
Notes	No remote command for this key specifically, but the :MMEM:STORe command is available for specific file types. An example is :MMEM:STOR:STATe <filename>.
Initial S/W Revision	Prior to A.02.00

## State

The Save State menu lets you choose a register or file for saving the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings which were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, Verbose SCPI) are not affected by either Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

After the save completes, the message "File <filename> saved" or "State Register <register number> saved" is displayed.

For rapid saving, the State menu lists 16 registers to save to. Pressing a Register key initiates the save. You can also select a file to save to.

The default path for all State Files is:

My Documents\<<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

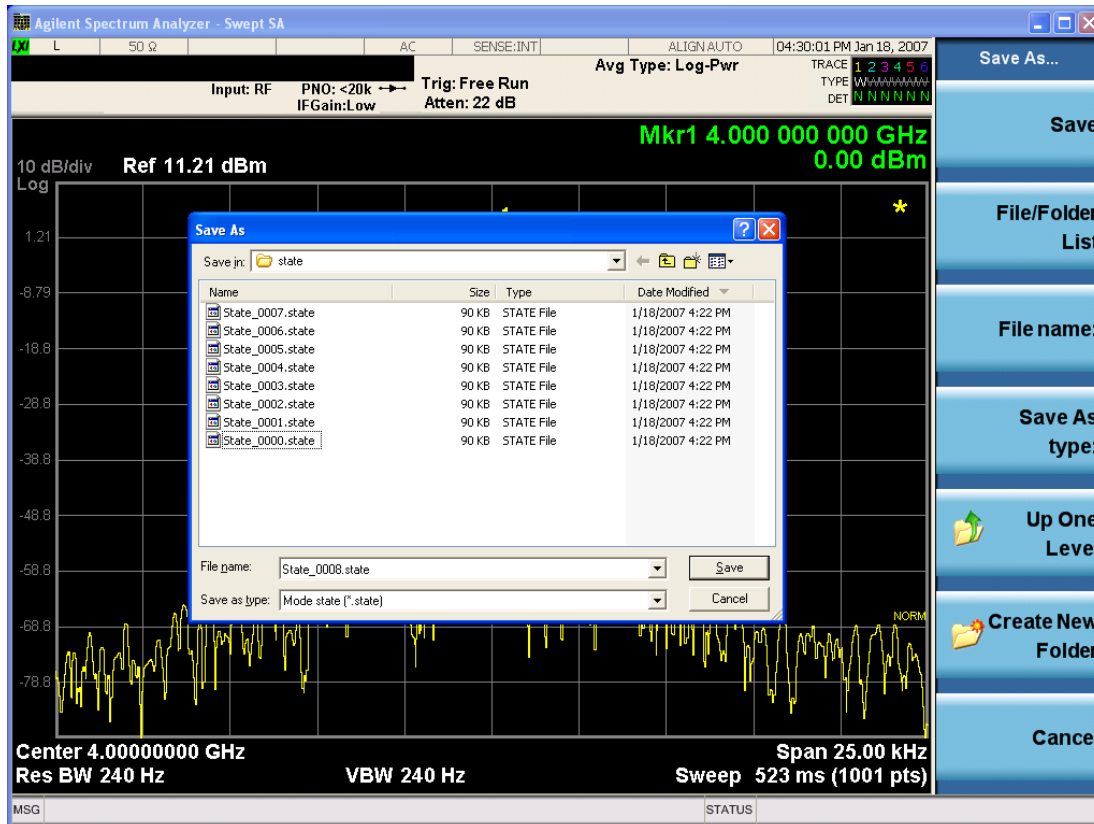
Key Path	Save
Mode	All
Remote Command	:MMEMory:STORe:STATe <filename>
Example	MMEM:STOR:STATe "MyStateFile.state" This stores the current instrument state data in the file MyStateFile.state in the default directory.
Notes	Both single and double quotes are supported for any filename parameter over remote. 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>
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 832](#) 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 437](#)

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

The Analog Demod Mode Export Data options include Traces and Measurement Results.

Key Path	Save, Data
Remote Command Notes	No SCPI command directly controls the Data Type that this key controls. The Data Type is included as part of the MMEM:STORe commands.
Preset	Trace; is not affected by a Preset, but is reset during Restore Mode Defaults and survives Power cycles.
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

## AM/FM/ $\Phi$ M Trace

Selects Trace as the data type to be exported with this save request. This key brings up the Trace menu that enables you to select one of the following traces:

- RF Spectrum (RFSPectrum)
- Demod (DEMod)
- Demod Avg (DAVerage)
- Demod Max (DMAXimum)
- Demod Min (DMINimum)

AF Spectrum (AFSPectrum)

RF Envelope (RFENvelope) --- only available in FM measurement

Demod Raw (DRAW) --- only available in FM measurement

Once you select a trace, the menu returns back to the Data menu and the name of the selected trace is annotated on the Trace key. Now that you have selected exactly what needs to be saved, to trigger a save of the selected trace, you must select the Save As key in the Data menu.

If the Demod Min trace, Demod Max trace, or Demod Avg trace is exported when the Average/Hold Num feature is turned off, the resulting data will be default values.

The trace data file is a .csv file containing the data for one trace, suitable for import into spreadsheet software. There is a header block, followed by metadata that includes the parameters necessary to recreate the measurement, followed by a DATA block that contains the x,y data for the specified trace. Each line in the metadata includes the parameter, followed by a comma, followed by the parameter value. The metadata includes the following information:

Parameter	
Measurement †	AM FM PM
Trace	AM PM: AF Spectrum RF Spectrum Demod  Demod Ave Demod Min Demod Max FM: AF Spectrum RF Spectrum Demod  Demod Ave Demod Min Demod Max RF Envelope Demod Raw
X Axis Unit	Hz S
Y Axis Unit	dBm % Hz Rad
Center Frequency †	[units of Hz]
Channel BW †	[units of Hz]
Average State †	Off On
Average Count	#
HPF/BPF †	Off HPF20 HPF50 HPF300 HPF400 CCITT AWEighting  CWEighting CMESsage CCIR1k CCIR2k CUNWeighting
LPF †	Off LPF300 LPF3K LPF10K LPF15K LPF30K LPF80K LPF300K LPF100K M500K
Attenuation †	[units of dB]
RF Coupling †	AC DC
Ref Level	[units of Y Axis Unit]
RF Span †	[units of Hz]
RF Res Bandwidth †	[units of Hz]
Sweep Time †	[units of S]
AF Start Freq	[units of Hz]



AF Stop Freq †	[units of Hz]
AF Res Bandwidth †	[units of Hz]
Trigger Source †	Off Ext1 Ext2
Trigger Level †	[units of V]
Trigger Slope †	Positive Negative
Trigger Delay †	[units of S]
PreAmp State †	Off On
PreAmp Band †	Low High
Input Z Correction †	50 75
RF Calibrator	Off 50 MHz 4.8 GHz Comb
External Gain	[units of dB]
Auto Carrier Frequency †	Off On
Auto Carrier Phase †	Off On

† Changing this parameter requires a measurement restart.

Note that all metadata is stored for each trace. After the metadata, the keyword DATA occurs on its own line, followed by the data (one X, Y pair per line).

Key Path	Save, Data
Notes	The first key press selects traces out of the 1-of-N file type options. The second key press brings up the Traces menu so you can select which trace you want to export.
Preset	RF Spectrum; is not affected by a Preset, but is reset during Restore Mode Defaults and survives Power cycles.
State Saved	Saved in instrument state.
Readback	Selected Trace table
Readback line	RF Spectrum, Demod, Demod Avg, Demod Max, Demod Min, AF Spectrum, RF Envelope, Demod Raw
Initial S/W Revision	Prior to A.02.00

## Measurement Results

The file format of the .csv Measurement Results file is shown in the table below. If any metrics are off, or there is no valid value, they will appear as not a number (9.91 e37)

AM	FM and PM
Carrier Power	Carrier Power

<b>AM</b>	<b>FM and PM</b>
Carrier Frequency Error (0)	Carrier Frequency Error
Modulation Rate	Modulation Rate
SINAD value	SINAD value
Distortion/Total Voltage (rms)	Distortion/Total Voltage (rms)
Total Harmonic Distortion	Total Harmonic Distortion
Mod Depth (Peak+)	Deviation (Peak+)
Mod Depth (Peak-)	Deviation (Peak-)
Mod Depth (Pk-Pk)/2	Deviation (Pk-Pk)/2
Mod Depth (RMS)	Deviation (RMS)
Mod Depth (Peak+) Max Hold	Deviation (Peak+) Max Hold
Mod Depth (Peak-) Max Hold	Deviation (Peak-) Max Hold
Mod Depth (Pk-Pk)/2 Max Hold	Deviation (Pk-Pk)/2 Max Hold
Mod Depth (RMS) Max Hold	Deviation (RMS) Max Hold
RMS Ratio (only valid for Metrics Setting of RMS Ratio)	RMS Ratio (only valid for Metrics Setting of RMS Ratio)
Ratio Reference (only valid for Metrics Setting of RMS Ratio)	Ratio Reference (only valid for Metrics Setting of RMS Ratio)

For FM Stereo, the results are

RF Carrier Power, RF Carrier Frequency Error, 38 kHz Carrier Frequency Error, 38 kHz Carrier Phase Error, Left To Right, Mono To Stereo,

MPX SINAD value, MPX Distortion/Total Voltage (rms), MPX Deviation (Peak+), MPX Deviation (Peak-), MPX Deviation (Pk-Pk)/2, MPX Deviation (RMS), MPX Deviation (Peak+) Max Hold, MPX Deviation (Peak-) Max Hold, MPX Deviation (Pk-Pk)/2 Max Hold, MPX Deviation (RMS) Max Hold, MPX RMS Ratio (only valid for Metrics Setting of RMS Ratio), MPX Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Mono Modulation Frequency, Mono SINAD value, Mono Distortion/Total Voltage (rms), Mono Deviation (Peak+), Mono Deviation (Peak-), Mono Deviation (Pk-Pk)/2, Mono Deviation (RMS), Mono Deviation (Peak+) Max Hold, Mono Deviation (Peak-) Max Hold, Mono Deviation (Pk-Pk)/2 Max Hold, Mono Deviation (RMS) Max Hold, Mono RMS Ratio (only valid for Metrics Setting of RMS Ratio), Mono Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Stereo Modulation Frequency, Stereo Deviation (Peak+), Stereo Deviation (Peak-), Stereo Deviation (Pk-Pk)/2, Stereo Deviation (RMS), Stereo Deviation (Peak+) Max Hold, Stereo Deviation (Peak-) Max Hold, Stereo Deviation (Pk-Pk)/2 Max Hold, Stereo Deviation (RMS) Max Hold, Stereo RMS Ratio (only valid for Metrics Setting of RMS Ratio), Stereo Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Left Modulation Frequency, Left SINAD value, Left Distortion/Total Voltage (rms), Left Total Harmonic Distortion, Left Deviation (Peak+), Left Deviation (Peak-), Left Deviation (Pk-Pk)/2, Left Deviation (RMS), Left Deviation (Peak+) Max Hold, Left Deviation (Peak-) Max Hold, Left Deviation (Pk-Pk)/2 Max Hold, Left Deviation (RMS) Max Hold, Left RMS Ratio (only valid for Metrics Setting of RMS Ratio), Left Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Right Modulation Frequency, Right SINAD value, Right Distortion/Total Voltage (rms), Right Total Harmonic Distortion, Right Deviation (Peak+), Right Deviation (Peak-), Right Deviation (Pk-Pk)/2, Right Deviation (RMS), Right Deviation (Peak+) Max Hold, Right Deviation (Peak-) Max Hold, Right Deviation (Pk-Pk)/2 Max Hold, Right Deviation (RMS) Max Hold, Right RMS Ratio (only valid for Metrics Setting of RMS Ratio), Right Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Pilot Modulation Frequency, Pilot Deviation (Peak+), Pilot Deviation (Peak-), Pilot Deviation (Pk-Pk)/2, Pilot Deviation (RMS), Pilot Deviation (Peak+) Max Hold, Pilot Deviation (Peak-) Max Hold, Pilot Deviation (Pk-Pk)/2 Max Hold, Pilot Deviation (RMS) Max Hold, Pilot RMS Ratio (only valid for Metrics Setting of RMS Ratio), Pilot Ratio Reference (only valid for Metrics Setting of RMS Ratio),

RDS Deviation (Peak+), RDS Deviation (Peak-), RDS Deviation (Pk-Pk)/2, RDS Deviation (RMS), RDS Deviation (Peak+) Max Hold, RDS Deviation (Peak-) Max Hold, RDS Deviation (Pk-Pk)/2 Max Hold, RDS Deviation (RMS) Max Hold, RDS RMS Ratio (only valid for Metrics Setting of RMS Ratio), RDS Ratio Reference (only valid for Metrics Setting of RMS Ratio), RDS Error Block Count, RDS Total Block Count, RDS BLER (Block Error Rate).

Key Path	Save, Data
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 844 in Save, State for a full description of this dialog and menu.

The default path for saving files is:

For all of the Trace Data Files:

My Documents\`<mode name>`\data\traces

For all of the Limit Data Files:

My Documents\`<mode name>`\data\limits

For all of the Measurement Results Data Files:

My Documents\`<mode name>`\data\`<measurement name>`\results

For all of the Capture Buffer Data Files:

My Documents\`<mode name>`\data\captureBuffer

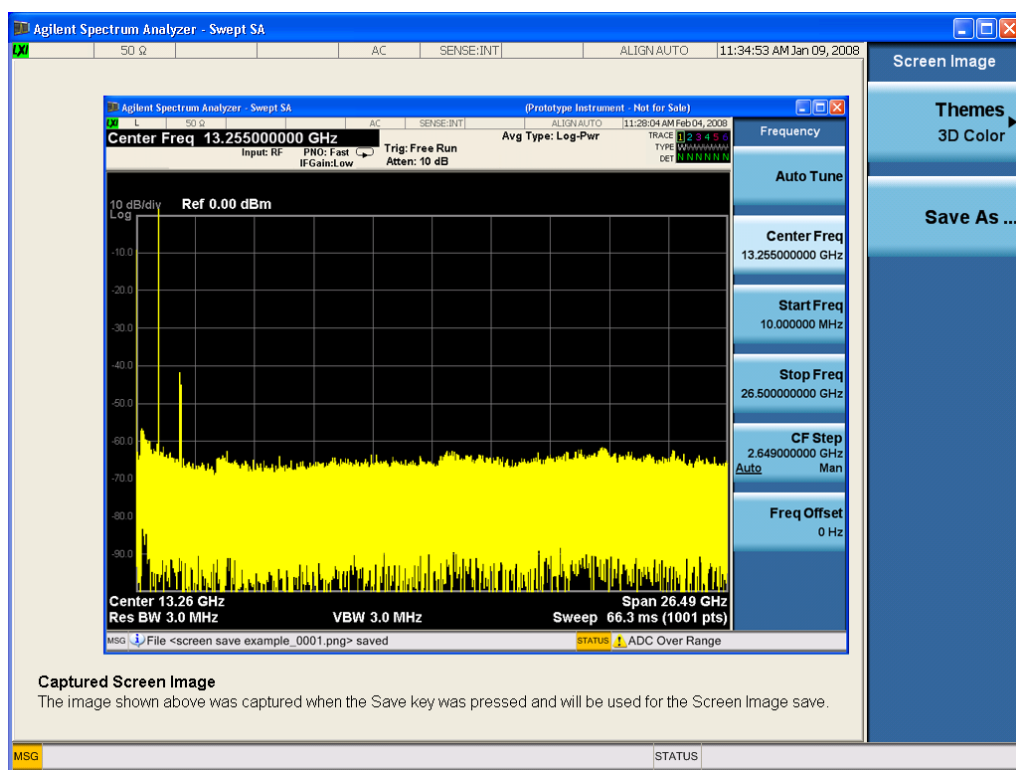
Key Path	Save, Data
Mode	All
Notes	The key location is mode-dependent and will vary. Brings up the Save As dialog for saving a <code>&lt;mode specific&gt;</code> Save Type. The save is performed immediately and does not wait until the measurement is complete.
Initial S/W Revision	Prior to A.02.00

## Screen Image

Pressing Screen Image accesses a menu of functions that enable you to specify a format and location for the saved screen image. It brings up a menu that allows you to specify the color scheme of the Screen Image (Themes) or navigate to the Save As dialog to perform the actual save.

Screen Image files contain an exact representation of the analyzer display. They cannot be loaded back onto the analyzer, but they can be loaded into your PC for use in many popular applications.

The image to be saved is actually captured when the Save front panel key is pressed, and kept in temporary storage to be used if you ask for a Screen Image save. When the Screen Image key is pressed, a "thumbnail" of the captured image is displayed, as shown below:



When you continue on into the Save As menu and complete the Screen Image save, the image depicted in the thumbnail is the one that gets saved, showing the menus that were on the screen before going into the Save menus. The save is performed immediately and does not wait until the measurement is complete.

After you have completed the save, the Quick Save front-panel key lets you quickly repeat the last save performed, using an auto-named file, with the current screen data.

### NOTE

For versions previous to A.01.55, if you initiate a screen image save by navigating through the Save menus, the image that is saved will contain the Save menu softkeys, not the menus and the active function that were on the screen when you first pressed the Save front panel key.

---

Key Path

Save

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Mode	All
<b>Remote Command</b>	:MMEMory:STORe:SCReen <filename>
<b>Example</b>	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
Initial S/W Revision	Prior to A.02.00

## Themes

Accesses a menu of functions that enable you to choose the theme to be used when saving the screen image.

The **Themes** option is the same as the **Themes** option under the **Display** and **Page Setup** dialogs. It allows you to choose between themes to be used when saving the screen image.

Key Path	Save, Screen Image
<b>Remote Command</b>	:MMEMory:STORe:SCReen:THEMe TDColor   TDMonochrome   FColor   FMONochrome  :MMEMory:STORe:SCReen:THEMe?
<b>Example</b>	:MMEM:STOR:SCR:THEM TDM
Preset	3D Color; Is not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.
Readback	3D Color   3D Mono   Flat Color   Flat Mono
Backwards Compatibility Notes	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if you selected Reverse Bitmap AND a black & white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
Initial S/W Revision	Prior to A.02.00

## 3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

Key Path	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

### 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 844 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\`<mode name>`\screen.

where `<mode name>` is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

## Mass Storage Catalog (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:CATalog? [<directory_name>]
Notes	<p>The string must be a valid logical path.</p> <p>Queries disk usage information (drive capacity, free space available) and obtains a list of files and directories in a specified directory in the following format: &lt;numeric_value&gt;,&lt;numeric_value&gt;,{&lt;file_entry&gt;}</p> <p>It returns two numeric parameters and as many strings as there are files and directories. The first parameter indicates the total amount of storage currently used in bytes. The second parameter indicates the total amount of storage available, also in bytes. The &lt;file_entry&gt; is a string. Each &lt;file_entry&gt; indicates the name, type, and size of one file in the directory list: &lt;file_name&gt;,&lt;file_type&gt;,&lt;file_size&gt;</p> <p>As the windows file system has an extension that indicates file type, &lt;file_type&gt; is always empty. &lt;file_size&gt; provides the size of the file in bytes. For directories, &lt;file_entry&gt; is surrounded by square brackets and both &lt;file_type&gt; and &lt;file_size&gt; are empty</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Change Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:CDIRectory [<directory_name>] :MMEMory:CDIRectory?
Notes	<p>The string must be a valid logical path.</p> <p>Changes the default directory for a mass memory file system. The &lt;directory_name&gt; parameter is a string. If no parameter is specified, the directory is set to the *RST value.</p> <p>At *RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal.</p> <p>Query returns full path of the default directory.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Copy (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:COPY <string>,<string>[,<string>,<string>]
Notes	<p>The string must be a valid logical path.</p> <p>Copies an existing file to a new file or an existing directory to a new directory.</p> <p>Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination.</p> <p>The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the</p>

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source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.

This command will generate an "access denied" error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.

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### Mass Storage Device Copy (Remote Command Only)

This command transfers data to/from a file and a peripheral device.

---

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:COpy:DEvice <source_string>,<dest_string>
Notes	The strings must be a valid logical path or a valid device keyword. If the dest_string is a device keyword, the data is copied from the source file to the device. If the source_string is a device keyword, the data is copied to the source file from the device. Valid device keywords are: SNS (smart noise source) An error is generated if the file or device is not found.

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### Mass Storage Delete (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:DElete <file_name>[,<directory_name>]
Notes	The string must be a valid logical path. Removes a file from the specified directory. The <file_name> parameter specifies the file name to be removed. This command will generate an "access denied" error if the file is in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Data (Remote Command Only)

Creates a file containing the specified data OR queries the data from an existing file.

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Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:DATA <file_name>,<data> :MMEMory:DATA? <file_name>
Notes	The string must be a valid logical path. The command form is MMEMory:DATA <file_name>,<data>. It loads <data> into the file <file_name>. <data> is in 488.2 block format. <file_name> is string data. The query form is MMEMory:DATA? <file_name> with the response being the associated <data> in block format.
Initial S/W Revision	Prior to A.02.00

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## Mass Storage Make Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:MDIRectory <directory_name>
Notes	<p>The string must be a valid logical path.</p> <p>Creates a new directory. The &lt;directory_name&gt; parameter specifies the name to be created.</p> <p>This command will generate an “access denied” error if the new directory would be in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Move (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:MOVE <string>,<string>[,<string>,<string>]
Notes	<p>The string must be a valid logical path.</p> <p>Moves an existing file to a new file or an existing directory to a new directory.</p> <p>Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination.</p> <p>The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.</p> <p>This command will generate an “access denied” error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Remove Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:RDIRectory <directory_name>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a directory. The &lt;directory_name&gt; parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed.</p> <p>This command will generate an “access denied” error if the folder is a restricted folder (e.g., C:\Windows) or is in a restricted folder and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## 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 450](#)

Key Path	Front-panel key
Example	: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 841](#) 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 are no menus under this key in the Analog Demod mode.

---

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

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## SPAN X Scale

Activates and displays the Span function menu.

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

### Span

Adjusts the Span of the RF Spectrum window.

Key Path	SPAN X Scale
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:FREQuency:SPAN <freq> [ :SENSe ] :AM FM PM FMSTereo:FREQuency:SPAN?
<b>Example</b>	AM:FREQ:SPAN 2.122kHz AM:FREQ:SPAN?
Notes	Adjusts the Span of the RF Spectrum window.
Dependencies	The maximum value will be the maximum IF BW available in the instrument. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available IF BW of the instrument is 140 MHz. Thus, the maximum Span is not limited to 25 MHz but is 140 MHz.
Preset	= AM/FM/PM = 75 kHz = FMST = 500 kHz
State Saved	Saved in instrument state
Min	10 Hz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Sweep/Control

Activates a menu and selects Sweep Time as the active function. Sweep time is used by the Demod Waveform window, but this key is available in any view.

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

### Demod Wfm Sweep Time

Selects the display length for the Demod Waveform window. This is commonly set to two sample lengths.

Key Path	Sweep/Control
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:DWSweep:TIME <time> [ :SENSe ] :AM FM PM FMSTereo:DWSweep:TIME?
<b>Example</b>	AM:DWSW:TIME 50 ms AM:DWSW:TIME?
Preset	2 ms
State Saved	Saved in Instrument State
Min	1 $\mu$ s
Max	2 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Demod Time

Selects the minimum length of data acquisition used in demodulation. Increasing the demodulation time will result in more accurate metrics; reducing the demodulation time will result in a faster measurement.

The measurement might require more data than specified by the demodulation time. If the resolution bandwidth is low in the spectrum windows, or the demod waveform sweep time is high, then the data required for the measurement might be higher than the demodulation time.

If measurement speed is critical, make sure to increase the resolution bandwidth and reduce the demodulation waveform sweep time.

The Auto rules for the demodulation time will give the nominal specification performance if the sweep time is set to display two cycles of data.

Key Path	Sweep/Control
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:DEMod:TIME <time> [ :SENSe ] :AM FM PM FMSTereo:DEMod:TIME? [ :SENSe ] :AM FM PM:DEMod:TIME:AUTO OFF ON 0 1

	[ :SENSe ] :AM FM PM:DEMod:TIME:AUTO?
<b>Example</b>	AM:DEM:TIME 50 ms AM:DEM:TIME?
<b>Notes</b>	If current Demod Time, Span and Channel BW settings combinations result in a required acquisition length is excess of the capacity of the analyzer, 4MSamples, gives a warning message "Settings Alert; Acquisition truncated".
<b>Couplings</b>	When in Auto mode, the demodulation time depends on the demodulation waveform sweep time. Lower
<b>Preset</b>	= AM/FM/PM = 72 ms = FMST = 280 ms ON
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	1 $\mu$ s
<b>Max</b>	10 s
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.14.00

## System

See "System" on page 242

## Trace/Detector

There are no menus under this key in the Analog Demod mode.

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

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## Trigger

See ["Trigger" on page 322](#)

### Free Run

See ["Free Run " on page 329](#)

### External 1

See ["External 1 " on page 343](#)

### Trigger Level

See ["Trigger Level " on page 344](#)

### Trig Slope

See ["Trig Slope " on page 344](#)

### Trig Delay

See ["Trig Delay " on page 331](#)

### External 2

See ["External 2 " on page 345](#)

### Trigger Level

See ["Trigger Level " on page 346](#)

### Trig Slope

See ["Trig Slope " on page 346](#)

### Trig Delay

See ["Trig Delay " on page 333](#)

### RF Burst

See ["RF Burst " on page 347](#)

### Absolute Trigger

See ["Absolute Trigger Level" on page 347](#)

### Relative Trigger

See ["Relative Trigger Level" on page 336](#)

### Trig Slope

See ["Trigger Slope " on page 348](#)

### **Trig Delay**

See ["Trig Delay "](#) on page 337

### **Periodic Timer**

See ["Periodic Timer \(Frame Trigger\) "](#) on page 338

### **Period**

See ["Period "](#) on page 340

### **Offset**

See ["Offset "](#) on page 340

### **Offset Adjust (Remote Command Only)**

See ["Offset Adjust \(Remote Command Only\)"](#) on page 341

### **Reset Offset Display**

See ["Reset Offset Display "](#) on page 342

### **Sync Source**

See ["Sync Source "](#) on page 342

### **Off**

See ["Off "](#) on page 343

### **External 1**

See ["External 1 "](#) on page 343

### **Trigger Level**

See ["Trigger Level "](#) on page 344

### **Trig Slope**

See ["Trig Slope "](#) on page 344

### **External 2**

See ["External 2 "](#) on page 345

### **Trigger Level**

See ["Trigger Level "](#) on page 346

### **Trig Slope**

See ["Trig Slope "](#) on page 346

### **RF Burst**

See ["RF Burst "](#) on page 347

**Absolute Trigger**

See "Absolute Trigger Level" on page 347

**Trig Slope**

See "Trigger Slope " on page 348

**Trig Delay**

See "Trig Delay" on page 349

**Auto/Holdoff**

See "Auto/Holdoff " on page 349

**Auto Trig**

See "Auto Trig " on page 350

**Trig Holdoff**

See "Trig Holdoff " on page 350

## 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
Remote Command	:SYSTem:PRESet:USER:SAVE
Example	:SYST:PRES:USER:SAVE
Notes	:SYST:PRES:SAVE creates the same file as if the user requested a *SAV or a MMEM:STOR:STAT, except User Preset Save does not allow the user to specify the filename or the location of the file.
Initial S/W Revision	Prior to A.02.00

## View/Display (AM/FM/ΦM)

The AM and PM measurements have four views. The primary view is called “Quad View” and displays all four of the view windows with the focus in the RF Spectrum window. This is the view seen after a Mode Preset. There are also three other views that combine one of the graphics windows with the metrics windows. Besides the above four views, the FM measurement has an additional view called “Attack/Release Time”. This view includes a RF envelope graphic window and an AF demod waveform (without interpolation) graphic window. The views can be selected from the View/Display menu.

These views are designed such that you can identify analog modulated carriers, determine whether the carrier is a commercial or other broadcast station, and analyze the modulating signal.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW[:SElect] QUAD   RFSpectrum   DEMod   AFSpectrum   ARTime  :DISPlay:AM FM PM:VIEW[:SElect]?
<b>Example</b>	:DISP:FM:VIEW DEM selects Demod Waveform & Metrics View for FM Demod measurement
<b>Preset</b>	QUAD (Focus in RF Spectrum Window)
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	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.

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

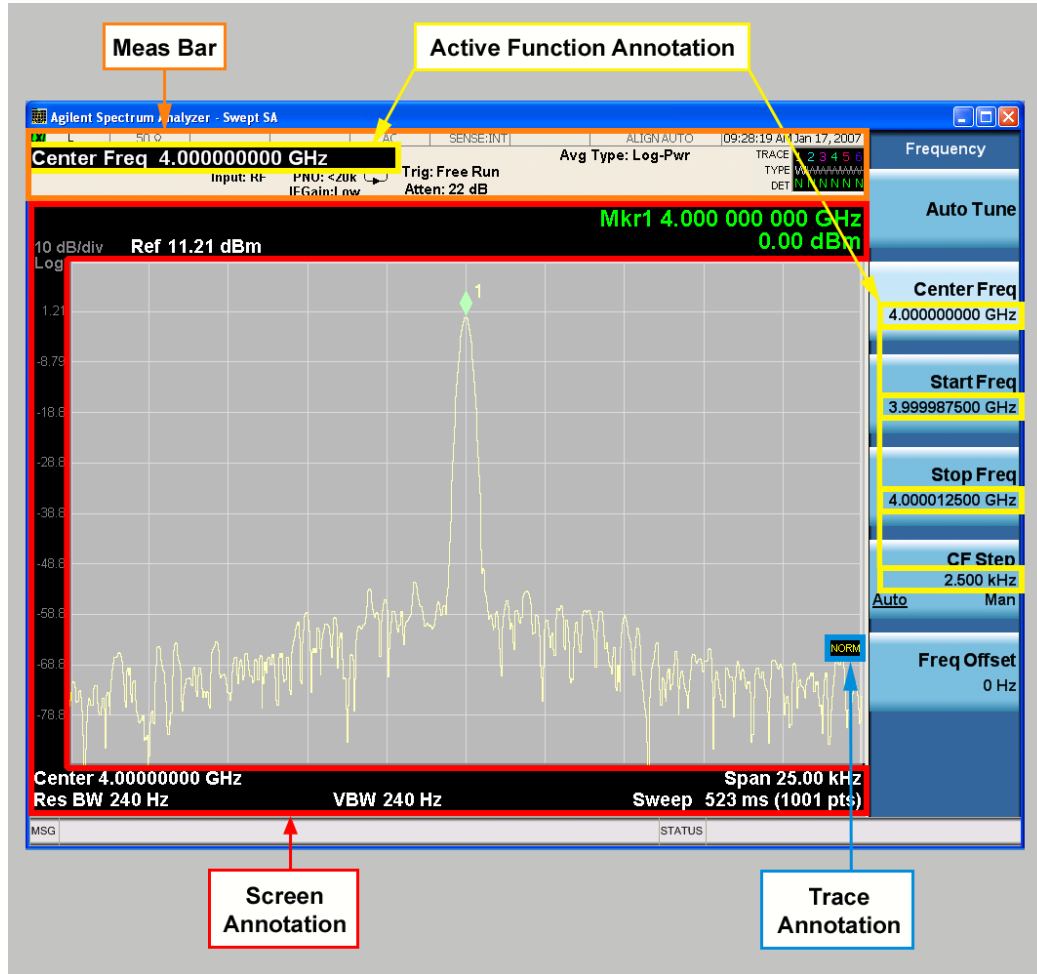
## Annotation

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.

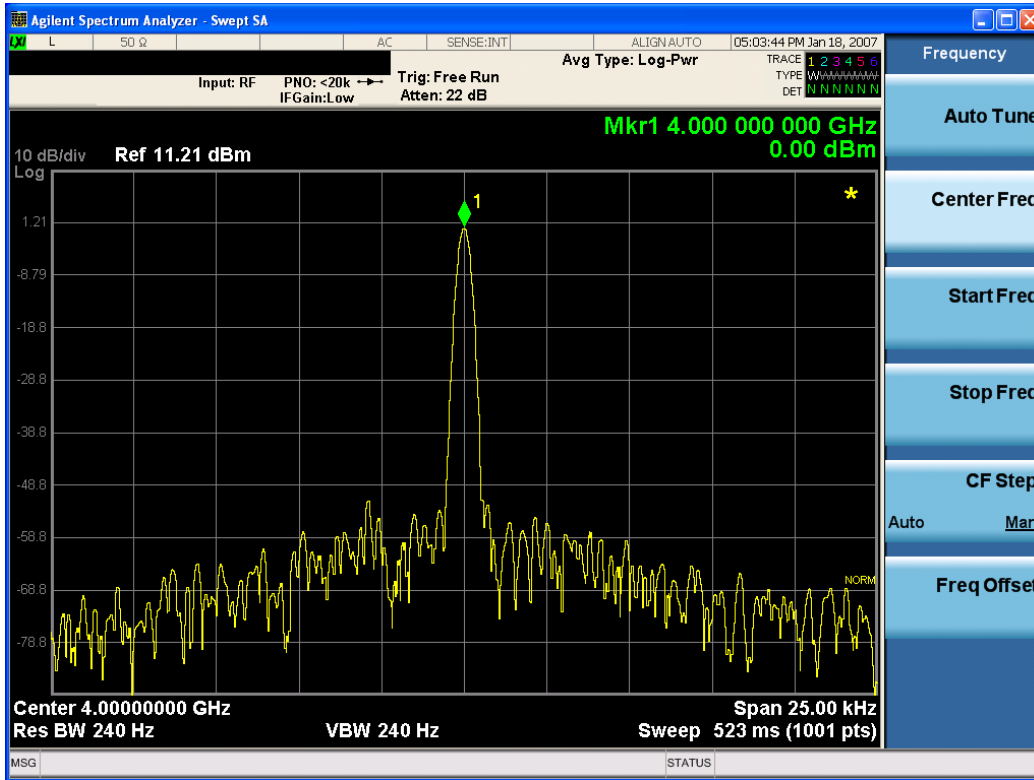
Key Path	View/Display, Display, Annotation
<b>Remote Command</b>	:DISPlay:ANNotation:SCReen[:STATe] OFF ON 0 1 :DISPlay:ANNotation:SCReen[:STATe]?
<b>Example</b>	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain 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 AM Demod Measurement  
View/Display (AM/FM/ $\Phi$ M)



Key Path	View/Display, Display, Annotation
Remote Command	:DISPlay:ACTivefunc[:STATE] ON OFF 1 0 :DISPlay:ACTivefunc[:STATE] ?
Example	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Title

Displays menu keys that enable you to change or clear a title on your display.

Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

Change Title

Writes a title into the "measurement name" field in the banner, for example, "Swept SA".

Press Change Title to enter a new title through the alpha editor. Press Enter or Return to complete the entry. Press ESC to cancel the entry and preserve your existing title.

The display title will replace the measurement name. It remains for this measurement until you press Change Title again, or you recall a state, or a Preset is performed. A title can also be cleared by pressing Title, Clear Title.

**NOTE**

Notice the inclusion of the <measurement> parameter in the command below. Because each measurement remembers the Display Title, the command must be qualified with the measurement name. For the Swept SA measurement this is not the case; no <measurement> parameter is used when changing the Display Title for the Swept SA measurement.

Key Path	View/Display, Display, Title
Mode	All
<b>Remote Command</b>	:DISPlay:<measurement>:ANNotation:TITLe:DATA <string> :DISPlay:<measurement>:ANNotation:TITLe:DATA?
<b>Example</b>	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
<b>Example</b>	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.

Key Path	View/Display, Display, System Display Settings
Remote Command	:DISPlay:WINDow[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDow[1]:ANNotation[:ALL]?
Example	:DISP:WIND:ANN OFF
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	The WINDow parameter and optional subopcode is included for backwards compatibility but ignored – all windows are equally affected.
Initial S/W Revision	Prior to A.02.00

## 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
<b>Preset</b>	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.
<b>Readback</b>	3D Color   3D Mono   Flat Color   Flat Mono
<b>Backwards Compatibility Notes</b>	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if you selected Reverse Bitmap AND a black & white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Color
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Mono
<b>Initial S/W Revision</b>	Prior to A.02.00

### Flat Color

Selects a format that is best when the screen is to be printed on an ink printer.

Key Path	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
Initial S/W Revision	Prior to A.02.00

### Flat Monochrome

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

Key Path	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

### Backlight

Accesses the display backlight on/off keys. This setting may interact with settings under the Windows "Power" menu.

When the backlight is off, pressing ESC, TAB, SPACE, ENTER, UP, DOWN, LEFT, RIGHT, DEL, BKSP, CTRL, or ALT turns the backlight on without affecting the application. Pressing any other key will turn backlight on and could potentially perform the action as well.

Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight ON OFF :DISPlay:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
Initial S/W Revision	Prior to A.02.00

### Backlight Intensity

An active function used to set the backlight intensity. It goes from 0 to 100 where 100 is full on and 0 is off. This value is independent of the values set under the Backlight on/off key.

Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50

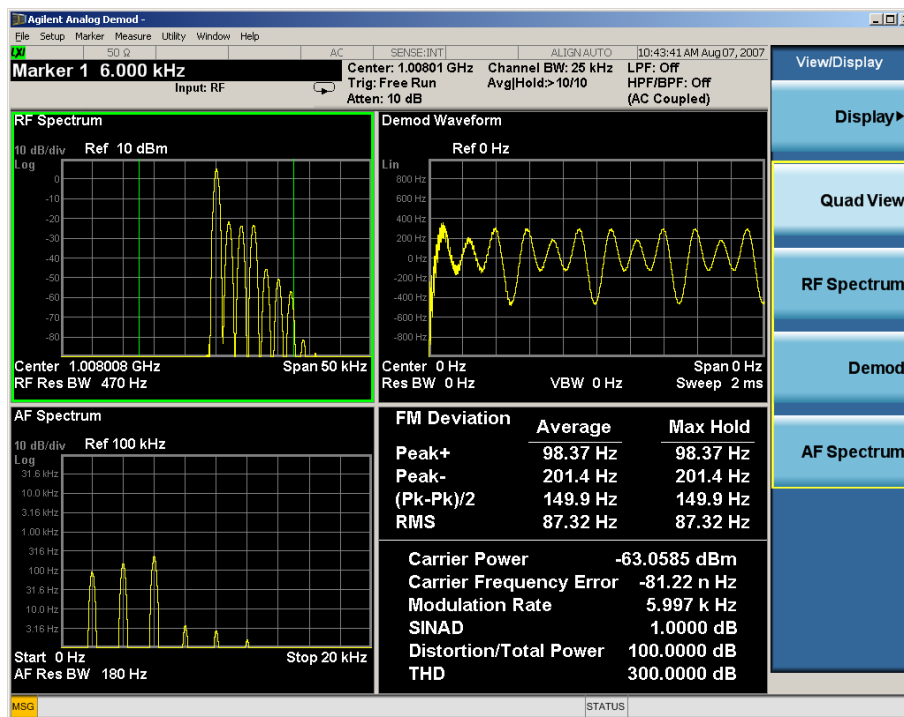
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

## Quad View

The Quad View displays each of the four fundamental windows of the Analog Demod mode. The basic window format is essentially the same for the 3 measurements. The main difference is the demodulation technique performed in the hardware and the specific metrics and units of the displayed results.

In general, there is little window-context sensitivity in the Analog Demod mode, that is, most of the variables have been designed so that they are unique to their window. The three variables that are window dependent are, Ref Value, Scale/Div, and Ref Position. These variables change to reflect the settings of the current window (the current window is always outlined in green).

The Quad View is shown below. For more information on the views, see ["RF Spectrum Window" on page 471](#), ["Demod Waveform Window" on page 472](#), ["AF Spectrum Window" on page 472](#), or ["Metrics Window" on page 472](#).



## RF Spectrum Window

The RF Spectrum window shows a spectral display of the input RF signal with amplitude in the vertical Y axis and frequency in the horizontal X axis. The vertical axis is always scaled in dB, with units of dBm, with the Ref Value initially at the top of the vertical scale. This spectral display is basically identical to the

frequency display of the Swept SA measurement; however it is always taken using an FFT. The span is restricted to 8 MHz and zero span is not allowed.

The RF Spectrum window provides a convenient way to identify broadcast stations by placing the signal of interest at the center frequency using this window and listening to the instrument's speaker. Demodulation is always performed at the center frequency of the RF Spectrum window; this is regarded as the application's center frequency and is annotated in the Measurement Bar.

In the RF Spectrum window, two green vertical lines are shown centered around the center frequency, with spacing equal to the Channel BW. If the Channel BW is wider than the span, they are not seen.

The Center Frequency, Span, and RF Res BW are annotated at the bottom of the RF Spectrum Window. The Ref Value and Scale/Div are annotated above the graticule.

### Demod Waveform Window

In the Demod Waveform window, the demodulated signal is displayed in the time domain (zero span) with time on the horizontal X axis, and modulation depth (AM) or deviation (FM,  $\Phi$ M) on the vertical Y axis.

In the Demod Waveform window the Y axis is linearly scaled in units of percent modulation for AM, frequency (Hz) for FM, or phase (radians) for  $\Phi$ M. On a preset, the Ref Value is positioned in the center of the vertical scale.

Four traces are available in the Demod Waveform window. The Demod trace, in yellow, shows the current demodulation signal. The Demod Max trace, in cyan, shows the Max Hold value for each display point bucket since the last restart and the Demod Min trace, in magenta, shows the Min Hold value for each display point bucket since the last restart. The Demod Average trace, in green, shows the averaged demodulation signal. If Averaging is turned off, only the Demod trace is displayed.

The Sweep Time is annotated at the bottom of the Demod Waveform Window. The Ref Value and Scale/Div are annotated above the graticule.

### AF Spectrum Window

In the AF Spectrum window, the demodulated signal is displayed in the frequency domain with frequency on the X axis and amplitude on the Y axis.

The vertical axis is always scaled in dB with the Ref Value initially at the top of the vertical scale. The Y-Axis Unit is % for AM, Hz for FM, and radians for  $\Phi$ M.

In this view you can observe the spectral components of the modulating signal. The preset Start Frequency of this window is 0 Hz. The AF Start Freq and AF Stop Freq are annotated at the bottom of the AF Spectrum Window, as is the AF Res BW.

The Ref Value and Scale/Div are annotated above the graticule.

It is only possible to show a spectrum to a maximum frequency of Channel BW / 2. For trace display points beyond that frequency, the value 1.0E-50 is plotted and returned in queries.

### Metrics Window

The metrics window displays measurement results.

If averaging is turned on, the column marked "Current" is relabeled "Average" and the results in that column are averaged over successive measurements until the Average/Hold number is reached. Then, if



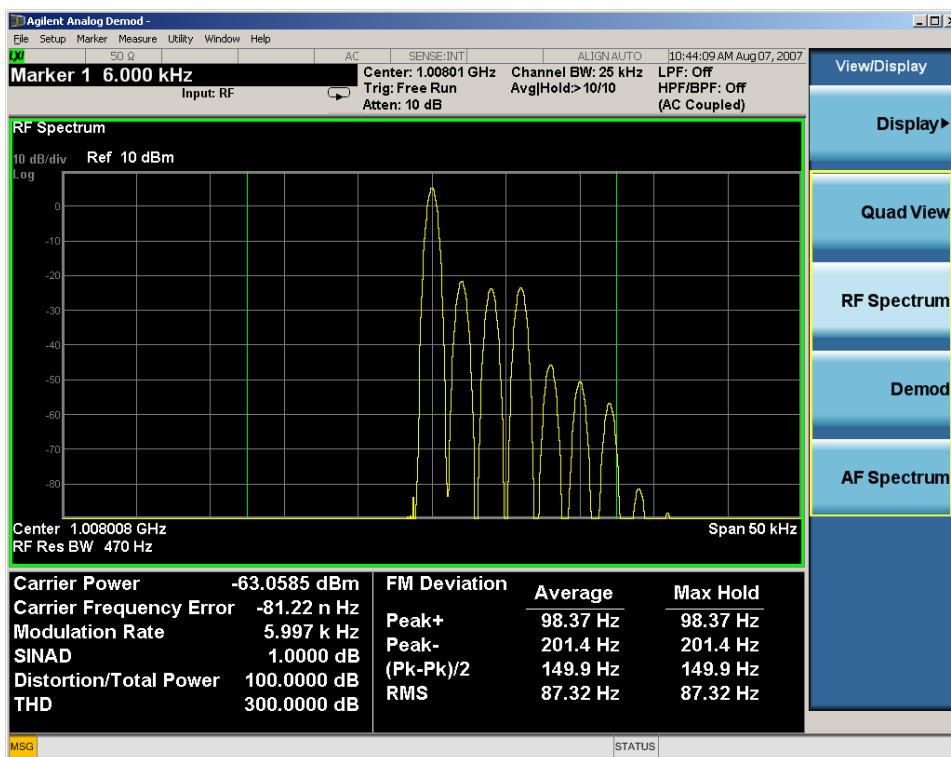
not in Single measurement mode, the measurement continues, exponentially averaging in successive results. The Max Hold column shows the Maximum value the un-averaged metric has attained since the last Restart. The Max Hold column is removed when averaging is turned off.

The window title is “FM Deviation” in FM, “AM Mod Depth” in AM, and “ $\Phi$ M Radians” in  $\Phi$ M.

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

## RF Spectrum & Metrics View

This view shows the RF Spectrum window and the Metrics window displayed in a split screen mode with the RF Spectrum window taking up approximately  $\frac{3}{4}$  of the display.

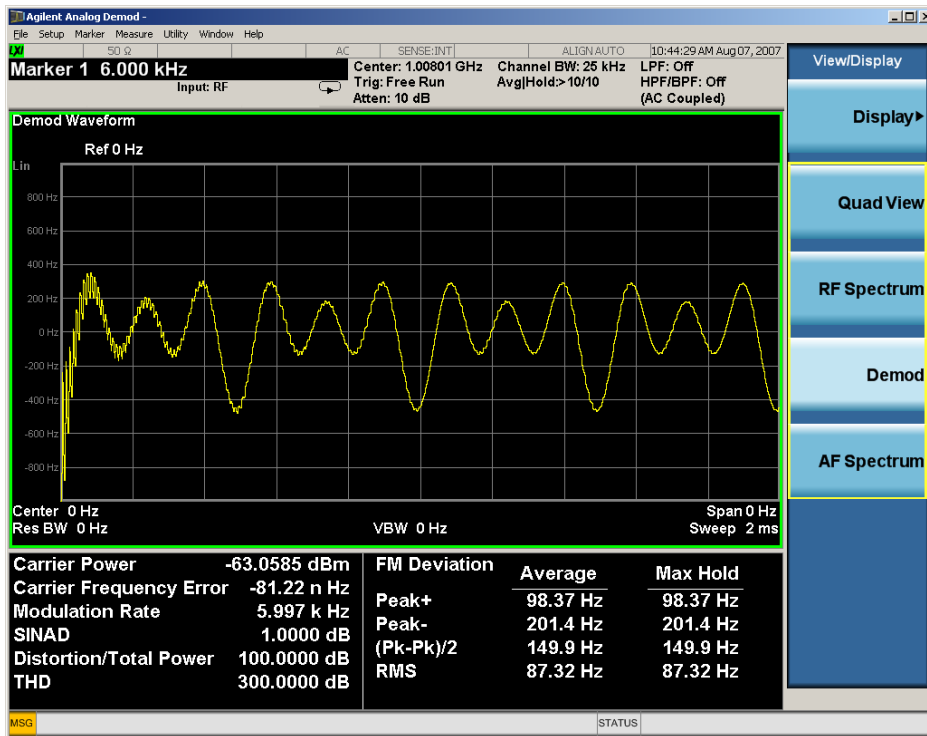


Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

## Demod Waveform & Metrics View

This view shows the Demod Waveform window and the Metrics windows displayed in a split screen mode with the Demod Waveform window taking up approximately  $\frac{3}{4}$  of the display.

## 8 AM Demod Measurement View/Display (AM/FM/ $\Phi$ M)

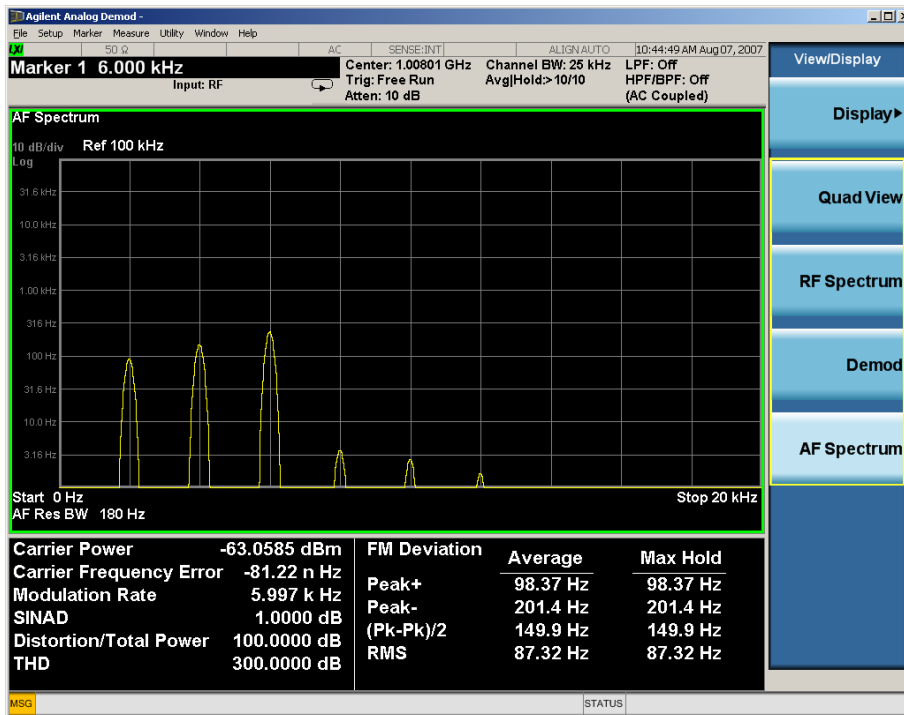


Key Path View/Display

Initial S/W Revision Prior to A.02.00

### AF Spectrum & Metrics View

This view shows the AF Spectrum window and the Metrics windows displayed in a split screen mode with the AF Spectrum window taking up approximately  $\frac{3}{4}$  of the display.



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

## Distortion & THD Unit

Changes the units of distortion and THD in the Metrics screen between % and dB units.

Key Path	View/Display
Remote Command	DISPlay:AM FM PM:VIEW:DISToRtion:UNIT DB PCT DISPlay:AM FM PM:VIEW:DISToRtion:UNIT?
Example	DISP:AM:VIEW:DIS:UNIT PCT Sets AM distortion and THD display to percent.
Preset	PCT
State Saved	Saved in State
Initial S/W Revision	Prior to A.02.00

## Metrics Settings

Accesses a menu used to control which metrics will be provided. This includes a 1-of-N menu which allows you to control which modulation magnitude metrics are displayed, as well as On/Off controls for Modulation Rate and SINAD/Distortion/THD. If speed is an issue, select only the metric(s) that is(are) required. If modulation magnitude is set to Peak+ Only, Pk-Pk/2 Only, or RMS Only, the other modulation magnitude metrics are loaded with not a number and show “---“ in the metrics window.

<b>Key Path</b>	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:MMAGnitude ALL   PPK   PNPk   RMS   RMSRatio  :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude?
<b>Example</b>	DISP:AM:VIEW:METR:MMAG PPK Sets AM modulation magnitude to peak +. DISP:FM:VIEW:METR:MMAG RMSR Sets ratio reference and sets FM modulation magnitude to ratio display
<b>Preset</b>	ALL
<b>State Saved</b>	Saved in State
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.05.00

### Normal

Turns on all absolute modulation magnitude metrics. In the metrics window, Peak +, Peak -, Pk-Pk/2 and RMS results are provided.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG ALL
<b>Notes</b>	This key was labeled "All" in earlier releases
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.05.00

### Peak+ Only

Turns on just the Peak+ metric in the portion of the metrics window that shows the modulation magnitude results.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG PPK
<b>Initial S/W Revision</b>	Prior to A.02.00

### Pk-Pk/2 Only

Turns on just the Pk-Pk/2 metric in the portion of the metrics window that shows the modulation magnitude results. .

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG PNPk
<b>Initial S/W Revision</b>	Prior to A.02.00

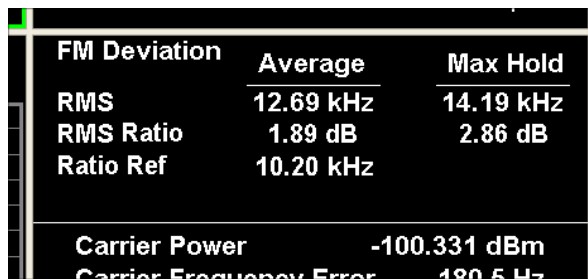
## RMS Only

Turns on just the RMS metric in the portion of the metrics window that shows the modulation magnitude results.

Key Path	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG RMS
Initial S/W Revision	Prior to A.02.00

## RMS Ratio

Turns on the display of RMS Ratio. In this mode, the only magnitude metrics that are displayed are the RMS metrics, but besides the display of RMS, the ratio (in dB) of the RMS modulation to its reference is displayed, as well as the value of the reference, as shown in the display below:



FM Deviation	Average	Max Hold
RMS	12.69 kHz	14.19 kHz
RMS Ratio	1.89 dB	2.86 dB
Ratio Ref	10.20 kHz	
Carrier Power	-100.331 dBm	
Carrier Frequency Error	180.5 Hz	

Pressing the RMS Ratio key (or sending :DISP:AM:VIEW:METR:MMAG RMSR) establishes the reference. Pressing it again (or sending the SCPI command again) establishes a new reference. If the Ratio Reference state is Auto, the reference is from the previous measurement result, otherwise, it's from the Ratio Reference's value you entered. Whenever this happens, the current value of RMS modulation from the left hand column (Current or Average) is taken as the new reference. If, when the ratio is to be established, there is not a valid value being displayed to use as a reference, an error is generated, the RMS Ratio and Ratio Ref values display --- and queries of either return not a number (9.91 e37).

To turn off the ratio display, select one of the other Mod magnitude views.

Note that each measurement (AM, FM and PM) has its own reference; and the reference is remembered when you leave the measurement and return.

The ratio references are saved in State, and when the recalled state of Metrics Settings is RMS Ratio, the saved reference for the current measurement should be recalled and used, rather than establishing a new one.

Key Path	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG RMSR
Initial S/W Revision	A.05.00

## Ratio Reference

Sets or displays the RMS ratio reference value and chooses the reference setting mode.

- If Auto is selected, pushing “RMS Ratio” does the following 3 actions:
  1. selects RMS Ratio as the Metrics Setting
  2. establishes RMS Ratio reference from previous measurement result
  3. displays the ratio reference value in step 2 on the “Ratio Reference” label text
- If Man is selected, pushing “RMS Ratio” does the following 2 actions:
  1. selects RMS Ratio as the Metrics Setting
  2. establishes RMS Ratio reference from “Ratio Reference” label value what you entered

Key Path	View/Display, Metrics Settings
<b>Remote Command</b>	<pre>:DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence &lt;real&gt; :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence? :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence:AUTO ON   OFF   1   0 :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence:AUTO?</pre>
<b>Example</b>	<pre>:DISP:AM FM PM:VIEW:METR:MMAG:REF 1 kHz :DISP:AM FM PM:VIEW:METR:MMAG:REF? :DISP:AM FM PM:VIEW:METR:MMAG:REF:AUTO ON :DISP:AM FM PM:VIEW:METR:MMAG:REF:AUTO?</pre>
<b>Notes</b>	If Auto is selected, the value of this key depends on the pervious measurement results. If Man is selected, the value is what you entered.
<b>Dependencies</b>	This feature is available only when Option N9063A-AFP is installed.
<b>Preset</b>	AM: 10 % FM: 1 kHz PM: 1 rad ON
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	AM: 0.01 % FM: 0.1 Hz PM: 1 mrad
<b>Max</b>	AM: 10000 % FM: 1GHz PM: 10 krad
<b>Initial S/W Revision</b>	A.14.00

## Modulation Rate

Toggles the Modulation Rate metric on and off. When turned on, the Modulation Rate metric is provided. When turned off, the Modulation Rate metric is set to not a number and shows “---” in the metric window.

Key Path	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:MRATe[:STATe] ON OFF 1 0 :DISPlay:AM FM PM:VIEW:METRics:MRATe[:STATe]?
<b>Example</b>	DISP:AM:VIEW:METR:MRAT OFF Sets AM modulation rate to off
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## SINAD, THD, Distortion

Toggles the distortion metrics (SINAD, Distortion, & THD) on and off. When turned on, the SINAD, Distortion, and THD metrics are provided. When turned off, the SINAD, Distortion, and THD metrics are set to not a number and show “---” in the metric window.

SINAD is the ratio of total received power (the received signal-plus-noise-plus-distortion power) to the received noise-plus-distortion power. It is always expressed in decibel units. The rejection of the carrier from the noise-plus-distortion power measurement is usually not much more than 50 dB, thus limiting the maximum SINAD.

THD is the ratio of the root mean square voltage of the harmonics referenced to the fundamental voltage, expressed in % or dB. Note the differences with respect to Distortion. The denominator of the ratio is different and the items in the numerator do not include the noise between harmonics, just the harmonics themselves.

Distortion/Total Voltage (rms) is the ratio of unwanted received power (noise plus distortion) to the total received power, expressed in % or dB. Therefore, this metric is the negative of SINAD when expressed in decibels.

Key Path	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:DISTortion[:STATe] ON OFF 1 0 :DISPlay:AM FM PM:VIEW:METRics:DISTortion[:STATe]?
<b>Example</b>	DISP:AM:VIEW:METR:DIST OFF Sets AM SINAD, Distortion, THD Metrics to off
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Carrier Power Unit

Chooses the unit of carrier power in the Metrics screen between watts and dBm.

8 AM Demod Measurement  
View/Display (AM/FM/ $\Phi$ M)

Key Path	View/Display
Remote Command	DISPlay:AM FM PM:VIEW:CARRier:POWer:UNIT DBM W DISPlay:AM FM PM:VIEW:CARRier:POWer:UNIT?
Example	DISP:AM:VIEW:CARR:POW:UNIT DBM Sets AM carrier power display to watts.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	DBM
State Saved	Saved in State
Initial S/W Revision	A.14.00



## 9 FM Demod Measurement

For the FM Demod measurement, the analyzer will display the metrics results, such as FM deviation, modulation rate, carrier frequency error, SINAD, total harmonic distortion and carrier power. The analyzer can also display trace data of the RF spectrum, the AF spectrum, or the demod waveform.

**NOTE**

For Analog FM demod to work correctly, phase change from sample-to-sample cannot exceed 90 degrees.

---

If the Demod Min trace, Demod Max trace or Demod Average trace is queried using a Meas, Read or Fetch command when Average/Hold feature is turned off, the resulting data will be default values.

If any of the metrics are off, a SCPI query will return not a number and show “---“ in the metrics window. The metrics that can be turned off are: Modulation Rate, SINAD, Distortion, THD and all but one of the Deviations.

For more measurement related commands, see the SENSE subsystem, and the ["Remote Measurement Functions" on page 795](#).

This topic contains the following sections:

["Measurement Commands for FM Demod " on page 482](#)

["Remote Command Results for FM Demod" on page 483](#)

## Measurement Commands for FM Demod

Parameter Name	FM Meas/Read/Fetch Query Results
SCPI Command	:MEASure READ FETCh:FM[1] 0 2 3 4 5?
SCPI Example	MEAS:FM? FETCh:FM0? READ:FM5?
Setup	[COMPARE OFF]
Post Setup	[COMPARE ON]

## Remote Command Results for FM Demod

Command	n	Return Value
:INITiate:FM	n/a	n/a
:CONFigure?	n/a	name of current measurement: "FM"
:CONFigure:FM	n/a	n/a (selects FM measurement in Meas Preset state)
:CONFigure:FM:NDEFault	n/a	n/a (selects FM measurement without affecting settings)
:FETCh:FM[n]? :MEASure:FM[n]? :READ:FM[n]?	0	This query returns the RF Spectrum trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	not specified or n=1	Returns the following comma-separated results: 1. The RF Spectrum window's center frequency 2. Carrier Power 3. Carrier Frequency Error 4. Modulation Rate 5. SINAD value 6. Distortion/Total Vrms (% - not ratio - or dB) 7. Total Harmonic Distortion(% - not ratio - or dB) 8. Deviation (Peak+) 9. Deviation (Peak-) 10. Deviation (Pk-Pk)/2 11. Deviation (RMS) 12. Deviation (Peak+) Max Hold 13. Deviation (Peak-) Max Hold 14. Deviation (Pk-Pk)/2 Max Hold 15. Deviation (RMS) Max Hold 16. SNR
	2	This query returns the Demod Min Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are 1 GHz.
	3	This query returns the Demod Max Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	4	This query returns the Demod Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view
	5	This query returns the Demod Average Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.

Command	n	Return Value
	6	This query returns the AF Spectrum Trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	7	Returns the following comma-separated results: 1. Deviation (RMS) 2. Deviation (RMS) Ratio 3. Ratio Reference
	8	<b>Returns the Demod Waveform Trace data (without interpolation), as a series of floating trace point values, in Hz.</b> The number of samples and the sample interval can be queried when n=10.
	9	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 number of samples and the sample interval can be queried when n=10.
	10	Returns the following scalar results: 1. Sample Interval is a floating point number representing the time between samples when using the trace queries (n=8 and n=9). 2. Number of samples is the number of data points in the Demod Waveform Trace (without interpolation). This number is useful when performing a query on the signal (when n=8 and n=9).
	11	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. The number of samples and the sample interval can be queried at n=12.
	12	Returns the following scalar results: 1. Sample Interval is a floating point number representing the time between samples when using the trace queries (n= 11). 2. Number of samples is the number of data points in the captured signal. This number is useful when performing a query on the signal (when n= 11).

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

## AMPTD Y Scale

Accesses a menu that enables you to set the reference level, attenuation, scale per division, reference position, and internal pre-amplifier parameters for your measurement.

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

### Ref Value (FM)

The reference value specifies the amplitude of a signal displayed on the reference graticule line. The reference line is at the top, center, or bottom of the graticule, depending on the value of the Ref Position function.

Changing the reference value does not restart a measurement, but changes all displayed traces and markers to the new value. If a change to the reference value changes an auto-coupled attenuation value, the measurement restarts.

The Ref Value key applies only to the window with the focus. If the focus is on the Metrics window, the Ref Value key is unavailable.

Key Path	AMPTD Y Scale
<b>Remote Command</b>	:DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALe]:RLEVel <real> :DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALe]:RLEVel?
<b>Example</b>	DISP:FM:WIND:TRAC:Y:RLEV 20 dBm Sets the reference value in window 1 to 20 dBm.
Remote Command Notes	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. RF Envelope (Attack/Release Time view) 5. FM Demod Waveform (Attack/Release Time view) 6. Metrics
Couplings	The value is constrained within the MAX and MIN values, but is otherwise generally not adjusted. In window 3, this value depends on Scale Type. If Scale Type is Log, the value will be expressed in decibel units. For example, x Hz will be expressed as y dBHz, where $y = 20 * \log(x)$ .
Preset	RF Spectrum0 dBm Demod Waveform0 Hz AF SpectrumScale Type is "Lin": 100 kHz Scale Type is "Log": 100 dBHz RF Envelope0 dBm FM Demod Waveform0 Hz

State Saved	Saved in instrument state
Min	RF Spectrum -170 dBm - Ext Gain Demod Waveform -10 GHz AF Spectrum Scale Type is "Lin": 1 Hz Scale Type is "Log": 0 dBHz RF Envelope-170 dBm FM Demod Waveform-10 GHz
Max	RF Spectrum N9030A: 30 dBm N9020A: 30 dBm N9010A: 23 dBm N9000A: 23 dBm Demod Waveform 10 GHz AF Spectrum Scale Type is "Lin": 10 GHz Scale Type is "Log": 200 dBHz RF Envelope 30 dBm FM Demod Waveform 10 GHz
Default Unit	depends on the current view
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## 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 487](#)

See ["Single Attenuator Configuration:" on page 487](#)

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 ,

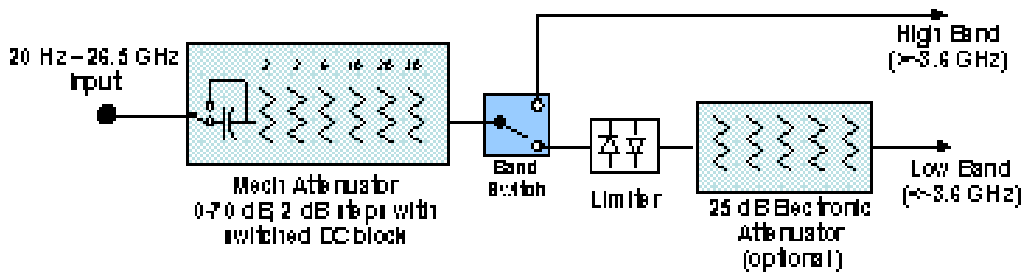
(Mech) Atten , and Enable Elec Atten keys for more detail on the contributors to the total attenuation.  
Note that when "Pre-Adjust for Min Clip" is on, this value can change at the start of every measurement.

Initial S/W Revision Prior to A.02.00

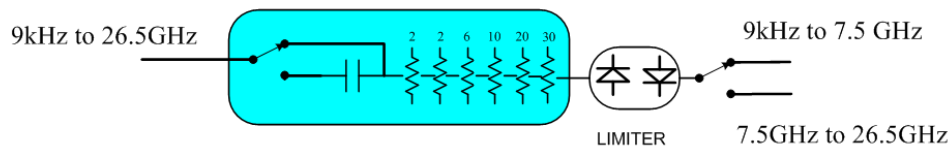
Modified at S/W Revision A.03.00

### Dual Attenuator Configurations:

Configuration 1: Mechanical attenuator + optional electronic attenuator

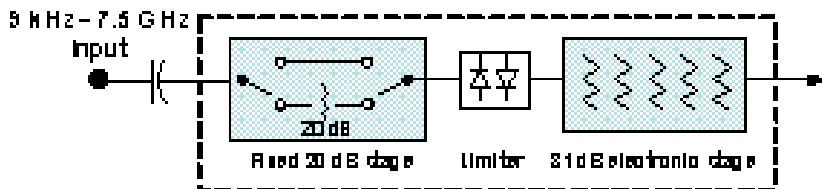


Configuration 2: Mechanical attenuator, no optional electronic attenuator

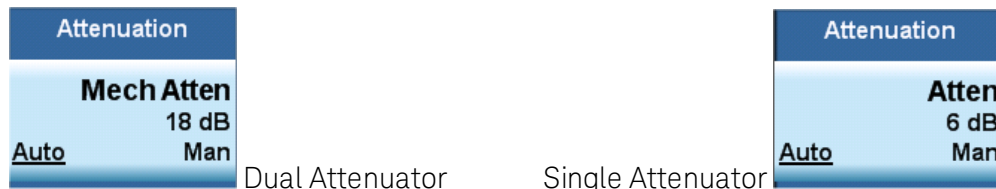


(note that Configuration 2 is not strictly speaking a dual-section attenuator, since there is no electronic section available. However, it behaves exactly like Configuration 1 without the Electronic Attenuator option EA3, therefore for the sake of this document it is grouped into the "Dual Attenuator" 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.

### Scale / Div (FM)

Sets the units per vertical graticule division on the display.

The Scale/Div key applies only to the window with the focus. If the focus is on the Metrics window, the Scale/Div key is unavailable.

Key Path	AMPTD Y Scale
Remote Command	:DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALe]:PDIVision <real> :DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALe]:PDIVision?
Example	DISP:FM:WIND:TRAC:Y:PDIV 5 DB
Remote Command Notes	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. RF Envelope (Attack/Release Time view) 5. FM Demod Waveform (Attack/Release Time view) 6. Metrics
Preset	RF Spectrum 10 dB Demod Waveform 15 kHz AF Spectrum 10 dB RF Envelope 10 dB FM Demod Waveform 15 kHz
State Saved	Saved in State
Min	RF Spectrum 0.1 dB Demod Waveform 1 Hz AF Spectrum 0.1 dB RF Envelope 0.1 dB FM Demod Waveform 1 Hz
Max	RF Spectrum 20 dB Demod Waveform 1 GHz



	AF Spectrum 20 dB
	RF Envelope 20 dB
	FM Demod Waveform 1 GHz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Scale Type

Chooses whether to display Y axis in decibel units in the AF spectrum window. No matter what the Scale Type value is, Log or Lin, the vertical graticule divisions are always scaled in logarithmic units.

### NOTE

This key applies only to the AF Spectrum window in AM, FM and PM measurement.

The following table describes the parameters that will be affected by Scale Type in the AF spectrum window.

Y axis unit,	AM: dBam	AM: %
Marker Y value,	FM: dBHz	FM: Hz
Refer Value	PM: dBrad	PM rad
	dBdeg	deg

Key Path	AMPTD Y Scale
Remote Command	:DISPlay:AM FM PM:WINDow3:TRACe:Y[:SCALe]:SPACing LINear   LOGarithmic :DISPlay:AM FM PM:WINDow3:TRACe:Y[:SCALe]:SPACing?
Example	DISP:AM:WIND:TRAC:Y:SPAC LOG DISP:AM:WIND:TRAC:Y:SPAC?
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Couplings	Changing the Scale Type always sets the Y axis unit to the last unit specified for the current amplitude scale. In other words, we restore the Y axis unit setting appropriate per log/lin.
Preset	LOG
State Saved	Saved in instrument state
Initial S/W Revision	A.14.00

## Ref Position

Positions the reference value at the top, center, or bottom of the Y Scale display. Changing the reference position does not change the reference value.

The Ref Position key applies only to the window with the focus. If the focus is on the Metrics window, the Ref Position key is unavailable.

<b>Key Path</b>	AMPTD Y Scale
<b>Remote Command</b>	<p>AM/PM/FM Stereo:</p> <pre>:DISPlay:AM PM FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALE]:RPOSition TOP   CENTER   BOTTom</pre> <pre>:DISPlay:AM PM FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALE]:RPOSition?</pre> <p>FM:</p> <pre>:DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALE]:RPOSition TOP   CENTER   BOTTom</pre> <pre>:DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALE]:RPOSition?</pre>
<b>Example</b>	DISP:AM:WIND:TRAC:Y:RPOS BOTT
<b>Remote Command Notes</b>	<p>AM/PM/FM Stereo:</p> <p>Regardless of the View, the windows are numbered as follows:</p> <ol style="list-style-type: none"> <li>1. RF Spectrum</li> <li>2. Demod Waveform</li> <li>3. AF Spectrum</li> <li>4. Metrics</li> </ol> <p>FM:</p> <p>Regardless of the View, the windows are numbered as follows:</p> <ol style="list-style-type: none"> <li>1. RF Spectrum</li> <li>2. Demod Waveform</li> <li>3. AF Spectrum</li> <li>4. RF Envelope (Attack/Release Time view)</li> <li>5. FM Demod Waveform (Attack/Release Time view)</li> <li>6. Metrics</li> </ol>
<b>Preset</b>	<p>RF Spectrum window: Top</p> <p>Demod Waveform window: Center</p> <p>AF Spectrum window: Top</p>
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.14.00

## Internal Preamp

Accesses a menu of keys that control the internal preamps. Turning on the preamp gives a better noise figure, but a poorer TOI to noise floor dynamic range. You can optimize this setting for your particular measurement.

The instrument takes the preamp gain into account as it sweeps. If you sweep outside of the range of the preamp the instrument will also account for that. The displayed result will always reflect the correct gain.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the

status line. For example ,for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

Key Path	AMPTD Y Scale
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe] :POWer [ :RF] :GAIN [ :STATe] OFF ON 0 1</code> <code>[ :SENSe] :POWer [ :RF] :GAIN [ :STATe] ?</code>
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown. The preamp is not available when the electronic/soft attenuator is enabled.
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be switched On, to Full Range. Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected. Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

Key Path	AMPTD Y Scale, Internal Preamp
Scope	Meas Global
<b>Remote Command</b>	<code>[ :SENSe] :POWer [ :RF] :GAIN :BAND LOW FULL</code> <code>[ :SENSe] :POWer [ :RF] :GAIN :BAND?</code>
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown. If a POW:GAIN:BAND FULL command is sent when a low band preamp is available, the preamp band parameter is to LOW instead of FULL, and an "Option not installed" message is generated.
Preset	LOW
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Off

Turns the internal preamp off

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

## Low Band

Sets the internal preamp to use only the low band.

The frequency range of the installed (optional) low-band preamp is displayed in square brackets on the Low Band key label.

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND LOW
Readback	Low Band
Initial S/W Revision	Prior to A.02.00

## Full Range

Sets the internal preamp to use its full range. The low band (0–3.6 GHz or 0–3GHz, depending on the model) is supplied by the low band preamp and the frequencies above low band are supplied by the high band preamp.

The frequency range of the installed (optional) preamp is displayed in square brackets on the Full Range key label. If the high band option is not installed the Full Range key does not appear.

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND FULL
Readback	Full Range
Initial S/W Revision	Prior to A.02.00

## $\mu$ W Path Control

The  $\mu$ W Path Control functions include the  $\mu$ W 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>	[ :SENSe ] :POWer [ :RF ] :MW:PATH STD LNPath MPBypass FULL [ :SENSe ] :POWer [ :RF ] :MW:PATH?
<b>Example</b>	:POW:MW:PATH LNP Enables the Low Noise path
<b>Notes</b>	If a Presel Center is performed, the analyzer will momentarily switch to the Standard Path, regardless of the setting of $\mu$ W Path Control  The DC Block will always be switched in when the low noise path is switched in, to protect succeeding circuitry from DC. Note that this does not mean “when the low noise path is enabled” but when, based on the Low Noise Path rules, the path is actually switched in. This can happen when the selection is Low Noise Path Enable . In the case where the DC Block is switched in the analyzer is now AC coupled. However, if the user has selected DC coupling, the UI will still behave as though it were DC coupled, including all annunciation, warnings, status bits, and responses to SCPI queries. This is because, based on other settings, the analyzer could switch out the low noise path at any time and hence go back to being DC coupled.  Alignment switching ignores the settings in this menu, and restores them when finished.
<b>Dependencies</b>	Unavailable in BBIQ and External Mixing
<b>Preset</b>	All modes other than IQ Analyzer mode and VXA: STD IQ Analyzer, VXA and WLAN mode: MPB option present and licensed: MPB MPB option not present and licensed: STD
<b>State Saved</b>	Save in instrument state
<b>Readback</b>	Value selected in the submenu
<b>Initial S/W Revision</b>	A.04.00
<b>Modified at S/W Revision</b>	A.10.00

## 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 which 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.

For Analog Demod, these parameters are:

- RF Res BW
- AF Res BW
- CF Step

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

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## BW

Opens a menu of keys that enable you to control the bandwidth functions of the application.

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

## RF Res BW

Activates the RF Res BW function, which enables you to manually set the resolution bandwidth used in the RF Spectrum window.

Normally, the RF Res BW (Auto) key selects automatic coupling of the resolution bandwidth. To decouple the resolution bandwidth, press the RF Res BW key until Man is underlined, or enter a different value for the resolution bandwidth.

When the resolution bandwidth is manually selected, it may be returned to the coupled state by pressing the RF Res BW key until Auto is underlined. This may also be done by pressing the Auto Couple key or by performing a preset.

Only the Gaussian filter type is used.

Key Path	BW
<b>Remote Command</b>	<pre>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth[:RESolution] &lt;freq&gt; [ :SENSe ] :AM FM PM FMSTereo:BANDwidth[:RESolution]? [ :SENSe ] :AM FM PM:BANDwidth[:RESolution]:AUTO OFF ON 0 1 [ :SENSe ] :AM FM PM:BANDwidth[:RESolution]:AUTO?</pre>
<b>Example</b>	<pre>AM:BAND 1 KHZ AM:BAND? AM:BAND:AUTO ON AM:BAND:AUTO?</pre>
Notes	Only certain discrete resolution bandwidths are available. For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Couplings	<p>AM/FM/PM: In Auto, the 3 dB RBW of the desired filter is the closest possible choice to that given by Span divided by 106 (the Span: 3 dB RBW parameter), except that the range for auto-coupling is restricted to not exceed 3 MHz.</p> <p>FMST: In Auto, RBW is coupled to Span in the following ways: <math>RBW = Span / 500</math> ( Span &gt; 500 kHz )  <math>RBW = 1 \text{ kHz}</math> ( 100kHz &lt;= Span &lt;= 500 kHz )  <math>RBW = Span / 100</math> ( Span &lt; 100 kHz )</p>
Preset	<p>AM/FM/PM: Preset is Auto, which results in a 680 Hz value since the preset span is 75 kHz and the Span/RBW ratio is 106</p> <p>FMST: Preset is Auto, which results in a 1 kHz value since the preset span is 500 kHz</p>
State Saved	Saved in Instrument state

Min	1 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Channel BW

The Channel BW variable is used to determine the bandwidth used for the demodulation. The flat top filter type must be used for demodulation.

This parameter also controls the RBW hardware setting for the demodulation fed to the speaker.

Key Path	BW
<b>Remote Command</b>	<code>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth:CHANnel &lt;freq&gt;</code> <code>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth:CHANnel?</code>
<b>Example</b>	AM:BAND:CHAN 200 kHz
Notes	If the Channel BW is greater than 8 MHz, gives a warning message "Settings Alert; Analog Output Undefined".
Dependencies	The maximum value will be the maximum IF BW available in the instrument. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available IF BW of the instrument is 140 MHz. Thus, the maximum Channel BW is not limited to 25 MHz but is 140 MHz.
Preset	= AM/FM/PM = 25 kHz = FMST = 400 kHz
State Saved	Saved in instrument state
Min	390 Hz
Max	When Option N9063A-AFP is installed, it depends on hardware: No Option = 10 MHz Option B25 = 25 MHz Option B40 = 40 MHz  Option B1X = 140 MHz Option B1Y = 160 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00



## AF Res BW

In the AF Spectrum window, the AF Res BW key is used to set the Resolution bandwidth of the FFT of the demodulated waveform.

The data acquisition uses the Channel BW value for hardware control during data acquisition, just as it does in the Demod Waveform window.

AF Res BW (Auto) selects automatic coupling of the AF Res BW to the AF Span (defined as AF Stop Freq – AF Start Freq) using the same factor of 106 used by the RF Res BW. To decouple the resolution bandwidth, press the AF Res BW key until Man is underlined, or enter a different value for the AF resolution bandwidth.

When the AF resolution bandwidth is manually selected, it may be returned to the coupled state by pressing the AF Res BW key until Auto is underlined. This may also be done by pressing the Auto Couple key or by performing a Preset.

Only the Gaussian filter type is used.

Key Path	BW
<b>Remote Command</b>	<pre>[ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth &lt;freq&gt; [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth? [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth:AUTO OFF   ON   0   1 [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth:AUTO?</pre>
<b>Example</b>	<pre>AM:AFSP:BAND 1 KHZ AM:AFSP:BAND?</pre>
Notes	Only certain discrete resolution bandwidths are available. For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Notes	For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Remote Command Notes	The setting and querying of values depends on the current bandwidth type.
Couplings	In Auto, the 3 dB RBW of the desired filter is the closest possible choice to that given by Span divided by 106 (the Span: 3 dB RBW parameter), except that the range for auto-coupling is restricted to not exceed 3 MHz.
Preset	Preset is Auto, which results in a 180 Hz value since the preset span is 20 kHz and the Span/RBW ratio is 106
State Saved	Saved in Instrument State
Min	1 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## 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.

<b>Key Path</b>	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
<b>Preset</b>	ON (Note that SYST:PRESet sets INIT:CONT to ON but *RST sets INIT:CONT to OFF)
<b>State Saved</b>	Saved in instrument state
<b>Backwards Compatibility Notes</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

In Swept SA Measurement (Spectrum Analysis Mode):

The analyzer takes repetitive sweeps, averages, measurements, etc., when in Continuous mode. When the average count reaches the Average/Hold Number the count stops incrementing, but the analyzer keeps sweeping. See the Trace/Detector section for the averaging formula used both before and after the Average/Hold Number is reached. The trigger condition must be met prior to each sweep. The type of trace processing for multiple sweeps, is set under the Trace/Detector key, with choices of Trace Average, Max Hold, or Min Hold.

In Other Measurements/Modes:

With Avg/Hold Num (in the Meas Setup menu) set to Off or set to On with a value of 1, a sweep is taken after the trigger condition is met; and the analyzer continues to take new sweeps after the current sweep has completed and the trigger condition is again met. However, with Avg/Hold Num set to On with a value >1, multiple sweeps (data acquisitions) are taken for the measurement. The trigger condition must be met prior to each sweep. The sweep is not stopped when the average count k equals the number N set for Avg/Hold Num is reached, but the number k stops incrementing. A measurement average usually applies to all traces, marker results, and numeric results. But sometimes it only applies to the numeric results.

If the analyzer is in Single measurement, pressing the Cont key does not change k and does not cause the sweep to be reset; the only action is to put the analyzer into Continuous measurement operation.

If it is already in continuous sweep:

the INIT:CONT 1 command has no effect

the INIT:CONT 0 command will place the analyzer in Single Sweep but will have no effect on the current sequence until  $k = N$ , at which point the current sequence will stop and the instrument will go to the idle state.

9 FM Demod Measurement  
File

File

See "File" on page 236

## FREQ Channel

Accesses a menu of keys that enable you to control the Frequency parameters of the instrument.

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

### Center Frequency

Sets the frequency that corresponds to the horizontal center of the RF Spectrum window. While adjusting the Center Frequency the Span is held constant, this means that both the start frequency and the stop frequency will change.

The Center Frequency is retained as you go from measurement to measurement.

Key Path	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :FREQuency:CENTer <freq> [ :SENSe ] :FREQuency:CENTer?
<b>Example</b>	FREQ:CENT 50MHz FREQ:CENT UP changes the center frequency to 150 MHz if you use FREQ:CENT:STEP 100MHz sets the center frequency step size to 100 MHz FREQ:CENT?
Dependencies	The Center Frequency can be limited by Start or Stop Freq limits, In addition, the Center Frequency can be limited if the Span is so large that Start or Stop hit 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 frequency range
Preset	1.000 GHz
State Saved	Saved in instrument state
Min	Depends on instrument minimum frequency and the 10 Hz minimum span. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters.
Max	Depends on the instrument’s maximum frequency and the 10 Hz minimum span. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

## CF Step

Changes the step size for the center frequency function. Once a step size has been selected and the center frequency function is active, the step keys (and the UP|DOWN parameters for the Center Frequency from remote commands) change the center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the analyzer.

<b>Key Path</b>	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :FREQuency:CENTer:STEP [ :INCRement ] <freq> [ :SENSe ] :FREQuency:CENTer:STEP [ :INCRement ] ? [ :SENSe ] :FREQuency:CENTer:STEP:AUTO OFF ON 0 1 [ :SENSe ] :FREQuency:CENTer:STEP:AUTO?
<b>Example</b>	FREQ:CENT:STEP:AUTO ON FREQ:CENT:STEP 500MHz FREQ:CENT UP increases the current center frequency value by 500 MHz FREQ:CENT:STEP? FREQ:CENT:STEP:AUTO?
<b>Remote Command Notes</b>	Preset and Max values are dependent on Hardware Options (503, 508, 513, 526)
<b>Dependencies</b>	Span, RBW, Center frequency
<b>Couplings</b>	When auto-coupled in a non-zero span, the center frequency step size is set to 10% of the span. When auto-coupled in zero span, the center frequency step size is set to the equivalent -3 dB RBW value.
<b>Preset</b>	Auto
<b>State Saved</b>	Saved in State
<b>Min</b>	- (the maximum frequency of the instrument). For example, a 27 GHz max frequency instrument has a CF step range of +/- 27 GHz.
<b>Max</b>	The maximum frequency of the instrument. For example, 27 GHz max freq instrument has a CF step range of +/- 27 GHz.
<b>Default Unit</b>	Hz
<b>Status Bits/OPC dependencies</b>	Non-overlapped
<b>Initial S/W Revision</b>	Prior to A.02.00

## AF Start Freq

Sets the frequency at the left side of the graticule in the AF Spectrum window. While adjusting the AF start frequency the AF stop frequency is held constant.

The AF Start Frequency is retained as you go from measurement to measurement.

<b>Key Path</b>	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:START <freq> [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:START?

<b>Example</b>	AM:AFSP:FREQ:STAR 0 Hz
Dependencies	You cannot set the Start frequency > the Stop frequency. You cannot set the Start frequency = Stop frequency. You cannot set the Start Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, Stop Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	0 Hz
State Saved	Saved in instrument state
Min	0 Hz
Max	99.999990 MHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## AF Stop Freq

Sets the frequency at the right side of the graticule in the AF Spectrum window. While adjusting the AF Stop Frequency the AF Start Frequency is held constant.

Key Path	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:STOP <freq> [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:STOP?
<b>Example</b>	AM:AFSP:FREQ:STOP 20 kHz
Dependencies	You cannot set the Stop frequency < the Start frequency. You cannot set the Start frequency = Stop frequency. You cannot set the Stop Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, the Start Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	20 kHz
State Saved	Saved in instrument state
Min	10 Hz
Max	100 MHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Input/Output

See ["Input/Output" on page 126](#)



## Marker

Accesses the Marker menu. A marker can be placed on a trace to allow the value of the trace at the marker point to be determined precisely. The functions in this menu include a 1-of-N selection of the control mode Normal, Delta, Fixed, or Off for the selected marker.

If the selected marker is Off, pressing the Marker key sets it to the selected window. If the metrics window is selected, the marker will appear in the first visible window (RF Spectrum if Quad View is selected).

The units of Delta Marker are window dependent. In the Spectrum windows they are dB, in the Demod Waveform window they are the same as the Y-Axis Unit. In this window, the delta marker is a linear difference rather than a ratio. For example, in FM, in the Demod Waveform window, the units of delta marker are Hz.

### Control Mode

Key Path	Front-panel key
Remote Command	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MODE POSition   DELTa   FIXed   OFF :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MODE?
Example	CALC:AM:MARK:MODE POS turns on marker 1 in Normal mode
Remote Command Notes	This command (not the query) causes the specified marker to become selected.
Preset	OFF (all markers)
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Select Marker

Displays a menu with 12 markers available for selection for the current measurement.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is initiated.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Normal

Sets the control mode for the selected marker to Normal and turns on the active function for setting its value. If the selected marker was off, it is placed at the center of the screen on the trace specified by the marker's Trace attribute.

A Normal mode (POSition type) marker can be moved to any point on the X Axis by specifying its X Axis value. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker
<b>Example</b>	: CALC: MARK: MODE POS sets Marker 1 to Normal.
Remote Command Notes	See the description under the " <b>Marker</b> " on page 779 key.
Couplings	The marker addressed by this command becomes the selected marker on the front panel.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Delta

Sets the control mode for the selected marker to Delta and turns on the active function for setting its delta value. If the selected marker is off, the marker is placed at the center of the screen on the trace specified by the marker's Trace attribute.

In Delta mode the marker result shows the relative result between the selected (Delta) marker and its reference marker. A delta marker can be moved to any point on the X Axis by specifying its X Axis offset from a reference marker. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker
<b>Example</b>	:CALC:MARK:MODE DELT sets marker 1 to Delta.
Remote Command Notes	See the description under the " <b>Marker</b> " on page 779 key.
Couplings	Coupled to fix absolute X when turned On.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Fixed

Sets the control mode for the selected marker to Fixed. A fixed marker is fixed in the sense that it stays where you place it. It can be directly moved in both X and Y. It can be moved with a Peak Search. It can also be indirectly moved by re-zeroing the delta if it is a relative marker. If it is moved, it again becomes fixed at the X Axis point it moved to and it has a Y-axis result that it took on when it moved there. If a Normal or Delta marker is changed to Fixed it becomes fixed at the X Axis point it was at, and with the Y-axis result it had when it was set to Fixed.

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

## Marker X

Sets and queries a marker's X value.

Key Path	Marker, Fixed
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<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:X <time>   <freq> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:X?
Remote Command Notes	The query is returned in the fundamental units for the current marker X Axis scale. This command (not the query) causes the specified marker to become selected.
Preset	After a preset, all Markers are turned off, so a Marker X Axis Value query will return not a number (9.91 e37). When a Marker is on, the default value of the Marker X value is the center of the appropriate window.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Marker Y

Sets and queries a marker's Y axis value.

Key Path	Marker, Fixed
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:Y <real> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:Y?
Remote Command Notes	The query is returned in the fundamental units for the current marker Y Axis scale. This command (not the query) causes the specified marker to become selected.
Preset	Defaults to the measurement result at the default X value, or not a number (9.91 e37) if off or if off screen is Fixed.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Off

Turns off the selected marker. Turning the marker off does not affect which marker is selected.

Key Path	Marker
<b>Example</b>	:CALC: MARK: MODE OFF sets Marker 1 to Off.
Remote Command Notes	See the description under the " <a href="#">Marker</a> " on page 779 key.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Properties

Accesses a menu used to assign properties to the selected marker.

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

## Select Marker

Displays a menu with 12 markers available for selection for the current measurement.

Key Path	Marker, Properties
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is initiated.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Relative To

Selects the reference marker for a marker in Delta mode.

If a delta marker has a reference marker in a different window, the delta marker's mode changes to POS (for example, it becomes a normal marker).

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:REFerence <int> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:REFerence?
<b>Example</b>	CALC:AM:MARK1:REF 2 Sets marker 1's reference marker to 2 and turns marker 1 on as a delta marker.
Remote Command Notes	This command (not the query) causes the specified marker to become selected.
Preset	By default, marker X is relative to marker X + 1 except for marker 12, which is relative to marker 1.
Min	1
Max	12
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## AM/FM/ΦM Marker Trace

Selects the trace on which to place the marker. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an

associated trace, even Fixed markers. It is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

In the AM/ΦM measurements, there are five named traces, and in the FM measurement, there are seven named traces. The RF Spectrum trace is the trace in the RF Spectrum window, and the AF Spectrum trace is the trace in the AF Spectrum window. There are four traces in the Demod Waveform window: Demod, Demod Avg, Demod Max, and Demod Min. The RF Envelope trace and the Demod Raw trace are from Attack/Release Time view which is only available in the FM measurement. The RF Envelope trace is in the RF Envelope window and the Demod Raw trace is in the FM Demod Waveform window. When Auto Init is on, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta, or Fixed) from an off state. The marker goes to the trace in the window that has the focus, or onto the RF spectrum window if the Metrics window has the focus. If in the Demod Waveform window, it goes to the Demod trace.

This command associates the marker with the specified trace. Setting the Marker Trace directly (whether the marker is on or off) will turn off Auto Init.

If the marker is not off, it moves the marker from the trace it was on to the new trace. If the new trace is in the same window, the marker goes to the same data point on the new trace. If the marker changes windows, it retains its relative horizontal positions in the new window. If it is a fixed marker, it will retain both relative horizontal and vertical position.

If the marker is off it stays off, but is now associated with the specified trace.

The query returns the name of the trace on which the marker is currently placed.

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM:MARKer[1] 2 ... 12:TRACe RFSpectrum   AFSPpectrum   DEMod   DAVerage   DMAXimum   DMINimum   RFENvelope   DRAW :CALCulate:AM FM PM:MARKer[1] 2 ... 12:TRACe?
<b>Example</b>	:CALC:AM:MARK1:TRAC DEM places marker 1 on the Demod trace
<b>Couplings</b>	This is not affected by Auto Coupling. Sending the remote command causes the addressed marker to become selected. If ever a delta marker has a reference marker in a different window, the delta marker's mode changes to POS (for example, it becomes a normal marker). When Marker Trace Auto Init State is on, the marker trace will automatically be set whenever the marker is turned on.
<b>Preset</b>	RF Spectrum on a Preset or All Markers Off
<b>State Saved</b>	The Marker Trace for each marker is saved in instrument state.
<b>Readback line</b>	[Trace name, Auto Init] or [Trace Name, Manual]
<b>Initial S/W Revision</b>	Prior to A.02.00

## RF Spectrum

Selects the input RF signal in the RF Spectrum window as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

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Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC RFSP
Initial S/W Revision	Prior to A.02.00

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### Demod

Selects the current demodulated signal in the Demod Waveform window, shown in yellow, as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

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Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DEM
Initial S/W Revision	Prior to A.02.00

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### Demod Average

Selects the averaged demodulation signal in the Demod Waveform window, shown in green, as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

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Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DAV
Initial S/W Revision	Prior to A.02.00

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### Demod Max

Selects the Demod Max trace in the Demod Waveform window, shown in cyan, as the trace on which you want to place your marker. This trace shows the maximum hold value for each data point since the last restart.

---

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DMAX
Initial S/W Revision	Prior to A.02.00

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### Demod Min

Selects the Demod Min trace in the Demod Waveform window, shown in magenta, as the trace on which you want to place your marker. This trace shows the minimum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DMIN
Initial S/W Revision	Prior to A.02.00

### AF Spectrum

Selects the demodulated signal in the AF Spectrum window as the trace on which you want to place your marker.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC AFSP
Initial S/W Revision	Prior to A.02.00

### RF Envelope (FM only)

Selects the input RF signal in the RF Envelop window as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC RFEN
Initial S/W Revision	A.14.00

### Demod Raw (FM only)

Selects the demodulated signal (without interpolation) in the FM Demod Waveform window, in Attack/Release view, as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DRAW
Initial S/W Revision	A.14.00

### Trace Auto Init

Selects whether the marker trace is automatically reset to the selected window when the marker is turned on or not.

Key Path	Marker, Properties, Trace
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:TRACe:AUTO OFF   ON   0   1

	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:TRACe:AUTO?
<b>Example</b>	:CALC:AM:MARK1:TRAC:AUTO 0 turns off auto-initialization of marker trace.
Preset	On
State Saved	Saved in instrument state.
Readback line	Trace name
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Lines

When on, displays a vertical line of graticule height and a horizontal line of graticule width, intersecting at the indicator point of the marker (that is, the center of the X or the bottom tip of the diamond). The lines are blue in color.

If the marker is off screen, the lines should be extended from the marker so that they go through the screen area if possible. This is really useful for off screen Fixed markers as it lets you see their amplitude even though they are off the X Axis.

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:LINes[:STATe] OFF   ON   0   1  :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:LINes[:STATe]?
<b>Example</b>	CALC:AM:MARK2:LIN ON turns Lines on for marker 2.
Couplings	Sending the remote command causes the addressed marker to become selected.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Marker Table

When set to On, the display is split into three windows: a measurement window, a metrics window and a marker data display window. For each marker that is on, information is displayed in the data display window, which includes the marker number, control mode, X axis scale, X axis value, and the Y-axis result.

**NOTE** Marker Table acts on all views except the Quad View.

Key Path	Marker
<b>Remote Command</b>	:CALCulate:AM FM PM:MARKer:TABLE[:STATe] OFF ON 0 1 :CALCulate:AM FM PM:MARKer:TABLE[:STATe]?
<b>Example</b>	CALC:AM FM PM:MARK:TABL ON turns on the marker table.



Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	OFF
State Saved	The on/off state of the Marker Table is saved in instrument state
Initial S/W Revision	A.14.00

## All Markers Off

Turns off all markers.

Key Path	Marker
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer:AOff
<b>Example</b>	CALC:AM:MARK:AOff turns off all markers for the AM measurement
Couplings	Sets the selected marker to 1.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Marker Function

There are no menus or marker functions under this key in the Analog Demod mode.

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

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## Marker To

Accesses a menu that contains only the marker center frequency key.

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

### Mkr->CF

Sets the center frequency of the RF Spectrum window to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display.

In delta marker mode, this function sets the center frequency to the x-axis value of the delta marker.

Key Path	Marker ->
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12[:SET]:CENTer
<b>Example</b>	CALC:AM:MARK2:CENt sets the CF of the analyzer to the value of marker 2.
Remote Command Notes	Sending this command selects the sub-op coded marker. If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the RF Spectrum trace as a normal type marker.
Dependencies	This function is unavailable (key is grayed out) unless the selected marker's trace is off, or on the RF Spectrum trace.
Couplings	All the usual couplings associated with setting Center Frequency apply (see <a href="#">"Center Frequency" on page 775</a> ).
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## 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.

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

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### Remote Measurement Functions

This section contains the following topics:

["Measurement Group of Commands" on page 796](#)

["Current Measurement Query \(Remote Command Only\) " on page 798](#)

["Limit Test Current Results \(Remote Command Only\)" on page 798](#)

["Data Query \(Remote Command Only\)" on page 798](#)

["Calculate/Compress Trace Data Query \(Remote Command Only\)" on page 799](#)

["Calculate Peaks of Trace Data \(Remote Command Only\)" on page 804](#)

[Hardware-Accelerated Fast Power Measurement \(Remote Command Only\)](#)

["Format Data: Numeric Data \(Remote Command Only\)" on page 805](#)

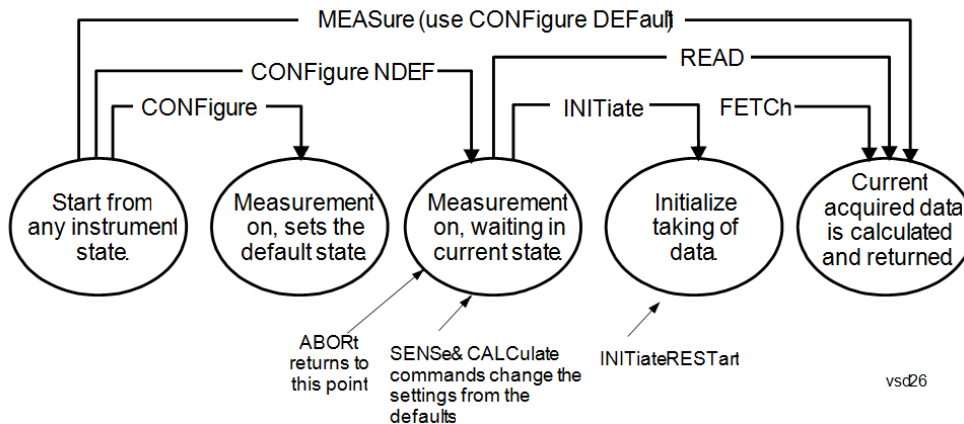
["Format Data: Byte Order \(Remote Command Only\)" on page 806](#)

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## Measurement Group of Commands




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### 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>?.

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### Configure Commands:

:CONFigure:<measurement>

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using

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the factory default instrument settings. It does not initiate the taking of measurement data unless INIT:CONTinuous is ON. If you change any measurement settings after using the CONFigure command, the READ command can be used to initiate a measurement without changing the settings back to their defaults.

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

:CONFigure: <measurement>: NDEFault stops the current measurement and changes to the specified measurement. It does not change the settings to the defaults. It does not initiate the taking of measurement data unless INIT:CONTinuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query returns a quoted string of all licensed measurement names in the current mode. For example, "SAN, CHP, OBW, ACP, PST, TXP, SPUR, SEM, LIST".

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#### Fetch Commands:

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:FETCh:<measurement>[n]?

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

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

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

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

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#### INITiate Commands:

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: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.
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#### READ Commands:

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:READ:<measurement>[n]?

- Does not preset the measurement to the factory default settings. For example, if you have previously initiated the ACP
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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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<b>Remote Command</b>	:CONFigure?
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<b>Example</b>	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.

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<b>Remote Command</b>	:CALCulate:CLIMits:FAIL?
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<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.
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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]?
<b>Notes</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

### Calculate/Compress Trace Data Query (Remote Command Only)

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

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

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

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

<b>Remote Command</b>	:CALCulate:DATA<n>:COMPRESS? BLOCK   CFIT   MAXimum   MINimum   MEAN   DMEan   RMS   RMSCubed   SAMPLE   SDEVIation   PPHase [,<soffset> [,<length>[,<roffset>[,<rlimit>]]]]
<b>Example</b>	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.)
<b>Notes</b>	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.
<b>Initial S/W Revision</b>	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)

$$\text{RMS} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i^2}$$

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:

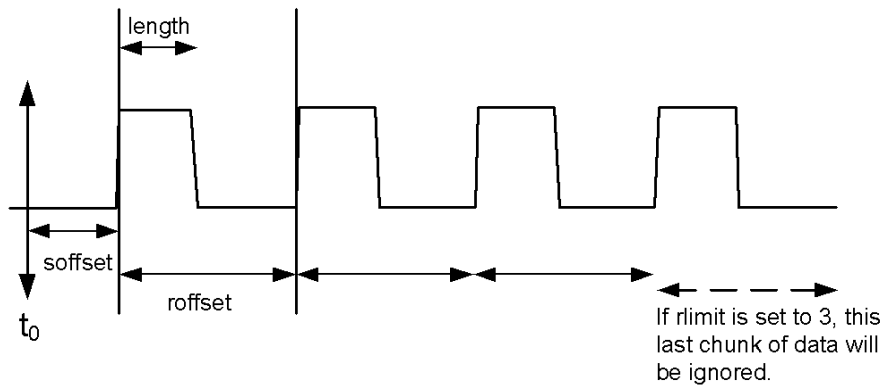
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

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.

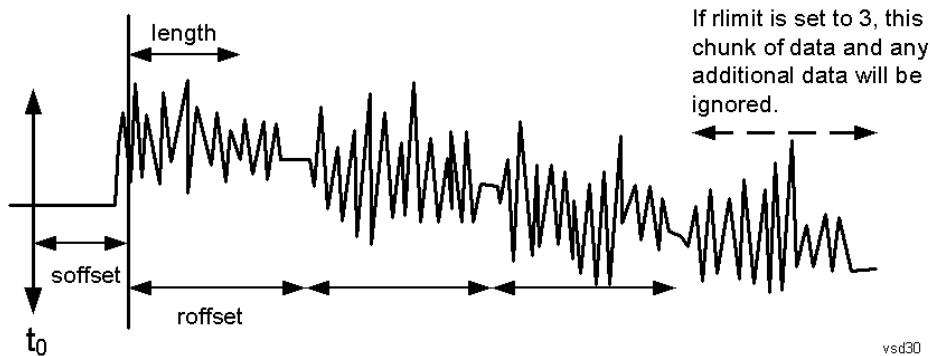
Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



<soffset> - start offset is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It specifies the amount of data at the beginning of the trace that will be ignored before the decimation process starts. It is the time or frequency change from the start of the trace to the point where you want to start using the data. The default value is zero.

<length> - is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It defines how much data will be compressed into one value. This parameter has a default value equal to the current trace length.

<roffset> - repeat offset is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It defines the beginning of the next field of trace elements to be compressed. This is relative to the beginning of the previous field. This parameter has a default value equal to the <length> variable. Note that this parameter is used for a completely different purpose when curve fitting (see CFIT above).

<rlimit> - repeat limit is an optional integer. It specifies the number of data items that you want returned. It will ignore any additional items beyond that number. You can use the Start offset and the Repeat limit to pick out exactly what part of the data you want to use. The default value is all the data.

## Calculate Peaks of Trace Data (Remote Command Only)

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

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

The command can only be used with specific sub-opcodes with measurement results that are trace data. Both real and complex traces can be searched, but complex traces are converted to magnitude in dBm. In many measurements the sub-opcode n=0, is the raw trace data which cannot be searched for peaks. And Sub-opcode n=1, is often calculated results values which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDER and FORMat:DATA commands and can return real or ASCII data. If the format is set to INT,32, it returns REAL,32 data.

The command has four types of parameters:

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

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<b>Remote Command</b>	<p>For Swept SA measurement:</p> <pre>:CALCulate:DATA[1] 2 ... 6:PEAKs? &lt;threshold&gt;,&lt;excursion&gt;[,AMPLitude   FREQuency   TIME[,ALL   GTDLline   LTDLine]]</pre> <p>For most other measurements:</p> <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>
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<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</p>
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excursion value stored under the Peak Criteria menu.

Values must be provided for threshold and excursion. The sorting and display line parameters are optional (defaults are AMPLitude and ALL).

Note that there is always a Y-axis value for the display line, regardless of whether the display line state is on or off. It is the current Y-axis value of the display line which is used by this command to determine whether a peak should be reported

Sorting order:

AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)

FREQuency - lists the peaks in order of occurrence, left to right across the x-axis.

TIME - lists the peaks in order of occurrence, left to right across the x-axis.

Peaks vs. Display Line:

ALL - lists all of the peaks found (default if optional parameter not sent).

GTDLine (greater than display line) - lists all of the peaks found above the display line.

LTDLine (less than display line) - lists all of the peaks found below the display line.

Initial S/W Revision      Prior to A.02.00

### Format Data: Numeric Data (Remote Command Only)

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

**Remote Command**      :FORMat [:TRACe] [:DATA] ASCii|INTEger, 32|REAL, 32 |REAL, 64  
:FORMat [:TRACe] [:DATA] ?

**Notes**      The query response is:  
ASCii: ASC,8  
REAL,32: REAL,32  
REAL,64: REAL,64  
INTEger,32: INT,32

When the numeric data format is REAL or ASCii, data is output in the current Y Axis unit. When the data format is INTEger, data is output in units of m dBm (.001 dBm).

The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.

**Dependencies**      Sending a data format spec with an invalid number (for example, INT,48) generates no error. The analyzer simply uses the default (8 for ASCii, 32 for INTEger, 32 for REAL).

Sending data to the analyzer which does not conform to the current FORMat specified, results in an error. Sending ASCII data when a definite block is expected generates message -161 "Invalid Block Data" and sending a definite block when ASCII data is expected generates message -121 "Invalid Character in Number".

**Preset**      ASCii

**Backwards Compatibility Notes**      Note that the INT,32 format is only applicable to the command, TRACe:DATA. This preserves backwards compatibility for the Swept SA measurement. For all other commands/queries which honor FORMat:DATA, if INT,32 is sent the analyzer will behave as though it were set to REAL,32.

Initial S/W Revision      Prior to A.02.00

The specs for each output type follow:

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

SX.YYYYYEsZZ

Where:

S = sign (+ or -)

X = one digit to left of decimal point

Y = 5 digits to right of decimal point

E = E, exponent header

s = sign of exponent (+ or -)

ZZ = two digit exponent

REAL,32 - Binary 32-bit real values in the current Y Axis Unit, in a definite length block.

REAL,64 - Binary 64-bit real values in the current Y Axis Unit, in a definite length block.

### Format Data: Byte Order (Remote Command Only)

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

By definition any command that 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?
<b>Preset</b>	NORMal
<b>Initial S/W Revision</b>	Prior to A.02.00

## Meas Setup

Accesses a menu of keys that enable you to control specific parameters for the current measurement.

["Overview" on page 528](#)

["Set Parameters " on page 528](#)

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

### Overview

This section describes the measurement setup features of the Analog Demod measurements.

### Set Parameters

The following parameters are set as indicated and are not settable by the user, therefore they do not appear in any menus:

FFT IF Gain	Low (0 dB)
ADC Dither	On
Avg Mode	Exponential
Phase Noise Optimization	Auto

### Auto Rules for Phase Noise Optimization:

Use "Optimize for  $f < 20$  kHz" when the Channel BW  $< 120$  kHz, otherwise use "Optimize for  $f > 30$  kHz".

["Optimizing Measurement Speed" on page 528](#)

["Channel Bandwidth" on page 529](#)

["RF Spectrum Span " on page 529](#)

["RF Spectrum RBW / AF Spectrum RBW" on page 529](#)

["AF Waveform Sweep Time" on page 529](#)

["Filters and Annotation" on page 529](#)

### Optimizing Measurement Speed

The speed of the analog demodulation measurements is driven largely by how much data must be acquired to satisfy the selected configuration.

Each measurement cycle generates all of the metrics and traces from a single acquisition, so there are several different settings which can affect the overall speed. Note that even though you may not be



viewing a particular result on the display, the result is available and its configuration and constraints are used to determine the acquisition settings.

### Channel Bandwidth

This setting determines the sampling rate used by the measurement, higher bandwidths will result in larger data sets being acquired and processed. This should be set to the lowest value possible which allows your signal to be fully captured.

### RF Spectrum Span

This setting is used in a similar way as the Channel Bandwidth in that it determines the sampling rate. As with channel bandwidth, it should be set as narrow as possible to capture the signal of interest.

### RF Spectrum RBW / AF Spectrum RBW

These settings dictate a minimum acquisition time for the measurement. The Auto setting is recommended for optimal performance while maintaining measurement integrity. Narrower resolution bandwidths (RBWs) require longer acquisitions to achieve the resolution improvements.

### AF Waveform Sweep Time

This setting sets another minimum acquisition time for the measurement. In many uses, the AF Spectrum RBW will dominate the determination of the data acquisition duration, but if the AF waveform view is not needed keeping its sweep time low will ensure that it does not negatively impact the throughput.

### Filters and Annotation

You may choose to filter by frequency – choosing an optional low-pass filter and an optional high-pass filter – or may filter using a standard published band-pass filter (CCITT). Turning on a band-pass filter will automatically turn off the high-pass and low-pass filters; similarly, the band-pass filter will automatically turn off if you request either a high-pass or a low-pass filter.

### Average/Hold Num

When turned on, the RF Spectrum and AF spectrum traces are averaged, and the Demod window shows an Average trace, a Max Hold trace, and a Min Hold trace in addition to the current trace. All metrics are averaged, and the metrics show an “Average” column and a “Max Hold” column.

The average feature for the Analog Demod measurement differs from other measurements in that the average type is fixed depending on the window as shown in the following table:

Window	Average Type
RF Spectrum	Pwr Average
Demod Waveform	Arithmetic Average
AF Spectrum	Log Average

For more details, see ["Average/Hold On/Off Functionality" on page 530](#).

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Key Path	Meas Setup
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<b>Remote Command</b>	[:SENSe]:AM FM PM FMSTereo:AVERage:COUNT <integer> [:SENSe]:AM FM PM FMSTereo:AVERage:COUNT? [:SENSe]:AM FM PM FMSTereo:AVERage[:STATe] ON OFF 1 0 [:SENSe]:AM FM PM FMSTereo:AVERage[:STATe]?
<b>Example</b>	AM:AVER:COUN 10
<b>Preset</b>	10 ON
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	1
<b>Max</b>	9999
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Average/Hold On/Off Functionality

Average, Minhold, and Maxhold are coupled.

When Average/Hold is on:

- The RF Spectrum and AF Spectrum traces are averaged.
- The Demod Waveform window will display a current trace, an Average trace, a Max Hold trace, and a Min Hold trace.
- The Metrics window will display an “Average” column and a “Max Hold” column.
- Metrics will display to four significant digits.
- The Meas Bar will display the Average/Hold number (along with how many of those sweeps have been captured).
- Demod Min trace, Demod Max trace, and Demod Avg trace are maintained.
- The Max Hold column shows the maximum value the un-averaged metric has attained since the last Restart.

When Average/Max Hold is off:

- The RF Spectrum and AF Spectrum traces are not averaged.
- The Demod Waveform window will display only the demod trace.
- The Metrics window will display only a “Current” column.
- Metrics will display to two significant digits.
- The Meas Bar will not display the Average/Hold number.
- Max Hold metrics over SCPI will return SCPI not a number.

- Demod Min trace, Demod Max trace and Demod Avg trace will return default values in a Meas?, Read?, and Fetch? and when exported to a .csv file
- Max Hold column is blank.

## Modulation Rate Periodic

The algorithms used by the instrument for demodulation have an improved speed/accuracy tradeoff when the modulation is both periodic (such as a sinusoidal test signal) and assumed to be periodic by the analysis system. Thus, “Yes” is best for periodic signals. When the modulation is aperiodic, such as voice or music or even multiple nonharmonically related tones, “No” gives better results.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe ] :AM FM PM FMSTereo:PERIodic[:STATe] ON   OFF   1   0</code> <code>[ :SENSe ] :AM FM PM FMSTereo:PERIodic[:STATe] ?</code>
<b>Example</b>	FM:PERI OFF
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	A.12.00

## Filters

Pressing this key displays the Filters menu, allowing you to control the post demodulation and de-emphasis filters.

If any filters are turned on and the filters cannot be applied, the error “161 Setting Modified; Filters not applied” will appear.

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

## High Pass Filter (Post Demod)

This parameter allows you to adjust the post demodulation high pass filters. This filter allows you to remove unwanted low-frequency components from the modulated signal..

Key Path	Meas Setup
<b>Remote Command</b>	<b>AM FM PM:</b> <code>[ :SENSe ] :AM FM PM:HPFilter OFF HPF20 HPF50 HPF300 HPF400</code> <code>[ :SENSe ] :AM FM PM:HPFilter?</code>
	<b>FM Stereo:</b> <code>[ :SENSe ] :FMSTereo:HPFilter OFF HPF20 HPF50 HPF300</code> <code>[ :SENSe ] :FMSTereo:HPFilter?</code>

<b>Example</b>	FM:HPF HPF20
Remote Command Notes	<p>AM FM PM:  Off = No filtering  HPF20 = Use 20 Hz high pass filter  HPF50 = Use 50 Hz high pass filter  HPF300 = Use 300 Hz high pass filter  HPF400 = Use 400 Hz high pass filter</p> <p>FM Stereo:  Off = No filtering  HPF20 = Use 20 Hz high pass filter  HPF50 = Use 50 Hz high pass filter  HPF300 = Use 300 Hz high pass filter</p>
Dependencies	The HPF400 is available only when Option N9063A-AFP is installed in AM/FM/PM.
Couplings	<p>AM/FM/PM:  Turning on any high-pass filter will turn off bandpass filters.  If a band-pass filter is turned off, the following advisory message is displayed:  “Band-pass filter set to OFF”.  If the band-pass filter was already off, no advisory message is displayed.</p> <p>FM Stereo:  None</p>
Preset	Off (AM/FM/FM Stereo, HPF20 (PM))
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Off

This selection turns the post demodulation high pass filter off.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF OFF
Notes	Annotation line (DC Coupled) appears in the Meas Bar, except if in the AM measurement.
Readback	Off
Initial S/W Revision	Prior to A.02.00

## 20 Hz

Sets the post demodulation high pass filter to 20 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 20 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF20
Readback	20 Hz
Initial S/W Revision	Prior to A.02.00

## 50 Hz

Sets the post demodulation high pass filter to 50 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 50 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF50
Readback	50 Hz
Initial S/W Revision	Prior to A.02.00

## 300 Hz

Sets the post demodulation high pass filter to 300 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 300 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF300
Readback	300 Hz
Initial S/W Revision	Prior to A.02.00

## 400 Hz

Sets the post demodulation high pass filter to 400 Hz. It is a 10-pole Butterworth filter, its 3 dB cutoff frequency is 430 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF400
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	400 Hz
Initial S/W Revision	A.14.00

## Lowpass Filter (Post Demod)

This parameter allows you to adjust the post demodulation low pass filter. The filter is useful in removing unwanted high frequency components of the modulating signal.

Key Path	Meas Setup
<b>Remote Command</b>	<p>AM FM PM:</p> <pre>[ :SENSe]:AM FM PM:LPFilter OFF   LPF300   LPF3K   LPF15K   LPF30K   LPF80K   LPF300K   LPF100K   MANual</pre> <p>[ :SENSe]:AM FM PM:LPFilter?</p> <p>FM Stereo:</p> <pre>[ :SENSe]:FMSTereo:LPFilter OFF   LPF300   LPF3K   LPF15K   LPF30K   LPF80K   LPF300K</pre> <p>[ :SENSe]:FMSTereo:LPFilter?</p>
<b>Example</b>	FM:LPF LPF3K
Remote Command Notes	<p>AM FM PM:</p> <p>Off = No filtering  LPF300 = Use 300 Hz low pass filter  LPF3K = Use 3 kHz low pass filter  LPF15K = Use 15 kHz low pass filter  LPF30K = Use 30 kHz low pass filter  LPF80K = Use 80 kHz low pass filter  LPF300K = Use 300 kHz low pass filter  LPF100K = Use &gt;20 kHz low pass filter  MANual=Use user-defined low pass filter</p> <p>FM Stereo:</p> <p>Off = No filtering  LPF300 = Use 300 Hz low pass filter  LPF3K = Use 3 kHz low pass filter  LPF15K = Use 15 kHz low pass filter  LPF30K = Use 30 kHz low pass filter  LPF80K = Use 80 kHz low pass filter  LPF300K = Use 300 kHz low pass filter</p>
Dependencies	<p>LPF key is unavailable (grayed out) when the band pass filter is not OFF.</p> <p>The following filters are available only when Option N9063A-AFP is installed in AM/FM/PM:  LPF100K and MANual.</p>
Couplings	<p>AM/FM/PM:</p> <p>Turning on any low-pass filter will turn off band-pass filters.</p> <p>If a band-pass filter is turned off, the following advisory message is displayed:  “Band-pass filter set to OFF”.</p> <p>If the band-pass filter was already off, no advisory message is displayed.</p>

	FM Stereo: None
Preset	Off
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

### Off

Turns the post demodulation low pass filter off.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

### 300 Hz

Sets the post demodulation low pass filter to 300 Hz. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 300 Hz.

Key Path	Meas Setup, HPF/LPF
<b>Example</b>	AM:HPBP LPF300
Readback	300 Hz
Initial S/W Revision	Prior to A.02.00

### 3 kHz

Selects the 3 kHz post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 3 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF3K
Readback	3 kHz
Initial S/W Revision	Prior to A.02.00

### 15 kHz

Selects the 15 kHz post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 15 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF15K
Readback	15 kHz
Initial S/W Revision	Prior to A.02.00

### 30 kHz

Selects the 30 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 30 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF30K
Readback	30 kHz
Initial S/W Revision	Prior to A.02.00

### 80 kHz

Selects the 80 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 80 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF80K
Readback	80 kHz
Initial S/W Revision	Prior to A.02.00

### 100 kHz

Selects the 100 kHz (“>20 kHz”) post demodulation low pass filter. It is a 9-pole Bessel filter designed for minimum overshoot (<1% nom) on square wave modulation, its 3 dB cutoff frequency is 100 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF100K
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	>20 kHz
Initial S/W Revision	A.14.00



### 300 kHz

Selects the 300 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 300 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF300K
Readback	300 kHz
Initial S/W Revision	Prior to A.02.00

### Manual

Selects the user-defined post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency can be changed through “[:SENSe]:AM|FM|PM|FM:LPFilter:MANual[:FREQUENCY] <freq>

” command.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF MAN
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	MAN
Initial S/W Revision	A.14.00

### User-defined Lowpass Filter

Allows user to set up a post demodulation low pass filter by manual.

Key Path	Meas Setup, Post Demod LPF
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FM:LPFilter:MANual [ :FREQUENCY ] <freq> [ :SENSe ] :AM FM PM FM:LPFilter:MANual [ :FREQUENCY ] ?
<b>Example</b>	AM:LPF:MAN 500kHz AM:LPF:MAN?
Notes	Adjusts the cutoff frequency of the user-defined low pass filter.
Dependencies	This feature is available only when Option N9063A-AFP is installed. Only active when Lowpass filter type is Manual.
Preset	300 Hz
State Saved	Saved in instrument state
Min	300 Hz
Max	Half of the maximum DIF BW.
Initial S/W Revision	A.14.00

## Band Pass Filter (Post Demod)

This parameter enables you to choose the post demodulation band pass filters, allowing you to apply industry-defined filters.

Key Path	Meas Setup
<b>Remote Command</b>	<p>AM FM PM:</p> <pre>[ :SENSe]:AM FM PM:BPFilter OFF   CCITT   AWEighting   CWEighting   CMESsage   CCIR1k   CCIR2k   CUNWeighting</pre> <p>[ :SENSe]:AM FM PM:BPFilter?</p> <p>FM Stereo:</p> <pre>[ :SENSe]:FMSTereo:BPFilter OFF CCITT AWAudio</pre> <p>[ :SENSe]:FMSTereo:BPFilter?</p>
<b>Example</b>	FM:BPFilter CCITT
Remote Command Notes	<p>AM FM PM:</p> <p>Off = No filtering</p> <p>CCITT = Use CCITT filter</p> <p>AWEighting = Use A-Weighted Audio filter</p> <p>CWEighting = Use C-Weighted audio filter</p> <p>CMESsage = Use C-Message audio filter</p> <p>CCIR1k = Use CCIR-1k Weighted audio filter</p> <p>CCIR2k = Use CCIR-2k Weighted audio filter</p> <p>CUNWeighting = Use CCIR Un-weighted audio filter</p> <p>FM Stereo:</p> <p>Off = No filtering</p> <p>CCITT = Use CCITT filter</p> <p>AWAudio = Use A-Weighted Audio filter</p>
Dependencies	The following filters are available only when Option N9063A-AFP is installed in AM/FM/PM: AWEighting, CWEighting, CMESsage, CCIR1k, CCIR2k and CUNWeighting.
Couplings	<p>AM/FM/PM:</p> <p>Turning on any bandpass filter will turn off high-pass and low-pass filters.</p> <p>If a high-pass filter is turned off, the following advisory message is displayed: "High-pass filter set to OFF".</p> <p>If a low-pass filter is turned off, the following advisory message is displayed: "Low-pass filter set to OFF".</p> <p>If both are turned off, the following advisory message is displayed: "High-pass and Low-pass filters set to OFF".</p> <p>If both high-pass and low-pass filters were already off, no advisory message is displayed.</p> <p>FM Stereo:</p> <p>None</p>
Preset	Off

State Saved	Saved in instrument state
Readback	1-of-N
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

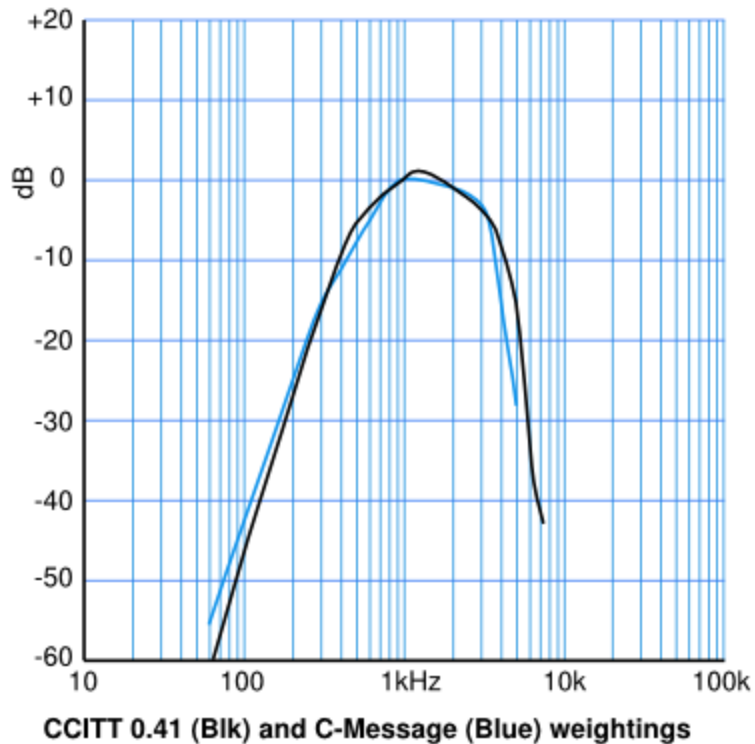
### Off

Turns the post demodulation band-pass filter off.

Key Path	Meas Setup, BPF
<b>Example</b>	AM:BPF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

### CCITT

Sets the post demodulation band-pass filter to CCITT.



Key Path	Meas Setup, BPF
----------	-----------------

<b>Example</b>	AM:BPF CCITT
Readback	CCITT
Initial S/W Revision	Prior to A.02.00

### A-Weighted

Sets the post demodulation band-pass filter to A-Weighted Audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF AWE
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	A-Weighted
Initial S/W Revision	A.14.00

### C-Weighted

Sets the post demodulation band-pass filter to C-Weighted audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CWE
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	C-Weighted
Initial S/W Revision	A.14.00

### C-Message

Sets the post demodulation band-pass filter to C-Message audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CMES
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	C-Message
Initial S/W Revision	A.14.00

### CCIR 1k Weighted

Sets the post demodulation band-pass filter to CCIR-1k weighted filter.

**NOTE**

The CCIR 1k Weighted filter is implemented in the N9063A with an RMS detector, and not the quasi-peak detector (QPD) called for in the ITU standards. A compensation factor is included to yield similar results. This implementation is valid when measuring amplitude of Gaussian noise, or SINAD of a single continuous sine tone (e.g. 1 kHz) in the presence of harmonics and Gaussian noise. The results may not comply with the standard if the input signal is bursty, clicky or impulsive; contains multiple tones; or contains other distortion products (intermodulation, spurs) above the noise level. Use the AF Spectrum results to validate these assumptions. Consider using Agilent U8903A Audio Analyzer if true QPD is required.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CCIR1
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-1k
Initial S/W Revision	A.14.00

**CCIR 2k Weighted**

Sets the post demodulation band-pass filter to CCIR-2k weighted filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CCIR2
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-2k
Initial S/W Revision	A.14.00

**CCIR Un-weighted**

Sets the post demodulation band-pass filter to CCIR un-weighted filter.

The CCIR Un-weighted filter is implemented in the N9063A with an RMS detector, and not the quasi-peak detector (QPD) called for in the ITU standards. A compensation factor is included to yield similar results. This implementation is valid when measuring amplitude of Gaussian noise, or SINAD of a single continuous sine tone (e.g. 1 kHz) in the presence of harmonics and Gaussian noise. The results may not comply with the standard if the input signal is bursty, clicky or impulsive; contains multiple tones; or contains other distortion products (intermodulation, spurs) above the noise level. Use the AF Spectrum results to validate these assumptions. Consider using Agilent U8903A Audio Analyzer if true QPD is required.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CUNW
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-Unweighted
Initial S/W Revision	A.14.00

### De-emphasis (FM and FM Stereo Demod measurement only)

Controls a single-pole filter, usually 6 dB/octave roll off, to counter intentional pre-emphasis in the transmitter. When the De-emphasis state is OFF the hardware digital filter is bypassed, otherwise the setting is applied

US75 is recommended for US commercial FM 75  $\mu$ s pre-emphasis.

The De-emphasis key only appears in the Meas Setup menu for the FM and FM Stereo Demod measurements. It is unavailable for the AM and  $\Phi$ M measurements.

Key Path	Meas Setup, Filters
Remote Command	[ :SENSe ] : FM   FMSTereo : DEEMphasis OFF   US25   US50   US75   US750 [ :SENSe ] : FM   FMSTereo : DEEMphasis ?
Example	FM:DEEM US75 FM:DEEM?
Dependencies	Only available in FM and FM Stereo measurements. Unavailable for AM and PM
Preset	OFF
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Off

Bypasses the De-emphasis filter.

Key Path	Meas Setup, Filters, De-emphasis
Example	FM:DEEM OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

### 25 $\mu$ s

Sets the De-emphasis time constant to 25  $\mu$ s.

Key Path	Meas Setup, Filters, De-emphasis
Example	FM:DEEM US25
Readback	25 $\mu$ s
Initial S/W Revision	Prior to A.02.00

### 50 $\mu$ s

Sets the De-emphasis time constant to 50  $\mu$ s.

Key Path	Meas Setup, Filters, De-emphasis
<b>Example</b>	FM:DEEM US50
Readback	50 $\mu$ s
Initial S/W Revision	Prior to A.02.00

### 75 $\mu$ s

Sets the De-emphasis time constant to 75  $\mu$ s.

Key Path	Meas Setup, Filters, De-emphasis
<b>Example</b>	FM:DEEM US75
Readback	75 $\mu$ s
Initial S/W Revision	Prior to A.02.00

### 750 $\mu$ s

Sets the De-emphasis time constant to 750  $\mu$ sec.

Key Path	Meas Setup, Filters, De-emphasis
<b>Example</b>	FM:DEEM US750
Readback	750 $\mu$ s
Initial S/W Revision	Prior to A.02.00

## Signaling Notch

This key is used to measure the SINAD and FM Hum and Noise Ratio with the sub-audible signaling present on the transmitted signal. When turned on, the signaling is filtered out when calculating the SINAD, SNR, Distortion and RMS deviation.

Key Path	Meas Setup
<b>Remote Command</b>	[:SENSe]:FM:SIGNaling:NOTCh:FREQuency <freq> [:SENSe]:FM:SIGNaling:NOTCh:FREQuency? [:SENSe]:FM:SIGNaling:NOTCh[:STATe] ON OFF 1 0 [:SENSe]:FM:SIGNaling:NOTCh[:STATe]?
<b>Example</b>	FM:SIGN:NOTC:FREQ 250Hz
Notes	You must be in the FM measurement to use this command. Use :CONFigure to set the measurement.

Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	250 Hz OFF
State Saved	Saved in instrument state
Min	50 Hz
Max	300 Hz
Initial S/W Revision	A.14.00

## Demod to Speaker

Controls whether a demodulated audio signal is connected to the speaker or not. This allows the demodulated audio to be turned off without completely disabling (muting) the instrument speaker. When the Analog Demod application is running, the demodulated signal can be heard from the speaker as long as the “Demod to Speaker” function is set to On.

**NOTE** The Windows controls for speaker volume and mute must also be properly set.

This function is shared among all measurements in the mode, but not across other modes.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe ] :SPEaker [ :STATe ] ON OFF 1 0</code> <code>[ :SENSe ] :SPEaker [ :STATe ] ?</code>
<b>Example</b>	SPE OFF Disconnects demodulated audio from speaker circuit.
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Auto BW & Scale

Automatically sets many measurement parameters by pressing one button, based upon the current signal under test. The feature requires that the center frequency be set to the signal of interest, and works best on stable periodic signals. The measurement is preset at the beginning of the Auto BW & Scale operation, with the exception that the user’s Center Frequency and audio Filters are maintained.

The signal is analyzed using an Occupied Bandwidth measurement to automatically set the RF Spectrum Span and Channel Bandwidth to good values. And then it sets the combination of mechanical and electronic attenuation based on the current measured signal level so that clipping will be at a minimum. Once these two steps are done, the software examines the demodulated signal and appropriately sets the Sweep Time and Demod Waveform Scale/Div.

There are no configurable parameters for Auto BW & Scale. The function is pre-configured to work with most real-world use cases.



Key Path	Meas Setup
<b>Remote Command</b>	[ :SENSE ] :AUToscale
<b>Example</b>	AUT
Initial S/W Revision	Prior to A.02.00

## Auto Carrier Frequency

Accurate angle demodulation (FM or PM) depends on precisely identifying the carrier frequency.

For FM, frequency error (carrier offset) results in DC offset of demodulated signal. There's one DC component imposed on the Demod Waveform, which affects the Peak+, Peak- deviation measurement. And there's one DC term in the AF Spectrum, which affects the SINAD measurement.

For PM, frequency error results in phase ramping of demodulated signal, which affects all the subsequent measurements, for example, deviation, SINAD and so on.

When the Auto Carrier Frequency is turned on, the frequency error will be compensated automatically. Note that the Channel BW must be large enough to take the carrier offset effect into consideration.

### Considerations When Using Auto Carrier Frequency

The following situations can bias the frequency error estimation:

- Low frequency modulation, such as a periodic signal with fewer than 10 cycles over the time record.
- Phase discontinuities present in digital communication formats.
- Transients, such as carrier turn-on in the middle of the time record.

In cases where biases are unavoidable, the auto carrier frequency should be turned off. Where possible, lock the analyzer's external reference to a reference coherent with the carrier to eliminate frequency errors.

Key Path	Meas Setup
<b>Remote Command</b>	[ :SENSE ] :FM PM:CARRier:FREQuency:AUTO OFF ON 0 1 [ :SENSE ] :FM PM:CARRier:FREQuency:AUTO?
<b>Example</b>	FM:CARR:FREQ:AUTO ON FM:CARR:FREQ:AUTO?
Notes	If current measurement is AM, this key is blank.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	OFF for FM, and ON for PM.
State Saved	Saved in instrument state.
Range	On   Off
Initial S/W Revision	A.14.00

## Analog Out Scale Adjust

Allows you to adjust the scale factor of the analog out signal from the rear-panel. This function is only available in FM measurement.

Key Path	Meas Setup																			
Remote Command	[ :SENSe ] :FM:ANALog:OUTPut [ :SCALe ] :ADJust <real> [ :SENSe ] :FM:ANALog:OUTPut [ :SCALe ] :ADJust?																			
Example	FM:ANAL:OUTP:ADJ 2.0 FM:ANAL:OUTP:ADJ?																			
Notes	This key sets a factor k that multiplies the scaling factor of the analog out signal. It applies only with FM demodulation. Different instrument with different hardware option has different scale factor as below table.																			
	<table border="1"> <thead> <tr> <th>Instrument</th> <th>Options</th> <th>Scale Factor</th> </tr> </thead> <tbody> <tr> <td>CXA</td> <td>N/A</td> <td><math>k * (1 \text{ V}) / \text{Channel BW}</math></td> </tr> <tr> <td rowspan="2">EXA</td> <td>B40, MPB, or DP2</td> <td><math>k * (4 \text{ V}) / \text{Channel BW}</math></td> </tr> <tr> <td>Others</td> <td><math>k * (1 \text{ V}) / \text{Channel BW}</math></td> </tr> <tr> <td rowspan="2">MXA</td> <td>B40, MPB, or DP2</td> <td><math>k * (4 \text{ V}) / \text{Channel BW}</math></td> </tr> <tr> <td>others</td> <td><math>k * (1 \text{ V}) / \text{Channel BW}</math></td> </tr> <tr> <td>PXA</td> <td>N/A</td> <td><math>k * (4 \text{ V}) / \text{Channel BW}</math></td> </tr> </tbody> </table>	Instrument	Options	Scale Factor	CXA	N/A	$k * (1 \text{ V}) / \text{Channel BW}$	EXA	B40, MPB, or DP2	$k * (4 \text{ V}) / \text{Channel BW}$	Others	$k * (1 \text{ V}) / \text{Channel BW}$	MXA	B40, MPB, or DP2	$k * (4 \text{ V}) / \text{Channel BW}$	others	$k * (1 \text{ V}) / \text{Channel BW}$	PXA	N/A	$k * (4 \text{ V}) / \text{Channel BW}$
Instrument	Options	Scale Factor																		
CXA	N/A	$k * (1 \text{ V}) / \text{Channel BW}$																		
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	others	$k * (1 \text{ V}) / \text{Channel BW}$																		
PXA	N/A	$k * (4 \text{ V}) / \text{Channel BW}$																		
Dependencies	This feature is available only when Option N9063A-AFP is installed. And this key is only available in FM measurement, otherwise it is blank.																			
Preset	1.0																			
State Saved	Saved in instrument state																			
Min	0.5																			
Max	10.0																			
Initial S/W Revision	A.14.00																			

## Limits (FM only)

Opens the Limit Lines menu that contains keys to control limit lines of the current measurement.

**NOTE**

This function only applies to the FM Demod Waveform window of the Attack/Release Time view in the FM measurement.

Key Path	Meas Setup
Notes	The limits only apply to the FM Demod Waveform window of the Attack/Release Time view in FM measurement.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
State Saved	Saved in instrument state.
Initial S/W Revision	A.14.00

## Select Limit (FM only)

Specifies the selected limit. The term “selected limit” is used throughout this document to specify which limit will be affected by the functions.

Key Path	Meas Setup, Limits
Notes	Front panel only. The selected limit is remembered even when not in the Limit Menu.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	Limit 1
State Saved	Saved in instrument state.
Initial S/W Revision	A.14.00

## Limit On/Off (FM only)

Selects whether the limit lines are displayed or not. If no limit line has been recalled when you turn Limit on, the information message “No Limit recalled” appears in the MSG line.

Key Path	Meas Setup, Limits
<b>Remote Command</b>	:CALCulate:FM:LLINe[1] 2 ... 6:DISPlay ON OFF 1 0 :CALCulate:FM:LLINe[1] 2 ... 6:DISPlay?
<b>Example</b>	CALC:FM:LLIN2:DISP ON CALC:FM:LLIN2:DISP?
Notes	The function only applies to the FM Demod Waveform window of the Attack/Release Time view in FM measurement.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	OFF
State Saved	Saved in instrument state.
Range	On Off
Initial S/W Revision	A.14.00

## Delete Limit (FM only)

Deletes the currently selected limit line. Limit data, including secondary parameters such as description, etc., will be cleared and returned to factory preset settings.

When this key is pressed a prompt is placed on the screen that says:

“Please press Enter or OK key to delete limit. Press ESC or Cancel to close this dialog.”

The deletion is only performed if you press OK or Enter; if so, after the deletion, the informational message “Limit deleted” appears in the MSG line.

Key Path	Meas Setup, Limits
<b>Remote Command</b>	:CALCulate:FM:LLINe[1] 2 ... 6:DElete
<b>Example</b>	CALC:FM:LLIN3:DEL Deletes all data for limit line 3
Notes	The function only applies to the FM Demod Waveform window of the Attack/Release Time view in FM measurement.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Initial S/W Revision	A.14.00

### Delete All Limits (FM only)

Deletes all limit lines. All limit data will be cleared and returned to factory preset settings.

When this key is pressed a prompt is placed on the screen that says:

“Please press Enter or OK key to delete all limits. Press ESC or Cancel to close this dialog.”

The deletion is only performed if you press OK or Enter. After a deletion, the informational message “All Limits deleted” appears in the MSG line.

Key Path	Meas Setup, Limits
<b>Remote Command</b>	:CALCulate:FM:LLINe:ALL:DElete
<b>Example</b>	CALC:FM:LLIN:ALL:DEL
Notes	The function only applies to the FM Demod Waveform window of the Attack/Release Time view in FM measurement.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Initial S/W Revision	A.14.00

### Limit Line Control (Remote Command Only)

Defines a list of limit line control values (in time unit) for a given limit line. Up to 999 points may be defined for each limit using the following parameters.

<x> Time values units default to second.

The points query returns the number of points in the time list. It will not be possible to turn on the limit line unless the number of points in the control matches the number of points in the amplitude.

<b>Remote Command</b>	:CALCulate:FM:LLINe[1] 2 ... 6:CONTRol[:DATA] <x>, <x>, ... :CALCulate:FM:LLINe[1] 2 ... 6:CONTRol[:DATA]?
<b>Example</b>	CALC:FM:LLIN:CONT 1ms, 2ms, 2ms, 3ms Describes the X values of a stair-stepped limit line. CALC:FM:LLIN:CONT?
Preset	Unaffected by Preset
State Saved	Saved in instrument state
Initial S/W Revision	A.14.00

<b>Remote Command</b>	:CALCulate:FM:LLINe[1] 2 ... 6:CONTRol:POINts?
<b>Example</b>	CALC:FM:LLIN:CONT:POIN? Returns the number of points in the limit line.
Preset	2
State Saved	Saved in instrument state
Initial S/W Revision	A.14.00

### Limit Line Upper (Remote Command Only)

Defines a list of amplitude values for a given limit line. Changing the number of elements in the list spectrum will automatically turn the limit line off. Up to 999 points may be defined for each limit using the following parameters.

<ampl>Amplitude values units default to Hz.

The points query returns the number of points in the amplitude list. It will not be possible to turn on the limit line unless the number of points in the control matches the number of points in the amplitude.

<b>Remote Command</b>	:CALCulate:FM:LLINe[1] 2 ... 6:UPPer[:DATA] <ampl>, <ampl>, ... :CALCulate:FM:LLINe[1] 2 ... 6:UPPer[:DATA]?
<b>Example</b>	:CALC:FM:LLIN:UPP 10kHz, 10kHz, 20kHz, 20kHz describes the amplitude values of an upper limit line
Preset	Unaffected by Preset
State Saved	Saved in instrument state.
Initial S/W Revision	A.14.00

<b>Remote Command</b>	:CALCulate:FM:LLINe[1] 2 ... 6:UPPer:POINts?
<b>Example</b>	:CALC:FM:LLIN:UPP:POIN? returns the number of points in the upper limit line.
Preset	2
State Saved	Saved in instrument state.
Initial S/W Revision	A.14.00

### SINAD BW

Sets the bandwidth of the signal to calculate SINAD and THD.

Key Path	Meas Setup, More
<b>Remote Command</b>	CALCulate:AM FM PM:SINad:BANDwidth <freq> CALCulate:AM FM PM:SINad:BANDwidth?
<b>Example</b>	CALC:AM:SIN:BAND 50e3

	CALC:AM:SIN:BAND?
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Couplings	Changing the Channel BW always sets the SINAD BW to the half of the Channel BW you entered.
Preset	12.5 kHz
State Saved	Saved in instrument state.
Min	1 Hz
Max	The half of the Channel BW.
Initial S/W Revision	A.14.00

### Meas Preset

Returns the variables in the current measurement to their preset values.

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

## Mode

See "Mode" on page 210

## 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 553 for more information.

Key Path	Front-panel key
Remote Command	:SYSTem:PRESet
Example	:SYST:PRES
Notes	*RST is preferred over :SYST:PRES for remote operation. *RST does a Mode Preset, as done by the :SYST:PRES command, and it sets the measurement mode to Single measurement rather than Continuous for optimal remote control throughput. Clears all pending OPC bits. The Status Byte is set to 0.
Couplings	A Mode Preset aborts the currently running measurement, activates the default measurement, and gets the mode to a consistent state with all of the default couplings set.
Backwards Compatibility Notes	In the X-Series, the legacy "Factory Preset" has been replaced with Mode Preset, which only presets the currently active mode, not the entire instrument. In the X-Series, the way to preset the entire instrument is by using System, Restore System Defaults All, which behaves essentially the same way as restore System Defaults does on ESA and PSA. There is also no "Preset Type" as there is on the PSA. There is a green Mode Preset front-panel key that does a Mode Preset and a white-with-green-letters User Preset front-panel key that does a User Preset. The old PRESet:TYPE command is ignored (without generating an error), and SYST:PRES without a parameter does a Mode Preset, which should cover most backward code compatibility issues. The settings and correction data under the Input/Output front-panel key (examples: Input Z Corr, Ext Amp Gain, etc.) are no longer part of any Mode, so they will not be preset by a Mode Preset. They are preset using Restore Input/Output Defaults, Restore System Defaults All. Note that because User Preset does a Recall State, and all of these settings are saved in State, they ARE recalled when using



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

## How-To Preset

The table below shows all possible presets, their corresponding SCPI commands and front-panel access (key paths). Instrument settings depend on the current measurement context. Some settings are local to the current measurement, some are global (common) across all the measurements in the current mode, and some are global to all the available modes. In a similar way, restoring the settings to their preset state can be done within the different contexts.

Auto Couple - is a measurement local key. It sets all Auto/Man parameter couplings in the measurement to Auto. Any Auto/Man selection that is local to other measurements in the mode will not be affected.

Meas Preset - is a measurement local key. Meas Preset resets all the variables local to the current measurement except the persistent ones.

Mode Preset - resets all the current mode's measurement local and measurement global variables except the persistent ones.

Restore Mode Defaults - resets ALL the Mode variables (and all the Meas global and Meas local variables), including the persistent ones.

Type Of Preset	SCPI Command	Front Panel Access
Auto Couple	:COUPlE ALL	Auto Couple front-panel key
Meas Preset	:CONFIgure:<Measurement>	Meas Setup Menu
Mode Preset	:SYSTem:PRESet	Mode Preset (green key)
Restore Mode Defaults	:INSTrument:DEFault	Mode Setup Menu
Restore All Mode Defaults	:SYSTem:DEFault MODEs	System Menu; Restore System Default Menu
*RST	*RST	not possible (Mode Preset with Single)
Restore Input/Output Defaults	:SYSTem:DEFault INPut	System Menu; Restore System Default Menu
Restore Power On Defaults	:SYSTem:DEFault PON	System Menu; Restore System Default Menu
Restore Alignment Defaults	:SYSTem:DEFault ALIGn	System Menu; Restore System Default Menu
Restore Miscellaneous Defaults	:SYSTem:DEFault MISC	System Menu; Restore System Default Menu
Restore All System Defaults	:SYSTem:DEFault [ALL] :SYSTem:PRESet:PERSistent	System Menu; Restore System Default Menu
User Preset	:SYSTem:PRESet:USER	User Preset Menu
User Preset All Modes	:SYSTem:PRESet:USER:ALL	User Preset Menu

9 FM Demod Measurement  
Mode Preset

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 231

## Peak Search

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.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MAXimum
<b>Example</b>	CALC:AM:MARK2:MAX
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Next Peak

Moves the selected marker to the peak that has the next highest amplitude less than the current marker value. If there is no valid peak lower than the current marker position, an error 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. In Analog Demod, the Peak Threshold and Peak Excursion functions are both OFF. If there is no valid peak, an error 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.

<b>Key Path</b>	Peak Search
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MAXimum:NEXT
<b>Example</b>	CALC:AM:MARK2:MAX:NEXT Selects marker 2 and moves it to the peak that is closest in amplitude to the current peak, but the next lower value.
<b>Remote Command Notes</b>	Sending this command selects the specified marker
<b>State Saved</b>	Not part of instrument saved state
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Pk-Pk Search

Finds and displays the amplitude and frequency (or time, if on a time domain 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. This function turns on the reference marker and sets its mode to Fixed if it is not already on. (These markers may be on two different traces.)

When peak-to-peak search is successful, a message is displayed on the message line.

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. It then performs the peak-to-peak function.

Key Path	Peak Search
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:PTPeak
<b>Example</b>	CALC:AM:MARK:PTP CALC:AM:MARK:Y? Queries the delta amplitude value for marker 1.
Notes	Turns on the Marker $\Delta$ active function.
Remote Command Notes	Sending this command selects the specified marker.
Couplings	Selected marker becomes a delta marker if not already in delta mode..
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Min Search

Moves the selected marker to the minimum y-axis value on the current trace. 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:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MINimum
<b>Example</b>	CALC:AM:MARK:MIN selects marker 1 and moves it to the minimum amplitude value.
Remote Command Notes	Sending this command selects the specified marker.
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

9 FM Demod Measurement  
Print

Print

See "Print" on page 241

## Quick Save

The Quick Save front-panel key repeats the most recent save that was performed from the Save menu, with the following exceptions:

- Register saves are not remembered as Saves for the purpose of the Quick Save function
- If the current measurement does not support the last non-register save that was performed, an informational message is generated, “File type not supported for this measurement”

Quick Save repeats the last type of qualified save (that is, a save qualified by the above criteria) in the last save directory by creating a unique filename using the Auto File Naming algorithm described below.

If Quick Save is pressed after startup and before any qualified Save has been performed, the Quick Save function performs a Screen Image save using the current settings for Screen Image saves (current theme, current directory), which then becomes the “last save” for the purpose of subsequent Quick Saves.

The Auto File Naming feature automatically generates a file name for use when saving a file. The filename consists of a prefix and suffix separated by a dot, as is standard for the Windows® file system. A default prefix exists for each of the available file types:

Type	Default Prefix	Menu
State	State_	(Save/Recall)
Trace + State	State_	(Save/Recall)
Screen	Screen_	(Save/Recall)
Amplitude Corrections	Ampcor_	(Import/Export)
Traces	Trace_	(Import/Export)
Limit Lines	LLine_	(Import/Export)
Measurement Result	MeasR_	(Import/Export)
Capture Buffer	CapBuf_	(Import/Export)

A four digit number is appended to the prefix to create a unique file name. The numbering sequence starts at 0000 within each Mode for each file type and updates incrementally to 9999, then wraps to 0000 again. It remembers where it was through a Mode Preset and when leaving and returning to the Mode. It is reset by Restore Misc Defaults and Restore System Defaults and subsequent running of the instrument application. So, for example, the first auto file name generated for State files is State\_0000.state. The next is State\_0001, and so forth.

One of the key features of Auto File Name is that we guarantee that the Auto File Name will never conflict with an existing file. The algorithm looks for the next available number. If it gets to 9999, then it looks for holes. If it find no holes, that is no more numbers are available, it gives an error.

For example, if when we get to State\_0010.state there is already a State\_0010.state file in the current directory, it advances the counter to State\_0011.state to ensure that no conflict will exist (and then it verifies that State\_0011.state also does not exist in the current directory and advances again if it does, and so forth).

If you enter a file name for a given file type, then the prefix becomes the filename you entered instead of the default prefix, followed by an underscore. The last four letters (the suffix) are the 4-digit number.

For example, if you save a measurement results file as “fred.csv”, then the next auto file name chosen for a measurement results save will be fred\_0000.csv.

**NOTE**

Although 0000 is used in the example above, the number that is used is actually the current number in the Meas Results sequence, that is, the number that would have been used if you had not entered your own file name.

---

**NOTE**

If the filename you entered ends with \_dddd, where d=any number, making it look just like an auto file name, then the next auto file name picks up where you left off with the suffix being dddd + 1.

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Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00



## Recall

The Recall menu lets you choose what you want to recall, and where you want to recall it from. Among the types of files you can recall are **States and Traces**. In addition, an Import (Data) option lets you recall a number of data types stored in CSV files (as used by Excel and other spreadsheet programs).

The default paths for Recall are data type dependent and are the same as for the Save key.

Key Path	Front-panel key
Notes	<p>No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe &lt;filename&gt;.</p> <p>If you try to recall a State file for a mode that is not licensed or not available in the instrument, an error message will occur and the state will not change.</p>
Backwards Compatibility Notes	<p>In legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly (since User Preset is actually loading a state), it was possible to do a User Preset without affecting the trace data, limit lines or correction data.</p> <p>In the X-Series, "state" always includes all of this data; so whenever state is loaded, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.</p>
Backwards Compatibility Notes	<p>Recall for the X-Series supports backward compatibility in the sense that you can recall a state file from any X-Series model number and any version of X-Series software. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. If you try to recall a state file onto an instrument with less capability than what was available on the instrument during the save, the recall will ignore the state it doesn't support and it will limit the recalled setting to what it allows.</p> <p>Example: if the saved state includes preamp ON, but the recalling instrument does not have a preamp; the preamp is limited to OFF. Conversely, if you save a state without a preamp, the preamp is OFF in the state file. When this saved file is recalled on an instrument with a licensed preamp, the preamp is changed to OFF. Another example is if the saved state has center frequency set to 20 GHz, but the instrument recalling the saved state is a different model and only supports 13.5 GHz. In this case, the center frequency is limited along with any other frequency based settings. Since the center frequency can't be preserved in this case, the recall limiting tries to at least preserve span to keep the measurement setup as intact as possible.</p> <p>It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user.</p> <p>Note that there is no state file compatibility outside of the X-Series. For example, you cannot recall a state file from ESA or PSA.</p>
Initial S/W Revision	Prior to A.02.00

## State

The Recall State menu lets you choose a register or file from which to recall the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings that were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the

additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either a Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

Since each state file is only for one Mode, the settings for other Modes are unaffected when it is loaded. Recall State will cause a mode switch if the state being recalled is not from the current active mode.

After the recall completes, the message "File <filename> recalled" or "Recalled State Register <register number>" is displayed.

For rapid recalls, the State menu lists 16 registers that you can choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files is:

My Documents\<<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

See ["More Information" on page 563](#).

<b>Key Path</b>	Recall
<b>Mode</b>	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.
<b>Notes</b>	<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> <li>• Executes a *CLS</li> </ul> <p>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</p>

	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.

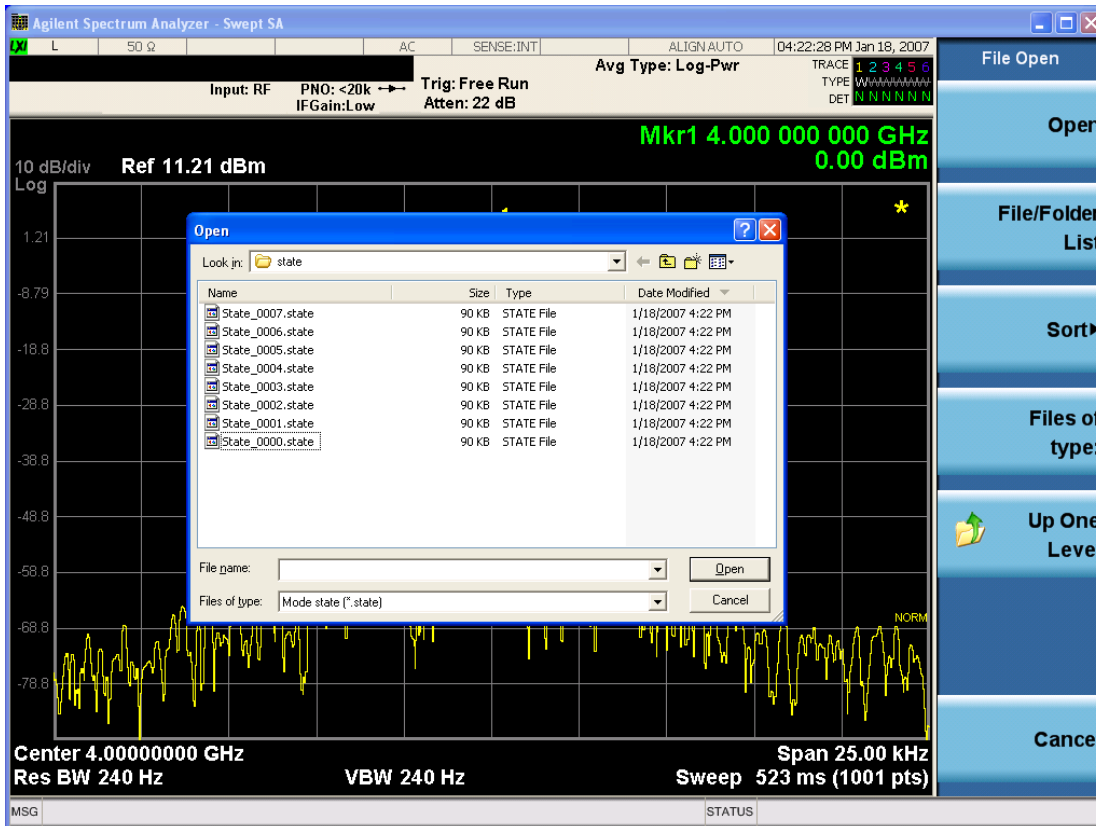
The following table describes the Trace Save and Recall possibilities:

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.

## 9 FM Demod Measurement Recall



Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

### Open

Performs the recall of the specified file. While the recall is being performed, the floppy icon appears briefly in the Meas bar.

### File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Look In.

### Look In

The Look In field shows the path from which the file will be recalled and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Look In field** first uses the last path from the Save As dialog **Save In:** path for that same file type. There is no softkey for directly navigating to the Look In field, but you can use the left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

### Sort

Accesses a menu that enables you to sort the files within the File Open dialog. Only one sorting type can be selected at a time and the sorting happens immediately. The sorting types are By Date, By Name, By extension, and By Size.

#### Files of Type

This field shows the file suffix for the type of file you have selected to recall. For example, if you navigated here while recalling State, "Mode state (\*.state)" is in the field. If you navigated here while recalling Trace, ""Mode state (\*.trace)" is in the field. If you navigated here while importing a trace data file, "Trace Data (\*.csv)" is in the field. For some file types, there is more than one choice in the dropdown menu, which you can select by using the up and down arrow keys and Enter.

#### Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. When pressed, it causes the file and folder list to navigate up one level in the directory structure. The Backspace key does the same thing.

#### Cancel

This key corresponds to the Cancel selection in the dialog. It causes the current **Open** request to be cancelled. The ESC key does the same thing.

Key Path	Recall, State
Notes	Brings up the Open dialog for recalling a State Save Type
Initial S/W Revision	Prior to A.02.00

### 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
<b>Example</b>	*RCL 1
Range	1-16 from front panel, 1-128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the 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.
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

## Limit

This key selects Limit Lines as the data type to be imported. When pressed a second time, it brings up the Limits Menu, which lets you select into which Limit the data will be imported.

A set of preloaded Limits files can be found in the directory

/My Documents/ADEMODO/data/Limits.

This function is only available for FM Demod Waveform window in FM measurement. There will be 6 limit lines for it. When in other windows in FM measurement or all windows in AM, PM and FM Stereo measurement, this key will be grayed out.

See "[Limits File Content](#)" on page 568

Key Path	Recall, Data
Remote Command	:MMEMory:LOAD:LIMit LLINE1   LLINE2   LLINE3   LLINE4   LLINE5   LLINE6,<filename>
Example	:MMEM:LOAD:LIM LLINE2, "myLimitLine2.csv" imports the 2nd Limit Line from the file myLimitLine2.csv in the current path. The default path is My Documents\ADEMOD\data\limits
Dependencies	This feature is available only when Option N9063A-AFP is installed. Errors are reported if the file is empty or missing, or if the file type does not match, or if there is a mismatch between the file type and the destination data type. If any of these occur during manual operation, the analyzer returns to the Import Data menu and the File Open dialog goes away.
Couplings	When a limit line is loaded from mass storage, it is automatically turned Limit On/Off (under Meas Setup, Limits) on. This allows you to see it, thus confirming the load.
Readback	Selected Limit Line
Status Bits/OPC dependencies	Sequential - aborts the current measurement
Initial S/W Revision	A.14.00

## Limits File Content

Limits file is a data file with a .csv extension.

.csv file format

Except for information in quotes, limit line files are not case sensitive. Information in bold is required verbatim; other text is example text, and italic text is commentary which should not be present in the file.

The first five lines are system-required header lines, and must be in the correct order.

<b>Limit</b>	<i>Data file type name</i>
<b>"[AIS BS EN 61097-1]"</b>	<i>File Description</i>
<b>"GMDSS limit mask"</b>	<i>Comment</i>
<b>A.14.00.R0001,N9020A</b>	<i>Instrument Version, Model Number</i>
<b>P26 B25 EA3,01</b>	<i>Option List, File Format Version</i>

The next few lines describe the parameters; on import they can be in any order. If some parameters are missing, they will revert to the default.



<b>Type, None</b>	<i>None; None means doesn't check pass/fail</i>
<b>X Axis Unit, S</b>	<i>S; all other time units should be converted appropriately</i>
<b>Amplitude Unit, Hz</b>	<i>Hz; all other frequency units should be converted appropriately</i>
<b>X Axis Interpolation, Linear</b>	<i>Logarithmic Linear</i>
<b>Amplitude Interpolation, Linear</b>	<i>Logarithmic Linear</i>

The remaining lines describe the data. Each line in the file represents an X-Y pair. The X values should be monotonically non-decreasing, although adjacent lines in the file can have the same X value as an aid to building a stair-stepped limit line. To specify a region over which there is no limit, use +999,999,999 Hz for upper limits or -999,999,999 for lower limits.

The data region begins with the keyword DATA:

DATA

200.000000, 10.00

300.000000, 10.00

300.000000, 20.00

500.000000, 20.00

### Limit Selection

These keys let you pick which Limit Line to import the data into; either 1, 2, 3, 4, 5 or 6. The default is the currently selected limit. Once selected, the key returns back to the Import Data menu and the selected Limit Line number is annotated on the key. Now you have selected exactly what needs to be imported. In order to trigger an import of the selected Limit Line, you must select the Open key in the Import Data menu.

An example of using this menu is: If you select 2 and continue to the File Open menu, Limit Line 2 will be imported from the file selected or entered in File Name option in the File Open dialog.

Key Path	Recall, Data, Limit Line
Notes	Auto return
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	LLINE1
State Saved	The selected limit number is saved in instrument state
Initial S/W Revision	A.14.00

## 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 570

Key Path	Front-panel key
Remote Command	:INITiate[:IMMediate] :INITiate:REStart
Example	:INIT:IMM :INIT:REST
Notes	:INITiate:REStart and :INITiate:IMMediate perform exactly the same function.
Couplings	Resets average/hold count k. For the first sweep overwrites all active (update=on) traces with new current data. For application modes, it resets other parameters as required by the measurement.
Status Bits/OPC dependencies	This is an Overlapped command. The STATus:OPERation register bits 0 through 8 are cleared. The STATus:QUESTionable register bit 9 (INTegrity sum) is cleared. The SWEEPING bit is set. The MEASURING bit is set.
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, the Restart hardkey and the INITiate:REStart command restart trace averages (displayed average count reset to 1) for a trace in Clear Write, but did not restart Max Hold and Min Hold.  In the X-Series, the Restart hardkey and the INITiate:REStart command restart not only Trace Average, but MaxHold and MinHold traces as well.  For wireless comms modes in ESA and PSA, the Restart hardkey and the INITiate:REStart command restart every measurement, which includes all traces and numeric results. There is no change to this operation.
Initial S/W Revision	Prior to A.02.00

### More Information

The **Restart** function first aborts the current sweep/measurement as quickly as possible. It then resets the sweep and trigger systems, sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met.

If the analyzer is in the process of aligning when **Restart** is executed, the alignment finishes before the restart function is performed.

Even when set for Single operation, multiple sweeps may be taken when Restart is pressed (for example, when averaging/holding is on). Thus when we say that **Restart** "restarts a measurement," we may mean:

- It restarts the current sweep
- It restarts the current measurement
- It restarts the current set of sweeps if any trace is in Trace Average, Max Hold or Min Hold
- It restarts the current set of measurements if Averaging, or Max Hold, or Min Hold is on for the measurement
- depending on the current settings.

With **Average/Hold Number** (in **Meas Setup** menu) set to 1, or Averaging off, or no trace in Trace Average or Hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met; and the analyzer stops sweeping once that sweep has completed. However, with **Average/Hold Number** >1 and at least one trace set to **Trace Average, Max Hold, or Min Hold (SA Measurement)** or **Averaging on (most other measurements)**, multiple sweeps/data acquisitions are taken for a single measurement. The trigger condition must be met prior to each sweep. The sweep is stopped when the average count  $k$  equals the number  $N$  set for **Average/Hold Number**. A measurement average usually applies to all traces, marker results, and numeric results; but sometimes it only applies to the numeric results.

Once the full set of sweeps has been taken, the analyzer will go to idle state. To take one more sweep without resetting the average count, increment the average count by 1, by pressing the step up key while **Average/Hold Number** is the active function, or sending the remote command `CALC:AVER:TCON UP`.

## Save

The Save menu lets you choose what you want to save and where you want to save it. Among the types of files you can save are **States**, **Traces**, and **Screen Images**. In addition, an Export (Data) option lets you save a number of data types as CSV files for easy import into Excel and other spreadsheet programs.

Key Path	Front-panel key
Mode	All
Notes	No remote command for this key specifically, but the :MMEM:STORe command is available for specific file types. An example is :MMEM:STOR:STATe <filename>.
Initial S/W Revision	Prior to A.02.00

## State

The Save State menu lets you choose a register or file for saving the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings which were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, Verbose SCPI) are not affected by either Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

After the save completes, the message "File <filename> saved" or "State Register <register number> saved" is displayed.

For rapid saving, the State menu lists 16 registers to save to. Pressing a Register key initiates the save. You can also select a file to save to.

The default path for all State Files is:

My Documents\<<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

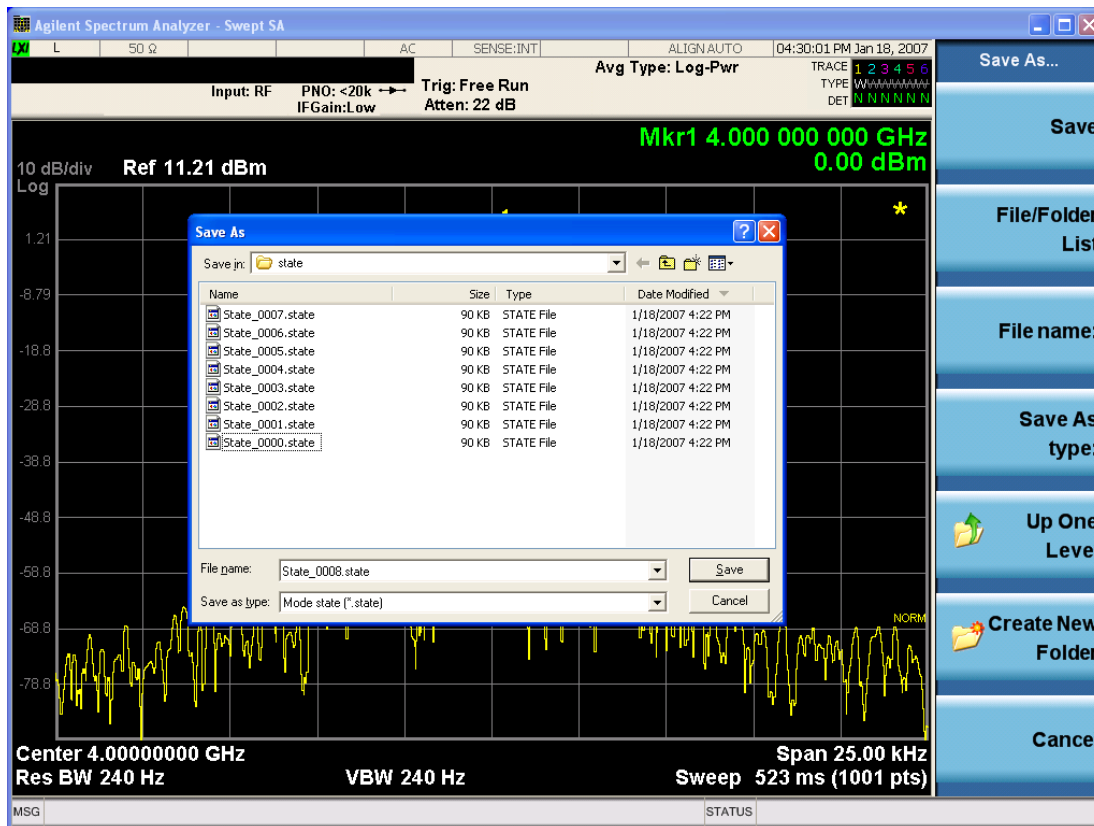
Key Path	Save
Mode	All
Remote Command	:MMEMory:STORe:STATe <filename>
Example	MMEM:STOR:STATe "MyStateFile.state" This stores the current instrument state data in the file MyStateFile.state in the default directory.
Notes	Both single and double quotes are supported for any filename parameter over remote. 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>
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 832](#) 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 575](#)

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

The Analog Demod Mode Export Data options include Traces and Measurement Results.

Key Path	Save, Data
Remote Command Notes	No SCPI command directly controls the Data Type that this key controls. The Data Type is included as part of the MMEM:STORe commands.
Preset	Trace; is not affected by a Preset, but is reset during Restore Mode Defaults and survives Power cycles.
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

## AM/FM/ $\Phi$ M Trace

Selects Trace as the data type to be exported with this save request. This key brings up the Trace menu that enables you to select one of the following traces:

- RF Spectrum (RFSPectrum)
- Demod (DEMod)
- Demod Avg (DAVerage)
- Demod Max (DMAXimum)
- Demod Min (DMINimum)

- AF Spectrum (AFSPectrum)
- RF Envelope (RFENvelope) --- only available in FM measurement
- Demod Raw (DRAW) --- only available in FM measurement

Once you select a trace, the menu returns back to the Data menu and the name of the selected trace is annotated on the Trace key. Now that you have selected exactly what needs to be saved, to trigger a save of the selected trace, you must select the Save As key in the Data menu.

If the Demod Min trace, Demod Max trace, or Demod Avg trace is exported when the Average/Hold Num feature is turned off, the resulting data will be default values.

The trace data file is a .csv file containing the data for one trace, suitable for import into spreadsheet software. There is a header block, followed by metadata that includes the parameters necessary to recreate the measurement, followed by a DATA block that contains the x,y data for the specified trace. Each line in the metadata includes the parameter, followed by a comma, followed by the parameter value. The metadata includes the following information:

Parameter	
Measurement †	AM FM PM
Trace	AM PM: AF Spectrum RF Spectrum Demod  Demod Ave Demod Min Demod Max FM: AF Spectrum RF Spectrum Demod  Demod Ave Demod Min Demod Max RF Envelope Demod Raw
X Axis Unit	Hz S
Y Axis Unit	dBm % Hz Rad
Center Frequency †	[units of Hz]
Channel BW †	[units of Hz]
Average State †	Off On
Average Count	#
HPF/BPF †	Off HPF20 HPF50 HPF300 HPF400 CCITT AWEighting  CWEighting CMESsage CCIR1k CCIR2k CUNWeighting
LPF †	Off LPF300 LPF3K LPF10K LPF15K LPF30K LPF80K LPF300K LPF100K M500K
Attenuation †	[units of dB]
RF Coupling †	AC DC
Ref Level	[units of Y Axis Unit]
RF Span †	[units of Hz]
RF Res Bandwidth †	[units of Hz]
Sweep Time †	[units of S]
AF Start Freq	[units of Hz]

AF Stop Freq †	[units of Hz]
AF Res Bandwidth †	[units of Hz]
Trigger Source †	Off Ext1 Ext2
Trigger Level †	[units of V]
Trigger Slope †	Positive Negative
Trigger Delay †	[units of S]
PreAmp State †	Off On
PreAmp Band †	Low High
Input Z Correction †	50 75
RF Calibrator	Off 50 MHz 4.8 GHz Comb
External Gain	[units of dB]
Auto Carrier Frequency †	Off On
Auto Carrier Phase †	Off On

† Changing this parameter requires a measurement restart.

Note that all metadata is stored for each trace. After the metadata, the keyword DATA occurs on its own line, followed by the data (one X, Y pair per line).

Key Path	Save, Data
Notes	The first key press selects traces out of the 1-of-N file type options. The second key press brings up the Traces menu so you can select which trace you want to export.
Preset	RF Spectrum; is not affected by a Preset, but is reset during Restore Mode Defaults and survives Power cycles.
State Saved	Saved in instrument state.
Readback	Selected Trace table
Readback line	RF Spectrum, Demod, Demod Avg, Demod Max, Demod Min, AF Spectrum, RF Envelope, Demod Raw
Initial S/W Revision	Prior to A.02.00

## Measurement Results

The file format of the .csv Measurement Results file is shown in the table below. If any metrics are off, or there is no valid value, they will appear as not a number (9.91 e37)

AM	FM and PM
Carrier Power	Carrier Power

<b>AM</b>	<b>FM and PM</b>
Carrier Frequency Error (0)	Carrier Frequency Error
Modulation Rate	Modulation Rate
SINAD value	SINAD value
Distortion/Total Voltage (rms)	Distortion/Total Voltage (rms)
Total Harmonic Distortion	Total Harmonic Distortion
Mod Depth (Peak+)	Deviation (Peak+)
Mod Depth (Peak-)	Deviation (Peak-)
Mod Depth (Pk-Pk)/2	Deviation (Pk-Pk)/2
Mod Depth (RMS)	Deviation (RMS)
Mod Depth (Peak+) Max Hold	Deviation (Peak+) Max Hold
Mod Depth (Peak-) Max Hold	Deviation (Peak-) Max Hold
Mod Depth (Pk-Pk)/2 Max Hold	Deviation (Pk-Pk)/2 Max Hold
Mod Depth (RMS) Max Hold	Deviation (RMS) Max Hold
RMS Ratio (only valid for Metrics Setting of RMS Ratio)	RMS Ratio (only valid for Metrics Setting of RMS Ratio)
Ratio Reference (only valid for Metrics Setting of RMS Ratio)	Ratio Reference (only valid for Metrics Setting of RMS Ratio)

For FM Stereo, the results are

RF Carrier Power, RF Carrier Frequency Error, 38 kHz Carrier Frequency Error, 38 kHz Carrier Phase Error, Left To Right, Mono To Stereo,

MPX SINAD value, MPX Distortion/Total Voltage (rms), MPX Deviation (Peak+), MPX Deviation (Peak-), MPX Deviation (Pk-Pk)/2, MPX Deviation (RMS), MPX Deviation (Peak+) Max Hold, MPX Deviation (Peak-) Max Hold, MPX Deviation (Pk-Pk)/2 Max Hold, MPX Deviation (RMS) Max Hold, MPX RMS Ratio (only valid for Metrics Setting of RMS Ratio), MPX Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Mono Modulation Frequency, Mono SINAD value, Mono Distortion/Total Voltage (rms), Mono Deviation (Peak+), Mono Deviation (Peak-), Mono Deviation (Pk-Pk)/2, Mono Deviation (RMS), Mono Deviation (Peak+) Max Hold, Mono Deviation (Peak-) Max Hold, Mono Deviation (Pk-Pk)/2 Max Hold, Mono Deviation (RMS) Max Hold, Mono RMS Ratio (only valid for Metrics Setting of RMS Ratio), Mono Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Stereo Modulation Frequency, Stereo Deviation (Peak+), Stereo Deviation (Peak-), Stereo Deviation (Pk-Pk)/2, Stereo Deviation (RMS), Stereo Deviation (Peak+) Max Hold, Stereo Deviation (Peak-) Max Hold, Stereo Deviation (Pk-Pk)/2 Max Hold, Stereo Deviation (RMS) Max Hold, Stereo RMS Ratio (only valid for Metrics Setting of RMS Ratio), Stereo Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Left Modulation Frequency, Left SINAD value, Left Distortion/Total Voltage (rms), Left Total Harmonic Distortion, Left Deviation (Peak+), Left Deviation (Peak-), Left Deviation (Pk-Pk)/2, Left Deviation (RMS), Left Deviation (Peak+) Max Hold, Left Deviation (Peak-) Max Hold, Left Deviation (Pk-Pk)/2 Max Hold, Left Deviation (RMS) Max Hold, Left RMS Ratio (only valid for Metrics Setting of RMS Ratio), Left Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Right Modulation Frequency, Right SINAD value, Right Distortion/Total Voltage (rms), Right Total Harmonic Distortion, Right Deviation (Peak+), Right Deviation (Peak-), Right Deviation (Pk-Pk)/2, Right Deviation (RMS), Right Deviation (Peak+) Max Hold, Right Deviation (Peak-) Max Hold, Right Deviation (Pk-Pk)/2 Max Hold, Right Deviation (RMS) Max Hold, Right RMS Ratio (only valid for Metrics Setting of RMS Ratio), Right Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Pilot Modulation Frequency, Pilot Deviation (Peak+), Pilot Deviation (Peak-), Pilot Deviation (Pk-Pk)/2, Pilot Deviation (RMS), Pilot Deviation (Peak+) Max Hold, Pilot Deviation (Peak-) Max Hold, Pilot Deviation (Pk-Pk)/2 Max Hold, Pilot Deviation (RMS) Max Hold, Pilot RMS Ratio (only valid for Metrics Setting of RMS Ratio), Pilot Ratio Reference (only valid for Metrics Setting of RMS Ratio),

RDS Deviation (Peak+), RDS Deviation (Peak-), RDS Deviation (Pk-Pk)/2, RDS Deviation (RMS), RDS Deviation (Peak+) Max Hold, RDS Deviation (Peak-) Max Hold, RDS Deviation (Pk-Pk)/2 Max Hold, RDS Deviation (RMS) Max Hold, RDS RMS Ratio (only valid for Metrics Setting of RMS Ratio), RDS Ratio Reference (only valid for Metrics Setting of RMS Ratio), RDS Error Block Count, RDS Total Block Count, RDS BLER (Block Error Rate).

Key Path	Save, Data
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 844 in Save, State for a full description of this dialog and menu.

The default path for saving files is:

For all of the Trace Data Files:

My Documents\<<mode name>\data\traces

For all of the Limit Data Files:

My Documents\<<mode name>\data\limits

For all of the Measurement Results Data Files:

My Documents\<<mode name>\data\<<measurement name>\results

For all of the Capture Buffer Data Files:

My Documents\<<mode name>\data\captureBuffer

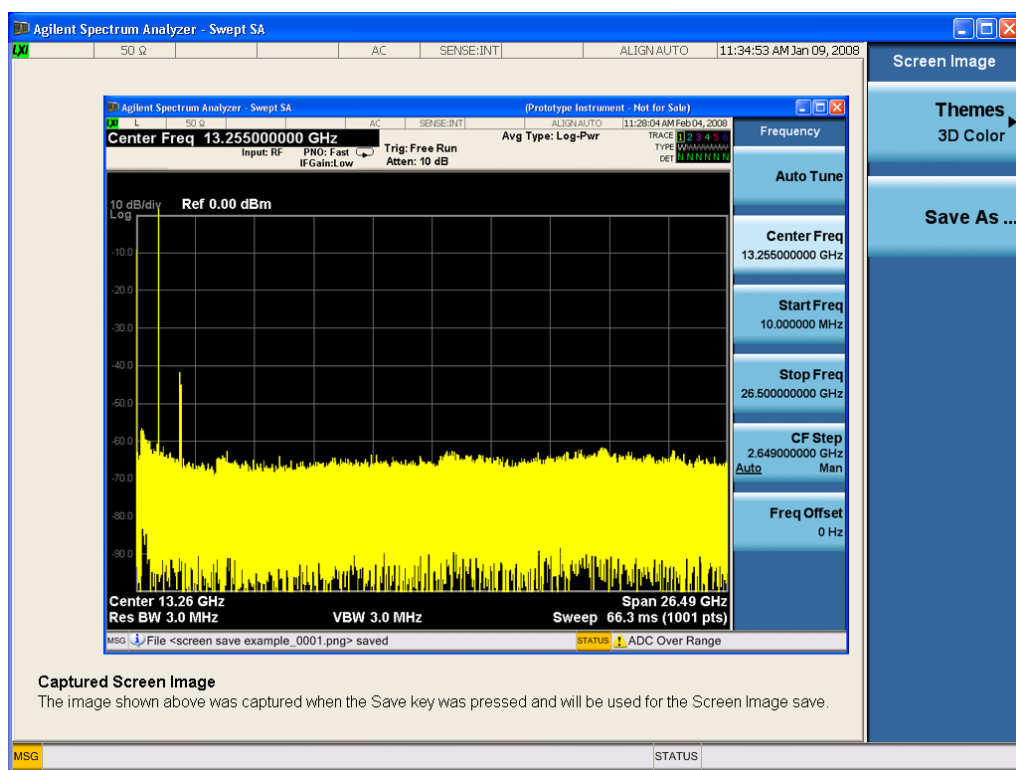
Key Path	Save, Data
Mode	All
Notes	The key location is mode-dependent and will vary. Brings up the Save As dialog for saving a <mode specific> Save Type. The save is performed immediately and does not wait until the measurement is complete.
Initial S/W Revision	Prior to A.02.00

## Screen Image

Pressing Screen Image accesses a menu of functions that enable you to specify a format and location for the saved screen image. It brings up a menu that allows you to specify the color scheme of the Screen Image (Themes) or navigate to the Save As dialog to perform the actual save.

Screen Image files contain an exact representation of the analyzer display. They cannot be loaded back onto the analyzer, but they can be loaded into your PC for use in many popular applications.

The image to be saved is actually captured when the Save front panel key is pressed, and kept in temporary storage to be used if you ask for a Screen Image save. When the Screen Image key is pressed, a "thumbnail" of the captured image is displayed, as shown below:



When you continue on into the Save As menu and complete the Screen Image save, the image depicted in the thumbnail is the one that gets saved, showing the menus that were on the screen before going into the Save menus. The save is performed immediately and does not wait until the measurement is complete.

After you have completed the save, the Quick Save front-panel key lets you quickly repeat the last save performed, using an auto-named file, with the current screen data.

### NOTE

For versions previous to A.01.55, if you initiate a screen image save by navigating through the Save menus, the image that is saved will contain the Save menu softkeys, not the menus and the active function that were on the screen when you first pressed the Save front panel key.

---

Key Path

Save

---

Mode	All
<b>Remote Command</b>	:MMEMory:STORe:SCReen <filename>
<b>Example</b>	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
Initial S/W Revision	Prior to A.02.00

## Themes

Accesses a menu of functions that enable you to choose the theme to be used when saving the screen image.

The **Themes** option is the same as the **Themes** option under the **Display** and **Page Setup** dialogs. It allows you to choose between themes to be used when saving the screen image.

Key Path	Save, Screen Image
<b>Remote Command</b>	:MMEMory:STORe:SCReen:THEMe TDColor   TDMonochrome   FColor   FMONochrome  :MMEMory:STORe:SCReen:THEMe?
<b>Example</b>	:MMEM:STOR:SCR:THEM TDM
Preset	3D Color; Is not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.
Readback	3D Color   3D Mono   Flat Color   Flat Mono
Backwards Compatibility Notes	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if you selected Reverse Bitmap AND a black & white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
Initial S/W Revision	Prior to A.02.00

## 3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

Key Path	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

### 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 844 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\`<mode name>`\screen.

where `<mode name>` is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00



## Mass Storage Catalog (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:CATalog? [<directory_name>]
Notes	<p>The string must be a valid logical path.</p> <p>Queries disk usage information (drive capacity, free space available) and obtains a list of files and directories in a specified directory in the following format: &lt;numeric_value&gt;,&lt;numeric_value&gt;,{&lt;file_entry&gt;}</p> <p>It returns two numeric parameters and as many strings as there are files and directories. The first parameter indicates the total amount of storage currently used in bytes. The second parameter indicates the total amount of storage available, also in bytes. The &lt;file_entry&gt; is a string. Each &lt;file_entry&gt; indicates the name, type, and size of one file in the directory list: &lt;file_name&gt;,&lt;file_type&gt;,&lt;file_size&gt;</p> <p>As the windows file system has an extension that indicates file type, &lt;file_type&gt; is always empty. &lt;file_size&gt; provides the size of the file in bytes. For directories, &lt;file_entry&gt; is surrounded by square brackets and both &lt;file_type&gt; and &lt;file_size&gt; are empty</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Change Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:CDIRectory [<directory_name>] :MMEMory:CDIRectory?
Notes	<p>The string must be a valid logical path.</p> <p>Changes the default directory for a mass memory file system. The &lt;directory_name&gt; parameter is a string. If no parameter is specified, the directory is set to the *RST value.</p> <p>At *RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal.</p> <p>Query returns full path of the default directory.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Copy (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:COPY <string>,<string>[,<string>,<string>]
Notes	<p>The string must be a valid logical path.</p> <p>Copies an existing file to a new file or an existing directory to a new directory.</p> <p>Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination.</p> <p>The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the</p>

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source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.

This command will generate an "access denied" error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.

---

### Mass Storage Device Copy (Remote Command Only)

This command transfers data to/from a file and a peripheral device.

---

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:COpy:DEvice <source_string>,<dest_string>
Notes	The strings must be a valid logical path or a valid device keyword. If the dest_string is a device keyword, the data is copied from the source file to the device. If the source_string is a device keyword, the data is copied to the source file from the device. Valid device keywords are: SNS (smart noise source) An error is generated if the file or device is not found.

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### Mass Storage Delete (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:DELeTe <file_name>[,<directory_name>]
Notes	The string must be a valid logical path. Removes a file from the specified directory. The <file_name> parameter specifies the file name to be removed. This command will generate an "access denied" error if the file is in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

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### Mass Storage Data (Remote Command Only)

Creates a file containing the specified data OR queries the data from an existing file.

---

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:DATA <file_name>,<data> :MMEMory:DATA? <file_name>
Notes	The string must be a valid logical path. The command form is MMEMory:DATA <file_name>,<data>. It loads <data> into the file <file_name>. <data> is in 488.2 block format. <file_name> is string data. The query form is MMEMory:DATA? <file_name> with the response being the associated <data> in block format.
Initial S/W Revision	Prior to A.02.00

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## Mass Storage Make Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:MDIRectory <directory_name>
Notes	<p>The string must be a valid logical path.</p> <p>Creates a new directory. The &lt;directory_name&gt; parameter specifies the name to be created.</p> <p>This command will generate an “access denied” error if the new directory would be in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Move (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:MOVE <string>,<string>[,<string>,<string>]
Notes	<p>The string must be a valid logical path.</p> <p>Moves an existing file to a new file or an existing directory to a new directory.</p> <p>Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination.</p> <p>The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.</p> <p>This command will generate an “access denied” error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Remove Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:RDIRectory <directory_name>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a directory. The &lt;directory_name&gt; parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed.</p> <p>This command will generate an “access denied” error if the folder is a restricted folder (e.g., C:\Windows) or is in a restricted folder and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## 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 588

Key Path	Front-panel key
Example	: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 841 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 are no menus under this key in the Analog Demod mode.

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

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## SPAN X Scale

Activates and displays the Span function menu.

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

### Span

Adjusts the Span of the RF Spectrum window.

Key Path	SPAN X Scale
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:FREQuency:SPAN <freq> [ :SENSe ] :AM FM PM FMSTereo:FREQuency:SPAN?
<b>Example</b>	AM:FREQ:SPAN 2.122kHz AM:FREQ:SPAN?
Notes	Adjusts the Span of the RF Spectrum window.
Dependencies	The maximum value will be the maximum IF BW available in the instrument. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available IF BW of the instrument is 140 MHz. Thus, the maximum Span is not limited to 25 MHz but is 140 MHz.
Preset	= AM/FM/PM = 75 kHz = FMST = 500 kHz
State Saved	Saved in instrument state
Min	10 Hz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

### Ref Value (FM)

Sets the reference value for time on the horizontal axis.

Key Path	SPAN X Scale
<b>Remote Command</b>	:DISPlay:FM:WINDow4 5:TRACe:X[:SCALE]:RLEVel <time> :DISPlay:FM:WINDow4 5:TRACe:X[:SCALE]:RLEVel?
<b>Example</b>	DISP:FM:WIND4:TRAC:X:RLEV 10 ms DISP:FM:WIND4:TRAC:X:RLEV?
Notes	You must be in a FM measurement to use this command.
Remote Command Notes	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum

	<ul style="list-style-type: none"> <li>2. Demod Waveform</li> <li>3. AF Spectrum</li> <li>4. RF Envelope (Attack/Release Time view)</li> <li>5. FM Demod Waveform (Attack/Release Time view)</li> <li>6. Metrics</li> </ul>
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Couplings	This value is discrete,
Preset	0.00 s
State Saved	Saved in instrument state.
Initial S/W Revision	A.14.00

### Scale/Div (FM)

Sets the horizontal scale by changing a time value per division.

Key Path	SPAN X Scale
<b>Remote Command</b>	<pre>:DISPlay:FM:WINDow4 5:TRACe:X[:SCALe]:PDIVision &lt;time&gt;</pre> <pre>:DISPlay:FM:WINDow4 5:TRACe:X[:SCALe]:PDIVision?</pre>
<b>Example</b>	<pre>DISP:FM:WIND4:TRAC:X:PDIV 500 us</pre> <pre>DISP:FM:WIND4:TRAC:X:PDIV?</pre>
Notes	You must be in FM measurement to use this command.
Remote Command Notes	<p>Regardless of the View, the windows are numbered as follows:</p> <ul style="list-style-type: none"> <li>1. RF Spectrum</li> <li>2. Demod Waveform</li> <li>3. AF Spectrum</li> <li>4. RF Envelope (Attack/Release Time view)</li> <li>5. FM Demod Waveform (Attack/Release Time view)</li> <li>6. Metrics</li> </ul>
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Couplings	If the value is not the integer multiples of the trace sample interval, analyzer will automatically rounds up it to an integer multiples of the sample interval.
Preset	Demod Wfm Sweep Time / 10
State Saved	Saved in instrument state.
Initial S/W Revision	A.14.00

### Ref Position (FM)

Sets the reference position for the X axis to Left, Center or Right.

<b>Key Path</b>	SPAN X Scale
<b>Remote Command</b>	:DISPlay:FM:WINDow4 5:TRACe:X[:SCALe]:RPOSition LEFT   CENTER   RIGHT :DISPlay:FM:WINDow4 5:TRACe:X[:SCALe]:RPOSition?
<b>Example</b>	DISP:FM:WIND4:TRAC:X:RPOS LEFT DISP:FM:WIND4:TRAC:X:RPOS?
<b>Notes</b>	Allows you to set the reference position to Left, Ctr (center) or Right. You must be in FM measurement to use this command.
<b>Remote Command Notes</b>	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. RF Envelope (Attack/Release Time view) 5. FM Demod Waveform (Attack/Release Time view) 6. Metrics
<b>Dependencies</b>	This feature is available only when Option N9063A-AFP is installed.
<b>Preset</b>	LEFT
<b>State Saved</b>	Saved in instrument state.
<b>Range</b>	Left Ctr Right
<b>Initial S/W Revision</b>	A.14.00

## X Axis Coupled

Toggles the X axis coupled on and off. When turned on, changing any window's X scale value (Ref Value, Scale/Div and Ref Position) changes both upper and lower window's X scale value, no matter which window (upper or lower) is currently active. When turned off, changing any window's X scale value only works on itself.

<b>Key Path</b>	SPAN X Scale
<b>Remote Command</b>	DISPlay:FM:WINDow4 5:TRACe:X[:SCALe]:COUple ON OFF 1 0 DISPlay:FM:WINDow4 5:TRACe:X[:SCALe]:COUple?
<b>Example</b>	DISP:FM:WIND4:TRAC:X:COUP OFF Sets X Axis coupled to off
<b>Notes</b>	You must be in FM measurement to use this command.
<b>Remote Command Notes</b>	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. RF Envelope (Attack/Release Time view) 5. FM Demod Waveform (Attack/Release Time view) 6. Metrics



Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	A.14.00

## Sweep/Control

Activates a menu and selects Sweep Time as the active function. Sweep time is used by the Demod Waveform window, but this key is available in any view.

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

### Demod Wfm Sweep Time

Selects the display length for the Demod Waveform window. This is commonly set to two sample lengths.

Key Path	Sweep/Control
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:DWSweep:TIME <time> [ :SENSe ] :AM FM PM FMSTereo:DWSweep:TIME?
<b>Example</b>	AM:DWSW:TIME 50 ms AM:DWSW:TIME?
Preset	2 ms
State Saved	Saved in Instrument State
Min	1 $\mu$ s
Max	2 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Demod Time

Selects the minimum length of data acquisition used in demodulation. Increasing the demodulation time will result in more accurate metrics; reducing the demodulation time will result in a faster measurement.

The measurement might require more data than specified by the demodulation time. If the resolution bandwidth is low in the spectrum windows, or the demod waveform sweep time is high, then the data required for the measurement might be higher than the demodulation time.

If measurement speed is critical, make sure to increase the resolution bandwidth and reduce the demodulation waveform sweep time.

The Auto rules for the demodulation time will give the nominal specification performance if the sweep time is set to display two cycles of data.

Key Path	Sweep/Control
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:DEMod:TIME <time> [ :SENSe ] :AM FM PM FMSTereo:DEMod:TIME? [ :SENSe ] :AM FM PM:DEMod:TIME:AUTO OFF ON 0 1

[ :SENSe] :AM FM PM:DEMod:TIME:AUTO?	
<b>Example</b>	AM:DEM:TIME 50 ms AM:DEM:TIME?
Notes	If current Demod Time, Span and Channel BW settings combinations result in a required acquisition length is excess of the capacity of the analyzer, 4MSamples, gives a warning message "Settings Alert; Acquisition truncated".
Couplings	When in Auto mode, the demodulation time depends on the demodulation waveform sweep time. Lower
Preset	= AM/FM/PM = 72 ms = FMST = 280 ms ON
State Saved	Saved in instrument state
Min	1 $\mu$ s
Max	10 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

9 FM Demod Measurement  
System

System

See "[System](#)" on page 242

## Trace/Detector

There are no menus under this key in the Analog Demod mode.

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

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## Trigger

See ["Trigger" on page 322](#)

### Free Run

See ["Free Run " on page 329](#)

### External 1

See ["External 1 " on page 343](#)

### Trigger Level

See ["Trigger Level " on page 344](#)

### Trig Slope

See ["Trig Slope " on page 344](#)

### Trig Delay

See ["Trig Delay " on page 331](#)

### External 2

See ["External 2 " on page 345](#)

### Trigger Level

See ["Trigger Level " on page 346](#)

### Trig Slope

See ["Trig Slope " on page 346](#)

### Trig Delay

See ["Trig Delay " on page 333](#)

### RF Burst

See ["RF Burst " on page 347](#)

### Absolute Trigger

See ["Absolute Trigger Level" on page 347](#)

### Relative Trigger

See ["Relative Trigger Level" on page 336](#)

### Trig Slope

See ["Trigger Slope " on page 348](#)

## Trig Delay

See "Trig Delay " on page 337

## Periodic Timer

See "Periodic Timer (Frame Trigger) " on page 338

## Period

See "Period " on page 340

## Offset

See "Offset " on page 340

## Offset Adjust (Remote Command Only)

See "Offset Adjust (Remote Command Only)" on page 341

## Reset Offset Display

See "Reset Offset Display " on page 342

## Sync Source

See "Sync Source " on page 342

## Off

See "Off " on page 343

## External 1

See "External 1 " on page 343

## Trigger Level

See "Trigger Level " on page 344

## Trig Slope

See "Trig Slope " on page 344

## External 2

See "External 2 " on page 345

## Trigger Level

See "Trigger Level " on page 346

## Trig Slope

See "Trig Slope " on page 346

## RF Burst

See "RF Burst " on page 347

**Absolute Trigger**

See "[Absolute Trigger Level](#)" on page 347

**Trig Slope**

See "[Trigger Slope](#) " on page 348

**Trig Delay**

See "[Trig Delay](#)" on page 349

**Auto/Holdoff**

See "[Auto/Holdoff](#) " on page 349

**Auto Trig**

See "[Auto Trig](#) " on page 350

**Trig Holdoff**

See "[Trig Holdoff](#) " on page 350



## 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	:SYSTem:PRESet:USER
Example	:SYST:PRES:USER:SAVE:SYST:PRES:USER
Notes	:SYST:PRES:USER:SAVE is used to save the current state as the user preset state. Clears all pending OPC bits. The Status Byte is set to 0. Pressing the User Preset front-panel key while already in the User Preset menu will cause the User Preset to get executed
Couplings	A user preset will cause the currently running measurement to be aborted and cause the saved measurement to be active. Recalling a User Preset file has the same issues that recalling a Save State file has. Some settings may need to be limited and therefore re-coupled, since the capabilities of the mode may have changes when the User Preset file was last saved.
Initial S/W Revision	Prior to A.02.00

### User Preset All Modes

Recalls all of the User Preset files for each mode, switches to the power-on mode, and activates the saved measurement from the power-on mode User Preset file.

**NOTE**

When the instrument is secured, all of the user preset files are converted back to their default user preset files.

The User Preset function does the following:

- Aborts the currently running measurement.
- Switches the Mode to the power-on mode.
- Restores the User Preset files for each mode.
- Makes the saved measurement for the power-on mode the active measurement.
- Brings up the saved menu for the power-on mode.
- Clears the input and output buffers.
- Sets the Status Byte to 0.

Key Path	User Preset
Remote Command	:SYSTem:PRESet:USER:ALL
Example	:SYST:PRES:USER:SAVE:SYST:PRES:USER:ALL
Notes	Clears all pending OPC bits. The Status Byte is set to 0. :SYST:PRES:USER:SAVE is used to save the current state as the user preset state.
Couplings	A user preset will cause the currently running measurement to be aborted, cause a mode switch to the power-on mode, and cause the saved measurement to be active in the power-on mode. Recalling a User Preset file has the same issues that recalling a Save State file has. Some settings may need to be limited and therefore re-coupled, since the capabilities of the mode may have changes when the User Preset file was last saved.
Initial S/W Revision	Prior to A.02.00

## Save User Preset

Saves the currently active mode and its State. You can recall this User Preset file by pressing the User Preset menu key or sending the SYST:PRES:USER remote command. This same state is also saved by the Save State function.

Key Path	User Preset
<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 (AM/FM/ΦM)

The AM and PM measurements have four views. The primary view is called “Quad View” and displays all four of the view windows with the focus in the RF Spectrum window. This is the view seen after a Mode Preset. There are also three other views that combine one of the graphics windows with the metrics windows. Besides the above four views, the FM measurement has an additional view called “Attack/Release Time”. This view includes a RF envelope graphic window and an AF demod waveform (without interpolation) graphic window. The views can be selected from the View/Display menu.

These views are designed such that you can identify analog modulated carriers, determine whether the carrier is a commercial or other broadcast station, and analyze the modulating signal.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW[:SElect] QUAD   RFSpectrum   DEMod   AFSpectrum   ARTIME  :DISPlay:AM FM PM:VIEW[:SElect]?
<b>Example</b>	:DISP:FM:VIEW DEM selects Demod Waveform & Metrics View for FM Demod measurement
<b>Preset</b>	QUAD (Focus in RF Spectrum Window)
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	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.

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

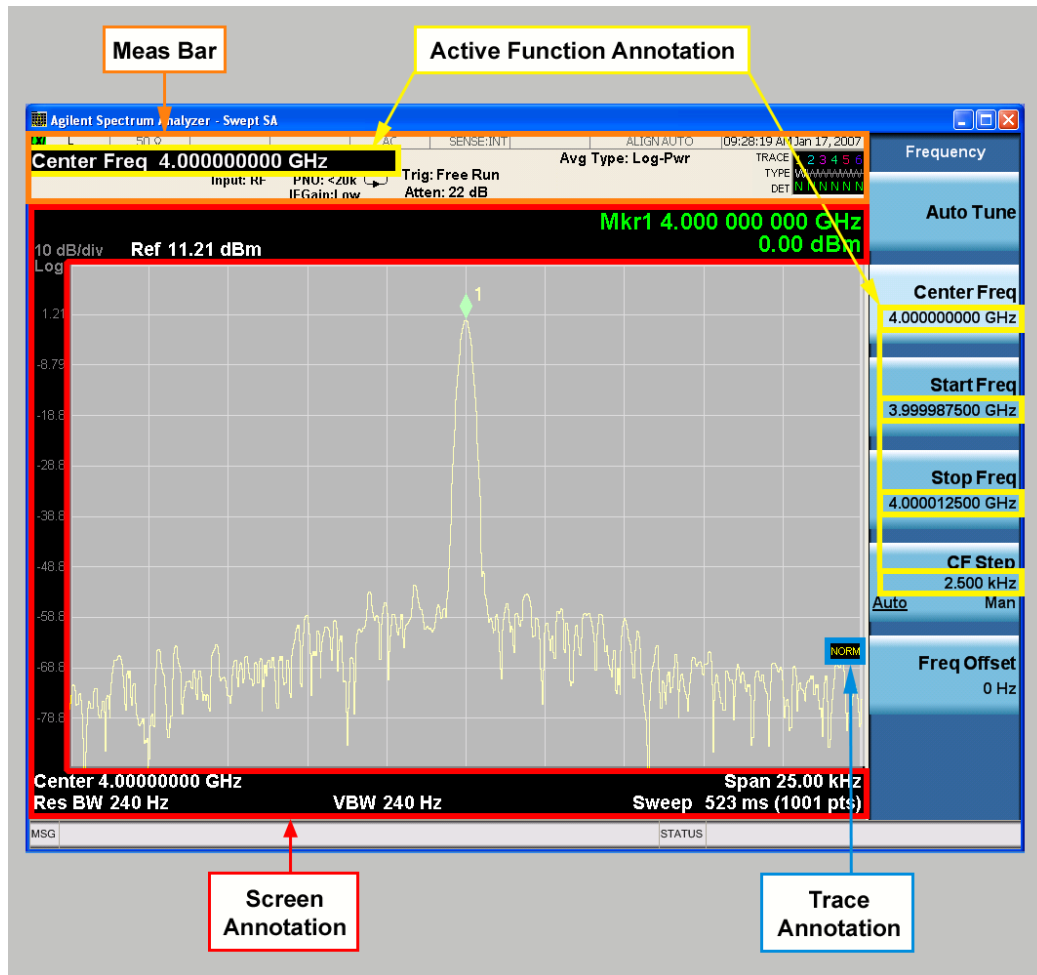
## Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

1. Meas Bar: This is the measurement bar at the top of the screen. It does not include the settings panel or the Active Function. Turning off the Meas Bar turns off the settings panel and the Active Function. When the Meas Bar is off, the graticule area expands to fill the area formerly occupied by the Meas Bar.
2. Screen Annotation: this is the annotation and annunciation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) This does NOT include the marker number or the N dB result. When off, the graticule expands to fill the entire graticule area.
3. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).

4. Active Function annotation: this is the active function display in the meas bar, and all of the active function values displayed on softkeys.

See the figure below. Each type of annotation can be turned on and off individually.



Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

### Meas Bar On/Off

This function turns the Measurement Bar on and off, including the settings panel. When off, the graticule area expands to fill the area formerly occupied by the Measurement Bar.

Key Path	View/Display, Display, Annotation
Remote Command	:DISPlay:ANNotation:MBAR[:STATe] OFF ON 0 1 :DISPlay:ANNotation:MBAR[:STATe]?
Example	DISP:ANN:MBAR OFF

Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Screen

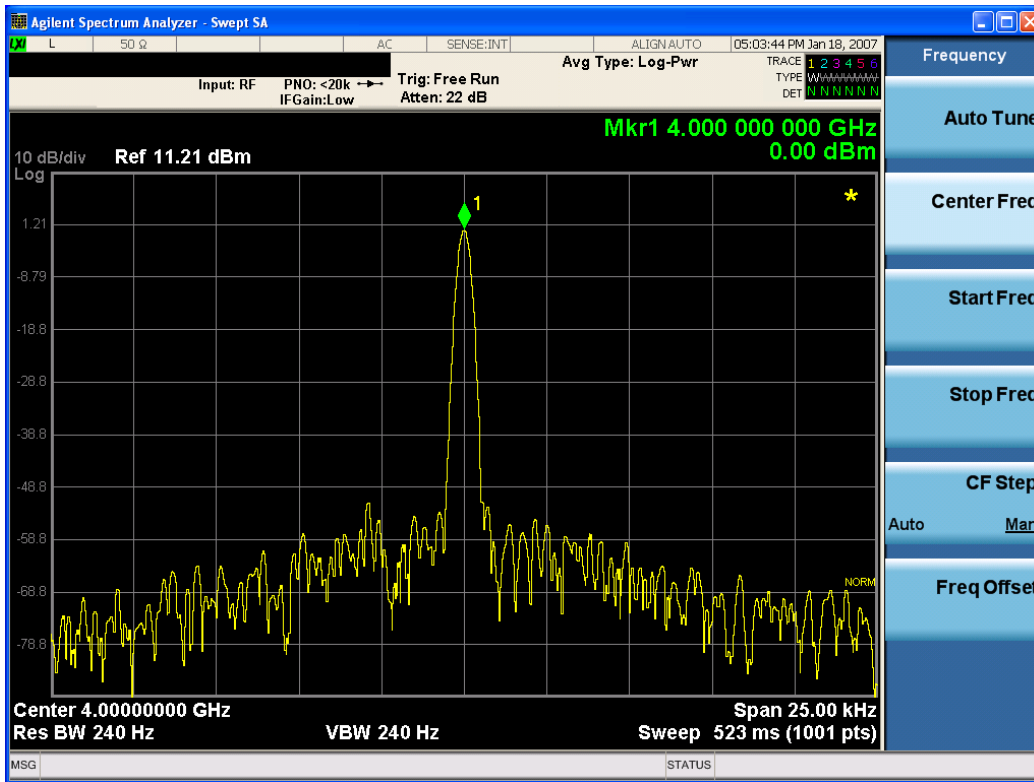
This controls the display of the annunciation and annotation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) and the y-axis annotation. This does NOT include marker annotation (or the N dB result). When off, the graticule expands to fill the entire graticule area, leaving only the 1.5% gap above the graticule as described in the Trace/Detector chapter.

Key Path	View/Display, Display, Annotation
Remote Command	:DISPlay:ANNotation:SCReen[:STATe] OFF ON 0 1 :DISPlay:ANNotation:SCReen[:STATe]?
Example	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Active Function Values On/Off

Turns on and off the active function display in the Meas Bar, and all of the active function values displayed on the softkeys.

Note that all of the softkeys that have active functions have these numeric values blanked when this function is on. This is a security feature..



Key Path	View/Display, Display, Annotation
Remote Command	:DISPlay:ACTivefunc[:STATE] ON OFF 1 0 :DISPlay:ACTivefunc[:STATE]?
Example	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Title

Displays menu keys that enable you to change or clear a title on your display.

Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

## Change Title

Writes a title into the "measurement name" field in the banner, for example, "Swept SA".

Press Change Title to enter a new title through the alpha editor. Press Enter or Return to complete the entry. Press ESC to cancel the entry and preserve your existing title.

The display title will replace the measurement name. It remains for this measurement until you press Change Title again, or you recall a state, or a Preset is performed. A title can also be cleared by pressing Title, Clear Title.

**NOTE**

Notice the inclusion of the <measurement> parameter in the command below. Because each measurement remembers the Display Title, the command must be qualified with the measurement name. For the Swept SA measurement this is not the case; no <measurement> parameter is used when changing the Display Title for the Swept SA measurement.

Key Path	View/Display, Display, Title
Mode	All
Remote Command	:DISPlay:<measurement>:ANNotation:TITLe:DATA <string> :DISPlay:<measurement>:ANNotation:TITLe:DATA?
Example	DISP:ANN:TITL:DATA "This Is My Title" This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer <measurement> name is not used. DISP:ACP:ANN:TITL:DATA "This Is My Title" This example is for Measurements other than Swept SA. Both set the title to: This Is My Title
Notes	Pressing this key cancels any active function. When a title is edited the previous title remains intact (it is not cleared) and the cursor goes at the end so that characters can be added or BKSP can be used to go back over previous characters.
Preset	No title (measurement name instead)
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Clear Title

Clears a title from the front-panel display. Once cleared, the title cannot be retrieved. After the title is cleared, the current Measurement Name replaces it in the title bar.

Key Path	View/Display, Display, Title
Example	The following commands clear the title and restore the measurement's original title: DISP:ANN:TITL:DATA "" This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer <measurement> name is not used. DISP:ACP:ANN:TITL:DATA "" This example is for ACP; in measurements other than Swept SA the measurement name is required.
Notes	Uses the :DISPlay:<measurement>:ANNotation:TITLe:DATA <string> command with an empty string (in the Swept SA, the <measurement> is omitted).
Preset	Performed on Preset.
Initial S/W Revision	Prior to A.02.00



## Graticule

Pressing Graticule turns the display graticule On or Off. It also turns the graticule y-axis annotation on and off.

Key Path	View/Display, Display
Remote Command	:DISPlay:WINDow[1]:TRACe:GRATicule:GRID[:STATe] OFF ON 0 1 :DISPlay:WINDow[1]:TRACe:GRATicule:GRID[:STATe]?
Example	DISP:WIND:TRAC:GRAT:GRID OFF
Notes	The graticule is the set of horizontal and vertical lines that make up the grid/divisions for the x-axis and y-axis.
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## System Display Settings

These settings are "Mode Global" – they affect all modes and measurements and are reset only by Restore Misc Defaults or Restore System Defaults under System.

Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

## Annotation Local Settings

This is a Mode Global override of the meas local annotation settings. When it is All Off, it forces ScreenAnnotation, Meas Bar, Trace, and Active Function Values settings to be OFF for all measurements in all modes. This provides the security based "annotation off" function of previous analyzers; hence it uses the legacy SCPI command.

When it is All Off, the Screen, Meas Bar, Trace, and Active Function Values keys under the Display, Annotation menu are grayed out and forced to Off. When Local Settings is selected, you are able to set the local annotation settings on a measurement by measurement basis.

Key Path	View/Display, Display, System Display Settings
Remote Command	:DISPlay:WINDow[1]:ANNOtation[:ALL] OFF ON 0 1 :DISPlay:WINDow[1]:ANNOtation[:ALL]?
Example	:DISP:WIND:ANN OFF
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	The WINDow parameter and optional subopcode is included for backwards compatibility but ignored – all windows are equally affected.
Initial S/W Revision	Prior to A.02.00

## 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
<b>Preset</b>	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.
<b>Readback</b>	3D Color   3D Mono   Flat Color   Flat Mono
<b>Backwards Compatibility Notes</b>	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if you selected Reverse Bitmap AND a black & white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Color
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Mono
<b>Initial S/W Revision</b>	Prior to A.02.00

### Flat Color

Selects a format that is best when the screen is to be printed on an ink printer.

Key Path	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
Initial S/W Revision	Prior to A.02.00

### Flat Monochrome

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

Key Path	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

### Backlight

Accesses the display backlight on/off keys. This setting may interact with settings under the Windows "Power" menu.

When the backlight is off, pressing ESC, TAB, SPACE, ENTER, UP, DOWN, LEFT, RIGHT, DEL, BKSP, CTRL, or ALT turns the backlight on without affecting the application. Pressing any other key will turn backlight on and could potentially perform the action as well.

Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight ON OFF :DISPlay:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
Initial S/W Revision	Prior to A.02.00

### Backlight Intensity

An active function used to set the backlight intensity. It goes from 0 to 100 where 100 is full on and 0 is off. This value is independent of the values set under the Backlight on/off key.

Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50

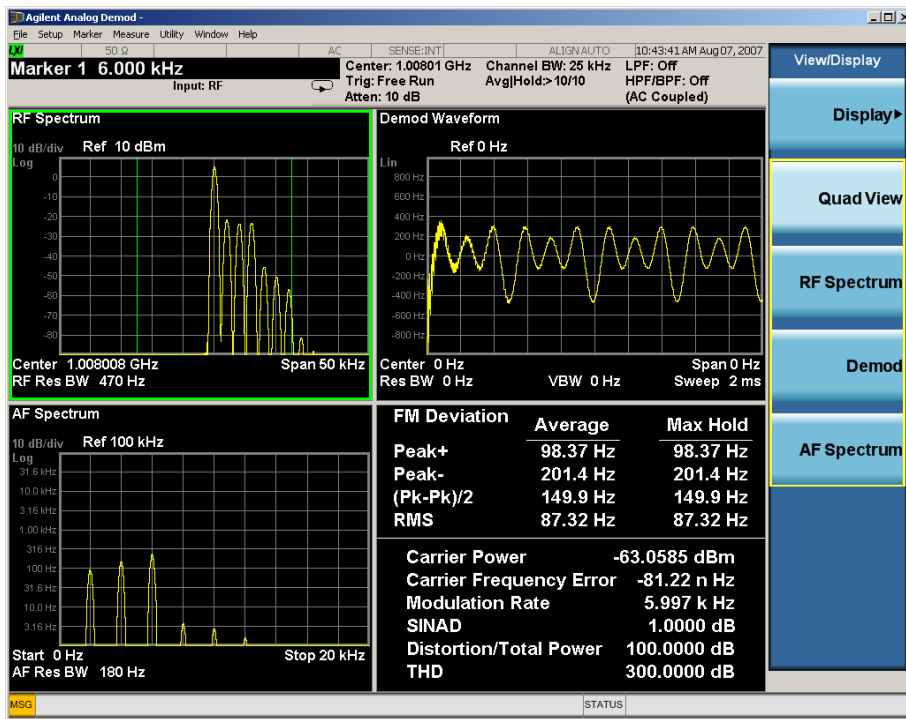
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

### Quad View

The Quad View displays each of the four fundamental windows of the Analog Demod mode. The basic window format is essentially the same for the 3 measurements. The main difference is the demodulation technique performed in the hardware and the specific metrics and units of the displayed results.

In general, there is little window-context sensitivity in the Analog Demod mode, that is, most of the variables have been designed so that they are unique to their window. The three variables that are window dependent are, Ref Value, Scale/Div, and Ref Position. These variables change to reflect the settings of the current window (the current window is always outlined in green).

The Quad View is shown below. For more information on the views, see ["RF Spectrum Window" on page 612](#), ["Demod Waveform Window" on page 613](#), ["AF Spectrum Window" on page 613](#), or ["Metrics Window" on page 613](#).



### RF Spectrum Window

The RF Spectrum window shows a spectral display of the input RF signal with amplitude in the vertical Y axis and frequency in the horizontal X axis. The vertical axis is always scaled in dB, with units of dBm, with the Ref Value initially at the top of the vertical scale. This spectral display is basically identical to the

frequency display of the Swept SA measurement; however it is always taken using an FFT. The span is restricted to 8 MHz and zero span is not allowed.

The RF Spectrum window provides a convenient way to identify broadcast stations by placing the signal of interest at the center frequency using this window and listening to the instrument's speaker. Demodulation is always performed at the center frequency of the RF Spectrum window; this is regarded as the application's center frequency and is annotated in the Measurement Bar.

In the RF Spectrum window, two green vertical lines are shown centered around the center frequency, with spacing equal to the Channel BW. If the Channel BW is wider than the span, they are not seen.

The Center Frequency, Span, and RF Res BW are annotated at the bottom of the RF Spectrum Window. The Ref Value and Scale/Div are annotated above the graticule.

### Demod Waveform Window

In the Demod Waveform window, the demodulated signal is displayed in the time domain (zero span) with time on the horizontal X axis, and modulation depth (AM) or deviation (FM,  $\Phi$ M) on the vertical Y axis.

In the Demod Waveform window the Y axis is linearly scaled in units of percent modulation for AM, frequency (Hz) for FM, or phase (radians) for  $\Phi$ M. On a preset, the Ref Value is positioned in the center of the vertical scale.

Four traces are available in the Demod Waveform window. The Demod trace, in yellow, shows the current demodulation signal. The Demod Max trace, in cyan, shows the Max Hold value for each display point bucket since the last restart and the Demod Min trace, in magenta, shows the Min Hold value for each display point bucket since the last restart. The Demod Average trace, in green, shows the averaged demodulation signal. If Averaging is turned off, only the Demod trace is displayed.

The Sweep Time is annotated at the bottom of the Demod Waveform Window. The Ref Value and Scale/Div are annotated above the graticule.

### AF Spectrum Window

In the AF Spectrum window, the demodulated signal is displayed in the frequency domain with frequency on the X axis and amplitude on the Y axis.

The vertical axis is always scaled in dB with the Ref Value initially at the top of the vertical scale. The Y-Axis Unit is % for AM, Hz for FM, and radians for  $\Phi$ M.

In this view you can observe the spectral components of the modulating signal. The preset Start Frequency of this window is 0 Hz. The AF Start Freq and AF Stop Freq are annotated at the bottom of the AF Spectrum Window, as is the AF Res BW.

The Ref Value and Scale/Div are annotated above the graticule.

It is only possible to show a spectrum to a maximum frequency of Channel BW / 2. For trace display points beyond that frequency, the value 1.0E-50 is plotted and returned in queries.

### Metrics Window

The metrics window displays measurement results.

If averaging is turned on, the column marked "Current" is relabeled "Average" and the results in that column are averaged over successive measurements until the Average/Hold number is reached. Then, if

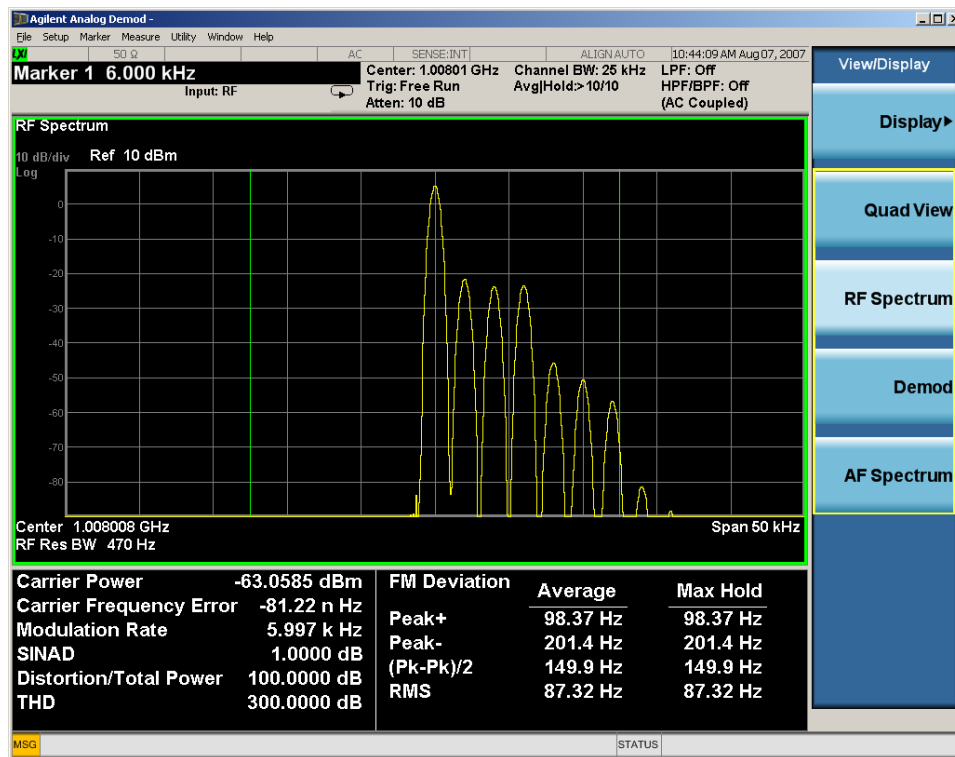
not in Single measurement mode, the measurement continues, exponentially averaging in successive results. The Max Hold column shows the Maximum value the un-averaged metric has attained since the last Restart. The Max Hold column is removed when averaging is turned off.

The window title is “FM Deviation” in FM, “AM Mod Depth” in AM, and “ $\Phi$ M Radians” in  $\Phi$ M.

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

### RF Spectrum & Metrics View

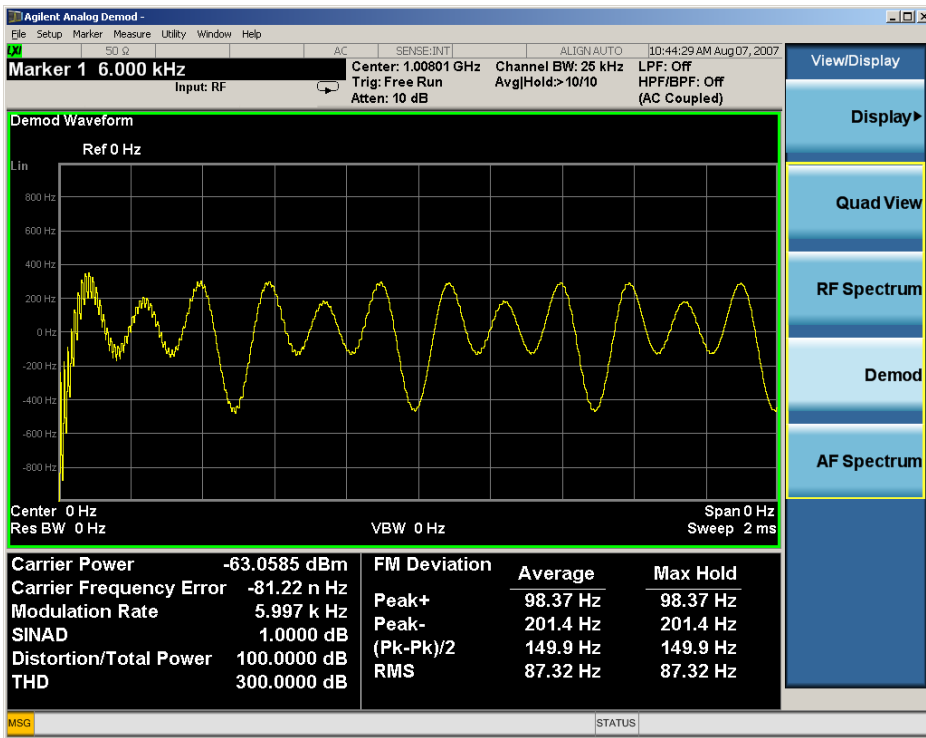
This view shows the RF Spectrum window and the Metrics window displayed in a split screen mode with the RF Spectrum window taking up approximately  $\frac{3}{4}$  of the display.



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

### Demod Waveform & Metrics View

This view shows the Demod Waveform window and the Metrics windows displayed in a split screen mode with the Demod Waveform window taking up approximately  $\frac{3}{4}$  of the display.




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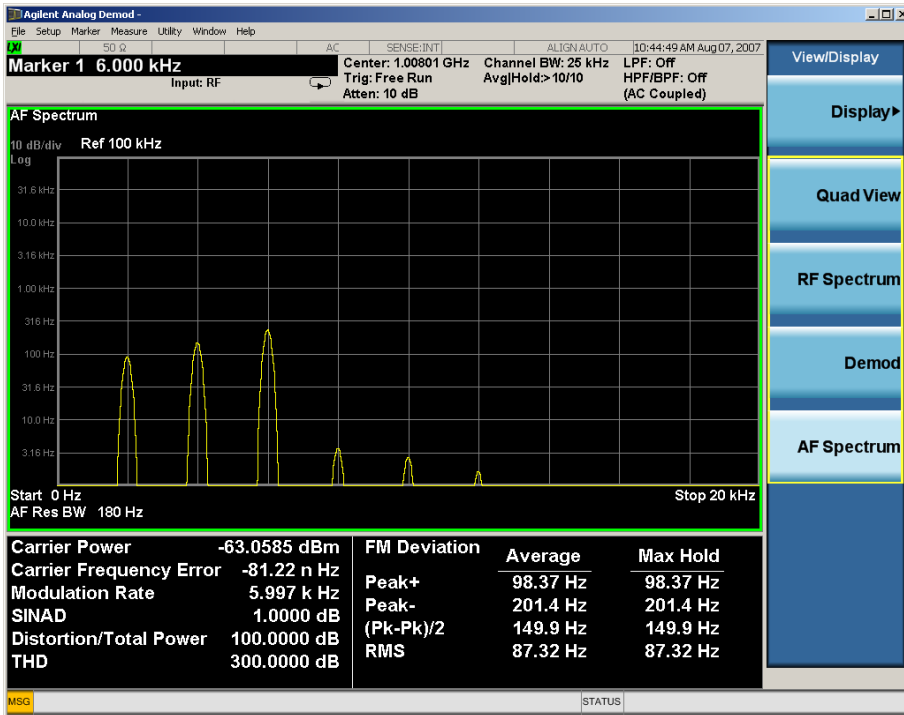
Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

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### AF Spectrum & Metrics View

This view shows the AF Spectrum window and the Metrics windows displayed in a split screen mode with the AF Spectrum window taking up approximately  $\frac{3}{4}$  of the display.

9 FM Demod Measurement  
View/Display (AM/FM/ $\Phi$ M)



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

**Distortion & THD Unit**

Changes the units of distortion and THD in the Metrics screen between % and dB units.

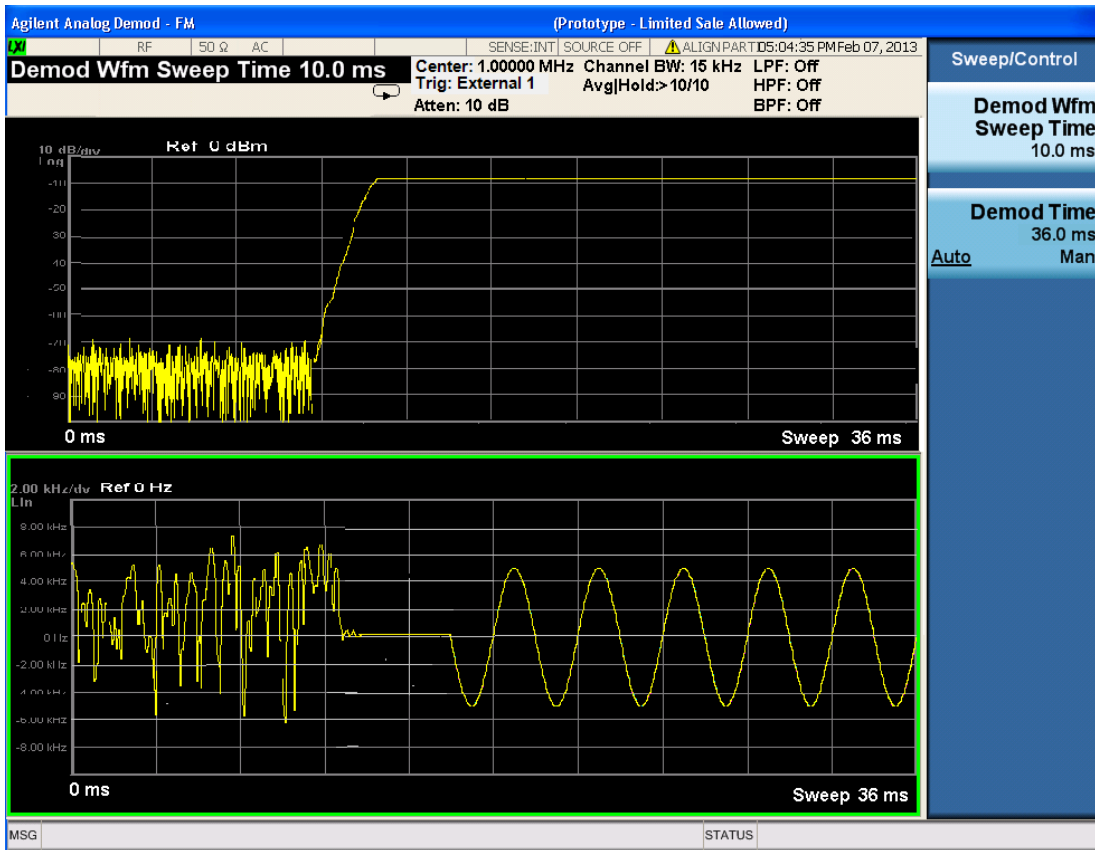
Key Path	View/Display
Remote Command	DISPlay:AM FM PM:VIEW:DISToRtion:UNIT DB PCT DISPlay:AM FM PM:VIEW:DISToRtion:UNIT?
Example	DISP:AM:VIEW:DIS:UNIT PCT Sets AM distortion and THD display to percent.
Preset	PCT
State Saved	Saved in State
Initial S/W Revision	Prior to A.02.00

**Attack/Release Time View (FM only)**

The Attack/Release Time View is shown below. This view provides an easy way to measure DUT's settling time, attack time or release time. For more information on the view, see **RF Envelope Window** and **FM Demod Waveform Window**.

This view is only available in FM measurement when Option N9063A-AFP is installed.





Attack/Release time view in FM measurement (need to be updated soon)

## RF Envelope Window

In this window, the RF envelope of the signal is displayed in the time domain with time on the horizontal X axis, and amplitude on the vertical Y axis. The vertical Y axis is always scaled in dB, with units of dBm, with the Ref Value initially at the top of the vertical scale.

The Sweep Time is annotated at the bottom of the window. The Ref Value and Scale/Div are annotated in their normal place above the graticule.

## FM Demod Waveform Window

In this window, the demodulated signal without interpolation is displayed in the time domain with time on the horizontal X axis, and deviation on the vertical Y axis. The Y axis is linearly scaled in units of frequency (Hz). On a preset, the Ref Value is positioned in the center of the vertical scale.

The Sweep Time is annotated at the bottom of the window. The Ref Value and Scale/Div are annotated in their normal place above the graticule.

Key Path	View/Display
Initial S/W Revision	A.14.00

## Metrics Settings

Accesses a menu used to control which metrics will be provided. This includes a 1-of-N menu which allows you to control which modulation magnitude metrics are displayed, as well as On/Off controls for Modulation Rate and SINAD/Distortion/THD. If speed is an issue, select only the metric(s) that is(are) required. If modulation magnitude is set to Peak+ Only, Pk-Pk/2 Only, or RMS Only, the other modulation magnitude metrics are loaded with not a number and show “---” in the metrics window.

<b>Key Path</b>	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:MMAGnitude ALL   PPK   PNPk   RMS   RMSRatio :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude?
<b>Example</b>	DISP:AM:VIEW:METR:MMAG PPK Sets AM modulation magnitude to peak +. DISP:FM:VIEW:METR:MMAG RMSR Sets ratio reference and sets FM modulation magnitude to ratio display
<b>Preset</b>	ALL
<b>State Saved</b>	Saved in State
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.05.00

## Normal

Turns on all absolute modulation magnitude metrics. In the metrics window, Peak +, Peak -, Pk-Pk/2 and RMS results are provided.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG ALL
<b>Notes</b>	This key was labeled “All” in earlier releases
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.05.00

## Peak+ Only

Turns on just the Peak+ metric in the portion of the metrics window that shows the modulation magnitude results.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG PPK
<b>Initial S/W Revision</b>	Prior to A.02.00

### Pk-Pk/2 Only

Turns on just the Pk-Pk/2 metric in the portion of the metrics window that shows the modulation magnitude results. .

Key Path	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG PNPk
Initial S/W Revision	Prior to A.02.00

### RMS Only

Turns on just the RMS metric in the portion of the metrics window that shows the modulation magnitude results.

Key Path	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG RMS
Initial S/W Revision	Prior to A.02.00

### RMS Ratio

Turns on the display of RMS Ratio. In this mode, the only magnitude metrics that are displayed are the RMS metrics, but besides the display of RMS, the ratio (in dB) of the RMS modulation to its reference is displayed, as well as the value of the reference, as shown in the display below:

FM Deviation	Average	Max Hold
RMS	12.69 kHz	14.19 kHz
RMS Ratio	1.89 dB	2.86 dB
Ratio Ref	10.20 kHz	
Carrier Power	-100.331 dBm	
Carrier Frequency Error	180.5 Hz	

Pressing the RMS Ratio key (or sending :DISP:AM:VIEW:METR:MMAG RMSR) establishes the reference. Pressing it again (or sending the SCPI command again) establishes a new reference. If the Ratio Reference state is Auto, the reference is from the previous measurement result, otherwise, it's from the Ratio Reference's value you entered. Whenever this happens, the current value of RMS modulation from the left hand column (Current or Average) is taken as the new reference. If, when the ratio is to be established, there is not a valid value being displayed to use as a reference, an error is generated, the RMS Ratio and Ratio Ref values display --- and queries of either return not a number (9.91 e37).

To turn off the ratio display, select one of the other Mod magnitude views.

Note that each measurement (AM, FM and PM) has its own reference; and the reference is remembered when you leave the measurement and return.

The ratio references are saved in State, and when the recalled state of Metrics Settings is RMS Ratio, the saved reference for the current measurement should be recalled and used, rather than establishing a new one.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG RMSR
<b>Initial S/W Revision</b>	A.05.00

## Ratio Reference

Sets or displays the RMS ratio reference value and chooses the reference setting mode.

- If Auto is selected, pushing “RMS Ratio” does the following 3 actions:
  1. selects RMS Ratio as the Metrics Setting
  2. establishes RMS Ratio reference from previous measurement result
  3. displays the ratio reference value in step 2 on the “Ratio Reference” label text
- If Man is selected, pushing “RMS Ratio” does the following 2 actions:
  1. selects RMS Ratio as the Metrics Setting
  2. establishes RMS Ratio reference from “Ratio Reference” label value what you entered

<b>Key Path</b>	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence <real> :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence? :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence:AUTO ON   OFF   1   0 :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence:AUTO?
<b>Example</b>	:DISP:AM FM PM:VIEW:METR:MMAG:REF 1 kHz :DISP:AM FM PM:VIEW:METR:MMAG:REF? :DISP:AM FM PM:VIEW:METR:MMAG:REF:AUTO ON :DISP:AM FM PM:VIEW:METR:MMAG:REF:AUTO?
<b>Notes</b>	If Auto is selected, the value of this key depends on the pervious measurement results. If Man is selected, the value is what you entered.
<b>Dependencies</b>	This feature is available only when Option N9063A-AFP is installed.
<b>Preset</b>	AM: 10 % FM: 1 kHz PM: 1 rad ON
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	AM: 0.01 % FM: 0.1 Hz

	PM: 1 mrad
Max	AM: 10000 % FM: 1GHz PM: 10 krad
Initial S/W Revision	A.14.00

## Modulation Rate

Toggles the Modulation Rate metric on and off. When turned on, the Modulation Rate metric is provided. When turned off, the Modulation Rate metric is set to not a number and shows “---” in the metric window.

Key Path	View/Display, Metrics Settings
Remote Command	:DISPlay:AM FM PM:VIEW:METRics:MRATe[:STATe] ON OFF 1 0 :DISPlay:AM FM PM:VIEW:METRics:MRATe[:STATe]?
Example	DISP:AM:VIEW:METR:MRAT OFF Sets AM modulation rate to off
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## SINAD, THD, Distortion

Toggles the distortion metrics (SINAD, Distortion, & THD) on and off. When turned on, the SINAD, Distortion, and THD metrics are provided. When turned off, the SINAD, Distortion, and THD metrics are set to not a number and show “---” in the metric window.

SINAD is the ratio of total received power (the received signal-plus-noise-plus-distortion power) to the received noise-plus-distortion power. It is always expressed in decibel units. The rejection of the carrier from the noise-plus-distortion power measurement is usually not much more than 50 dB, thus limiting the maximum SINAD.

THD is the ratio of the root mean square voltage of the harmonics referenced to the fundamental voltage, expressed in % or dB. Note the differences with respect to Distortion. The denominator of the ratio is different and the items in the numerator do not include the noise between harmonics, just the harmonics themselves.

Distortion/Total Voltage (rms) is the ratio of unwanted received power (noise plus distortion) to the total received power, expressed in % or dB. Therefore, this metric is the negative of SINAD when expressed in decibels.

Key Path	View/Display, Metrics Settings
Remote Command	:DISPlay:AM FM PM:VIEW:METRics:DISToRtion[:STATe] ON OFF 1 0 :DISPlay:AM FM PM:VIEW:METRics:DISToRtion[:STATe]?
Example	DISP:AM:VIEW:METR:DIS OFF Sets AM SINAD, Distortion, THD Metrics to off

9 FM Demod Measurement  
View/Display (AM/FM/ $\Phi$ M)

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Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

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## 10 $\Phi$ M Demod Measurement

For the PM Demod measurement, the analyzer will display the metrics results, such as deviation, modulation rate, carrier frequency error, SINAD, total harmonic distortion and carrier power. The analyzer can also display trace data of the RF spectrum, the AF spectrum, or the demod waveform.

If the Demod Min trace, Demod Max trace or Demod Average trace is queried using a Meas, Read or Fetch command when the Average/Hold feature is turned off, the resulting data will be default values.

If any of the metrics are off, a SCPI query will return not a number and show “---“ in the metrics window. The metrics that can be turned off are: Modulation Rate, SINAD, Distortion, THD and all but one of the Deviations.

For more measurement related commands, see the SENSE subsystem, and the ["Remote Measurement Functions" on page 795](#).

This topic contains the following sections:

[" \$\Phi\$ M Demod Measurement " on page 623](#)

[" \$\Phi\$ M Demod Measurement " on page 623](#)

## Measurement Commands for PM Demod

Parameter Name	PM Meas/Read/Fetch Query Results
SCPI Command	:MEASure READ FETCh:PM[1] 0 2 3 4 5?
SCPI Example	MEAS:PM? FETCH:PM0? READ:PM5?
Setup	[COMPARE OFF]
Post Setup	[COMPARE ON]



## Remote Command Results for PM Demod

Command	n	Return Value
:INITiate:PM	n/a	n/a
:CONFigure?	n/a	name of current measurement: "PM"
:CONFigure:PM	n/a	n/a (selects PM measurement in Meas Preset state)
:CONFigure:PM:NDEFault	n/a	n/a (selects PM measurement without affecting settings)
:FETCh:PM[n]? :MEASure:PM[n]? :READ:PM[n]?	0	This query returns the RF Spectrum trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	not specified or n=1	Returns the following comma-separated results: 1. The RF Spectrum window's center frequency 2. Carrier Power 3. Carrier Frequency Error 4. Modulation Rate 5. SINAD value 6. Distortion/Total Vrms (% - not ratio - or dB) 7. Total Harmonic Distortion(% - not ratio - or dB) 8. Deviation (Peak+) 9. Deviation (Peak-) 10. Deviation (Pk-Pk)/2 11. Deviation (RMS) 12. Deviation (Peak+) Max Hold 13. Deviation (Peak-) Max Hold 14. Deviation (Pk-Pk)/2 Max Hold 15. Deviation (RMS) Max Hold 16. SNR
	2	This query returns the Demod Min Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are 10 k.
	3	This query returns the Demod Max Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -10 k.
	4	This query returns the Demod Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view
	5	This query returns the Demod Average Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -10 k.

Command	n	Return Value
	6	This query returns the AF Spectrum Trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	7	Returns the following comma-separated results: 1. Deviation (RMS) 2. Deviation (RMS) Ratio 3. Ratio Reference
	8	<b>Returns the Demod Waveform Trace data (without interpolation), as a series of floating trace point values, in radians or degree depend on Y Axis Unit.</b> The number of samples and the sample interval can be queried when n=10.
	9	Reserved.
	10	Returns the following scalar results: 1. Sample Interval is a floating point number representing the time between samples when using the trace queries (n=8). 2. Number of samples is the number of data points in the Demod Waveform Trace (without interpolation). This number is useful when performing a query on the signal (when n=8).
	11	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. The number of samples and the sample interval can be queried when n=12.
	12	Returns the following scalar results: 1. Sample Interval is a floating point number representing the time between samples when using the trace queries (n=11). 2. Number of samples is the number of data points in the captured signal. This number is useful when performing a query on the signal (when n=11).

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

## AMPTD Y Scale

Accesses a menu that enables you to set the reference level, attenuation, scale per division, reference position, and internal pre-amplifier parameters for your measurement.

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

### Ref Value (PM)

The reference value specifies the amplitude of a signal displayed on the reference graticule line. The reference line is at the top, center, or bottom of the graticule, depending on the value of the Ref Position function.

Changing the reference value does not restart a measurement, but changes all displayed traces and markers to the new value. If a change to the reference value changes an auto-coupled attenuation value, the measurement restarts.

The Ref Value key applies only to the window with the focus. If the focus is on the Metrics window, the Ref Value key is unavailable.

Key Path	AMPTD Y Scale
<b>Remote Command</b>	:DISPlay:PM:WINDow[1] 2 3:TRACe:Y[:SCALe]:RLEVel <real> :DISPlay:PM:WINDow[1] 2 3:TRACe:Y[:SCALe]:RLEVel?
<b>Example</b>	DISP:PM:WIND:TRAC:Y:RLEV 20 dBm Sets the reference value in window 1 to 20 dBm.
Remote Command Notes	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. Metrics
Couplings	The value is constrained within the MAX and MIN values, but is otherwise generally not adjusted. In window 2, this value depends on Y Axis Unit. In window 3, this value depends on Y Axis Unit and Scale Type. If Scale Type is Log, the value will be expressed in decibel units. For example, x radians (degree) will be expressed as y dBrad (dBdeg), where $y = 20 * \log(x)$ .
Preset	RF Spectrum 0 dBm Demod Waveform Y Axis Unit is "rad": 0 rad Y Axis Unit is "deg": 0 deg AF Spectrum Y Axis Unit is "rad": 6.28 rad Y Axis Unit is "deg": 360 deg
State Saved	Saved in instrument state

Min	RF Spectrum -170 dBm - Ext Gain Demod Waveform Y Axis Unit is "rad": -10 krad Y Axis Unit is "deg": -572957 deg AF Spectrum Y Axis Unit is "rad": 100 urad Y Axis Unit is "deg": 0.006 deg
Max	RF SpectrumN9030A: 30 dBm N9020A: 30 dBm N9010A: 23 dBm N9000A: 23 dBm Demod Waveform Y Axis Unit is "rad": 10 krad Y Axis Unit is "deg": 572957 deg AF Spectrum Y Axis Unit is "rad": 10 krad Y Axis Unit is "deg": 572957 deg
Default Unit	depends on the current view
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## 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 629

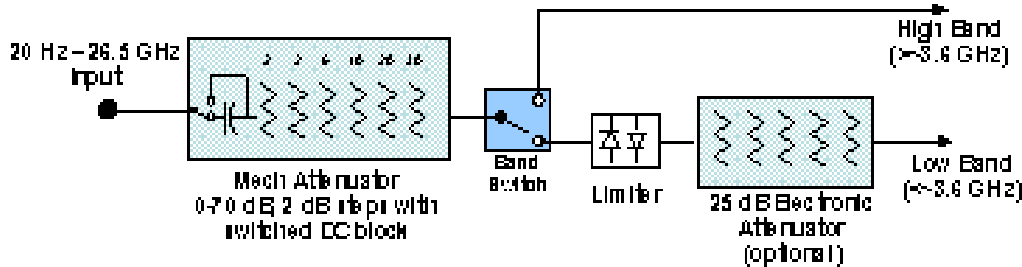
See "[Single Attenuator Configuration:](#)" on page 629

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.

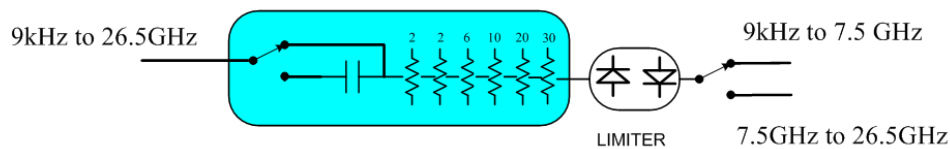
Key Path	AMPTD Y Scale
Scope	Meas Global
Dependencies	In measurements that support the I/Q inputs, this key is unavailable when I/Q is the selected input, and is replaced by the Range key in that case.
Readback Line	Contains a summary in [ ] brackets of the current total attenuation. See the descriptions of the , (Mech) Atten , and Enable Elec Atten 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

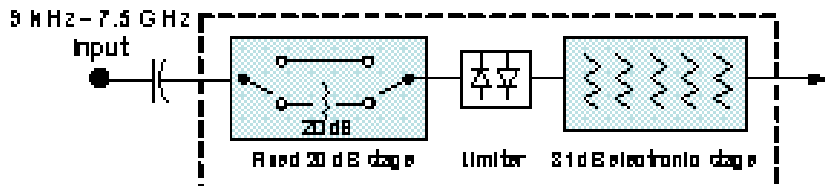


Configuration 2: Mechanical attenuator, no optional electronic attenuator



(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
Auto	Auto
Man	Man
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.

## Scale / Div (PM)

Sets the units per vertical graticule division on the display.

The Scale/Div key applies only to the window with the focus. If the focus is on the Metrics window, the Scale/Div key is unavailable.

<b>Key Path</b>	AMPTD Y Scale
<b>Remote Command</b>	:DISPlay:PM:WINDow[1]   2   3:TRACe:Y[:SCALe]:PDIVision <real> :DISPlay:PM:WINDow[1]   2   3:TRACe:Y[:SCALe]:PDIVision?
<b>Example</b>	DISP:PM:WIND:TRAC:Y:PDIV 5 DB
<b>Remote Command Notes</b>	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. Metrics
<b>Preset</b>	RF Spectrum 1 0 dB Demod Waveform Y Axis Unit is "rad": 1 rad Y Axis Unit is "deg": 57.296 deg AF Spectrum 10 dB
<b>State Saved</b>	Saved in State
<b>Min</b>	RF Spectrum 0.1 dB Demod Waveform Y Axis Unit is "rad": 1 rad Y Axis Unit is "deg": 0.573 deg AF Spectrum 0.1 dB
<b>Max</b>	RF Spectrum 20 dB Demod Waveform Y Axis Unit is "rad": 1 krad Y Axis Unit is "deg": 57295.780 deg AF Spectrum 20 dB
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.14.00

## Scale Type

Chooses whether to display Y axis in decibel units in the AF spectrum window. No matter what the Scale Type value is, Log or Lin, the vertical graticule divisions are always scaled in logarithmic units.

**NOTE**

This key applies only to the AF Spectrum window in AM, FM and PM measurement. The following table describes the parameters that will be affected by Scale Type in the AF spectrum window.

Y axis unit,	AM: dBam	AM: %
Marker Y value,	FM: dBHz	FM: Hz
Refer Value	PM: dBrad	PM rad
	dBdeg	deg

Key Path	AMPTD Y Scale
Remote Command	:DISPlay:AM FM PM:WINDow3:TRACe:Y[:SCALE]:SPACing LINear   LOGarithmic :DISPlay:AM FM PM:WINDow3:TRACe:Y[:SCALE]:SPACing?
Example	DISP:AM:WIND:TRAC:Y:SPAC LOG DISP:AM:WIND:TRAC:Y:SPAC?
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Couplings	Changing the Scale Type always sets the Y axis unit to the last unit specified for the current amplitude scale. In other words, we restore the Y axis unit setting appropriate per log/lin.
Preset	LOG
State Saved	Saved in instrument state
Initial S/W Revision	A.14.00

### Y Axis Unit (PM)

Chooses the Y axis unit of the Demod Waveform window and the AF Spectrum window in PM measurement.

**NOTE**

This key applies only to the Demod Waveform window and the AF Spectrum window in PM measurement. If current window is neither of them, this key is blank.

Key Path	AMPTD Y Scale
Remote Command	[:SENSe]:PM:UNIT:POWer RADian DEGree [:SENSe]:PM:UNIT:POWer?
Example	PM:UNIT:POW RAD PM:UNIT:POW?
Notes	This key is only available in PM measurement, otherwise it's blank.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	RAD
State Saved	Saved in instrument state
Initial S/W Revision	A.14.00

## Ref Position

Positions the reference value at the top, center, or bottom of the Y Scale display. Changing the reference position does not change the reference value.

The Ref Position key applies only to the window with the focus. If the focus is on the Metrics window, the Ref Position key is unavailable.

<b>Key Path</b>	<b>AMPTD Y Scale</b>
<b>Remote Command</b>	<b>AM/PM/FM Stereo:</b> <code>:DISPlay:AM PM FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALE]:RPOSition TOP   CENTER   BOTTom</code> <code>:DISPlay:AM PM FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALE]:RPOSition?</code> <b>FM:</b> <code>:DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALE]:RPOSition TOP   CENTER   BOTTom</code> <code>:DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALE]:RPOSition?</code>
<b>Example</b>	<b>DISP:AM:WIND:TRAC:Y:RPOS BOTT</b>
<b>Remote Command Notes</b>	<b>AM/PM/FM Stereo:</b> Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. Metrics <b>FM:</b> Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. RF Envelope (Attack/Release Time view) 5. FM Demod Waveform (Attack/Release Time view) 6. Metrics
<b>Preset</b>	RF Spectrum window: Top Demod Waveform window: Center AF Spectrum window: Top
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.14.00

## Internal Preamp

Accesses a menu of keys that control the internal preamps. Turning on the preamp gives a better noise figure, but a poorer TOI to noise floor dynamic range. You can optimize this setting for your particular



measurement.

The instrument takes the preamp gain into account as it sweeps. If you sweep outside of the range of the preamp the instrument will also account for that. The displayed result will always reflect the correct gain.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the status line. For example, for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

Key Path	AMPTD Y Scale
Scope	Meas Global
Remote Command	[ :SENSe] :POWer [ :RF] :GAIN [ :STATe] OFF ON 0 1 [ :SENSe] :POWer [ :RF] :GAIN [ :STATe] ?
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown. The preamp is not available when the electronic/soft attenuator is enabled.
Couplings	The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be switched On, to Full Range. Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected. Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

Key Path	AMPTD Y Scale, Internal Preamp
Scope	Meas Global
Remote Command	[ :SENSe] :POWer [ :RF] :GAIN :BAND LOW FULL [ :SENSe] :POWer [ :RF] :GAIN :BAND?
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown. If a POW:GAIN:BAND FULL command is sent when a low band preamp is available, the preamp band parameter is to LOW instead of FULL, and an "Option not installed" message is generated.
Preset	LOW
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Off

Turns the internal preamp off

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

## Low Band

Sets the internal preamp to use only the low band.

The frequency range of the installed (optional) low-band preamp is displayed in square brackets on the Low Band key label.

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND LOW
Readback	Low Band
Initial S/W Revision	Prior to A.02.00

## Full Range

Sets the internal preamp to use its full range. The low band (0–3.6 GHz or 0–3GHz, depending on the model) is supplied by the low band preamp and the frequencies above low band are supplied by the high band preamp.

The frequency range of the installed (optional) preamp is displayed in square brackets on the Full Range key label. If the high band option is not installed the Full Range key does not appear.

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND FULL
Readback	Full Range
Initial S/W Revision	Prior to A.02.00

## $\mu$ W Path Control

The  $\mu$ W Path Control functions include the  $\mu$ W 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>	[ :SENSe ] :POWer [ :RF ] :MW:PATH STD LNPath MPBypass FULL [ :SENSe ] :POWer [ :RF ] :MW:PATH?
<b>Example</b>	:POW:MW:PATH LNP Enables the Low Noise path
<b>Notes</b>	If a Presel Center is performed, the analyzer will momentarily switch to the Standard Path, regardless of the setting of $\mu$ W Path Control  The DC Block will always be switched in when the low noise path is switched in, to protect succeeding circuitry from DC. Note that this does not mean “when the low noise path is enabled” but when, based on the Low Noise Path rules, the path is actually switched in. This can happen when the selection is Low Noise Path Enable . In the case where the DC Block is switched in the analyzer is now AC coupled. However, if the user has selected DC coupling, the UI will still behave as though it were DC coupled, including all annunciation, warnings, status bits, and responses to SCPI queries. This is because, based on other settings, the analyzer could switch out the low noise path at any time and hence go back to being DC coupled.  Alignment switching ignores the settings in this menu, and restores them when finished.
<b>Dependencies</b>	Unavailable in BBIQ and External Mixing
<b>Preset</b>	All modes other than IQ Analyzer mode and VXA: STD IQ Analyzer, VXA and WLAN mode: MPB option present and licensed: MPB MPB option not present and licensed: STD
<b>State Saved</b>	Save in instrument state
<b>Readback</b>	Value selected in the submenu
<b>Initial S/W Revision</b>	A.04.00
<b>Modified at S/W Revision</b>	A.10.00



## 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 which 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.

For Analog Demod, these parameters are:

- RF Res BW
- AF Res BW
- CF Step

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

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## BW

Opens a menu of keys that enable you to control the bandwidth functions of the application.

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

### RF Res BW

Activates the RF Res BW function, which enables you to manually set the resolution bandwidth used in the RF Spectrum window.

Normally, the RF Res BW (Auto) key selects automatic coupling of the resolution bandwidth. To decouple the resolution bandwidth, press the RF Res BW key until Man is underlined, or enter a different value for the resolution bandwidth.

When the resolution bandwidth is manually selected, it may be returned to the coupled state by pressing the RF Res BW key until Auto is underlined. This may also be done by pressing the Auto Couple key or by performing a preset.

Only the Gaussian filter type is used.

Key Path	BW
<b>Remote Command</b>	<pre>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth[:RESolution] &lt;freq&gt; [ :SENSe ] :AM FM PM FMSTereo:BANDwidth[:RESolution]? [ :SENSe ] :AM FM PM:BANDwidth[:RESolution]:AUTO OFF ON 0 1 [ :SENSe ] :AM FM PM:BANDwidth[:RESolution]:AUTO?</pre>
<b>Example</b>	<pre>AM:BAND 1 KHZ AM:BAND? AM:BAND:AUTO ON AM:BAND:AUTO?</pre>
<b>Notes</b>	Only certain discrete resolution bandwidths are available. For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
<b>Couplings</b>	<p>AM/FM/PM: In Auto, the 3 dB RBW of the desired filter is the closest possible choice to that given by Span divided by 106 (the Span: 3 dB RBW parameter), except that the range for auto-coupling is restricted to not exceed 3 MHz.</p> <p>FMST: In Auto, RBW is coupled to Span in the following ways: <math>RBW = Span / 500</math> ( <math>Span &gt; 500</math> kHz )  <math>RBW = 1</math> kHz ( <math>100kHz \leq Span \leq 500</math> kHz )  <math>RBW = Span / 100</math> ( <math>Span &lt; 100</math> kHz )</p>
<b>Preset</b>	<p>AM/FM/PM: Preset is Auto, which results in a 680 Hz value since the preset span is 75 kHz and the Span/RBW ratio is 106</p> <p>FMST: Preset is Auto, which results in a 1 kHz value since the preset span is 500 kHz</p>
<b>State Saved</b>	Saved in Instrument state

Min	1 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Channel BW

The Channel BW variable is used to determine the bandwidth used for the demodulation. The flat top filter type must be used for demodulation.

This parameter also controls the RBW hardware setting for the demodulation fed to the speaker.

Key Path	BW
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:BANDwidth:CHANnel <freq> [ :SENSe ] :AM FM PM FMSTereo:BANDwidth:CHANnel?
<b>Example</b>	AM:BAND:CHAN 200 kHz
Notes	If the Channel BW is greater than 8 MHz, gives a warning message "Settings Alert; Analog Output Undefined".
Dependencies	The maximum value will be the maximum IF BW available in the instrument. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available IF BW of the instrument is 140 MHz. Thus, the maximum Channel BW is not limited to 25 MHz but is 140 MHz.
Preset	= AM/FM/PM = 25 kHz = FMST = 400 kHz
State Saved	Saved in instrument state
Min	390 Hz
Max	When Option N9063A-AFP is installed, it depends on hardware: No Option = 10 MHz Option B25 = 25 MHz Option B40 = 40 MHz  Option B1X = 140 MHz Option B1Y = 160 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## AF Res BW

In the AF Spectrum window, the AF Res BW key is used to set the Resolution bandwidth of the FFT of the demodulated waveform.

The data acquisition uses the Channel BW value for hardware control during data acquisition, just as it does in the Demod Waveform window.

AF Res BW (Auto) selects automatic coupling of the AF Res BW to the AF Span (defined as AF Stop Freq – AF Start Freq) using the same factor of 106 used by the RF Res BW. To decouple the resolution bandwidth, press the AF Res BW key until Man is underlined, or enter a different value for the AF resolution bandwidth.

When the AF resolution bandwidth is manually selected, it may be returned to the coupled state by pressing the AF Res BW key until Auto is underlined. This may also be done by pressing the Auto Couple key or by performing a Preset.

Only the Gaussian filter type is used.

Key Path	BW
<b>Remote Command</b>	<pre>[ :SENSe ] :AM FM PM}  FMSTereo:AFSPepectrum:BA NDwidth &lt;freq&gt; [ :SENSe ] :AM FM PM FMSTereo:AFSPepectrum:BA NDwidth? [ :SENSe ] :AM FM PM FMSTereo:AFSPepectrum:BA NDwidth:AUTO OFF   ON   0   1 [ :SENSe ] :AM FM PM FMSTereo:AFSPepectrum:BA NDwidth:AUTO?</pre>
<b>Example</b>	<pre>AM:AFSP:BA ND 1 KHZ AM:AFSP:BA ND?</pre>
Notes	Only certain discrete resolution bandwidths are available. For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Notes	For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Remote Command Notes	The setting and querying of values depends on the current bandwidth type.
Couplings	In Auto, the 3 dB RBW of the desired filter is the closest possible choice to that given by Span divided by 106 (the Span: 3 dB RBW parameter), except that the range for auto-coupling is restricted to not exceed 3 MHz.
Preset	Preset is Auto, which results in a 180 Hz value since the preset span is 20 kHz and the Span/RBW ratio is 106
State Saved	Saved in Instrument State
Min	1 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00



## Cont (Continuous Measurement/Sweep)

Sets the analyzer for Continuous measurement operation. The single/continuous state is Meas Global so the setting will affect all measurements. If you are Paused, pressing Cont does a Resume.

Key Path	Front-panel key
Remote Command	:INITiate:CONTinuous OFF ON 0 1 :INITiate:CONTinuous?
Example	:INIT:CONT 0 puts analyzer in Single measurement operation. :INIT:CONT 1 puts analyzer in Continuous measurement operation
Preset	ON (Note that SYST:PRESet sets INIT:CONT to ON but *RST sets INIT:CONT to OFF)
State Saved	Saved in instrument state
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, there is no Cont hardkey, instead there is a Sweep Single/Cont key. In these analyzers, switching the Sweep Single/Cont key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart Max Hold and Min Hold. The X-Series has Single and Cont keys in place of the SweepSingleCont key. In the X-Series, if in single measurement, the Cont key (and INIT:CONT ON ) switches to continuous measurement, but never restarts a measurement and never resets a sweep.
Initial S/W Revision	Prior to A.02.00

In Swept SA Measurement (Spectrum Analysis Mode):

The analyzer takes repetitive sweeps, averages, measurements, etc., when in Continuous mode. When the average count reaches the Average/Hold Number the count stops incrementing, but the analyzer keeps sweeping. See the Trace/Detector section for the averaging formula used both before and after the Average/Hold Number is reached. The trigger condition must be met prior to each sweep. The type of trace processing for multiple sweeps, is set under the Trace/Detector key, with choices of Trace Average, Max Hold, or Min Hold.

In Other Measurements/Modes:

With Avg/Hold Num (in the Meas Setup menu) set to Off or set to On with a value of 1, a sweep is taken after the trigger condition is met; and the analyzer continues to take new sweeps after the current sweep has completed and the trigger condition is again met. However, with Avg/Hold Num set to On with a value >1, multiple sweeps (data acquisitions) are taken for the measurement. The trigger condition must be met prior to each sweep. The sweep is not stopped when the average count k equals the number N set for Avg/Hold Num is reached, but the number k stops incrementing. A measurement average usually applies to all traces, marker results, and numeric results. But sometimes it only applies to the numeric results.

If the analyzer is in Single measurement, pressing the Cont key does not change k and does not cause the sweep to be reset; the only action is to put the analyzer into Continuous measurement operation.

If it is already in continuous sweep:

the INIT:CONT 1 command has no effect

10  $\Phi$ M Demod 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 236

## FREQ Channel

Accesses a menu of keys that enable you to control the Frequency parameters of the instrument.

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

### Center Frequency

Sets the frequency that corresponds to the horizontal center of the RF Spectrum window. While adjusting the Center Frequency the Span is held constant, this means that both the start frequency and the stop frequency will change.

The Center Frequency is retained as you go from measurement to measurement.

Key Path	FREQ Channel
<b>Remote Command</b>	<code>[ :SENSe ] :FREQuency:CENTer &lt;freq&gt;</code> <code>[ :SENSe ] :FREQuency:CENTer?</code>
<b>Example</b>	FREQ:CENT 50MHz FREQ:CENT UP changes the center frequency to 150 MHz if you use FREQ:CENT:STEP 100MHz sets the center frequency step size to 100 MHz FREQ:CENT?
Dependencies	The Center Frequency can be limited by Start or Stop Freq limits, In addition, the Center Frequency can be limited if the Span is so large that Start or Stop hit 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 frequency range
Preset	1.000 GHz
State Saved	Saved in instrument state
Min	Depends on instrument minimum frequency and the 10 Hz minimum span. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters.
Max	Depends on the instrument’s maximum frequency and the 10 Hz minimum span. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

## CF Step

Changes the step size for the center frequency function. Once a step size has been selected and the center frequency function is active, the step keys (and the UP|DOWN parameters for the Center Frequency from remote commands) change the center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the analyzer.

Key Path	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :FREQuency:CENTer:STEP [ :INCRement ] <freq> [ :SENSe ] :FREQuency:CENTer:STEP [ :INCRement ] ? [ :SENSe ] :FREQuency:CENTer:STEP:AUTO OFF   ON   0   1 [ :SENSe ] :FREQuency:CENTer:STEP:AUTO ?
<b>Example</b>	FREQ:CENT:STEP:AUTO ON FREQ:CENT:STEP 500MHz FREQ:CENT UP increases the current center frequency value by 500 MHz FREQ:CENT:STEP? FREQ:CENT:STEP:AUTO?
Remote Command Notes	Preset and Max values are dependent on Hardware Options (503, 508, 513, 526)
Dependencies	Span, RBW, Center frequency
Couplings	When auto-coupled in a non-zero span, the center frequency step size is set to 10% of the span. When auto-coupled in zero span, the center frequency step size is set to the equivalent -3 dB RBW value.
Preset	Auto
State Saved	Saved in State
Min	– (the maximum frequency of the instrument). For example, a 27 GHz max frequency instrument has a CF step range of +/- 27 GHz.
Max	The maximum frequency of the instrument. For example, 27 GHz max freq instrument has a CF step range of +/- 27 GHz.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

## AF Start Freq

Sets the frequency at the left side of the graticule in the AF Spectrum window. While adjusting the AF start frequency the AF stop frequency is held constant.

The AF Start Frequency is retained as you go from measurement to measurement.

Key Path	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :AM   FM   PM   FMSTereo :AFSPectrum :FREQuency :START <freq> [ :SENSe ] :AM   FM   PM   FMSTereo :AFSPectrum :FREQuency :START ?

<b>Example</b>	AM:AFSP:FREQ:STAR 0 Hz
Dependencies	You cannot set the Start frequency > the Stop frequency. You cannot set the Start frequency = Stop frequency. You cannot set the Start Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, Stop Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	0 Hz
State Saved	Saved in instrument state
Min	0 Hz
Max	99.999990 MHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### AF Stop Freq

Sets the frequency at the right side of the graticule in the AF Spectrum window. While adjusting the AF Stop Frequency the AF Start Frequency is held constant.

Key Path	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:STOP <freq> [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:STOP?
<b>Example</b>	AM:AFSP:FREQ:STOP 20 kHz
Dependencies	You cannot set the Stop frequency < the Start frequency. You cannot set the Start frequency = Stop frequency. You cannot set the Stop Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, the Start Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	20 kHz
State Saved	Saved in instrument state
Min	10 Hz
Max	100 MHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Input/Output

See "Input/Output" on page 126

## Marker

Accesses the Marker menu. A marker can be placed on a trace to allow the value of the trace at the marker point to be determined precisely. The functions in this menu include a 1-of-N selection of the control mode Normal, Delta, Fixed, or Off for the selected marker.

If the selected marker is Off, pressing the Marker key sets it to the selected window. If the metrics window is selected, the marker will appear in the first visible window (RF Spectrum if Quad View is selected).

The units of Delta Marker are window dependent. In the Spectrum windows they are dB, in the Demod Waveform window they are the same as the Y-Axis Unit. In this window, the delta marker is a linear difference rather than a ratio. For example, in FM, in the Demod Waveform window, the units of delta marker are Hz.

### Control Mode

<b>Key Path</b>	<b>Front-panel key</b>
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MODE POSition   DELTA   FIXed   OFF :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MODE?
<b>Example</b>	CALC:AM:MARK:MODE POS turns on marker 1 in Normal mode
<b>Remote Command Notes</b>	This command (not the query) causes the specified marker to become selected.
<b>Preset</b>	OFF (all markers)
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Select Marker

Displays a menu with 12 markers available for selection for the current measurement.

<b>Key Path</b>	<b>Marker</b>
<b>Notes</b>	The selected marker is remembered even when not in the Marker menu and is used if a Search is initiated.
<b>Preset</b>	Marker 1
<b>State Saved</b>	The number of the selected marker is saved in instrument state.
<b>Initial S/W Revision</b>	Prior to A.02.00

### Normal

Sets the control mode for the selected marker to Normal and turns on the active function for setting its value. If the selected marker was off, it is placed at the center of the screen on the trace specified by the marker's Trace attribute.

A Normal mode (POSition type) marker can be moved to any point on the X Axis by specifying its X Axis value. Its absolute Y Axis value is then the value of the trace point at that X Axis value.



Key Path	Marker
<b>Example</b>	: CALC: MARK: MODE POS sets Marker 1 to Normal.
Remote Command Notes	See the description under the " <b>Marker</b> " on page 779 key.
Couplings	The marker addressed by this command becomes the selected marker on the front panel.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Delta

Sets the control mode for the selected marker to Delta and turns on the active function for setting its delta value. If the selected marker is off, the marker is placed at the center of the screen on the trace specified by the marker's Trace attribute.

In Delta mode the marker result shows the relative result between the selected (Delta) marker and its reference marker. A delta marker can be moved to any point on the X Axis by specifying its X Axis offset from a reference marker. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker
<b>Example</b>	:CALC:MARK:MODE DELT sets marker 1 to Delta.
Remote Command Notes	See the description under the " <b>Marker</b> " on page 779 key.
Couplings	Coupled to fix absolute X when turned On.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Fixed

Sets the control mode for the selected marker to Fixed. A fixed marker is fixed in the sense that it stays where you place it. It can be directly moved in both X and Y. It can be moved with a Peak Search. It can also be indirectly moved by re-zeroing the delta if it is a relative marker. If it is moved, it again becomes fixed at the X Axis point it moved to and it has a Y-axis result that it took on when it moved there. If a Normal or Delta marker is changed to Fixed it becomes fixed at the X Axis point it was at, and with the Y-axis result it had when it was set to Fixed.

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

## Marker X

Sets and queries a marker's X value.

Key Path	Marker, Fixed
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<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:X <time>   <freq> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:X?
Remote Command Notes	The query is returned in the fundamental units for the current marker X Axis scale. This command (not the query) causes the specified marker to become selected.
Preset	After a preset, all Markers are turned off, so a Marker X Axis Value query will return not a number (9.91 e37). When a Marker is on, the default value of the Marker X value is the center of the appropriate window.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Marker Y

Sets and queries a marker's Y axis value.

Key Path	Marker, Fixed
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:Y <real> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:Y?
Remote Command Notes	The query is returned in the fundamental units for the current marker Y Axis scale. This command (not the query) causes the specified marker to become selected.
Preset	Defaults to the measurement result at the default X value, or not a number (9.91 e37) if off or if off screen is Fixed.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Off

Turns off the selected marker. Turning the marker off does not affect which marker is selected.

Key Path	Marker
<b>Example</b>	: CALC: MARK: MODE OFF sets Marker 1 to Off.
Remote Command Notes	See the description under the " <a href="#">Marker</a> " on page 779 key.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Properties

Accesses a menu used to assign properties to the selected marker.

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

## Select Marker

Displays a menu with 12 markers available for selection for the current measurement.

Key Path	Marker, Properties
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is initiated.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Relative To

Selects the reference marker for a marker in Delta mode.

If a delta marker has a reference marker in a different window, the delta marker's mode changes to POS (for example, it becomes a normal marker).

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:REference <int> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:REference?
<b>Example</b>	CALC:AM:MARK1:REF 2 Sets marker 1's reference marker to 2 and turns marker 1 on as a delta marker.
Remote Command Notes	This command (not the query) causes the specified marker to become selected.
Preset	By default, marker X is relative to marker X + 1 except for marker 12, which is relative to marker 1.
Min	1
Max	12
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## AM/FM/ $\Phi$ M Marker Trace

Selects the trace on which to place the marker. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an

associated trace, even Fixed markers. It is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

In the AM/ $\Phi$ M measurements, there are five named traces, and in the FM measurement, there are seven named traces. The RF Spectrum trace is the trace in the RF Spectrum window, and the AF Spectrum trace is the trace in the AF Spectrum window. There are four traces in the Demod Waveform window: Demod, Demod Avg, Demod Max, and Demod Min. The RF Envelope trace and the Demod Raw trace are from Attack/Release Time view which is only available in the FM measurement. The RF Envelope trace is in the RF Envelope window and the Demod Raw trace is in the FM Demod Waveform window. When Auto Init is on, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta, or Fixed) from an off state. The marker goes to the trace in the window that has the focus, or onto the RF spectrum window if the Metrics window has the focus. If in the Demod Waveform window, it goes to the Demod trace.

This command associates the marker with the specified trace. Setting the Marker Trace directly (whether the marker is on or off) will turn off Auto Init.

If the marker is not off, it moves the marker from the trace it was on to the new trace. If the new trace is in the same window, the marker goes to the same data point on the new trace. If the marker changes windows, it retains its relative horizontal positions in the new window. If it is a fixed marker, it will retain both relative horizontal and vertical position.

If the marker is off it stays off, but is now associated with the specified trace.

The query returns the name of the trace on which the marker is currently placed.

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM:MARKer[1] 2 ... 12:TRACe RFSpectrum   AFSPpectrum   DEMod   DAVerage   DMAXimum   DMINimum   RFENvelope   DRAW  :CALCulate:AM FM PM:MARKer[1] 2 ... 12:TRACe?
<b>Example</b>	:CALC:AM:MARK1:TRAC DEM places marker 1 on the Demod trace
<b>Couplings</b>	This is not affected by Auto Coupling.  Sending the remote command causes the addressed marker to become selected.  If ever a delta marker has a reference marker in a different window, the delta marker's mode changes to POS (for example, it becomes a normal marker).  When Marker Trace Auto Init State is on, the marker trace will automatically be set whenever the marker is turned on.
<b>Preset</b>	RF Spectrum on a Preset or All Markers Off
<b>State Saved</b>	The Marker Trace for each marker is saved in instrument state.
<b>Readback line</b>	[Trace name, Auto Init] or [Trace Name, Manual]
<b>Initial S/W Revision</b>	Prior to A.02.00

## RF Spectrum

Selects the input RF signal in the RF Spectrum window as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC RFSP
Initial S/W Revision	Prior to A.02.00

### Demod

Selects the current demodulated signal in the Demod Waveform window, shown in yellow, as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DEM
Initial S/W Revision	Prior to A.02.00

### Demod Average

Selects the averaged demodulation signal in the Demod Waveform window, shown in green, as the trace on which you want to place your marker. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DAV
Initial S/W Revision	Prior to A.02.00

### Demod Max

Selects the Demod Max trace in the Demod Waveform window, shown in cyan, as the trace on which you want to place your marker. This trace shows the maximum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DMAX
Initial S/W Revision	Prior to A.02.00

### Demod Min

Selects the Demod Min trace in the Demod Waveform window, shown in magenta, as the trace on which you want to place your marker. This trace shows the minimum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC DMIN
Initial S/W Revision	Prior to A.02.00

### AF Spectrum

Selects the demodulated signal in the AF Spectrum window as the trace on which you want to place your marker.

Key Path	Marker, Properties, Marker Trace
<b>Example</b>	:CALC:AM:MARK1:TRAC AFSP
Initial S/W Revision	Prior to A.02.00

### Trace Auto Init

Selects whether the marker trace is automatically reset to the selected window when the marker is turned on or not.

Key Path	Marker, Properties, Trace
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer [1]   2   ...   12:TRACe:AUTO OFF   ON   0   1 :CALCulate:AM FM PM FMSTereo:MARKer [1]   2   ...   12:TRACe:AUTO?
<b>Example</b>	:CALC:AM:MARK1:TRAC:AUTO 0 turns off auto-initialization of marker trace.
Preset	On
State Saved	Saved in instrument state.
Readback line	Trace name
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Lines

When on, displays a vertical line of graticule height and a horizontal line of graticule width, intersecting at the indicator point of the marker (that is, the center of the X or the bottom tip of the diamond). The lines are blue in color.

If the marker is off screen, the lines should be extended from the marker so that they go through the screen area if possible. This is really useful for off screen Fixed markers as it lets you see their amplitude even though they are off the X Axis.

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer [1]   2   ...   12:LINEs[:STATe] OFF   ON

	0   1
	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:LINes[:STATe]?
<b>Example</b>	CALC:AM:MARK2:LIN ON turns Lines on for marker 2.
<b>Couplings</b>	Sending the remote command causes the addressed marker to become selected.
<b>Preset</b>	OFF
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

## All Markers Off

Turns off all markers.

<b>Key Path</b>	Marker
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer:AOff
<b>Example</b>	CALC:AM:MARK:AOff turns off all markers for the AM measurement
<b>Couplings</b>	Sets the selected marker to 1.
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

## Marker Function

There are no menus or marker functions under this key in the Analog Demod mode.

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

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## Marker To

Accesses a menu that contains only the marker center frequency key.

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

### Mkr->CF

Sets the center frequency of the RF Spectrum window to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display.

In delta marker mode, this function sets the center frequency to the x-axis value of the delta marker.

Key Path	Marker ->
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12[:SET]:CENTer
<b>Example</b>	CALC:AM:MARK2:CENT sets the CF of the analyzer to the value of marker 2.
Remote Command Notes	Sending this command selects the sub-op coded marker. If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the RF Spectrum trace as a normal type marker.
Dependencies	This function is unavailable (key is grayed out) unless the selected marker's trace is off, or on the RF Spectrum trace.
Couplings	All the usual couplings associated with setting Center Frequency apply (see " <a href="#">Center Frequency</a> " on <a href="#">page 775</a> ).
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## 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.

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

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### Remote Measurement Functions

This section contains the following topics:

["Measurement Group of Commands" on page 796](#)

["Current Measurement Query \(Remote Command Only\)" on page 798](#)

["Limit Test Current Results \(Remote Command Only\)" on page 798](#)

["Data Query \(Remote Command Only\)" on page 798](#)

["Calculate/Compress Trace Data Query \(Remote Command Only\)" on page 799](#)

["Calculate Peaks of Trace Data \(Remote Command Only\)" on page 804](#)

[Hardware-Accelerated Fast Power Measurement \(Remote Command Only\)](#)

["Format Data: Numeric Data \(Remote Command Only\)" on page 805](#)

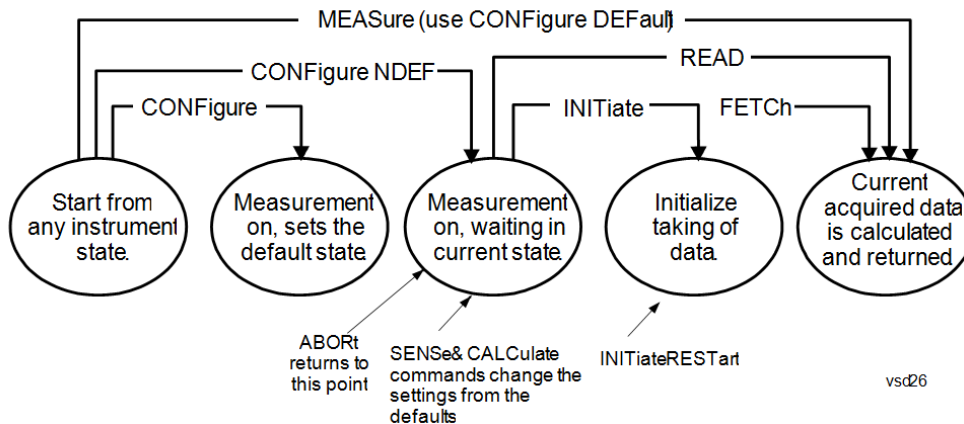
["Format Data: Byte Order \(Remote Command Only\)" on page 806](#)

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Initial S/W Revision	Prior to A.02.00
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## Measurement Group of Commands




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### 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>?.

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### Configure Commands:

:CONFIgure:<measurement>

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using

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the factory default instrument settings. It does not initiate the taking of measurement data unless INIT:CONTinuous is ON. If you change any measurement settings after using the CONFigure command, the READ command can be used to initiate a measurement without changing the settings back to their defaults.

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

:CONFigure: <measurement>: NDEFault stops the current measurement and changes to the specified measurement. It does not change the settings to the defaults. It does not initiate the taking of measurement data unless INIT:CONTinuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query returns a quoted string of all licensed measurement names in the current mode. For example, "SAN, CHP, OBW, ACP, PST, TXP, SPUR, SEM, LIST".

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#### Fetch Commands:

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:FETCh:<measurement>[n]?

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

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

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

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

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#### INITiate Commands:

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: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.
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#### READ Commands:

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:READ:<measurement>[n]?

- Does not preset the measurement to the factory default settings. For example, if you have previously initiated the ACP
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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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<b>Remote Command</b>	:CONFigure?
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<b>Example</b>	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.

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<b>Remote Command</b>	:CALCulate:CLIMits:FAIL?
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<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.
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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]?
<b>Notes</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

### Calculate/Compress Trace Data Query (Remote Command Only)

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

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

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

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

<b>Remote Command</b>	:CALCulate:DATA<n>:COMPress? BLOCk   CFIT   MAXimum   MINimum   MEAN   DMEan   RMS   RMSCubed   SAMple   SDEVIation   PPHase [,<soffset> [,<length>[,<roffset>[,<rlimit>]]]]
<b>Example</b>	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.)
<b>Notes</b>	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.
<b>Initial S/W Revision</b>	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)

$$\text{RMS} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i^2}$$

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:

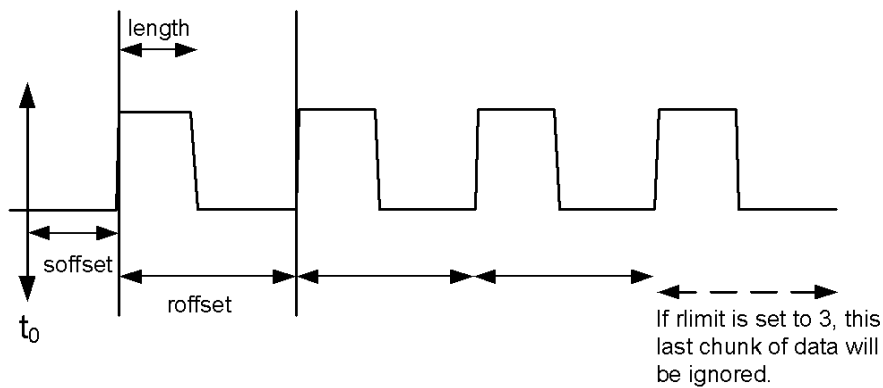
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

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.

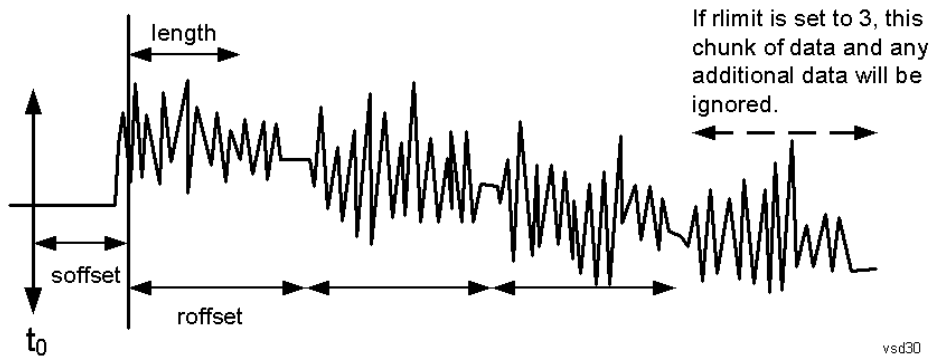
Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



<soffset> - start offset is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It specifies the amount of data at the beginning of the trace that will be ignored before the decimation process starts. It is the time or frequency change from the start of the trace to the point where you want to start using the data. The default value is zero.

<length> - is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It defines how much data will be compressed into one value. This parameter has a default value equal to the current trace length.

<roffset> - repeat offset is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It defines the beginning of the next field of trace elements to be compressed. This is relative to the beginning of the previous field. This parameter has a default value equal to the <length> variable. Note that this parameter is used for a completely different purpose when curve fitting (see CFIT above).

<rlimit> - repeat limit is an optional integer. It specifies the number of data items that you want returned. It will ignore any additional items beyond that number. You can use the Start offset and the Repeat limit to pick out exactly what part of the data you want to use. The default value is all the data.

## Calculate Peaks of Trace Data (Remote Command Only)

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

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

The command can only be used with specific sub-opcodes with measurement results that are trace data. Both real and complex traces can be searched, but complex traces are converted to magnitude in dBm. In many measurements the sub-opcode n=0, is the raw trace data which cannot be searched for peaks. And Sub-opcode n=1, is often calculated results values which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDER and FORMat:DATA commands and can return real or ASCII data. If the format is set to INT,32, it returns REAL,32 data.

The command has four types of parameters:

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

---

<b>Remote Command</b>	<p>For Swept SA measurement:</p> <pre>:CALCulate:DATA[1] 2 ... 6:PEAKs? &lt;threshold&gt;,&lt;excursion&gt;[,AMPLitude   FREQuency   TIME[,ALL   GTDLline   LTDLine]]</pre> <p>For most other measurements:</p> <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>
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<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</p>
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excursion value stored under the Peak Criteria menu.

Values must be provided for threshold and excursion. The sorting and display line parameters are optional (defaults are AMPLitude and ALL).

Note that there is always a Y-axis value for the display line, regardless of whether the display line state is on or off. It is the current Y-axis value of the display line which is used by this command to determine whether a peak should be reported

Sorting order:

AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)

FREQuency - lists the peaks in order of occurrence, left to right across the x-axis.

TIME - lists the peaks in order of occurrence, left to right across the x-axis.

Peaks vs. Display Line:

ALL - lists all of the peaks found (default if optional parameter not sent).

GTDLine (greater than display line) - lists all of the peaks found above the display line.

LTDLine (less than display line) - lists all of the peaks found below the display line.

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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.

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**Remote Command**      :FORMat [:TRACe] [:DATA] ASCii|INTeger, 32|REAL, 32 |REAL, 64  
:FORMat [:TRACe] [:DATA] ?

---

**Notes**      The query response is:  
ASCii: ASC,8  
REAL,32: REAL,32  
REAL,64: REAL,64  
INTeger,32: INT,32

When the numeric data format is REAL or ASCii, data is output in the current Y Axis unit. When the data format is INTeger, data is output in units of m dBm (.001 dBm).

The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.

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**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".

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**Preset**      ASCii

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**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.

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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.

<b>Remote Command</b>	:FORMat:BORDER NORMal SWAPped :FORMat:BORDER?
<b>Preset</b>	NORMal
<b>Initial S/W Revision</b>	Prior to A.02.00

## Meas Setup

Accesses a menu of keys that enable you to control specific parameters for the current measurement.

["Overview" on page 670](#)

["Set Parameters " on page 670](#)

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

### Overview

This section describes the measurement setup features of the Analog Demod measurements.

### Set Parameters

The following parameters are set as indicated and are not settable by the user, therefore they do not appear in any menus:

FFT IF Gain	Low (0 dB)
ADC Dither	On
Avg Mode	Exponential
Phase Noise Optimization	Auto

### Auto Rules for Phase Noise Optimization:

Use "Optimize for  $f < 20$  kHz" when the Channel BW  $< 120$  kHz, otherwise use "Optimize for  $f > 30$  kHz".

["Optimizing Measurement Speed" on page 670](#)

["Channel Bandwidth" on page 671](#)

["RF Spectrum Span " on page 671](#)

["RF Spectrum RBW / AF Spectrum RBW" on page 671](#)

["AF Waveform Sweep Time" on page 671](#)

["Filters and Annotation" on page 671](#)

### Optimizing Measurement Speed

The speed of the analog demodulation measurements is driven largely by how much data must be acquired to satisfy the selected configuration.

Each measurement cycle generates all of the metrics and traces from a single acquisition, so there are several different settings which can affect the overall speed. Note that even though you may not be

viewing a particular result on the display, the result is available and its configuration and constraints are used to determine the acquisition settings.

### Channel Bandwidth

This setting determines the sampling rate used by the measurement, higher bandwidths will result in larger data sets being acquired and processed. This should be set to the lowest value possible which allows your signal to be fully captured.

### RF Spectrum Span

This setting is used in a similar way as the Channel Bandwidth in that it determines the sampling rate. As with channel bandwidth, it should be set as narrow as possible to capture the signal of interest.

### RF Spectrum RBW / AF Spectrum RBW

These settings dictate a minimum acquisition time for the measurement. The Auto setting is recommended for optimal performance while maintaining measurement integrity. Narrower resolution bandwidths (RBWs) require longer acquisitions to achieve the resolution improvements.

### AF Waveform Sweep Time

This setting sets another minimum acquisition time for the measurement. In many uses, the AF Spectrum RBW will dominate the determination of the data acquisition duration, but if the AF waveform view is not needed keeping its sweep time low will ensure that it does not negatively impact the throughput.

### Filters and Annotation

You may choose to filter by frequency – choosing an optional low-pass filter and an optional high-pass filter – or may filter using a standard published band-pass filter (CCITT). Turning on a band-pass filter will automatically turn off the high-pass and low-pass filters; similarly, the band-pass filter will automatically turn off if you request either a high-pass or a low-pass filter.

### Average/Hold Num

When turned on, the RF Spectrum and AF spectrum traces are averaged, and the Demod window shows an Average trace, a Max Hold trace, and a Min Hold trace in addition to the current trace. All metrics are averaged, and the metrics show an “Average” column and a “Max Hold” column.

The average feature for the Analog Demod measurement differs from other measurements in that the average type is fixed depending on the window as shown in the following table:

Window	Average Type
RF Spectrum	Pwr Average
Demod Waveform	Arithmetic Average
AF Spectrum	Log Average

For more details, see ["Average/Hold On/Off Functionality" on page 672](#).

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Key Path	Meas Setup
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<b>Remote Command</b>	[:SENSe]:AM FM PM FMSTereo:AVERage:COUNT <integer> [:SENSe]:AM FM PM FMSTereo:AVERage:COUNT? [:SENSe]:AM FM PM FMSTereo:AVERage[:STATe] ON OFF 1 0 [:SENSe]:AM FM PM FMSTereo:AVERage[:STATe]?
<b>Example</b>	AM:AVER:COUN 10
<b>Preset</b>	10 ON
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	1
<b>Max</b>	9999
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Average/Hold On/Off Functionality

Average, Minhold, and Maxhold are coupled.

When Average/Hold is on:

- The RF Spectrum and AF Spectrum traces are averaged.
- The Demod Waveform window will display a current trace, an Average trace, a Max Hold trace, and a Min Hold trace.
- The Metrics window will display an “Average” column and a “Max Hold” column.
- Metrics will display to four significant digits.
- The Meas Bar will display the Average/Hold number (along with how many of those sweeps have been captured).
- Demod Min trace, Demod Max trace, and Demod Avg trace are maintained.
- The Max Hold column shows the maximum value the un-averaged metric has attained since the last Restart.

When Average/Max Hold is off:

- The RF Spectrum and AF Spectrum traces are not averaged.
- The Demod Waveform window will display only the demod trace.
- The Metrics window will display only a “Current” column.
- Metrics will display to two significant digits.
- The Meas Bar will not display the Average/Hold number.
- Max Hold metrics over SCPI will return SCPI not a number.



- Demod Min trace, Demod Max trace and Demod Avg trace will return default values in a Meas?, Read?, and Fetch? and when exported to a .csv file
- Max Hold column is blank.

### Modulation Rate Periodic

The algorithms used by the instrument for demodulation have an improved speed/accuracy tradeoff when the modulation is both periodic (such as a sinusoidal test signal) and assumed to be periodic by the analysis system. Thus, “Yes” is best for periodic signals. When the modulation is aperiodic, such as voice or music or even multiple nonharmonically related tones, “No” gives better results.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe ] :AM FM PM FMSTereo:PERIodic[:STATe] ON   OFF   1   0</code> <code>[ :SENSe ] :AM FM PM FMSTereo:PERIodic[:STATe] ?</code>
<b>Example</b>	FM:PERI OFF
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	A.12.00

### Filters

Pressing this key displays the Filters menu, allowing you to control the post demodulation and de-emphasis filters.

If any filters are turned on and the filters cannot be applied, the error “161 Setting Modified; Filters not applied” will appear.

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

### High Pass Filter (Post Demod)

This parameter allows you to adjust the post demodulation high pass filters. This filter allows you to remove unwanted low-frequency components from the modulated signal..

Key Path	Meas Setup
<b>Remote Command</b>	<b>AM FM PM:</b> <code>[ :SENSe ] :AM FM PM:HPFilter OFF HPF20 HPF50 HPF300 HPF400</code> <code>[ :SENSe ] :AM FM PM:HPFilter?</code>
	<b>FM Stereo:</b> <code>[ :SENSe ] :FMSTereo:HPFilter OFF HPF20 HPF50 HPF300</code> <code>[ :SENSe ] :FMSTereo:HPFilter?</code>

<b>Example</b>	FM:HPF HPF20
Remote Command Notes	<p>AM FM PM:  Off = No filtering  HPF20 = Use 20 Hz high pass filter  HPF50 = Use 50 Hz high pass filter  HPF300 = Use 300 Hz high pass filter  HPF400 = Use 400 Hz high pass filter</p> <p>FM Stereo:  Off = No filtering  HPF20 = Use 20 Hz high pass filter  HPF50 = Use 50 Hz high pass filter  HPF300 = Use 300 Hz high pass filter</p>
Dependencies	The HPF400 is available only when Option N9063A-AFP is installed in AM/FM/PM.
Couplings	<p>AM/FM/PM:  Turning on any high-pass filter will turn off bandpass filters.  If a band-pass filter is turned off, the following advisory message is displayed:  “Band-pass filter set to OFF”.  If the band-pass filter was already off, no advisory message is displayed.</p> <p>FM Stereo:  None</p>
Preset	Off (AM/FM/FM Stereo, HPF20 (PM))
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

### Off

This selection turns the post demodulation high pass filter off.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF OFF
Notes	Annotation line (DC Coupled) appears in the Meas Bar, except if in the AM measurement.
Readback	Off
Initial S/W Revision	Prior to A.02.00

## 20 Hz

Sets the post demodulation high pass filter to 20 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 20 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF20
Readback	20 Hz
Initial S/W Revision	Prior to A.02.00

## 50 Hz

Sets the post demodulation high pass filter to 50 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 50 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF50
Readback	50 Hz
Initial S/W Revision	Prior to A.02.00

## 300 Hz

Sets the post demodulation high pass filter to 300 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 300 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF300
Readback	300 Hz
Initial S/W Revision	Prior to A.02.00

## 400 Hz

Sets the post demodulation high pass filter to 400 Hz. It is a 10-pole Butterworth filter, its 3 dB cutoff frequency is 430 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF400
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	400 Hz
Initial S/W Revision	A.14.00

## Lowpass Filter (Post Demod)

This parameter allows you to adjust the post demodulation low pass filter. The filter is useful in removing unwanted high frequency components of the modulating signal.

Key Path	Meas Setup
<b>Remote Command</b>	<b>AM FM PM:</b> <code>[[:SENSe]:AM FM PM:LPFilter OFF   LPF300   LPF3K   LPF15K   LPF30K   LPF80K   LPF300K   LPF100K   MANual</code> <code>[[:SENSe]:AM FM PM:LPFilter?</code> <b>FM Stereo:</b> <code>[[:SENSe]:FMSTereo:LPFilter OFF   LPF300   LPF3K   LPF15K   LPF30K   LPF80K   LPF300K</code> <code>[[:SENSe]:FMSTereo:LPFilter?</code>
<b>Example</b>	FM:LPF LPF3K
<b>Remote Command Notes</b>	<b>AM FM PM:</b> Off = No filtering LPF300 = Use 300 Hz low pass filter LPF3K = Use 3 kHz low pass filter LPF15K = Use 15 kHz low pass filter LPF30K = Use 30 kHz low pass filter LPF80K = Use 80 kHz low pass filter LPF300K = Use 300 kHz low pass filter LPF100K = Use >20 kHz low pass filter MANual=Use user-defined low pass filter <b>FM Stereo:</b> Off = No filtering LPF300 = Use 300 Hz low pass filter LPF3K = Use 3 kHz low pass filter LPF15K = Use 15 kHz low pass filter LPF30K = Use 30 kHz low pass filter LPF80K = Use 80 kHz low pass filter LPF300K = Use 300 kHz low pass filter
<b>Dependencies</b>	LPF key is unavailable (grayed out) when the band pass filter is not OFF. The following filters are available only when Option N9063A-AFP is installed in AM/FM/PM: LPF100K and MANual.
<b>Couplings</b>	<b>AM/FM/PM:</b> Turning on any low-pass filter will turn off band-pass filters. If a band-pass filter is turned off, the following advisory message is displayed: "Band-pass filter set to OFF". If the band-pass filter was already off, no advisory message is displayed.

	FM Stereo: None
Preset	Off
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

### Off

Turns the post demodulation low pass filter off.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

### 300 Hz

Sets the post demodulation low pass filter to 300 Hz. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 300 Hz.

Key Path	Meas Setup, HPF/LPF
<b>Example</b>	AM:HPBP LPF300
Readback	300 Hz
Initial S/W Revision	Prior to A.02.00

### 3 kHz

Selects the 3 kHz post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 3 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF3K
Readback	3 kHz
Initial S/W Revision	Prior to A.02.00

### 15 kHz

Selects the 15 kHz post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 15 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF15K
Readback	15 kHz
Initial S/W Revision	Prior to A.02.00

### 30 kHz

Selects the 30 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 30 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF30K
Readback	30 kHz
Initial S/W Revision	Prior to A.02.00

### 80 kHz

Selects the 80 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 80 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF80K
Readback	80 kHz
Initial S/W Revision	Prior to A.02.00

### 100 kHz

Selects the 100 kHz (“>20 kHz”) post demodulation low pass filter. It is a 9-pole Bessel filter designed for minimum overshoot (<1% nom) on square wave modulation, its 3 dB cutoff frequency is 100 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF100K
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	>20 kHz
Initial S/W Revision	A.14.00

### 300 kHz

Selects the 300 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 300 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF300K
Readback	300 kHz
Initial S/W Revision	Prior to A.02.00

### Manual

Selects the user-defined post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency can be changed through “[:SENSe]:AM|FM|PM|FM:LPFilter:MANual[:FREQUENCY] <freq>

” command.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF MAN
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	MAN
Initial S/W Revision	A.14.00

### User-defined Lowpass Filter

Allows user to set up a post demodulation low pass filter by manual.

Key Path	Meas Setup, Post Demod LPF
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FM:LPFilter:MANual [ :FREQUENCY ] <freq> [ :SENSe ] :AM FM PM FM:LPFilter:MANual [ :FREQUENCY ] ?
<b>Example</b>	AM:LPF:MAN 500kHz AM:LPF:MAN?
Notes	Adjusts the cutoff frequency of the user-defined low pass filter.
Dependencies	This feature is available only when Option N9063A-AFP is installed. Only active when Lowpass filter type is Manual.
Preset	300 Hz
State Saved	Saved in instrument state
Min	300 Hz
Max	Half of the maximum DIF BW.
Initial S/W Revision	A.14.00

## Band Pass Filter (Post Demod)

This parameter enables you to choose the post demodulation band pass filters, allowing you to apply industry-defined filters.

Key Path	Meas Setup
<b>Remote Command</b>	<p>AM FM PM:            [:SENSe]:AM FM PM:BPFilter OFF   CCITT   AWEighting   CWEighting   CMESsage   CCIR1k   CCIR2k   CUNWeighting            [:SENSe]:AM FM PM:BPFilter?</p> <p>FM Stereo:            [:SENSe]:FMSTereo:BPFilter OFF CCITT AWAudio            [:SENSe]:FMSTereo:BPFilter?</p>
<b>Example</b>	FM:BPFilter CCITT
Remote Command Notes	<p>AM FM PM:            Off = No filtering            CCITT = Use CCITT filter            AWEighting = Use A-Weighted Audio filter            CWEighting = Use C-Weighted audio filter            CMESsage = Use C-Message audio filter            CCIR1k = Use CCIR-1k Weighted audio filter            CCIR2k = Use CCIR-2k Weighted audio filter            CUNWeighting = Use CCIR Un-weighted audio filter</p> <p>FM Stereo:            Off = No filtering            CCITT = Use CCITT filter            AWAudio = Use A-Weighted Audio filter</p>
Dependencies	The following filters are available only when Option N9063A-AFP is installed in AM/FM/PM: AWEighting, CWEighting, CMESsage, CCIR1k, CCIR2k and CUNWeighting.
Couplings	<p>AM/FM/PM:            Turning on any bandpass filter will turn off high-pass and low-pass filters.            If a high-pass filter is turned off, the following advisory message is displayed:            "High-pass filter set to OFF".            If a low-pass filter is turned off, the following advisory message is displayed:            "Low-pass filter set to OFF".            If both are turned off, the following advisory message is displayed:            "High-pass and Low-pass filters set to OFF".            If both high-pass and low-pass filters were already off, no advisory message is displayed.</p> <p>FM Stereo:            None</p>
Preset	Off



State Saved	Saved in instrument state
Readback	1-of-N
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

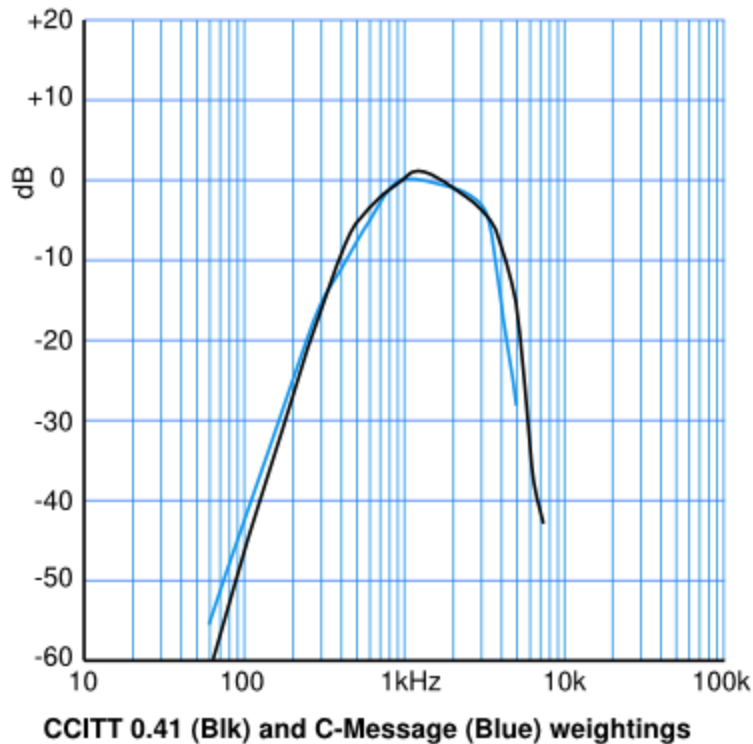
### Off

Turns the post demodulation band-pass filter off.

Key Path	Meas Setup, BPF
<b>Example</b>	AM:BPF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

### CCITT

Sets the post demodulation band-pass filter to CCITT.



Key Path	Meas Setup, BPF
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<b>Example</b>	AM:BPF CCITT
Readback	CCITT
Initial S/W Revision	Prior to A.02.00

### A-Weighted

Sets the post demodulation band-pass filter to A-Weighted Audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF AWE
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	A-Weighted
Initial S/W Revision	A.14.00

### C-Weighted

Sets the post demodulation band-pass filter to C-Weighted audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CWE
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	C-Weighted
Initial S/W Revision	A.14.00

### C-Message

Sets the post demodulation band-pass filter to C-Message audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CMES
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	C-Message
Initial S/W Revision	A.14.00

### CCIR 1k Weighted

Sets the post demodulation band-pass filter to CCIR-1k weighted filter.

**NOTE**

The CCIR 1k Weighted filter is implemented in the N9063A with an RMS detector, and not the quasi-peak detector (QPD) called for in the ITU standards. A compensation factor is included to yield similar results. This implementation is valid when measuring amplitude of Gaussian noise, or SINAD of a single continuous sine tone (e.g. 1 kHz) in the presence of harmonics and Gaussian noise. The results may not comply with the standard if the input signal is bursty, clicky or impulsive; contains multiple tones; or contains other distortion products (intermodulation, spurs) above the noise level. Use the AF Spectrum results to validate these assumptions. Consider using Agilent U8903A Audio Analyzer if true QPD is required.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CCIR1
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-1k
Initial S/W Revision	A.14.00

**CCIR 2k Weighted**

Sets the post demodulation band-pass filter to CCIR-2k weighted filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CCIR2
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-2k
Initial S/W Revision	A.14.00

**CCIR Un-weighted**

Sets the post demodulation band-pass filter to CCIR un-weighted filter.

The CCIR Un-weighted filter is implemented in the N9063A with an RMS detector, and not the quasi-peak detector (QPD) called for in the ITU standards. A compensation factor is included to yield similar results. This implementation is valid when measuring amplitude of Gaussian noise, or SINAD of a single continuous sine tone (e.g. 1 kHz) in the presence of harmonics and Gaussian noise. The results may not comply with the standard if the input signal is bursty, clicky or impulsive; contains multiple tones; or contains other distortion products (intermodulation, spurs) above the noise level. Use the AF Spectrum results to validate these assumptions. Consider using Agilent U8903A Audio Analyzer if true QPD is required.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CUNW
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-Unweighted
Initial S/W Revision	A.14.00

## Demod to Speaker

Controls whether a demodulated audio signal is connected to the speaker or not. This allows the demodulated audio to be turned off without completely disabling (muting) the instrument speaker. When the Analog Demod application is running, the demodulated signal can be heard from the speaker as long as the “Demod to Speaker” function is set to On.

**NOTE** The Windows controls for speaker volume and mute must also be properly set.

This function is shared among all measurements in the mode, but not across other modes.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe ] :SPEaker [ :STATe ] ON OFF 1 0</code> <code>[ :SENSe ] :SPEaker [ :STATe ] ?</code>
<b>Example</b>	SPE OFF Disconnects demodulated audio from speaker circuit.
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Auto BW & Scale

Automatically sets many measurement parameters by pressing one button, based upon the current signal under test. The feature requires that the center frequency be set to the signal of interest, and works best on stable periodic signals. The measurement is preset at the beginning of the Auto BW & Scale operation, with the exception that the user’s Center Frequency and audio Filters are maintained.

The signal is analyzed using an Occupied Bandwidth measurement to automatically set the RF Spectrum Span and Channel Bandwidth to good values. And then it sets the combination of mechanical and electronic attenuation based on the current measured signal level so that clipping will be at a minimum. Once these two steps are done, the software examines the demodulated signal and appropriately sets the Sweep Time and Demod Waveform Scale/Div.

There are no configurable parameters for Auto BW & Scale. The function is pre-configured to work with most real-world use cases.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe ] :AUToscale</code>
<b>Example</b>	AUT
Initial S/W Revision	Prior to A.02.00

## Auto Carrier Frequency

Accurate angle demodulation (FM or PM) depends on precisely identifying the carrier frequency.

For FM, frequency error (carrier offset) results in DC offset of demodulated signal. There's one DC component imposed on the Demod Waveform, which affects the Peak+, Peak- deviation measurement. And there's one DC term in the AF Spectrum, which affects the SINAD measurement.

For PM, frequency error results in phase ramping of demodulated signal, which affects all the subsequent measurements, for example, deviation, SINAD and so on.

When the Auto Carrier Frequency is turned on, the frequency error will be compensated automatically. Note that the Channel BW must be large enough to take the carrier offset effect into consideration.

### Considerations When Using Auto Carrier Frequency

The following situations can bias the frequency error estimation:

- Low frequency modulation, such as a periodic signal with fewer than 10 cycles over the time record.
- Phase discontinuities present in digital communication formats.
- Transients, such as carrier turn-on in the middle of the time record.

In cases where biases are unavoidable, the auto carrier frequency should be turned off. Where possible, lock the analyzer's external reference to a reference coherent with the carrier to eliminate frequency errors.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe ] : FM   PM : CARRier : FREQuency : AUTO OFF   ON   0   1</code> <code>[ :SENSe ] : FM   PM : CARRier : FREQuency : AUTO ?</code>
<b>Example</b>	<code>FM:CARR:FREQ:AUTO ON</code> <code>FM:CARR:FREQ:AUTO?</code>
Notes	If current measurement is AM, this key is blank.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	OFF for FM, and ON for PM.
State Saved	Saved in instrument state.
Range	On   Off
Initial S/W Revision	A.14.00

### Auto Carrier Phase

PM demodulation also has the option of correcting the phase offsets. A phase offset does not affect the FM results, because the offset differentiates to zero.

For PM, phase offset results in a DC offset of the demodulated signal. There's one DC component imposed on the Demod Waveform, which affects the Peak+, Peak- deviation measurement. And there's one DC term in the AF spectrum, which affects the SINAD measurement.

When Auto Carrier Phase is turned on, the phase offset will be compensated automatically.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe ] : PM : CARRier : PHASe : AUTO OFF   ON   0   1</code> <code>[ :SENSe ] : PM : CARRier : PHASe : AUTO ?</code>

<b>Example</b>	PM:CARR:PHAS:AUTO ON PM:CARR:PHAS:AUTO?
Notes	If current measurement is AM or FM, this key is blank.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	ON
State Saved	Saved in instrument state.
Range	On   Off
Initial S/W Revision	A.14.00

## SINAD BW

Sets the bandwidth of the signal to calculate SINAD and THD.

Key Path	Meas Setup, More
<b>Remote Command</b>	CALCulate:AM FM PM:SINad:BANDwidth <freq> CALCulate:AM FM PM:SINad:BANDwidth?
<b>Example</b>	CALC:AM:SIN:BAND 50e3 CALC:AM:SIN:BAND?
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Couplings	Changing the Channel BW always sets the SINAD BW to the half of the Channel BW you entered.
Preset	12.5 kHz
State Saved	Saved in instrument state.
Min	1 Hz
Max	The half of the Channel BW.
Initial S/W Revision	A.14.00

## Meas Preset

Returns the variables in the current measurement to their preset values.

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

## Mode

See "Mode" on page 210

## 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 689 for more information.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:SYSTem:PRESet
<b>Example</b>	:SYST:PRES
<b>Notes</b>	*RST is preferred over :SYST:PRES for remote operation. *RST does a Mode Preset, as done by the :SYST:PRES command, and it sets the measurement mode to Single measurement rather than Continuous for optimal remote control throughput. Clears all pending OPC bits. The Status Byte is set to 0.
<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>	In the X-Series, the legacy "Factory Preset" has been replaced with Mode Preset, which only presets the currently active mode, not the entire instrument. In the X-Series, the way to preset the entire instrument is by using System, Restore System Defaults All, which behaves essentially the same way as restore System Defaults does on ESA and PSA. There is also no "Preset Type" as there is on the PSA. There is a green Mode Preset front-panel key that does a Mode Preset and a white-with-green-letters User Preset front-panel key that does a User Preset. The old PRESet:TYPE command is ignored (without generating an error), and SYST:PRES without a parameter does a Mode Preset, which should cover most backward code compatibility issues. The settings and correction data under the Input/Output front-panel key (examples: Input Z Corr, Ext Amp Gain, etc.) are no longer part of any Mode, so they will not be preset by a Mode Preset. They are preset using Restore Input/Output Defaults, Restore System Defaults All. Note that because User Preset does a Recall State, and all of these settings are saved in State, they ARE recalled when using



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

## How-To Preset

The table below shows all possible presets, their corresponding SCPI commands and front-panel access (key paths). Instrument settings depend on the current measurement context. Some settings are local to the current measurement, some are global (common) across all the measurements in the current mode, and some are global to all the available modes. In a similar way, restoring the settings to their preset state can be done within the different contexts.

Auto Couple - is a measurement local key. It sets all Auto/Man parameter couplings in the measurement to Auto. Any Auto/Man selection that is local to other measurements in the mode will not be affected.

Meas Preset - is a measurement local key. Meas Preset resets all the variables local to the current measurement except the persistent ones.

Mode Preset - resets all the current mode's measurement local and measurement global variables except the persistent ones.

Restore Mode Defaults - resets ALL the Mode variables (and all the Meas global and Meas local variables), including the persistent ones.

Type Of Preset	SCPI Command	Front Panel Access
Auto Couple	:COUPlE ALL	Auto Couple front-panel key
Meas Preset	:CONFIgure:<Measurement>	Meas Setup Menu
Mode Preset	:SYSTem:PRESet	Mode Preset (green key)
Restore Mode Defaults	:INSTrument:DEFault	Mode Setup Menu
Restore All Mode Defaults	:SYSTem:DEFault MODEs	System Menu; Restore System Default Menu
*RST	*RST	not possible (Mode Preset with Single)
Restore Input/Output Defaults	:SYSTem:DEFault INPut	System Menu; Restore System Default Menu
Restore Power On Defaults	:SYSTem:DEFault PON	System Menu; Restore System Default Menu
Restore Alignment Defaults	:SYSTem:DEFault ALIGn	System Menu; Restore System Default Menu
Restore Miscellaneous Defaults	:SYSTem:DEFault MISC	System Menu; Restore System Default Menu
Restore All System Defaults	:SYSTem:DEFault [ALL] :SYSTem:PRESet:PERSistent	System Menu; Restore System Default Menu
User Preset	:SYSTem:PRESet:USER	User Preset Menu
User Preset All Modes	:SYSTem:PRESet:USER:ALL	User Preset Menu

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Mode Preset

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 231

## Peak Search

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.

<b>Key Path</b>	Front-panel key
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MAXimum
<b>Example</b>	CALC:AM:MARK2:MAX
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Next Peak

Moves the selected marker to the peak that has the next highest amplitude less than the current marker value. If there is no valid peak lower than the current marker position, an error 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. In Analog Demod, the Peak Threshold and Peak Excursion functions are both OFF. If there is no valid peak, an error 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.

<b>Key Path</b>	Peak Search
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MAXimum:NEXT
<b>Example</b>	CALC:AM:MARK2:MAX:NEXT Selects marker 2 and moves it to the peak that is closest in amplitude to the current peak, but the next lower value.
<b>Remote Command Notes</b>	Sending this command selects the specified marker
<b>State Saved</b>	Not part of instrument saved state
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Pk-Pk Search

Finds and displays the amplitude and frequency (or time, if on a time domain 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. This function turns on the reference marker and sets its mode to Fixed if it is not already on. (These markers may be on two different traces.)

When peak-to-peak search is successful, a message is displayed on the message line.

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. It then performs the peak-to-peak function.

Key Path	Peak Search
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:PTPeak
<b>Example</b>	CALC:AM:MARK:PTP CALC:AM:MARK:Y? Queries the delta amplitude value for marker 1.
Notes	Turns on the Marker $\Delta$ active function.
Remote Command Notes	Sending this command selects the specified marker.
Couplings	Selected marker becomes a delta marker if not already in delta mode..
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Min Search

Moves the selected marker to the minimum y-axis value on the current trace. 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:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MINimum
<b>Example</b>	CALC:AM:MARK:MIN selects marker 1 and moves it to the minimum amplitude value.
Remote Command Notes	Sending this command selects the specified marker.
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

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Print

Print

See "Print" on page 241

## Quick Save

The Quick Save front-panel key repeats the most recent save that was performed from the Save menu, with the following exceptions:

- Register saves are not remembered as Saves for the purpose of the Quick Save function
- If the current measurement does not support the last non-register save that was performed, an informational message is generated, “File type not supported for this measurement”

Quick Save repeats the last type of qualified save (that is, a save qualified by the above criteria) in the last save directory by creating a unique filename using the Auto File Naming algorithm described below.

If Quick Save is pressed after startup and before any qualified Save has been performed, the Quick Save function performs a Screen Image save using the current settings for Screen Image saves (current theme, current directory), which then becomes the “last save” for the purpose of subsequent Quick Saves.

The Auto File Naming feature automatically generates a file name for use when saving a file. The filename consists of a prefix and suffix separated by a dot, as is standard for the Windows® file system. A default prefix exists for each of the available file types:

Type	Default Prefix	Menu
State	State_	(Save/Recall)
Trace + State	State_	(Save/Recall)
Screen	Screen_	(Save/Recall)
Amplitude Corrections	Ampcor_	(Import/Export)
Traces	Trace_	(Import/Export)
Limit Lines	LLine_	(Import/Export)
Measurement Result	MeasR_	(Import/Export)
Capture Buffer	CapBuf_	(Import/Export)

A four digit number is appended to the prefix to create a unique file name. The numbering sequence starts at 0000 within each Mode for each file type and updates incrementally to 9999, then wraps to 0000 again. It remembers where it was through a Mode Preset and when leaving and returning to the Mode. It is reset by Restore Misc Defaults and Restore System Defaults and subsequent running of the instrument application. So, for example, the first auto file name generated for State files is State\_0000.state. The next is State\_0001, and so forth.

One of the key features of Auto File Name is that we guarantee that the Auto File Name will never conflict with an existing file. The algorithm looks for the next available number. If it gets to 9999, then it looks for holes. If it find no holes, that is no more numbers are available, it gives an error.

For example, if when we get to State\_0010.state there is already a State\_0010.state file in the current directory, it advances the counter to State\_0011.state to ensure that no conflict will exist (and then it verifies that State\_0011.state also does not exist in the current directory and advances again if it does, and so forth).

If you enter a file name for a given file type, then the prefix becomes the filename you entered instead of the default prefix, followed by an underscore. The last four letters (the suffix) are the 4-digit number.

For example, if you save a measurement results file as “fred.csv”, then the next auto file name chosen for a measurement results save will be fred\_0000.csv.

**NOTE**

Although 0000 is used in the example above, the number that is used is actually the current number in the Meas Results sequence, that is, the number that would have been used if you had not entered your own file name.

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**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.

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Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00



## Recall

The Recall menu lets you choose what you want to recall, and where you want to recall it from. Among the types of files you can recall are **States and Traces**. In addition, an Import (Data) option lets you recall a number of data types stored in CSV files (as used by Excel and other spreadsheet programs).

The default paths for Recall are data type dependent and are the same as for the Save key.

Key Path	Front-panel key
Notes	<p>No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe &lt;filename&gt;.</p> <p>If you try to recall a State file for a mode that is not licensed or not available in the instrument, an error message will occur and the state will not change.</p>
Backwards Compatibility Notes	<p>In legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly (since User Preset is actually loading a state), it was possible to do a User Preset without affecting the trace data, limit lines or correction data.</p> <p>In the X-Series, “state” always includes all of this data; so whenever state is loaded, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.</p>
Backwards Compatibility Notes	<p>Recall for the X-Series supports backward compatibility in the sense that you can recall a state file from any X-Series model number and any version of X-Series software. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. If you try to recall a state file onto an instrument with less capability than what was available on the instrument during the save, the recall will ignore the state it doesn't support and it will limit the recalled setting to what it allows.</p> <p>Example: if the saved state includes preamp ON, but the recalling instrument does not have a preamp; the preamp is limited to OFF. Conversely, if you save a state without a preamp, the preamp is OFF in the state file. When this saved file is recalled on an instrument with a licensed preamp, the preamp is changed to OFF. Another example is if the saved state has center frequency set to 20 GHz, but the instrument recalling the saved state is a different model and only supports 13.5 GHz. In this case, the center frequency is limited along with any other frequency based settings. Since the center frequency can't be preserved in this case, the recall limiting tries to at least preserve span to keep the measurement setup as intact as possible.</p> <p>It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user.</p> <p>Note that there is no state file compatibility outside of the X-Series. For example, you cannot recall a state file from ESA or PSA.</p>
Initial S/W Revision	Prior to A.02.00

## State

The Recall State menu lets you choose a register or file from which to recall the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings that were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the

additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either a Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

Since each state file is only for one Mode, the settings for other Modes are unaffected when it is loaded. Recall State will cause a mode switch if the state being recalled is not from the current active mode.

After the recall completes, the message "File <filename> recalled" or "Recalled State Register <register number>" is displayed.

For rapid recalls, the State menu lists 16 registers that you can choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files is:

My Documents\<<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

See "[More Information](#)" on page 699.

<b>Key Path</b>	Recall
<b>Mode</b>	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.
<b>Notes</b>	<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> <li>• Executes a *CLS</li> </ul> <p>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</p>

	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

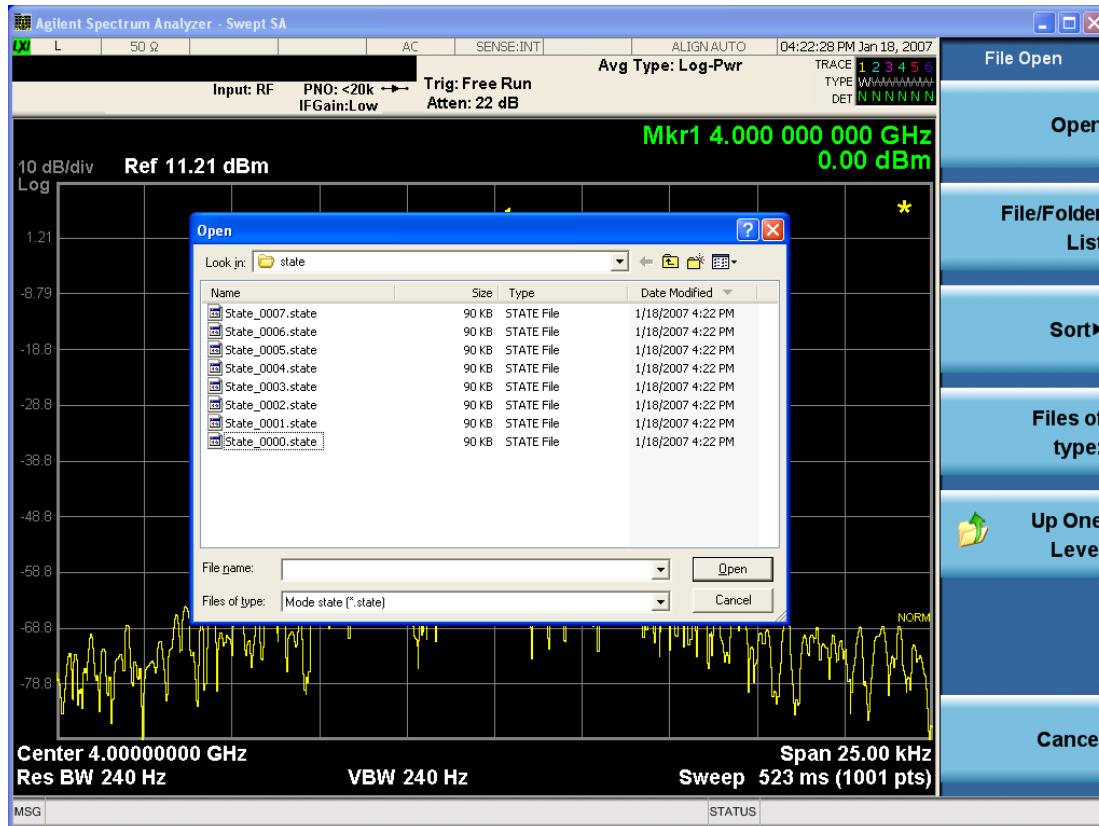
In measurements that support saving Traces, for example, Swept SA, the Trace data is saved along with the State in the State file. When recalling the State, the Trace data is recalled as well. Traces are recalled exactly as they were stored, including the writing mode and update and display modes. If 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

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.

Key Path	Recall, State
<b>Example</b>	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the 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

## Register 1 thru Register 16

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Each of the register keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key under Save, State to enter custom names for each register.

Registers are shared by all modes, so recalling from any one of the registers will cause a mode switch to the mode that was active when the save to the Register occurred.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the \*RCL command.

After the recall completes, the message "Register <register number> recalled" appears in the message bar. If you are in the Spectrum Analyzer Mode, and you are recalling a register that was saved in the Spectrum Analyzer Mode, then after the recall, you will still be in the Recall Register menu. If the Recall causes you to switch modes, then after the Recall, you will be in the Frequency menu.

If a requested register is empty an error is generated.

Key Path	Recall, State
<b>Example</b>	*RCL 1
Range	1-16 from front panel, 1-128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the 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

## 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 704

Key Path	Front-panel key
Remote Command	:INITiate[:IMMEDIATE] :INITiate:RESTART
Example	:INIT:IMM :INIT:REST
Notes	:INITiate:RESTART and :INITiate:IMMEDIATE perform exactly the same function.
Couplings	Resets average/hold count k. For the first sweep overwrites all active (update=on) traces with new current data. For application modes, it resets other parameters as required by the measurement.
Status Bits/OPC dependencies	This is an Overlapped command. The STATus:OPERation register bits 0 through 8 are cleared. The STATus:QUESTionable register bit 9 (INTegrity sum) is cleared. The SWEEPING bit is set. The MEASURING bit is set.
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, the Restart hardkey and the INITiate:RESTART command restart trace averages (displayed average count reset to 1) for a trace in Clear Write, but did not restart Max Hold and Min Hold.  In the X-Series, the Restart hardkey and the INITiate:RESTART command restart not only Trace Average, but MaxHold and MinHold traces as well.  For wireless comms modes in ESA and PSA, the Restart hardkey and the INITiate:RESTART command restart every measurement, which includes all traces and numeric results. There is no change to this operation.
Initial S/W Revision	Prior to A.02.00

### More Information

The **Restart** function first aborts the current sweep/measurement as quickly as possible. It then resets the sweep and trigger systems, sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met.

If the analyzer is in the process of aligning when **Restart** is executed, the alignment finishes before the restart function is performed.



Even when set for Single operation, multiple sweeps may be taken when Restart is pressed (for example, when averaging/holding is on). Thus when we say that **Restart** "restarts a measurement," we may mean:

- It restarts the current sweep
- It restarts the current measurement
- It restarts the current set of sweeps if any trace is in Trace Average, Max Hold or Min Hold
- It restarts the current set of measurements if Averaging, or Max Hold, or Min Hold is on for the measurement
- depending on the current settings.

With **Average/Hold Number** (in **Meas Setup** menu) set to 1, or Averaging off, or no trace in Trace Average or Hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met; and the analyzer stops sweeping once that sweep has completed. However, with **Average/Hold Number** >1 and at least one trace set to **Trace Average, Max Hold, or Min Hold (SA Measurement)** or **Averaging on (most other measurements)**, multiple sweeps/data acquisitions are taken for a single measurement. The trigger condition must be met prior to each sweep. The sweep is stopped when the average count  $k$  equals the number  $N$  set for **Average/Hold Number**. A measurement average usually applies to all traces, marker results, and numeric results; but sometimes it only applies to the numeric results.

Once the full set of sweeps has been taken, the analyzer will go to idle state. To take one more sweep without resetting the average count, increment the average count by 1, by pressing the step up key while **Average/Hold Number** is the active function, or sending the remote command `CALC:AVER:TCON UP`.

## Save

The Save menu lets you choose what you want to save and where you want to save it. Among the types of files you can save are **States**, **Traces**, and **Screen Images**. In addition, an Export (Data) option lets you save a number of data types as CSV files for easy import into Excel and other spreadsheet programs.

Key Path	Front-panel key
Mode	All
Notes	No remote command for this key specifically, but the :MMEM:STORe command is available for specific file types. An example is :MMEM:STOR:STATe <filename>.
Initial S/W Revision	Prior to A.02.00

## State

The Save State menu lets you choose a register or file for saving the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings which were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, Verbose SCPI) are not affected by either Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

After the save completes, the message "File <filename> saved" or "State Register <register number> saved" is displayed.

For rapid saving, the State menu lists 16 registers to save to. Pressing a Register key initiates the save. You can also select a file to save to.

The default path for all State Files is:

My Documents\<<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

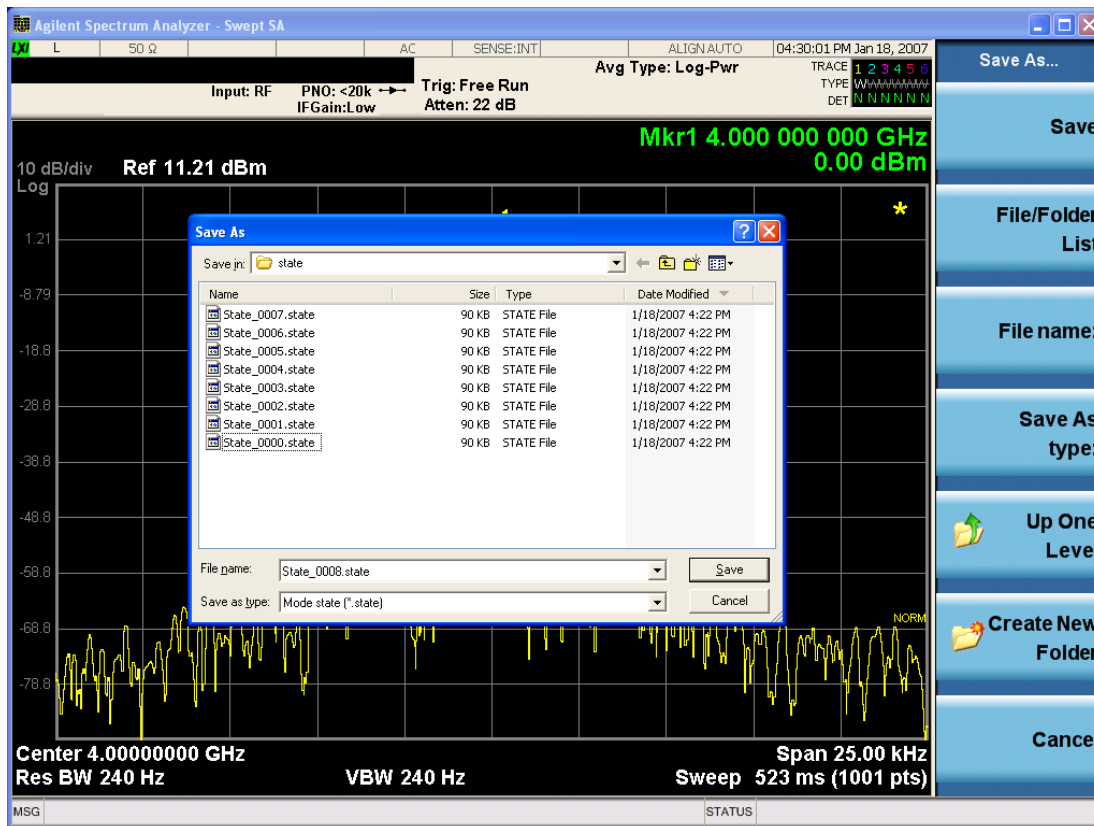
Key Path	Save
Mode	All
Remote Command	:MMEMory:STORe:STATe <filename>
Example	MMEM:STOR:STATe "MyStateFile.state" This stores the current instrument state data in the file MyStateFile.state in the default directory.
Notes	Both single and double quotes are supported for any filename parameter over remote. 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>
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 832](#) 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 709

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

The Analog Demod Mode Export Data options include Traces and Measurement Results.

Key Path	Save, Data
Remote Command Notes	No SCPI command directly controls the Data Type that this key controls. The Data Type is included as part of the MMEM:STORe commands.
Preset	Trace; is not affected by a Preset, but is reset during Restore Mode Defaults and survives Power cycles.
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

## AM/FM/ $\Phi$ M Trace

Selects Trace as the data type to be exported with this save request. This key brings up the Trace menu that enables you to select one of the following traces:

- RF Spectrum (RFSPectrum)
- Demod (DEMod)
- Demod Avg (DAVerage)
- Demod Max (DMAXimum)
- Demod Min (DMINimum)

- AF Spectrum (AFSPectrum)
- RF Envelope (RFENvelope) --- only available in FM measurement
- Demod Raw (DRAW) --- only available in FM measurement

Once you select a trace, the menu returns back to the Data menu and the name of the selected trace is annotated on the Trace key. Now that you have selected exactly what needs to be saved, to trigger a save of the selected trace, you must select the Save As key in the Data menu.

If the Demod Min trace, Demod Max trace, or Demod Avg trace is exported when the Average/Hold Num feature is turned off, the resulting data will be default values.

The trace data file is a .csv file containing the data for one trace, suitable for import into spreadsheet software. There is a header block, followed by metadata that includes the parameters necessary to recreate the measurement, followed by a DATA block that contains the x,y data for the specified trace. Each line in the metadata includes the parameter, followed by a comma, followed by the parameter value. The metadata includes the following information:

Parameter	
Measurement †	AM FM PM
Trace	AM PM: AF Spectrum RF Spectrum Demod  Demod Ave Demod Min Demod Max FM: AF Spectrum RF Spectrum Demod  Demod Ave Demod Min Demod Max RF Envelope Demod Raw
X Axis Unit	Hz S
Y Axis Unit	dBm % Hz Rad
Center Frequency †	[units of Hz]
Channel BW †	[units of Hz]
Average State †	Off On
Average Count	#
HPF/BPF †	Off HPF20 HPF50 HPF300 HPF400 CCITT AWEighting  CWEighting CMESsage CCIR1k CCIR2k CUNWeighting
LPF †	Off LPF300 LPF3K LPF10K LPF15K LPF30K LPF80K LPF300K LPF100K M500K
Attenuation †	[units of dB]
RF Coupling †	AC DC
Ref Level	[units of Y Axis Unit]
RF Span †	[units of Hz]
RF Res Bandwidth †	[units of Hz]
Sweep Time †	[units of S]
AF Start Freq	[units of Hz]



AF Stop Freq †	[units of Hz]
AF Res Bandwidth †	[units of Hz]
Trigger Source †	Off Ext1 Ext2
Trigger Level †	[units of V]
Trigger Slope †	Positive Negative
Trigger Delay †	[units of S]
PreAmp State †	Off On
PreAmp Band †	Low High
Input Z Correction †	50 75
RF Calibrator	Off 50 MHz 4.8 GHz Comb
External Gain	[units of dB]
Auto Carrier Frequency †	Off On
Auto Carrier Phase †	Off On

† Changing this parameter requires a measurement restart.

Note that all metadata is stored for each trace. After the metadata, the keyword DATA occurs on its own line, followed by the data (one X, Y pair per line).

Key Path	Save, Data
Notes	The first key press selects traces out of the 1-of-N file type options. The second key press brings up the Traces menu so you can select which trace you want to export.
Preset	RF Spectrum; is not affected by a Preset, but is reset during Restore Mode Defaults and survives Power cycles.
State Saved	Saved in instrument state.
Readback	Selected Trace table
Readback line	RF Spectrum, Demod, Demod Avg, Demod Max, Demod Min, AF Spectrum, RF Envelope, Demod Raw
Initial S/W Revision	Prior to A.02.00

## Measurement Results

The file format of the .csv Measurement Results file is shown in the table below. If any metrics are off, or there is no valid value, they will appear as not a number (9.91 e37)

AM	FM and PM
Carrier Power	Carrier Power

<b>AM</b>	<b>FM and PM</b>
Carrier Frequency Error (0)	Carrier Frequency Error
Modulation Rate	Modulation Rate
SINAD value	SINAD value
Distortion/Total Voltage (rms)	Distortion/Total Voltage (rms)
Total Harmonic Distortion	Total Harmonic Distortion
Mod Depth (Peak+)	Deviation (Peak+)
Mod Depth (Peak-)	Deviation (Peak-)
Mod Depth (Pk-Pk)/2	Deviation (Pk-Pk)/2
Mod Depth (RMS)	Deviation (RMS)
Mod Depth (Peak+) Max Hold	Deviation (Peak+) Max Hold
Mod Depth (Peak-) Max Hold	Deviation (Peak-) Max Hold
Mod Depth (Pk-Pk)/2 Max Hold	Deviation (Pk-Pk)/2 Max Hold
Mod Depth (RMS) Max Hold	Deviation (RMS) Max Hold
RMS Ratio (only valid for Metrics Setting of RMS Ratio)	RMS Ratio (only valid for Metrics Setting of RMS Ratio)
Ratio Reference (only valid for Metrics Setting of RMS Ratio)	Ratio Reference (only valid for Metrics Setting of RMS Ratio)

For FM Stereo, the results are

RF Carrier Power, RF Carrier Frequency Error, 38 kHz Carrier Frequency Error, 38 kHz Carrier Phase Error, Left To Right, Mono To Stereo,

MPX SINAD value, MPX Distortion/Total Voltage (rms), MPX Deviation (Peak+), MPX Deviation (Peak-), MPX Deviation (Pk-Pk)/2, MPX Deviation (RMS), MPX Deviation (Peak+) Max Hold, MPX Deviation (Peak-) Max Hold, MPX Deviation (Pk-Pk)/2 Max Hold, MPX Deviation (RMS) Max Hold, MPX RMS Ratio (only valid for Metrics Setting of RMS Ratio), MPX Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Mono Modulation Frequency, Mono SINAD value, Mono Distortion/Total Voltage (rms), Mono Deviation (Peak+), Mono Deviation (Peak-), Mono Deviation (Pk-Pk)/2, Mono Deviation (RMS), Mono Deviation (Peak+) Max Hold, Mono Deviation (Peak-) Max Hold, Mono Deviation (Pk-Pk)/2 Max Hold, Mono Deviation (RMS) Max Hold, Mono RMS Ratio (only valid for Metrics Setting of RMS Ratio), Mono Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Stereo Modulation Frequency, Stereo Deviation (Peak+), Stereo Deviation (Peak-), Stereo Deviation (Pk-Pk)/2, Stereo Deviation (RMS), Stereo Deviation (Peak+) Max Hold, Stereo Deviation (Peak-) Max Hold, Stereo Deviation (Pk-Pk)/2 Max Hold, Stereo Deviation (RMS) Max Hold, Stereo RMS Ratio (only valid for Metrics Setting of RMS Ratio), Stereo Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Left Modulation Frequency, Left SINAD value, Left Distortion/Total Voltage (rms), Left Total Harmonic Distortion, Left Deviation (Peak+), Left Deviation (Peak-), Left Deviation (Pk-Pk)/2, Left Deviation (RMS), Left Deviation (Peak+) Max Hold, Left Deviation (Peak-) Max Hold, Left Deviation (Pk-Pk)/2 Max Hold, Left Deviation (RMS) Max Hold, Left RMS Ratio (only valid for Metrics Setting of RMS Ratio), Left Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Right Modulation Frequency, Right SINAD value, Right Distortion/Total Voltage (rms), Right Total Harmonic Distortion, Right Deviation (Peak+), Right Deviation (Peak-), Right Deviation (Pk-Pk)/2, Right Deviation (RMS), Right Deviation (Peak+) Max Hold, Right Deviation (Peak-) Max Hold, Right Deviation (Pk-Pk)/2 Max Hold, Right Deviation (RMS) Max Hold, Right RMS Ratio (only valid for Metrics Setting of RMS Ratio), Right Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Pilot Modulation Frequency, Pilot Deviation (Peak+), Pilot Deviation (Peak-), Pilot Deviation (Pk-Pk)/2, Pilot Deviation (RMS), Pilot Deviation (Peak+) Max Hold, Pilot Deviation (Peak-) Max Hold, Pilot Deviation (Pk-Pk)/2 Max Hold, Pilot Deviation (RMS) Max Hold, Pilot RMS Ratio (only valid for Metrics Setting of RMS Ratio), Pilot Ratio Reference (only valid for Metrics Setting of RMS Ratio),

RDS Deviation (Peak+), RDS Deviation (Peak-), RDS Deviation (Pk-Pk)/2, RDS Deviation (RMS), RDS Deviation (Peak+) Max Hold, RDS Deviation (Peak-) Max Hold, RDS Deviation (Pk-Pk)/2 Max Hold, RDS Deviation (RMS) Max Hold, RDS RMS Ratio (only valid for Metrics Setting of RMS Ratio), RDS Ratio Reference (only valid for Metrics Setting of RMS Ratio), RDS Error Block Count, RDS Total Block Count, RDS BLER (Block Error Rate).

Key Path	Save, Data
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 844 in Save, State for a full description of this dialog and menu.

The default path for saving files is:

For all of the Trace Data Files:

My Documents\`<mode name>`\data\traces

For all of the Limit Data Files:

My Documents\`<mode name>`\data\limits

For all of the Measurement Results Data Files:

My Documents\`<mode name>`\data\`<measurement name>`\results

For all of the Capture Buffer Data Files:

My Documents\`<mode name>`\data\captureBuffer

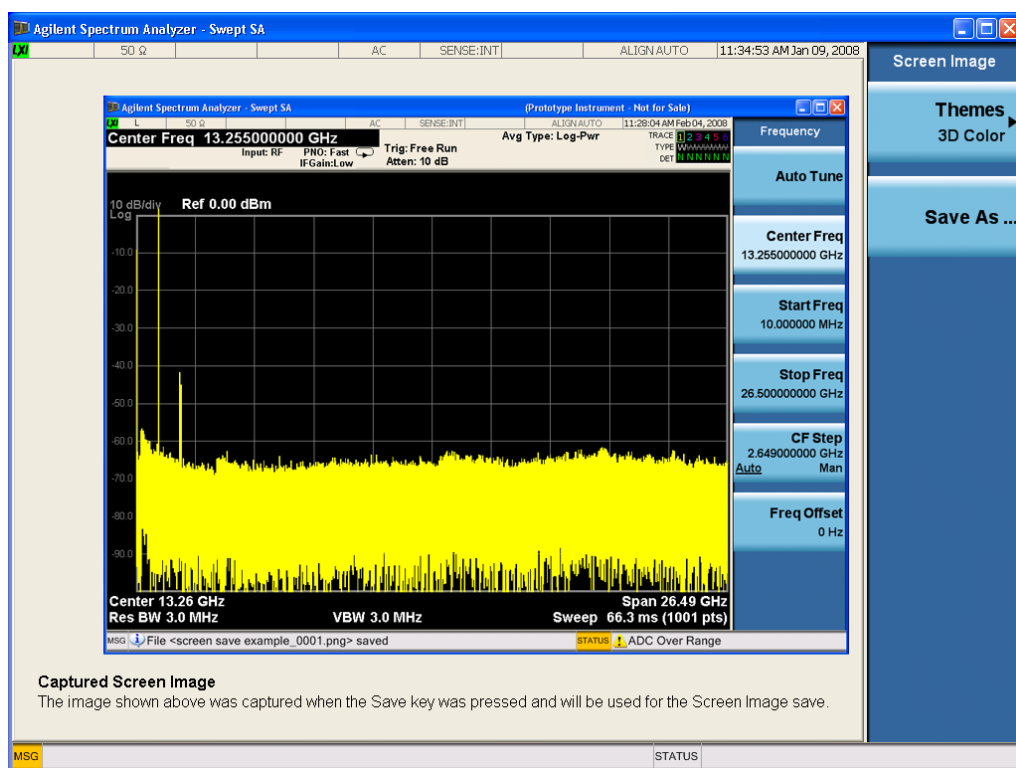
Key Path	Save, Data
Mode	All
Notes	The key location is mode-dependent and will vary. Brings up the Save As dialog for saving a <code>&lt;mode specific&gt;</code> Save Type. The save is performed immediately and does not wait until the measurement is complete.
Initial S/W Revision	Prior to A.02.00

## Screen Image

Pressing Screen Image accesses a menu of functions that enable you to specify a format and location for the saved screen image. It brings up a menu that allows you to specify the color scheme of the Screen Image (Themes) or navigate to the Save As dialog to perform the actual save.

Screen Image files contain an exact representation of the analyzer display. They cannot be loaded back onto the analyzer, but they can be loaded into your PC for use in many popular applications.

The image to be saved is actually captured when the Save front panel key is pressed, and kept in temporary storage to be used if you ask for a Screen Image save. When the Screen Image key is pressed, a "thumbnail" of the captured image is displayed, as shown below:



When you continue on into the Save As menu and complete the Screen Image save, the image depicted in the thumbnail is the one that gets saved, showing the menus that were on the screen before going into the Save menus. The save is performed immediately and does not wait until the measurement is complete.

After you have completed the save, the Quick Save front-panel key lets you quickly repeat the last save performed, using an auto-named file, with the current screen data.

### NOTE

For versions previous to A.01.55, if you initiate a screen image save by navigating through the Save menus, the image that is saved will contain the Save menu softkeys, not the menus and the active function that were on the screen when you first pressed the Save front panel key.

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Key Path

Save

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Mode	All
<b>Remote Command</b>	:MMEMory:STORe:SCReen <filename>
<b>Example</b>	:MMEM:STOR:SCR "myScreen.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
Initial S/W Revision	Prior to A.02.00

## Themes

Accesses a menu of functions that enable you to choose the theme to be used when saving the screen image.

The **Themes** option is the same as the **Themes** option under the **Display** and **Page Setup** dialogs. It allows you to choose between themes to be used when saving the screen image.

Key Path	Save, Screen Image
<b>Remote Command</b>	:MMEMory:STORe:SCReen:THEMe TDColor   TDMonochrome   FColor   FMONochrome  :MMEMory:STORe:SCReen:THEMe?
<b>Example</b>	:MMEM:STOR:SCR:THEM TDM
Preset	3D Color; Is not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.
Readback	3D Color   3D Mono   Flat Color   Flat Mono
Backwards Compatibility Notes	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if you selected Reverse Bitmap AND a black & white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
Initial S/W Revision	Prior to A.02.00

## 3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

Key Path	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

### 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 844 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\`<mode name>`\screen.

where `<mode name>` is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

## Mass Storage Change Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:CDIRectory [<directory_name>] :MMEMory:CDIRectory?
Notes	The string must be a valid logical path. Changes the default directory for a mass memory file system. The <directory_name> parameter is a string. If no parameter is specified, the directory is set to the *RST value. At *RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal. Query returns full path of the default directory.
Initial S/W Revision	Prior to A.02.00

## Mass Storage Catalog (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:CATalog? [<directory_name>]
Notes	The string must be a valid logical path. Queries disk usage information (drive capacity, free space available) and obtains a list of files and directories in a specified directory in the following format: <numeric_value>,<numeric_value>,{<file_entry>} It returns two numeric parameters and as many strings as there are files and directories. The first parameter indicates the total amount of storage currently used in bytes. The second parameter indicates the total amount of storage available, also in bytes. The <file_entry> is a string. Each <file_entry> indicates the name, type, and size of one file in the directory list: <file_name>,<file_type>,<file_size> As the windows file system has an extension that indicates file type, <file_type> is always empty. <file_size> provides the size of the file in bytes. For directories, <file_entry> is surrounded by square brackets and both <file_type> and <file_size> are empty
Initial S/W Revision	Prior to A.02.00

## Mass Storage Copy (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:COPY <string>,<string>[,<string>,<string>]
Notes	The string must be a valid logical path. Copies an existing file to a new file or an existing directory to a new directory. Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination. The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the

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source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.

This command will generate an "access denied" error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.

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## Mass Storage Device Copy (Remote Command Only)

This command transfers data to/from a file and a peripheral device.

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Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:COpy:DEvice <source_string>,<dest_string>
Notes	The strings must be a valid logical path or a valid device keyword. If the dest_string is a device keyword, the data is copied from the source file to the device. If the source_string is a device keyword, the data is copied to the source file from the device.  Valid device keywords are: SNS (smart noise source)  An error is generated if the file or device is not found.

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## Mass Storage Delete (Remote Command Only)

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Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:DELeTe <file_name>[,<directory_name>]
Notes	The string must be a valid logical path.  Removes a file from the specified directory. The <file_name> parameter specifies the file name to be removed. This command will generate an "access denied" error if the file is in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

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## Mass Storage Data (Remote Command Only)

Creates a file containing the specified data OR queries the data from an existing file.

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Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:DATA <file_name>,<data> :MMEMory:DATA? <file_name>
Notes	The string must be a valid logical path.  The command form is MMEMory:DATA <file_name>,<data>. It loads <data> into the file <file_name>. <data> is in 488.2 block format. <file_name> is string data.  The query form is MMEMory:DATA? <file_name> with the response being the associated <data> in block format.
Initial S/W Revision	Prior to A.02.00

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## Mass Storage Make Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:MDIRectory <directory_name>
Notes	<p>The string must be a valid logical path.</p> <p>Creates a new directory. The &lt;directory_name&gt; parameter specifies the name to be created.</p> <p>This command will generate an “access denied” error if the new directory would be in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Move (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:MOVE <string>,<string>[,<string>,<string>]
Notes	<p>The string must be a valid logical path.</p> <p>Moves an existing file to a new file or an existing directory to a new directory.</p> <p>Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination.</p> <p>The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.</p> <p>This command will generate an “access denied” error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## Mass Storage Remove Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:RDIRectory <directory_name>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a directory. The &lt;directory_name&gt; parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed.</p> <p>This command will generate an “access denied” error if the folder is a restricted folder (e.g., C:\Windows) or is in a restricted folder and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## 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 722

Key Path	Front-panel key
Example	: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 841 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 are no menus under this key in the Analog Demod mode.

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

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## SPAN X Scale

Activates and displays the Span function menu.

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

### Span

Adjusts the Span of the RF Spectrum window.

Key Path	SPAN X Scale
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:FREQuency:SPAN <freq> [ :SENSe ] :AM FM PM FMSTereo:FREQuency:SPAN?
<b>Example</b>	AM:FREQ:SPAN 2.122kHz AM:FREQ:SPAN?
Notes	Adjusts the Span of the RF Spectrum window.
Dependencies	The maximum value will be the maximum IF BW available in the instrument. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available IF BW of the instrument is 140 MHz. Thus, the maximum Span is not limited to 25 MHz but is 140 MHz.
Preset	= AM/FM/PM = 75 kHz = FMST = 500 kHz
State Saved	Saved in instrument state
Min	10 Hz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Sweep/Control

Activates a menu and selects Sweep Time as the active function. Sweep time is used by the Demod Waveform window, but this key is available in any view.

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

### Demod Wfm Sweep Time

Selects the display length for the Demod Waveform window. This is commonly set to two sample lengths.

Key Path	Sweep/Control
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:DWSweep:TIME <time> [ :SENSe ] :AM FM PM FMSTereo:DWSweep:TIME?
<b>Example</b>	AM:DWSW:TIME 50 ms AM:DWSW:TIME?
Preset	2 ms
State Saved	Saved in Instrument State
Min	1 $\mu$ s
Max	2 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Demod Time

Selects the minimum length of data acquisition used in demodulation. Increasing the demodulation time will result in more accurate metrics; reducing the demodulation time will result in a faster measurement.

The measurement might require more data than specified by the demodulation time. If the resolution bandwidth is low in the spectrum windows, or the demod waveform sweep time is high, then the data required for the measurement might be higher than the demodulation time.

If measurement speed is critical, make sure to increase the resolution bandwidth and reduce the demodulation waveform sweep time.

The Auto rules for the demodulation time will give the nominal specification performance if the sweep time is set to display two cycles of data.

Key Path	Sweep/Control
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:DEMod:TIME <time> [ :SENSe ] :AM FM PM FMSTereo:DEMod:TIME? [ :SENSe ] :AM FM PM:DEMod:TIME:AUTO OFF ON 0 1

	[ :SENSe ] :AM FM PM:DEMod:TIME:AUTO?
<b>Example</b>	AM:DEM:TIME 50 ms AM:DEM:TIME?
<b>Notes</b>	If current Demod Time, Span and Channel BW settings combinations result in a required acquisition length is excess of the capacity of the analyzer, 4MSamples, gives a warning message "Settings Alert; Acquisition truncated".
<b>Couplings</b>	When in Auto mode, the demodulation time depends on the demodulation waveform sweep time. Lower
<b>Preset</b>	= AM/FM/PM = 72 ms = FMST = 280 ms ON
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	1 $\mu$ s
<b>Max</b>	10 s
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.14.00

## System

See "System" on page 242

## Trace/Detector

There are no menus under this key in the Analog Demod mode.

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

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## Trigger

See ["Trigger" on page 322](#)

### Free Run

See ["Free Run " on page 329](#)

### External 1

See ["External 1 " on page 343](#)

### Trigger Level

See ["Trigger Level " on page 344](#)

### Trig Slope

See ["Trig Slope " on page 344](#)

### Trig Delay

See ["Trig Delay " on page 331](#)

### External 2

See ["External 2 " on page 345](#)

### Trigger Level

See ["Trigger Level " on page 346](#)

### Trig Slope

See ["Trig Slope " on page 346](#)

### Trig Delay

See ["Trig Delay " on page 333](#)

### RF Burst

See ["RF Burst " on page 347](#)

### Absolute Trigger

See ["Absolute Trigger Level" on page 347](#)

### Relative Trigger

See ["Relative Trigger Level" on page 336](#)

### Trig Slope

See ["Trigger Slope " on page 348](#)

### **Trig Delay**

See "[Trig Delay](#) " on page 337

### **Periodic Timer**

See "[Periodic Timer \(Frame Trigger\)](#) " on page 338

### **Period**

See "[Period](#) " on page 340

### **Offset**

See "[Offset](#) " on page 340

### **Offset Adjust (Remote Command Only)**

See "[Offset Adjust \(Remote Command Only\)](#)" on page 341

### **Reset Offset Display**

See "[Reset Offset Display](#) " on page 342

### **Sync Source**

See "[Sync Source](#) " on page 342

### **Off**

See "[Off](#) " on page 343

### **External 1**

See "[External 1](#) " on page 343

### **Trigger Level**

See "[Trigger Level](#) " on page 344

### **Trig Slope**

See "[Trig Slope](#) " on page 344

### **External 2**

See "[External 2](#) " on page 345

### **Trigger Level**

See "[Trigger Level](#) " on page 346

### **Trig Slope**

See "[Trig Slope](#) " on page 346

### **RF Burst**

See "[RF Burst](#) " on page 347

### **Absolute Trigger**

See "Absolute Trigger Level" on page 347

### **Trig Slope**

See "Trigger Slope " on page 348

### **Trig Delay**

See "Trig Delay" on page 349

### **Auto/Holdoff**

See "Auto/Holdoff " on page 349

### **Auto Trig**

See "Auto Trig " on page 350

### **Trig Holdoff**

See "Trig Holdoff " on page 350

## 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
Remote Command	:SYSTem:PRESet:USER:SAVE
Example	:SYST:PRES:USER:SAVE
Notes	:SYST:PRES:SAVE creates the same file as if the user requested a *SAV or a MMEM:STOR:STAT, except User Preset Save does not allow the user to specify the filename or the location of the file.
Initial S/W Revision	Prior to A.02.00

## View/Display (AM/FM/ $\Phi$ M)

The AM and PM measurements have four views. The primary view is called “Quad View” and displays all four of the view windows with the focus in the RF Spectrum window. This is the view seen after a Mode Preset. There are also three other views that combine one of the graphics windows with the metrics windows. Besides the above four views, the FM measurement has an additional view called “Attack/Release Time”. This view includes a RF envelope graphic window and an AF demod waveform (without interpolation) graphic window. The views can be selected from the View/Display menu.

These views are designed such that you can identify analog modulated carriers, determine whether the carrier is a commercial or other broadcast station, and analyze the modulating signal.

<b>Key Path</b>	<b>Front-panel key</b>
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW[:SElect] QUAD   RFSpectrum   DEMod   AFSpectrum   ARTime  :DISPlay:AM FM PM:VIEW[:SElect]?
<b>Example</b>	:DISP:FM:VIEW DEM selects Demod Waveform & Metrics View for FM Demod measurement
<b>Preset</b>	QUAD (Focus in RF Spectrum Window)
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	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.

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

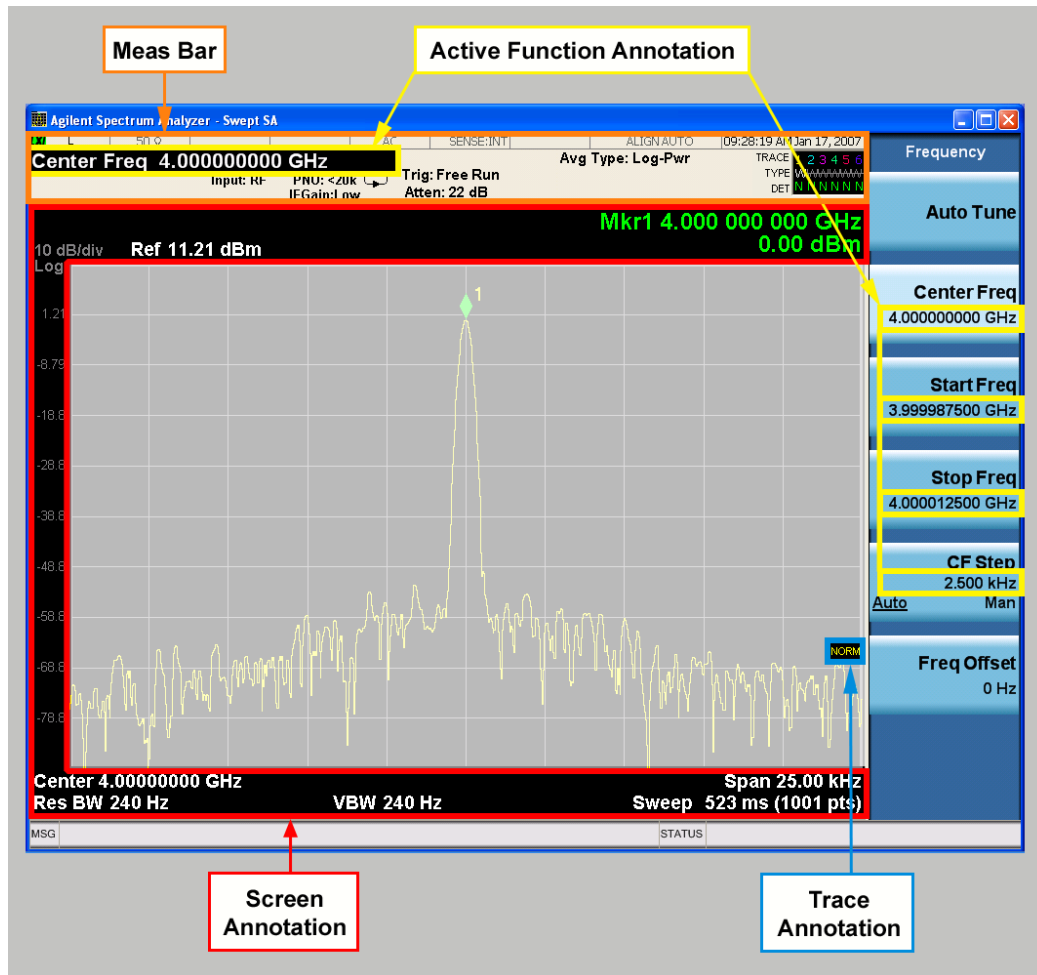
## Annotation

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.

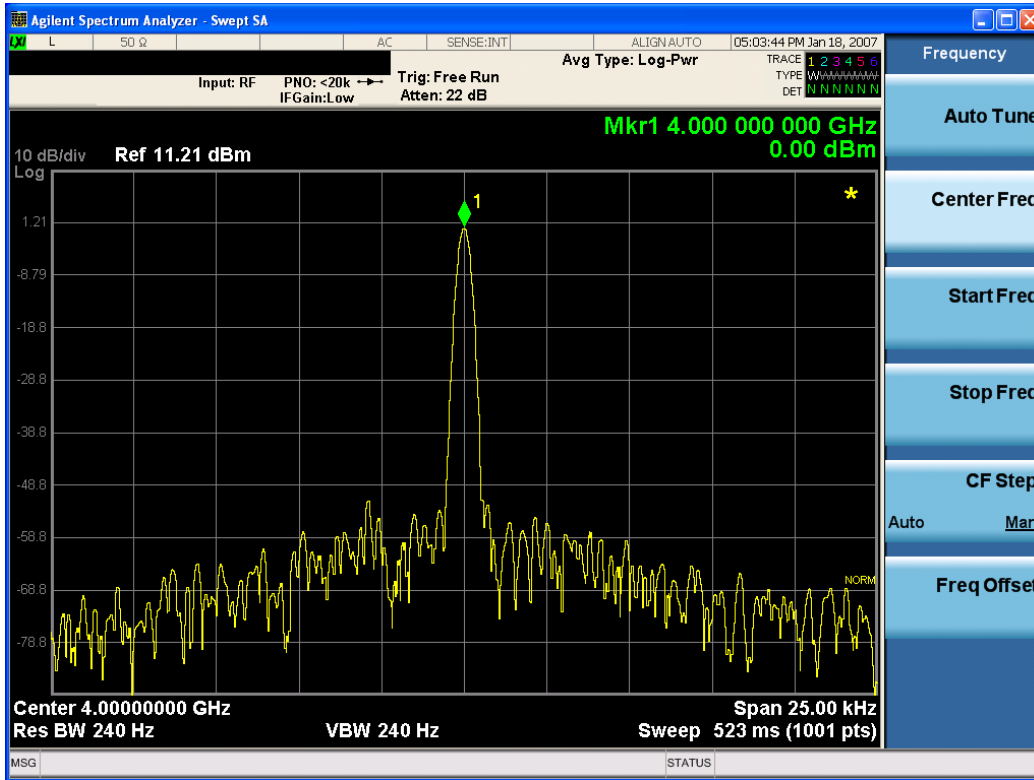
Key Path	View/Display, Display, Annotation
<b>Remote Command</b>	:DISPlay:ANNotation:SCReen[:STATe] OFF ON 0 1 :DISPlay:ANNotation:SCReen[:STATe]?
<b>Example</b>	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain 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..

10  $\Phi$ M Demod Measurement  
View/Display (AM/FM/ $\Phi$ M)



Key Path	View/Display, Display, Annotation
Remote Command	:DISPlay:ACTivefunc[:STATE] ON OFF 1 0 :DISPlay:ACTivefunc[:STATE]?
Example	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Title

Displays menu keys that enable you to change or clear a title on your display.

Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

### Change Title

Writes a title into the "measurement name" field in the banner, for example, "Swept SA".

Press Change Title to enter a new title through the alpha editor. Press Enter or Return to complete the entry. Press ESC to cancel the entry and preserve your existing title.

The display title will replace the measurement name. It remains for this measurement until you press Change Title again, or you recall a state, or a Preset is performed. A title can also be cleared by pressing Title, Clear Title.

**NOTE**

Notice the inclusion of the <measurement> parameter in the command below. Because each measurement remembers the Display Title, the command must be qualified with the measurement name. For the Swept SA measurement this is not the case; no <measurement> parameter is used when changing the Display Title for the Swept SA measurement.

Key Path	View/Display, Display, Title
Mode	All
<b>Remote Command</b>	:DISPlay:<measurement>:ANNotation:TITLe:DATA <string> :DISPlay:<measurement>:ANNotation:TITLe:DATA?
<b>Example</b>	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
<b>Example</b>	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.

Key Path	View/Display, Display, System Display Settings
Remote Command	:DISPlay:WINDow[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDow[1]:ANNotation[:ALL]?
Example	:DISP:WIND:ANN OFF
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	The WINDow parameter and optional subopcode is included for backwards compatibility but ignored – all windows are equally affected.
Initial S/W Revision	Prior to A.02.00

## 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:SCReem:THEMe TDColor   TDMonochrome   FCOlor   FMONochrome  :MMEMory:STORe:SCReem:THEMe?
<b>Example</b>	:MMEM:STOR:SCR:THEM TDM
<b>Preset</b>	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.
<b>Readback</b>	3D Color   3D Mono   Flat Color   Flat Mono
<b>Backwards Compatibility Notes</b>	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if you selected Reverse Bitmap AND a black & white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Color
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Mono
<b>Initial S/W Revision</b>	Prior to A.02.00

### Flat Color

Selects a format that is best when the screen is to be printed on an ink printer.

Key Path	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
Initial S/W Revision	Prior to A.02.00

### Flat Monochrome

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

Key Path	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

### Backlight

Accesses the display backlight on/off keys. This setting may interact with settings under the Windows "Power" menu.

When the backlight is off, pressing ESC, TAB, SPACE, ENTER, UP, DOWN, LEFT, RIGHT, DEL, BKSP, CTRL, or ALT turns the backlight on without affecting the application. Pressing any other key will turn backlight on and could potentially perform the action as well.

Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight ON OFF :DISPlay:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
Initial S/W Revision	Prior to A.02.00

### Backlight Intensity

An active function used to set the backlight intensity. It goes from 0 to 100 where 100 is full on and 0 is off. This value is independent of the values set under the Backlight on/off key.

Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50

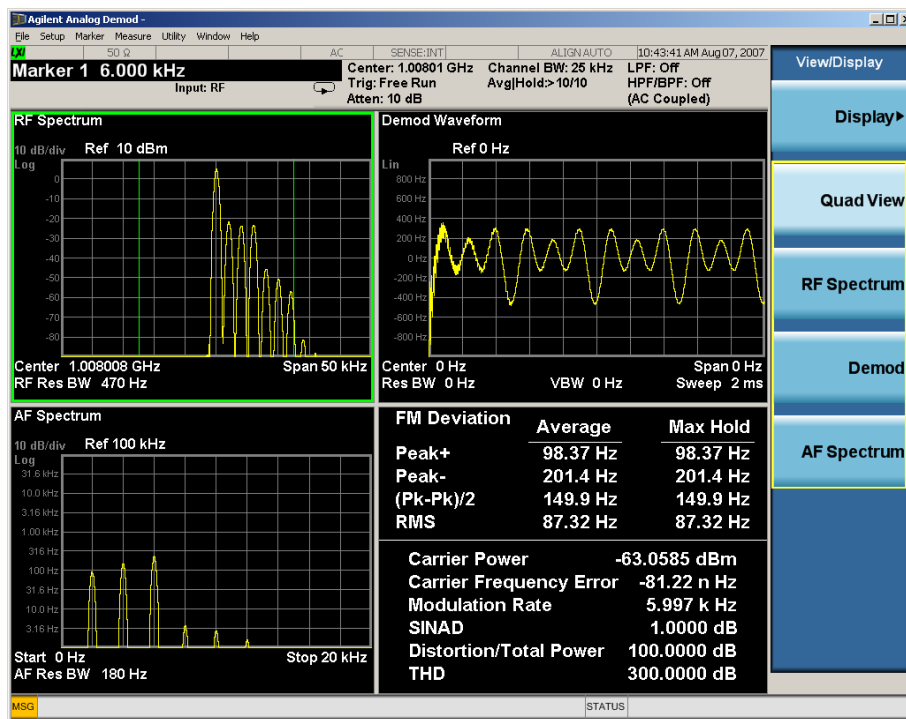
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

## Quad View

The Quad View displays each of the four fundamental windows of the Analog Demod mode. The basic window format is essentially the same for the 3 measurements. The main difference is the demodulation technique performed in the hardware and the specific metrics and units of the displayed results.

In general, there is little window-context sensitivity in the Analog Demod mode, that is, most of the variables have been designed so that they are unique to their window. The three variables that are window dependent are, Ref Value, Scale/Div, and Ref Position. These variables change to reflect the settings of the current window (the current window is always outlined in green).

The Quad View is shown below. For more information on the views, see ["RF Spectrum Window" on page 743](#), ["Demod Waveform Window" on page 744](#), ["AF Spectrum Window" on page 744](#), or ["Metrics Window" on page 744](#).



## RF Spectrum Window

The RF Spectrum window shows a spectral display of the input RF signal with amplitude in the vertical Y axis and frequency in the horizontal X axis. The vertical axis is always scaled in dB, with units of dBm, with the Ref Value initially at the top of the vertical scale. This spectral display is basically identical to the

frequency display of the Swept SA measurement; however it is always taken using an FFT. The span is restricted to 8 MHz and zero span is not allowed.

The RF Spectrum window provides a convenient way to identify broadcast stations by placing the signal of interest at the center frequency using this window and listening to the instrument's speaker. Demodulation is always performed at the center frequency of the RF Spectrum window; this is regarded as the application's center frequency and is annotated in the Measurement Bar.

In the RF Spectrum window, two green vertical lines are shown centered around the center frequency, with spacing equal to the Channel BW. If the Channel BW is wider than the span, they are not seen.

The Center Frequency, Span, and RF Res BW are annotated at the bottom of the RF Spectrum Window. The Ref Value and Scale/Div are annotated above the graticule.

### Demod Waveform Window

In the Demod Waveform window, the demodulated signal is displayed in the time domain (zero span) with time on the horizontal X axis, and modulation depth (AM) or deviation (FM,  $\Phi$ M) on the vertical Y axis.

In the Demod Waveform window the Y axis is linearly scaled in units of percent modulation for AM, frequency (Hz) for FM, or phase (radians) for  $\Phi$ M. On a preset, the Ref Value is positioned in the center of the vertical scale.

Four traces are available in the Demod Waveform window. The Demod trace, in yellow, shows the current demodulation signal. The Demod Max trace, in cyan, shows the Max Hold value for each display point bucket since the last restart and the Demod Min trace, in magenta, shows the Min Hold value for each display point bucket since the last restart. The Demod Average trace, in green, shows the averaged demodulation signal. If Averaging is turned off, only the Demod trace is displayed.

The Sweep Time is annotated at the bottom of the Demod Waveform Window. The Ref Value and Scale/Div are annotated above the graticule.

### AF Spectrum Window

In the AF Spectrum window, the demodulated signal is displayed in the frequency domain with frequency on the X axis and amplitude on the Y axis.

The vertical axis is always scaled in dB with the Ref Value initially at the top of the vertical scale. The Y-Axis Unit is % for AM, Hz for FM, and radians for  $\Phi$ M.

In this view you can observe the spectral components of the modulating signal. The preset Start Frequency of this window is 0 Hz. The AF Start Freq and AF Stop Freq are annotated at the bottom of the AF Spectrum Window, as is the AF Res BW.

The Ref Value and Scale/Div are annotated above the graticule.

It is only possible to show a spectrum to a maximum frequency of Channel BW / 2. For trace display points beyond that frequency, the value  $1.0E-50$  is plotted and returned in queries.

### Metrics Window

The metrics window displays measurement results.

If averaging is turned on, the column marked "Current" is relabeled "Average" and the results in that column are averaged over successive measurements until the Average/Hold number is reached. Then, if



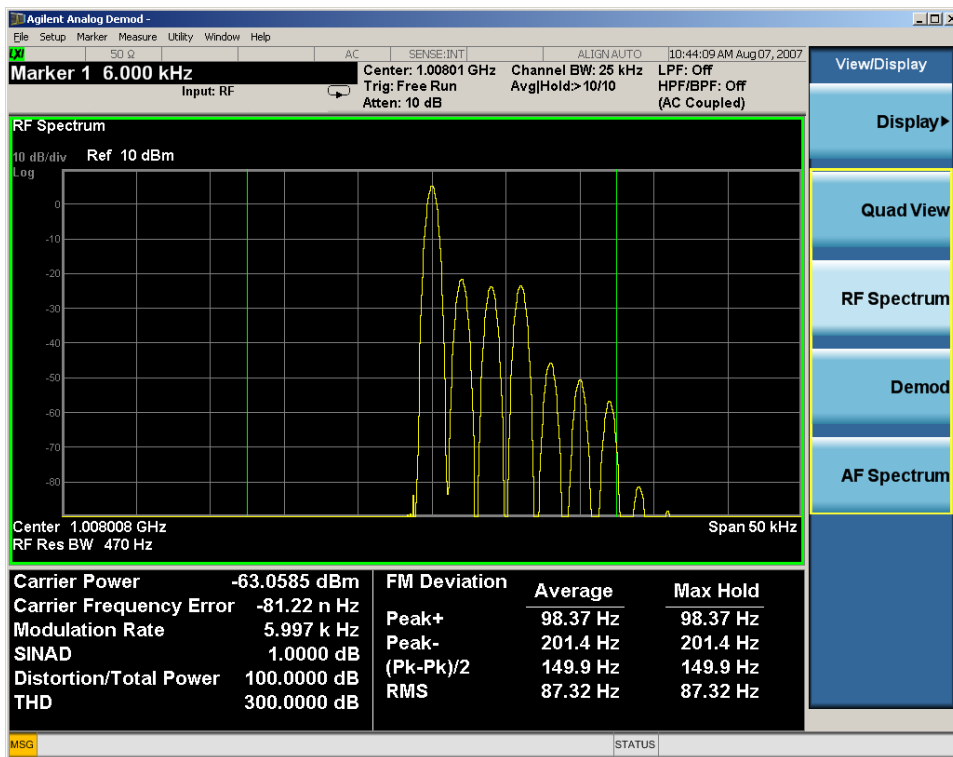
not in Single measurement mode, the measurement continues, exponentially averaging in successive results. The Max Hold column shows the Maximum value the un-averaged metric has attained since the last Restart. The Max Hold column is removed when averaging is turned off.

The window title is “FM Deviation” in FM, “AM Mod Depth” in AM, and “ $\Phi$ M Radians” in  $\Phi$ M.

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

## RF Spectrum & Metrics View

This view shows the RF Spectrum window and the Metrics window displayed in a split screen mode with the RF Spectrum window taking up approximately  $\frac{3}{4}$  of the display.

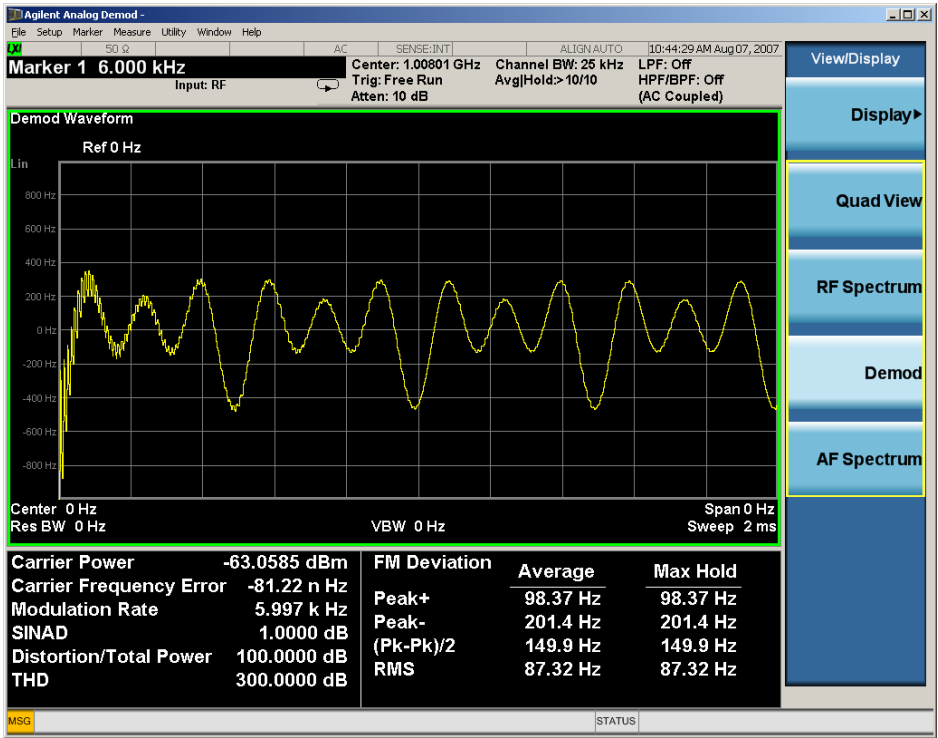


Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

## Demod Waveform & Metrics View

This view shows the Demod Waveform window and the Metrics windows displayed in a split screen mode with the Demod Waveform window taking up approximately  $\frac{3}{4}$  of the display.

10  $\Phi$ M Demod Measurement  
View/Display (AM/FM/ $\Phi$ M)



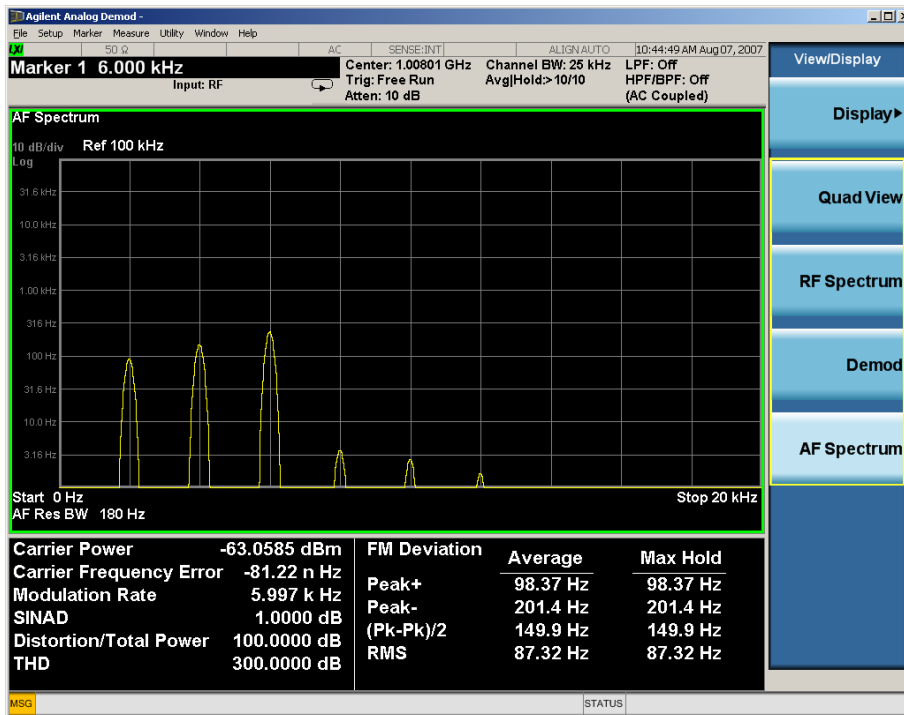

---

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

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### AF Spectrum & Metrics View

This view shows the AF Spectrum window and the Metrics windows displayed in a split screen mode with the AF Spectrum window taking up approximately ¾ of the display.



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

## Distortion & THD Unit

Changes the units of distortion and THD in the Metrics screen between % and dB units.

Key Path	View/Display
Remote Command	DISPlay:AM FM PM:VIEW:DISToRtion:UNIT DB PCT DISPlay:AM FM PM:VIEW:DISToRtion:UNIT?
Example	DISP:AM:VIEW:DIS:UNIT PCT Sets AM distortion and THD display to percent.
Preset	PCT
State Saved	Saved in State
Initial S/W Revision	Prior to A.02.00

## Metrics Settings

Accesses a menu used to control which metrics will be provided. This includes a 1-of-N menu which allows you to control which modulation magnitude metrics are displayed, as well as On/Off controls for Modulation Rate and SINAD/Distortion/THD. If speed is an issue, select only the metric(s) that is(are) required. If modulation magnitude is set to Peak+ Only, Pk-Pk/2 Only, or RMS Only, the other modulation magnitude metrics are loaded with not a number and show “---“ in the metrics window.

<b>Key Path</b>	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:MMAGnitude ALL   PPK   PNPk   RMS   RMSRatio  :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude?
<b>Example</b>	DISP:AM:VIEW:METR:MMAG PPK Sets AM modulation magnitude to peak +. DISP:FM:VIEW:METR:MMAG RMSR Sets ratio reference and sets FM modulation magnitude to ratio display
<b>Preset</b>	ALL
<b>State Saved</b>	Saved in State
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.05.00

## Normal

Turns on all absolute modulation magnitude metrics. In the metrics window, Peak +, Peak -, Pk-Pk/2 and RMS results are provided.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG ALL
<b>Notes</b>	This key was labeled "All" in earlier releases
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.05.00

## Peak+ Only

Turns on just the Peak+ metric in the portion of the metrics window that shows the modulation magnitude results.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG PPK
<b>Initial S/W Revision</b>	Prior to A.02.00

## Pk-Pk/2 Only

Turns on just the Pk-Pk/2 metric in the portion of the metrics window that shows the modulation magnitude results. .

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG PNPk
<b>Initial S/W Revision</b>	Prior to A.02.00

## RMS Only

Turns on just the RMS metric in the portion of the metrics window that shows the modulation magnitude results.

Key Path	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG RMS
Initial S/W Revision	Prior to A.02.00

## RMS Ratio

Turns on the display of RMS Ratio. In this mode, the only magnitude metrics that are displayed are the RMS metrics, but besides the display of RMS, the ratio (in dB) of the RMS modulation to its reference is displayed, as well as the value of the reference, as shown in the display below:

FM Deviation	Average	Max Hold
RMS	12.69 kHz	14.19 kHz
RMS Ratio	1.89 dB	2.86 dB
Ratio Ref	10.20 kHz	
Carrier Power	-100.331 dBm	
Carrier Frequency Error	180.5 Hz	

Pressing the RMS Ratio key (or sending :DISP:AM:VIEW:METR:MMAG RMSR) establishes the reference. Pressing it again (or sending the SCPI command again) establishes a new reference. If the Ratio Reference state is Auto, the reference is from the previous measurement result, otherwise, it's from the Ratio Reference's value you entered. Whenever this happens, the current value of RMS modulation from the left hand column (Current or Average) is taken as the new reference. If, when the ratio is to be established, there is not a valid value being displayed to use as a reference, an error is generated, the RMS Ratio and Ratio Ref values display --- and queries of either return not a number (9.91 e37).

To turn off the ratio display, select one of the other Mod magnitude views.

Note that each measurement (AM, FM and PM) has its own reference; and the reference is remembered when you leave the measurement and return.

The ratio references are saved in State, and when the recalled state of Metrics Settings is RMS Ratio, the saved reference for the current measurement should be recalled and used, rather than establishing a new one.

Key Path	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:AM:VIEW:METR:MMAG RMSR
Initial S/W Revision	A.05.00

## Ratio Reference

Sets or displays the RMS ratio reference value and chooses the reference setting mode.

- If Auto is selected, pushing “RMS Ratio” does the following 3 actions:
  1. selects RMS Ratio as the Metrics Setting
  2. establishes RMS Ratio reference from previous measurement result
  3. displays the ratio reference value in step 2 on the “Ratio Reference” label text
- If Man is selected, pushing “RMS Ratio” does the following 2 actions:
  1. selects RMS Ratio as the Metrics Setting
  2. establishes RMS Ratio reference from “Ratio Reference” label value what you entered

Key Path	View/Display, Metrics Settings
<b>Remote Command</b>	<pre>:DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence &lt;real&gt; :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence? :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence:AUTO ON   OFF   1   0 :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude:REFeRence:AUTO?</pre>
<b>Example</b>	<pre>:DISP:AM FM PM:VIEW:METR:MMAG:REF 1 kHz :DISP:AM FM PM:VIEW:METR:MMAG:REF? :DISP:AM FM PM:VIEW:METR:MMAG:REF:AUTO ON :DISP:AM FM PM:VIEW:METR:MMAG:REF:AUTO?</pre>
<b>Notes</b>	If Auto is selected, the value of this key depends on the pervious measurement results. If Man is selected, the value is what you entered.
<b>Dependencies</b>	This feature is available only when Option N9063A-AFP is installed.
<b>Preset</b>	AM: 10 % FM: 1 kHz PM: 1 rad ON
<b>State Saved</b>	Saved in instrument state.
<b>Min</b>	AM: 0.01 % FM: 0.1 Hz PM: 1 mrad
<b>Max</b>	AM: 10000 % FM: 1GHz PM: 10 krad
<b>Initial S/W Revision</b>	A.14.00

## Modulation Rate

Toggles the Modulation Rate metric on and off. When turned on, the Modulation Rate metric is provided. When turned off, the Modulation Rate metric is set to not a number and shows “---” in the metric window.

Key Path	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:MRATe[:STATe] ON OFF 1 0 :DISPlay:AM FM PM:VIEW:METRics:MRATe[:STATe]?
<b>Example</b>	DISP:AM:VIEW:METR:MRAT OFF Sets AM modulation rate to off
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## SINAD, THD, Distortion

Toggles the distortion metrics (SINAD, Distortion, & THD) on and off. When turned on, the SINAD, Distortion, and THD metrics are provided. When turned off, the SINAD, Distortion, and THD metrics are set to not a number and show “---” in the metric window.

SINAD is the ratio of total received power (the received signal-plus-noise-plus-distortion power) to the received noise-plus-distortion power. It is always expressed in decibel units. The rejection of the carrier from the noise-plus-distortion power measurement is usually not much more than 50 dB, thus limiting the maximum SINAD.

THD is the ratio of the root mean square voltage of the harmonics referenced to the fundamental voltage, expressed in % or dB. Note the differences with respect to Distortion. The denominator of the ratio is different and the items in the numerator do not include the noise between harmonics, just the harmonics themselves.

Distortion/Total Voltage (rms) is the ratio of unwanted received power (noise plus distortion) to the total received power, expressed in % or dB. Therefore, this metric is the negative of SINAD when expressed in decibels.

Key Path	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:DISTortion[:STATe] ON OFF 1 0 :DISPlay:AM FM PM:VIEW:METRics:DISTortion[:STATe]?
<b>Example</b>	DISP:AM:VIEW:METR:DIST OFF Sets AM SINAD, Distortion, THD Metrics to off
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Carrier Power Unit

Chooses the unit of carrier power in the Metrics screen between watts and dBm.

Key Path	View/Display
Remote Command	DISPlay:AM FM PM:VIEW:CARRier:POWer:UNIT DBM W DISPlay:AM FM PM:VIEW:CARRier:POWer:UNIT?
Example	DISP:AM:VIEW:CARR:POW:UNIT DBM Sets AM carrier power display to watts.
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Preset	DBM
State Saved	Saved in State
Initial S/W Revision	A.14.00



## 11 FM Stereo Measurement

For the FM Stereo Demod measurement, the analyzer will display the metrics results, such as FM deviation, modulation rate, carrier frequency error, SINAD, total harmonic distortion and carrier power. The analyzer can also display trace data of the RF spectrum, the AF spectrum, the demod waveform, or the L/R channel waveform/spectrum.

If the Demod Min trace, Demod Max trace or Demod Average trace is queried using a Meas, Read or Fetch command when the Average/Hold feature is turned off, the resulting data will be default values.

If any of the metrics are off, a SCPI query will return not a number and show “---“ in the metrics window. The metrics that can be turned off are: Modulation Rate, SINAD, Distortion, THD and all but one of the Deviations.

For more measurement related commands, see the SENSE subsystem, and the ["Remote Measurement Functions" on page 795](#).

This topic contains the following sections:

["Measurement Commands for FM Stereo Demod" on page 754](#)

["Remote Command Results for FM Stereo Demod" on page 755](#)

## Measurement Commands for FM Stereo Demod

Parameter Name	FM Stereo Meas/Read/Fetch Query Results
SCPI Command	:MEASure READ FETCh:FMSTereo[1] 0 2 3 4 5?
SCPI Example	MEAS:FMST? FETCH:FMST0? READ:FMST5?
Setup	[COMPARE OFF]
Post Setup	[COMPARE ON]

## Remote Command Results for FM Stereo Demod

Command	n	Return Value
INITiate:FMSTereo	n/a	n/a
CONFigure?	n/a	name of current measurement: "FMST"
CONFigure:FMSTereo	n/a	n/a (selects FM Stereo measurement in Meas Preset state)
CONFigure:FMSTereo:NDEFault	n/a	n/a (selects FM Stereo measurement without affecting settings)
FETCh:FMSTereo[n]?	0	This query returns the RF Spectrum trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
MEASure:FMSTereo[n]?		
READ:FMSTereo[n]?	not specified or n=1	Returns the following comma-separated results: 1. The RF Spectrum window's center frequency 2. RF Carrier Power 3. RF Carrier Frequency Error 4. 38 kHz Carrier Frequency Error 5. 38 kHz Carrier Phase Error 6. Left To Right 7. Mono To Stereo 8. MPX SINAD value 9. MPX Distortion/Total Vrms (% - not ratio - or dB) 10. MPX Deviation (Peak+) 11. MPX Deviation (Peak-) 12. MPX Deviation (Pk-Pk)/2 13. MPX Deviation (RMS) 14. MPX Deviation (Peak+) Max Hold 15. MPX Deviation (Peak-) Max Hold 16. MPX Deviation (Pk-Pk)/2 Max Hold 17. MPX Deviation (RMS) Max Hold 18. Mono Modulation Frequency 19. Mono SINAD value 20. Mono Distortion/Total Vrms (% - not ratio - or dB) 21. Mono Deviation (Peak+) 22. Mono Deviation (Peak-) 23. Mono Deviation (Pk-Pk)/2 24. Mono Deviation (RMS) 25. Mono Deviation (Peak+) Max Hold 26. Mono Deviation (Peak-) Max Hold 27. Mono Deviation (Pk-Pk)/2 Max Hold 28. Mono Deviation (RMS) Max Hold 29. Stereo Modulation Frequency

Command	n	Return Value
		30. Stereo Deviation (Peak+)
		31. Stereo Deviation (Peak-)
		32. Stereo Deviation (Pk-Pk)/2
		33. Stereo Deviation (RMS)
		34. Stereo Deviation (Peak+) Max Hold
		35. Stereo Deviation (Peak-) Max Hold
		36. Stereo Deviation (Pk-Pk)/2 Max Hold
		37. Stereo Deviation (RMS) Max Hold
		38. Left Modulation Frequency
		39. Left SINAD value
		40. Left Distortion/Total Vrms (% - not ratio - or dB)
		41. Left Total Harmonic Distortion(% - not ratio - or dB)
		42. Left Deviation (Peak+)
		43. Left Deviation (Peak-)
		44. Left Deviation (Pk-Pk)/2
		45. Left Deviation (RMS)
		46. Left Deviation (Peak+) Max Hold
		47. Left Deviation (Peak-) Max Hold
		48. Left Deviation (Pk-Pk)/2 Max Hold
		49. Left Deviation (RMS) Max Hold
		50. Right Modulation Frequency
		51. Right SINAD value
		52. Right Distortion/Total Vrms (% - not ratio - or dB)
		53. Right Total Harmonic Distortion(% - not ratio - or dB)
		54. Right Deviation (Peak+)
		55. Right Deviation (Peak-)
		56. Right Deviation (Pk-Pk)/2
		57. Right Deviation (RMS)
		58. Right Deviation (Peak+) Max Hold
		59. Right Deviation (Peak-) Max Hold
		60. Right Deviation (Pk-Pk)/2 Max Hold
		61. Right Deviation (RMS) Max Hold
		62. Pilot Modulation Frequency
		63. Pilot Deviation (Peak+)
		64. Pilot Deviation (Peak-)
		65. Pilot Deviation (Pk-Pk)/2
		66. Pilot Deviation (RMS)
		67. Pilot Deviation (Peak+) Max Hold
		68. Pilot Deviation (Peak-) Max Hold
		69. Pilot Deviation (Pk-Pk)/2 Max Hold

Command	n	Return Value
		70. Pilot Deviation (RMS) Max Hold
		71. RDS Deviation (Peak+)
		72. RDS Deviation (Peak-)
		73. RDS Deviation (Pk-Pk)/2
		74. RDS Deviation (RMS)
		75. RDS Deviation (Peak+) Max Hold
		76. RDS Deviation (Peak-) Max Hold
		77. RDS Deviation (Pk-Pk)/2 Max Hold
		78. RDS Deviation (RMS) Max Hold
		79. RDS Error Block Count
		80. RDS Total Block Count
		81. RDS BLER (Block Error Rate)
	2	This query returns the MPX Demod Min Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are 1 GHz.
	3	This query returns the MPX Demod Max Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	4	This query returns the MPX Demod Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view
	5	This query returns the MPX Demod Average Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	6	This query returns the MPX AF Spectrum Trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	7	This query returns the Mono Demod Min Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are 1 GHz.
	8	This query returns the Mono Demod Max Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	9	This query returns the Mono Demod Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view
	10	This query returns the Mono Demod Average Trace data as a list of x,y

Command	n	Return Value
		pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	11	This query returns the Mono AF Spectrum Trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	12	This query returns the Stereo Demod Min Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are 1 GHz.
	13	This query returns the Stereo Demod Max Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	14	This query returns the Stereo Demod Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view
	15	This query returns the Stereo Demod Average Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	16	This query returns the Stereo AF Spectrum Trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	17	This query returns the Left Demod Min Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are 1 GHz.
	18	This query returns the Left Demod Max Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	19	This query returns the Left Demod Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view
	20	This query returns the Left Demod Average Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	21	This query returns the Left AF Spectrum Trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	22	This query returns the Right Demod Min Trace data as a list of x,y

Command	n	Return Value
		pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are 1 GHz.
	23	This query returns the Right Demod Max Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	24	This query returns the Right Demod Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view
	25	This query returns the Right Demod Average Trace data as a list of x,y pairs. The x-axis values are in units of seconds. The y-value units depend on the current view If Aver/Hold is off, all y-values are -1 GHz.
	26	This query returns the Right AF Spectrum Trace data as a list of x,y pairs. The x-axis values are in units of Hz. The y-value units depend on the current view
	27	Returns the following comma-separated results: <ol style="list-style-type: none"> <li>1. MPX Deviation (RMS)</li> <li>2. MPX Deviation (RMS) Ratio</li> <li>3. MPX Ratio Referenced</li> <li>4. Mono Deviation (RMS)</li> <li>5. Mono Deviation (RMS) Ratio</li> <li>6. Mono Ratio Referenced</li> <li>7. Stereo Deviation (RMS)</li> <li>8. Stereo Deviation (RMS) Ratio</li> <li>9. Stereo Ratio Referenced</li> <li>10. Left Deviation (RMS)</li> <li>11. Left Deviation (RMS) Ratio</li> <li>12. Left Ratio Referenced</li> <li>13. Right Deviation (RMS)</li> <li>14. Right Deviation (RMS) Ratio</li> <li>15. Right Ratio Referenced</li> <li>16. Pilot Deviation (RMS)</li> <li>17. Pilot Deviation (RMS) Ratio</li> <li>18. Pilot Ratio Referenced</li> <li>19. RDS Deviation (RMS)</li> <li>20. RDS Deviation (RMS) Ratio</li> <li>21. RDS Ratio Referenced</li> </ol>

## 11 FM Stereo Measurement

Key Path	Meas
Initial S/W Revision	A.10.00



## AMPTD Y Scale

Accesses a menu that enables you to set the reference level, attenuation, scale per division, reference position, and internal pre-amplifier parameters for your measurement.

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

### Ref Value (FM Stereo)

The reference value specifies the amplitude of a signal displayed on the reference graticule line. The reference line is at the top, center, or bottom of the graticule, depending on the value of the Ref Position function.

Changing the reference value does not restart a measurement, but changes all displayed traces and markers to the new value. If a change to the reference value changes an auto-coupled attenuation value, the measurement restarts.

The Ref Value key applies only to the window with the focus. If the focus is on the Metrics window, the Ref Value key is unavailable.

Key Path	AMPTD Y Scale
<b>Remote Command</b>	:DISPlay:FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALE]:RLEVel <real> :DISPlay:FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALE]:RLEVel?
<b>Example</b>	DISP:FMST:WIND:TRAC:Y:RLEV 20 dBm Sets the reference value in window 1 to 20 dBm.
Remote Command Notes	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. Metrics
Couplings	The value is constrained within the MAX and MIN values, but is otherwise generally not adjusted.
Preset	RF Spectrum 0 dBm Demod Waveform 0 Hz AF Spectrum 100 kHz
State Saved	Saved in instrument state
Min	RF Spectrum -170 dBm - Ext Gain Demod Waveform -10 GHz AF Spectrum 1 Hz
Max	RF Spectrum 30 dBm Demod Waveform 10 GHz AF Spectrum 1 GHz

Default Unit	depends on the current view
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## 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 762](#)

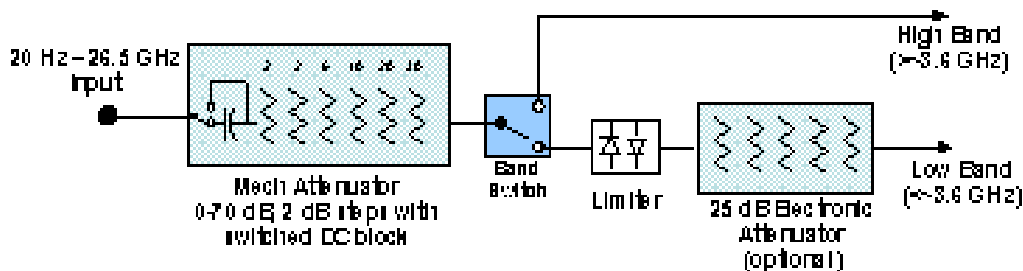
See ["Single Attenuator Configuration:" on page 763](#)

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.

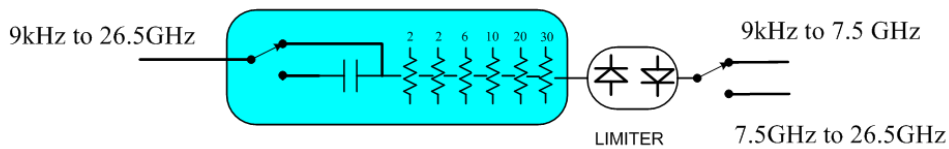
Key Path	AMPTD Y Scale
Scope	Meas Global
Dependencies	In measurements that support the I/Q inputs, this key is unavailable when I/Q is the selected input, and is replaced by the Range key in that case.
Readback Line	Contains a summary in [ ] brackets of the current total attenuation. See the descriptions of the , (Mech) Atten , and Enable Elec Atten keys for more detail on the contributors to the total attenuation. Note that when "Pre-Adjust for Min Clip" is on, this value can change at the start of every measurement.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

## Dual Attenuator Configurations:

Configuration 1: Mechanical attenuator + optional electronic attenuator

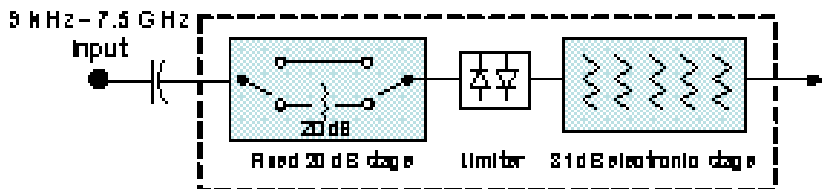


Configuration 2: Mechanical attenuator, no optional electronic attenuator

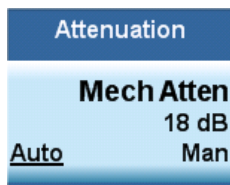


(note that Configuration 2 is not strictly speaking a dual-section attenuator, since there is no electronic section available. However, it behaves exactly like Configuration 1 without the Electronic Attenuator option EA3, therefore for the sake of this document it is grouped into the “Dual Attenuator” configuration)

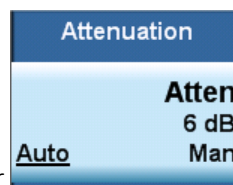
### Single Attenuator Configuration:



You can tell which attenuator configuration you have by pressing the Attenuation key, which (in most Modes) opens the Attenuation menu. If the first key in the Attenuation menu says Mech Atten you have the dual attenuator configuration. If the first key says Atten you have the single attenuator configuration.



Dual Attenuator



Single Attenuator

In the single attenuator configuration, you control the attenuation with a single control, as the fixed stage has only two states. In the dual attenuator configuration, both stages have significant range so you are given separate control of the mechanical and electronic attenuator stages.

When you have the dual attenuator configuration, you may still have only a single attenuator, because unless option EA3 (the Electronic Attenuator option) is available, and you purchase it, you will have only the mechanical attenuator.

### Scale / Div (FM Stereo)

Sets the units per vertical graticule division on the display.

The Scale/Div key applies only to the window with the focus. If the focus is on the Metrics window, the Scale/Div key is unavailable.

Key Path	AMPTD Y Scale
<b>Remote Command</b>	:DISPlay:FMSTereo:WINDow[1]   2   3:TRACe:Y[:SCALe]:PDIVision <real>
	:DISPlay:FMSTereo:WINDow[1]   2   3:TRACe:Y[:SCALe]:PDIVision?

<b>Example</b>	DISP:FMST:WIND:TRAC:Y:PDIV 5 DB
Remote Command Notes	Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform 3. AF Spectrum 4. Metrics
Preset	RF Spectrum 10 dB Demod Waveform 15 kHz AF Spectrum 10 dB
State Saved	Saved in State
Min	RF Spectrum 0.1 dB Demod Waveform 1 Hz AF Spectrum 0.1 dB
Max	RF Spectrum 20 dB Demod Waveform 1 GHz AF Spectrum 20 dB
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Ref Position

Positions the reference value at the top, center, or bottom of the Y Scale display. Changing the reference position does not change the reference value.

The Ref Position key applies only to the window with the focus. If the focus is on the Metrics window, the Ref Position key is unavailable.

Key Path	AMPTD Y Scale
Remote Command	AM/PM/FM Stereo: :DISPlay:AM PM FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALE]:RPOSition TOP   CENTER   BOTTom  :DISPlay:AM PM FMSTereo:WINDow[1] 2 3:TRACe:Y[:SCALE]:RPOSition?  FM: :DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALE]:RPOSition TOP   CENTER   BOTTom  :DISPlay:FM:WINDow[1] 2 ... 5:TRACe:Y[:SCALE]:RPOSition?
Example	DISP:AM:WIND:TRAC:Y:RPOS BOTT
Remote Command Notes	AM/PM/FM Stereo: Regardless of the View, the windows are numbered as follows: 1. RF Spectrum 2. Demod Waveform

	<p>3. AF Spectrum</p> <p>4. Metrics</p> <p>FM:</p> <p>Regardless of the View, the windows are numbered as follows:</p> <p>1. RF Spectrum</p> <p>2. Demod Waveform</p> <p>3. AF Spectrum</p> <p>4. RF Envelope (Attack/Release Time view)</p> <p>5. FM Demod Waveform (Attack/Release Time view)</p> <p>6. Metrics</p>
Preset	<p>RF Spectrum window: Top</p> <p>Demod Waveform window: Center</p> <p>AF Spectrum window: Top</p>
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Internal Preamp

Accesses a menu of keys that control the internal preamps. Turning on the preamp gives a better noise figure, but a poorer TOI to noise floor dynamic range. You can optimize this setting for your particular measurement.

The instrument takes the preamp gain into account as it sweeps. If you sweep outside of the range of the preamp the instrument will also account for that. The displayed result will always reflect the correct gain.

For some measurements, when the preamp is on and any part of the displayed frequency range is below the lowest frequency for which the preamp has specifications, a warning condition message appears in the status line. For example, for a preamp with a 9 kHz lowest specified frequency: "Preamp: Accy unspec'd below 9 kHz".

Key Path	AMPTD Y Scale
Scope	Meas Global
Remote Command	<pre>[ :SENSe] :POWer [:RF] :GAIN [:STATe] OFF ON 0 1</pre> <pre>[ :SENSe] :POWer [:RF] :GAIN [:STATe] ?</pre>
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>
Couplings	<p>The act of connecting the U7227A USB Preamplifier to one of the analyzer's USB ports will cause the Internal Preamp to be switched on. When this happens an informational message will be generated: "Internal Preamp turned on for optimal operation with USB Preamp." Note that if the Internal Preamp was already on, there will be no change to the setting, but if it was Off it will be</p>

	switched On, to Full Range. Note that this same action occurs when the SA mode is selected while the USB Preamp is connected to one of the analyzer's USB ports, if it is the first time that the SA mode has run since powerup, or if the last time the SA mode was running the USB Preamp was NOT connected. Subsequently disconnecting the USB Preamp from USB does not change the Internal Preamp setting nor restore the previous setting.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

Key Path	AMPTD Y Scale, Internal Preamp
Scope	Meas Global
<b>Remote Command</b>	[ :SENSe ] :POWer [ :RF ] :GAIN :BAND LOW   FULL [ :SENSe ] :POWer [ :RF ] :GAIN :BAND ?
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown. If a POW:GAIN:BAND FULL command is sent when a low band preamp is available, the preamp band parameter is to LOW instead of FULL, and an "Option not installed" message is generated.
Preset	LOW
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Off

Turns the internal preamp off

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

## Low Band

Sets the internal preamp to use only the low band.

The frequency range of the installed (optional) low-band preamp is displayed in square brackets on the Low Band key label.

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND LOW
Readback	Low Band
Initial S/W Revision	Prior to A.02.00

## Full Range

Sets the internal preamp to use its full range. The low band (0–3.6 GHz or 0–3GHz, depending on the model) is supplied by the low band preamp and the frequencies above low band are supplied by the high band preamp.

The frequency range of the installed (optional) preamp is displayed in square brackets on the Full Range key label. If the high band option is not installed the Full Range key does not appear.

Key Path	AMPTD Y Scale, Internal Preamp
<b>Example</b>	:POW:GAIN ON :POW:GAIN:BAND FULL
Readback	Full Range
Initial S/W Revision	Prior to A.02.00

## Auto 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 which 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.

For Analog Demod, these parameters are:

- RF Res BW
- AF Res BW
- CF Step

---

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

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## BW

Opens a menu of keys that enable you to control the bandwidth functions of the application.

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

### RF Res BW

Activates the RF Res BW function, which enables you to manually set the resolution bandwidth used in the RF Spectrum window.

Normally, the RF Res BW (Auto) key selects automatic coupling of the resolution bandwidth. To decouple the resolution bandwidth, press the RF Res BW key until Man is underlined, or enter a different value for the resolution bandwidth.

When the resolution bandwidth is manually selected, it may be returned to the coupled state by pressing the RF Res BW key until Auto is underlined. This may also be done by pressing the Auto Couple key or by performing a preset.

Only the Gaussian filter type is used.

Key Path	BW
Remote Command	<pre>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth[:RESolution] &lt;freq&gt; [ :SENSe ] :AM FM PM FMSTereo:BANDwidth[:RESolution]? [ :SENSe ] :AM FM PM:BANDwidth[:RESolution]:AUTO OFF ON 0 1 [ :SENSe ] :AM FM PM:BANDwidth[:RESolution]:AUTO?</pre>
Example	<pre>AM:BAND 1 KHZ AM:BAND? AM:BAND:AUTO ON AM:BAND:AUTO?</pre>
Notes	Only certain discrete resolution bandwidths are available. For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Couplings	<p>AM/FM/PM: In Auto, the 3 dB RBW of the desired filter is the closest possible choice to that given by Span divided by 106 (the Span: 3 dB RBW parameter), except that the range for auto-coupling is restricted to not exceed 3 MHz.</p> <p>FMST: In Auto, RBW is coupled to Span in the following ways: <math>RBW = Span / 500</math> ( Span &gt; 500 kHz )  <math>RBW = 1 \text{ kHz}</math> ( 100kHz &lt;= Span &lt;= 500 kHz )  <math>RBW = Span / 100</math> ( Span &lt; 100 kHz )</p>
Preset	<p>AM/FM/PM: Preset is Auto, which results in a 680 Hz value since the preset span is 75 kHz and the Span/RBW ratio is 106</p> <p>FMST: Preset is Auto, which results in a 1 kHz value since the preset span is 500 kHz</p>
State Saved	Saved in Instrument state

Min	1 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Channel BW

The Channel BW variable is used to determine the bandwidth used for the demodulation. The flat top filter type must be used for demodulation.

This parameter also controls the RBW hardware setting for the demodulation fed to the speaker.

Key Path	BW
<b>Remote Command</b>	<code>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth:CHANnel &lt;freq&gt;</code> <code>[ :SENSe ] :AM FM PM FMSTereo:BANDwidth:CHANnel?</code>
<b>Example</b>	AM:BAND:CHAN 200 kHz
Notes	If the Channel BW is greater than 8 MHz, gives a warning message "Settings Alert; Analog Output Undefined".
Dependencies	The maximum value will be the maximum IF BW available in the instrument. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available IF BW of the instrument is 140 MHz. Thus, the maximum Channel BW is not limited to 25 MHz but is 140 MHz.
Preset	= AM/FM/PM = 25 kHz = FMST = 400 kHz
State Saved	Saved in instrument state
Min	390 Hz
Max	When Option N9063A-AFP is installed, it depends on hardware: No Option = 10 MHz Option B25 = 25 MHz Option B40 = 40 MHz  Option B1X = 140 MHz Option B1Y = 160 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## AF Res BW

In the AF Spectrum window, the AF Res BW key is used to set the Resolution bandwidth of the FFT of the demodulated waveform.

The data acquisition uses the Channel BW value for hardware control during data acquisition, just as it does in the Demod Waveform window.

AF Res BW (Auto) selects automatic coupling of the AF Res BW to the AF Span (defined as AF Stop Freq – AF Start Freq) using the same factor of 106 used by the RF Res BW. To decouple the resolution bandwidth, press the AF Res BW key until Man is underlined, or enter a different value for the AF resolution bandwidth.

When the AF resolution bandwidth is manually selected, it may be returned to the coupled state by pressing the AF Res BW key until Auto is underlined. This may also be done by pressing the Auto Couple key or by performing a Preset.

Only the Gaussian filter type is used.

Key Path	BW
<b>Remote Command</b>	<pre>[ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth &lt;freq&gt; [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth? [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth:AUTO OFF   ON   0   1 [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:BANDwidth:AUTO?</pre>
<b>Example</b>	<pre>AM:AFSP:BAND 1 KHZ AM:AFSP:BAND?</pre>
Notes	Only certain discrete resolution bandwidths are available. For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Notes	For numeric entries, all RBW Types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Remote Command Notes	The setting and querying of values depends on the current bandwidth type.
Couplings	In Auto, the 3 dB RBW of the desired filter is the closest possible choice to that given by Span divided by 106 (the Span: 3 dB RBW parameter), except that the range for auto-coupling is restricted to not exceed 3 MHz.
Preset	Preset is Auto, which results in a 180 Hz value since the preset span is 20 kHz and the Span/RBW ratio is 106
State Saved	Saved in Instrument State
Min	1 Hz
Max	8 MHz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## 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.

<b>Key Path</b>	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
<b>Preset</b>	ON (Note that SYST:PRESet sets INIT:CONT to ON but *RST sets INIT:CONT to OFF)
<b>State Saved</b>	Saved in instrument state
<b>Backwards Compatibility Notes</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

In Swept SA Measurement (Spectrum Analysis Mode):

The analyzer takes repetitive sweeps, averages, measurements, etc., when in Continuous mode. When the average count reaches the Average/Hold Number the count stops incrementing, but the analyzer keeps sweeping. See the Trace/Detector section for the averaging formula used both before and after the Average/Hold Number is reached. The trigger condition must be met prior to each sweep. The type of trace processing for multiple sweeps, is set under the Trace/Detector key, with choices of Trace Average, Max Hold, or Min Hold.

In Other Measurements/Modes:

With Avg/Hold Num (in the Meas Setup menu) set to Off or set to On with a value of 1, a sweep is taken after the trigger condition is met; and the analyzer continues to take new sweeps after the current sweep has completed and the trigger condition is again met. However, with Avg/Hold Num set to On with a value >1, multiple sweeps (data acquisitions) are taken for the measurement. The trigger condition must be met prior to each sweep. The sweep is not stopped when the average count k equals the number N set for Avg/Hold Num is reached, but the number k stops incrementing. A measurement average usually applies to all traces, marker results, and numeric results. But sometimes it only applies to the numeric results.

If the analyzer is in Single measurement, pressing the Cont key does not change k and does not cause the sweep to be reset; the only action is to put the analyzer into Continuous measurement operation.

If it is already in continuous sweep:

the INIT:CONT 1 command has no effect

the INIT:CONT 0 command will place the analyzer in Single Sweep but will have no effect on the current sequence until  $k = N$ , at which point the current sequence will stop and the instrument will go to the idle state.

11 FM Stereo Measurement  
File

File

See "File" on page 236

## FREQ Channel

Accesses a menu of keys that enable you to control the Frequency parameters of the instrument.

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

### Center Frequency

Sets the frequency that corresponds to the horizontal center of the RF Spectrum window. While adjusting the Center Frequency the Span is held constant, this means that both the start frequency and the stop frequency will change.

The Center Frequency is retained as you go from measurement to measurement.

Key Path	FREQ Channel
<b>Remote Command</b>	<code>[ :SENSe ] :FREQuency:CENTer &lt;freq&gt;</code> <code>[ :SENSe ] :FREQuency:CENTer?</code>
<b>Example</b>	FREQ:CENT 50MHz FREQ:CENT UP changes the center frequency to 150 MHz if you use FREQ:CENT:STEP 100MHz sets the center frequency step size to 100 MHz FREQ:CENT?
Dependencies	The Center Frequency can be limited by Start or Stop Freq limits, In addition, the Center Frequency can be limited if the Span is so large that Start or Stop hit 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 frequency range
Preset	1.000 GHz
State Saved	Saved in instrument state
Min	Depends on instrument minimum frequency and the 10 Hz minimum span. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters.
Max	Depends on the instrument’s maximum frequency and the 10 Hz minimum span. If the knob or step keys are being used, it depends on the value of the other three interdependent parameters.
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00

## CF Step

Changes the step size for the center frequency function. Once a step size has been selected and the center frequency function is active, the step keys (and the UP|DOWN parameters for the Center Frequency from remote commands) change the center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the analyzer.

<b>Key Path</b>	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :FREQuency:CENTer:STEP [ :INCRement ] <freq> [ :SENSe ] :FREQuency:CENTer:STEP [ :INCRement ] ? [ :SENSe ] :FREQuency:CENTer:STEP:AUTO OFF   ON   0   1 [ :SENSe ] :FREQuency:CENTer:STEP:AUTO ?
<b>Example</b>	FREQ:CENT:STEP:AUTO ON FREQ:CENT:STEP 500MHz FREQ:CENT UP increases the current center frequency value by 500 MHz FREQ:CENT:STEP? FREQ:CENT:STEP:AUTO?
<b>Remote Command Notes</b>	Preset and Max values are dependent on Hardware Options (503, 508, 513, 526)
<b>Dependencies</b>	Span, RBW, Center frequency
<b>Couplings</b>	When auto-coupled in a non-zero span, the center frequency step size is set to 10% of the span. When auto-coupled in zero span, the center frequency step size is set to the equivalent -3 dB RBW value.
<b>Preset</b>	Auto
<b>State Saved</b>	Saved in State
<b>Min</b>	- (the maximum frequency of the instrument). For example, a 27 GHz max frequency instrument has a CF step range of +/- 27 GHz.
<b>Max</b>	The maximum frequency of the instrument. For example, 27 GHz max freq instrument has a CF step range of +/- 27 GHz.
<b>Default Unit</b>	Hz
<b>Status Bits/OPC dependencies</b>	Non-overlapped
<b>Initial S/W Revision</b>	Prior to A.02.00

## AF Start Freq

Sets the frequency at the left side of the graticule in the AF Spectrum window. While adjusting the AF start frequency the AF stop frequency is held constant.

The AF Start Frequency is retained as you go from measurement to measurement.

<b>Key Path</b>	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :AM   FM   PM   FMSTereo:AFSPectrum:FREQuency:START <freq> [ :SENSe ] :AM   FM   PM   FMSTereo:AFSPectrum:FREQuency:START ?



<b>Example</b>	AM:AFSP:FREQ:STAR 0 Hz
Dependencies	You cannot set the Start frequency > the Stop frequency. You cannot set the Start frequency = Stop frequency. You cannot set the Start Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, Stop Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	0 Hz
State Saved	Saved in instrument state
Min	0 Hz
Max	99.999990 MHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## AF Stop Freq

Sets the frequency at the right side of the graticule in the AF Spectrum window. While adjusting the AF Stop Frequency the AF Start Frequency is held constant.

Key Path	FREQ Channel
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:STOP <freq> [ :SENSe ] :AM FM PM FMSTereo:AFSPectrum:FREQuency:STOP?
<b>Example</b>	AM:AFSP:FREQ:STOP 20 kHz
Dependencies	You cannot set the Stop frequency < the Start frequency. You cannot set the Start frequency = Stop frequency. You cannot set the Stop Frequency to a value that would create a span of less than 10 Hz. If you try to do any of these, the Start Frequency will change to maintain a minimum value of 10 Hz for the difference between Start and Stop.
Preset	20 kHz
State Saved	Saved in instrument state
Min	10 Hz
Max	100 MHz
Default Unit	Hz
Status Bits/OPC dependencies	Non-overlapped
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

11 FM Stereo Measurement  
Input/Output

Input/Output

See "[Input/Output](#)" on page 126

## Marker

Accesses the Marker menu. A marker can be placed on a trace to allow the value of the trace at the marker point to be determined precisely. The functions in this menu include a 1-of-N selection of the control mode Normal, Delta, Fixed, or Off for the selected marker.

If the selected marker is Off, pressing the Marker key sets it to the selected window. If the metrics window is selected, the marker will appear in the first visible window (RF Spectrum if Quad View is selected).

The units of Delta Marker are window dependent. In the Spectrum windows they are dB, in the Demod Waveform window they are the same as the Y-Axis Unit. In this window, the delta marker is a linear difference rather than a ratio. For example, in FM, in the Demod Waveform window, the units of delta marker are Hz.

### Control Mode

Key Path	Front-panel key
Remote Command	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MODE POSition   DELTa   FIXed   OFF :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MODE?
Example	CALC:AM:MARK:MODE POS turns on marker 1 in Normal mode
Remote Command Notes	This command (not the query) causes the specified marker to become selected.
Preset	OFF (all markers)
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Select Marker

Displays a menu with 12 markers available for selection for the current measurement.

Key Path	Marker
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is initiated.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

### Normal

Sets the control mode for the selected marker to Normal and turns on the active function for setting its value. If the selected marker was off, it is placed at the center of the screen on the trace specified by the marker's Trace attribute.

A Normal mode (POSition type) marker can be moved to any point on the X Axis by specifying its X Axis value. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker
<b>Example</b>	: CALC: MARK: MODE POS sets Marker 1 to Normal.
Remote Command Notes	See the description under the " <b>Marker</b> " on page 779 key.
Couplings	The marker addressed by this command becomes the selected marker on the front panel.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Delta

Sets the control mode for the selected marker to Delta and turns on the active function for setting its delta value. If the selected marker is off, the marker is placed at the center of the screen on the trace specified by the marker's Trace attribute.

In Delta mode the marker result shows the relative result between the selected (Delta) marker and its reference marker. A delta marker can be moved to any point on the X Axis by specifying its X Axis offset from a reference marker. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Key Path	Marker
<b>Example</b>	:CALC:MARK:MODE DELT sets marker 1 to Delta.
Remote Command Notes	See the description under the " <b>Marker</b> " on page 779 key.
Couplings	Coupled to fix absolute X when turned On.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) and X Axis value are saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Fixed

Sets the control mode for the selected marker to Fixed. A fixed marker is fixed in the sense that it stays where you place it. It can be directly moved in both X and Y. It can be moved with a Peak Search. It can also be indirectly moved by re-zeroing the delta if it is a relative marker. If it is moved, it again becomes fixed at the X Axis point it moved to and it has a Y-axis result that it took on when it moved there. If a Normal or Delta marker is changed to Fixed it becomes fixed at the X Axis point it was at, and with the Y-axis result it had when it was set to Fixed.

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

## Marker X

Sets and queries a marker's X value.

Key Path	Marker, Fixed
----------	---------------

<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:X <time>   <freq> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:X?
Remote Command Notes	The query is returned in the fundamental units for the current marker X Axis scale. This command (not the query) causes the specified marker to become selected.
Preset	After a preset, all Markers are turned off, so a Marker X Axis Value query will return not a number (9.91 e37). When a Marker is on, the default value of the Marker X value is the center of the appropriate window.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Marker Y

Sets and queries a marker's Y axis value.

Key Path	Marker, Fixed
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:Y <real> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:Y?
Remote Command Notes	The query is returned in the fundamental units for the current marker Y Axis scale. This command (not the query) causes the specified marker to become selected.
Preset	Defaults to the measurement result at the default X value, or not a number (9.91 e37) if off or if off screen is Fixed.
Min	-9.9E+37
Max	9.9E+37
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Off

Turns off the selected marker. Turning the marker off does not affect which marker is selected.

Key Path	Marker
<b>Example</b>	: CALC: MARK: MODE OFF sets Marker 1 to Off.
Remote Command Notes	See the description under the " <a href="#">Marker</a> " on page 779 key.
State Saved	The marker control mode (Normal, Delta, Fixed, Off) is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Properties

Accesses a menu used to assign properties to the selected marker.

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

## Select Marker

Displays a menu with 12 markers available for selection for the current measurement.

Key Path	Marker, Properties
Notes	The selected marker is remembered even when not in the Marker menu and is used if a Search is initiated.
Preset	Marker 1
State Saved	The number of the selected marker is saved in instrument state.
Initial S/W Revision	Prior to A.02.00

## Relative To

Selects the reference marker for a marker in Delta mode.

If a delta marker has a reference marker in a different window, the delta marker's mode changes to POS (for example, it becomes a normal marker).

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:REFerence <int> :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:REFerence?
<b>Example</b>	CALC:AM:MARK1:REF 2 Sets marker 1's reference marker to 2 and turns marker 1 on as a delta marker.
Remote Command Notes	This command (not the query) causes the specified marker to become selected.
Preset	By default, marker X is relative to marker X + 1 except for marker 12, which is relative to marker 1.
Min	1
Max	12
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## FM Stereo Marker Trace

Selects the trace on which to place the marker. A marker is associated with one and only one trace. This trace is used to determine the placement, result, and X Axis Scale of the marker. All markers have an

associated trace, even Fixed markers. It is from that trace that they determine their attributes and behaviors, and it is to that trace that they go when they become Normal or Delta markers.

In the Analog Demod mode FM Stereo Measurement, there are 26 named traces. The RF Spectrum trace is the trace in the RF Spectrum window of MPX view. The Spectrum trace is the trace in the Spectrum window of the five views (MPX/Mono (L+R)/Stereo (L-R)/Left/Right). There are four kinds of traces in the Demod Waveform window of the five views (MPX/Mono (L+R)/Stereo (L-R)/Left/Right): Demod, Demod Avg, Demod Max, and Demod Min.

When Auto Init is on, the marker's trace attribute is re-determined automatically by the analyzer whenever the marker turns on (Normal, Delta, or Fixed) from an off state. The marker goes to the trace in the window that has the focus, or onto the RF spectrum window if the Metrics window has the focus. If in the Demod Waveform window, it goes to the Demod trace.

This command associates the marker with the specified trace. Setting the Marker Trace directly (whether the marker is on or off) will turn off Auto Init.

If the marker is not off, it moves the marker from the trace it was on to the new trace. If the new trace is in the same window, the marker goes to the same data point on the new trace. If the marker changes windows, it retains its relative horizontal positions in the new window. If it is a fixed marker, it will retain both relative horizontal and vertical position.

If the marker is off it stays off, but is now associated with the specified trace.

The query returns the name of the trace on which the marker is currently placed.

Key Path	Marker, Properties
<b>Remote Command</b>	:CALCulate:FMSTereo:MARKer[1] 2 ... 12:TRACe RFSpectrum   AFSPpectrum   DEMod   DAVerage   DMAXimum   DMINimum   MDEMod   MDAverage   MMAXimum   MMINimum   MSpectrum   SDEMod   SDAverage   SMAXimum   SMINimum   SSpectrum   LDEMod   LDAverage   LMAXimum   LMINimum   LSpectrum   RDEMod   RDAverage   RMAXimum   RMINimum   RSPpectrum  :CALCulate:FMSTereo:MARKer[1] 2 ... 12:TRACe?
<b>Example</b>	:CALC:FMST:MARK1:TRAC DEM places marker 1 on the Demod trace
<b>Couplings</b>	This is not affected by Auto Coupling.  Sending the remote command causes the addressed marker to become selected.  If ever a delta marker has a reference marker in a different window, the delta marker's mode changes to POS (for example, it becomes a normal marker).  When Marker Trace Auto Init State is on, the marker trace will automatically be set whenever the marker is turned on.
<b>Preset</b>	RF Spectrum on a Preset or All Markers Off
<b>State Saved</b>	The Marker Trace for each marker is saved in instrument state.
<b>Readback line</b>	[Trace name, Auto Init] or [Trace Name, Manual]
<b>Initial S/W Revision</b>	A.10.00

## MPX

Selects the trace in MPX view to place the marker on.

---

Key Path	Marker, Properties, Marker Trace
Initial S/W Revision	A.10.00

---

### RF Spectrum

Selects the input RF signal in the RF Spectrum window as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

---

Key Path	Marker, Properties, Marker Trace, MPX
<b>Example</b>	:CALC:FMST:MARK1:TRAC RFSP
Initial S/W Revision	A.10.00

---

### Demod

Selects the current demodulated signal in the MPX Waveform window, shown in yellow, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

---

Key Path	Marker, Properties, Marker Trace, MPX
<b>Example</b>	:CALC:FMST:MARK1:TRAC DEM
Initial S/W Revision	A.10.00

---

### Demod Average

Selects the averaged demodulation signal in the MPX Waveform window, shown in green, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

---

Key Path	Marker, Properties, Marker Trace, MPX
<b>Example</b>	:CALC:FMST:MARK1:TRAC DAV
Initial S/W Revision	A.10.00

---

### Demod Max

Selects the Demod Max trace in the MPX Waveform window, shown in cyan, as the trace that you want your marker to be placed on. This trace shows the maximum hold value for each data point since the last restart.

---

Key Path	Marker, Properties, Marker Trace, MPX
<b>Example</b>	:CALC:FMST:MARK1:TRAC DMAX
Initial S/W Revision	A.10.00

---



### Demod Min

Selects the Demod Min trace in the MPX Waveform window, shown in magenta, as the trace that you want your marker to be placed on. This trace shows the minimum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace, MPX
<b>Example</b>	:CALC:FMST:MARK1:TRAC DMIN
Initial S/W Revision	A.10.00

### Spectrum

Selects the spectrum signal in the MPX Spectrum window as the trace that you want your marker to be placed on.

Key Path	Marker, Properties, Marker Trace, MPX
<b>Example</b>	:CALC:FMST:MARK1:TRAC AFSP
Initial S/W Revision	A.10.00

### Mono (L+R)

Selects the trace in Mono (L+R) view to place the marker on.

Key Path	Marker, Properties, Marker Trace
Initial S/W Revision	A.10.00

### Demod

Selects the current demodulated signal in the Mono (L+R) Waveform window, shown in yellow, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Mono
<b>Example</b>	:CALC:FMST:MARK1:TRAC MDEM
Initial S/W Revision	A.10.00

### Demod Average

Selects the averaged demodulation signal in the Mono (L+R) Waveform window, shown in green, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

---

Key Path	Marker, Properties, Marker Trace, Mono
<b>Example</b>	:CALC:FMST:MARK1:TRAC MDAV
Initial S/W Revision	A.10.00

---

#### Demod Max

Selects the Demod Max trace in the Mono (L+R) Waveform window, shown in cyan, as the trace that you want your marker to be placed on. This trace shows the maximum hold value for each data point since the last restart.

---

Key Path	Marker, Properties, Marker Trace, Mono
<b>Example</b>	:CALC:FMST:MARK1:TRAC MMAX
Initial S/W Revision	A.10.00

---

#### Demod Min

Selects the Demod Min trace in the Mono (L+R) Waveform window, shown in magenta, as the trace that you want your marker to be placed on. This trace shows the minimum hold value for each data point since the last restart.

---

Key Path	Marker, Properties, Marker Trace, Mono
<b>Example</b>	:CALC:FMST:MARK1:TRAC MMIN
Initial S/W Revision	A.10.00

---

#### Spectrum

Selects the spectrum signal in the Mono (L+R) Spectrum window as the trace that you want your marker to be placed on.

---

Key Path	Marker, Properties, Marker Trace, Mono
<b>Example</b>	:CALC:FMST:MARK1:TRAC MSP
Initial S/W Revision	A.10.00

---

#### Stereo (L-R)

Selects the trace in Stereo (L-R) view to place the marker on.

---

Key Path	Marker, Properties, Marker Trace
Initial S/W Revision	A.10.00

---

### Demod

Selects the current demodulated signal in the Stereo (L-R) Waveform window, shown in yellow, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Stereo
<b>Example</b>	:CALC:FMST:MARK1:TRAC SDEM
Initial S/W Revision	A.10.00

### Demod Average

Selects the averaged demodulation signal in the Stereo (L-R) Waveform window, shown in green, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Stereo
<b>Example</b>	:CALC:FMST:MARK1:TRAC SDAV
Initial S/W Revision	A.10.00

### Demod Max

Selects the Demod Max trace in the Stereo (L-R) Waveform window, shown in cyan, as the trace that you want your marker to be placed on. This trace shows the maximum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace, Stereo
<b>Example</b>	:CALC:FMST:MARK1:TRAC SMAX
Initial S/W Revision	A.10.00

### Demod Min

Selects the Demod Min trace in the Stereo (L-R) Waveform window, shown in magenta, as the trace that you want your marker to be placed on. This trace shows the minimum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace, Stereo
<b>Example</b>	:CALC:FMST:MARK1:TRAC SMIN
Initial S/W Revision	A.10.00

### Spectrum

Selects the spectrum signal in the Stereo (L-R) Spectrum window as the trace that you want your marker to be placed on.

Key Path	Marker, Properties, Marker Trace, Stereo
<b>Example</b>	:CALC:FMST:MARK1:TRAC SSP
Initial S/W Revision	A.10.00

### Left

Selects the trace in Left view to place the marker on.

Key Path	Marker, Properties, Marker Trace
Initial S/W Revision	A.10.00

### Demod

Selects the current demodulated signal in the Left Waveform window, shown in yellow, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Left
<b>Example</b>	:CALC:FMST:MARK1:TRAC LDEM
Initial S/W Revision	A.10.00

### Demod Average

Selects the averaged demodulation signal in the Left Waveform window, shown in green, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Left
<b>Example</b>	:CALC:FMST:MARK1:TRAC LDAV
Initial S/W Revision	A.10.00

### Demod Max

Selects the Demod Max trace in the Left Waveform window, shown in cyan, as the trace that you want your marker to be placed on. This trace shows the maximum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace, Left
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<b>Example</b>	:CALC:FMST:MARK1:TRAC LMAX
Initial S/W Revision	A.10.00

### Demod Min

Selects the Demod Min trace in the Left Waveform window, shown in magenta, as the trace that you want your marker to be placed on. This trace shows the minimum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace, Left
<b>Example</b>	:CALC:FMST:MARK1:TRAC LMIN
Initial S/W Revision	A.10.00

### Spectrum

Selects the Left spectrum trace in the Left Spectrum window as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Left
<b>Example</b>	:CALC:FMST:MARK1:TRAC LSP
Initial S/W Revision	A.10.00

### Right

Selects the trace in Right view to place the marker on.

Key Path	Marker, Properties, Marker Trace
Initial S/W Revision	A.10.00

### Demod

Selects the current demodulated signal in the Right Waveform window, shown in yellow, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Right
<b>Example</b>	:CALC:FMST:MARK1:TRAC RDEM
Initial S/W Revision	A.10.00

### Demod Average

Selects the averaged demodulation signal in the Right Waveform window, shown in green, as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Right
<b>Example</b>	:CALC:FMST:MARK1:TRAC RDAV
Initial S/W Revision	A.10.00

### Demod Max

Selects the Demod Max trace in the Right Waveform window, shown in cyan, as the trace that you want your marker to be placed on. This trace shows the maximum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace, Right
<b>Example</b>	:CALC:FMST:MARK1:TRAC RMAX
Initial S/W Revision	A.10.00

### Demod Min

Selects the Demod Min trace in the Right Waveform window, shown in magenta, as the trace that you want your marker to be placed on. This trace shows the minimum hold value for each data point since the last restart.

Key Path	Marker, Properties, Marker Trace, Right
<b>Example</b>	:CALC:FMST:MARK1:TRAC RMIN
Initial S/W Revision	A.10.00

### Spectrum

Selects the Right spectrum trace in the Right Spectrum window as the trace that you want your marker to be placed on. This trace is used to determine the placement, result, and X Axis Scale of the marker.

Key Path	Marker, Properties, Marker Trace, Right
<b>Example</b>	:CALC:FMST:MARK1:TRAC RSP
Initial S/W Revision	A.10.00

### Trace Auto Init

Selects whether the marker trace is automatically reset to the selected window when the marker is turned on or not.

Key Path	Marker, Properties, Trace
Remote Command	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:TRACe:AUTO OFF   ON   0   1  :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:TRACe:AUTO?
Example	:CALC:AM:MARK1:TRAC:AUTO 0 turns off auto-initialization of marker trace.
Preset	On
State Saved	Saved in instrument state.
Readback line	Trace name
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Lines

When on, displays a vertical line of graticule height and a horizontal line of graticule width, intersecting at the indicator point of the marker (that is, the center of the X or the bottom tip of the diamond). The lines are blue in color.

If the marker is off screen, the lines should be extended from the marker so that they go through the screen area if possible. This is really useful for off screen Fixed markers as it lets you see their amplitude even though they are off the X Axis.

Key Path	Marker, Properties
Remote Command	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:LINes[:STATe] OFF   ON   0   1  :CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:LINes[:STATe]?
Example	CALC:AM:MARK2:LIN ON turns Lines on for marker 2.
Couplings	Sending the remote command causes the addressed marker to become selected.
Preset	OFF
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## All Markers Off

Turns off all markers.

Key Path	Marker
Remote Command	:CALCulate:AM FM PM FMSTereo:MARKer:AOff
Example	CALC:AM:MARK:AOff turns off all markers for the AM measurement
Couplings	Sets the selected marker to 1.

11 FM Stereo Measurement  
Marker

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## Marker Function

There are no menus or marker functions under this key in the Analog Demod mode.

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

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## Marker To

Accesses a menu that contains only the marker center frequency key.

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

### Mkr->CF

Sets the center frequency of the RF Spectrum window to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display.

In delta marker mode, this function sets the center frequency to the x-axis value of the delta marker.

Key Path	Marker ->
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12[:SET]:CENTer
<b>Example</b>	CALC:AM:MARK2:CENT sets the CF of the analyzer to the value of marker 2.
Remote Command Notes	Sending this command selects the sub-op coded marker. If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the RF Spectrum trace as a normal type marker.
Dependencies	This function is unavailable (key is grayed out) unless the selected marker's trace is off, or on the RF Spectrum trace.
Couplings	All the usual couplings associated with setting Center Frequency apply (see " <a href="#">Center Frequency</a> " on <a href="#">page 775</a> ).
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Meas

The information in this section is common to all measurements. For key and remote command information for a specific measurement, refer to the section that describes the measurement of interest.

Measurements available under the Meas key are specific to the current Mode.

When viewing Help for measurements, note the following:

**NOTE**

Operation for some keys differs between measurements. The information displayed in Help pertains to the current measurement. To see how a key operates in a different measurement, exit Help (press the Cancel Esc key), select the measurement, then reenter Help (press the Help key) and press that key.

---

Key Path	Front-panel key
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### Remote Measurement Functions

This section contains the following topics:

"Measurement Group of Commands" on page 796

"Current Measurement Query (Remote Command Only)" on page 798

"Limit Test Current Results (Remote Command Only)" on page 798

"Data Query (Remote Command Only)" on page 798

"Calculate/Compress Trace Data Query (Remote Command Only)" on page 799

"Calculate Peaks of Trace Data (Remote Command Only)" on page 804

Hardware-Accelerated Fast Power Measurement (Remote Command Only)

"Format Data: Numeric Data (Remote Command Only)" on page 805

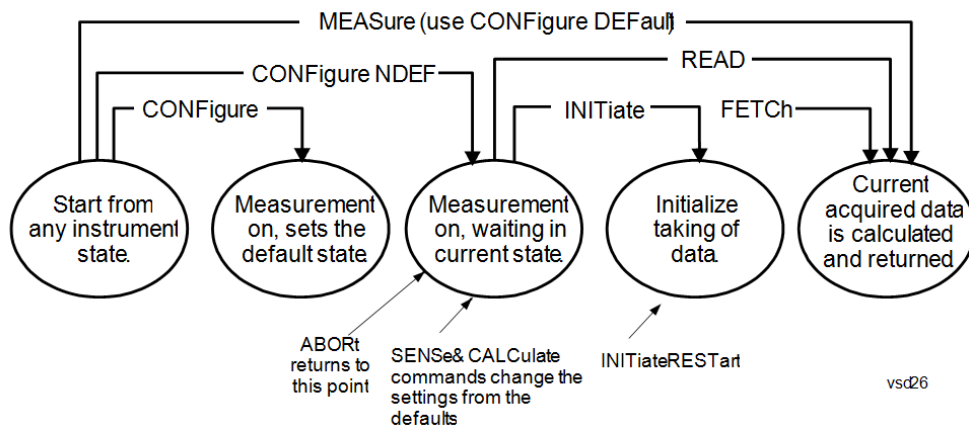
"Format Data: Byte Order (Remote Command Only)" on page 806

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## Measurement Group of Commands




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### 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>?.

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### Configure Commands:

:CONFIGure:<measurement>

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using

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the factory default instrument settings. It does not initiate the taking of measurement data unless INIT:CONTInuous is ON. If you change any measurement settings after using the CONFigure command, the READ command can be used to initiate a measurement without changing the settings back to their defaults.

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

:CONFigure: <measurement>: NDEFault stops the current measurement and changes to the specified measurement. It does not change the settings to the defaults. It does not initiate the taking of measurement data unless INIT:CONTInuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query returns a quoted string of all licensed measurement names in the current mode. For example, "SAN, CHP, OBW, ACP, PST, TXP, SPUR, SEM, LIST".

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#### Fetch Commands:

:FETCh:<measurement>[n]?

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

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

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

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

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#### INITiate Commands:

:INITiate:<measurement>

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

- Initiates a trigger cycle for the specified measurement, but does not output any data. You must then use the FETCh<meas> command to return data. If a measurement other than the current one is specified, the instrument will switch to that measurement and then initiate it.
- For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. If you send INIT:ACP? it will change from channel power to ACP and will initiate an ACP measurement.
- Does not change any of the measurement settings. For example, if you have previously started the ACP measurement and you send INIT:ACP? it will initiate a new ACP measurement using the same instrument settings as the last time ACP was run.
- If your selected measurement is currently active (in the idle state) it triggers the measurement, assuming the trigger conditions are met. Then it completes one trigger cycle. Depending upon the measurement and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle. It also holds off additional commands on GPIB until the acquisition is complete.

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#### READ Commands:

:READ:<measurement>[n]?

- Does not preset the measurement to the factory default settings. For example, if you have previously initiated the ACP
-

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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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<b>Remote Command</b>	:CONFigure?
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<b>Example</b>	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.

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<b>Remote Command</b>	:CALCulate:CLIMits:FAIL?
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<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.
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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]?
<b>Notes</b>	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.
<b>Initial S/W Revision</b>	Prior to A.02.00

### Calculate/Compress Trace Data Query (Remote Command Only)

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

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

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

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

<b>Remote Command</b>	:CALCulate:DATA<n>:COMPRESS? BLOCK   CFIT   MAXimum   MINimum   MEAN   DMEan   RMS   RMSCubed   SAMPLE   SDEVIation   PPHase [,<soffset> [,<length>[,<roffset>[,<rlimit>]]]]
<b>Example</b>	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.)
<b>Notes</b>	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.
<b>Initial S/W Revision</b>	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)

$$MEAN = \frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i$$

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)

$$MEAN = \frac{1}{n} \sum_{X_i \in \text{region}(s)} |X_i|$$

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:

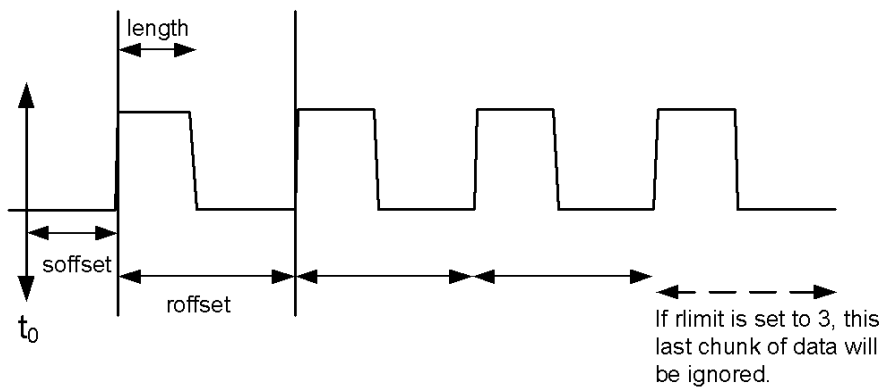
$$\frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

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.

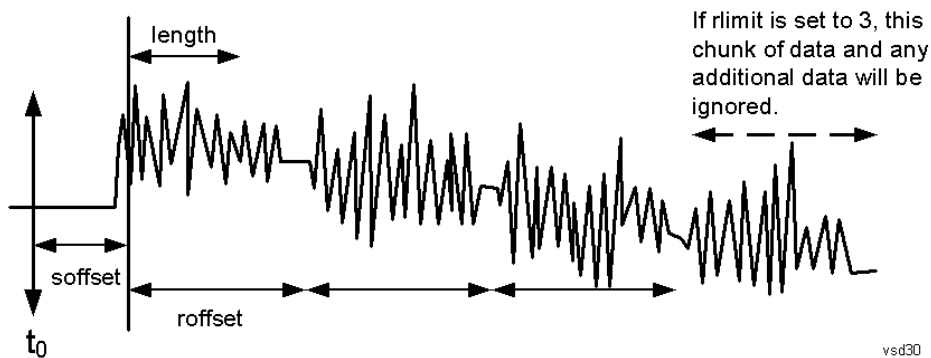
Sample Trace Data - Constant Envelope

(See below for explanation of variables.)



### Sample Trace Data - Not Constant Envelope

(See below for explanation of variables.)



<soffset> - start offset is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It specifies the amount of data at the beginning of the trace that will be ignored before the decimation process starts. It is the time or frequency change from the start of the trace to the point where you want to start using the data. The default value is zero.

<length> - is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It defines how much data will be compressed into one value. This parameter has a default value equal to the current trace length.

<roffset> - repeat offset is an optional real number. (It is in seconds for time-domain traces, and is a dimensionless index 0 to Npoints - 1, for frequency-domain traces). It defines the beginning of the next field of trace elements to be compressed. This is relative to the beginning of the previous field. This parameter has a default value equal to the <length> variable. Note that this parameter is used for a completely different purpose when curve fitting (see CFIT above).

<rlimit> - repeat limit is an optional integer. It specifies the number of data items that you want returned. It will ignore any additional items beyond that number. You can use the Start offset and the Repeat limit to pick out exactly what part of the data you want to use. The default value is all the data.

## Calculate Peaks of Trace Data (Remote Command Only)

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

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

The command can only be used with specific sub-opcodes with measurement results that are trace data. Both real and complex traces can be searched, but complex traces are converted to magnitude in dBm. In many measurements the sub-opcode n=0, is the raw trace data which cannot be searched for peaks. And Sub-opcode n=1, is often calculated results values which also cannot be searched for peaks.

This command uses the data setting specified by the FORMat:BORDER and FORMat:DATA commands and can return real or ASCII data. If the format is set to INT,32, it returns REAL,32 data.

The command has four types of parameters:

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

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<b>Remote Command</b>	<p>For Swept SA measurement:</p> <pre>:CALCulate:DATA[1] 2 ... 6:PEAKs? &lt;threshold&gt;,&lt;excursion&gt;[,AMPLitude   FREQuency   TIME[,ALL   GTDLine   LTDLine]]</pre> <p>For most other measurements:</p> <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>
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<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</p>
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excursion value stored under the Peak Criteria menu.

Values must be provided for threshold and excursion. The sorting and display line parameters are optional (defaults are AMPLitude and ALL).

Note that there is always a Y-axis value for the display line, regardless of whether the display line state is on or off. It is the current Y-axis value of the display line which is used by this command to determine whether a peak should be reported

Sorting order:

AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)

FREQUency - lists the peaks in order of occurrence, left to right across the x-axis.

TIME - lists the peaks in order of occurrence, left to right across the x-axis.

Peaks vs. Display Line:

ALL - lists all of the peaks found (default if optional parameter not sent).

GTDLine (greater than display line) - lists all of the peaks found above the display line.

LTDLine (less than display line) - lists all of the peaks found below the display line.

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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.

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**Remote Command**      :FORMat[:TRACe][:DATA] ASCii|INTeger,32|REAL,32 |REAL,64  
:FORMat[:TRACe][:DATA]?

---

**Notes**      The query response is:  
ASCii: ASC,8  
REAL,32: REAL,32  
REAL,64: REAL,64  
INTeger,32: INT,32

When the numeric data format is REAL or ASCii, data is output in the current Y Axis unit. When the data format is INTeger, data is output in units of m dBm (.001 dBm).

The INT,32 format returns binary 32-bit integer values in internal units (m dBm), in a definite length block.

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**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".

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**Preset**      ASCii

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**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.

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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?
<b>Preset</b>	NORMal
<b>Initial S/W Revision</b>	Prior to A.02.00

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## Meas Setup

Accesses a menu of keys that enable you to control specific parameters for the current measurement.

["Overview" on page 807](#)

["Set Parameters " on page 807](#)

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

### Overview

This section describes the measurement setup features of the Analog Demod measurements.

### Set Parameters

The following parameters are set as indicated and are not settable by the user, therefore they do not appear in any menus:

FFT IF Gain	Low (0 dB)
ADC Dither	On
Avg Mode	Exponential
Phase Noise Optimization	Auto

### Auto Rules for Phase Noise Optimization:

Use "Optimize for  $f < 20$  kHz" when the Channel BW  $< 120$  kHz, otherwise use "Optimize for  $f > 30$  kHz".

["Optimizing Measurement Speed" on page 807](#)

["Channel Bandwidth" on page 808](#)

["RF Spectrum Span " on page 808](#)

["RF Spectrum RBW / AF Spectrum RBW" on page 808](#)

["AF Waveform Sweep Time" on page 808](#)

["Filters and Annotation" on page 808](#)

### Optimizing Measurement Speed

The speed of the analog demodulation measurements is driven largely by how much data must be acquired to satisfy the selected configuration.

Each measurement cycle generates all of the metrics and traces from a single acquisition, so there are several different settings which can affect the overall speed. Note that even though you may not be

viewing a particular result on the display, the result is available and its configuration and constraints are used to determine the acquisition settings.

### Channel Bandwidth

This setting determines the sampling rate used by the measurement, higher bandwidths will result in larger data sets being acquired and processed. This should be set to the lowest value possible which allows your signal to be fully captured.

### RF Spectrum Span

This setting is used in a similar way as the Channel Bandwidth in that it determines the sampling rate. As with channel bandwidth, it should be set as narrow as possible to capture the signal of interest.

### RF Spectrum RBW / AF Spectrum RBW

These settings dictate a minimum acquisition time for the measurement. The Auto setting is recommended for optimal performance while maintaining measurement integrity. Narrower resolution bandwidths (RBWs) require longer acquisitions to achieve the resolution improvements.

### AF Waveform Sweep Time

This setting sets another minimum acquisition time for the measurement. In many uses, the AF Spectrum RBW will dominate the determination of the data acquisition duration, but if the AF waveform view is not needed keeping its sweep time low will ensure that it does not negatively impact the throughput.

### Filters and Annotation

You may choose to filter by frequency – choosing an optional low-pass filter and an optional high-pass filter – or may filter using a standard published band-pass filter (CCITT). Turning on a band-pass filter will automatically turn off the high-pass and low-pass filters; similarly, the band-pass filter will automatically turn off if you request either a high-pass or a low-pass filter.

### Average/Hold Num

When turned on, the RF Spectrum and AF spectrum traces are averaged, and the Demod window shows an Average trace, a Max Hold trace, and a Min Hold trace in addition to the current trace. All metrics are averaged, and the metrics show an “Average” column and a “Max Hold” column.

The average feature for the Analog Demod measurement differs from other measurements in that the average type is fixed depending on the window as shown in the following table:

Window	Average Type
RF Spectrum	Pwr Average
Demod Waveform	Arithmetic Average
AF Spectrum	Log Average

For more details, see ["Average/Hold On/Off Functionality" on page 809](#).

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Key Path	Meas Setup
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<b>Remote Command</b>	[:SENSe]:AM FM PM FMSTereo:AVERAge:COUNT <integer> [:SENSe]:AM FM PM FMSTereo:AVERAge:COUNT? [:SENSe]:AM FM PM FMSTereo:AVERAge[:STATe] ON OFF 1 0 [:SENSe]:AM FM PM FMSTereo:AVERAge[:STATe]?
<b>Example</b>	AM:AVER:COUN 10
<b>Preset</b>	10 ON
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	1
<b>Max</b>	9999
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.10.00

### Average/Hold On/Off Functionality

Average, Minhold, and Maxhold are coupled.

When Average/Hold is on:

- The RF Spectrum and AF Spectrum traces are averaged.
- The Demod Waveform window will display a current trace, an Average trace, a Max Hold trace, and a Min Hold trace.
- The Metrics window will display an “Average” column and a “Max Hold” column.
- Metrics will display to four significant digits.
- The Meas Bar will display the Average/Hold number (along with how many of those sweeps have been captured).
- Demod Min trace, Demod Max trace, and Demod Avg trace are maintained.
- The Max Hold column shows the maximum value the un-averaged metric has attained since the last Restart.

When Average/Max Hold is off:

- The RF Spectrum and AF Spectrum traces are not averaged.
- The Demod Waveform window will display only the demod trace.
- The Metrics window will display only a “Current” column.
- Metrics will display to two significant digits.
- The Meas Bar will not display the Average/Hold number.
- Max Hold metrics over SCPI will return SCPI not a number.

- Demod Min trace, Demod Max trace and Demod Avg trace will return default values in a Meas?, Read?, and Fetch? and when exported to a .csv file
- Max Hold column is blank.

### Modulation Rate Periodic

The algorithms used by the instrument for demodulation have an improved speed/accuracy tradeoff when the modulation is both periodic (such as a sinusoidal test signal) and assumed to be periodic by the analysis system. Thus, “Yes” is best for periodic signals. When the modulation is aperiodic, such as voice or music or even multiple nonharmonically related tones, “No” gives better results.

Key Path	Meas Setup
<b>Remote Command</b>	<code>[ :SENSe ] :AM FM PM FMSTereo:PERIodic[:STATe] ON   OFF   1   0</code> <code>[ :SENSe ] :AM FM PM FMSTereo:PERIodic[:STATe] ?</code>
<b>Example</b>	FM:PERI OFF
Preset	ON
State Saved	Saved in instrument state
Initial S/W Revision	A.12.00

### Filters

Pressing this key displays the Filters menu, allowing you to control the post demodulation and de-emphasis filters.

If any filters are turned on and the filters cannot be applied, the error “161 Setting Modified; Filters not applied” will appear.

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

### High Pass Filter (Post Demod)

This parameter allows you to adjust the post demodulation high pass filters. This filter allows you to remove unwanted low-frequency components from the modulated signal..

Key Path	Meas Setup
<b>Remote Command</b>	<b>AM FM PM:</b> <code>[ :SENSe ] :AM FM PM:HPFilter OFF HPF20 HPF50 HPF300 HPF400</code> <code>[ :SENSe ] :AM FM PM:HPFilter ?</code>
	<b>FM Stereo:</b> <code>[ :SENSe ] :FMSTereo:HPFilter OFF HPF20 HPF50 HPF300</code> <code>[ :SENSe ] :FMSTereo:HPFilter ?</code>

<b>Example</b>	FM:HPF HPF20
Remote Command Notes	<p>AM FM PM:  Off = No filtering  HPF20 = Use 20 Hz high pass filter  HPF50 = Use 50 Hz high pass filter  HPF300 = Use 300 Hz high pass filter  HPF400 = Use 400 Hz high pass filter</p> <p>FM Stereo:  Off = No filtering  HPF20 = Use 20 Hz high pass filter  HPF50 = Use 50 Hz high pass filter  HPF300 = Use 300 Hz high pass filter</p>
Dependencies	The HPF400 is available only when Option N9063A-AFP is installed in AM/FM/PM.
Couplings	<p>AM/FM/PM:  Turning on any high-pass filter will turn off bandpass filters.  If a band-pass filter is turned off, the following advisory message is displayed:  “Band-pass filter set to OFF”.  If the band-pass filter was already off, no advisory message is displayed.</p> <p>FM Stereo:  None</p>
Preset	Off (AM/FM/FM Stereo, HPF20 (PM))
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Off

This selection turns the post demodulation high pass filter off.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF OFF
Notes	Annotation line (DC Coupled) appears in the Meas Bar, except if in the AM measurement.
Readback	Off
Initial S/W Revision	Prior to A.02.00

## 20 Hz

Sets the post demodulation high pass filter to 20 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 20 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF20
Readback	20 Hz
Initial S/W Revision	Prior to A.02.00

## 50 Hz

Sets the post demodulation high pass filter to 50 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 50 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF50
Readback	50 Hz
Initial S/W Revision	Prior to A.02.00

## 300 Hz

Sets the post demodulation high pass filter to 300 Hz. It is a 2-pole Butterworth filter, its 3 dB cutoff frequency is 300 Hz.

Key Path	Meas Setup, HPF
<b>Example</b>	AM:HPF HPF300
Readback	300 Hz
Initial S/W Revision	Prior to A.02.00

## Lowpass Filter (Post Demod)

This parameter allows you to adjust the post demodulation low pass filter. The filter is useful in removing unwanted high frequency components of the modulating signal.

Key Path	Meas Setup
<b>Remote Command</b>	<p>AM FM PM:</p> <pre>[ :SENSe]:AM FM PM:LPFilter OFF   LPF300   LPF3K   LPF15K   LPF30K   LPF80K   LPF300K   LPF100K   MANual</pre> <p>[ :SENSe]:AM FM PM:LPFilter?</p> <p>FM Stereo:</p> <pre>[ :SENSe]:FMSTereo:LPFilter OFF   LPF300   LPF3K   LPF15K   LPF30K   LPF80K   LPF300K</pre>

	[ :SENSe ] :FMSTereo:LPFilter?
<b>Example</b>	FM:LPF LPF3K
Remote Command Notes	<p>AM FM PM:</p> <p>Off = No filtering</p> <p>LPF300 = Use 300 Hz low pass filter</p> <p>LPF3K = Use 3 kHz low pass filter</p> <p>LPF15K = Use 15 kHz low pass filter</p> <p>LPF30K = Use 30 kHz low pass filter</p> <p>LPF80K = Use 80 kHz low pass filter</p> <p>LPF300K = Use 300 kHz low pass filter</p> <p>LPF100K = Use &gt;20 kHz low pass filter</p> <p>MANual=Use user-defined low pass filter</p> <p>FM Stereo:</p> <p>Off = No filtering</p> <p>LPF300 = Use 300 Hz low pass filter</p> <p>LPF3K = Use 3 kHz low pass filter</p> <p>LPF15K = Use 15 kHz low pass filter</p> <p>LPF30K = Use 30 kHz low pass filter</p> <p>LPF80K = Use 80 kHz low pass filter</p> <p>LPF300K = Use 300 kHz low pass filter</p>
Dependencies	<p>LPF key is unavailable (grayed out) when the band pass filter is not OFF.</p> <p>The following filters are available only when Option N9063A-AFP is installed in AM/FM/PM: LPF100K and MANual.</p>
Couplings	<p>AM/FM/PM:</p> <p>Turning on any low-pass filter will turn off band-pass filters.</p> <p>If a band-pass filter is turned off, the following advisory message is displayed: "Band-pass filter set to OFF".</p> <p>If the band-pass filter was already off, no advisory message is displayed.</p> <p>FM Stereo:</p> <p>None</p>
Preset	Off
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Off

Turns the post demodulation low pass filter off.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

### 300 Hz

Sets the post demodulation low pass filter to 300 Hz. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 300 Hz.

Key Path	Meas Setup, HPF/LPF
<b>Example</b>	AM:HPBP LPF300
Readback	300 Hz
Initial S/W Revision	Prior to A.02.00

### 3 kHz

Selects the 3 kHz post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 3 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF3K
Readback	3 kHz
Initial S/W Revision	Prior to A.02.00

### 15 kHz

Selects the 15 kHz post demodulation low pass filter. It is a 5-pole Butterworth filter, its 3 dB cutoff frequency is 15 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF15K
Readback	15 kHz
Initial S/W Revision	Prior to A.02.00

### 30 kHz

Selects the 30 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 30 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF30K
Readback	30 kHz
Initial S/W Revision	Prior to A.02.00

### 80 kHz

Selects the 80 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 80 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF80K
Readback	80 kHz
Initial S/W Revision	Prior to A.02.00

### 300 kHz

Selects the 300 kHz post demodulation low pass filter. It is a 3-pole Butterworth filter, its 3 dB cutoff frequency is 300 kHz.

Key Path	Meas Setup, Post Demod LPF
<b>Example</b>	AM:LPF LPF300K
Readback	300 kHz
Initial S/W Revision	Prior to A.02.00

## Band Pass Filter (Post Demod)

This parameter enables you to choose the post demodulation band pass filters, allowing you to apply industry-defined filters.

Key Path	Meas Setup
<b>Remote Command</b>	<p><b>AM FM PM:</b></p> <pre>[ :SENSe]:AM FM PM:BPFilter OFF   CCITT   AWEighting   CWEighting   CMESsage   CCIR1k   CCIR2k   CUNWeighting  [:SENSe]:AM FM PM:BPFilter?</pre> <p><b>FM Stereo:</b></p> <pre>[ :SENSe]:FMSTereo:BPFilter OFF CCITT AWAudio  [:SENSe]:FMSTereo:BPFilter?</pre>

<b>Example</b>	FM:BPF CCITT
Remote Command Notes	<p>AM FM PM:  Off = No filtering  CCITT = Use CCITT filter  AWEighting = Use A-Weighted Audio filter  CWEighting = Use C-Weighted audio filter  CMESsage = Use C-Message audio filter  CCIR1k = Use CCIR-1k Weighted audio filter  CCIR2k = Use CCIR-2k Weighted audio filter  CUNWeighting = Use CCIR Un-weighted audio filter</p> <p>FM Stereo:  Off = No filtering  CCITT = Use CCITT filter  AWAudio = Use A-Weighted Audio filter</p>
Dependencies	The following filters are available only when Option N9063A-AFP is installed in AM/FM/PM: AWEighting, CWEighting, CMESsage, CCIR1k, CCIR2k and CUNWeighting.
Couplings	<p>AM/FM/PM:  Turning on any bandpass filter will turn off high-pass and low-pass filters.  If a high-pass filter is turned off, the following advisory message is displayed:  “High-pass filter set to OFF”.  If a low-pass filter is turned off, the following advisory message is displayed:  “Low-pass filter set to OFF”.  If both are turned off, the following advisory message is displayed:  “High-pass and Low-pass filters set to OFF”.  If both high-pass and low-pass filters were already off, no advisory message is displayed.</p> <p>FM Stereo:  None</p>
Preset	Off
State Saved	Saved in instrument state
Readback	1-of-N
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

### Off

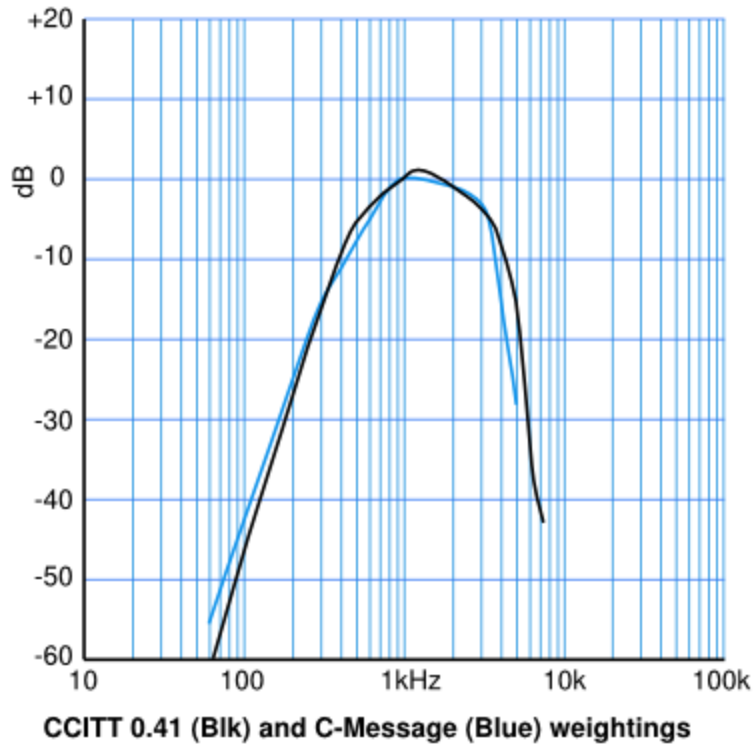
Turns the post demodulation band-pass filter off.

Key Path	Meas Setup, BPF
<b>Example</b>	AM:BPF OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00



## CCITT

Sets the post demodulation band-pass filter to CCITT.



Key Path	Meas Setup, BPF
<b>Example</b>	AM:BPF CCITT
Readback	CCITT
Initial S/W Revision	Prior to A.02.00

## A-Weighted

Sets the post demodulation band-pass filter to A-Weighted Audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF AWE
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	A-Weighted
Initial S/W Revision	A.14.00

### C-Weighted

Sets the post demodulation band-pass filter to C-Weighted audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CWE
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	C-Weighted
Initial S/W Revision	A.14.00

### C-Message

Sets the post demodulation band-pass filter to C-Message audio filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CMES
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	C-Message
Initial S/W Revision	A.14.00

### CCIR 1k Weighted

Sets the post demodulation band-pass filter to CCIR-1k weighted filter.

**NOTE**

The CCIR 1k Weighted filter is implemented in the N9063A with an RMS detector, and not the quasi-peak detector (QPD) called for in the ITU standards. A compensation factor is included to yield similar results. This implementation is valid when measuring amplitude of Gaussian noise, or SINAD of a single continuous sine tone (e.g. 1 kHz) in the presence of harmonics and Gaussian noise. The results may not comply with the standard if the input signal is bursty, clicky or impulsive; contains multiple tones; or contains other distortion products (intermodulation, spurs) above the noise level. Use the AF Spectrum results to validate these assumptions. Consider using Agilent U8903A Audio Analyzer if true QPD is required.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CCIR1
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-1k
Initial S/W Revision	A.14.00

### CCIR 2k Weighted

Sets the post demodulation band-pass filter to CCIR-2k weighted filter.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CCIR2
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-2k
Initial S/W Revision	A.14.00

### CCIR Un-weighted

Sets the post demodulation band-pass filter to CCIR un-weighted filter.

The CCIR Un-weighted filter is implemented in the N9063A with an RMS detector, and not the quasi-peak detector (QPD) called for in the ITU standards. A compensation factor is included to yield similar results. This implementation is valid when measuring amplitude of Gaussian noise, or SINAD of a single continuous sine tone (e.g. 1 kHz) in the presence of harmonics and Gaussian noise. The results may not comply with the standard if the input signal is bursty, clicky or impulsive; contains multiple tones; or contains other distortion products (intermodulation, spurs) above the noise level. Use the AF Spectrum results to validate these assumptions. Consider using Agilent U8903A Audio Analyzer if true QPD is required.

Key Path	Meas Setup, Filters, Bandpass Filter
<b>Example</b>	AM FM PM:BPF CUNW
Dependencies	This feature is available only when Option N9063A-AFP is installed.
Readback	CCIR-Unweighted
Initial S/W Revision	A.14.00

### De-emphasis (FM and FM Stereo Demod measurement only)

Controls a single-pole filter, usually 6 dB/octave roll off, to counter intentional pre-emphasis in the transmitter. When the De-emphasis state is OFF the hardware digital filter is bypassed, otherwise the setting is applied

US75 is recommended for US commercial FM 75  $\mu$ s pre-emphasis.

The De-emphasis key only appears in the Meas Setup menu for the FM and FM Stereo Demod measurements. It is unavailable for the AM and  $\Phi$ M measurements.

Key Path	Meas Setup, Filters
<b>Remote Command</b>	[ :SENSe ] :FM FMSTereo:DEEMphasis OFF US25 US50 US75 US750 [ :SENSe ] :FM FMSTereo:DEEMphasis?
<b>Example</b>	FM:DEEM US75 FM:DEEM?
Dependencies	Only available in FM and FM Stereo measurements. Unavailable for AM and PM

Preset	OFF
State Saved	Saved in instrument state
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Off

Bypasses the De-emphasis filter.

Key Path	Meas Setup, Filters, De-emphasis
<b>Example</b>	FM:DEEM OFF
Readback	Off
Initial S/W Revision	Prior to A.02.00

### 25 $\mu$ s

Sets the De-emphasis time constant to 25  $\mu$ s.

Key Path	Meas Setup, Filters, De-emphasis
<b>Example</b>	FM:DEEM US25
Readback	25 $\mu$ s
Initial S/W Revision	Prior to A.02.00

### 50 $\mu$ s

Sets the De-emphasis time constant to 50  $\mu$ s.

Key Path	Meas Setup, Filters, De-emphasis
<b>Example</b>	FM:DEEM US50
Readback	50 $\mu$ s
Initial S/W Revision	Prior to A.02.00

### 75 $\mu$ s

Sets the De-emphasis time constant to 75  $\mu$ s.

Key Path	Meas Setup, Filters, De-emphasis
<b>Example</b>	FM:DEEM US75

Readback	75 $\mu$ s
Initial S/W Revision	Prior to A.02.00

### 750 $\mu$ s

Sets the De-emphasis time constant to 750  $\mu$ sec.

Key Path	Meas Setup, Filters, De-emphasis
<b>Example</b>	FM:DEEM US750
Readback	750 $\mu$ s
Initial S/W Revision	Prior to A.02.00

## Demod to Speaker

Controls whether a demodulated audio signal is connected to the speaker or not. This allows the demodulated audio to be turned off without completely disabling (muting) the instrument speaker. When the Analog Demod application is running, the demodulated signal can be heard from the speaker as long as the “Demod to Speaker” function is set to On.

**NOTE** The Windows controls for speaker volume and mute must also be properly set.

This function is shared among all measurements in the mode, but not across other modes.

Key Path	Meas Setup
<b>Remote Command</b>	[ :SENSe ] :SPEaker [ :STATe ] ON OFF 1 0 [ :SENSe ] :SPEaker [ :STATe ] ?
<b>Example</b>	SPE OFF Disconnects demodulated audio from speaker circuit.
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	Prior to A.02.00

## Advanced

Accesses a menu to specify advanced settings for the FM Stereo measurement. This key and sub menu are only valid in the FM Stereo measurement.

Key Path	Meas Setup
Initial S/W Revision	A.10.00

## BLER Block Count

Sets BLER Block Count. It is used to control the stop time of BLER Calculation. When the total block count exceeds the value of BLER Block Count for the first time, the calculation of BLER will stop.

Key Path	Meas Setup, Advanced
Remote Command	[ :SENSe ] : FMSTereo : BLER : COUNT <real> [ :SENSe ] : FMSTereo : BLER : COUNT ?
Example	FMST:BLER:COUN 1.0e8 FMST:BLER:COUN?
Preset	1.0e8
State Saved	Saved in instrument state.
Min	1
Max	1.0e+307
Initial S/W Revision	A.10.00

## Ref Deviation

Sets the FM reference deviation.

Key Path	Meas Setup, Advanced
Remote Command	[ :SENSe ] : FMSTereo : RDEVIation <freq> [ :SENSe ] : FMSTereo : RDEVIation ?
Example	FMST:RDEV 75e3 FMST:RDEV?
Preset	75 kHz
State Saved	Saved in instrument state.
Min	15 kHz
Max	150 kHz
Initial S/W Revision	A.10.00

## SINAD MPX BW

Sets the bandwidth of the MPX signal to calculate SINAD.

Key Path	Meas Setup, Advanced
Remote Command	CALCulate : FMSTereo : MPX [ :BANDwidth ] <freq> CALCulate : FMSTereo : MPX [ :BANDwidth ] ?
Example	CALC:FMST:MPX 53e3 CALC:FMST:MPX?

Preset	53 kHz
State Saved	Saved in instrument state.
Min	0 kHz
Max	58 kHz
Initial S/W Revision	A.10.00

## SINAD Mono BW

Sets the bandwidth of the Mono signal to calculate SINAD.

Key Path	Meas Setup, Advanced
<b>Remote Command</b>	CALCulate:FMSTereo:MONO[:BANDwidth] <freq> CALCulate:FMSTereo:MONO[:BANDwidth]?
<b>Example</b>	CALC:FMST:MONO 16e3 CALC:FMST:MONO?
Preset	16 kHz
State Saved	Saved in instrument state.
Min	0 kHz
Max	16 kHz
Initial S/W Revision	A.10.00

## Meas Preset

Returns the variables in the current measurement to their preset values.

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

11 FM Stereo Measurement  
Mode

Mode

See ["Mode" on page 210](#)



## 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 826 for more information.

Key Path	Front-panel key
<b>Remote Command</b>	:SYSTem:PRESet
<b>Example</b>	:SYST:PRES
Notes	*RST is preferred over :SYST:PRES for remote operation. *RST does a Mode Preset, as done by the :SYST:PRES command, and it sets the measurement mode to Single measurement rather than Continuous for optimal remote control throughput. Clears all pending OPC bits. The Status Byte is set to 0.
Couplings	A Mode Preset aborts the currently running measurement, activates the default measurement, and gets the mode to a consistent state with all of the default couplings set.
Backwards Compatibility Notes	In the X-Series, the legacy "Factory Preset" has been replaced with Mode Preset, which only presets the currently active mode, not the entire instrument. In the X-Series, the way to preset the entire instrument is by using System, Restore System Defaults All, which behaves essentially the same way as restore System Defaults does on ESA and PSA. There is also no "Preset Type" as there is on the PSA. There is a green Mode Preset front-panel key that does a Mode Preset and a white-with-green-letters User Preset front-panel key that does a User Preset. The old PRESet:TYPE command is ignored (without generating an error), and SYST:PRES without a parameter does a Mode Preset, which should cover most backward code compatibility issues. The settings and correction data under the Input/Output front-panel key (examples: Input Z Corr, Ext Amp Gain, etc.) are no longer part of any Mode, so they will not be preset by a Mode Preset. They are preset using Restore Input/Output Defaults, Restore System Defaults All. Note that because User Preset does a Recall State, and all of these settings are saved in State, they ARE recalled when using

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

## How-To Preset

The table below shows all possible presets, their corresponding SCPI commands and front-panel access (key paths). Instrument settings depend on the current measurement context. Some settings are local to the current measurement, some are global (common) across all the measurements in the current mode, and some are global to all the available modes. In a similar way, restoring the settings to their preset state can be done within the different contexts.

Auto Couple - is a measurement local key. It sets all Auto/Man parameter couplings in the measurement to Auto. Any Auto/Man selection that is local to other measurements in the mode will not be affected.

Meas Preset - is a measurement local key. Meas Preset resets all the variables local to the current measurement except the persistent ones.

Mode Preset - resets all the current mode's measurement local and measurement global variables except the persistent ones.

Restore Mode Defaults - resets ALL the Mode variables (and all the Meas global and Meas local variables), including the persistent ones.

Type Of Preset	SCPI Command	Front Panel Access
Auto Couple	:COUPle ALL	Auto Couple front-panel key
Meas Preset	:CONFigure:<Measurement>	Meas Setup Menu
Mode Preset	:SYSTem:PRESet	Mode Preset (green key)
Restore Mode Defaults	:INSTrument:DEFault	Mode Setup Menu
Restore All Mode Defaults	:SYSTem:DEFault MODes	System Menu; Restore System Default Menu
*RST	*RST	not possible (Mode Preset with Single)
Restore Input/Output Defaults	:SYSTem:DEFault INPUt	System Menu; Restore System Default Menu
Restore Power On Defaults	:SYSTem:DEFault PON	System Menu; Restore System Default Menu
Restore Alignment Defaults	:SYSTem:DEFault ALIGN	System Menu; Restore System Default Menu
Restore Miscellaneous Defaults	:SYSTem:DEFault MISC	System Menu; Restore System Default Menu
Restore All System Defaults	:SYSTem:DEFault [ALL] :SYSTem:PRESet:PERsistent	System Menu; Restore System Default Menu
User Preset	:SYSTem:PRESet:USER	User Preset Menu
User Preset All Modes	:SYSTem:PRESet:USER:ALL	User Preset Menu

Power On Mode Preset	:SYSTEM:PON:TYPE MODE	System Menu
Power On User Preset	:SYSTEM:PON:TYPE USER	System Menu
Power On Last State	:SYSTEM:PON:TYPE LAST	System Menu

## Mode Setup

See "[Mode Setup](#)" on page 231

## Peak Search

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.

Key Path	Front-panel key
<b>Remote Command</b>	:CALCulate:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MAXimum
<b>Example</b>	CALC:AM:MARK2:MAX
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Next Peak

Moves the selected marker to the peak that has the next highest amplitude less than the current marker value. If there is no valid peak lower than the current marker position, an error 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. In Analog Demod, the Peak Threshold and Peak Excursion functions are both OFF. If there is no valid peak, an error 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:AM FM PM FMSTereo:MARKer[1] 2 ... 12:MAXimum:NEXT
<b>Example</b>	CALC:AM:MARK2:MAX:NEXT Selects marker 2 and moves it to the peak that is closest in amplitude to the current peak, but the next lower value.
Remote Command Notes	Sending this command selects the specified marker
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Pk-Pk Search

Finds and displays the amplitude and frequency (or time, if on a time domain 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. This function turns on the reference marker and sets its mode to Fixed if it is not already on. (These markers may be on two different traces.)

When peak-to-peak search is successful, a message is displayed on the message line.

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. It then performs the peak-to-peak function.

Key Path	Peak Search
Remote Command	:CALCulate:AM FM PM FMSTereo:MARKer [1]   2   . . .   12:PTPeak
Example	CALC:AM:MARK:PTP CALC:AM:MARK:Y? Queries the delta amplitude value for marker 1.
Notes	Turns on the Marker $\Delta$ active function.
Remote Command Notes	Sending this command selects the specified marker.
Couplings	Selected marker becomes a delta marker if not already in delta mode..
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

## Min Search

Moves the selected marker to the minimum y-axis value on the current trace. If the selected marker is off, it is turned on before the minimum search is performed.

Key Path	Peak Search
Remote Command	:CALCulate:AM FM PM FMSTereo:MARKer [1]   2   . . .   12:MINimum
Example	CALC:AM:MARK:MIN selects marker 1 and moves it to the minimum amplitude value.
Remote Command Notes	Sending this command selects the specified marker.
State Saved	Not part of instrument saved state
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

Print

See "Print" on page 241

## Quick Save

The Quick Save front-panel key repeats the most recent save that was performed from the Save menu, with the following exceptions:

- Register saves are not remembered as Saves for the purpose of the Quick Save function
- If the current measurement does not support the last non-register save that was performed, an informational message is generated, “File type not supported for this measurement”

Quick Save repeats the last type of qualified save (that is, a save qualified by the above criteria) in the last save directory by creating a unique filename using the Auto File Naming algorithm described below.

If Quick Save is pressed after startup and before any qualified Save has been performed, the Quick Save function performs a Screen Image save using the current settings for Screen Image saves (current theme, current directory), which then becomes the “last save” for the purpose of subsequent Quick Saves.

The Auto File Naming feature automatically generates a file name for use when saving a file. The filename consists of a prefix and suffix separated by a dot, as is standard for the Windows® file system. A default prefix exists for each of the available file types:

Type	Default Prefix	Menu
State	State_	(Save/Recall)
Trace + State	State_	(Save/Recall)
Screen	Screen_	(Save/Recall)
Amplitude Corrections	Ampcor_	(Import/Export)
Traces	Trace_	(Import/Export)
Limit Lines	LLine_	(Import/Export)
Measurement Result	MeasR_	(Import/Export)
Capture Buffer	CapBuf_	(Import/Export)

A four digit number is appended to the prefix to create a unique file name. The numbering sequence starts at 0000 within each Mode for each file type and updates incrementally to 9999, then wraps to 0000 again. It remembers where it was through a Mode Preset and when leaving and returning to the Mode. It is reset by Restore Misc Defaults and Restore System Defaults and subsequent running of the instrument application. So, for example, the first auto file name generated for State files is State\_0000.state. The next is State\_0001, and so forth.

One of the key features of Auto File Name is that we guarantee that the Auto File Name will never conflict with an existing file. The algorithm looks for the next available number. If it gets to 9999, then it looks for holes. If it find no holes, that is no more numbers are available, it gives an error.

For example, if when we get to State\_0010.state there is already a State\_0010.state file in the current directory, it advances the counter to State\_0011.state to ensure that no conflict will exist (and then it verifies that State\_0011.state also does not exist in the current directory and advances again if it does, and so forth).



If you enter a file name for a given file type, then the prefix becomes the filename you entered instead of the default prefix, followed by an underscore. The last four letters (the suffix) are the 4-digit number.

For example, if you save a measurement results file as “fred.csv”, then the next auto file name chosen for a measurement results save will be fred\_0000.csv.

**NOTE**

Although 0000 is used in the example above, the number that is used is actually the current number in the Meas Results sequence, that is, the number that would have been used if you had not entered your own file name.

**NOTE**

If the filename you entered ends with \_dddd, where d=any number, making it look just like an auto file name, then the next auto file name picks up where you left off with the suffix being dddd + 1.

Key Path	Front-panel key
Notes	No remote command for this key specifically.
Initial S/W Revision	Prior to A.02.00

## Recall

The Recall menu lets you choose what you want to recall, and where you want to recall it from. Among the types of files you can recall are **States and Traces**. In addition, an Import (Data) option lets you recall a number of data types stored in CSV files (as used by Excel and other spreadsheet programs).

The default paths for Recall are data type dependent and are the same as for the Save key.

Key Path	Front-panel key
Notes	<p>No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATE &lt;filename&gt;.</p> <p>If you try to recall a State file for a mode that is not licensed or not available in the instrument, an error message will occur and the state will not change.</p>
Backwards Compatibility Notes	<p>In legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly (since User Preset is actually loading a state), it was possible to do a User Preset without affecting the trace data, limit lines or correction data.</p> <p>In the X-Series, "state" always includes all of this data; so whenever state is loaded, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.</p>
Backwards Compatibility Notes	<p>Recall for the X-Series supports backward compatibility in the sense that you can recall a state file from any X-Series model number and any version of X-Series software. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. If you try to recall a state file onto an instrument with less capability than what was available on the instrument during the save, the recall will ignore the state it doesn't support and it will limit the recalled setting to what it allows.</p> <p>Example: if the saved state includes preamp ON, but the recalling instrument does not have a preamp; the preamp is limited to OFF. Conversely, if you save a state without a preamp, the preamp is OFF in the state file. When this saved file is recalled on an instrument with a licensed preamp, the preamp is changed to OFF. Another example is if the saved state has center frequency set to 20 GHz, but the instrument recalling the saved state is a different model and only supports 13.5 GHz. In this case, the center frequency is limited along with any other frequency based settings. Since the center frequency can't be preserved in this case, the recall limiting tries to at least preserve span to keep the measurement setup as intact as possible.</p> <p>It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user.</p> <p>Note that there is no state file compatibility outside of the X-Series. For example, you cannot recall a state file from ESA or PSA.</p>
Initial S/W Revision	Prior to A.02.00

## State

The Recall State menu lets you choose a register or file from which to recall the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings that were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the

additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either a Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

Since each state file is only for one Mode, the settings for other Modes are unaffected when it is loaded. Recall State will cause a mode switch if the state being recalled is not from the current active mode.

After the recall completes, the message "File <filename> recalled" or "Recalled State Register <register number>" is displayed.

For rapid recalls, the State menu lists 16 registers that you can choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files is:

My Documents\<<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

See ["More Information" on page 836](#).

<b>Key Path</b>	Recall
<b>Mode</b>	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.
<b>Notes</b>	<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> <li>• Executes a *CLS</li> </ul> <p>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</p>

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	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

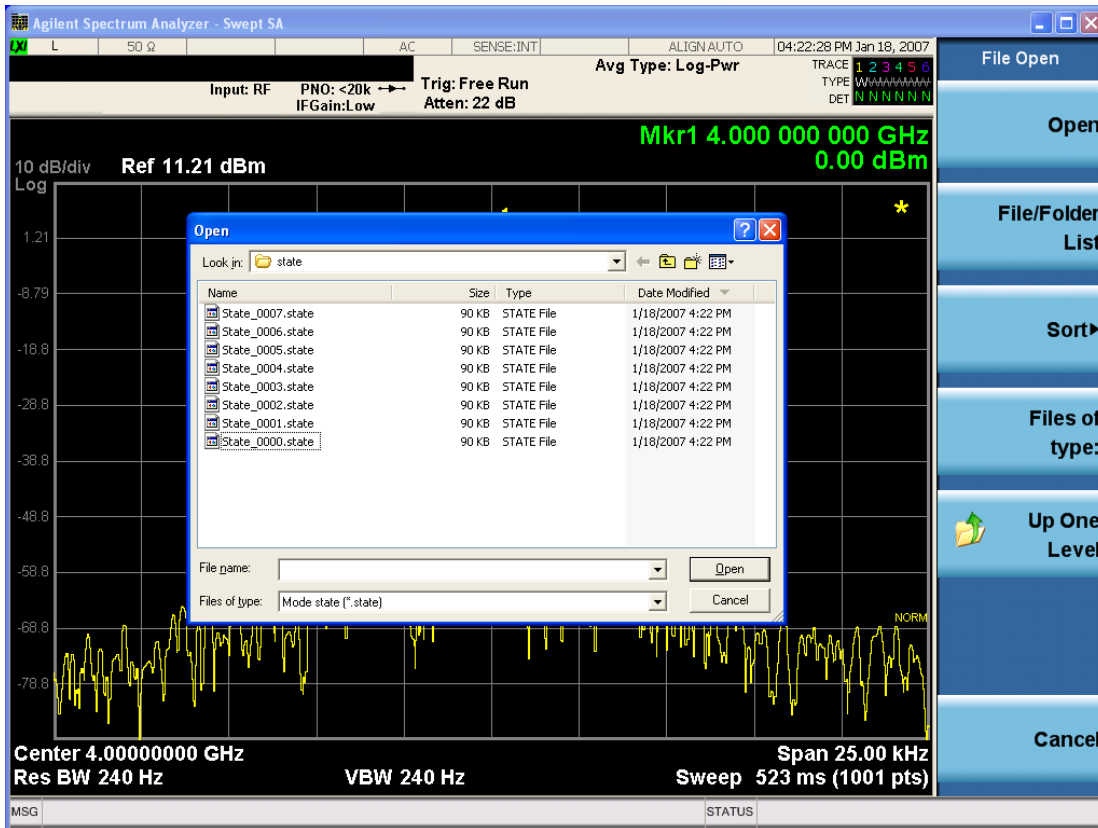
In measurements that support saving Traces, for example, Swept SA, the Trace data is saved along with the State in the State file. When recalling the State, the Trace data is recalled as well. Traces are recalled exactly as they were stored, including the writing mode and update and display modes. If 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

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.

Key Path	Recall, State
<b>Example</b>	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the 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

## 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.

11 FM Stereo Measurement  
Recall

Key Path	Recall, State
<b>Example</b>	*RCL 1
Range	1-16 from front panel, 1-128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the 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



## 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 841

Key Path	Front-panel key
Remote Command	:INITiate[:IMMEDIATE] :INITiate:RESTART
Example	:INIT:IMM :INIT:REST
Notes	:INITiate:RESTART and :INITiate:IMMEDIATE perform exactly the same function.
Couplings	Resets average/hold count k. For the first sweep overwrites all active (update=on) traces with new current data. For application modes, it resets other parameters as required by the measurement.
Status Bits/OPC dependencies	This is an Overlapped command. The STATUS:OPERation register bits 0 through 8 are cleared. The STATUS:QUESTIONable register bit 9 (INTEgrity sum) is cleared. The SWEEPING bit is set. The MEASURING bit is set.
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, the Restart hardkey and the INITiate:RESTART command restart trace averages (displayed average count reset to 1) for a trace in Clear Write, but did not restart Max Hold and Min Hold. In the X-Series, the Restart hardkey and the INITiate:RESTART command restart not only Trace Average, but MaxHold and MinHold traces as well. For wireless comms modes in ESA and PSA, the Restart hardkey and the INITiate:RESTART command restart every measurement, which includes all traces and numeric results. There is no change to this operation.
Initial S/W Revision	Prior to A.02.00

### More Information

The **Restart** function first aborts the current sweep/measurement as quickly as possible. It then resets the sweep and trigger systems, sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met.

If the analyzer is in the process of aligning when **Restart** is executed, the alignment finishes before the restart function is performed.

Even when set for Single operation, multiple sweeps may be taken when Restart is pressed (for example, when averaging/holding is on). Thus when we say that **Restart** "restarts a measurement," we may mean:

- It restarts the current sweep
- It restarts the current measurement
- It restarts the current set of sweeps if any trace is in Trace Average, Max Hold or Min Hold
- It restarts the current set of measurements if Averaging, or Max Hold, or Min Hold is on for the measurement
- depending on the current settings.

With **Average/Hold Number** (in **Meas Setup** menu) set to 1, or Averaging off, or no trace in Trace Average or Hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met; and the analyzer stops sweeping once that sweep has completed. However, with **Average/Hold Number** >1 and at least one trace set to **Trace Average, Max Hold, or Min Hold (SA Measurement)** or **Averaging on (most other measurements)**, multiple sweeps/data acquisitions are taken for a single measurement. The trigger condition must be met prior to each sweep. The sweep is stopped when the average count  $k$  equals the number  $N$  set for **Average/Hold Number**. A measurement average usually applies to all traces, marker results, and numeric results; but sometimes it only applies to the numeric results.

Once the full set of sweeps has been taken, the analyzer will go to idle state. To take one more sweep without resetting the average count, increment the average count by 1, by pressing the step up key while **Average/Hold Number** is the active function, or sending the remote command CALC:AVER:TCON UP.

## Save

The Save menu lets you choose what you want to save and where you want to save it. Among the types of files you can save are **States**, **Traces**, and **Screen Images**. In addition, an Export (Data) option lets you save a number of data types as CSV files for easy import into Excel and other spreadsheet programs.

Key Path	Front-panel key
Mode	All
Notes	No remote command for this key specifically, but the :MMEM:STORe command is available for specific file types. An example is :MMEM:STOR:STATe <filename>.
Initial S/W Revision	Prior to A.02.00

## State

The Save State menu lets you choose a register or file for saving the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings which were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, Verbose SCPI) are not affected by either Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

After the save completes, the message "File <filename> saved" or "State Register <register number> saved" is displayed.

For rapid saving, the State menu lists 16 registers to save to. Pressing a Register key initiates the save. You can also select a file to save to.

The default path for all State Files is:

My Documents\<>mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save
Mode	All
Remote Command	:MMEMory:STORe:STATe <filename>
Example	MMEM:STOR:STATe "MyStateFile.state" This stores the current instrument state data in the file MyStateFile.state in the default directory.
Notes	Both single and double quotes are supported for any filename parameter over remote. After saving to a register, that register's menu key is updated with the date the time, unless a custom label has been entered for that key. After saving to a register, you remain in the Save State menu, so that you can see the Register key

update. After saving to a file, the analyzer automatically returns to the previous menu and any Save As dialog goes away.

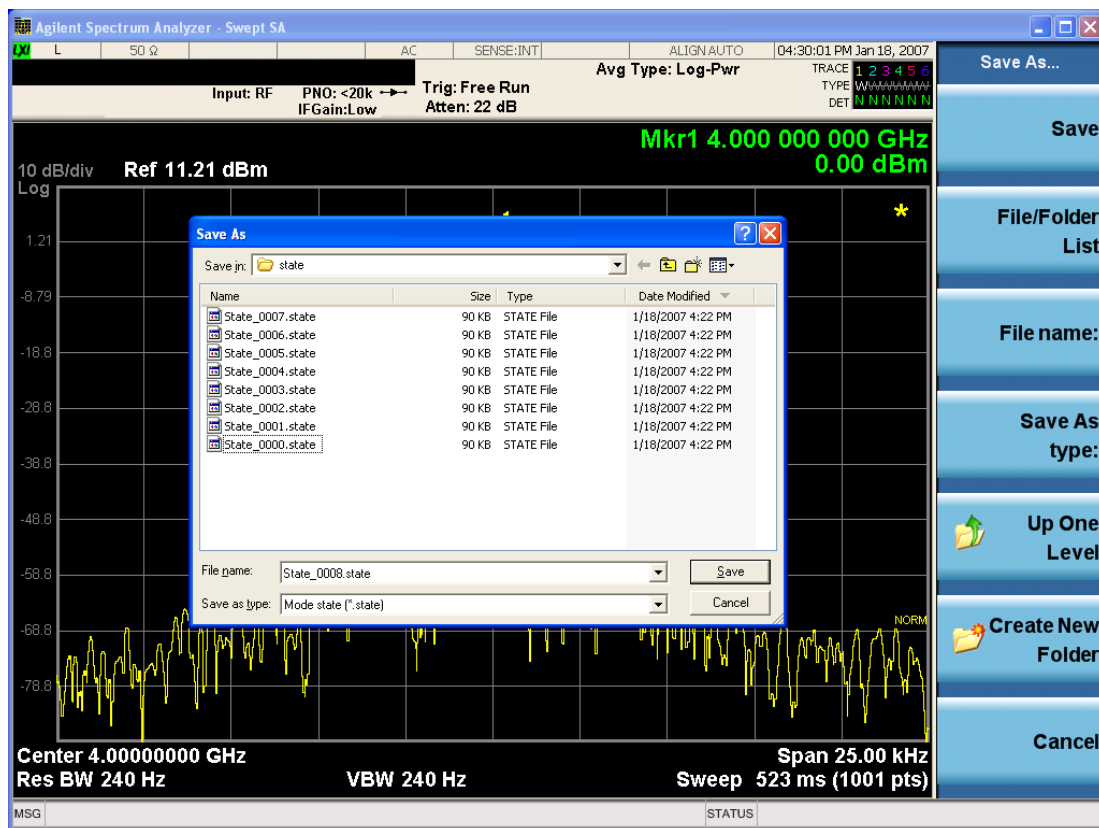
**Backwards Compatibility SCPI** :MMEMory:STORe:STATe 1,<filename>

For backwards compatibility, the above syntax is supported. The "1" is simply ignored. The command is sequential.

Initial S/W Revision Prior to A.02.00

### To File . . .

When you press “To File”, the analyzer brings up a Windows dialog and a menu entitled “Save As.” This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.



The Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

#### Save

Performs the save to the specified file of the selected type. If the file already exists, a dialog will appear that allows you to replace the existing file by selecting OK, or you can Cancel the request. If you select OK, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade.

While the save is being performed, the floppy icon appears briefly in the Meas bar.

## File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file and use the tab keys to navigate to the other fields in the dialog, such as Save In.

## Save In

The Save In field shows the path to which the file will be saved and allows you to change the path using the up and down arrow keys to navigate to other paths; the Enter key to open a directory; and the Backspace key to go back one directory. The **Save In field** defaults to the default path for this type of file and remembers the last path you used to save this type of file. There is no softkey for directly navigating to the Save In field but you can use left tab to get here from the File/Folder List.

User specified paths are remembered when you leave and return to a Mode and are reset back to the default using Restore Mode Defaults.

## File Name

The File Name field is initially loaded with an automatically generated filename specific to the appropriate Save Type. The automatically generated filename is guaranteed not to conflict with any filename currently in the directory. You may replace or modify this filename using the File Name key. See the ["Quick Save " on page 832](#) 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 846](#)

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
<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

### Register 1 thru Register 16

Selecting any one of these register menu keys causes the State of the currently active mode to be saved to the specified Register. The registers are provided for rapid saving and recalling, since you do not need to specify a filename or navigate to a file. Each of the register menu keys annotates whether it is empty or at what date and time it was last modified. In addition, you can use the Edit Register Names key to enter custom names for each register.

Although these 16 registers are the only registers available from the front panel, there are 128 state registers available in the instrument. Registers 17–128 are only available from the SCPI interface, using the \*SAV command.

There is one set of 128 state registers in the instrument, not one set for each Mode. When a state is saved, the Mode it was saved from is saved with it; then when it is recalled, the instrument switches to that Mode.

After the save completes, the corresponding register menu key annotation is updated with the date and time and the message "Register <register number> saved" is displayed.

Key Path	Save, State
Mode	All
Example	*SAV 1
Range	1-16 from front panel, 1-128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key OR A custom name of up to 30 characters entered using the Edit Register Names key OR “(empty)” if no prior save operation has been performed to this register.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.11.00

## Data

The Analog Demod Mode Export Data options include Traces and Measurement Results.

Key Path	Save, Data
Remote Command Notes	No SCPI command directly controls the Data Type that this key controls. The Data Type is included as part of the MMEM:STORe commands.
Preset	Trace; is not affected by a Preset, but is reset during Restore Mode Defaults and survives Power cycles.
State Saved	Saved in instrument state.
Readback line	1-of-N selection
Initial S/W Revision	Prior to A.02.00

## FM Stereo Trace

Selects Trace as the data type to be exported with this save request. This key brings up the Trace menu that enables you to select one of the following traces:

- RF Spectrum(RFSpectrum)
- MPX Demod(DEMod)
- MPX Demod Avg(DAVerage)
- MPX Demod Max(DMAXimum)
- MPX Demod Min(DMINimum)



- MPX Spectrum(AFSPpectrum)
- Mono Demod(MDEMod)
- Mono Demod Avg(MDAverage)
- Mono Demod Max(MMAXimum)
- Mono Demod Min(MMINimum)
- Mono Spectrum(MSPpectrum)
- Stereo Demod(SDEMod)
- Stereo Demod Avg(SDAverage)
- Stereo Demod Max(SMAXimum)
- Stereo Demod Min(SMINimum)
- Stereo Spectrum(SSpectrum)
- Left Demod(LDEMod)
- Left Demod Avg(LDAverage)
- Left Demod Max(LMAXimum)
- Left Demod Min(LMINimum)
- Left Spectrum(LSPpectrum)
- Right Demod(RDEMod)
- Right Demod Avg(RDAverage)
- Right Demod Max(RMAXimum)
- Right Demod Min(RMINimum)
- Right Spectrum(RSPpectrum)

Once you select a trace, the menu returns back to the Data menu and the name of the selected trace is annotated on the Trace key. Now that you have selected exactly what needs to be saved, to trigger a save of the selected trace, you must select the Save As key in the Data menu.

If the Demod Min trace, Demod Max trace, or Demod Avg trace is exported when the Average/Hold Num feature is turned off, the resulting data will be default values.

The trace data file is a .csv file containing the data for one trace, suitable for import into spreadsheet software. There is a header block , followed by metadata that includes the parameters necessary to recreate the measurement, followed by a DATA block that contains the x,y data for the specified trace. Each line in the metadata includes the parameter, followed by a comma, followed by the parameter value. The metadata includes the following information:

Measurement †	FM Stereo
Trace	RF Spectrum MPX Demod MPX Demod Ave MPX Demod Min MPX Demod Max  MPX Spectrum Mono

	Demod Mono Demod Ave Mono Demod Min Mono Demod Max  Mono Spectrum Stereo Demod Stereo Demod Ave Stereo Demod Min Stereo Demod Max  Stereo Spectrum Left Demod Left Demod Ave Left Demod Min Left Demod Max  Left Spectrum Right Demod Right Demod Ave Right Demod Min Right Demod Max  Right Spectrum
X Axis Unit	Hz S
Y Axis Unit	dBm % Hz Rad
Center Frequency †	[units of Hz]
Channel BW †	[units of Hz]
Average State †	Off On
Average Count	#
HPF/BPF †	Off HPF20 HPF50 HPF300 CCITT A-Weighted
LPF †	Off LPF300 LPF3K LPF15K LPF30K LPF80K LPF300K
Attenuation †	[units of dB]
RF Coupling †	AC DC
Ref Level	[units of Y Axis Unit]
RF Span †	[units of Hz]
RF Res Bandwidth †	[units of Hz]
Sweep Time †	[units of S]
AF Start Freq	[units of Hz]
AF Stop Freq †	[units of Hz]
AF Res Bandwidth †	[units of Hz]
Trigger Source †	Off Ext1 Ext2
Trigger Level †	[units of V]
Trigger Slope †	Positive Negative
Trigger Delay †	[units of S]
PreAmp State †	Off On
PreAmp Band †	Low High
Input Z Correction †	50 75
RF Calibrator	Off 50 MHz 4.8 GHz Comb
External Gain	[units of dB]

† Changing this parameter requires a measurement restart.

Note that all metadata is stored for each trace. After the metadata, the keyword DATA occurs on its own line, followed by the data (one X, Y pair per line).

Key Path	Save, Data
Key Path	Save, Data
Notes	The first key press selects traces out of the 1-of-N file type options. The second key press brings up the Traces menu so you can select which trace you want to export.
Preset	RF Spectrum; is not affected by a Preset, but is reset during Restore Mode Defaults and survives Power cycles.
State Saved	Saved in instrument state.
Readback	Selected Trace table
Readback line	RF Spectrum, MPX Demod, MPX Demod Avg, MPX Demod Max, MPX Demod Min, MPX Spectrum, Mono Demod, Mono Demod Avg, Mono Demod Max, Mono Demod Min, Mono Spectrum, Stereo Demod, Stereo Demod Avg, Stereo Demod Max, Stereo Demod Min, Stereo Spectrum, Left Demod, Left Demod Avg, Left Demod Max, Left Demod Min, Left Spectrum, Right Demod, Right Demod Avg, Right Demod Max, Right Demod Min, Right Spectrum
Initial S/W Revision	A.10.00

## MPX

Selects the trace in MPX view to save.

Key Path	Save, Data, Trace
Initial S/W Revision	A.10.00

## RF Spectrum

Selects the input RF signal in the RF Spectrum window as the trace to save.

Key Path	Save, Data, Trace, MPX
Initial S/W Revision	A.10.00

## Demod

Selects the current demodulated signal in the MPX Waveform window, shown in yellow, as the trace to save.

Key Path	Save, Data, Trace, MPX
Initial S/W Revision	A.10.00

## Demod Average

Selects the averaged demodulation signal in the MPX Waveform window, shown in green, as the trace to save.

---

Key Path	Save, Data, Trace, MPX
Initial S/W Revision	A.10.00

---

#### Demod Max

Selects the Demod Max trace in the MPX Waveform window, shown in cyan, as the trace to save.

---

Key Path	Save, Data, Trace, MPX
Initial S/W Revision	A.10.00

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#### Demod Min

Selects the Demod Min trace in the MPX Waveform window, shown in magenta, as the trace to save.

---

Key Path	Save, Data, Trace, MPX
Initial S/W Revision	A.10.00

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#### Spectrum

Selects the spectrum signal in the MPX Spectrum window as the trace to save.

---

Key Path	Save, Data, Trace, MPX
Initial S/W Revision	A.10.00

---

#### Mono (L+R)

Selects the trace in Mono (L+R) view to save.

---

Key Path	Save, Data, Trace
Initial S/W Revision	A.10.00

---

#### Demod

Selects the current demodulated signal in the Mono (L+R) Waveform window, shown in yellow, as the trace to save.

---

Key Path	Save, Data, Trace, Mono (L+R)
Initial S/W Revision	A.10.00

---

**Demod Average**

Selects the averaged demodulation signal in the Mono (L+R) Waveform window, shown in green, as the trace to save.

Key Path	Save, Data, Trace, Mono (L+R)
Initial S/W Revision	A.10.00

**Demod Max**

Selects the Demod Max trace in the Mono (L+R) Waveform window, shown in cyan, as the trace to save.

Key Path	Save, Data, Trace, Mono (L+R)
Initial S/W Revision	A.10.00

**Demod Min**

Selects the Demod Min trace in the Mono (L+R) Waveform window, shown in magenta, as the trace to save.

Key Path	Save, Data, Trace, Mono (L+R)
Initial S/W Revision	A.10.00

**Spectrum**

Selects the spectrum signal in the Mono (L+R) Spectrum window as the trace to save.

Key Path	Save, Data, Trace, Mono (L+R)
Initial S/W Revision	A.10.00

**Stereo (L-R)**

Selects the trace in Stereo (L-R) view to save.

Key Path	Save, Data, Trace
Initial S/W Revision	A.10.00

**Demod**

Selects the current demodulated signal in the Stereo (L-R) Waveform window, shown in yellow, as the trace to save.

Key Path	Save, Data, Trace, Stereo (L-R)
Initial S/W Revision	A.10.00

### Demod Average

Selects the averaged demodulation signal in the Stereo (L-R) Waveform window, shown in green, as the trace to save.

---

Key Path	Save, Data, Trace, Stereo (L-R)
Initial S/W Revision	A.10.00

---

### Demod Max

Selects the Demod Max trace in the Stereo (L-R) Waveform window, shown in cyan, as the trace to save.

---

Key Path	Save, Data, Trace, Stereo (L-R)
Initial S/W Revision	A.10.00

---

### Demod Min

Selects the Demod Min trace in the Stereo (L-R) Waveform window, shown in magenta, as the trace to save.

---

Key Path	Save, Data, Trace, Stereo (L-R)
Initial S/W Revision	A.10.00

---

### Spectrum

Selects the spectrum signal in the Stereo (L-R) Spectrum window as the trace to save.

---

Key Path	Save, Data, Trace, Stereo (L-R)
Initial S/W Revision	A.10.00

---

### Left

Selects the trace in Left view to save.

---

Key Path	Save, Data, Trace
Initial S/W Revision	A.10.00

---

### Demod

Selects the current demodulated signal in the Left Waveform window, shown in yellow, as the trace to save.

---

Key Path	Save, Data, Trace, Left
Initial S/W Revision	A.10.00

---

### Demod Average

Selects the averaged demodulation signal in the Left Waveform window, shown in green, as the trace to save.

---

Key Path	Save, Data, Trace, Left
Initial S/W Revision	A.10.00

---

### Demod Max

Selects the Demod Max trace in the Left Waveform window, shown in cyan, as the trace to save.

---

Key Path	Save, Data, Trace, Left
Initial S/W Revision	A.10.00

---

### Demod Min

Selects the Demod Min trace in the Left Waveform window, shown in magenta, as the trace to save.

---

Key Path	Save, Data, Trace, Left
Initial S/W Revision	A.10.00

---

### Spectrum

Selects the spectrum signal in the Left Spectrum window as the trace to save.

---

Key Path	Save, Data, Trace, Left
Initial S/W Revision	A.10.00

---

### Right

Selects the trace in Right view to save.

---

Key Path	Save, Data, Trace
Initial S/W Revision	A.10.00

---

### Demod

Selects the current demodulated signal in the Right Waveform window, shown in yellow, as the trace to save.

Key Path	Save, Data, Trace, Right
Initial S/W Revision	A.10.00

### Demod Average

Selects the averaged demodulation signal in the Right Waveform window, shown in green, as the trace to save.

Key Path	Save, Data, Trace, Right
Initial S/W Revision	A.10.00

### Demod Max

Selects the Demod Max trace in the Right Waveform window, shown in cyan, as the trace to save.

Key Path	Save, Data, Trace, Right
Initial S/W Revision	A.10.00

### Demod Min

Selects the Demod Min trace in the Right Waveform window, shown in magenta, as the trace to save.

Key Path	Save, Data, Trace, Right
Initial S/W Revision	A.10.00

### Spectrum

Selects the spectrum signal in the Right Spectrum window as the trace to save.

Key Path	Save, Data, Trace, Right
Initial S/W Revision	A.10.00

### Measurement Results

The file format of the .csv Measurement Results file is shown in the table below. If any metrics are off, or there is no valid value, they will appear as not a number (9.91 e37)



<b>AM</b>	<b>FM and PM</b>
Carrier Power	Carrier Power
Carrier Frequency Error (0)	Carrier Frequency Error
Modulation Rate	Modulation Rate
SINAD value	SINAD value
Distortion/Total Voltage (rms)	Distortion/Total Voltage (rms)
Total Harmonic Distortion	Total Harmonic Distortion
Mod Depth (Peak+)	Deviation (Peak+)
Mod Depth (Peak-)	Deviation (Peak-)
Mod Depth (Pk-Pk)/2	Deviation (Pk-Pk)/2
Mod Depth (RMS)	Deviation (RMS)
Mod Depth (Peak+) Max Hold	Deviation (Peak+) Max Hold
Mod Depth (Peak-) Max Hold	Deviation (Peak-) Max Hold
Mod Depth (Pk-Pk)/2 Max Hold	Deviation (Pk-Pk)/2 Max Hold
Mod Depth (RMS) Max Hold	Deviation (RMS) Max Hold
RMS Ratio (only valid for Metrics Setting of RMS Ratio)	RMS Ratio (only valid for Metrics Setting of RMS Ratio)
Ratio Reference (only valid for Metrics Setting of RMS Ratio)	Ratio Reference (only valid for Metrics Setting of RMS Ratio)

For FM Stereo, the results are

RF Carrier Power, RF Carrier Frequency Error, 38 kHz Carrier Frequency Error, 38 kHz Carrier Phase Error, Left To Right, Mono To Stereo,

MPX SINAD value, MPX Distortion/Total Voltage (rms), MPX Deviation (Peak+), MPX Deviation (Peak-), MPX Deviation (Pk-Pk)/2, MPX Deviation (RMS), MPX Deviation (Peak+) Max Hold, MPX Deviation (Peak-) Max Hold, MPX Deviation (Pk-Pk)/2 Max Hold, MPX Deviation (RMS) Max Hold, MPX RMS Ratio (only valid for Metrics Setting of RMS Ratio), MPX Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Mono Modulation Frequency, Mono SINAD value, Mono Distortion/Total Voltage (rms), Mono Deviation (Peak+), Mono Deviation (Peak-), Mono Deviation (Pk-Pk)/2, Mono Deviation (RMS), Mono Deviation (Peak+) Max Hold, Mono Deviation (Peak-) Max Hold, Mono Deviation (Pk-Pk)/2 Max Hold, Mono Deviation (RMS) Max Hold, Mono RMS Ratio (only valid for Metrics Setting of RMS Ratio), Mono Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Stereo Modulation Frequency, Stereo Deviation (Peak+), Stereo Deviation (Peak-), Stereo Deviation (Pk-Pk)/2, Stereo Deviation (RMS), Stereo Deviation (Peak+) Max Hold, Stereo Deviation (Peak-) Max Hold, Stereo Deviation (Pk-Pk)/2 Max Hold, Stereo Deviation (RMS) Max Hold, Stereo RMS Ratio (only valid for Metrics Setting of RMS Ratio), Stereo Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Left Modulation Frequency, Left SINAD value, Left Distortion/Total Voltage (rms), Left Total Harmonic Distortion, Left Deviation (Peak+), Left Deviation (Peak-), Left Deviation (Pk-Pk)/2, Left Deviation (RMS), Left Deviation (Peak+) Max Hold, Left Deviation (Peak-) Max Hold, Left Deviation (Pk-Pk)/2 Max Hold, Left

Deviation (RMS) Max Hold, Left RMS Ratio (only valid for Metrics Setting of RMS Ratio), Left Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Right Modulation Frequency, Right SINAD value, Right Distortion/Total Voltage (rms), Right Total Harmonic Distortion, Right Deviation (Peak+), Right Deviation (Peak-), Right Deviation (Pk-Pk)/2, Right Deviation (RMS), Right Deviation (Peak+) Max Hold, Right Deviation (Peak-) Max Hold, Right Deviation (Pk-Pk)/2 Max Hold, Right Deviation (RMS) Max Hold, Right RMS Ratio (only valid for Metrics Setting of RMS Ratio), Right Ratio Reference (only valid for Metrics Setting of RMS Ratio),

Pilot Modulation Frequency, Pilot Deviation (Peak+), Pilot Deviation (Peak-), Pilot Deviation (Pk-Pk)/2, Pilot Deviation (RMS), Pilot Deviation (Peak+) Max Hold, Pilot Deviation (Peak-) Max Hold, Pilot Deviation (Pk-Pk)/2 Max Hold, Pilot Deviation (RMS) Max Hold, Pilot RMS Ratio (only valid for Metrics Setting of RMS Ratio), Pilot Ratio Reference (only valid for Metrics Setting of RMS Ratio),

RDS Deviation (Peak+), RDS Deviation (Peak-), RDS Deviation (Pk-Pk)/2, RDS Deviation (RMS), RDS Deviation (Peak+) Max Hold, RDS Deviation (Peak-) Max Hold, RDS Deviation (Pk-Pk)/2 Max Hold, RDS Deviation (RMS) Max Hold, RDS RMS Ratio (only valid for Metrics Setting of RMS Ratio), RDS Ratio Reference (only valid for Metrics Setting of RMS Ratio), RDS Error Block Count, RDS Total Block Count, RDS BLER (Block Error Rate).

---

Key Path	Save, Data
Initial S/W Revision	Prior to A.02.00

---

### Save As...

Accesses a menu that enables you to select the location where you can save the Data Type. This menu is a standard Windows dialog with Save As menu keys. The Save As dialog is loaded with the file information related to the Data Type. The filename is filled in using the auto file naming algorithm for the specific Data Type and is highlighted. The “auto file name” feature automatically generates a file name for use when saving a file.

When you navigate to this selection, you have already determined that you are saving Data and now you want to specify to which file to direct the save.

When you first enter this dialog, the path in the Save In: field in this Save As dialog depends on the export data type from which you navigated. The only files that are visible are the files with the corresponding data type suffix, and the Save As type lists the same suffix.

For Analog Demod Mode, the file suffix is .csv and the \*.csv files are the only visible files in the Save As dialog and .csv is the Save As Type.

The default path for saving files is:

My Documents\Analog Demod\data\traces

---

Key Path	Save, Data
Initial S/W Revision	Prior to A.02.00

---

## Save

When a Save of a specific Data File is requested, the data is saved to the specified or selected file. The save is performed immediately and does not wait until the measurement is complete.

If the file already exists, a dialog will appear that allows you to replace the existing file by selecting an OK or you can cancel the request.

While the save is being performed, the floppy icon will show up in the settings bar near the Continuous/Single icon. After a register save completes, the corresponding register key annotation is updated with the date, time, and an advisory message that the file was saved appears in the message bar.

<b>Remote Command</b>	<p>AM/FM/PM: :MMEMory:STORe:TRACe:DATA</p> <p>RFSPepectrum   DEMod   DAVerage   DMAXimum   DMINimum   AFSPepectrum   RFENvelope   DRAW,&lt;filename&gt;</p> <p>FM Stereo: :MMEMory:STORe:TRACe:DATA</p> <p>RFSPepectrum   DEMod   DAVerage   DMAXimum   DMINimum   AFSPepectrum   MDEMod   MDAVerage   MMAXimum   MMINimum   MSPepectrum   SDEMod   SDAVerage   SMAximum   SMINimum   SSPepectrum   LDEMod   LDAVerage   LMAXimum   LMInimum   LSPepectrum   RDEMod   RDAVerage   RMAXimum   RMInimum   RSPepectrum,&lt;filename&gt;</p>
<b>Example</b>	:MMEM:STOR:TRAC:DATA RRSP, "myRFSpectrum.csv" exports the RF Spectrum trace to the file myRFSpectrum.csv in the default path.
Remote Command Notes	If the save is initiated through 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 remote.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

<b>Remote Command</b>	:MMEMory:STORe:RESults <filename>
<b>Example</b>	:MMEM:STOR:RES "myResults.csv" saves the results from the current measurement to the file myResults.csv in the default path.
Remote Command Notes	If the save is initiated through 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 remote.

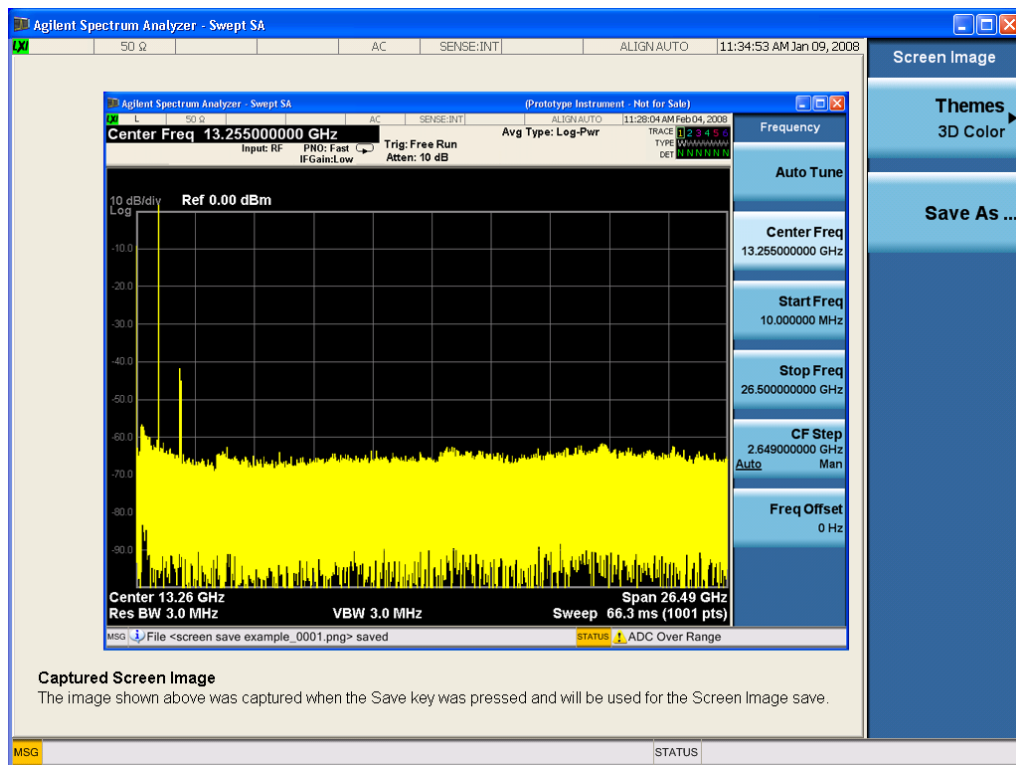
## Screen Image

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.

11 FM Stereo Measurement  
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
<b>Preset</b>	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.
<b>Readback</b>	3D Color   3D Mono   Flat Color   Flat Mono
<b>Backwards Compatibility Notes</b>	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if you selected Reverse Bitmap AND a black & white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Color
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Mono
<b>Initial S/W Revision</b>	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 844 in Save, State for a full description of this dialog and menu.

The default path for Screen Images is

My Documents\`<mode name>`\screen.

where `<mode name>` is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

Key Path	Save, Screen Image
Notes	Brings up Save As dialog for saving a Screen Image Save Type
Initial S/W Revision	Prior to A.02.00

### Mass Storage Catalog (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:CATalog? [ <code>&lt;directory_name&gt;</code> ]
Notes	The string must be a valid logical path. Queries disk usage information (drive capacity, free space available) and obtains a list of files and directories in a specified directory in the following format: <code>&lt;numeric_value&gt;,&lt;numeric_value&gt;,{&lt;file_entry&gt;}</code> It returns two numeric parameters and as many strings as there are files and directories. The first

parameter indicates the total amount of storage currently used in bytes. The second parameter indicates the total amount of storage available, also in bytes. The <file\_entry> is a string. Each <file\_entry> indicates the name, type, and size of one file in the directory list:

<file\_name>,<file\_type>,<file\_size>

As the windows file system has an extension that indicates file type, <file\_type> is always empty. <file\_size> provides the size of the file in bytes. For directories, <file\_entry> is surrounded by square brackets and both <file\_type> and <file\_size> are empty

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Initial S/W Revision      Prior to A.02.00

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### Mass Storage Change Directory (Remote Command Only)

---

Key path                      SCPI Only

**Remote Command**        :MMEMory:CDIRectory [<directory\_name>]  
                                  :MMEMory:CDIRectory?

**Notes**                      The string must be a valid logical path.  
  
Changes the default directory for a mass memory file system. The <directory\_name> parameter is a string. If no parameter is specified, the directory is set to the \*RST value.  
At \*RST, this value is set to the default user data storage area, that is defined as System.Environment.SpecialFolder.Personal.  
Query returns full path of the default directory.

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Initial S/W Revision      Prior to A.02.00

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### Mass Storage Copy (Remote Command Only)

---

Key path                      SCPI Only

**Remote Command**        :MMEMory:COPY <string>,<string> [,<string>,<string>]

**Notes**                      The string must be a valid logical path.  
  
Copies an existing file to a new file or an existing directory to a new directory.  
Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination.  
The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.  
  
This command will generate an "access denied" error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.

### Mass Storage Device Copy (Remote Command Only)

This command transfers data to/from a file and a peripheral device.

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:COpy:DEvice <source_string>,<dest_string>
Notes	The strings must be a valid logical path or a valid device keyword. If the dest_string is a device keyword, the data is copied from the source file to the device. If the source_string is a device keyword, the data is copied to the source file from the device.  Valid device keywords are: SNS (smart noise source)  An error is generated if the file or device is not found.

### Mass Storage Delete (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:DELeTe <file_name>[,<directory_name>]
Notes	The string must be a valid logical path.  Removes a file from the specified directory. The <file_name> parameter specifies the file name to be removed. This command will generate an "access denied" error if the file is in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

### Mass Storage Data (Remote Command Only)

Creates a file containing the specified data OR queries the data from an existing file.

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:DATA <file_name>, <data> :MMEMory:DATA? <file_name>
Notes	The string must be a valid logical path.  The command form is MMEMory:DATA <file_name>,<data>. It loads <data> into the file <file_name>. <data> is in 488.2 block format. <file_name> is string data.  The query form is MMEMory:DATA? <file_name> with the response being the associated <data> in block format.
Initial S/W Revision	Prior to A.02.00

### Mass Storage Make Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:MDIRectory <directory_name>
Notes	The string must be a valid logical path.  Creates a new directory. The <directory_name> parameter specifies the name to be created.



	This command will generate an “access denied” error if the new directory would be in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

### Mass Storage Move (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:MOVE <string>,<string>[,<string>,<string>]
Notes	<p>The string must be a valid logical path.</p> <p>Moves an existing file to a new file or an existing directory to a new directory.</p> <p>Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination.</p> <p>The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.</p> <p>This command will generate an “access denied” error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

### Mass Storage Remove Directory (Remote Command Only)

Key path	SCPI Only
<b>Remote Command</b>	:MMEMory:RDIrectory <directory_name>
Notes	<p>The string must be a valid logical path.</p> <p>Removes a directory. The &lt;directory_name&gt; parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed.</p> <p>This command will generate an “access denied” error if the folder is a restricted folder (e.g., C:\Windows) or is in a restricted folder and the current user does not have Power User or Administrator privileges.</p>
Initial S/W Revision	Prior to A.02.00

## 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 866](#)

Key Path	Front-panel key
Example	: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 841](#) 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 are no menus under this key in the Analog Demod mode.

---

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

---

## SPAN X Scale

Activates and displays the Span function menu.

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

### Span

Adjusts the Span of the RF Spectrum window.

Key Path	SPAN X Scale
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:FREQuency:SPAN <freq> [ :SENSe ] :AM FM PM FMSTereo:FREQuency:SPAN?
<b>Example</b>	AM:FREQ:SPAN 2.122kHz AM:FREQ:SPAN?
Notes	Adjusts the Span of the RF Spectrum window.
Dependencies	The maximum value will be the maximum IF BW available in the instrument. For example, if the instrument has the options B25, B40, and B1X installed, the maximum available IF BW of the instrument is 140 MHz. Thus, the maximum Span is not limited to 25 MHz but is 140 MHz.
Preset	= AM/FM/PM = 75 kHz = FMST = 500 kHz
State Saved	Saved in instrument state
Min	10 Hz
Default Unit	Hz
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

## Sweep/Control

Activates a menu and selects Sweep Time as the active function. Sweep time is used by the Demod Waveform window, but this key is available in any view.

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

### Demod Wfm Sweep Time

Selects the display length for the Demod Waveform window. This is commonly set to two sample lengths.

Key Path	Sweep/Control
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:DWSweep:TIME <time> [ :SENSe ] :AM FM PM FMSTereo:DWSweep:TIME?
<b>Example</b>	AM:DWSW:TIME 50 ms AM:DWSW:TIME?
Preset	2 ms
State Saved	Saved in Instrument State
Min	1 $\mu$ s
Max	2 s
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.10.00

### Demod Time

Selects the minimum length of data acquisition used in demodulation. Increasing the demodulation time will result in more accurate metrics; reducing the demodulation time will result in a faster measurement.

The measurement might require more data than specified by the demodulation time. If the resolution bandwidth is low in the spectrum windows, or the demod waveform sweep time is high, then the data required for the measurement might be higher than the demodulation time.

If measurement speed is critical, make sure to increase the resolution bandwidth and reduce the demodulation waveform sweep time.

The Auto rules for the demodulation time will give the nominal specification performance if the sweep time is set to display two cycles of data.

Key Path	Sweep/Control
<b>Remote Command</b>	[ :SENSe ] :AM FM PM FMSTereo:DEMod:TIME <time> [ :SENSe ] :AM FM PM FMSTereo:DEMod:TIME? [ :SENSe ] :AM FM PM:DEMod:TIME:AUTO OFF ON 0 1

	[ :SENSe ] :AM FM PM:DEMod:TIME:AUTO?
<b>Example</b>	AM:DEMod:TIME 50 ms AM:DEMod:TIME?
<b>Notes</b>	If current Demod Time, Span and Channel BW settings combinations result in a required acquisition length is excess of the capacity of the analyzer, 4MSamples, gives a warning message "Settings Alert; Acquisition truncated".
<b>Couplings</b>	When in Auto mode, the demodulation time depends on the demodulation waveform sweep time. Lower
<b>Preset</b>	= AM/FM/PM = 72 ms = FMST = 280 ms ON
<b>State Saved</b>	Saved in instrument state
<b>Min</b>	1 $\mu$ s
<b>Max</b>	10 s
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.14.00

## System

See "System" on page 242

## Trace/Detector

There are no menus under this key in the Analog Demod mode.

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

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## Trigger

See ["Trigger" on page 322](#)

### Free Run

See ["Free Run " on page 329](#)

### External 1

See ["External 1 " on page 343](#)

### Trigger Level

See ["Trigger Level " on page 344](#)

### Trig Slope

See ["Trig Slope " on page 344](#)

### Trig Delay

See ["Trig Delay " on page 331](#)

### External 2

See ["External 2 " on page 345](#)

### Trigger Level

See ["Trigger Level " on page 346](#)

### Trig Slope

See ["Trig Slope " on page 346](#)

### Trig Delay

See ["Trig Delay " on page 333](#)

### RF Burst

See ["RF Burst " on page 347](#)

### Absolute Trigger

See ["Absolute Trigger Level" on page 347](#)

### Relative Trigger

See ["Relative Trigger Level" on page 336](#)

### Trig Slope

See ["Trigger Slope " on page 348](#)

### **Trig Delay**

See ["Trig Delay "](#) on page 337

### **Periodic Timer**

See ["Periodic Timer \(Frame Trigger\) "](#) on page 338

### **Period**

See ["Period "](#) on page 340

### **Offset**

See ["Offset "](#) on page 340

### **Offset Adjust (Remote Command Only)**

See ["Offset Adjust \(Remote Command Only\)"](#) on page 341

### **Reset Offset Display**

See ["Reset Offset Display "](#) on page 342

### **Sync Source**

See ["Sync Source "](#) on page 342

### **Off**

See ["Off "](#) on page 343

### **External 1**

See ["External 1 "](#) on page 343

### **Trigger Level**

See ["Trigger Level "](#) on page 344

### **Trig Slope**

See ["Trig Slope "](#) on page 344

### **External 2**

See ["External 2 "](#) on page 345

### **Trigger Level**

See ["Trigger Level "](#) on page 346

### **Trig Slope**

See ["Trig Slope "](#) on page 346

### **RF Burst**

See ["RF Burst "](#) on page 347

**Absolute Trigger**

See "Absolute Trigger Level" on page 347

**Trig Slope**

See "Trigger Slope " on page 348

**Trig Delay**

See "Trig Delay" on page 349

**Auto/Holdoff**

See "Auto/Holdoff " on page 349

**Auto Trig**

See "Auto Trig " on page 350

**Trig Holdoff**

See "Trig Holdoff " on page 350

## 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
Remote Command	:SYSTem:PRESet:USER:SAVE
Example	:SYST:PRES:USER:SAVE
Notes	:SYST:PRES:SAVE creates the same file as if the user requested a *SAV or a MMEM:STOR:STAT, except User Preset Save does not allow the user to specify the filename or the location of the file.
Initial S/W Revision	Prior to A.02.00

## View/Display (FM Stereo)

The primary view is called “MPX View” and displays RF Spectrum, MPX Demod Waveform, MPX Spectrum, and Metrics. This is the view seen after a Mode Preset. There are also six other views. Mono view displays Waveform, Spectrum, and Metrics of mono signal. Stereo view displays Waveform, Spectrum, and Metrics of stereo signal. Left view displays Waveform, Spectrum, and Metrics of the left-channel signal. Right view displays Waveform, Spectrum, and Metrics of right-channel signal. RDS/RBDS view displays the decoded RDS bits. Result Metrics Summary view displays all the results together in one view. The views can be selected from the View/Display menu.

These views are designed such that you can identify analog modulated carriers, determine whether the carrier is a commercial or other broadcast station, and analyze the modulating signal.

<b>Key Path</b>	<b>Front-panel key</b>
<b>Remote Command</b>	:DISPlay:FMSTereo:VIEW[:SElect] MPX   MONO   STEReo   LEFT   RIGHT   RDS   NRESults  :DISPlay:FMSTereo:VIEW[:SElect]?
<b>Example</b>	:DISP:FMST:VIEW MPX selects MPX View for FM Stereo Demod measurement
<b>Preset</b>	MPX (Focus in RF Spectrum Window)
<b>State Saved</b>	Saved in instrument state
<b>Initial S/W Revision</b>	A.10.00

## 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.

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

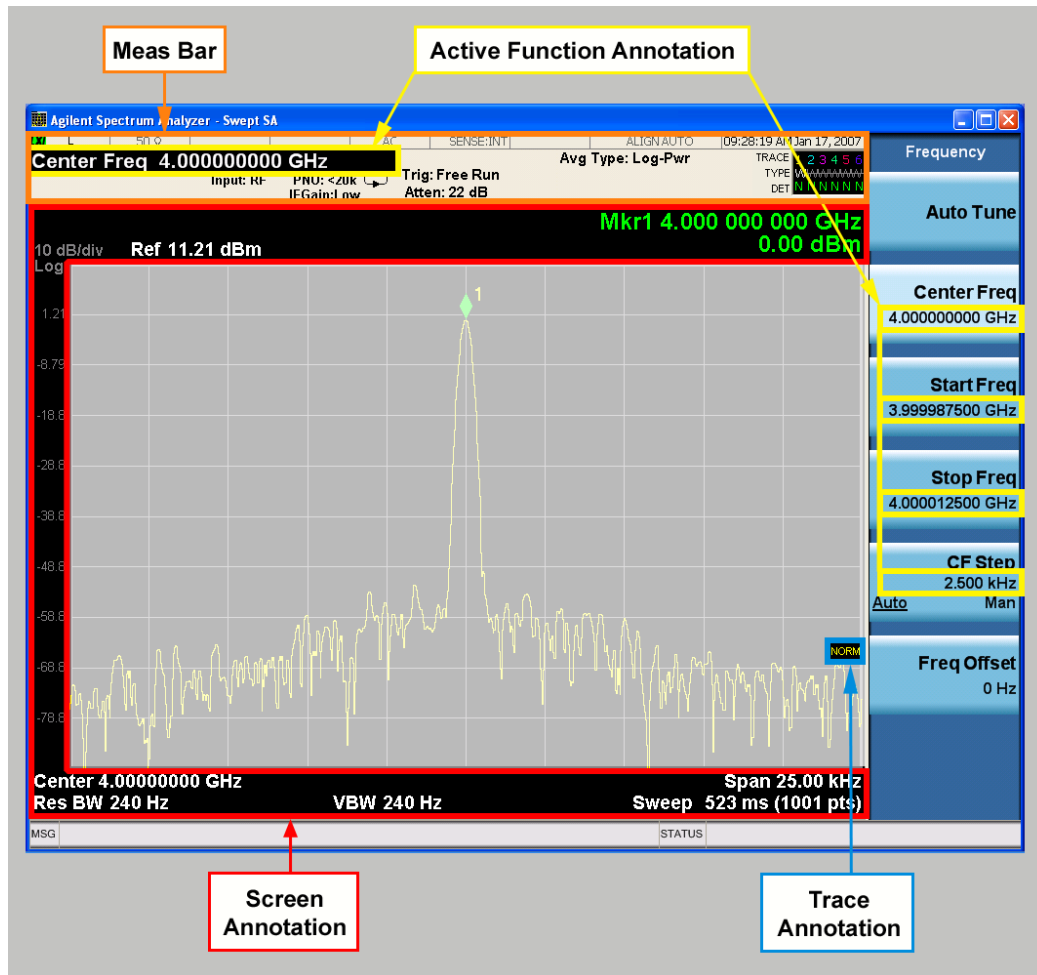
## Annotation

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.

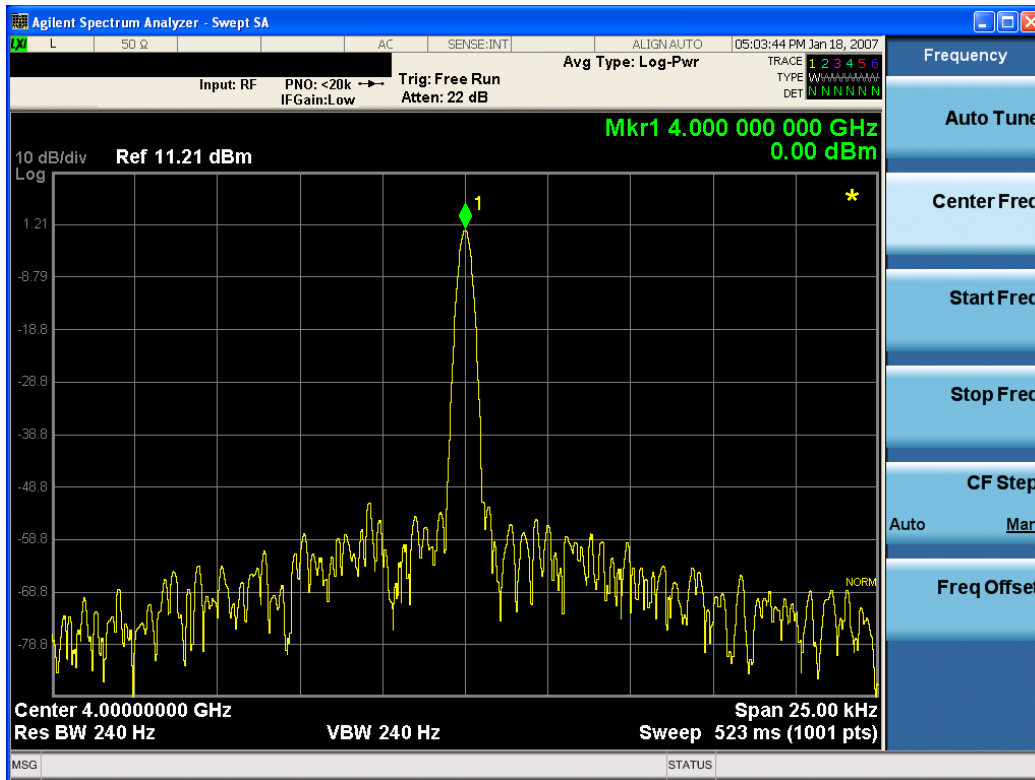
Key Path	View/Display, Display, Annotation
<b>Remote Command</b>	:DISPlay:ANNotation:SCReen[:STATe] OFF ON 0 1 :DISPlay:ANNotation:SCReen[:STATe]?
<b>Example</b>	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain 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..

11 FM Stereo Measurement  
View/Display (FM Stereo)



Key Path	View/Display, Display, Annotation
Remote Command	:DISPlay:ACTivefunc[:STATE] ON OFF 1 0 :DISPlay:ACTivefunc[:STATE] ?
Example	DISP:ACT OFF
Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Title

Displays menu keys that enable you to change or clear a title on your display.

Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

Change Title

Writes a title into the "measurement name" field in the banner, for example, "Swept SA".

Press Change Title to enter a new title through the alpha editor. Press Enter or Return to complete the entry. Press ESC to cancel the entry and preserve your existing title.

The display title will replace the measurement name. It remains for this measurement until you press Change Title again, or you recall a state, or a Preset is performed. A title can also be cleared by pressing Title, Clear Title.

**NOTE**

Notice the inclusion of the <measurement> parameter in the command below. Because each measurement remembers the Display Title, the command must be qualified with the measurement name. For the Swept SA measurement this is not the case; no <measurement> parameter is used when changing the Display Title for the Swept SA measurement.

Key Path	View/Display, Display, Title
Mode	All
<b>Remote Command</b>	:DISPlay:<measurement>:ANNotation:TITLe:DATA <string> :DISPlay:<measurement>:ANNotation:TITLe:DATA?
<b>Example</b>	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
<b>Example</b>	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.

Key Path	View/Display, Display, System Display Settings
Remote Command	:DISPlay:WINDow[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDow[1]:ANNotation[:ALL]?
Example	:DISP:WIND:ANN OFF
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Backwards Compatibility Notes	The WINDow parameter and optional subopcode is included for backwards compatibility but ignored – all windows are equally affected.
Initial S/W Revision	Prior to A.02.00

## 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:SCReem:THEMe TDColor   TDMonochrome   FCOLOR   FMONochrome  :MMEMory:STORe:SCReem:THEMe?
<b>Example</b>	:MMEM:STOR:SCR:THEM TDM
<b>Preset</b>	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.
<b>Readback</b>	3D Color   3D Mono   Flat Color   Flat Mono
<b>Backwards Compatibility Notes</b>	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if you selected Reverse Bitmap AND a black & white screen image, that would be much like "Flat Monochrome". In other words, each of the X-Series themes has a similar screen image type in ESA/PSA. But they are not identical.
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Color
<b>Initial S/W Revision</b>	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
<b>Readback</b>	3D Mono
<b>Initial S/W Revision</b>	Prior to A.02.00

### Flat Color

Selects a format that is best when the screen is to be printed on an ink printer.

Key Path	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
Initial S/W Revision	Prior to A.02.00

### Flat Monochrome

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

Key Path	Save, Screen Image, Themes
<b>Example</b>	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

### Backlight

Accesses the display backlight on/off keys. This setting may interact with settings under the Windows "Power" menu.

When the backlight is off, pressing ESC, TAB, SPACE, ENTER, UP, DOWN, LEFT, RIGHT, DEL, BKSP, CTRL, or ALT turns the backlight on without affecting the application. Pressing any other key will turn backlight on and could potentially perform the action as well.

Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight ON OFF :DISPlay:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
Initial S/W Revision	Prior to A.02.00

### Backlight Intensity

An active function used to set the backlight intensity. It goes from 0 to 100 where 100 is full on and 0 is off. This value is independent of the values set under the Backlight on/off key.

Key Path	View/Display, Display, System Display Settings
<b>Remote Command</b>	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
<b>Example</b>	DISP:BACK:INT 50

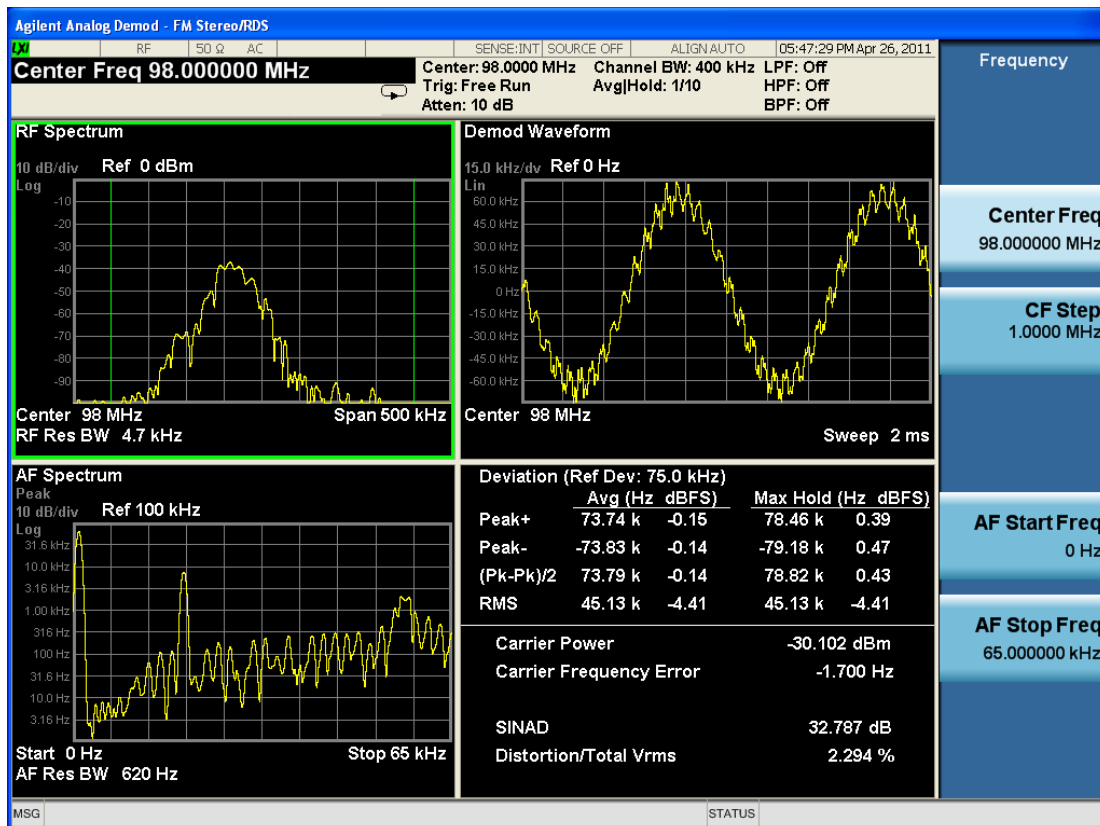
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Initial S/W Revision	Prior to A.02.00

## MPX View

The MPX View displays RF Spectrum, Demod Waveform, AF Spectrum, and Metrics of the multiplex signal.

In general, there is little window-context sensitivity in the Analog Demod mode, that is, most of the variables have been designed so that they are unique to their window. The three variables that are window dependent are, Ref Value, Scale/Div, and Ref Position. These variables change to reflect the settings of the current window (the current window is always outlined in green).

The MPX View is shown below. For more information on the views, see "[RF Spectrum Window](#)" on page 743, "[Demod Waveform Window](#)" on page 744, "[AF Spectrum Window](#)" on page 744, or "[Metrics Window](#)" on page 744.



## RF Spectrum Window

The RF Spectrum window shows a spectral display of the input RF signal with amplitude in the vertical Y axis and frequency in the horizontal X axis. The vertical axis is always scaled in dB, with units of dBm, with

the Ref Value initially at the top of the vertical scale. This spectral display is basically identical to the Swept SA measurement's frequency display; however it is always taken using an FFT. Its span is restricted to 8 MHz. Zero span is not allowed.

The RF Spectrum window provides a convenient way to identify broadcast stations by placing the signal of interest at the center frequency using this window and listening to the instrument's speaker. Demodulation is always performed at the center frequency of the RF Spectrum window; this is regarded as the application's center frequency and is annotated in the Measurement Bar.

In the RF Spectrum window, two green vertical lines are shown centered around the center frequency, with spacing equal to the Channel BW. If the Channel BW is wider than the span, they are not seen.

The Center Frequency, Span, and RF Res BW are annotated at the bottom of the RF Spectrum Window. The Ref Value and Scale/Div are annotated above the graticule.

### Demod Waveform Window

In the Demod Waveform window, the demodulated signal is displayed in the time domain (zero span) with time on the horizontal X axis, and deviation on the vertical Y axis.

In the Demod Waveform window the Y axis is linearly scaled in units of frequency (Hz). On a preset, the Ref Value is positioned in the center of the vertical scale.

Four traces are available in the Demod Waveform window. The Demod trace, in yellow, shows the current demodulation signal. The Demod Max trace, in cyan, shows the Max Hold value for each display point since the last restart and the Demod Min trace, in magenta, shows the Min Hold value for each display point since the last restart. The Demod Average trace, in green, shows the averaged demodulation signal. If Averaging is turned off, only the Demod trace is displayed.

The Sweep Time is annotated at the bottom of the Demod Waveform Window. The Ref Value and Scale/Div are annotated above the graticule.

### Spectrum Window

In the Spectrum window, the demodulated signal is displayed in the frequency domain with frequency on the X axis and amplitude on the Y axis.

The vertical axis is always scaled in dB with the Ref Value initially at the top of the vertical scale. The Y-Axis Unit is Hz.

In this view you can observe the spectral components of the modulating signal. The preset Start Frequency of this window is 0 Hz. The AF Start Freq and AF Stop Freq are annotated at the bottom of the AF Spectrum Window, as is the AF Res BW.

The Ref Value and Scale/Div are annotated above the graticule.

It is only possible to show a spectrum to a maximum frequency of Channel BW / 2. For trace display points buckets beyond that frequency, the value 1.0E-50 is plotted and returned in queries.

### Metrics Window

The metrics window displays measurement results..

If averaging is turned on, the column marked "Current" is relabeled "Average" and the results in that column are averaged over successive measurements until the Average/Hold number is reached. Then, if



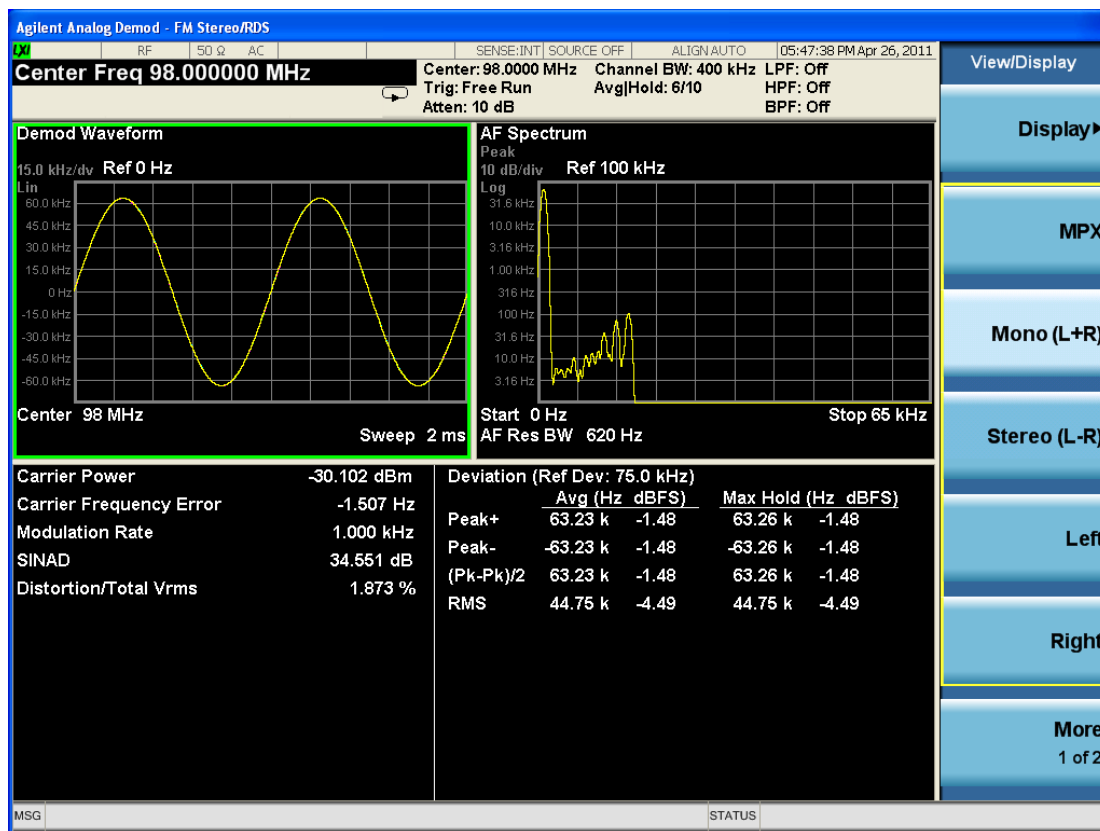
not in Single measurement mode, the measurement continues, exponentially averaging in successive results. The Max Hold column shows the Maximum value the un-averaged metric has attained since the last Restart. The Max Hold column is removed when averaging is turned off.

The window title is “FM Deviation”.

Key Path	View/Display
Initial S/W Revision	A.10.00

### Mono (L+R) View

This view shows the Waveform, Spectrum, and the Metrics of the mono (L+R) signal.

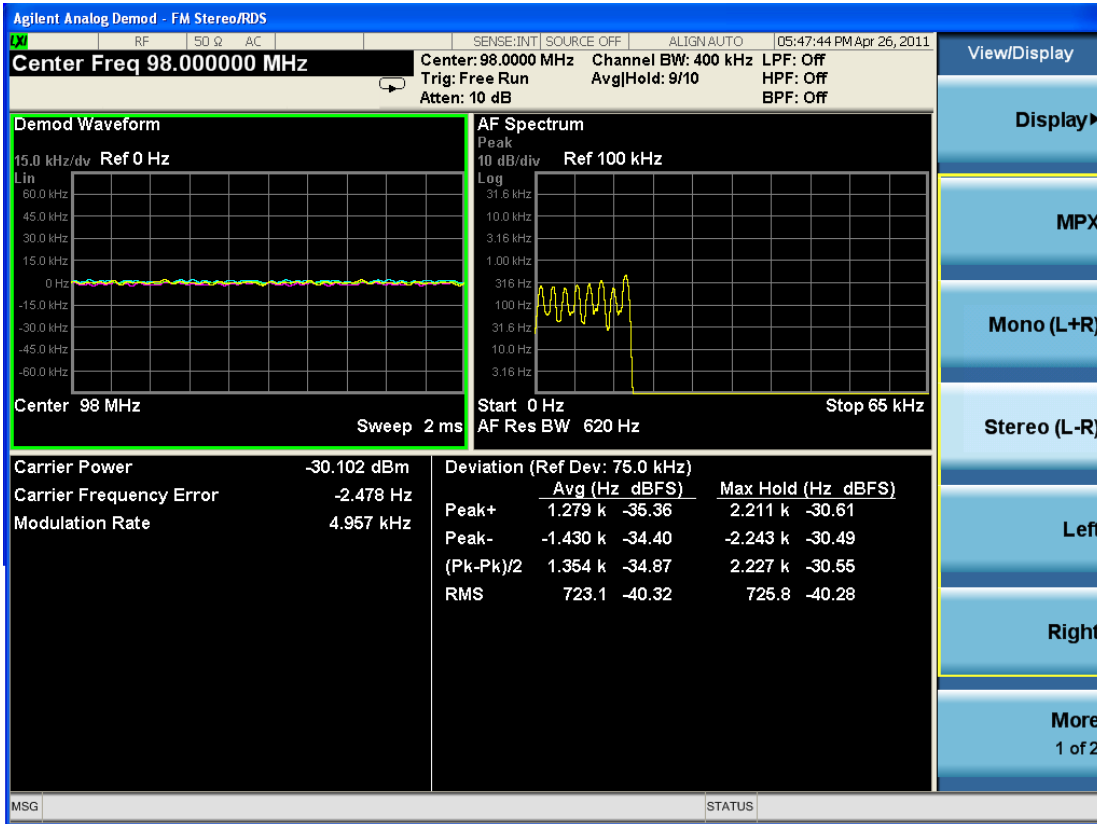


Key Path	View/Display
Initial S/W Revision	A.10.00

### Stereo (L-R) View

This view shows the Waveform, Spectrum, and the Metrics of the stereo (L-R) signal.

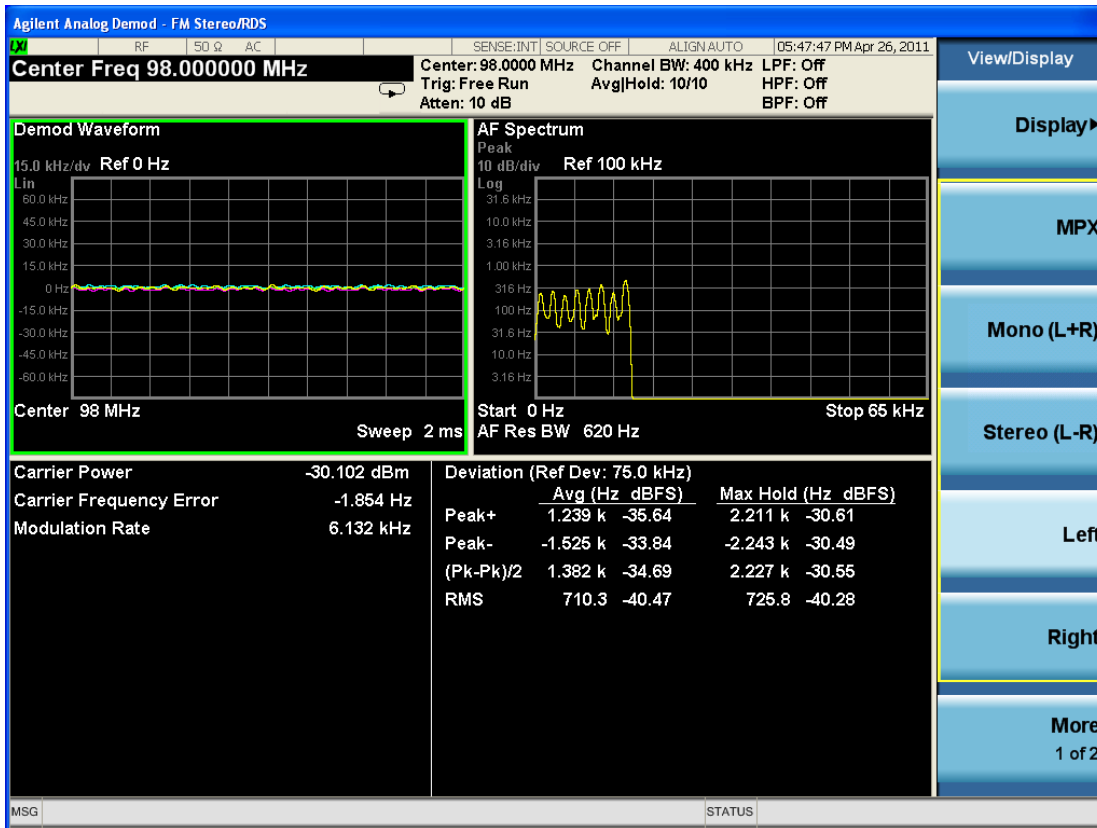
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View/Display (FM Stereo)



Key Path	View/Display
Initial S/W Revision	A.10.00

Left View

This view shows the Waveform, Spectrum, and the Metrics of the left audio signal.



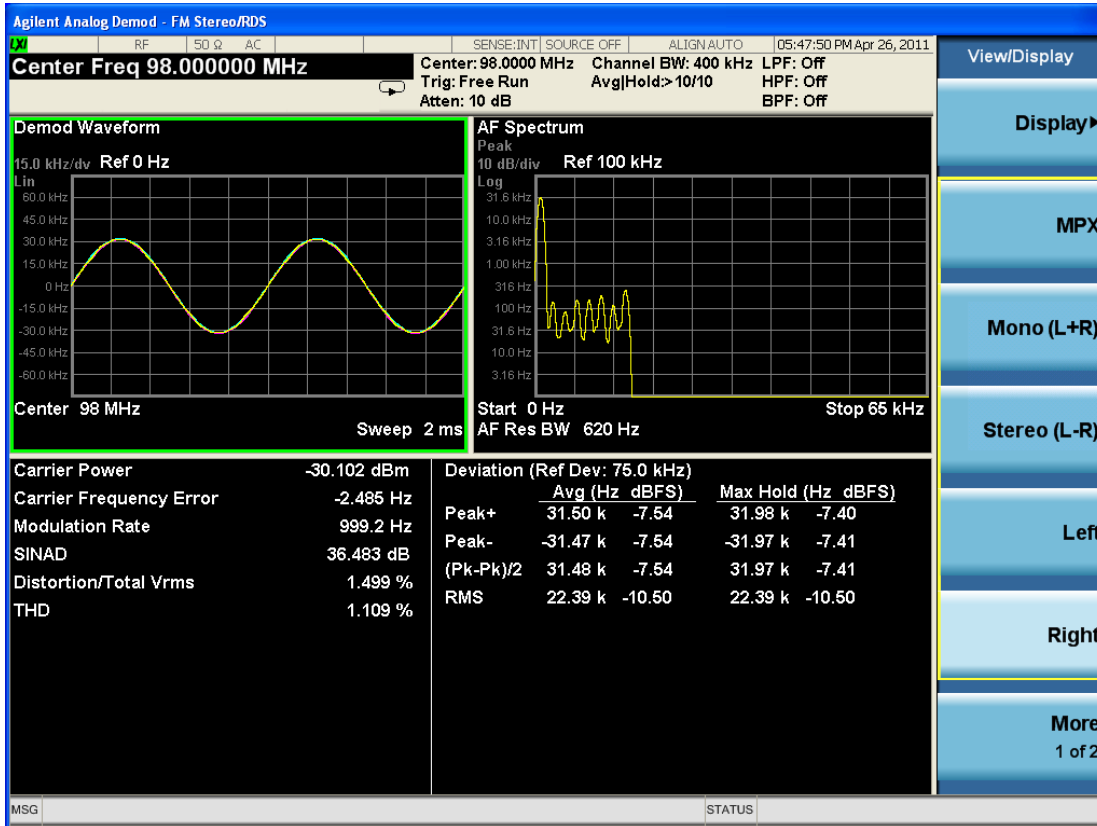
Key Path View/Display

Initial S/W Revision A.10.00

## Right View

This view shows the Waveform, Spectrum, and the Metrics of the right audio signal.

11 FM Stereo Measurement  
View/Display (FM Stereo)



Key Path	View/Display
Initial S/W Revision	A.10.00

RDS/RBDS View

This view shows the RDS bits.

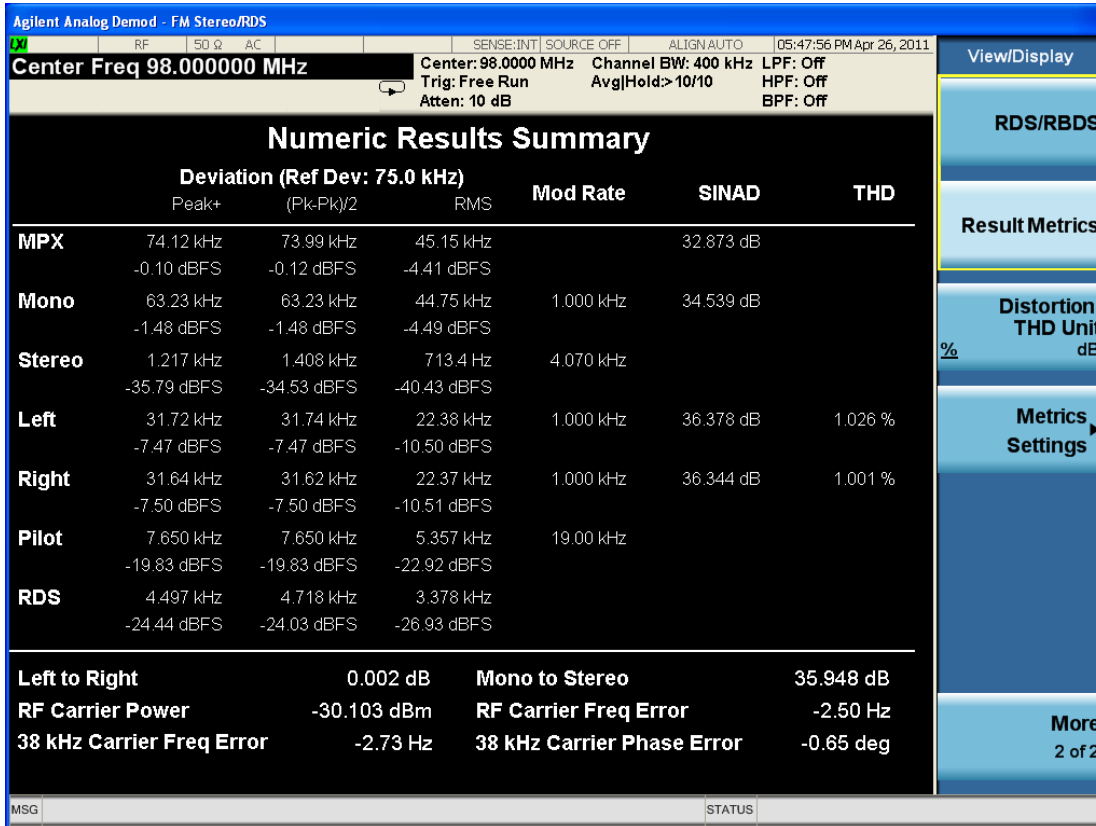
The screenshot displays the 'RDS/RBDS Decoding Results' view in the Agilent Analog Demod software. The interface includes a top status bar with parameters like 'Center Freq 98.00000 MHz', 'Channel BW: 400 kHz', and 'LPF: Off'. The main area is divided into several sections: 'BLER: 0.00E+000 ( 0 / 74 )', 'Information Bits' (a long binary string), 'Basic Tuning and Switching Info' (e.g., Traffic Announcement: Off, Music/Speech: Music), 'Programme Item Number and slow labeling codes' (e.g., Link Actuator: ---), 'Clock-Time and date' (e.g., Modified Julian Day: 2008.8.8), and 'Radio Text' (Text: Radio Text). A right-hand sidebar contains navigation buttons: 'View/Display', 'RDS/RBDS', 'Result Metrics', 'Distortion THD Unit % dB', 'Metrics Settings', and 'More 2 of 2'. The bottom status bar shows 'MSG File <Screen\_0028.png> saved' and 'STATUS'.

Key Path	View/Display
Initial S/W Revision	A.10.00

### Result Metrics Summary View

This view shows all the results together in one view.

11 FM Stereo Measurement  
View/Display (FM Stereo)



Key Path	View/Display
Initial S/W Revision	A.10.00

### Distortion & THD Unit

Changes the units of distortion and THD in the Metrics screen between % and dB units.

Key Path	View/Display
<b>Remote Command</b>	DISPlay:FMSTereo:VIEW:DISTortion:UNIT DB PCT DISPlay:FMSTereo:VIEW:DISTortion:UNIT?
<b>Example</b>	DISP:FMST:VIEW:DIST:UNIT PCT Sets FM Stereo distortion and THD display to percent.
Preset	PCT
State Saved	Saved in State
Initial S/W Revision	A.10.00

### Metrics Settings

Accesses a menu used to control which metrics will be provided. This includes a 1-of-N menu which allows you to control which modulation magnitude metrics are displayed, as well as On/Off controls for

Modulation Rate and SINAD/Distortion/THD. If speed is an issue, select only the metric(s) that is(are) required. If modulation magnitude is set to Peak+ Only, Pk-Pk/2 Only, or RMS Only, the other modulation magnitude metrics are loaded with not a number and show “---“ in the metrics window.

<b>Key Path</b>	View/Display, Metrics Settings
<b>Remote Command</b>	:DISPlay:AM FM PM:VIEW:METRics:MMAGnitude ALL   PPK   PNPk   RMS   RMSRatio  :DISPlay:AM FM PM:VIEW:METRics:MMAGnitude?
<b>Example</b>	DISP:AM:VIEW:METR:MMAG PPK Sets AM modulation magnitude to peak +. DISP:FM:VIEW:METR:MMAG RMSR Sets ratio reference and sets FM modulation magnitude to ratio display
<b>Preset</b>	ALL
<b>State Saved</b>	Saved in State
<b>Initial S/W Revision</b>	Prior to A.02.00
<b>Modified at S/W Revision</b>	A.05.00

### Normal

Turns on all absolute modulation magnitude metrics. In the metrics window, Peak +, Peak -, Pk-Pk/2 and RMS results are provided.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:FMST:VIEW:METR:MMAG ALL
<b>Notes</b>	This key was labeled “All” in earlier releases
<b>Initial S/W Revision</b>	A.10.00

### Peak+ Only

Turns on just the Peak+ metric in the portion of the metrics window that shows the modulation magnitude results.

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:FMST:VIEW:METR:MMAG PPK
<b>Initial S/W Revision</b>	A.10.00

### Pk-Pk/2 Only

Turns on just the Pk-Pk/2 metric in the portion of the metrics window that shows the modulation magnitude results. .

<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
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<b>Example</b>	:DISP:FMST:VIEW:METR:MMAG PNPK
Initial S/W Revision	A.10.00

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### RMS Only

Turns on just the RMS metric in the portion of the metrics window that shows the modulation magnitude results.

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<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
<b>Example</b>	:DISP:FMST:VIEW:METR:MMAG RMS
Initial S/W Revision	A.10.00

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### RMS Ratio

Turns on the display of RMS Ratio. In this mode, the only magnitude metrics that are displayed are the RMS metrics, but besides the display of RMS, the ratio (in dB) of the RMS modulation to its reference is displayed, as well as the value of the reference, as shown in the display below:

FM Deviation	Average	Max Hold
RMS	12.69 kHz	14.19 kHz
RMS Ratio	1.89 dB	2.86 dB
Ratio Ref	10.20 kHz	
<hr/>		
Carrier Power	-100.331 dBm	
Carrier Frequency Error	180.5 Hz	

Pressing the RMS Ratio key (or sending :DISP:FMST:VIEW:METR:MMAG RMSR) establishes the reference. Pressing it again (or sending the SCPI command again) establishes a new reference. Whenever this happens, the current value of RMS modulation from the left hand column (Current or Average) is taken as the new reference.

If, when the ratio is to be established, there is not a valid value being displayed to use as a reference, an error is generated, the RMS Ratio and Ratio Ref values display --- and queries of either return not a number (9.91 e37).

To turn off the ratio display, select one of the other Mod magnitude views.

Note that each measurement (AM, FM, PM, PM and FM Stereo) has its own reference; and the reference is remembered when you leave the measurement and return.

The ratio references are saved in State, and when the recalled state of Metrics Settings is RMS Ratio, the saved reference for the current measurement should be recalled and used, rather than establishing a new one.

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<b>Key Path</b>	View/Display, Metrics Settings, Mod Magnitude
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<b>Example</b>	:DISP:FMST:VIEW:METR:MMAG RMSR
Initial S/W Revision	A.10.00

## Modulation Rate

Toggles the Modulation Rate metric on and off. When turned on, the Modulation Rate metric is provided. When turned off, the Modulation Rate metric is set to not a number and shows “---” in the metric window.

<b>Key Path</b>	View/Display, Metrics Settings
<b>Remote Command</b>	DISPlay:FMSTereo:VIEW:METRics:MRATe[:STATe] ON OFF 1 0 DISPlay:FMSTereo:VIEW:METRics:MRATe[:STATe]?
<b>Example</b>	DISP:FMST:VIEW:METR:MRAT OFF Sets FM Stereo modulation rate to off
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	A.10.00

## SINAD, THD, Distortion

Toggles the distortion metrics – SINAD, Distortion and THD. When turned off, SINAD, Distortion and THD metrics are set to not a number and show “---” in the metric window.

SINAD is the ratio of total received power (the received signal-plus-noise-plus-distortion power) to the received noise-plus-distortion power. It is always expressed in decibel units. The rejection of the carrier from the noise-plus-distortion power measurement is usually not much more than 50 dB, thus limiting the maximum SINAD.

THD is the ratio of the root mean square voltage of the harmonics referenced to the fundamental voltage, expressed in % or dB. Note the differences with respect to Distortion. The denominator of the ratio is different and the items in the numerator do not include the noise between harmonics, just the harmonics themselves.

Distortion/Total Voltage (rms) is the ratio of unwanted received power (noise plus distortion) to the total received power, expressed in % or dB. Therefore, this metric is the negative of SINAD when expressed in decibels.

<b>Key Path</b>	View/Display, Metrics Settings
<b>Remote Command</b>	DISPlay:FMSTereo:VIEW:METRics:DISToRtion[:STATe] ON OFF 1 0 DISPlay:FMSTereo:VIEW:METRics:DISToRtion[:STATe]?
<b>Example</b>	DISP:FMST:VIEW:METRics:DIST OFF Sets FM Stereo modulation rate to off
Preset	On
State Saved	Saved in instrument state
Initial S/W Revision	A.10.00

11 FM Stereo Measurement  
View/Display (FM Stereo)

## 12 Metrics

## Metrics

In all views, the display is split into a signal display window and a numeric results (metrics) window. The metrics window displays carrier and modulation metrics and is similar to the numeric windows common in the SA communications measurements such as Channel Power and Occupied Bandwidth. The metrics associated with the 3 Demod measurements and their metrics including units are shown below.

For the Modulation Depth/FM Deviation/ $\Phi$ M Deviation metrics, two columns are displayed.

Column 1: Averaging off - shows the metrics in real time, that is, the value from the last measurement.

Averaging on - shows the average value of the metric since the last restart. This uses the arithmetic average:

$$\text{New avg} = ((K-1) \text{Old avg} + \text{New data})/K$$

where K is the average counter

Column 2: Only displayed if Aver/Hold Num is on - shows the maximum value that the non-averaged metric has taken on since the last time the measurement was restarted, known as the "Max Hold" value (note: for the Peak(-) metric, Max Hold reads the negative of the absolute value of the maximum value. For example, if the absolute value of Peak- got up to 80 kHz, the Max Hold column would read -80 kHz)

Metric	Units			
	AM	FM	$\Phi$ M	FM Stereo
Carrier Power - the average power detected at the carrier frequency, averaged over integer periods of the modulation frequency	(dBm or W)	(dBm or W)	(dBm or W)	(dBm)
Carrier Frequency Error - represents the difference between the instrument's tuned center frequency and the detected carrier's frequency. This does not apply to AM signals.	N/A	(Hz)	(Hz)	(Hz)
Modulation Rate - represents the frequency of the detected modulation. This is also sometimes known as Modulation Frequency.	(Hz)	(Hz)	(Hz)	(Hz) for Left, Right, and Pilot
SINAD - represents the ratio of total received power (the received signal-plus-noise-plus-distortion power) to the received noise-plus-distortion power. It is always expressed in decibel units. The rejection of the carrier from the noise-plus-distortion power measurement is usually not much more than 50 dB, thus limiting the maximum SINAD.	(dB)	(dB)	(dB)	(dB) for MPX, Mono, Left, and Right
Distortion/Total Vrms - represents the ratio of unwanted received rms voltage (noise combined with distortion) to the total received rms voltage, expressed in % or dB on the display and over SCPI. Therefore, this metric is the negative of SINAD when expressed in decibels. When expressed in %, the SCPI value is a true percentage, thus 100 times as large as the ratio - for example, 99% would return as 99, not as 0.99.	(dB or %)	(dB or %)	(dB or %)	(dB or %) for MPX, Mono, Left, and Right

THD - represents the ratio of the root mean square voltage of the harmonics referenced to the fundamental voltage, expressed in % or dB on the display and over SCPI. Note the difference with respect to Distortion. The denominator of the ratio is different and the items in the numerator do not include the noise between harmonics, just the harmonics themselves. When expressed in %, the SCPI value is a true percentage, thus 100 times as large as the ratio - for example, 99% would return as 99, not as 0.99.	(dB or %)	(dB or %)	(dB or %)	(dB or %) for Left, and Right
AM Mod Depth Peak (+) - the maximum AM modulation depth in units of % during the acquisition period.  When averaging is on, column 1 includes averaging of peaks through the acquisition period - this significantly improves the SNR when measuring cyclic signals. If averaging is off, column 1 shows simply the highest peak. Column 2 always shows the maximum of the highest peak.  Note that in amplitude modulation, the modulation depth (also known as % modulation or modulation index) is the amount of voltage deviation the modulated signal has relative to its original un-modulated level. Modulation depth of 100% means the peak voltage doubles, which in turn implies the peak power quadruples.	(%)	N/A	N/A	N/A
AM Mod Depth Peak (-) - represents the minimum value of AM modulation depth in units of % during the acquisition period. Not the absolute value, but the negative value.	(%)	N/A	N/A	N/A
AM Mod Depth (Pk - Pk)/2 - half the difference between the AM modulation depth Peak+ and Peak-.	(%)	N/A	N/A	N/A
AM Mod Depth RMS - represents the Root Mean Square AM modulation depth in units of % during the acquisition period.	(%)	N/A	N/A	N/A
Deviation Peak (+) - represents the maximum frequency (FM) or phase (PM) deviation during the acquisition period.  When averaging is on, column 1 includes averaging of peaks through the acquisition period - this significantly improves the SNR when measuring cyclic signals. If averaging is off, column 1 shows simply the highest peak. Column 2 always shows the maximum of the highest peak.	N/A	(Hz)	(rad or deg)	(Hz) for MPX, Mono, Stereo, Left, Right, Pilot, and RDS
Deviation Peak (-) - the minimum frequency (FM) or phase (PM) deviation during the acquisition period.	N/A	(Hz)	(rad or deg)	(Hz) for MPX, Mono, Stereo, Left, Right, Pilot, and RDS
Deviation (Pk-Pk)/2 - half the difference between the modulation depth Peak+ and Peak-.	N/A	(Hz)	(rad or deg)	(Hz) for MPX, Mono, Stereo, Left,

				Right, Pilot, and RDS
Deviation RMS - the Root Mean Square frequency (FM) or phase (PM) deviation during the acquisition period.	N/A	(Hz)	(rad   deg)	(Hz) for MPX, Mono, Stereo, Left, Right, Pilot, and RDS
RMS Ratio - the ratio between the displayed value of RMS modulation and the Ratio Reference (see below). Only appears when RMS Ratio is selected under View/Display, Metrics Settings.	(dB)	(dB)	(dB)	(dB) for MPX, Mono, Stereo, Left, Right, Pilot, and RDS
Ratio Ref - the reference value being used for the Ratio display. The reference is set whenever the ratio metric is selected (see View/Display, Metrics Settings, RMS Ratio). Only appears when RMS Ratio is selected (see above)	(%)	(Hz)	(rad   deg)	(Hz) for MPX, Mono, Stereo, Left, Right, Pilot, and RDS
Left to Right - represents the ratio of the left-channel signal power to the right-channel signal power. This only applies to FM Stereo signals.	N/A	N/A	N/A	(dB)
Mono to Stereo - represents the ratio of the mono signal power to the stereo signal power. This only applies to FM Stereo signals.	N/A	N/A	N/A	(dB)
38 kHz Carrier Freq Error This only applies to FM Stereo signals.	N/A	N/A	N/A	(Hz)
38 kHz Carrier Phase Error This only applies to FM Stereo signals.	N/A	N/A	N/A	(deg)