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

KEYSIGHT
TECHNOLOGIES

N9069A & W9069A
Noise Figure
Measurement
Application User's
and Programmer's
Reference

Notices

Manual Part Number

N9069-90005

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Warranty

Technology Licenses

Restricted Rights Legend

Safety Notices

CAUTION

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

WARNING

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

Noise Figure Measurement Application Reference

Table of Contents

1 About the Analyzer

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

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

KEYSIGHT
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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

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/mxa_software

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

   www.agilent.com/find/exa

   www.agilent.com/find/mxa

   www.agilent.com/find/pxa

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

3. Locate the Options tab, as highlighted in the example below, which shows the home page for the MXA.

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

Front-Panel Features

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

Getting Started Guide

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

Display Annotations

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

Getting Started Guide

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

Rear-Panel Features

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

Getting Started Guide

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

Window Control Keys

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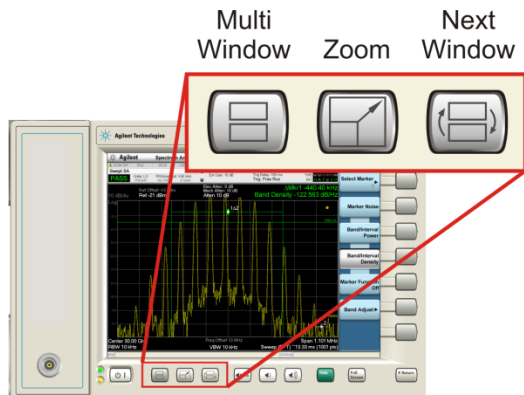
Multi-Window

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

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

Zoom

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

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

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

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

Remote Command	`:DISPlay:WINDow:FORMat:ZOOM`

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

Next Window

Selects the next window of the current view.When the Next Window key is pressed, the next window in the order of precedencebecomes 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.):
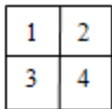
Four window display   Two window display
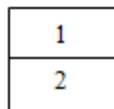
RTSA measurements:

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.

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

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

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

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

Display Enable (Remote Command Only)

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

- To increase speed as much as possible by freeing the instrument from having to update the display

- To reduce emissions from the display, drive circuitry

- For security purposes

If you have turned off the display:

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

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

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

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

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:
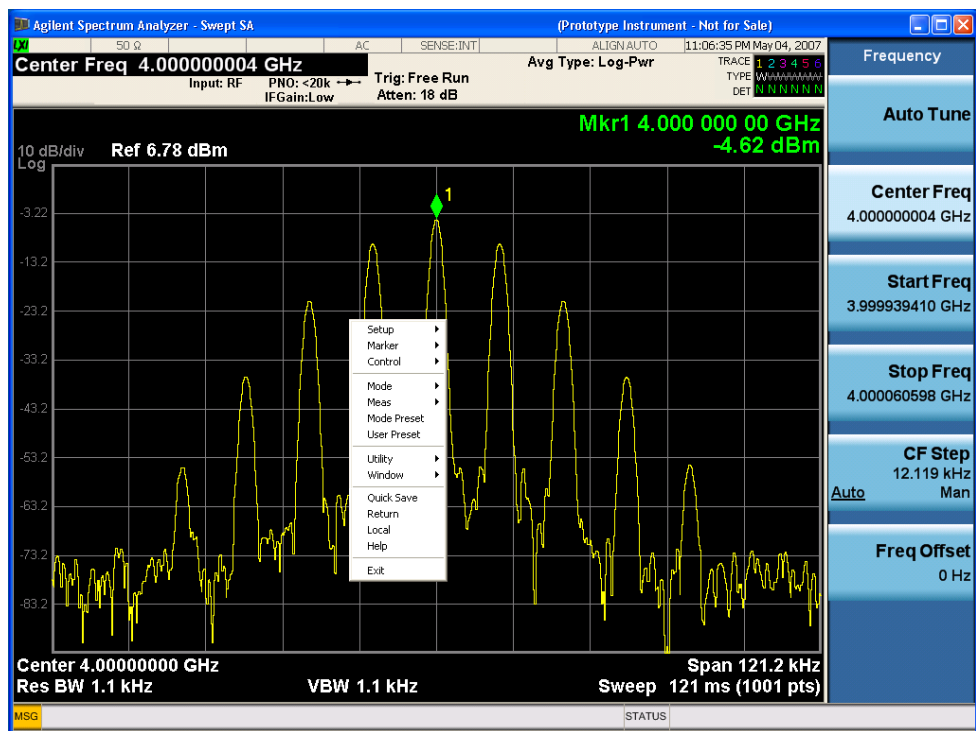
Placing the mouse on one of the rows marked with a right arrow symbol will cause that row to expand, as for example below where the mouse is hovered over the "Utility" row:
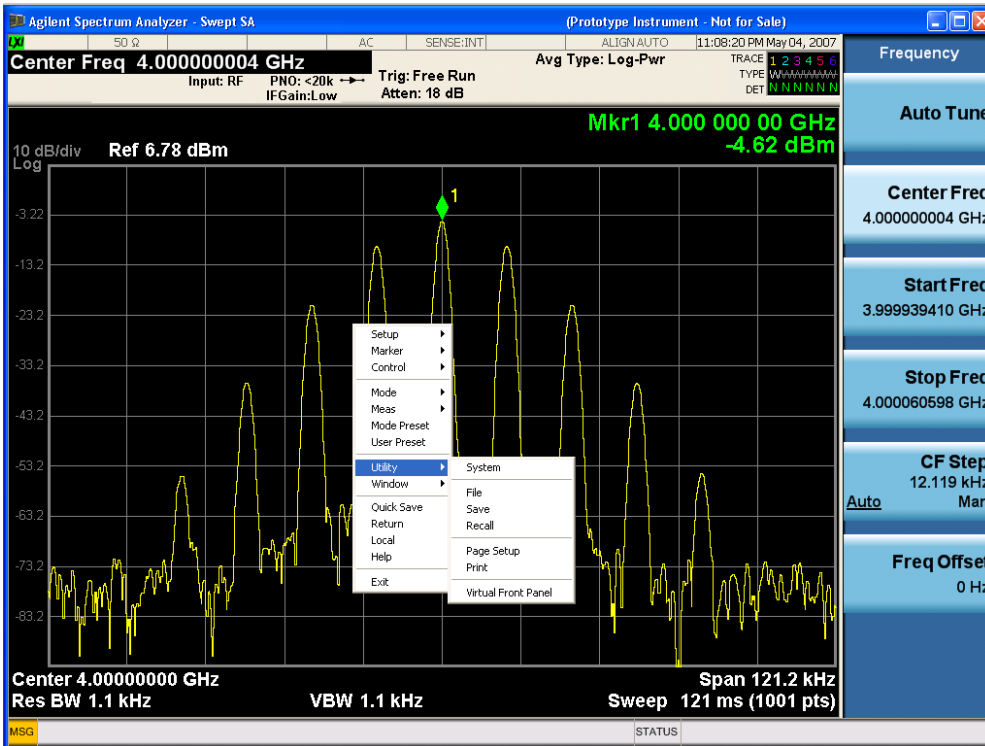
This method can be used to access any of the front-panel keys by using a mouse; as for example if you are accessing the instrument through Remote Desktop.

The array of keys thus available is shown below:
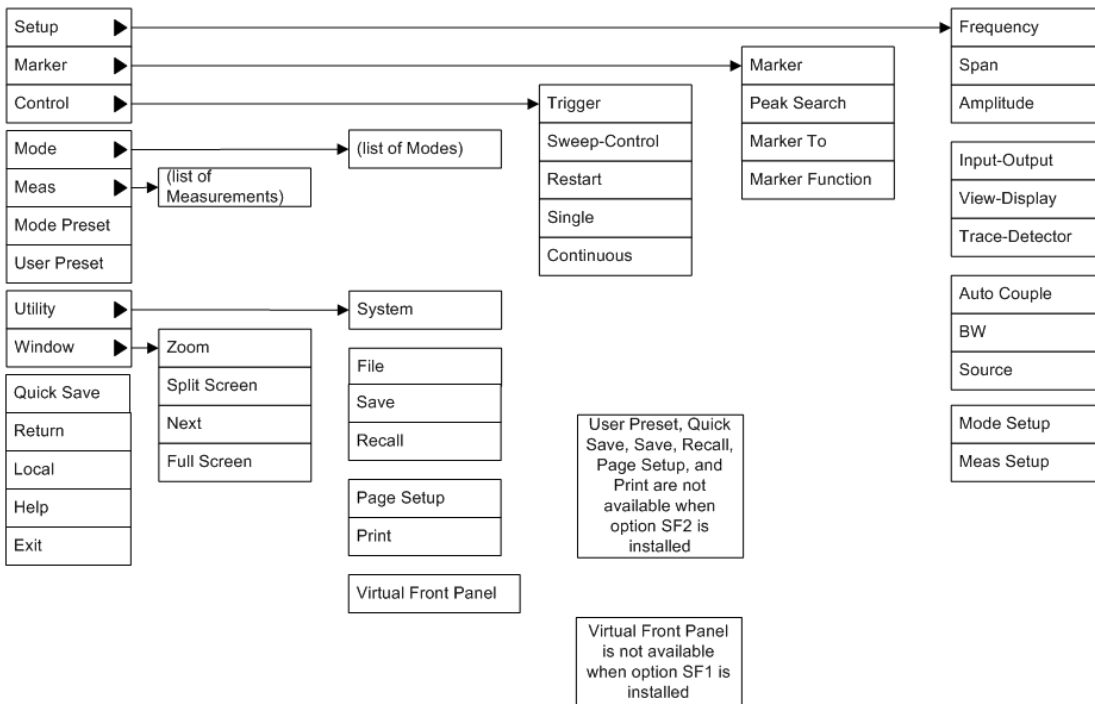
PC Keyboard

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

This is a pictorial view of the table:
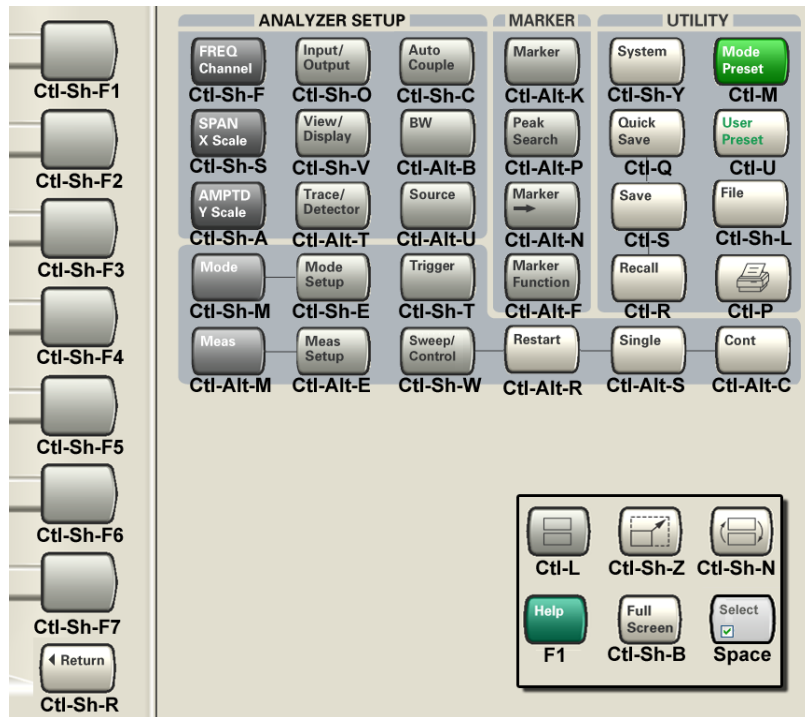
Instrument Security & Memory Volatility

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 Noise Figure Measurement Application

This section provides information on using the Noise Figure Measurement Application in your Agilent Signal Analyzer.

What Does Noise Figure Application Do?

The Noise Figure Application enables you to make a number of individual noise figure measurements over the range of frequencies specified by the frequency parameters. After each frequency point has been measured, the results are displayed.

The measurement includes the following functionality:

- Multiple data views: Graphic, Meter and Table

- Result types including Noise Figure, Gain, Y-Factor, Effective Temp, P hot and P cold

- DUT type including amplifier, downconverter, upconverter and multi-stage converter

- Supports traditional 346x Series Noise Sources

- Supports Smart Noise Sources (SNS)

- Supports external source control using LAN, USB and GPIB

3 Programming the Analyzer

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

- "What Programming Information is Available?" on page 46

- "STATus Subsystem " on page 68

- "IEEE 488.2 Common Commands" on page 110

What Programming Information is Available?

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

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

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

List of 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:CLIMits:FAIL?
CALCulate:DATA<n>:COMPress? BLOCk | CFIT | MAXimum | MINimum | MEAN |
DMEan | RMS | RMSCubed | SAMPle | SDEViation | PPHase[, <soffset>[,
<length>[, <roffset>[, <rlimit>]]]]
CALCulate:DATA[n]?
CALCulate:DATA[1]|2|...|6:PEAKs? <threshold>, <excursion>[, AMPLitude |
FREQuency | TIME[, ALL | GTDLine | LTDLine]]
CALCulate:DATA[1]|2|...|6:PEAKs? <threshold>, <excursion>[, AMPLitude |
FREQuency | TIME]
CALCulate:FPOWer:POWer[1,2,...,999]?
CALCulate:FPOWer:POWer[1,2,...,999]:CONFigure
CALCulate:FPOWer:POWer[1,2,...,999]:DEFine "configurationstring"
CALCulate:FPOWer:POWer[1,2,...,999]:DEFine?
CALCulate:FPOWer:POWer[1,2,...,999]:FETCh?
CALCulate:FPOWer:POWer[1,2,...,999]:INITiate
CALCulate:FPOWer:POWer[1,2,...,999]:READ?
CALCulate:FPOWer:POWer[1,2,...,999]:READ2?
CALCulate:FPOWer:POWer[1,2,...,999]:READ1?
CALCulate:FPOWer:POWer[1,2,...,999]:RESet
CALCulate:LLINe[1]|2|...|4:TYPE UPPer | LOWer
CALCulate:LLINe[1]|2|...|4:TYPE?
CALCulate:MARKer[1]|2|...|4:Y?
CALCulate:NFIGure:LLINe:ALL:DELete
CALCulate:NFIGure:LLINe[1]|2|...|4:DELete
CALCulate:NFIGure:LLINe[1]|2|...|4:DISPlay OFF | ON | 0 | 1
CALCulate:NFIGure:LLINe[1]|2|...|4:DISPlay?
CALCulate[:NFIGure]:LLINe[1]|2|...|4:DISPlay[:STATe]
CALCulate[:NFIGure]:LLINe[1]|2|...|4[:STATe]
CALCulate:NFIGure:LLINe:TEST OFF | ON | 0 | 1
CALCulate:NFIGure:LLINe:TEST?
CALCulate[:NFIGure]:LLINe[1]|2|...|4:TEST[:STATe]
CALCulate:NFIGure:LLINe[1]|2|...|4:TRACe 1 | 2
```

```
CALCulate:NFIGure:LLINe[1]|2|...|4:TRACe?
CALCulate[:NFIGure]:LLINe[1]|2|...|4:TYPE
CALCulate[:NFIGure]:MARKer:COMPatible OFF | ON | 0 | 1
CALCulate[:NFIGure]:MARKer:COMPatible?
CALCulate:NFIGure:MARKer:COUPle[:STATe] ON | OFF | 1 | 0
CALCulate:NFIGure:MARKer:COUPle[:STATe]?
CALCulate:NFIGure:MARKer[1]|2|...|4:CPEak[:STATe] ON | OFF | 1 | 0
CALCulate:NFIGure:MARKer[1]|2|...|4:CPEak[:STATe]?
CALCulate:NFIGure:MARKer[1]|2|...|4:MAXimum
CALCulate:NFIGure:MARKer[1]|2|...|4:MAXimum:LEFT
CALCulate:NFIGure:MARKer[1]|2|...|4:MAXimum:NEXT
CALCulate:NFIGure:MARKer[1]|2|...|4:MAXimum:RIGHt
CALCulate:NFIGure:MARKer[1]|2|...|4:MINimum
CALCulate[:NFIGure]:MARKer[1]|2|...|4:MODE
CALCulate:NFIGure:MARKer[1]|2|...|4:MODE POSition | DELTa | OFF
CALCulate:NFIGure:MARKer[1]|2|...|4:MODE?
CALCulate:NFIGure:MARKer[1]|2|...|4:PTPeak
CALCulate:NFIGure:MARKer[1]|2|...|4:REFerence <int>
CALCulate:NFIGure:MARKer[1]|2|...|4:REFerence?
CALCulate[:NFIGure]:MARKer[1]|2|...|4:SEARch:CONTinuous[:STATe]
CALCulate[:NFIGure]:MARKer:SEARch:TYPE
CALCulate:NFIGure:MARKer:SEARch:TYPE
CALCulate:NFIGure:MARKer:SEARch:TYPE?
CALCulate:NFIGure:MARKer[1]|2|...|4:TRACe TRACe1 | TRACe2
CALCulate:NFIGure:MARKer[1]|2|...|4:TRACe?
CALCulate[:NFIGure]:MARKer[1]|2|...|4:X
CALCulate:NFIGure:MARKer[1]|2|...|4:X <freq>
CALCulate:NFIGure:MARKer[1]|2|...|4:X?
CALCulate:NFIGure:MARKer[1]|2|...|4:X:POSition <real>
CALCulate:NFIGure:MARKer[1]|2|...|4:X:POSition?
CALCulate:NFIGure:MARKer[1]|2|...|4:Y?
CALCulate:UNCertainty:DUT AMPLifier | CONVerter
CALCulate:UNCertainty:DUT?
CALCulate:UNCertainty:DUT:GAIN <value>
CALCulate:UNCertainty:DUT:GAIN <value>
CALCulate:UNCertainty:DUT:GAIN?
CALCulate:UNCertainty:DUT:GAIN?
CALCulate:UNCertainty:DUT:MATCh:INPut
CALCulate:UNCertainty:DUT:MATCh[:INPut] <value>
CALCulate:UNCertainty:DUT:MATCh[:INPut] <value>
CALCulate:UNCertainty:DUT:MATCh:INPut
CALCulate:UNCertainty:DUT:MATCh[:INPut]?
CALCulate:UNCertainty:DUT:MATCh[:INPut]?
CALCulate:UNCertainty:DUT:MATCh[:INPut]:DISTribution RAYLeigh | FIXed | UNIForm
CALCulate:UNCertainty:DUT:MATCh[:INPut]:DISTribution?
CALCulate:UNCertainty:DUT:MATCh[:INPut]:SPEC:STYLe MAXimum | PCT95 | PCT80 | MEDian | MEAN | FIXed
CALCulate:UNCertainty:DUT:MATCh[:INPut]:SPEC:STYLe?
CALCulate:UNCertainty:DUT:MATCh:OUTPut <value>
CALCulate:UNCertainty:DUT:MATCh:OUTPut <value>
CALCulate:UNCertainty:DUT:MATCh:OUTPut?
CALCulate:UNCertainty:DUT:MATCh:OUTPut?
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CALCulate:UNCertainty:DUT:MATCh:OUTPut:DISTribution RAYLeigh | FIXed |
UNIForm
CALCulate:UNCertainty:DUT:MATCh:OUTPut:DISTribution?
CALCulate:UNCertainty:DUT:MATCh:OUTPut:SPEC:STYLe MAXimum | PCT95 | PCT80
| MEDian | MEAN | FIXed
CALCulate:UNCertainty:DUT:MATCh:OUTPut:SPEC:STYLe?
CALCulate:UNCertainty:DUT:NFIGure <value>
CALCulate:UNCertainty:DUT:NFIGure <value>
CALCulate:UNCertainty:DUT:NFIGure?
CALCulate:UNCertainty:DUT:NFIGure?
CALCulate:UNCertainty:EXTernal:PREamp AUTO | MANual | NONE
CALCulate:UNCertainty:EXTernal:PREamp?
CALCulate:UNCertainty:EXTernal:PREamp:GAIN <value>
CALCulate:UNCertainty:EXTernal:PREamp:GAIN?
CALCulate:UNCertainty:EXTernal:PREamp:MATCh <value>
CALCulate:UNCertainty:EXTernal:PREamp:MATCh?
CALCulate:UNCertainty:EXTernal:PREamp:MATCh:DISTribution RAYLeigh | FIXed
| UNIForm
CALCulate:UNCertainty:EXTernal:PREamp:MATCh:DISTribution?
CALCulate:UNCertainty:EXTernal:PREamp:MATCh:SPEC:STYLe MAXimum | PCT95 |
PCT80 | MEDian | MEAN | FIXed
CALCulate:UNCertainty:EXTernal:PREamp:MATCh:SPEC:STYLe?
CALCulate:UNCertainty:EXTernal:PREamp:NFE[:IMPRovement] <value>
CALCulate:UNCertainty:EXTernal:PREamp:NFE[:IMPRovement]?
CALCulate:UNCertainty:EXTernal:PREamp:NFIGure?
CALCulate:UNCertainty:EXTernal:PREamp:NFIGure<value>
CALCulate:UNCertainty:INSTrument AUTO | MANual
CALCulate:UNCertainty:INSTrument?
CALCulate:UNCertainty:INSTrument:FREQuency <freq>
CALCulate:UNCertainty:INSTrument:FREQuency?
CALCulate:UNCertainty:INSTrument:GAIN <value>
CALCulate:UNCertainty:INSTrument:GAIN <value>
CALCulate:UNCertainty:INSTrument:GAIN?
CALCulate:UNCertainty:INSTrument:GAIN?
CALCulate:UNCertainty:INSTrument:MATCh
CALCulate:UNCertainty:INSTrument:MATCh
CALCulate:UNCertainty:INSTrument:MATCh:DISTribution?
CALCulate:UNCertainty:INSTrument:MATCh[:INPut] <value>
CALCulate:UNCertainty:INSTrument:MATCh[:INPut] <value>
CALCulate:UNCertainty:INSTrument:MATCh[:INPut]?
CALCulate:UNCertainty:INSTrument:MATCh[:INPut]?
CALCulate:UNCertainty:INSTrument:MATCh[:INPut]:DISTribution RAYLeigh |
FIXed | UNIForm
CALCulate:UNCertainty:INSTrument:MATCh[:INPut]:SPEC:STYLe MAXimum | PCT95
| PCT80 | MEDian | MEAN | FIXed
CALCulate:UNCertainty:INSTrument:MATCh:SPEC:STYLe?
CALCulate:UNCertainty:INSTrument:NFE[:IMPRovement] <value>
CALCulate:UNCertainty:INSTrument:NFE[:IMPRovement]?
CALCulate:UNCertainty:INSTrument:NFIGure <value>
CALCulate:UNCertainty:INSTrument:NFIGure <value>
CALCulate:UNCertainty:INSTrument:NFIGure?
CALCulate:UNCertainty:INSTrument:NFIGure?
```

```
CALCulate:UNCertainty:INSTrument:NFIGure:UNCertainty <value>
CALCulate:UNCertainty:INSTrument:NFIGure:UNCertainty <value>
CALCulate:UNCertainty:INSTrument:NFIGure:UNCertainty?
CALCulate:UNCertainty:INSTrument:NFIGure:UNCertainty?
CALCulate:UNCertainty:INTernal?
CALCulate:UNCertainty:PARameter:AUTO ON | OFF | 1 | 0
CALCulate:UNCertainty:PARameter:AUTO?
CALCulate:UNCertainty:PARameter:FREQuency:CENTer:UPDate
CALCulate:UNCertainty:PARameter:FREQuency:SELected <freq>
CALCulate:UNCertainty:PARameter:FREQuency:SELected?
CALCulate:UNCertainty:PARameter:FREQuency:SELected:UPDate <freq>
CALCulate:UNCertainty:RSS?
CALCulate:UNCertainty:RSS?
CALCulate:UNCertainty:SOURce AUTO | MANual | A346A | A346B | A346C
CALCulate:UNCertainty:SOURce?
CALCulate:UNCertainty:SOURce:ENR <value>
CALCulate:UNCertainty:SOURce:ENR <value>
CALCulate:UNCertainty:SOURce:ENR?
CALCulate:UNCertainty:SOURce:ENR?
CALCulate:UNCertainty:SOURce:FREQuency <freq>
CALCulate:UNCertainty:SOURce:FREQuency?
CALCulate:UNCertainty:SOURce:MATCh <value>
CALCulate:UNCertainty:SOURce:MATCh <value>
CALCulate:UNCertainty:SOURce:MATCh?
CALCulate:UNCertainty:SOURce:MATCh?
CALCulate:UNCertainty:SOURce:MATCh:DISTribution RAYLeigh | FIXed | UNIForm
CALCulate:UNCertainty:SOURce:MATCh:DISTribution?
CALCulate:UNCertainty:SOURce:MATCh:SPEC:STYLe MAXimum | PCT95 | PCT80 |
MEDian | MEAN | FIXed
CALCulate:UNCertainty:SOURce:MATCh:SPEC:STYLe?
CALCulate:UNCertainty:SOURce:TYPE USER | A346A | A346B | A346C | AN4000A |
AN4001A | AN4002A
CALCulate:UNCertainty:SOURce:TYPE?
CALCulate:UNCertainty:SWEep:ARRay:USER|INTernal|UNCal?
CALCulate:UNCertainty:SWEep:PARameter NFIGure | GAIN | INMatch | OUTMatch
CALCulate:UNCertainty:SWEep:PARameter?
CALCulate:UNCertainty:SWEep:POINts <value>
CALCulate:UNCertainty:SWEep:POINts?
CALCulate:UNCertainty:SWEep:STARt <value>
CALCulate:UNCertainty:SWEep:STARt?
CALCulate:UNCertainty:SWEep:STOP <value>
CALCulate:UNCertainty:SWEep:STOP?
CALCulate:UNCertainty:UNCal?
CALCulate:UNCertainty:USER?
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:EMIXer
CALibration:EMIXer?
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:SCHeduler:TIME:NEXT?
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?
CALibration:TIME:RFPSelector:LRADiated?
CALibration:YTF
```

```
CALibration:YTF?
CONF FSC
CONFigure?
CONFigure:NFIGure
CONF:NFIGure
COUPle ALL | NONE
DISPlay:<measurement>:ANNotation:TITLe:DATA <string>
DISPlay:<measurement>:ANNotation:TITLe:DATA?
DISPlay:ACTivefunc[:STATe] ON | OFF | 1 | 0
DISPlay:ACTivefunc[:STATe]?
DISPlay:ANNotation:MBAR[:STATe] OFF | ON | 0 | 1
DISPlay:ANNotation:MBAR[:STATe]?
DISPlay:ANNotation:SCReen[:STATe] OFF | ON | 0 | 1
DISPlay:ANNotation:SCReen[:STATe]?
DISPlay:BACKlight ON | OFF
DISPlay:BACKlight?
DISPlay:BACKlight:INTensity <integer>
DISPlay:BACKlight:INTensity?
DISPlay:DATA:CORRections[:STATe]
DISPlay:ENABle OFF | ON | 0 | 1
DISPlay:ENABle?
DISPlay:FSCReen[:STATe] OFF | ON | 0 | 1
DISPlay:FSCReen[:STATe]?
DISPlay:MENU[:STATe] OFF | ON | 0 | 1
DISPlay[:NFIGure]:ANNotation[:STATe] ON | OFF | 1 | 0
DISPlay[:NFIGure]:ANNotation[:STATe]?
DISPlay[:NFIGure]:DATA:CORRections[:STATe]
DISPlay:NFIGure:DATA:TRACe[1] | 2NFIGure | NFACtor | GAIN | YFACtor |
TEFFective | PHOT | PCOLd
DISPlay:NFIGure:DATA:TRACe[1]|2?
DISPlay[:NFIGure]:DATA:TRACe[1]|2[:RESult]
DISPlay[:NFIGure]:FORMat
DISPlay:NFIGure:FORMat GRAPh | TABLe | METer
DISPlay:NFIGure:FORMat?
DISPlay:NFIGure:FORMat:AUTO OFF | ON | 0 | 1
DISPlay:NFIGure:FORMat:AUTO?
DISPlay[:NFIGure]:GRATicule[:STATe] ON | OFF | 1 | 0
DISPlay[:NFIGure]:GRATicule[:STATe]?
DISPlay:NFIGure:TRACe:COMBined[:STATe] OFF | ON | 0 | 1
DISPlay[:NFIGure]:TRACe:COMBined[:STATe]
DISPlay:NFIGure:TRACe:COMBined[:STATe]?
DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:PDIVision?
DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RPOSition?
DISPlay:NFIGure:TRACe:METer:Y[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:METer:Y[:SCALe]:PDIVision?
DISPlay:NFIGure:TRACe:METer:Y[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:METer:Y[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:PDIVision?
```

```
DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RPOSition?
DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y
[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y
[:SCALe]:PDIVision?
DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y
[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y
[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y
[:SCALe]:RPOSition TOP | CENTer | BOTTom
DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y
[:SCALe]:RPOSition?
DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:PDIVision?
DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RPOSition?
DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:PDIVision?
DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RPOSition?
DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:PDIVision?
DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RPOSition?
DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:PDIVision?
DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RPOSition?
DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:PDIVision <value>
DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:PDIVision?
DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:RLEVel <value>
DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:RLEVel?
DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:RPOSition?
DISPlay[:NFIGure]:TRACe:Y[:SCALe]:PDIVision NFIGure | NFACtor | GAIN |
YFACtor | TEFFective | PHOT | PCOLd, <float>
DISPlay[:NFIGure]:TRACe:Y[:SCALe]:PDIVision? NFIGure | NFACtor | GAIN |
YFACtor | TEFFective | PHOT | PCOLd
DISPlay[:NFIGure]:TRACe:Y[:SCALe]:RLEVel:VALue NFACtor | GAIN | YFACtor |
TEFFective | PHOT | PCOLd, <float>
```

```
DISPlay[:NFIGure]:TRACe:Y[:SCALe]:RLEVel:VALue? NFACtor | GAIN | YFACtor |
TEFFective | PHOT | PCOLd
DISPlay:NFIGure:VIEW3:WINDow[1]:TRACe:Y[:SCALe]:COUPle 0 | 1 | OFF | ON
DISPlay:NFIGure:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:COUPle 0 | 1 | OFF | ON
DISPlay:NFIGure:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:COUPle?
DISPlay:NFIGure:VIEW3:WINDow[1]:TRACe:Y[:SCALe]:COUPle?
DISPlay[:NFIGure]:ZOOM:WINDow OFF | LOWer | UPPer
DISPlay[:NFIGure]:ZOOM:WINDow?
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]?
DISPlay:WINDow1:TRACe[1]|2:Y[:SCALe]:AUTO
DISPlay[:WINDow]:TRACe[1]|2:Y[:SCALe]:AUTO
FETCh|MEASure|READ[:NFIGure]?
FETCh|MEASure|READ:NFIGure?
FETCh|MEASure|READ[:NFIGure][:ARRay][:DATA]:CORRected:NFIGure | NFACtor |
GAIN | TEFFective | PHOT | PCOLd?
FETCh|MEASure|READ:NFIGure[:ARRay][:DATA]:CORRected:NFIGure | NFACtor |
GAIN | TEFFective | PHOT | PCOLd?
FETCh|MEASure|READ:NFIGure[:ARRay][:DATA]:TCOLd?
FETCh|MEASure|READ[:NFIGure][:ARRay][:DATA]:TCOLd?
FETCh|MEASure|READ:NFIGure[:ARRay][:DATA]:UNCorrected:NFIGure | NFACtor |
YFACtor | TEFFective | PHOT | PCOLd?
FETCh|MEASure|READ[:NFIGure][:ARRay][:DATA]:UNCorrected:NFIGure | NFACtor
| YFACtor | TEFFective | PHOT | PCOLd?
FETCh|MEASure|READ:NFIGure:SCALar[:DATA]:CORRected:NFIGure | NFACtor |
GAIN | TEFFective | PHOT | PCOLd?
FETCh|MEASure|READ[:NFIGure]:SCALar[:DATA]:CORRected:NFIGure | NFACtor |
GAIN | TEFFective | PHOT | PCOLd?
FETCh|MEASure|READ[:NFIGure]:SCALar[:DATA]:TCOLd?
FETCh|MEASure|READ:NFIGure:SCALar[:DATA]:TCOLd?
FETCh|MEASure|READ[:NFIGure]:SCALar[:DATA]:UNCorrected:NFIGure | NFACtor |
YFACtor | TEFFective | PHOT | PCOLd?
FETCh|MEASure|READ:NFIGure:SCALar[:DATA]:UNCorrected:NFIGure | NFACtor |
YFACtor | TEFFective | PHOT | PCOLd?
FETCh:NFIGure?
FETCh|READ[:NFIGure]:METer?
FETCh|READ[:NFIGure]:METer:MINimum?
FORMat:BORDer NORMal | SWAPped
FORMat:BORDer?
FORMat[:TRACe][:DATA] ASCii | INTeger, 32 | REAL, 32 | REAL, 64
FORMat[:TRACe][:DATA]?
GLOBal:DEFault
GLOBal:FREQuency:CENTer[:STATe] 1 | 0 | ON | OFF
GLOBal:FREQuency:CENTer[:STATe]?
HCOPy:ABORt
HCOPy[:IMMediate]
```

```
INITiate:CONTinuous OFF | ON | 0 | 1
INITiate:CONTinuous?
INITiate[:IMMediate]
INITiate[:NFIGure]
INITiate:NFIGure
INITiate:NFIGure
INITiate:RESTart
INPut:COUPling AC | DC
INPut:COUPling?
INPut:COUPling:I|Q DC | LFR1 | LFR2
INPut:COUPling:I|Q?
INPut:GAIN:STATe
INPut:IMPedance:IQ U50 | B50 | U1M | B1M
INPut:IMPedance:IQ?
INPut:IMPedance:REFerence <integer>
INPut:IMPedance:REFerence?
INPut[1]:IQ:BALanced[:STATe] OFF | ON | 0 | 1
INPut[1]:IQ:BALanced[:STATe]?
INPut:IQ[:I]:DIFFerential OFF | ON | 0 | 1
INPut:IQ[:I]:DIFFerential?
INPut[1]:IQ[:I]:IMPedance LOW | HIGH
INPut[1]:IQ[:I]:IMPedance?
INPut:IQ:MIRRored OFF | ON | 0 | 1
INPut:IQ:MIRRored?
INPut:IQ:Q:DIFFerential OFF | ON | 0 | 1
INPut:IQ:Q:DIFFerential?
INPut[1]:IQ:Q:IMPedance LOW | HIGH
INPut[1]:IQ:Q:IMPedance?
INPut[1]:IQ:TYPE IQ | I | Q
INPut[1]:IQ:TYPE?
INPut[1]|2:LISN:FILTer:HPAS[:STATe] ON | OFF
INPut[1]|2:LISN:FILTer:HPAS[:STATe]?
INPut[1]|2:LISN:PEARth GROunded | FLOating
INPut[1]|2:LISN:PEARth?
INPut[1]|2:LISN:PHASe L1 | L2 | L3 | N
INPut[1]|2:LISN:PHASe?
INPut[1]|2:LISN[:TYPE] FOURphase | ESH2Z5 | ENV216 | OFF
INPut[1]|2:LISN[:TYPE]?
INPut:MIXer EXTernal | INTernal
INPut:MIXer?
INPut[:NFIGure]:ATTenuation:MWAVe:MAXimum
INPut[:NFIGure]:ATTenuation:MWAVe[:MINimum]
INPut[:NFIGure]:ATTenuation[:RF]:MAXimum
INPut[:NFIGure]:ATTenuation[:RF][:MINimum]
INPut[:NFIGure]:ATTenuation:VALue
INPut:OFFSet:I|Q <voltage>
INPut:OFFSet:I|Q?
INST:NSEL 105
INST:NSEL 102
INSTrument:CATalog?
INSTrument:COUPle:DEFault
INSTrument:COUPle:FREQuency:CENTer ALL | NONE
INSTrument:COUPle:FREQuency:CENTer?
```

```
INSTrument:NSELect <integer>
INSTrument:NSELect?
INSTrument[:SELect] SANalyzer
INSTrument[:SELect] GSM
INSTrument[:SELect] SA | RTSA | SEQAN | EMI | BASIC | WCDMA | EDGEGSM |
WIMAXOFDMA | VSA | PNOISE | NFIGure | ADEMOD | BTooth | TDSCDMA | CDMA2K |
CDMA1XEV | LTE | LTETDD | LTEAFDD | LTEATDD | MSR | DVB | DTMB | DCATV |
ISDBT | CMMB | WLAN | CWLAN | CWIMAXOFDM | WIMAXFIXED | IDEN | RLC |
SCPILC | VSA89601
INSTrument[:SELect] RECeiver
INSTrument[:SELect] 'SA' | 'PNOISE' | 'EDGE' | 'GSM' | 'BASIC'
INSTrument[:SELect]?
INST:SEL LTETDD
INST:SEL LTE
INST:SEL SCPILC
INST:SEL EMI
LXI:IDENtify[:STATe] OFF | ON | 0 | 1
LXI:IDENtify[:STATe]?
MEASure:NFIGure?
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:ENR
MMEMory:LOAD:ENR MEASurements | CALibration, <file_name>
MMEMory:LOAD:FREQuency <file_name>
MMEMory:LOAD:FREQuency
MMEMory:LOAD:LIMit LLINE1 | LLINE2 | LLINE3 | LLINE4, <file_name>
MMEMory:LOAD:LOSS BEFore | AFTer, <file_name>
MMEMory:LOAD:LOSS
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:ENR MEASurements | CALibration, <file_name>
MMEMory:STORe:ENR
MMEMory:STORe:FREQuency
MMEMory:STORe:FREQuency <file_name>
MMEMory:STORe:LIMit LLINE1 | LLINE2 | LLINE3 | LLINE4, <file_name>
MMEMory:STORe:LOSS BEFore | AFTer, <file_name>
MMEMory:STORe:LOSS
MMEMory:STORe:RESults <file_name>
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:UNCertainty USER | INTernal | UNCal, <file_name>
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:NFIGure?
[:SENSe]:CONFigure:MODE:DOWNconv|SYSTem|UPConv:FREQuency:CONText
[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:IF:FREQuency (NFA)
[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency
(PSA/NFA/FSP)
[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency
(PSA/NFA/FSP)
[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:LOSCillator:OFFSet (ESA/PSA/NFA)
[:SENSe]:CONFigure:MODE:DUT (PSA/ESA/NFA/FSP)
[:SENSe]:CONFigure:MODE:DUT:LOSCillator (ESA/PSA/NFA)
[:SENSe]:CONFigure:MODE:SYSTem:DOWNconv[:STATe] (ESA/PSA/NFA)
[:SENSe]:CONFigure:MODE:SYSTem:IF:FREQuency (NFA)
[:SENSe]:CONFigure:MODE:SYSTem:LOSCillator (FSP)
[:SENSe]:CONFigure:MODE:SYSTem:LOSCillator:FREQuency (PSA/NFA/FSP)
[:SENSe]:CONFigure:MODE:SYSTem:LOSCillator:OFFSet (ESA/PSA/NFA)
[: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:SKEW <seconds>
[:SENSe]:CORRection:IQ:Q:SKEW?
[:SENSe]:CORRection:LOSS:INPut:SPOT
[:SENSe]:CORRection:LOSS:OUTPut:SPOT
[:SENSe]:CORRection[:STATe]
[:SENSe]:CORRection:TEMPerature
[:SENSe]:FEED AREFerence
[:SENSe]:FEED RF | AIQ | EMIXer
[:SENSe]:FEED IQ | IONLy | QONLy
[:SENSe]:FEED?
[:SENSe]:FEED?
[:SENSe]:FEED:IQ:TYPE IQ | IONLy | QONLy
[:SENSe]:FEED:IQ:TYPE?
[: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][:NFIGure]:AVERage:COUNt
[:SENSe]:NFIGure:AVERage:COUNt <integer>
[:SENSe]:NFIGure:AVERage:COUNt?
[:SENSe]:NFIGure:AVERage[:STATe] ON | OFF | 1 | 0
[:SENSe]:NFIGure:AVERage[:STATe]?
[:SENSe][:NFIGure]:BWIDth|BANDwidth[:RESolution]
(DefaultRBWinPSAESAappswas1MHz)
[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution] <freq>
[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]?
[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]:AUTO ON | OFF | 1 | 0
[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]:AUTO?
[:SENSe]:NFIGure:CALibration:CONDition?
[:SENSe]:NFIGure:CALibration:DELete
[:SENSe]:NFIGure:CALibration:INITiate
[:SENSe]:NFIGure:CALibration:STATe ON | OFF | 1 | 0
[:SENSe]:NFIGure:CALibration:STATe?
[:SENSe]:NFIGure:CALibration:TYPE USER | INTernal
[:SENSe]:NFIGure:CALibration:USER:ATTenuation:MAXimum <integer>
[:SENSe]:NFIGure:CALibration:USER:ATTenuation:MAXimum?
[:SENSe]:NFIGure:CALibration:USER:ATTenuation:MINimum <integer>
[:SENSe]:NFIGure:CALibration:USER:ATTenuation:MINimum?
[:SENSe][:NFIGure]:CORRection:ENR:AUTO[:STATe]
[:SENSe]:NFIGure:CORRection:ENR:AUTO[:STATe] OFF | ON | 0 | 1
[:SENSe]:NFIGure:CORRection:ENR:AUTO[:STATe]?
[:SENSe]:NFIGure:CORRection:ENR:CALibration:TABLe:DATA:DELete
[:SENSe]:NFIGure:CORRection:ENR:COMMon[:STATe] ON | OFF | 1 | 0
[:SENSe][:NFIGure]:CORRection:ENR:COMMon[:STATe]
[:SENSe]:NFIGure:CORRection:ENR:COMMon[:STATe]?
[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:COUNt?
[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:DATA
<frequency>, <amplitude>([, <frequency>, <amplitude>])
[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:DATA?
[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:ID:DATA
<string>
[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:ID:DATA?
[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SERial:DATA
<string>
[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SERial:DATA?
```

```
[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SNS
[:SENSe]:NFIGure:CORRection:ENR[:MEASurement]:TABLe:DATA:DELete
[:SENSe]:NFIGure:CORRection:ENR:MODE TABLe | SPOT
[:SENSe][:NFIGure]:CORRection:ENR:MODE
[:SENSe]:NFIGure:CORRection:ENR:MODE?
[:SENSe]:NFIGure:CORRection:ENR:PREFerence NORMal | SNS
[:SENSe]:NFIGure:CORRection:ENR:PREFerence?
[:SENSe]:NFIGure:CORRection:ENR:SNS:ATTached?
[:SENSe]:NFIGure:CORRection:ENR:SPOT <value>
[:SENSe][:NFIGure]:CORRection:ENR:SPOT
[:SENSe]:NFIGure:CORRection:ENR:SPOT?
[:SENSe][:NFIGure]:CORRection:ENR:THOT
[:SENSe]:NFIGure:CORRection:ENR:THOT <temperature>
[:SENSe]:NFIGure:CORRection:ENR:THOT?
[:SENSe][:NFIGure]:CORRection:LOSS:AFTer:MODE
[:SENSe]:NFIGure:CORRection:LOSS:AFTer:MODE OFF | FIXed | TABLe
[:SENSe]:NFIGure:CORRection:LOSS:AFTer:MODE?
[:SENSe]:NFIGure:CORRection:LOSS:AFTer:TABLe:DATA:DELete
[:SENSe]:NFIGure:CORRection:LOSS:AFTer:VALue <value>
[:SENSe][:NFIGure]:CORRection:LOSS:AFTer:VALue
[:SENSe]:NFIGure:CORRection:LOSS:AFTer:VALue?
[:SENSe]:NFIGure:CORRection:LOSS:BEFore|AFTer:TABLe:COUNt?
[:SENSe][:NFIGure]:CORRection:LOSS:BEFore|AFTer:TABLe:COUNt?
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<amplitude>([, <frequency>, <amplitude>])*
[:SENSe][:NFIGure]:CORRection:LOSS:BEFore|AFTer:TABLe:DATA
[:SENSe]:NFIGure:CORRection:LOSS:BEFore|AFTer:TABLe:DATA?
[:SENSe]:NFIGure:CORRection:LOSS:BEFore:MODE OFF | FIXed | TABLe
[:SENSe][:NFIGure]:CORRection:LOSS:BEFore:MODE
[:SENSe]:NFIGure:CORRection:LOSS:BEFore:MODE?
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[:SENSe][:NFIGure]:CORRection:SPOT:MODE
[:SENSe]:NFIGure:CORRection:SPOT:MODE?
[:SENSe]:NFIGure:CORRection:TCOLd USER | DEFault
[:SENSe]:NFIGure:CORRection:TCOLd?
[:SENSe]:NFIGure:CORRection:TCOLd:SNS[:STATe] ON | OFF | 1 | 0
[:SENSe][:NFIGure]:CORRection:TCOLd:SNS[:STATe]
[:SENSe]:NFIGure:CORRection:TCOLd:SNS[:STATe]?
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[:SENSe]:NFIGure:CORRection:TCOLd:USER:SET
[:SENSe][:NFIGure]:CORRection:TCOLd:USER:VALue <value>
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[:SENSe][:NFIGure]:CORRection:TCOLd:USER:VALue?
[:SENSe][:NFIGure]:CORRection:TEMPerature:AFTer
[:SENSe]:NFIGure:CORRection:TEMPerature:AFTer <value>
[:SENSe]:NFIGure:CORRection:TEMPerature:AFTer?
[:SENSe]:NFIGure:CORRection:TEMPerature:BEFore <temperature>
[:SENSe][:NFIGure]:CORRection:TEMPerature:BEFore
[:SENSe]:NFIGure:CORRection:TEMPerature:BEFore?
```

```
[:SENSe]:NFIGure:DETector[:FUNCtion] AVERage
[:SENSe][:NFIGure]:DETector[:FUNCtion]
[:SENSe]:NFIGure:DETector[:FUNCtion]?
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[:SENSe]:NFIGure:FREQuency:CENTer <freq>
[:SENSe]:NFIGure:FREQuency:CENTer?
[:SENSe][:NFIGure]:FREQuency:FIXed
[:SENSe]:NFIGure:FREQuency:FIXed <freq>
[:SENSe]:NFIGure:FREQuency:FIXed?
[:SENSe]:NFIGure:FREQuency:LIST RF | LO | IF
[:SENSe]:NFIGure:FREQuency:LIST?
[:SENSe]:NFIGure:FREQuency:LIST:COUNt?
[:SENSe][:NFIGure]:FREQuency:LIST:COUNt?
[:SENSe]:NFIGure:FREQuency:LIST:DATA <frequency>, ([, <frequency>])*
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[:SENSe]:NFIGure:FREQuency:LIST:DATA?
[:SENSe]:NFIGure:FREQuency:LIST:DATA:DELete
[:SENSe][:NFIGure]:FREQuency:MODE
[:SENSe]:NFIGure:FREQuency:MODE SWEPt | FIXed | LIST
[:SENSe]:NFIGure:FREQuency:MODE?
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[:SENSe]:NFIGure:FREQuency:STOP <freq>
[:SENSe]:NFIGure:FREQuency:STOP <freq>
[:SENSe]:NFIGure:FREQuency:STOP <freq>
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[:SENSe]:NFIGure:MANual:ABORt
[:SENSe]:NFIGure:MANual:CONTinue
[:SENSe][:NFIGure]:MANual:MWAVe:FIXed
[:SENSe][:NFIGure]:MANual:RF:FIXed
[:SENSe]:NFIGure:MODE:DIAGram CALibration | MEASurement
[:SENSe]:NFIGure:MODE:DIAGram?
[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:IF:FREQuency <freq>
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[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency <freq>
[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency?
[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:OFFSet LSB | USB | DSB
[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:OFFSet?
```

```
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[:SENSe]:NFIGure:MODE:DUT?
[:SENSe]:NFIGure:MODE:DUT:LOSCillator FIXed | SWEPt
[:SENSe]:NFIGure:MODE:DUT:LOSCillator?
[:SENSe]:NFIGure:MODE:FREQuency:CONText RF | IF | LO
[:SENSe]:NFIGure:MODE:FREQuency:CONText?
[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:AUXiliary <string>
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[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:PREFix?
[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:SUFFix <string>
[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:SUFFix?
[:SENSe]:NFIGure:MODE:LOSCillator:CONTrol[:STATe] ON | OFF | 1 | 0
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[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:SUFFix
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[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:CONTrol[:STATe] ON | OFF | 1
| 0
[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:CONTrol[:STATe]?
[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MAXimum[:FREQuency]
<freq>
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[:FREQuency]?
[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MINimum[:FREQuency]
<freq>
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[:FREQuency]?
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tor <int>
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tor?
[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:NUMerato
r <int>
[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:NUMerato
r?
```

```
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<float>
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[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:SETTling[:TIME]
<float>
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[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:TYPE SCPI | CUSTom
[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:TYPE?
[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MAXimum[:FREQuency] <freq>
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[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MINimum[:FREQuency] <freq>
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[:SENSe]:NFIGure:MODE:LOSCillator:TYPE?
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[:SENSe]:NFIGure:MODE:MCONverter:RF:FREQuency <freq>
[:SENSe]:NFIGure:MODE:MCONverter:RF:FREQuency?
[:SENSe]:NFIGure:MODE:SYSTem:DOWNconv[:STATe] ON | OFF | 1 | 0
[:SENSe]:NFIGure:MODE:SYSTem:DOWNconv[:STATe]?
[:SENSe]:NFIGure:MODE:SYSTem:IF:FREQuency <freq>
[:SENSe]:NFIGure:MODE:SYSTem:IF:FREQuency?
[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator FIXed | SWEPt
[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator?
[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator:FREQuency <freq>
[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator:FREQuency?
[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator:OFFSet LSB | USB | DSB
[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator:OFFSet?
[:SENSe]:NFIGure:NSSTime <time>
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[:SENSe]:NFIGure:POWer[:RF]:ATTenuation <float>
[:SENSe]:NFIGure:POWer[:RF]:ATTenuation?
[:SENSe][:NFIGure]:POWer[:RF]:GAIN:AUTO OFF | ON | 0 | 1
[:SENSe][:NFIGure]:POWer[:RF]:GAIN:AUTO?
[:SENSe]:NFIGure:POWer[:RF]:GAIN[:STATe] OFF | ON | 0 | 1
[:SENSe][:NFIGure]:POWer[:RF]:GAIN[:STATe]
[:SENSe]:NFIGure:POWer[:RF]:GAIN[:STATe]?
[:SENSe]:NFIGure:PRESelector:OPTimize
[:SENSe][:NFIGure]:SWEep:POINts
```

```
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[:SENSe]:NFIGure:SWEep:TIME?
[:SENSe]:NFIGure:SWEep:TIME:AUTO ON | OFF | 1 | 0
[:SENSe]:NFIGure:SWEep:TIME:AUTO?
[:SENSe]:ROSCillator:BANDwidth WIDE | NARRow
[:SENSe]:ROSCillator:BANDwidth?
[:SENSe]:ROSCillator:COUPling NORMal | NACQuisition
[:SENSe]:ROSCillator:COUPling?
[:SENSe]:ROSCillator:EXTernal:FREQuency <freq>
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[: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]:SWEep:COUNt
[:SENSe]:SWEep:TIME
SOURce:EXTernal:FREQuency[:FACTor]:DENominator (FSP)
SOURce:EXTernal:FREQuency[:FACTor]:NUMerator (FSP)
SOURce:EXTernal:POWer[:LEVel] (FSP)
SOURce[:NFIGure]:NOISe[:PREFerence]
SOURce:NFIGure:NOISe:STATe NORMAL | ON | OFF
SOURce:NFIGure:NOISe:STATe?
SOURce:NOISe:SNS:ATTached?
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?
SYST:CONF:DUT:STIM
SYSTem:APPLication:CATalog[:NAME]?
SYSTem:APPLication:CATalog[:NAME]:COUNt?
SYSTem:APPLication:CATalog:OPTion? <model>
SYSTem:APPLication:CATalog:REVision? <model>
SYSTem:APPLication[:CURRent][:NAME]?
SYSTem:APPLication[:CURRent]:OPTion?
SYSTem:APPLication[:CURRent]:REVision?
SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess <integer>
SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess?
SYSTem:COMMunicate:GPIB[1][:SELF]:CONTroller[:ENABle] ON | OFF | 0 | 1
SYSTem:COMMunicate:GPIB[1][:SELF]:CONTroller[:ENABle]?
SYSTem:COMMunicate:LAN:SCPI:HISLip:ENABle OFF | ON | 0 | 1
SYSTem:COMMunicate:LAN:SCPI:HISLip:ENABle?
SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle OFF | ON | 0 | 1
SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle?
SYSTem:COMMunicate:LAN:SCPI:SOCKet:CONTrol?
SYSTem:COMMunicate:LAN:SCPI:SOCKet:ENABle OFF | ON | 0 | 1
SYSTem:COMMunicate:LAN:SCPI:SOCKet:ENABle?
SYSTem:COMMunicate:LAN:SCPI:TELNet:ENABle OFF | ON | 0 | 1
SYSTem:COMMunicate:LAN:SCPI:TELNet:ENABle?
SYSTem:COMMunicate:SOURce:DUT|SYSTem:ADDRess <addressstring>
SYSTem:COMMunicate:SOURce:DUT|SYSTem:ADDRess?
SYSTem:COMMunicate:USB:CONNection?
SYSTem:COMMunicate:USB:PACKets?
SYSTem:COMMunicate:USB:STATus?
SYSTem:CONFigure:GENerator:CONTrol:STATe
SYSTem:CONFigure:LOSCillator:COMMand:AUXiliary
SYSTem:CONFigure:LOSCillator:COMMand:FREQuency:PREFix
SYSTem:CONFigure:LOSCillator:COMMand:FREQuency:SUFFix
SYSTem:CONFigure:LOSCillator:COMMand:POWer:PREFix
SYSTem:CONFigure:LOSCillator:COMMand:POWer:SUFFix
SYSTem:CONFigure:LOSCillator:PARameter:MAXimum[:FREQuency]
```

```
SYSTem:CONFigure:LOSCillator:PARameter:MINimum[:FREQuency]
SYSTem:CONFigure:LOSCillator:PARameter:MULTiplier (NFA)
SYSTem:CONFigure:LOSCillator:PARameter:POWer[:LEVel] (NFA)
SYSTem:CONFigure:LOSCillator:PARameter:SETTling[:TIME]
SYSTem:CONFigure:LOSCillator:TYPE
SYSTem:CONFigure[:SYSTem]?
SYSTem:CSYStem?
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[:NFIGure]:CONFigure:LOSCillator:CONTrol[:STATe] (NFA/PSA)
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
SYSTem:SHOW?
SYSTem:TEMPerature:HEXTreme?
SYSTem:TEMPerature:LEXTreme?
SYSTem:TIME "<hour>, <minute>, <second>"
SYSTem:TIME?
SYSTem:VERSion?
TRACe[1]|2|...|6:DISPlay[:STATe] ON | OFF | 0 | 1
TRACe[1]|2|...|6:DISPlay[:STATe]?
TRACe:MODE VIEW
TRACe:MODE BLANk
TRACe:NFIGure:WRITe:ALL
TRACe[1]|2|...|6:UPDate[:STATe] ON | OFF | 0 | 1
TRACe[1]|2|...|6:UPDate[:STATe]?
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 69
- "X-Series Status Register System (2) " on page 70

X-Series Status Register System (1)

STATus:QUEStionable:CALibration:EXTended:NEEDed

Unused — 0
Align 9kHz-30MHz required — 1
Align 30MHz-1GHz required — 2
Reserved — 3
Input Attenuation not calibrated — 4
Unused — 5
Unused — 6
Unused — 7
MPA Align required — 8
Unused — 9
Unused — 10
Unused — 11
Unused — 12
Unused — 13
Unused — 14
Always Zero (0) — 15

STATus:QUEStionable:CALibration:EXTended:FAILure

Align 9kHz to 30MHz failed — 0
Align 30MHz to 1GHz failed — 1
Characterize Preselector Failure — 2
Unused — 3
Unused — 4
Unused — 5
Align Source IQ failed — 6
Align Source RF failed — 7
MPA Align failed — 8
Unused — 9
Unused — 10
Unused — 11
Unused — 12
Unused — 13
Unused — 14
Always Zero (0) — 15

STATus:QUEStionable:CALibration:SKIPped

Align RF Skipped — 0
Unused — 1
Unused — 2
Unused — 3
Unused — 4
Unused — 5
Unused — 6
Unused — 7
Unused — 8
Unused — 9
Unused — 10
Unused — 11
Unused — 12
Unused — 13
Unused — 14
Always Zero (0) — 15

STATus:QUEStionable:INTegrity:SIGNal

Unused — 0
Unused — 1
Burst Not Found — 2
Timing Error — 3
Carrier(s) incorrect or missing — 4
Freq Out of Range — 5
Sync Error — 6
Demod Error — 7
Signal Too Noisy — 8
Slot Error — 9
Unused — 10
Unused — 11
Unused — 12
Unused — 13
Unused — 14
Always Zero (0) — 15

* AU = Accuracy Unspecified, XX = Model-specific Frequency

STATus:QUEStionable:INTegrity:UNCalibrated

Meas Uncal — 0
Signal ID on — 1
No Long Code Phase — 2
AC coupled: AU* < 10 MHz — 3
User Cal — 4
Calibration — 5
Source Uncal — 6
Preamp: AU* < XX kHz — 7
Unused — 8
Unused — 9
Unused — 10
Unused — 11
Unused — 12
Unused — 13
Unused — 14
Always Zero (0) — 15

STATus:QUEStionable:POWer

RPP Tripped — 0
Source Unleveled — 1
Source LO Unleveled — 2
LO Unleveled — 3
Unused — 4
Unused — 5
Unused — 6
Unused — 7
Unused — 8
Unused — 9
Unused — 10
Unused — 11
Unused — 12
Unused — 13
Unused — 14
Always Zero (0) — 15

→ P

STATus:QUEStionable:TEMPerature

Ref Osc Oven Cold — 0
Unused — 1
Unused — 2
Unused — 3
Unused — 4
Unused — 5
Unused — 6
Unused — 7
Unused — 8
Unused — 9
Unused — 10
Unused — 11
Unused — 12
Unused — 13
Unused — 14
Always Zero (0) — 15

→ T

STATus:QUEStionable:FREQuency

Source Synth Unlocked — 0
Freq Ref Unlocked — 1
2nd LO Unlocked — 2
Unused — 3
LO Unlocked — 4
Unused — 5
IF Synth Unlocked — 6
Cal Osc Unlocked — 7
Unused — 8
Demodulation — 9
Ref out of range — 10
Unused — 11
Unused — 12
Unused — 13
Unused — 14
Always Zero (0) — 15

→ F

*See
Next
Page*

STATus:QUEStionable:CALibration

Unused — 0
Unused — 1
TG Alignment Failure — 2
RF Align Failure — 3
IF Align Failure — 4
LO Align Failure — 5
ADC Align Failure — 6
FM Demod Alignment Failure — 7
EXTended Align Needed Sum — 8
Extended Align Failure Sum — 9
Unused — 10
Align Skipped Sum — 11
Align RF Now Needed — 12
Unused — 13
Align All Now Needed — 14
Always Zero (0) — 15

→ C

STATus:QUEStionable:INTegrity

SIGNal Summary — 0
No Results Available — 1
Unused — 2
UNCalibrated Summary — 3
Input Overload — 4
Reserved — 5
Reserved — 6
Insufficient Data — 7
Meas Error — 8
Memory Error — 9
I/O Error — 10
Trigger Error — 11
Invalid Data — 12
Settings Alert — 13
Setting Modified — 14
Always Zero (0) — 15

→ I

X-Series Status Register System (2)

*See
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Page*

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?
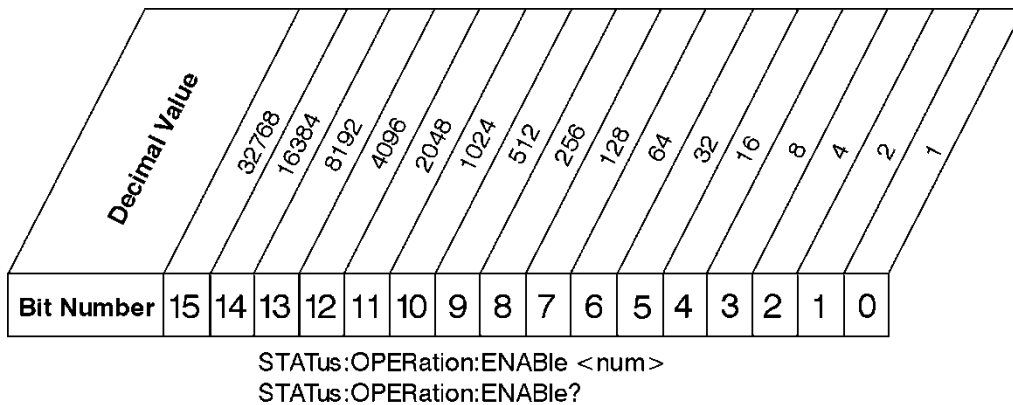
Standard Operation Event Enable Register   ck730a

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 who's RQS bit is set to 1 is the device that requested service.

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

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

1. Set INITiate:CONTinuous off.

2. Set/enable the status registers.

3. Restart the measurement (send INIT).

Status Register System

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

The Status Byte Register
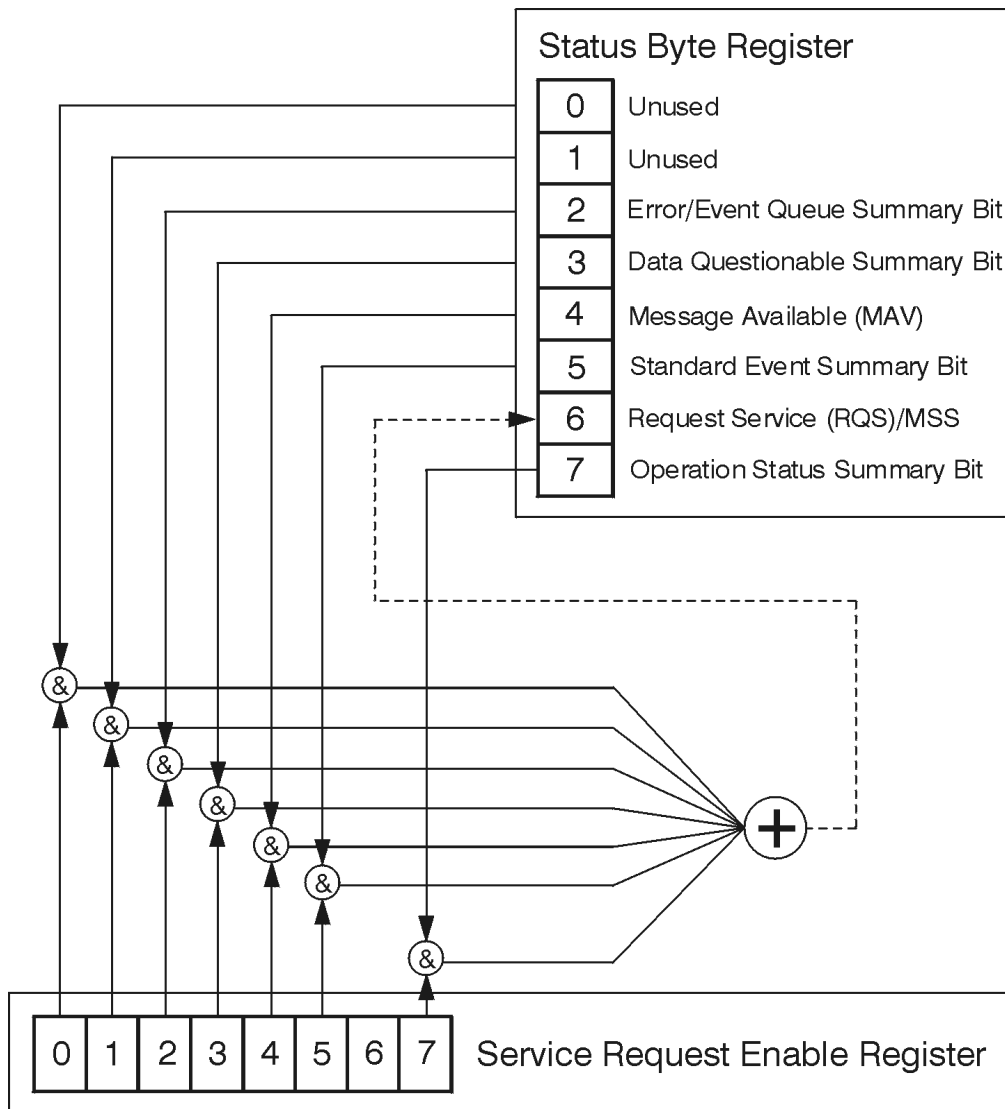
ck776a

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

*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?
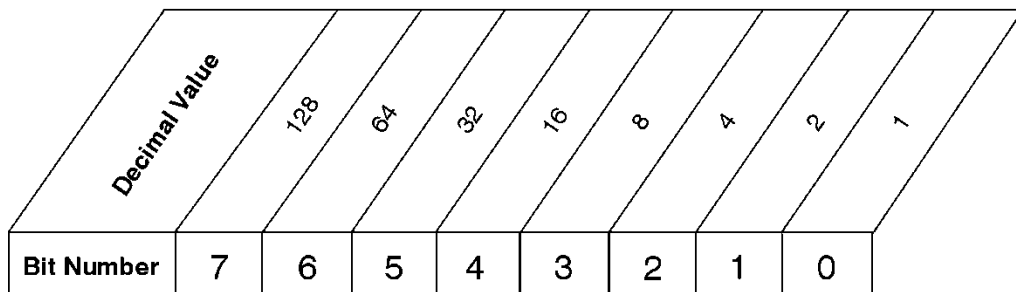
Service Request Enable Register   ck726a

Standard Event Status Register
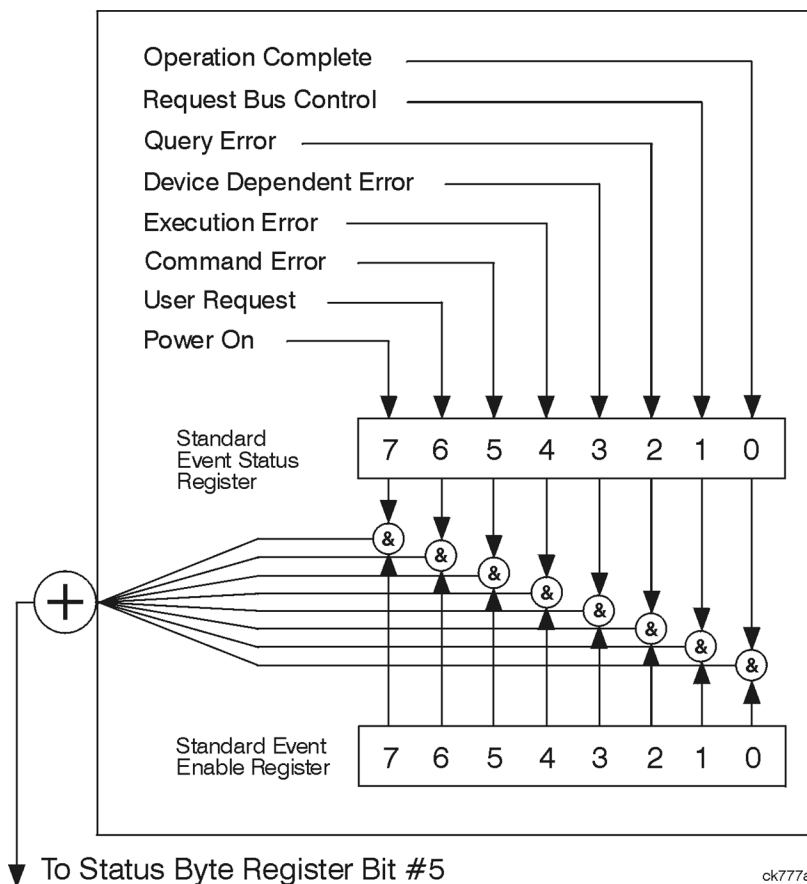
To Status Byte Register Bit #5   ck777a

The standard event status register contains the following bits:

*ESR?
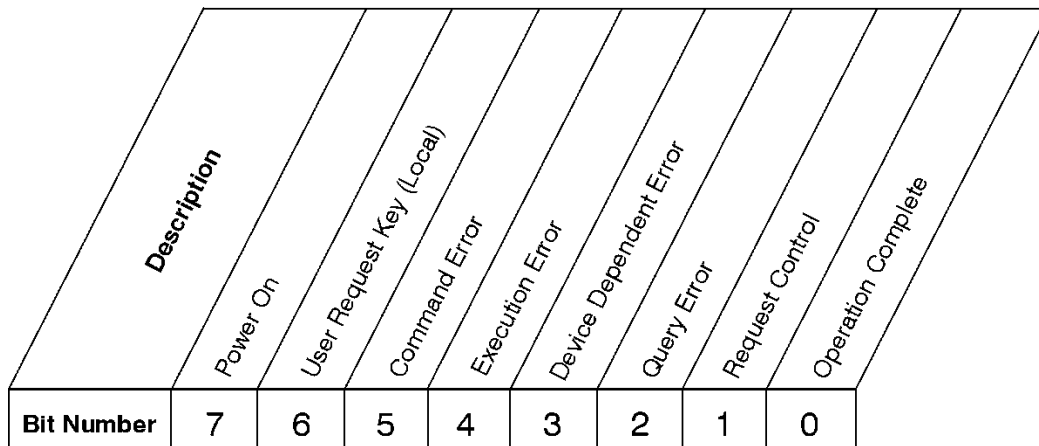
Standard Event Status Register

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).
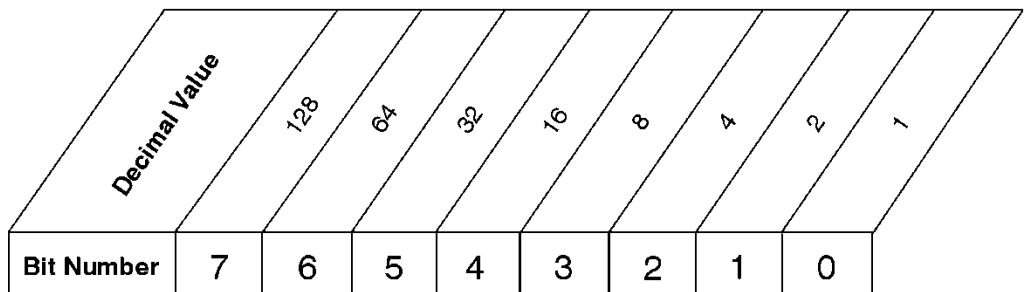
*ESE <num>
*ESE?
Standard Event Status Enable Register   ck728a

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

STATus Subsystem Command Descriptions

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

Numeric values for bit patterns can be entered using decimal or hexadecimal representations. (i.e. 0 to 32767 is equivalent to #H0 to #H7FFF. It is also equal to all ones, 111111111111111) See the SCPI Basics information about using bit patterns for variable parameters.

Operation Register

"Operation Condition Query" on page 81

"Operation Enable" on page 82

"Operation Event Query" on page 82

"Operation Negative Transition" on page 82

"Operation Positive Transition" on page 83

Operation Condition Query

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

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

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

Operation Enable

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

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

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

Operation Event Query

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

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

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

Operation Negative Transition

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

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

Operation Positive Transition

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

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

Preset the Status Byte

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

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

Questionable Register

Questionable Condition

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

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

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

Questionable Enable

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

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

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

Questionable Event Query

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

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

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

Questionable Negative Transition

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

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

Questionable Positive Transition

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

Mode	All

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

Questionable Calibration Register

Questionable Calibration Condition

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

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

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

Questionable Calibration Enable

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

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

Questionable Calibration Event Query

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

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

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

Questionable Calibration Negative Transition

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

Mode	All
Remote Command	:STATus:QUEStionable:CALibration:NTRansition <integer>
	:STATus:QUEStionable:CALibration:NTRansition?
Example	STAT:QUES:CAL:NTR 16384 Alignment is not required.
Preset	0
Min	0

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

Questionable Calibration Positive Transition

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

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

Questionable Calibration Skipped Register

Questionable Calibration Skipped Condition

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

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

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:SKIPped:CONDition?`

Example	STAT:QUES:CAL:SKIP:COND?
Preset	0
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Skipped Enable

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

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

Questionable Calibration Skipped Event Query

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

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

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

Questionable Calibration Skipped Negative Transition

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

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

Questionable Calibration Skipped Positive Transition

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

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:SKIPped:PTRansition <integer>`
	`:STATus:QUEStionable:CALibration:SKIPped:PTRansition?`
Example	STAT:QUES:CAL:SKIP:PTR 1 Align RF skipped is required.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Failure Register

"Questionable Calibration Extended Failure Condition " on page 91

"Questionable Calibration Extended Failure Enable " on page 91

"Questionable Calibration Extended Failure Event Query " on page 91

"Questionable Calibration Extended Failure Negative Transition " on page 92

Questionable Calibration Extended Failure Condition

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

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

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

Questionable Calibration Extended Failure Enable

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

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

Questionable Calibration Extended Failure Event Query

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

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

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

Questionable Calibration Extended Failure Negative Transition

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

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:FAILure:NTRansition <integer>`
	`:STATus:QUEStionable:CALibration:EXTended:FAILure:NTRansition?`
Example	STAT:QUES:CAL:EXT:FAIL:NTR 1 EMI conducted align failure is not required.
Preset	0
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

Questionable Calibration Extended Failure Positive Transition

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

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:FAILure:PTRansition <integer>`
	`:STATus:QUEStionable:CALibration:EXTended:FAILure:PTRansition?`
Example	STAT:QUES:CAL:EXT:FAIL:PTR 1 EMI conducted align failure is required.
Preset	32767
Min	0
Max	32767

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

Questionable Calibration Extended Needed Register

Questionable Calibration Extended Needed Condition

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

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

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

Questionable Calibration Extended Needed Enable

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

Mode	All
Remote Command	:STATus:QUEStionable:CALibration:EXTended:NEEDed:ENABle <integer>
	:STATus:QUEStionable:CALibration:EXTended:NEEDed:ENABle?
Example	STAT:QUES:CAL:EXT:NEED:ENAB 2 Can be used to query if an EMI conducted alignment is needed.
Preset	32767
Min	0

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

Questionable Calibration Extended Needed Event Query

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

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

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

Questionable Calibration Extended Needed Negative Transition

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

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

Questionable Calibration Extended Needed Positive Transition

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

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

Questionable Frequency Register

Questionable Frequency Condition

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

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

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

Questionable Frequency Enable

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

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

Questionable Frequency Event Query

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

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

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

Questionable Frequency Negative Transition

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

Mode	All

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

Questionable Frequency Positive Transition

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

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

Questionable Integrity Register

Questionable Integrity Condition

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

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

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

Questionable Integrity Enable

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

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

Questionable Integrity Event Query

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

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

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

Questionable Integrity Negative Transition

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

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

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

Questionable Integrity Positive Transition

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

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

Questionable Integrity Signal Register

Questionable Integrity Signal Condition

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

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

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

Questionable Integrity Signal Enable

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

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

Questionable Integrity Signal Event Query

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

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

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

Questionable Integrity Signal Negative Transition

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

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

Questionable Integrity Signal Positive Transition

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

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

Questionable Integrity Uncalibrated Register

Questionable Integrity Uncalibrated Condition

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

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

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

Questionable Integrity Uncalibrated Enable

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

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

Questionable Integrity Uncalibrated Event Query

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

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

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

Questionable Integrity Uncalibrated Negative Transition

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

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

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

Questionable Integrity Uncalibrated Positive Transition

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

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

Questionable Power Register

Questionable Power Condition

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

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

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

Questionable Power Enable

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

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

Questionable Power Event Query

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

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

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

Questionable Power Negative Transition

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

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

Questionable Power Positive Transition

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

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

Questionable Temperature Register

Questionable Temperature Condition

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

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

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

Questionable Temperature Enable

This command determines which bits in the Questionable Temperature Condition Register will set bits in the Questionable Temperature Event register, which also sets the Temperature Summary bit (bit 4) in the Questionable Register. The variable <integer> is the sum of the decimal values of the bits you want to enable.

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

Questionable Temperature Event Query

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

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

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

Questionable Temperature Negative Transition

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

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

Questionable Temperature Positive Transition

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

Mode	All
Remote Command	`:STATus:QUEStionable:TEMPerature:PTRansition <integer>`
	`:STATus:QUEStionable:TEMPerature:PTRansition?`
Example	STAT:QUES:TEMP:PTR 1 Reference Oscillator Oven became cold will be reported to the

	Temperature Summary of the Status Questionable register.
Preset	32767
Min	0
Max	32767
Status Bits/OPC dependencies	Sequential command
Initial S/W Revision	Prior to A.02.00

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 374
*CLS	"Clear Status " on page 112
*ESE *ESE?	"Standard Event Status Enable " on page 112
*ESR?	"Standard Event Status Register Query " on page 113
*IDN?	"Identification Query " on page 113
*OPC *OPC?	"Operation Complete " on page 114
*OPT?	"Query Instrument Options " on page 115
*RCL	"Recall Instrument State " on page 115
*RST	"*RST (Remote Command Only)" on page 116
*SAV	"Save Instrument State " on page 116
*SRE *SRE?	"Service Request Enable " on page 116
*STB?	"Status Byte Query " on page 117
*TRG	"Trigger " on page 117
*TST?	"Self Test Query " on page 117
*WAI	"Wait-to-Continue " on page 118

All

(In MXE the key label is "All (plus RF Presel 20 Hz – 3.6 GHz)")Immediately executes an alignment of all subsystems In MXE, the Align Now All is followed by additionally aligning the RF Preselector section, so in MXE, the key label contains the parenthetical note "(plus RF Presel 20 Hz – 3.6 GHz)". The instrument stops any measurement currently underway, performs the alignment, then restarts the measurement from the beginning (similar to pressing the Restart key).

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

The query form of the remote commands (:CALibration[:ALL]? or *CAL?) invokes the alignment of all subsystems and returns a success or failure value. An interfering user signal is not grounds for failure; if the

alignment was able to succeed on all portions but unable to align the RF because of an interfering signal, the resultant will be the success value.

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

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

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

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

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

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

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

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

Clear Status

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

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

Standard Event Status Enable

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

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

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

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

Standard Event Status Register Query

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

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

Identification Query

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

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

- Manufacturer

- Model

- Serial number

- Firmware version

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

Operation Complete

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

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

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

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

Query Instrument Options

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

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

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

Recall Instrument State

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

- If the state being loaded has a newer firmware revision than the revision of the instrument, no state is recalled and an error is reported

- If the state being loaded has an equal firmware revision than the revision of the instrument, the state will be loaded.

- If the state being loaded has an older firmware revision than the revision of the instrument, the instrument will only load the parts of the state that apply to the older revision.

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

*RST (Remote Command Only)

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

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

Save Instrument State

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

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

Service Request Enable

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

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

Remote Command	`*SRE <integer>`
	`*SRE?`
Example	*SRE 22 Enables bits 1, 2, and 4 in the service request enable register.

Notes	For related commands, see the STATus subsystem and SYSTem:ERRor[:NEXT]? commands.
Preset	0
Min	0
Max	255
Status Bits/OPC dependencies	Service Request Enable Register (all bits, 0 – 7).
Initial S/W Revision	Prior to A.02.00

Status Byte Query

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

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

Trigger

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

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

Self Test Query

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

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

Wait-to-Continue

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

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

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.

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

Key Path	Front-panel key
Remote Command	`[:SENSe]:FEED RF|AIQ|EMIXer`
	`[:SENSe]:FEED?`
Example	:FEED RF
	:FEED?
Couplings	The [:SENSe]:FEED RF command turns the calibrator OFF
Preset	This setting is unaffected by a Preset or power cycle. It survives a Mode Preset and mode changes.
	It is set to RF on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`[:SENSe]:FEED AREFerence`
	In the PSA the calibrator was one of the inputs and selected using the AREF parameter to the same :FEED command that switched the inputs. In the X-Series it is controlled in a separate menu and overrides the input selection. For code compatibility the [:SENSe]:FEED AREFerence command is provided, and is aliased to [SENSe]:FEED:AREF REF50, which causes the input to be switched to the 50 MHz calibrator. The [:SENSe]:FEED RF command switches the input back to the RF port and turns the calibrator OFF, thus providing full compatibility with the PSA calibrator function.
	Note that after sending this, the query [:SENSe]:FEED? will NOT return "AREF" but instead the currently selected input.
Backwards Compatibility SCPI	`[:SENSe]:FEED IQ|IONLy|QONLy`
	`[:SENSe]:FEED?`
	The parameters IQ	IONLy	QONLy are supported for backwards compatibility with the E44406A.
	[:SENSe]:FEED IQ aliases to [:SENSe]:FEED: IQ:TYPE IQ
	[:SENSe]:FEED IONLy aliases to [:SENSe]:FEED:IQ:TYPE IONLy

	[:SENSe]:FEED QONLy aliases to [:SENSe]:FEED:IQ:TYPE QONLy
	The query [:SENSe]:FEED? will always returns AIQ whatever the type of legacy parameters IQ | IONLy | QONLy has been used.
Backwards Compatibility Notes	Most of the settings in the X-Series Input/Output system, including External Gain, Amplitude Corrections settings and data, etc., are shared by all modes and are not changed by a mode switch. Furthermore, most variables in the Input/Output system key are not affected by Mode Preset. Both of these behaviors represent a departure from legacy behavior.
	In the X-Series. Input/Output settings are reset by using the "Restore Input/Output Defaults" function. They can also be reset to their default values through the System->Restore System Defaults-> In/Out Config key or through the System ->Restore System Defaults -> All key (and corresponding SCPI).
	While this matches most use cases better, it does create some code compatibility issues. For example, Amplitude Corrections are no longer turned off by a Mode Preset, but instead by using the "Restore Input/Output Defaults" key/SCPI.
	Although Input/Output settings are not part of each Mode's State, they are saved in the Save State files, so that all of the instrument settings can be recalled with Recall State, as in legacy instruments.
Initial S/W Revision	Prior to A.02.00

Remote Command	`:INPut:MIXer EXTernal|INTernal`
	`:INPut:MIXer?`
Example	INP:MIX INT
	INP:MIX?
Notes	In legacy analyzers you choose between the Internal mixer or an External Mixer. In the X-Series, the External Mixer is one of the choices for the Input and is selected using the FEED command (:SENSe:FEED EXTMixer).
	For compatibility, the INPut:MIXer EXTernal|INTernal legacy command is mapped as follows:
	1. When INPut:MIXer EXTernal is received, SENSe:FEED EMIXer is executed.
	2. When INPut:MIXer INTernal is received, SENSe:FEED RF is executed.
	3. When INPut:MIXer? is received, the response will be INT if any input other than the external mixer is selected and EXT if the external mixer is selected
Preset	INT
Backwards Compatibility Notes	PSA supports the following SCPI Command :
	:INPut:MIXer:TYPE PRESelected|UNPReselect
	:INPut:MIXer:TYPE?
	PXA does not support the :INPut:MIXer:TYPE command.
Initial S/W Revision	A.08.01

Input/Output variables – Preset behavior

Virtually all the input/output settings are NOT a part of mode preset. They can be set to their default value

by one of the three ways:

- by using the Restore Input/Output Defaults key on the first page of the input/output menu,

- by using the System->Restore System Defaults->Input/Output Settings or,

- by using the System -> Restore System Defaults->All. Also, they survive a Preset and a Power cycle.

A very few of the Input/Output settings do respond to a Mode Preset; for example, if the Calibrator is on it turns off on a Preset, and if DC coupling is in effect it switches to AC on a Preset. These exceptions are made in the interest of reliability and usability, which overrides the need for absolute consistency. Exceptions are noted in the SCPI table for the excepted functions.

RF Input

Selects the front-panel RF input port to be the analyzer signal input. If RF is already selected, pressing this key accesses the RF input setup functions.

Key Path	Input/Output
Example	[:SENSe]:FEED RF
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

RF Coupling

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

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

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

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

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

Key Path	Input/Output, RF Input
Remote Command	:INPut:COUPling AC|DC
	:INPut:COUPling?
Example	INP:COUP DC
Dependencies	This key does not appear in models that are always AC coupled. When the SCPI command to set DC coupling is sent to these models, it results in the error "Illegal parameter value; This model is always AC coupled" In these models, the SCPI query INP:COUP? always returns AC.
	This key does not appear in models that are always DC coupled.When the SCPI command to set AC coupling is sent to these models, it results in the error "Illegal parameter value; This instrument is always DC coupled" In these models, the SCPI query INP:COUP? always returns DC.
Preset	AC on models that support AC coupling
	On models that are always DC coupled, such as millimeter wave models (frequency ranges 30 GHz and above), the preset is DC.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.03.00

External Mixer

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

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

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

See "More Information" on page 124

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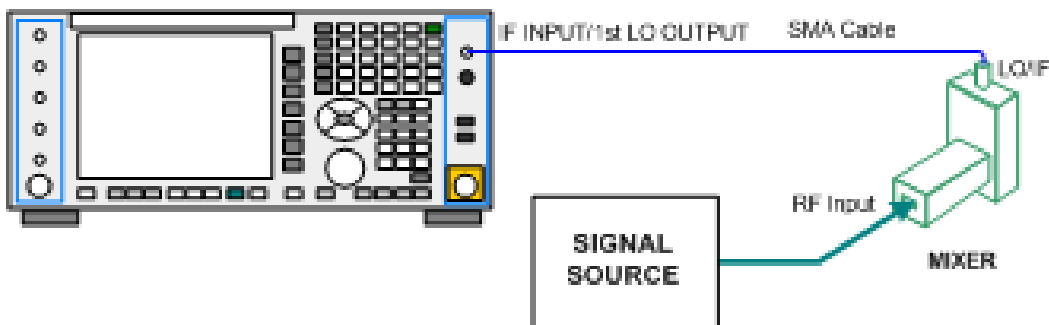
Legacy HP/Agilent and some third party mixers have separate LO In and IF out connections. This requires you to use an external diplexer to connect these mixers. A diplexer can easily be purchased for this purpose (for example, Diplexer Model # DPL.26 or # DPL.313B from OML Inc., Morgan Hill CA)

The connection diagram for such a legacy mixer is:
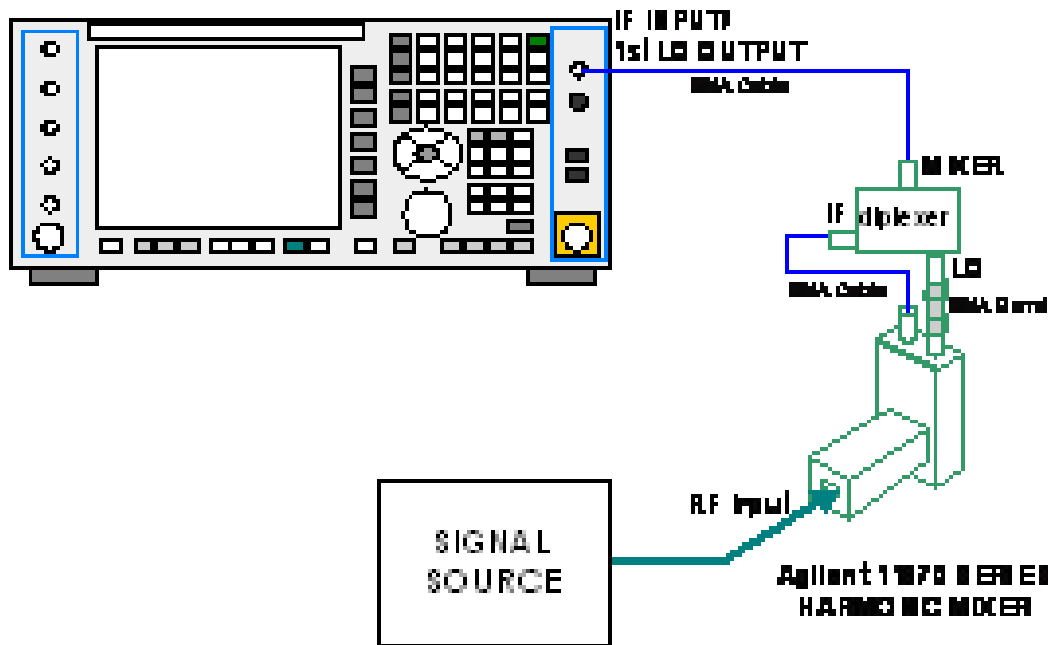
In addition, External Mixing in the X-Series supports the new Agilent M1970 series of Harmonic Mixers, which provide a USB connection for download of calibration data and additional control.

The connection diagram for one of the Agilent USB mixers is:
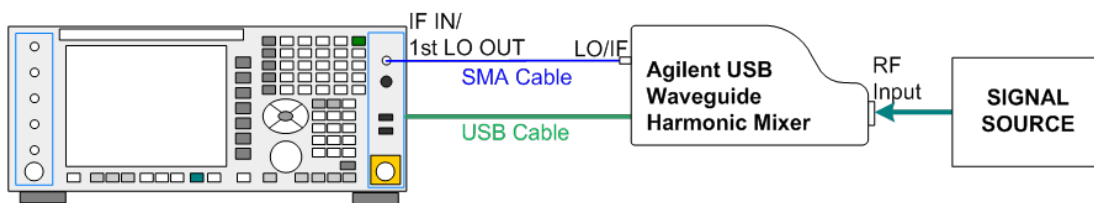
External Mixing is only supported in certain Modes and Measurements in the X-Series, as shown in the table below:

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

* the Swept SA measurement also supports Image Shift

Ext Mix Setup

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

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

NOTE	The 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
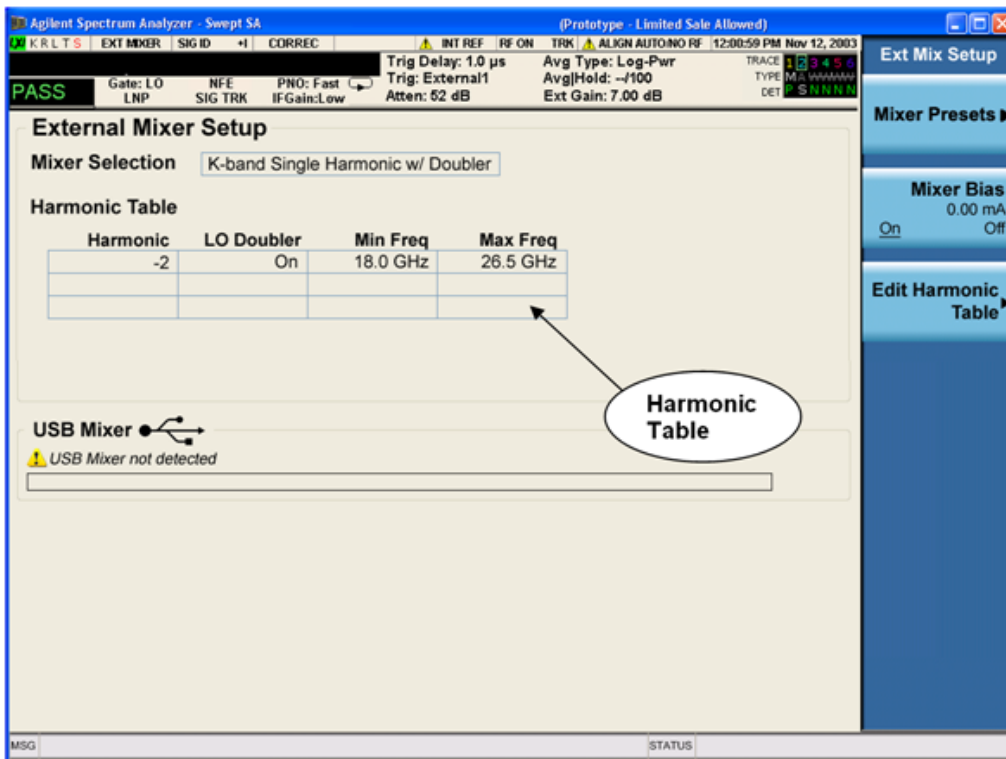
The External Mixer Setup screen looks like this

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 (Span=Stop Freq – Start Freq), the analyzer uses the maximum Span the measurement allows, and sets the Center Freq to the midpoint of the Start and Stop Freq values in the Harmonic Table.
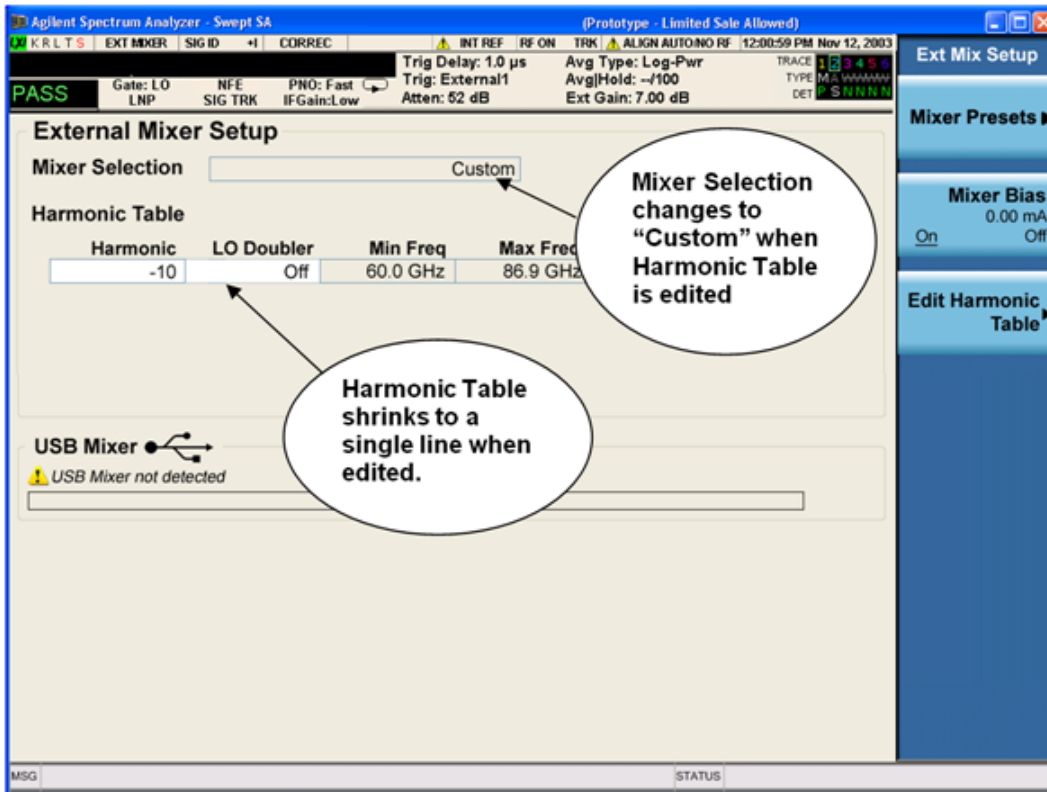
You may customize the Harmonic Table, but when you do this the analyzer goes into "single harmonic" mode. You may enter the harmonic number and whether to use the doubler or not, but now range switching is not supported, so you can only have one harmonic.

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

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

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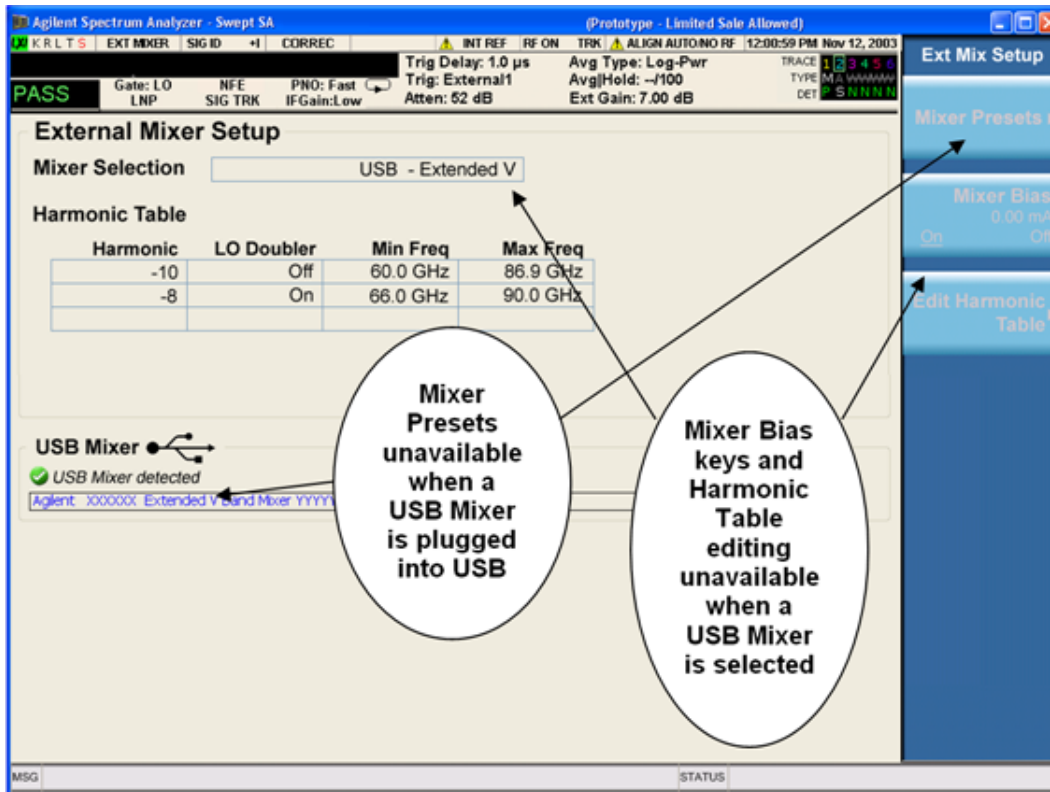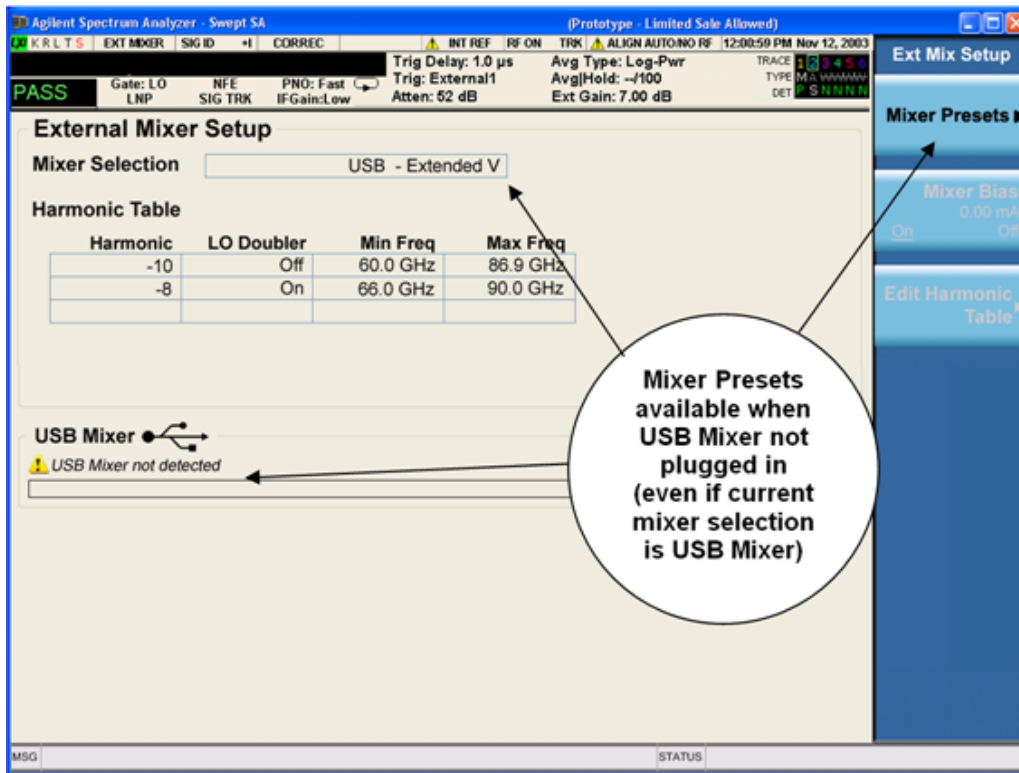
Only one USB Mixer is supported at a time. To switch to a different USB Mixer, disconnect the one that is no longer being used prior to connecting a new one.

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

Remote Command	`[: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?`

Example	:MIX:BAND A :MIX:BAND?
Notes	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:
	USBE Agilent E-Band USB Mixer
	USBV Agilent V-Band USB Mixer
	USBVEXT Agilent Extended V-Band USB Mixer
	USBWAgilent W-Band USB Mixer
	Note that the parameters CUSTOM, USBV, USBVEXT, and USBW are query responses only, and cannot be sent TO the analyzer.

	The following cross-reference matches the mixer band designators used by Agilent to the EIA waveguide designations:
	EIAAgilentFreq Range
	WR–28 A26.5 – 40 GHz
	WR–22 Q33 – 50 GHz
	WR–19 U40 – 60 GHz
	WR–15 V50 – 75 GHz
	WR–12 E60 – 90 GHz
	WR–10 W75 – 110 GHz
	WR–8 F90 – 140 GHz
	WR–6 D110 – 170 GHz
	WR–5 G140 – 220 GHz
	WR–3 J220 – 325 GHz
Preset	When Restore Input/Output Defaults is performed, an "A" mixer preset is also issued (11970A band), unless an Agilent USB Mixer is plugged into the analyzer's USB port, in which case the Mixer Selection remains unchanged.
	When using Agilent USB Mixers, if a Restore All Deafults (SCPI command SYSTem:DEFault) has been perform, either remove and reinsert the USB cable or press the Refresh USB Mixer Connection softkey.
Backwards Compatibility Notes	The [:SENSe]:MIXer:BAND command was used in PSA and ESA to select the mixer band. In the X-Series, only the legacy parameters A, Q, U, V, and W are honored, and they preset the analyzer to match the corresponding Agilent 11970 legacy mixer. Parameters D, E, F, G ,J , K, Y, which were accepted in ESA and PSA, return an error if sent. If you are using a mixer in one of these bands, you should study the tables of presets and choose the appropriate preset to match your application. Also the USER parameter is no longer accepted, as the control model for mixer customization is very different in the X-Series.
Initial S/W Revision	A.08.01
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.

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
Example	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
Example	MIX:BAND MA
Initial S/W Revision	A.08.01

These are the presets for multiple harmonic operation:

Mixer	Readout in setup screen	Readback on softkeys	Range	Harm #	Dblr?	RF start	RF stop	RF Center
A-band	A-band 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).

Key Path	Input/Output, External Mixer, Ext Mix Setup
Remote Command	`[:SENSe]:MIXer:BIAS <real>`
	`[:SENSe]:MIXer:BIAS?`
	`[:SENSe]:MIXer:BIAS:STATe OFF|ON|0|1`
	`[:SENSe]:MIXer:BIAS:STATe?`
Example	:MIX:BIAS 0
	:MIX:BIAS?
	MIX:BIAS:STAT 0
	MIX:BIAS:STAT?
Preset	This is unaffected by Preset but is set to OFF and 0 on a "Restore Input/Output Defaults"
State Saved	Saved ininstrument state
Min	–10 mA
Max	10 mA
Initial S/W Revision	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 Tablekey, 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 it 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
Remote Command	[:SENSe]:MIXer:TTYPe SINGle|HARMonic|DOUBler
	[:SENSe]:MIXer:TTYPE?
Example	:MIX:TTYP SING
Couplings	When you change the Table Type, the Mixer Selection changes to "Custom"
Preset	Depends on the current Mixer Preset. This is unaffected by Mode Preset, but on a "Restore Input/Output Defaults" the Mixer is preset to 11970A, for which the Table Type is Harmonic Switching
State Saved	Saved in instrument state
Initial S/W Revision	A.09.491

Single Row

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

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

Harmonic Switching

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

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

Harmonic

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

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

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

Refresh USB Mixer Connection

This operation re-reads the USB devices and refreshes connection to 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
Example	:MIX:BAND USB

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 Trace1. 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 Supress 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 143 is installed.

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

Key Path	Input/Output
Mode	BASIC, CDMA2K, EDGEGSM, TDSCMDA, VSA89601, WIMAXOFDMA, LTE, LTETDD, LTEAFDD, LTEATDD, 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 MΩ 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 Ω single ended and the probe power is supplied through the Infinimax interface. The probe can be configured for a variety of input coupling and low frequency rejection modes. In addition, a wide range of offset voltages and probe attenuation accessories are supported at the probe interface. The active probe has the advantage that it does not significantly load the circuit under test, even with unity gain probing.

With passive 1 MΩ probes, the probe will introduce a capacitive load on the circuit, unless higher attenuation is used at the probe interface. Higher attenuation reduces the signal level and degrades the signal-to-noise-ratio of the measurement. Passive probes are available with a variety of attenuation values for a moderate cost. Most Agilent passive probes can be automatically identified by the system, setting the input impedance setting required as well as the nominal attenuation. For single ended

measurements a single probe is used for each channel. Other passive probes can be used, with the attenuation and impedance settings configured manually.

For full differential measurements, the system supports probes on each of the four inputs. The attenuation of the probes should be the same for good common mode rejection and channel match.

Both active and passive probes in single ended and differential configurations can be calibrated. This calibration uses the Cal Out BNC connection and a probe connection accessory. The calibration achieves excellent absolute gain flatness in a probed measurement. It matches both the gain and frequency response of the I and Q channels as well as any delay skew, resulting in high accuracy in derived measurements such as Error Vector Magnitude (EVM).

When a probe is connected a status message will be displayed. The message will indicate if calibration data is available or not. Calibration data is saved for each type of probe (including "none") for each port and will be reapplied whenever that type of probe is re-connected to the same port. For probes with EEPROM identification, the calibration data will be stored based on the unique probe identifier and will reapply data for that particular probe if it is available. The data will not follow a probe from one port to another. For probes without EEPROM identification, the instrument cannot distinguish between different probes of the same type and it will use the data from the last calibration for that probe type on that port.

When in differential mode, both the main and complementary probes are expected to be of the same type.

In some situations, the I and Q channels should be configured identically. In other situations it is convenient to control them independently. Some menus have a "Q Same as I" setting that will cause the Q channel configuration to mirror the I channel configuration, avoiding the overhead of double data entry when the channels should be the same.

The output port is for calibrating the I/Q input ports, although it can also be manually controlled.

There are two types of calibrations available: cable calibration and probe calibration. The cable calibration will guide the user through connecting each input port in turn. All ports must be calibrated together. The probe calibration is done for a specific channel (I or Q). If in Single-Ended mode, only the main port is calibrated. When in Differential Input mode, the user is guided through calibrating both main and complementary ports.

The front panel I/Q port LEDs indicate the current state of that port. On (green) indicates it is active, and off (dark) indicates it is not in use. For example, the Cal Out port LED is on if and only if there is signal coming out of that port.

The input is a context and some parameters have separate values for each context. The SCPI for these parameters has an optional "[:RF|IQ]" node. If the specific context is omitted, the command acts on the current input context's value. Here are the parameters that are input context sensitive:

- Center Frequency

- Trigger Source

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

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

I+jQ

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

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

I Only

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

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

Q Only

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

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

I Setup

Access the channel setup parameters for the I channel.

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

I Differential Input

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

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

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

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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 .

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

Attenuation

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

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

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

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

Calibrate

Invokes the guided probe calibration. The guided probe calibration is context sensitive and depends on the channel (I or Q) and the Differential Input state. The calibration is only performed on the selected channel. When Differential Input is on, both the probe attached to the main port and the probe attached to the complementary port are calibrated. When Differential Input is off, only the probe attached to the main port is calibrated. See "I/Q Guided Calibration " on page 182.

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

Clear Calibration

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

Key Path	Input/Output, I/Q, I Setup	Q Setup, I Probe	Q Probe
Remote Command	`:CALibration:IQ:PROBe:I|Q:CLEar`
Example	Clear the calibration data for the I channel and the current probe (with EEPROM identification) or probe type (without EEPROM identification).

	:CAL:IQ:PROBe:I:CLE
Initial S/W Revision	Prior to A.02.00

Combined Differential/Input Z (Remote Command Only)

This is Remote Command only (no front panel) and is for backwards compatibility only. It combines the Differential Input and Input Z selections into a single SCPI command.

Remote Command	:INPut:IMPedance:IQ U50|B50|U1M|B1M
	:INPut:IMPedance:IQ?
Example	:INPut:IMPedance:IQ U50
	This is equivalent to the following two SCPI commands:
	:INP:IQ:DIFF OFF
	:INP:IQ:IMP 50
Notes	Provided for E4406A code compatibility.
	The enum values translate as follows:
	U50: Differential Input = Off, Input Z = 50Ω
	B50: Differential Input = On, Input Z = 50Ω
	U1M: Differential Input = Off, Input Z = 1 MΩ
	B1M: Differential Input = On, Input Z = 1 MΩ
	This command is for backwards compatibility. It combines the Input Z (50Ω or 1 MΩ) parameter with the Differential Input (Off = "Unbalanced", On = "Balanced") parameter into a single enumeration.
	This backwards compatibility SCPI command was for an instrument without independent settings for the I and Q channels. Therefore, it is tied only to the I channel and does not provide an equivalent for the Q channel. For proper operation of the backwards compatibility command Q Same as I should be set to On.
	Also, note the subtle difference between this SCPI command and the backwards compatibility command for Input Z. The Input Z SCPI has "IQ" before "IMP" while this command has that order reversed.
Couplings	This command does not have an independent parameter, but instead is tied to the Differential Input and Input Z parameters. The coupling for those parameters apply to this command too.
Preset	U50
Initial S/W Revision	Prior to A.02.00

Q Setup

Access the channel setup parameters for the Q channel.

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

Q Same as I

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

Key Path	Input/Output, I/Q, Q Setup
Remote Command	:INPut:IQ:MIRRored OFF|ON|0|1
	:INPut:IQ:MIRRored?
Example	Turn off the mirroring of parameters from I to Q.
	INP:IQ:MIRR OFF
Couplings	Only displayed for the Q channel. When Yes, the I channel values for some parameters are mirrored (copied) to the Q channel. However, when a parameter is determined by the type of probe and a probe is sensed, the probe setting is always used and the I channel setting is ignored. The following parameters are mirrored:
	Differential Input (when not determined by probe)
	Input Z (when not determined by probe)
Preset	This is unaffected by a Preset but is set to the default value (Q Same as I set to "On") on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in instrument state
Range	On | Off
Readback Text	"Q Same as I" when On, otherwise none.
Initial S/W Revision	Prior to A.02.00

Q Differential Input

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

Key Path	Input/Output, I/Q, Q Setup
Remote Command	:INPut:IQ:Q:DIFFerential OFF|ON|0|1
	:INPut:IQ:Q:DIFFerential?
Example	Put the Q channel in Differential Input mode
	INP:IQ:Q:DIFF ON
Notes	When Differential Input = On, the analyzer will check for attenuation mismatches between the Q and Q-bar ports. If the difference in attenuation values exceeds 0.5 dB a Settings Alert error condition, error 159 will be set.
	When Q Differential Input = On, and IQ Path is I+jQ, the I Differential input must also be On. Similarly, when Q Differential Input = Off, and IQ Path is I+jQ, the I Differential input must also be

	Off. If the states of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Differential.
Couplings	Some active probes include built-in differential capability. When one of these probes is sensed, this key is disabled. Since the differential capability is handled in the probe, the Analyzer will use only the main port and the key will show that the Analyzer's Differential Input mode is Off (indicating that the complementary port not in use).
	When a differential probe is not sensed and Q Same as I is On, the value set for I will be copied to Q. This key is disabled when Q Same as I is On.
Preset	Off
State Saved	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 MΩ
	INP:IQ:Q:IMP HIGH
Notes	LOW = 50 Ω, HIGH = 1 MΩ
	When IQ Path is I+jQ, the I Input Z setting must be the same as the Q Input Z setting. If the settings of the two inputs do not match, an error condition message is generated, 159;Settings Alert;I/Q mismatch:Input Z.
Couplings	Input impedance is a built-in characteristic of a probe. Therefore, whenever a probe is sensed, this key is disabled and the value is set to match the probe.
	When no probe is sensed and Q Same as I is On, the value set for I will also be copied to Q. This key is disabled when Q Same as I is On.
Preset	LOW
State Saved	Yes
	This is unaffected by Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	50 Ω	1 MΩ
Initial S/W Revision	Prior to A.02.00

Q Skew

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

Key Path	Input/Output, I/Q, Q Setup
Remote Command	[:SENSe]:CORRection:IQ:Q:SKEW <seconds>
	[:SENSe]:CORRection:IQ:Q:SKEW?
Example	Delay the data for the Q channel by 10 ns.
	CORR:IQ:Q:SKEW 10 ns
Preset	0
State Saved	Yes
	This is unaffected by a Preset but is set to the default value on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Range	0 s to 100 ns
Min	0 s
Max	+100 ns
Initial S/W Revision	Prior to A.02.00

Q Probe

Accesses the probe setup parameters for the Q channel. See.

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

Attenuation

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

Key Path	Input/Output, I/Q, I Setup	Q Setup, I Probe	Q Probe
Remote Command	[:SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio <real>
	[:SENSe]:CORRection:IQ:I|Q:ATTenuation:RATio?
Example	Set the attenuation for the current I probe to 100.00:1.
	CORR:IQ:I:ATT:RAT 100

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

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

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

Calibrate

Invokes the guided probe calibration. The guided probe calibration is context sensitive and depends on the channel (I or Q) and the Differential Input state. The calibration is only performed on the selected channel. When Differential Input is on, both the probe attached to the main port and the probe attached to the complementary port are calibrated. When Differential Input is off, only the probe attached to the main port is calibrated. See "I/Q Guided Calibration " on page 182.

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 149).

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

I/Q Cable Calibrate...

The I/Q cable calibration creates correction data for each of the front panel I/Q ports. This calibration data is used whenever no probe specific calibration data is available. It is important that all ports are calibrated

using the same short BNC cable so that the data is comparable from port to port.

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

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

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

For example, if the prior instrument state is Cal Out = Off, Input = I+jQ, and Differential = Off, then up until the time the "Next" button is pressed the I Input and Q Input LEDs are on and the Cal Out, I-bar Input and Q-bar Input LEDs are off. Once the "Next" button is pressed for the I port calibration, only the Cal Out and I Input LEDs will be on and the others will be off. When the screen progresses to the next step ("Next" button again enabled), the prior state is restored and only the I Input and Q Input LEDs are on (Cal Out is off again).

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

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

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).

Attenuation

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

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

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

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

Offset

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

Key Path	Input/Output, I/Q, I Setup | Q Setup, I Probe | Q Probe
Remote Command	:INPut:OFFSet:I|Q <voltage>
	:INPut:OFFSet:I|Q?
Example	Remove a DC offset of –0.5 V from the I channel input.
	INP:OFFS:I –0.5
Notes	Only some probe types support Offset. For those that do, each probe type has its own Offset setting. As probes are changed the Offset value will reflect the new probe's setting. Changing the Offset affects only the current probe type's setting and leaves all others unchanged.
Preset	0 V
State Saved	Saved with probe calibration data. It survives power cycle and is not affected by Preset or Restore.
Range	–18 V to +18 V
Min	–18 V
Max	+18 V
Initial S/W Revision	Prior to A.02.00

Coupling

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

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

DC

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

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

LFR1

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

Key Path	Input/Output, I/Q, I Setup	Q Setup, I Probe	Q Probe, Coupling
Example	Turn on low frequency rejection on the I channel for frequencies lower than 1.7 Hz
	INP:COUP:I LFR1
Initial S/W Revision	Prior to A.02.00

LFR2

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

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

Calibrate

Invokes the guided probe calibration. The guided probe calibration is context sensitive and depends on the channel (I or Q) and the Differential Input state. The calibration is only performed on the selected channel. When Differential Input is on, both the probe attached to the main port and the probe attached to the complementary port are calibrated. When Differential Input is off, only the probe attached to the main port is calibrated. See "I/Q Guided Calibration " on page 182.

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

Restore Input/Output Defaults

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

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

Key Path	Input/Output
Example	:SYST:DEF INP presets all the Input/Output variables to their factory default values.
Notes	Refer to the Utility Functions for information about Restore System Defaults and the complete description of the :SYSTem:DEFault INPut: command.
Initial S/W Revision	Prior to A.02.00

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
Remote Command	`[:SENSe]:ROSCillator:SOURce:TYPE INTernal	EXTernal	SENSe	PULSe`  `[:SENSe]:ROSCillator:SOURce:TYPE?`
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 dependencies	STATus:QUEStionable:FREQuency bit 1 set if unlocked.
Backwards Compatibility Notes	Freq Ref In was not saved in state in the legacy instruments. It is a part of state in the X-Series.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.14.00

Remote Command	`[:SENSe]:ROSCillator:SOURce?`
Notes	The query [SENSe]:ROSCillator:SOURce? returns the current switch setting. This means: 1. If it was set to SENSe but there is no external reference nor 1pps signal so the instrument is

actually using the internal reference, then this query returns INTernal and not SENSe.

2. If it was set to SENSe and there is an external reference present, the query returns EXTernal and not SENSe.

3. If it was set to SENSe and there is a 1 pps signal present, the query returns PULSe and not SENSe.

4. If it was set to EXTernal, then the query returns "EXTernal"

5. If it was set to INTernal, then the query returns "INTernal".

6. If it was set to PULSe, then the query returns "PULSe"

Preset	SENSe
Backwards Compatibility Notes	The query [:SENSe]:ROSCillator:SOURce? was a query-only command in ESA which always returned whichever reference the instrument was using. The instrument automatically switched to the ext ref if it was present.
	In PSA (which had no sensing) the command [:SENSe]:ROSCillator:SOURce set the reference (INT or EXT), so again its query returned the actual routing.
	Thus the query form of this command is 100% backwards compatible with both instruments.
Initial S/W Revision	Prior to A.02.00

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

Sense

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
Example	: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
Example	: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
Example	:ROSC:SOUR:TYPE EXT
Readback	External
Initial S/W Revision	Prior to A.02.00

Pulse

The internal reference continues to be the frequency reference for the instrument in that it determines the reference contribution to the phase noise, but its average frequency is adjusted to follow the 1 pps signal at the EXT REF IN input. Therefore, the analyzer frequency accuracy will be dominated by the aging rate of the 1 pps signal instead of the aging rate of the internal reference, except during the time it takes to lock to a new 1 pps signal, approximately 10 minutes.

See

Key Path	Input/Output, Freq Ref In
Example	:ROSC:SOUR:TYPE PULS
Couplings	Sets the System, Alignments, Timebase DAC setting to "User". This setting survives Preset and Power Cycle but it set to "Calibrated" on a System, Restore Defaults, Align or a System, Restore Defaults, All
Readback	Pulse
Initial S/W Revision	A.14.00

More Information

When a 1 pps signal is present at the EXT REF IN input, and either Pulse or Sense is selected, the internal reference frequency is affected by this signal; in effect, it "learns" a new accuracy setting. This setting can

be seen by going to the System, Alignments, Timebase Dac menu, and looking at the User key in that menu. You will note that User has become automatically selected, and that the value shown on the User key is the updated value of the timebase DAC as "learned" from the 1 pps signal. Note that this replaces any value the user might have previously set on this key.

Once the setting is learned the user may remove the 1 pps signal; the User setting for the Timebase DAC is retained until you manually select "Calibrated" or execute a System, Restore Defaults, Align or a System, Restore Defaults, All.   If you want to make the User setting permanent there is information in the Service Guide that tells you how to change the Calibrated setting of the Timebase DAC.

Note also that if the 1 pps signal is removed when Sense is selected, the analyzer will simply switch to the normal state of the Internal reference and display SENSE:INT in the Settings Panel. However, if the 1 pps signal is removed when Pulse is selected, the analyzer will generate an error

The J7203A Atomic Frequency Reference is an accessory for the X-Series Signal Analyzer that provides a highly accurate 1 pps timebase to use in conjunction with the Pulse setting. With the J7203A, the 1 pps signal is guaranteed to meet the input requirements of the EXT REF IN port, and the improved accuracy of the analyzer's internal frequency reference is specified.   This is the only 1 pps signal that is guaranteed to function properly with the X-Series.

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.

Key Path	Input/Output, Freq Ref In
Scope	Mode Global
Remote Command	`[:SENSe]:ROSCillator:BANDwidth WIDE|NARRow`
	`[:SENSe]:ROSCillator:BANDwidth?`
Example	ROSC:BAND WIDE
Dependencies	Still available with Internal or Pulse selected, to allow setup for when External is in use. However, the setting has no effect if the Internal Reference is in use (Freq Ref In set to Internal, Pulse, or SENSE:INT or SENSE:PULSE).
	This key only appears in analyzers equipped with the required hardware.
Preset	This is unaffected by a Preset but is set to Narrow on a "Restore Input/Output Defaults" or "Restore

	System Defaults -> All"
State Saved	Saved in Input/Output state.
Initial S/W Revision	A.04.00
Modified at S/W Revision	A.14.00

External Ref Coupling

Only appears with option ERC installed and licensed.

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

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

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

:INIT:CONT OFF

:INIT:IMM;*OPC?

--

:INIT:CONT OFF

:INIT:IMM;*WAI?

--

:INIT:CONT OFF

:READ?

--

:INIT:CONT OFF

:MEASure?

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

External reference problem.
Data acquisition suspended.
To resume data acquisition, fix the
problem and press the Restart key
OR
Press the following keys:
Input/Output, More 1 of 2, Freq Ref In,
External Ref Coupling, Normal
OR
Input/Output, More 1 of 2,
Freq Ref In, Internal

If you press the Restart key this message will be taken off the screen and a new acquisition will be attempted. If the External Reference problem persists the message will re-appear. You can also remove the message by changing back to the Normal setting of Sweep/Ext Ref Coupling, or by pressing Freq Ref In, Internal, or Freq Ref In, Sense, or Restore Input/Output Defaults.

The setting of External Ref Coupling is persistent across power-cycling and is not reset with a Preset. It is reset to the default state (Normal) when Restore Input/Output Defaults is invoked, which will also restart normal data acquisition.

The detection of invalid external reference is under interrupt processing. If the external reference becomes invalid then returns to valid in too short a time, no error condition will be detected or reported and therefore the acquisition will not be stopped.

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

Output Config

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

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

Trig Out

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

Polarity

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

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

Off

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

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

Sweeping (HSWP)

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

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

Measuring

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

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

Main Trigger

Selects the current instrument trigger signal to be output to the Trig 1 Out, or Trig 2 Out, connector.

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

Gate Trigger

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

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

Gate

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

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

Source Point Trigger

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

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

Odd/Even Trace Point

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

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

Analog Out

This menu lets you control which signal is fed to the "Analog Out" connector on the analyzer rear panel.

See

Key Path	Input/Output, Output Config
Remote Command	`:OUTPut:ANALog OFF|SVIDeo|LOGVideo|LINVideo|DAUDio`
	`:OUTPut:ANALog?`
Example	OUTP:ANAL SVIDeo ! causes the analog output type to be Screen Video
Preset	This is unaffected by Preset but is set to DAUDio on a "Restore Input/Output Defaults" or "Restore System Defaults->All
Preset	OFF
State Saved	Saved in Input/Output State
Readback line	1-of-N selection [variable]
Backwards Compatibility Notes	Prior to A.04.00, OFF was the default functionality except when in the Analog Demod application or with Tune and Listen, in which case it was DAUDio, and there was no selection menu. So for backwards compatibility with earlier X-Series firmware versions, Auto (:OUTP:ANAL:AUTO ON) will duplicate the prior behavior.
	The DNWB and SANalyzer parameters, which were legal in PSA but perform no function in the X-Series, are accepted without error.
Initial S/W Revision	A.04.00

More Information

The table below gives the range for each output.

Analog Out	Nominal Range exc. (10% overrange)	Scale Factor	Notes
Off	0 V		
Screen Video	0 – 1 V open circuit	10%/division	8566 compatible
Log Video	0 – 1 V terminated	1/(192.66 dB/V)	dB referenced to mixer level, 1V out for –10 dBm at the mixer.
Linear Video	0 – 1 V terminated	100%/V	Linear referenced to Ref Level, 1 V out for RF envelope at the Ref Level.
Demod Audio	(varies with analyzer setting)		

Auto

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

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

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

Off

Turns off the analog output.

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

Screen Video

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

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

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL SVID
Dependencies	Because the Screen Video output uses one of the two IF processing channels, only one detector is available while Screen Video is selected. All active traces will change to use the same detector as the selected trace when Screen Video is activated.
	Screen Video output is not available while any EMI Detector is selected (Quasi Peak, RMS Average or EMI Average), because these detectors use both IF processing channels. Consequently, if the user chooses an EMI Detector, there will be no Screen Video output.
	The output holds at its last value during an alignment and during a marker count. After a sweep:
	• If a new sweep is to follow (as in Continuous sweep mode), the output holds at its last value during the retrace before the next sweep starts. If the analyzer is in zero-span, there is no retrace, as the analyzer remains tuned to the Center Frequency and does not sweep. Therefore, in zero-span, the output simply remains live between display updates.

- If no new sweep is to follow (as in Single sweep mode), the output remains live, and continues to show the pre-detector data

This function depends on optional capability; the key will be blanked and the command will generate an "Option not available" error unless you have Option YAV or YAS licensed in your instrument.

Couplings	Screen Video output changes while in FFT Sweeps, so for measurements that use exclusively FFT Sweeps, or if the user manually chooses FFT Sweeps, the Screen Video output will look different than it does in swept mode.
Readback Text	Screen Video
Backwards Compatibility Notes	See "Backwards Compatibility:" on page 175, below.
Initial S/W Revision	A.04.00

Backwards Compatibility:

The Screen Video function is intended to be very similar to the 8566 Video Output and the PSA Option 124. However, unlike the PSA, it is not always on; it must be switched on by the Screen Video key. Also, unlike the PSA, there are certain dependencies (detailed above) – for example, the Quasi Peak Detector is unavailable when Screen Video is on.

Furthermore, the PSA Option 124 hardware was unipolar and its large range was padded to be exactly right for use as a Screen Video output. In the X-Series, the hardware is bipolar and has a wider range to accommodate the other output choices. Therefore, the outputs won't match up exactly and users may have to modify their setup when applying the X-Series in a PSA application.

Log Video (RF Envelope, Ref=Mixer Level)

Selects the analog output to be the log of the video signal. In this mode, the pre-detector data is output to the Analog Out connector with a Log scaling. The output is referenced to the current level at the mixer, does not depend on display settings like Reference Level or dB per division, and it is not influenced by the selected detector or any digital flatness corrections or trace post-processing (like Trace Averaging), but does change with input attenuation.

The output is designed so that full scale (1 V) corresponds to –10 dBm at the mixer. The full range (0–1 V) covers 192.66 dB ; thus, 0 V corresponds to –202.66 dBm at the mixer.

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL LOGV
Dependencies	Because the Log Video output uses one of the two IF processing channels, only one detector is available while Screen Video is selected. All active traces will change to use the same detector as the selected trace when Log Video is activated.
	Log Video output is not available while any EMI Detector is selected (Quasi Peak, RMS Average or EMI Average), because these detectors use both IF processing channels. Consequently, if the user chooses an EMI Detector, there will be no Log Video output.
	The output holds at its last value during an alignment, during a marker count, and during retrace (after a sweep and before the next sweep starts).
	This function depends on optional capability. The key will be blanked and the command will generate

	an "Option not available" error unless you have Option YAV licensed in your instrument.
Couplings	Log Video output changes while in FFT Sweeps, so for measurements that use exclusively FFT Sweeps, or if the user manually chooses FFT Sweeps, the Log Video output will look different than it does in swept mode.
Readback Text	Log Video
Initial S/W Revision	A.04.00

Linear Video (RF Envelope, Ref=Ref Level)

Selects the analog output to be the envelope signal on a linear (voltage) scale. In this mode, the pre-detector data is output to the Analog Out connector with a Linear scaling. The output is based on the current Reference Level, and is not influenced by the selected detector or any digital flatness corrections or trace post-processing (like Trace Averaging).

The scaling is set so that 1 V output occurs with an instantaneous video level equal to the reference level, and 0 V occurs at the bottom of the graticule. This scaling gives you the ability to control the gain without having another setup control for the key. But it requires you to control the look of the display (the reference level) in order to control the analog output.

This mode is ideal for looking at Amplitude Modulated signals, as the linear envelope effectively demodulates the signal.

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL LINV
Dependencies	Because the Linear Video output uses one of the two IF processing channels, only one detector is available while Linear Video is selected. All active traces will change to use the same detector as the selected trace when Log Video is activated.
	Linear Video output is not available while any EMI Detector is selected (Quasi Peak, RMS Average or EMI Average), because these detectors use both IF processing channels. Consequently, if the user chooses an EMI Detector, there will be no Linear Video output.
	The output holds at its last value during an alignment and during a marker count and during retrace (after a sweep and before the next sweep starts).
	This function depends on optional capability; the key will be blanked and the command will generate an "Option not available" error unless you have Option YAV licensed in your instrument.
Couplings	Linear Video output changes while in FFT Sweeps, so for measurements that use exclusively FFT Sweeps, or if the user manually chooses FFT Sweeps, the Linear Video output will look different than it does in swept mode.
Readback Text	Linear Video
Initial S/W Revision	A.04.00

Demod Audio

Selects the analog output to be the demodulation of the video signal.

When Demod Audio is selected, the demodulated audio signal appears at this output whenever the Analog Demod application is demodulating a signal or when Analog Demod Tune and Listen is operating in the Swept SA measurement.

When Analog Out is in the Auto state, this output is auto-selected when in the Analog Demod mode or when Analog Demod Tune and Listen is operating in the Swept SA measurement.

If any other Analog Output is manually selected when in the Analog Demod mode or when Analog Demod Tune and Listen is operating in the Swept SA measurement, a condition warning message appears.

Key Path	Input/Output, Output Config, Analog Out
Example	OUTP:ANAL DAUD
Dependencies	This key only appears if the Analog Demod application (N9063A), the N6141A or W6141A application, or Option EMC is installed and licensed, otherwise the key will be blanked and the command will generate an "Option not available" error.
	The output holds at its last value during an alignment and during a marker count. It is not held between sweeps, in order for Tune and Listen to work properly.
	When Demod Audio is the selected Analog Output:
	• all active traces are forced to use the same detector.
	• CISPR detectors (QPD, EMI Avg, RMS Avg) are unavailable
Readback Text	Demod Audio
Initial S/W Revision	Prior to A.02.00 (this was the default functionality, and there was no selection)
Modified at S/W Revision	A.04.00

Digital Bus

This menu allows you to configure the LVDS connector located on the rear panel of the instrument. It is a unidirectional link of real time data at a 90 MSa/s rate. The ADC is sampling a 22.5 MHz IF.

The data that appears on this port is raw, uncorrected ADC samples, unless you have option RTL. With option RTL, you get fully corrected I/Q data.

This connector will only be active when the Narrowband IF Path is currently in use.

Key Path	Input/Output, Output Config
Initial S/W Revision	A.04.00

Bus Out On/Off

When Bus Out is on, all acquisitions are streamed to the output port including acquisitions for internal purposes such as Alignment. The internal processing and routing of acquisitions continues as usual and is unaffected by the state of Bus Out.

When Bus Out is off, no signal appears on the LVDS port.

Key Path	Input/Output, Output Config, Digital Bus

Scope	Mode Global
Remote Command	`:OUTPut:DBUS[1][:STATe] ON|OFF|1|0`
	`:OUTPut:DBUS[1][:STATe]?`
Example	OUTP:DBUS ON
Preset	This is unaffected by a Preset but is set to Off on a "Restore Input/Output Defaults" or "Restore System Defaults -> All"
State Saved	Saved in Input/Output State
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.04.00

I/Q Cal Out

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

Key Path	Input/Output, Output Config
Remote Command	`:OUTPut:IQ:OUTPut IQ1|IQ250|OFF`
	`:OUTPut:IQ:OUTPut?`
Example	OUTP:IQ:OUTP IQ1
Couplings	An I/Q Cable Calibration or an I/Q Probe Calibration will change the state of the Cal Out port as needed by the calibration routine. When the calibration is finished the I/Q Cal Out is restored to the pre-calibration state.
Preset	Off
State Saved	Saved in instrument state
Range	1 kHz Square Wave|250 kHz Square Wave|Off
Readback Text	1 kHz|250 kHz|Off
Initial S/W Revision	Prior to A.02.00

1 kHz Square Wave

Turns on the 1 kHz square wave signal at the Cal Out port. This choice is only available with option BBA.

Key Path	Input/Output, Output Config, I/Q Cal Out
Readback	I/Q 1kHz
Initial S/W Revision	Prior to A.02.00

250 kHz Square Wave

Turns on the 250 kHz square wave signal at the Cal Out port. This choice is only available with option BBA.

Key Path	Input/Output, Output Config, I/Q Cal Out
Readback	I/Q 250kHz
Initial S/W Revision	Prior to A.02.00

Off

Turns off the signal at the Cal Out port. This choice is only available with option BBA.

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

Aux IF Out

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

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

Key Path	Input/Output, Output Config
Remote Command	`:OUTPut:AUX SIF|AIF|LOGVideo|OFF` `:OUTPut:AUX?`
Dependencies	The softkey does not appear in models that do not support the Aux IF Out.
Preset	This is unaffected by a Preset but is set to OFF on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in Input/Output state
Readback line	1-of-N selection [variable]
Backwards Compatibility Notes	In the PSA, the IF output has functionality equivalent to the "Second IF" function in the X-Series' Aux IF Out menu. In the X-Series, it is necessary to switch the Aux IF Out to "Second IF" to get this functionality, whereas in PSA it is always on, since there are no other choices. Hence a command to switch this function to "Second IF" will have to be added by customers migrating from PSA who use the IF Output in PSA.
Initial S/W Revision	A.04.00

Off

In this mode nothing comes out of the "AUX IF OUT" connector on the rear panel. The connector appears as an open-circuit (that is, it is not terminated in any way).

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

Example	OUTP:AUX OFF
	causes the aux output type to be off
Readback Text	Off
Initial S/W Revision	A.04.00

Second IF

In this mode the 2nd IF output is routed to the rear panel connector. The annotation on the key shows the current 2nd IF frequency in use in the analyzer.

The frequency of the 2nd IF depends on the current IF signal path as shown in the table below:

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

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

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

Arbitrary IF

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

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

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

fold to become a +5 MHz signal at the IF output. Therefore, lower IF output frequencies are only useful with known band-limited signals.

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

Key Path	Input/Output, Output Config, Aux IF Out
Scope	Mode Global
Remote Command	:OUTPut:AUX:AIF <value>
	:OUTPut:AUX:AIF?
Example	:OUTP:AUX:AIF 50 MHZ
Preset	This is unaffected by a Preset but is set to 70 MHz on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in Input/Output State
Min	10 MHz
Max	75 MHz
Default Unit	Hz
Initial S/W Revision	A.04.00

Fast Log Video

In this mode the 2nd IF output is passed through a log amp and the log envelope of the IF signal is sent to the rear panel. The open circuit output level varies by about 25 mV per dB, with a top-of-screen signal producing about 1.6 Volts. The output impedance is nominally 50 ohms.

This mode is intended to meet the same needs as Option E4440A-H7L Fast Rise Time Video Output on the 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
Example	OUTP:AUX LOGVideo
	causes the aux output type to be Fast Log Video
Dependencies	Does not appear unless Option ALV is installed.
	The output is off during an alignment but not during a marker count, and is not blanked during retrace (after a sweep and before the next sweep starts).
Readback Text	Fast Log Video
Initial S/W Revision	A.04.00

I/Q Guided Calibration

Calibrating the Baseband I/Q ports requires several steps and manual connections. The Guided Calibration 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 "Exit Confirmation" on page 194).
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|IB|Q|QB command until the operation is complete.

For example, if the prior instrument state is Cal Out = Off, Input = I+jQ, and Differential = Off, then up until the time the "Next" button is pressed the I Input and Q Input LEDs are on and the Cal Out, I-bar Input and Q-bar Input LEDs are off. Once the "Next" button is pressed for the I port calibration, only the Cal Out and I Input LEDs will be on and the others will be off. When the screen progresses to the next step ("Next" button again enabled), the prior state is restored and only the I Input and Q Input LEDs are on (Cal Out is off again).

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

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

I Port

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

Back

Return to the prior step in the calibration procedure.

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

Next

Perform the I port calibration.

Key Path	Input/Output, I/Q, I/Q Cable Calibrate...
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 "Exit Confirmation" on page 194).
Initial S/W Revision	Prior to A.02.00

I-bar Port

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

Back

Return to the prior step in the calibration procedure.

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

Next

Perform the I-bar port calibration.

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

Exit

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

Key Path	Input/Output, I/Q, I/Q Cable Calibrate...
Notes	Using the Exit button will not restore the calibration data to the state prior to entering the guided calibration. Once a port is calibrated the data is stored immediately and the only way to change it is to redo the calibration step.
	When the calibration may be left in an inconsistent state, a confirmation dialog will be displayed (see "Exit Confirmation" on page 194).
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 "Exit Confirmation" on page 194).
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.

Key Path	Input/Output, I/Q, I/Q Cable Calibrate...
Remote Command	:CALibration:IQ:FLATness:QBAR
Example	CAL:IQ:FLAT:QBAR
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-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 "Exit Confirmation" on page 194).
Initial S/W Revision	Prior to A.02.00

I/Q Cable Calibration Time (Remote Command Only)

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

Remote Command	:CALibration:IQ:FLATness:I|IBAR|Q|QBAR:TIME?
Example	:CAL:IQ:FLAT:I:TIME?

Notes	This returns 6 integer values: year, month, day, hour, minute, second. When no calibration has been performed, all values will be 0.
Initial S/W Revision	A.02.00

I/Q Probe Calibration

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

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

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

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

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

For example, if the prior instrument state is Cal Out = Off, Input = I+jQ, and Differential = Off, then up until the time the "Next" button is pressed the I Input and Q Input LEDs are on and the Cal Out, I-bar Input and Q-bar Input LEDs are off. Once the "Next" button is pressed for the I port calibration, only the Cal Out and I Input LEDs will be on and the others will be off. When the screen progresses to the next step ("Next" button again enabled), the prior state is restored and only the I Input and Q Input LEDs are on (Cal Out is off again).

The last calibration date and time for each relevant port will be displayed. For passive probes with Differential On, any calibration that is more than a day older than the most recent calibration will be displayed with the color amber.

I Port

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

Show Adapter

Show a connection diagram and instructions for the probe and adapter. See .

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
Remote Command	:CALibration:IQ:PROBe:I
Example	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 "Exit Confirmation" on page 194).
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 193.

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
Remote Command	`:CALibration:IQ:PROBe:IBar`
Example	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 "Exit Confirmation" on page 194).
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 193.

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

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 194).
Initial S/W Revision	Prior to A.02.00

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 193.

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

Back

Return to the prior step in the calibration procedure.

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

Next

Perform the Q-bar port calibration.

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

Exit

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

Key Path	Input/Output, I/Q, Q Setup, Q Probe, Calibrate
Notes	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 194).
Initial S/W Revision	Prior to A.02.00

Show Adapter Screen

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

I/Q Probe Calibration Time (Remote Command Only)

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

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

Exit Confirmation

When Exit is pressed during one of the calibration routines, the calibration may be in an inconsistent state with some of the ports having newly measured calibration data and others with old data. If this is the case, a dialog 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.

LISN Control

Enables you to access LISN related functions. LISN control is only available with option LSN indicating that the LISN IO board is installed. This is a remote query command only.

V-network (Remote Command Only)

Enables you to select the V-network that is controlled via the AUX IO port.

Remote Command	INPut[1]|2:LISN[:TYPE] FOURphase|ESH2Z5| ENV216 | OFF
	INPut[1]|2:LISN[:TYPE]?
Example	:INP:LISN FOUR
Notes	FOURPhase and ESH2-Z5
	R&S ESH2-Z5 (four phases and protective earth are controllable)
	ENV216
	R&S ENV216 (two phases and highpass are controllable)
	OFF
	Remote control deactivated
	This query will return :-
	FOUR when ESH2-Z5 is selected.
Preset	Set to off on a "Restore Input/Output Defaults"
State Saved	Saved in instrument state
Initial S/W Revision	A.14.50

Phase (Remote Command Only)

This command enables you to select the phase of the V-network that is used, which is controlled via the AUX IO port. The permissible selection depends on the selected V-network.

Remote Command	INPut[1]|2:LISN:PHASe L1|L2|L3|N
	INPut[1]|2:LISN:PHASe?
Example	:INP:LISN:PHAS L1
Couplings	L2, L3 keys are grayed out when ENV216 is selected. If the grayed out key is pressed, an advisory message is generated. If the equivalent SCPI command is sent, this same message is generated as part of a "–224, Illegal parameter value; must apply ESH2Z5 to make this phase available" warning.
Preset	Set to N on a "Restore Input/Output Defaults"

State Saved	Saved in instrument state
Range	Phase N|Phase L1|Phase L2|Phase L3
	Only one phase can be selected.
Initial S/W Revision	A.14.50

150 kHz Highpass (Remote Command Only)

Controls highpass setting on the V-network.

Remote Command	`INPut[1]|2:LISN:FILTer:HPAS[:STATe] ON|OFF`
	`INPut[1]|2:LISN:FILTer:HPAS[:STATe]?`
Example	:INP:LISN:FILT:HPAS ON
Dependencies	Only available for ENV216 V-network . This key is grayed out when a V-network that is not ENV216 is selected. If the grayed out key is pressed, an advisory message is generated. If the equivalent SCPI command is sent, this same message is generated as part of a "–221, Settings conflicts; LISN function not available" warning.
Preset	Set to off on a "Restore Input/Output Defaults"
State Saved	Saved in instrument state
Range	ON|OFF
Initial S/W Revision	A.14.50

Protective Earth (Remote Command Only)

Enables you to set the Protective Earth setting that is controlled via the AUX IO port.

Remote Command	`INPut[1]|2:LISN:PEARth GROunded|FLOating`
	`INPut[1]|2:LISN:PEARth?`
Example	:INP:LISN:PEAR GRO
Dependencies	Only available for ESH2Z5. This key is grayed out when a v-network other than ESH2Z5 is selected. If the grayed out key is pressed, an advisory message is generated. If the equivalent SCPI command is sent, this same message is generated as part of a "–221, Settings conflict; LISN function not available" warning.
Preset	Set to GRO on a "Restore Input/Output Defaults"
State Saved	Saved in instrument state
Range	GRO|FLO
Initial S/W Revision	A.14.50

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,

Key Path	Front-panel key
Remote Command	`:INSTrument[:SELect] SA	RTSA	SEQAN	EMI	BASIC	WCDMA	EDGEGSM	WIMAXOFDMA	VSA	PNOISE	NFIGure	ADEMOD	BTooth	TDSCDMA	CDMA2K	CDMA1XEV	LTE	LTETDD	LTEAFDD	LTEATDD	MSR	DVB	DTMB	DCATV	ISDBT	CMMB	WLAN	CWLAN	CWIMAXOFDM	WIMAXFIXED	IDEN	RLC	SCPILC	VSA89601`  `:INSTrument[:SELect]?`
Example	:INST SA
Notes	The available parameters are dependent upon installed and licensed applications resident in the instrument. Parameters given here are an example, specific parameters are in the individual Application. A list of the valid mode choices is returned with the INST:CAT? Query.
Preset	This is unaffected by a Preset but is set on a "Restore System Defaults->All" to: For N9038A: EMI For N8973B, N8974B, N8975B, or N8976B: NFIG For all other models: SA
State Saved	Saved in instrument state
Backwards Compatibility SCPI	`:INSTrument[:SELect] GSM` provided forbackwards compatibility. Mapped to EDGEGSM.

Backwards Compatibility SCPI	`:INSTrument[:SELect] SANalyzer`
	
	provided for ESU compatibility. When this command is received, the analyzer aliases it to the following:
	`INST:SEL SCPILC`
	
	This results in the analyzer being placed in SCPI Language Compatibility Mode, in order to emulate

	the ESU Spectrum Analyzer Mode.
Backwards Compatibility SCPI	`:INSTrument[:SELect] RECeiver`
	provided for ESU compatibility. When this command is received, the 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

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

More Information

The Mode name appears on the banner after the word "Agilent" followed by the Measurement Title. For example, for the Spectrum Analyzer mode with the Swept SA measurement running:

It is possible to specify the order in which the Modes appear in the Mode menu, using the Configure Applications utility (System, Power On, Configure Applications). It is also possible, using the same utility, to specify a subset of the available applications to load into memory at startup time, which can significantly decrease the startup time of the analyzer. During runtime, if an application that is not loaded into memory is selected (by either pressing that applications Mode key or sending that applications :INST:SEL command over SCPI), there will be a pause while the Application is loaded. During this pause a message box that says "Loading application, please wait…" is displayed.

Each application (Mode) that runs in the X-Series signal analyzers consumes virtual memory. The various applications consume varying amounts of virtual memory, and as more applications run, the memory consumption increases. Once an application is run, some of its memory remains allocated even when it is not running, and is not released until the analyzer program (xSA.exe) is shut down.

Agilent characterizes each Mode and assigns a memory usage quantity based on a conservative estimate. There is a limited amount of virtual memory available to applications (note that this is virtual memory and is independent of how much physical RAM is in the instrument). The instrument keeps track of how much

memory is being used by all loaded applications – which includes those that preloaded at startup, and all of those that have been run since startup.

When you request a Mode that is not currently loaded, the instrument looks up the memory estimate for that Mode, and adds it to the residual total for all currently loaded Modes. If there is not enough virtual memory to load the Mode, a dialog box and menu will appear that gives you four options:

1. Close and restart the analyzer program without changing your configured preloads. This may free up enough memory to load the requested Mode, depending on your configured preloads

2. Clear out all preloads and close and restart the analyzer program with only the requested application preloaded, and with that application running. This choice is guaranteed to allow you to run the requested application; but you will lose your previously configured preloads. In addition, there may be little or no room for other applications, depending on the size of the requested application.

3. Bring up the Configure Applications utility in order to reconfigure the preloaded apps to make room for the applications you want to run (this will then require restarting the analyzer program with your new configuration). This is the recommended choice because it gives you full flexibility to select exactly what you want.

4. Exit the dialog box without doing anything, which means you will be unable to load the application you requested.

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

If you attempt to load a mode via SCPI that will exceed memory capacity, the Mode does not load and an error message is returned:

–225,"Out of memory;Insufficient resources to load Mode (mode name)"

where "mode name" is the SCPI parameter for the Mode in question, for example, SA for Spectrum Analyzer Mode.

DVB-T/H with T2

Selects the DVB-T/H mode for measurements of digital video signals using this format. There are several power and demod measurements available in this mode.

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

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

EMI Receiver

The EMI Receiver Mode makes EMC measurements. Several measurements are provided to aid the user in characterizing EMC performance of their systems, including looking at signals with CISPR–16 compliant detectors, performing scans for interfering signals, and determining and charting interfering signals over time.

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

Key Path	Mode
Example	INST:SEL EMI
	INST:NSEL 141
Initial S/W Revision	A.07.01

Spectrum Analyzer

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

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

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

ISDB-T

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

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

Key Path	Mode
Example	INST:SEL ISDBT
	INST:NSEL 239
Initial S/W Revision	A.03.00

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
Example	INST:SEL VSA
	INST:NSEL 100
Initial S/W Revision	Prior to A.02.00

Analog Demod

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

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

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

Phase Noise

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

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

Key Path	Mode
Example	INST:SEL PNOISE

	or
	INST:NSEL 14
Initial S/W Revision	Prior to A.02.00

CMMB

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

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

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

Combined WLAN

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

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

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

TD-SCDMA with HSPA/8PSK

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

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

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

IQ Analyzer (Basic)

The IQ Analyzer Mode makes general purpose frequency domain and time domain measurements. These measurements often use alternate hardware signal paths when compared with a similar measurement in the Signal Analysis Mode using the Swept SA measurement. These frequency domain and time domain measurements can be used to output I/Q data results when measuring complex modulated digital signals.

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

Key Path	Mode
Example	INST:SEL BASIC
	INST:NSEL 8
Initial S/W Revision	Prior to A.02.00

GSM/EDGE/EDGE Evo

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

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

Key Path	Mode
Example	INST:SEL EDGEGSM
	INST:NSEL 13
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

Noise Figure

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

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

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

Combined Fixed WiMAX

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

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

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

W-CDMA with HSPA+

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

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

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

802.16 OFDM (Fixed WiMAX)

Selects the 802.16 OFDM (Fixed WiMAX) mode. This mode allows modulation quality measurements of signals that comply with IEEE 802.16a–2003 and IEEE 802.16–2004 standards, with flexibility to measure nonstandard OFDM formats. Along with the typical digital demodulation measurement results, several additional 802.16 OFDM unique trace data formats and numeric error data results provide enhanced data analysis.

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

Key Path	Mode
Example	INST:SEL WIMAXFIXED
	INST:NSEL 104
Initial S/W Revision	A.02.00

WLAN

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

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

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

1xEV-DO

Selects the 1xEV-DO mode for general purpose measurements of signals following this standard. There are several measurements available in this mode.

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

Key Path	Mode
Example	INST:SEL CDMA1XEV
	INST:NSEL 15
Initial S/W Revision	Prior to A.02.00

802.16 OFDMA (WiMAX/WiBro)

Selects the OFDMA mode for general purpose measurements of WiMAX signals. There are several measurements available in this mode.

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

Key Path	Mode
Example	INST:SEL WIMAXOFDMA
	INST:NSEL 75
Initial S/W Revision	Prior to A.02.00

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

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
Example	INST:SEL VSA89601
	INST:NSEL 101
Initial S/W Revision	Prior to A.02.00

MSR

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

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

Key Path	Mode
Example	INST:SEL MSR

	INST:NSEL 106
Initial S/W Revision	A.09.491

cdma2000

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

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

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

Bluetooth

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

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

Key Path	Mode
Example	INST:SEL BT
	INST:NSEL 228
Initial S/W Revision	A.06.01

SCPI Language Compatibility

The SCPI Language Compatibility mode provides remote language compatibility for SCPI-based instruments, such as the Rohde and Schwartz FSP and related series of spectrum analyzers.

NOTE After changing into or out of this mode, allow a 1 second delay before sending any subsequent commands.

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

Key Path	Mode
Example	INST:SEL SCPILC
	Or
	INST:NSEL 270
Initial S/W Revision	A.06.00

iDEN/WiDEN/MOTOTalk

Selects the iDEN/WiDEN/MOTOTalk mode for general purpose measurements of iDEN and iDEN-related signals. There are several measurements available in this mode.

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

Key Path	Mode
Example	INST:SEL IDEN
	INST:NSEL 103
Initial S/W Revision	A.02.00

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 coverged 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
Example	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.
Backwards Compatibility SCPI	INST:SEL LTE
	INST:NSEL 102
Initial S/W Revision	A.14.00
Modified at S/W Revision	A.14.50

Digital Cable TV

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

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

Key Path	Mode
Example	INST:SEL DCATV

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

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 coverged 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
Example	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.
Backwards Compatibility SCPI	INST:SEL LTETDD
	INST:NSEL 105
Initial S/W Revision	A.14.00
Modified at S/W Revision	A.14.50

Remote Language Compatibility

The Remote Language Compatibility (RLC) mode provides remote command backwards compatibility for the 8560 series of spectrum analyzers, known as legacy spectrum analyzers.

> **NOTE** After changing into or out of this mode, allow a 1 second delay before sending any subsequent commands.

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

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

DTMB (CTTB)

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

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

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

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 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	EDGEGSM
802.16 OFDMA (WiMAX/WiBro)	75	WIMAXOFDMA
Vector Signal Analyzer (VXA)	100	VSA
Phase Noise	14	PNOISE
Noise Figure	219	NFIGure
Analog Demod	234	ADEMOD
Bluetooth	228	BTooth
TD-SCDMA with HSPA/8PSK	211	TDSCDMA
cdma2000	10	CDMA2K
1xEV-DO	15	CDMA1XEV
LTE	102	LTE

LTE TDD	105	LTETDD
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.

Remote Command	`:INSTrument:CATalog?`

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

Application Identification (Remote Commands Only)

Each entry in the Mode Menu will have a Model Number and associated information: Version, and Options.

This information is displayed in the Show System screen. The corresponding SCPI remote commands are defined here.

Current Application Model

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

Remote Command	:SYSTem:APPLication[:CURRent][:NAME]?
Example	:SYST:APPL?
Notes	Query returns a quoted string that is the Model Number of the currently selected application (Mode). Example:
	"N9060A"
	String length is 6 characters.
Preset	Not affected by Preset
State Saved	Not saved in state, the value will be the selected application when a Save is done.
Initial S/W Revision	Prior to A.02.00

Current Application Revision

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

Remote Command	:SYSTem:APPLication[:CURRent]:REVision?
Example	:SYST:APPL:REV?
Notes	Query returns a quoted string that is the Revision of the currently selected application (Mode). Example:
	"1.0.0.0"
	String length is a maximum of 23 characters. (each numeral can be an integer + 3 decimal points)
Preset	Not affected by a Preset
State Saved	Not saved in state, the value will be the selected application when a Save is done.
Initial S/W Revision	Prior to A.02.00

Current Application Options

Returns a string that is the Options list of the currently selected application (Mode).

Remote Command	:SYSTem:APPLication[:CURRent]:OPTion?
Example	:SYST:APPL:OPT?
Notes	Query returns a quoted string that is the Option list of the currently selected application (Mode). The format is the name as the *OPT? or SYSTem:OPTion command: a comma separated list of option identifiers. Example:
	"1FP,2FP"
	String length is a maximum of 255 characters.
Preset	Not affected by a Preset
State Saved	Not saved in state per se, the value will be the selected application when a Save is invoked.
Initial S/W Revision	Prior to A.02.00

Application Identification Catalog (Remote Commands Only)

A catalog of the installed and licensed applications (Modes) can be queried for their identification.

Application Catalog Number of Entries

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

Remote Command	:SYSTem:APPLication:CATalog[:NAME]:COUNt?

Example	:SYST:APPL:CAT:COUN?
Preset	Not affected by Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Application Catalog Model Numbers

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

Remote Command	:SYSTem:APPLication:CATalog[:NAME]?
Example	:SYST:APPL:CAT?
Notes	Returned value is a quoted string of a comma separated list of Model Numbers. Example, if SAMS and Phase Noise are installed and licensed: "N9060A,N9068A" String length is COUNt * 7 – 1. (7 = Model Number length + 1 for comma. –1 = no comma for the 1st entry.)
Preset	Not affected by a Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Application Catalog Revision

Returns the Revision of the provided Model Number.

Remote Command	:SYSTem:APPLication:CATalog:REVision? <model>
Example	:SYST:APPL:CAT:REV? 'N9060A'
Notes	Returned value is a quoted string of revision for the provided Model Number. The revision will be a null-string ("") if the provided Model Number is not installed and licensed. Example, if SAMS is installed and licensed: "1.0.0.0"
Preset	Not affected by a Preset.
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Application Catalog Options

Returns a list of Options for the provided Model Number

Remote Command	:SYSTem:APPLication:CATalog:OPTion? <model>

Example	:SYST:APPL:CAT:OPT? 'N9060A'
Notes	Returned value is a quoted string of a comma separated list of Options, in the same format as *OPT? or :SYSTem:OPTion?. If the provided Model Number is not installed and licensed a null-string ("") will be returned. Example, if SAMS is installed and licensed: "2FP" String length is a maximum of 255 characters.
Preset	Not affected by a Preset
State Saved	Not saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Detailed List of Modes

This 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
Example	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
Example	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
Example	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

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
Example	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
Example	INST:SEL ADEMOD
	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
Example	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
Example	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
Example	INST:SEL CMMB
	INST:NSEL 240
Initial S/W Revision	A.03.00

Combined WLAN

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

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

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

Combined Fixed WiMAX

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

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

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

Digital Cable TV

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

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

Key Path	Mode
Example	INST:SEL DCATV
	INST:NSEL 238
Initial S/W Revision	A.07.00

DTMB (CTTB)

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

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

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

DVB-T/H with T2

Selects the DVB-T/H mode for measurements of digital video signals using this format. There are several power and demod measurements available in this mode.

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

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

EMI Receiver

The EMI Receiver Mode makes EMC measurements. Several measurements are provided to aid the user in characterizing EMC performance of their systems, including looking at signals with CISPR–16 compliant

detectors, performing scans for interfering signals, and determining and charting interfering signals over time.

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

Key Path	Mode
Example	INST:SEL EMI
	INST:NSEL 141
Initial S/W Revision	A.07.01

GSM/EDGE/EDGE Evo

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

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

Key Path	Mode
Example	INST:SEL EDGEGSM
	INST:NSEL 13
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.02.00

iDEN/WiDEN/MOTOTalk

Selects the iDEN/WiDEN/MOTOTalk mode for general purpose measurements of iDEN and iDEN-related signals. There are several measurements available in this mode.

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

Key Path	Mode
Example	INST:SEL IDEN
	INST:NSEL 103
Initial S/W Revision	A.02.00

IQ Analyzer (Basic)

The IQ Analyzer Mode makes general purpose frequency domain and time domain measurements. These measurements often use alternate hardware signal paths when compared with a similar measurement in the Signal Analysis Mode using the Swept SA measurement. These frequency domain and time domain measurements can be used to output I/Q data results when measuring complex modulated digital signals.

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

Key Path	Mode
Example	INST:SEL BASIC
	INST:NSEL 8
Initial S/W Revision	Prior to A.02.00

ISDB-T

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

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

Key Path	Mode
Example	INST:SEL ISDBT
	INST:NSEL 239
Initial S/W Revision	A.03.00

LTE

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

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

Key Path	Mode
Example	INST:SEL LTE
	INST:NSEL 102
Initial S/W Revision	Prior to A.02.00

LTE TDD

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

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

Key Path	Mode
Example	INST:SEL LTETDD

	INST:NSEL 105
Initial S/W Revision	A.03.00

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 coverged 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
Example	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.
Backwards Compatibility SCPI	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 coverged 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
Example	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.
Backwards Compatibility SCPI	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
Example	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
Example	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
Example	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
Example	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
Example	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
Example	INST:SEL SCPILC
	Or
	INST:NSEL 270
Initial S/W Revision	A.06.00

Spectrum Analyzer

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

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

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

Global Settings

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

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

Global Center Freq

The software maintains a Mode Global value called "Global Center Freq".

When the Global Center Freq key is switched to On in any mode, the current mode's center frequency is copied into the Global Center Frequency, and from then on all modes that support global settings use the Global Center Frequency. So you can switch between any of these modes and the Center Freq will remain unchanged.

Adjusting the Center Freq of any mode which supports Global Settings, while Global Center Freq is On, will modify the Global Center Frequency.

When Global Center Freq is turned Off, the Center Freq of the current mode is unchanged, but now the Center Freq of each mode is once again independent.

When Mode Preset is pressed while Global Center Freq is On, the Global Center Freq is preset to the preset Center Freq of the current mode.

This function is reset to Off when the Restore Defaults key is pressed in the Global Settings menu, or when System, Restore Defaults, All Modes is pressed.

Key Path	Mode Setup, Global Settings
Scope	Mode Global
Remote Command	`:INSTrument:COUPle:FREQuency:CENTer ALL|NONE`
	`:INSTrument:COUPle:FREQuency:CENTer?`
Example	INST:COUP:FREQ:CENT ALL
	INST:COUP:FREQ:CENT?
Preset	Set to Off on Global Settings, Restore Defaults
	and System, Restore Defaults, All Modes
Range	On|Off
Initial S/W Revision	Prior to A.02.00

Remote Command	`:GLOBal:FREQuency:CENTer[:STATe] 1|0|ON|OFF`
	`:GLOBal:FREQuency:CENTer[:STATe]?`
Preset	Off
Initial S/W Revision	Prior to A.02.00

Restore Defaults

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

Key Path	Mode Setup, Global Settings
Remote Command	`:INSTrument:COUPle:DEFault`

Example	INST:COUP:DEF
Backwards Compatibility SCPI	`:GLOBal:DEFault`
Initial S/W Revision	Prior to A.02.00

Mode Setup

Mode Setup opens a menu of keys that allows you to specify parameters of the mode.

Key Path	Front panel
Initial S/W Revision	Prior to A.04.00

DUT Setup

The DUT Setup form enables the user to prepare the application for measuring specific devices and setups. It also provides information about how to set up the instrumentation for calibration and measurement.

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

DUT Setup Form (Shown for a multi-stage converter with system downconverter)

There are three groups of parameters on the top of the DUT Setup Form. Parameters in the left group are DUT parameters; parameters in the middle group are System down converter parameters; parameters in the right group are Frequency parameters.

The active parameter field in the form is highlighted in blue. The tab front-panel keys can be used to navigate through the fields and load the corresponding softkey menus. Fields which do not apply to the current DUT type are disabled and cannot be accessed via the tab front-panel keys.

When the frequencies are fixed the labels are changed to "Fixed".

The blue eye ball icon goes with the Frequency Context parameter, when Frequency Context = RF, the eye ball will be displayed next to the RF frequencies. Similarly for IF and LO, the eye ball will be near the LO and the IF frequencies.

Navigation of this form with a mouse is also possible. Where the field can be clicked, the appropriate menu comes up. The softkeys can also be clicked to select 1 of N selections or allow number entry.

DUT

Opens a menu of softkeys that allows you to select the type of DUT to be measured: Amplifier, Down Converter, Up Converter, Converter (Multi-stage).

Key Path	Mode Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:DUT AMPLifier	DOWNconv	UPConv	MCONverter`
	`[:SENSe]:NFIGure:MODE:DUT?`
Example	:NFIG:MODE:DUT AMPL
	:NFIG:MODE:DUT?
Preset	AMPLifier
State Saved	Saved in instrument state.
Range	AMPLifier	DOWNconv	UPConv	MCONverter
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:DUT (PSA/ESA/NFA/FSP)`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	
	6. When DUT is Amplifier, Freq Context is automatically set to RF and grayed.
	7. When DUT is Amplifier, Sideband and LO Freq Mode in DUT group are disabled (grayed).
	8. When DUT is Upconv, the DSB sideband option in DUT group is invalid.
	9. When DUT is Converter, Sideband in DUT group is disabled (grayed).

Sideband (For DUT)

Sets the LO offset of the DUT.

LSB – Lower Sideband (Signal Frequency < LO Frequency)

USB – Upper Sideband (Signal Frequency > LO Frequency)

DSB – Double Sideband (Only available when DUT = Downconv). Double sideband means both upper and lower sidebands.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:OFFSet LSB | USB | DSB`
	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:OFFSet?`
Example	:NFIG:MODE:DOWN:LOSC:OFFS LSB
	:NFIG:MODE:DOWN:LOSC:OFFS?
Preset	LSB
State Saved	Saved in instrument state.
Range	LSB|USB|DSB
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:LOSCillator:OFFSet (ESA/PSA/NFA)`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Valid only when DUT is Downconv or Upconv.
	2. DSB choice is valid only when DUT is Downconv. Disabled for other DUT type.
	3. When Sideband, Freq Context and LO Freq Mode are disabled and tried to be set remotely, then an advisory message will appear "Settings conflict; Parameter only available when .DUT is a downconverter (or upconverter)" number −221 5502.
	4. When DSB is selected, advisory msg 0.2191 is shown.
	5. If DSB is selected and DUT changes to Upconv, LSB is selected by default.

DSB

DSB requires more detail as to how it operates in a noise figure measurement.

Making accurate measurements using DSB essentially requires that the IF is small and that the DUT is a broadband device. The main advantage of using DSB is that the filtering requirement is substantially reduced. In the X-Series Signal Analyzer application we will return the values for the LSB only assuming the RF context is set. Using DSB is a trade-off between filtering needs and result accuracy.

For DSB measurements, noise from two separated RF bands are mixed into the IF band, where a power addition takes place. Measurements are made with the noise from a pair of separate bands, symmetrically arranged about the LO frequency. The selection of the IF frequency value should be a low frequency. Hence this technique maintains the two bands close together. The reason is to justify making the assumption that the variations in noise source ENR, gain and noise figure are linear between the two bands. This means that the averaging of results for the two bands, due to the power summation, gives a result which can be assigned to the centre frequency - the LO frequency.

For the downconverter DUT, the noise from two bands are combined during the measurement, while during calibration, when the DUT was not connected, only one band (at the IF frequency) was used. If the assumptions about the parameters being flat over frequency between the two sidebands are valid, this causes a doubling in power (3.01 dB increase) in noise level during the measurement. This does not happen during calibration. This can be corrected for, using the Loss Compensation facility, and entering

Before DUT Value of –3.01 dB and selecting Fixed in the Before DUT field. The DSB power addition occurs for both the Hot and Cold noise from the noise source, and the noise created in the input of the DUT. A temperature value can be assigned to this loss using the Before Temperature. Using the Cold temperature of the noise source (often assumed to be 290 Kelvin) corrects for this, and the X–Series Signal Analyzer will give corrected results comparable to those that would have been given by an SSB measurement.

If you must use a high IF frequency, or if it has variations in performance over frequency, then the assumption is invalid. DSB measurements are not appropriate for making measurements where DUT performance, or noise source ENR, have significant variation over the frequency range LO±IF. DSB measurements need care to determine their filtering needs.

In all cases where DSB is selected, advisory message 0.2191 will be displayed and "(LSB only)" will also be appended to the 'RF' label on the DUT setup form to remind users that only the LSB frequencies are displayed.

RF　(LSB only)

Start: | 200.000000 | MHz

Stop: | 290.000000 | MHz

There are two conditions where DSB could be used.

DUT = Downconv, LO = Fixed.
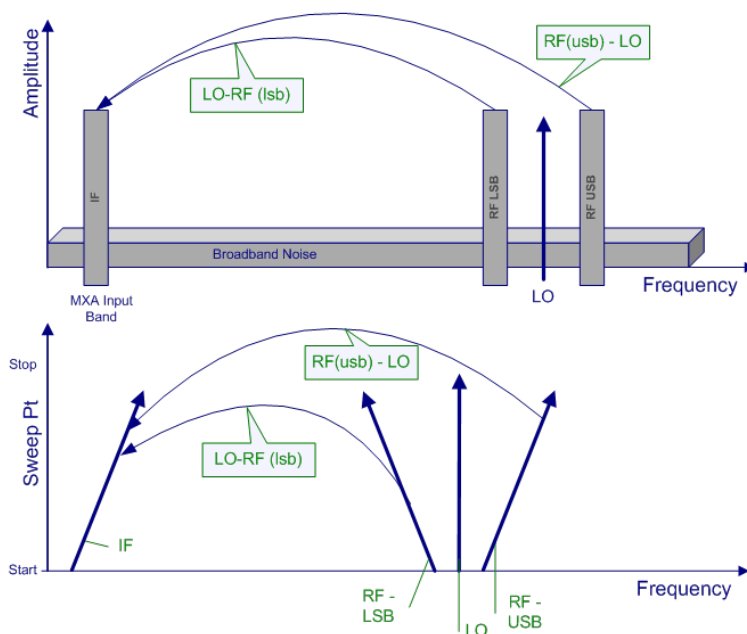
DSB – Downconv, Fixed LO

The fixed LO mode produces no sweep at the DUT input, as the two sideband input pairs diverge their average remains fixed. This mode could be useful for measuring a complex DUT where the effect of

variation of performance of the post-mixer stage over IF frequency is of interest. Because the LO frequency is held constant it is the IF frequency at the X-Series Signal Analyzer input that is swept. The figure illustrates this mode. Note again that the ENR values for the measurement are taken at the LO frequency i.e. effectively the average of both sidebands.

DUT = Downconv, LO = Swept.

In the fixed IF (swept LO) mode, the IF frequency at the input of the signal analyzer is constant, and the LO frequency is swept to perform the measurement.
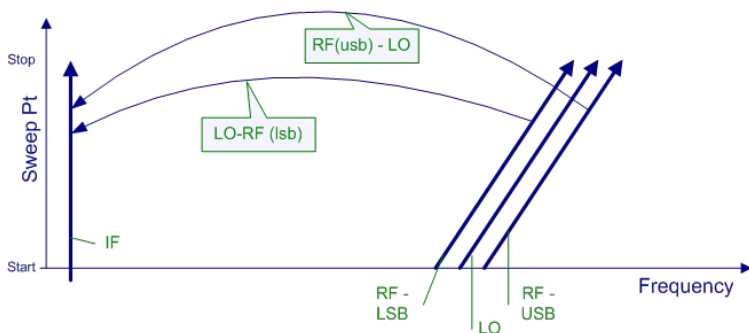
DSB – Downconv, Swept LO. Note Y axis is Sweep Pts.

The figure shows how the different frequencies in a DSB, downconverter, fixed IF, measurement vary as the measurement sweep proceeds. This mode measures the DUT's noise figure across a range of DUT input frequencies. This is the main use of the DSB mode. A similar diagram could be drawn, if needed, showing the LO harmonic mixing modes at higher frequencies, with flatter slopes due to frequency multiplication. Note again that the ENR values for the measurement are taken at the LO frequency i.e. effectively the average of both sidebands.

External LO Frequency Mode (For DUT)

Set the mode of the external LO frequency for DUT. This can be fixed, where a constant LO frequency is being used, or swept, where the LO frequency changes between sweep points.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:DUT:LOSCillator FIXed|SWEPt`
	`[:SENSe]:NFIGure:MODE:DUT:LOSCillator?`
Example	:NFIG:MODE:DUT:LOSC FIX
	:NFIG:MODE:DUT:LOSC?
Preset	FIXed
State Saved	Saved in instrument state.
Range	Fixed|Swept
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:SYSTem:LOSCillator (FSP)`
	`[:SENSe]:CONFigure:MODE:DUT:LOSCillator (ESA/PSA/NFA)`
Initial S/W Revision	Prior to A.04.00

Modified at S/W Revision	A.13.00
Coupling	1. Valid only when DUT is Downconv or Upconv or Converter.
	2. When set to Swept (IF is Fixed), the Freq Context parameter is set to RF.
	3. When changed from Swept to Fixed, then the Freq Context gets set to IF.
	4. When DUT is Downconv or Upconv, LO Freq Mode in DUT group is set to Swept, if Freq Context is RF, LO Frequency start stop are auto calculated from the RF and IF frequencies, if Freq Context is LO, then the RF frequencies are auto calculated from the LO and IF frequencies.
	5. Changing LO Freq Mode in DUT group from Fixed to Swept will set the LO Freq Mode in System Downconverter group to Fixed automatically if its current setting is Swept.
	6. When Freq Mode is set to Fixed, LO Freq Mode in DUT group will be set to Fixed automatically and grayed out.
	7. When LO Freq Mode in DUT group is Fixed, Freq Context can't be set to LO.

External LO Control (on/off) (For DUT)

Toggles external LO control on/off for DUT. This softkey provides a shortcut to "LO Control (on/off)" on page 288"LO Control (on/off)" on page 288.

System Downconverter

Selects whether or not the system downconverter is active. A system downconverter effectively increases the range of the measurement by downconverting high frequencies to those that the analyzer can measure. The system downconverter is similar to the standard downconverting DUT, although because it is not actually a part of the DUT it can be calibrated out of the measurement. This is used normally for testing DUTs outside the range of the signal analyzer or possibly to move the frequencies into the range of specified (not nominal specs) signal analyzer frequencies.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:SYSTem:DOWNconv[:STATe] ON|OFF|1|0`
	`[:SENSe]:NFIGure:MODE:SYSTem:DOWNconv[:STATe]?`
Example	:NFIG:MODE:SYST:DOWN ON
	:NFIG:MODE:SYST:DOWN?
Preset	OFF
State Saved	Saved in instrument state.
Range	OFF|ON|0|1
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:SYSTem:DOWNconv[:STATe]` (ESA/PSA/NFA)
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	

Sideband (For Sys Downconv)

Sets the LO offset of the system downconverter.

LSB – Lower Sideband (Signal Frequency < LO Frequency)

USB – Upper Sideband (Signal Frequency > LO Frequency)

DSB – Double Sideband (Only available when DUT = Amplifier and Sys Downconv = On). Double sideband means both upper and lower sidebands.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator:OFFSet LSB|USB|DSB`
	`[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator:OFFSet?`
Example	:NFIG:MODE:SYST:LOSC:OFFS LSB
	:NFIG:MODE:SYST:LOSC:OFFS?
Preset	LSB
State Saved	Saved in instrument state.
Range	LSB| USB	DSB
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:SYSTem:LOSCillator:OFFSet (ESA/PSA/NFA)`
Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled (grayed out) when Sys Downconv is Off.
	2. DSB is only available when DUT is Amplifier.

DSB

DSB requires more detail as to how it operates in a noise figure measurement.

For an Amplifier with system downconverter, the –3.01 dB adjustment is not needed since the doubling of the power is made in both the calibration stage and the measurement stage.

There are two conditions where DSB could be used.

DUT = Amplifier, Sys Downconv ON, LO = Fixed

With the fixed LO, there may be a gap in the coverage of the DUT test (see figure below), and hence will limit the usefulness of the measurement. With the swept LO, fixed IF (assuming the conditions mentioned are met) causes no gaps in the coverage. Another issue here (also the same for downconverter DUT's) is that the values being averaged are getting further apart as the sweep takes place, increasing the possibility of accuracy errors.

The X-Series Analyzers do not restrict this mode of operation, however a warning message is displayed when DSB is selected. You enter the LSB range and the diagram on the DUT setup form shows "(LSB range only)" alerting you to consider the USB, also.
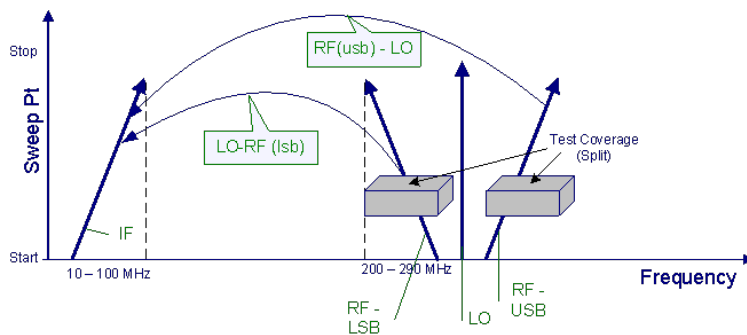
Note that in the amp "test coverage" area the results will effectively be the average of both upper and lower sidebands.

DUT = Amplifier, Sys Downconv ON, LO = Swept

This condition is similar to the downconverter DUT above (see figure below), however in this case the DUT is an amplifier and the setting of the sweep span and IF, are important to the results obtained. If the span of the sweep is not large enough compared to the IF, then the results are split into two bands that do not overlap leaving an area in the middle untested. The sweep span needs to be approximately 10 times the IF to allow a sensible overlap. On the NFA, the results are returned with the RF values equal to the LO, so the overlap condition may not be obvious. In the X-Series Signal Analyzer application we will return the values for the LSB only assuming the RF context is set.
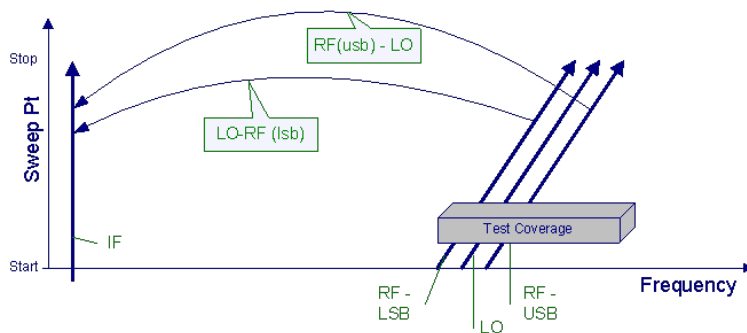
Note that in the amp "test coverage" area the results will effectively be the average of both upper and lower sidebands.

External LO Frequency Mode (For Sys Downconv)

Set the mode of the external LO frequency for system downconverter. This can be fixed, where a constant LO frequency is being used, or swept, where the LO frequency changes between sweep points.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator FIXed|SWEPt
	[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator?
Example	:NFIG:MODE:SYST:LOSC FIX
	:NFIG:MODE:SYST:LOSC?
Preset	FIXed

State Saved	Saved in instrument state.
Range	Fixed|Swept
Initial S/W Revision	A.13.00
Coupling	1. Disabled (grayed out) when Sys Downconv is Off.
	2. Swept choice is disabled when LO Freq Mode in DUT group is Swept.
	3. When Fixed is selected, Sys DownConv IF frequency will be grayed out and calcualted automatically from DUT IF and Sys Downconv LO.
	4. When Swept is selected, Sys Downconv LO frequency will be grayed out and calculated automatically from DUT IF and Sys Downconv IF.
	5. Change to Fixed automatically and gray out when Freq Mode is set to Fixed.

External LO Control (on/off) (For Sys Downconv)

Toggles external LO control on/off for System Downconverter. This softkey provides a shortcut to "LO Control (on/off)" on page 288.

System Downconverter IF

IF Fixed Frequency

Sets the tuned frequency at the input of the Analyzer when system downconverter is turned on. This parameter is only available when External LO Frequency Mode of system downconverter is Swept.

When Frequency Mode is Swept or List and system downconverter is Swept, IF start and stop frequency will be hidden. System downconverter LO start and stop frequency will be displayed.

Sys Downconv LO:

Start: 15.030000000 GHz

Stop: 18.030000000 GHz

Sys Downconv IF:

Fixed: 30.000000 MHz

When Frequency Mode is Fixed, only IF Fixed and LO Fixed frequencies will be displayed. LO Fixed frequency will be enabled for changing the frequency. IF Fixed frequency will be disabled.

Sys Downconv LO:

Fixed: 30.000000000 GHz

Sys Downconv IF:

Fixed: 29.970000000 GHz

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:SYSTem:IF:FREQuency <freq>`
	`[:SENSe]:NFIGure:MODE:SYSTem:IF:FREQuency?`
Example	:NFIG:MODE:SYST:IF:FREQ 15 GHz
	:NFIG:MODE:SYST:IF:FREQ?
Preset	None – only displayed when DUT is a mixing device. Default DUT is AMPLifier.
State Saved	Saved in instrument state.
Range	Depends on the frequency range of purchased model.
Min	1 Hz
Max	Depends on the frequency range of purchased model.
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:SYSTem:IF:FREQuency (NFA)`
Initial S/W Revision	A.13.00
Coupling	1. Disabled (grayed out) when Sys Downconv is Off.
	2. Disabled (grayed out) and calculated automatically from DUT IF and Sys Downconv LO when LO Freq Mode in system downconverter group is Fixed.
	1. Disabled (grayed out) when Sys Downconv is Off.
	2. Hidden when Sys Downconv LO Freq Mode is Fixed.
	3. Disabled (grayed out) and calculated automatically when Freq Mode is Fixed and System Downconv is On.

IF Start Frequency

Displays the IF Start frequency of the system downconverter when the LO Freq Mode of system downconverter is Fixed and Freq Mode is Swept or List. This value is not editable.

IF Stop Frequency

Displays the IF Stop frequency of the system downconverter when the LO Freq Mode of system downconverter is Fixed and Freq Mode is Swept or List. This value is not editable.

System Downconverter LO

LO Fixed Frequency

Sets the External LO frequency for system downconverter when the LO Freq Mode of system downconverter is set to Fixed.

When Frequency Mode is Swept or List and system downconverter is Fixed, IF start and stop frequency will be displayed. System downconverter LO start and stop frequency will be hidden.

When Frequency Mode is Fixed, only IF Fixed and LO Fixed frequencies will be displayed. LO Fixed frequency will be enabled for changing the frequency. IF Fixed frequency will be disabled.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NF
Remote Command	`[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator:FREQuency <freq>`
	`[:SENSe]:NFIGure:MODE:SYSTem:LOSCillator:FREQuency?`
Example	:NFIG:MODE:SYST:LOSC:FREQ 10 MHz
	:NFIG:MODE:SYST:LOSC:FREQ?
Preset	30 GHz
State Saved	Saved in instrument state.
Range	1 Hz to 325 GHz
Min	1 Hz
Max	325 GHz
Readback Text	Value shown on DUT Setup Form.
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:SYSTem:LOSCillator:FREQuency (PSA/NFA/FSP)`
Initial S/W Revision	A.13.00
Coupling	1. Disabled (grayed out) when Sys Downconv is Off.
	2. Disabled (grayed out) and calculated automatically from DUT IF and Sys Downconv IF when LO Freq Mode in system downconverter group is Swept.
	1. Disabled (grayed out) when Sys Downconv is Off.
	2. Hidden when Sys Downconv LO Freq Mode is Swept.

Freq Mode

The frequency mode determines how the list of frequencies to be measured is calculated. The options are:

Swept – Points are linearly distributed between Start and Stop Frequency, where the number of points is determined by the Points parameter. Start Freq, Stop Freq, Center Freq, and Span parameters are coupled.

In this mode, Fixed Freq is grayed out (disabled).

Fixed – A single frequency (supplied by the Fixed Freq parameter) is measured. Meter View is ideal for this mode.

In this mode, the Start/Stop/Center Freq, Span, and Points parameters are grayed out (disabled).

List – A user-specified list of frequencies is measured. The list of frequencies can be supplied using the respective SCPI commands, loading the frequency list from file, or by entering the data manually into the frequency list. Duplicate frequencies are not acceptable. See ""Table Editor Operation" on page 549" for more information on entering data manually.

In this mode, the Start/Stop/Center/Fixed Freq, Span, and Points parameters are grayed out (disabled).

NOTE	When DUT is MCONverter, user needs to specify RF, IF and LO (if DUT LO is Swept) frequency list respectively. Switching DUT type will not change the frequency lists for MCONverter, i.e. when user switchs to MCONverter from other DUT types, RF, IF and LO freuqnecy lists will be restored to the latest values. See "Selected Freq List" on page 462 and Edit for more details on how to specify the frequency for MCONverter.

When the Frequency Mode is LIST and the context changes, the list values are recalculated to satisfy the new context.

Key Path	Frequency
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:MODE SWEPt	FIXed	LIST`
	`[:SENSe]:NFIGure:FREQuency:MODE?`
Example	FREQ:MODE FIX
Remote Command Notes	SWEPt parameter replaces SWEep
Preset	SWEPt
State Saved	Saved in instrument state.
Range	SWEPt|FIXed|LIST
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:FREQuency:MODE`
Initial S/W Revision	Prior to A.04.00
Coupling	See above.

DUT Setup Form Interaction

The frequencies displayed under the DUT Setup form change depending on the Frequency Mode parameter.

• When in SWEpt mode, the RF, IF and LO frequencies are displayed as described in section "DUT Setup" on page 230.

• When in FIXed mode, a RF, IF and LO fixed frequencies are all displayed. LO Frequency Mode is set to FIXed and disabled.

• If context=RF, RF and LO Fixed frequencies are enabled and IF is disabled.

• If context=IF, IF and LO Fixed frequencies are enabled and RF is disabled.

• When in LIST mode, all swept DUT Setup frequency parameters are grayed. The Start and Stop frequencies of the current context are taken from the frequency list (first and last entry in sorted frequency list). When DUT is not MCONverter, the frequencies of the other contexts are recalculated accordingly. The fixed frequency (IF or LO; determined by LO Freq Mode) is enabled. When DUT is MCONverter, users need to enter frequency list for other contexts (See "Selected Freq List" on page 462 and Edit).

Frequency Context

Defines the way frequencies are shown in the results view to the user when using a frequency converting device:

RF – Frequencies are displayed as they are before they enter the DUT and before any frequency conversion takes place. In the case of Sideband = DSB measurements, the RF frequencies represented are only that of the LSB Start and Stop range. If a frequency conversion is taking place then the RF frequencies are not the ones being measured at the signal analyzer RF input port.

IF – Frequencies are displayed as they are when they leave the DUT after the conversion takes place. If system downconverter is not used, these are the frequencies that the analyzer is physically measuring. If system downconverter is used, these are the frequencies that enter the system downconverter.

LO – Frequencies at the DUT external LO are displayed. These are NOT the frequencies that the analyzer is physically measuring. This context lets you review the LO frequencies required to program the external LO or those set by the analyzer. LO context is only selectable when the DUT external LO frequency mode is swept.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:FREQuency:CONText RF | IF | LO
	[:SENSe]:NFIGure:MODE:FREQuency:CONText?
Example	:NFIG:MODE:FREQ:CONT RF
	:NFIG:MODE:FREQ:CONT?
Preset	RF (Amplifier & System Down Conv), IF (Downconv Fixed LO), RF (Downconv, Swept LO) IF (Upconv, fixed LO), RF (Upconv Swept LO)
Range	RF | IF | LO
Backwards Compatibility SCPI	[:SENSe]:CONFigure:MODE:DOWNconv|SYSTem|UPConv:FREQuency:CONText

Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	

1. Disabled (grayed) when DUT is Amplifier. Context in this case defaults to RF.

2. When DUT is set to Downconv or Upconv, the context defaults to IF if LO Freq Mode in DUT group is set to Fixed, and the context defaults to RF if LO Freq Mode in DUT group is set to Swept.

3. Coupled with the 'eye' in the Calibration/Setup Diagram.

4. The frequencies under the Frequency softkey are changed to match the frequencies of the selected context. For example: if context is IF, and changed to RF, then the RF frequencies shown in the diagram remain the same, but the frequencies set under the freq key change to reflect RF frequencies.

5. Only when LO Freq Mode in DUT group is set to Swept, and DUT is Downconv or Upconv or Converter, can the context be set to LO.

6. Announciator in the Meas Bar displays the context.

Diagram

Opens a menu that enables you to select either the Calibration or Measurement diagram.

See for more information.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:DIAGram CALibration	MEASurement`
	`[:SENSe]:NFIGure:MODE:DIAGram?`
Example	:NFIG:MODE:DIAG CAL
	:NFIG:MODE:DIAG?
Preset	Measurement
State Saved	No
Range	CALibration	MEASurement
Initial S/W Revision	Prior to A.04.00

Connecting Different Device Types

The Noise Figure measurement application is capable of measuring a wide range of different device types. Figuring out how to hook up each of these devices for calibration and measurement is not immediately obvious, so to simplify things, some diagrams are provided.
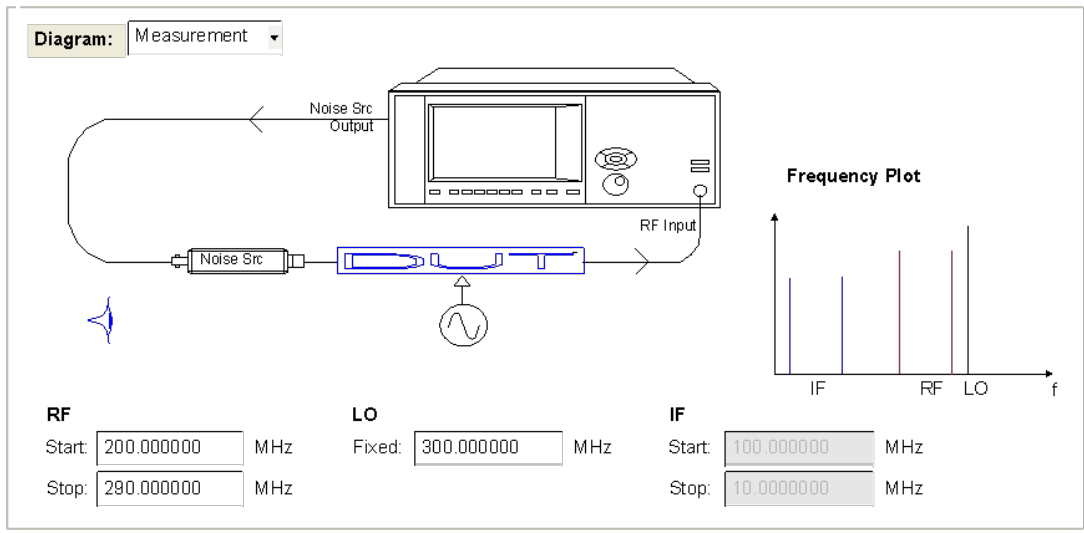
Calibration/Setup Diagram Layout

The IF/RF frequencies are displayed below the diagram (and the LO frequency or Factor if appropriate). A small 'eye' icon is displayed next to the frequencies that are used. This can be toggled between RF/IF/LO using the frequency context parameter. See the "Frequency Context" on page 242 parameter details for couplings.

The diagrams update in real-time as the settings on the form are changed, and the respective Calibration or Measurement diagram is displayed depending on the selection made in the form.
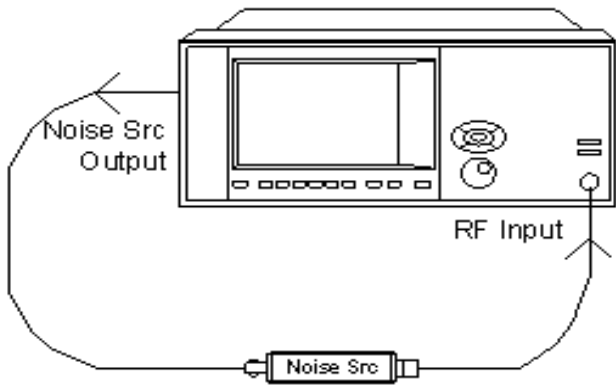
Figure 0-1: Calibration Diagram
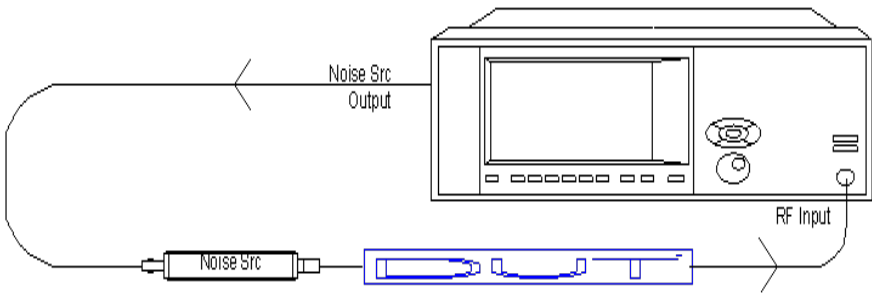
Amplifier Measurement Diagram
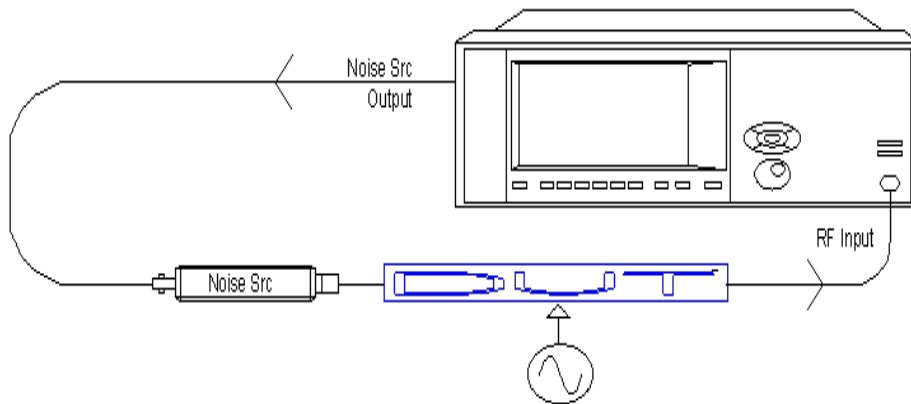
Frequency Converter Measurement Diagram
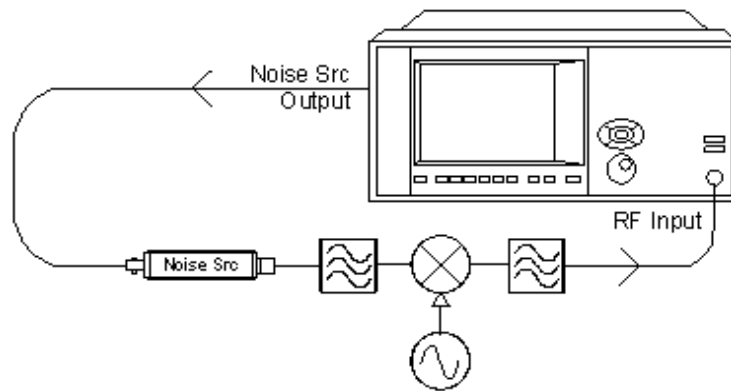
System Downconverter Calibration Diagram

For DSB measurements in System Downconverter mode, the filter at the RF port is removed from the diagram – it is misleading since this filter is normally used to remove one of the sidebands. In some cases the LPF at the output of the mixer is not needed if the 3.6GHz LPF in the RF front end of signal analyzer will suffice.
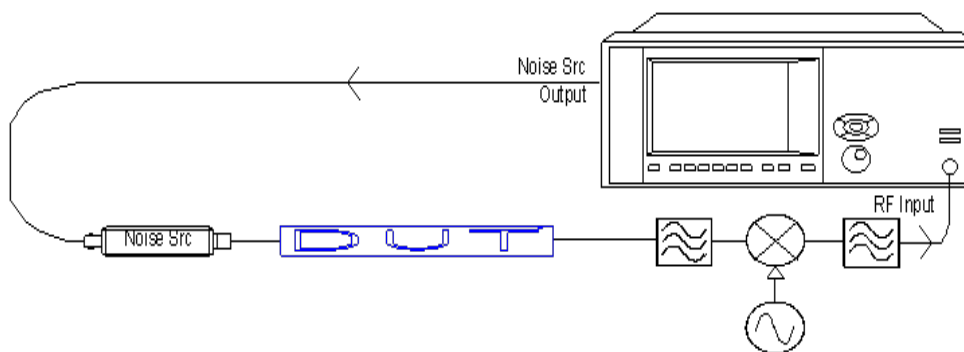
Figure 0-2: System Downconverter Measurement Diagram
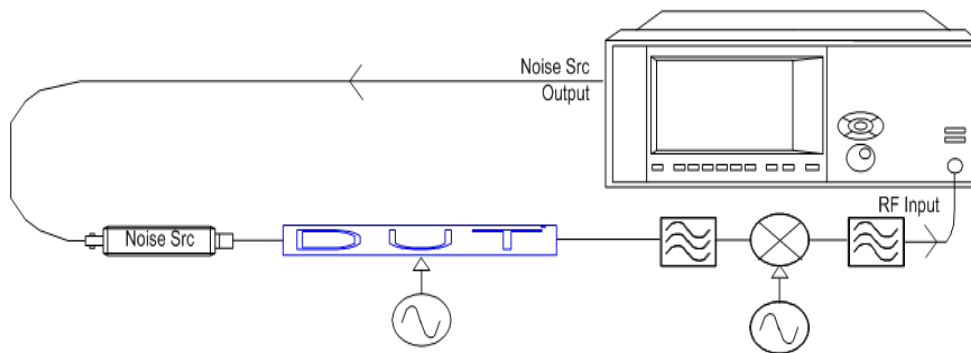
Frequency Converter with System Downconverter Diagram

For DSB measurements in System Downconverter mode, the filter at the input of the mixer will be removed from the diagram – it is misleading since this filter is normally used to remove one of the sidebands. In some cases the LPF at the output of the mixer is not needed if the 3.6 GHz LPF in the RF front end of the signal analyzer will suffice.
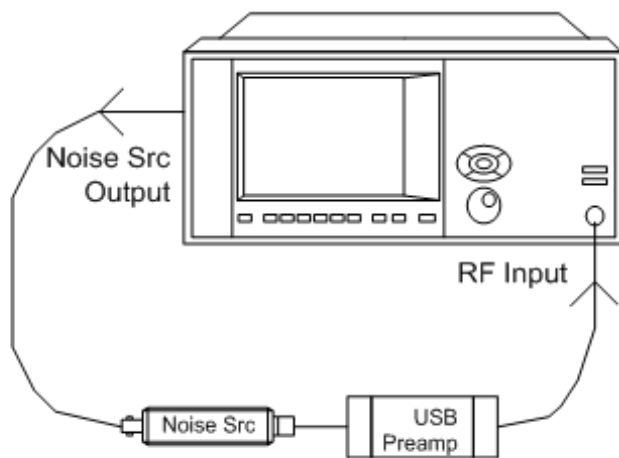
Figure 0-3: USB Preamp Calibration Diagram
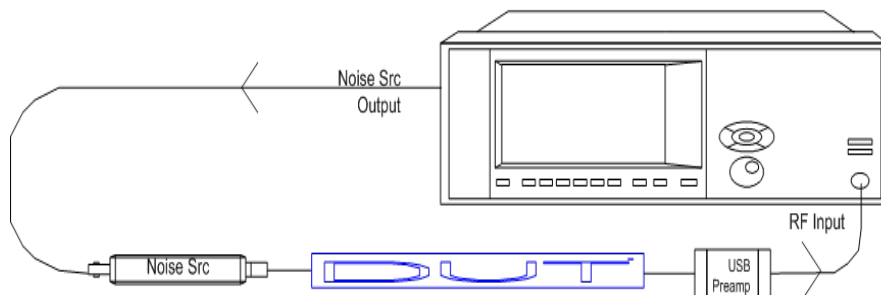
Figure 0-4: Amplifier with USB Preamp Measurement Diagram
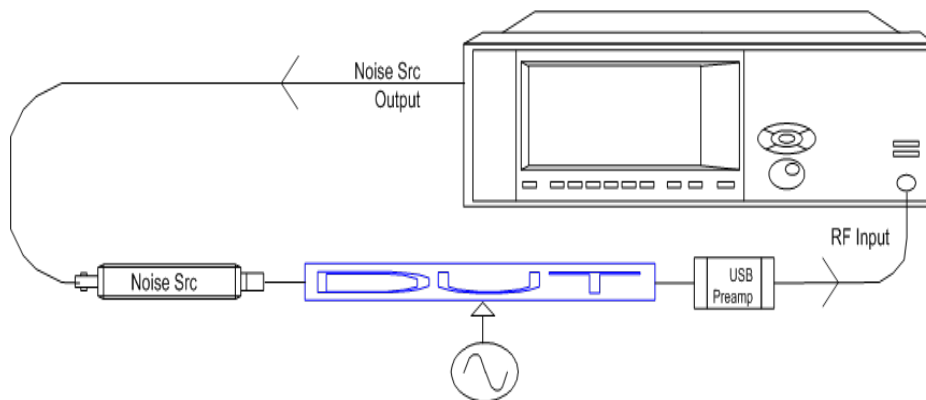
Figure 0-5: Frequency Converter with USB Preamp Measurement Diagram

LO Start Frequency

Sets the start frequency for a swept LO.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:STARt <freq>`
	`[:SENSe]:NFIGure:FREQuency:STARt?`
Example	FREQ:NFIG:STAR 11 MHz
Preset	Dependent on IF/RF Frequencies and only displayed when External LO Frequency Mode = SWEPt (Preset is FIXed).
State Saved	Saved in instrument state.
Range	1 Hz to 324.999999990 GHz
Min	1 Hz
Max	324.9 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled and hidden when LO Freq Mode is Fixed.
	2. Coupled to IF and RF frequencies.

LO Stop Frequency

Sets the stop frequency for a swept LO.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:STOP <freq>`
	`[:SENSe]:NFIGure:FREQuency:STOP?`
Example	FREQ:NFIG:STOP 11 MHz
Preset	Dependent on IF/RF Frequencies and only displayed when External LO Frequency Mode = SWEPt

	(Preset is FIXed).
State Saved	Saved in instrument state.
Range	2 Hz to 325 GHz
Min	2 Hz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled and hidden when LO Freq Mode is Fixed.
	2. Coupled to IF and RF frequencies.

LO Fixed Frequency

Sets the External LO frequency when the LO Freq Mode is set to Fixed when measuring frequency converting devices.

When using a fixed LO, this parameter becomes active along with the frequency in context (RF or IF). The frequencies used in the measurement can then be set between this parameter and the RF/IF. When a Swept LO is selected, this parameter is disabled and hidden and the LO Start and Stop frequency boxes are enabled and displayed to allow swept frequency adjustments.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency <freq>`
	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency?`
Example	:NFIG:MODE:DOWN:LOSC:FREQ 10 MHz
	:NFIG:MODE:DOWN:LOSC:FREQ?
Preset	30 GHz
State Saved	Saved in instrument state.
Range	1 Hz to 325 GHz
Min	1 Hz
Max	325 GHz
Readback Text	Value shown on DUT Setup Form.
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency (PSA/NFA/FSP)`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Only available when LO Freq Mode is Fixed.
	2. Coupled to IF and RF frequencies.

RF, LO and IF Frequencies

This section describes RF, LO and IF frequencies when DUT is Downconv, Upconv, Converter (Multi-stage). All the three parameters refer to DUT group. RF is the DUT input frequency, and IF is the DUT output frequency, and LO is the external LO frequency at DUT.

RF, LO and IF Frequencies (For DownConv and Upconv)

This section describes RF, LO and IF frequencies when DUT is Downconv, Upconv.

RF

The RF Start, Stop and Fixed frequencies can be changed via the DUT setup form. These parameters mirror those seen in the Frequency menu (as documented in section "Frequency (FREQ) Channel" on page 456) when the frequency context is RF. The Fixed frequency menu will appear only when the LO is Fixed, and the Frequency Mode is set to "Fixed".

RF Start Frequency

Sets the start frequency for a swept RF.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:STARt <freq>`
	`[:SENSe]:NFIGure:FREQuency:STARt?`
Example	FREQ:NFIG:STAR 11 MHz
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 324.999999990 GHz
Min	1 Hz
Max	324.9 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled and hidden when Freq Mode is Fixed.
	2. Grayed out when Freq Mode is List.
	3. Grayed out when Freq Context is LO or IF.
	4. Coupled to LO and IF frequencies.

RF Stop Frequency

Sets the stop frequency for a swept RF.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:STOP <freq>`
	`[:SENSe]:NFIGure:FREQuency:STOP?`

Example	FREQ:NFIG:STOP 11 MHz
Preset	3 GHz
State Saved	Saved in instrument state.
Range	2 Hz to 325 GHz
Min	2 Hz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled and hidden when Freq Mode is Fixed.
	2. Grayed out when Freq Mode is List.
	3. Grayed out when Freq Context is LO or IF.
	4. Coupled to LO and IF frequencies.

RF Fixed Frequency

Sets the RF fixed frequency.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:RF:FREQuency <freq>`
	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:RF:FREQuency?`
Example	:NFIG:MODE:DOWN:RF:FREQ 10 MHz
	:NFIG:MODE:DOWN:RF:FREQ?
Preset	30 GHz
State Saved	Saved in instrument state.
Range	1 Hz to 325 GHz
Min	1 Hz
Max	325 GHz
Readback Text	Value shown on DUT Setup Form.
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency` (PSA/NFA/FSP)
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Only available when Freq Mode is Fixed
	2. Grayed out when Freq Context is IF.
	3. Coupled to LO and IF frequencies.

LO

The LO Start, Stop and Fixed frequencies can be changed via the DUT setup form. These parameters mirror those seen in the Frequency menu (as documented in section "Frequency (FREQ) Channel" on page 456) when the frequency context is LO. If any of the LO frequencies lie outwith the range defined by the LO Min and Max frequencies (see "Min Freq" on page 298 and "Max Freq" on page 299), message 525 will be displayed.

LO Start Frequency

Sets the start frequency for a swept LO.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:STARt <freq>`
	`[:SENSe]:NFIGure:FREQuency:STARt?`
Example	FREQ:NFIG:STAR 11 MHz
Preset	Dependent on IF/RF Frequencies and only displayed when External LO Frequency Mode = SWEPt (Preset is FIXed).
State Saved	Saved in instrument state.
Range	1 Hz to 324.999999990 GHz
Min	1 Hz
Max	324.9 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled and hidden when LO Freq Mode is Fixed.
	2. Coupled to IF and RF frequencies.

LO Stop Frequency

Sets the stop frequency for a swept LO.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:STOP <freq>`
	`[:SENSe]:NFIGure:FREQuency:STOP?`
Example	FREQ:NFIG:STOP 11 MHz
Preset	Dependent on IF/RF Frequencies and only displayed when External LO Frequency Mode = SWEPt (Preset is FIXed).
State Saved	Saved in instrument state.
Range	2 Hz to 325 GHz
Min	2 Hz
Max	325 GHz

Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled and hidden when LO Freq Mode is Fixed.
	2. Coupled to IF and RF frequencies.

LO Fixed Frequency

Sets the External LO frequency when the LO Freq Mode is set to Fixed when measuring frequency converting devices.

When using a fixed LO, this parameter becomes active along with the frequency in context (RF or IF). The frequencies used in the measurement can then be set between this parameter and the RF/IF. When a Swept LO is selected, this parameter is disabled and hidden and the LO Start and Stop frequency boxes are enabled and displayed to allow swept frequency adjustments.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency <freq>`
	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency?`
Example	:NFIG:MODE:DOWN:LOSC:FREQ 10 MHz
	:NFIG:MODE:DOWN:LOSC:FREQ?
Preset	30 GHz
State Saved	Saved in instrument state.
Range	1 Hz to 325 GHz
Min	1 Hz
Max	325 GHz
Readback Text	Value shown on DUT Setup Form.
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:LOSCillator:FREQuency` (PSA/NFA/FSP)
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Only available when LO Freq Mode is Fixed.
	2. Coupled to IF and RF frequencies.

IF

The IF Start, Stop and Fixed frequencies can be configured via the DUT Setup form. These parameters mirror those found in the FREQ Channel menu when the frequency context is IF. The Start and Stop frequencies are only available when the context is IF.

IF Start Frequency

Sets the start frequency for a swept IF. This parameter is only available when External LO Frequency Mode is Fixed and Frequency Mode is Swept.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:FREQuency:STARt <freq>
	[:SENSe]:NFIGure:FREQuency:STARt?
Example	FREQ:NFIG:STAR 11 MHz
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 26.4 GHz
Min	1 Hz
Max	Hardware Dependent:
	Opt503 = 3.599999990 GHz
	Opt508 = 8.399999990 GHz
	Opt513 = 13.599999990 GHz
	Opt526 = 26.499999990 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled and hidden when LO Freq Mode is Swept.
	2. Disabled and hidden when Freq Mode is Fixed.
	3. Grayed out when Freq Mode is List.
	4. Coupled to RF and LO frequencies.

IF Stop Frequency

Sets the stop frequency for a swept IF. This parameter is only available when External LO Frequency Mode is Fixed and Frequency Mode is Swept.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:FREQuency:STOP <freq>
	[:SENSe]:NFIGure:FREQuency:STOP?
Example	FREQ:NFIG:STOP 11 MHz
Preset	3 GHz
State Saved	Saved in instrument state.
Range	2 Hz to 26.5 GHz
Min	2 Hz
Max	Hardware Dependent:
	Opt503 = 3.6 GHz
	Opt508 = 8.4 GHz
	Opt513 = 13.6 GHz
	Opt526 = 26.5 GHz

Initial S/W Revision	Prior to A.04.00
Coupling	1. Disabled and hidden when LO Freq Mode is Swept.
	2. Disabled and hidden when Freq Mode is Fixed.
	3. Grayed out when Freq Mode is List.
	4. Coupled to RF and LO frequencies.

IF Fixed Frequency

Sets the tuned frequency at the input of the Analyzer. This parameter is only available when External LO Frequency Mode is Swept, or Frequency Mode is set to Fixed.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:IF:FREQuency <freq>`
	`[:SENSe]:NFIGure:MODE:DOWNconv|UPConv:IF:FREQuency?`
Example	:NFIG:MODE:DOWN:IF:FREQ 15 GHz
	:NFIG:MODE:DOWN:IF:FREQ?
Preset	None – only displayed when DUT is a mixing device (Upconverter, downconverter). Default DUT is AMPLifier.
State Saved	Saved in instrument state.
Range	Depends on the frequency range of purchased model.
Min	1 Hz
Max	Depends on the frequency range of purchased model.
Backwards Compatibility SCPI	`[:SENSe]:CONFigure:MODE:DOWNconv|UPConv:IF:FREQuency (NFA)`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Available only when LO Freq Mode is Swept or Freq Mode is Fixed.

RF, LO and IF Frequencies (For Converter)

When measuring Converter (multi-stage), RF, LO and IF frequencies should be set by editing Start, Stop and Fixed frequencies (when Freq Mode is Swept or Fixed), or by editing RF, LO and IF frequency list (when Freq Mode is List). Application will not calculate and check these frequencies for this type of DUT.

There is no limitation on whether the Stop frequency should be greater than Start frequency. For example, when External LO Frequency Mode is Fixed and Frequency Mode is Swept, IF Start and Stop frequencies could be equal if there was a swept LO in the combination of multi-stage converter. However it's not controlled by application.

RF

The RF Start, Stop and Fixed frequencies can be changed via the DUT setup form. These parameters mirror those seen in the Frequency menu (as documented in section "Frequency (FREQ) Channel" on page 456) when the frequency context is RF.

The following commands are used to set the RF Start, Stop and Fixed frequencies when DUT is Converter (multi-stage).

RF Fixed Frequency

Sets the fixed RF Frequency for Converter (multi-stage) when Frequency Mode is set to Fixed.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:MCONverter:RF:FREQuency <freq>`
	`[:SENSe]:NFIGure:MODE:MCONverter:RF:FREQuency?`
Example	:NFIG:MODE:MCON:RF:FREQ 15 GHz
	:NFIG:MODE:MCON:RF:FREQ?
Preset	30 MHz
State Saved	Saved in instrument state.
Range	Depends on the frequency range of purchased model.
Min	1 Hz
Max	Depends on the frequency range of purchased model.
Initial S/W Revision	A.13.00
Coupling	Only available when Freq Mode is Fixed.

LO

The LO Start, Stop and Fixed frequencies can be changed via the DUT setup form. These parameters mirror those seen in the Frequency menu (as documented in section "Frequency (FREQ) Channel" on page 456) when the frequency context is LO.

The following commands are used to set the LO Start, Stop and Fixed frequencies when DUT is Converter (multi-stage).

LO Fixed Frequency

Sets the External LO frequency when the LO Frequency Mode is set to Fixed. When a Swept LO is selected, this parameter is disabled and hidden and the LO Start and Stop frequency boxes are enabled and displayed to allow swept frequency adjustments.

When measuring Converter (multi-stage) using a fixed LO, RF, LO and IF frequency parameters will be always active no matter which frequency context is selected.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE

Remote Command	`[:SENSe]:NFIGure:MODE:MCONverter:LOSCillator:FREQuency <freq>`
	`[:SENSe]:NFIGure:MODE:MCONverter:LOSCillator:FREQuency?`
Example	:NFIG:MODE:MCON:LOSC:FREQ 15 GHz
Preset	30 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 325 GHz
Min	1 Hz
Max	325 GHz
Initial S/W Revision	A.13.00
Coupling	Disabled when LO Freq Mode is Swept.

IF

The IF Start and Stop frequencies can be changed via the DUT setup form. These parameters mirror those seen in the Frequency menu (as documented in section) when the frequency context is IF.

The following commands are used to set the IF Start, Stop and Fixed frequencies when DUT is Converter (multi-stage).

IF Start Frequency

This command is used to set the IF start frequency when DUT type is Converter (multi-stage). When Frequency Context is IF, user can use [:SENSe]:NFIGure:FREQuency:STARt or this command to set IF start frequency; When Frequency Context is RF/LO, user can only use this command to set IF start frequency.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:MCONverter:IF:FREQuency:STARt <freq>`
	`[:SENSe]:NFIGure:MODE:MCONverter:IF:FREQuency:STARt?`
Example	NFIG:MODE:MCON:IF:FREQ:STAR 30MHz
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 26.4 GHz
Min	1 Hz
Max	Hardware Dependent:
	Opt503 = 3.7 GHz
	Opt507 (for CXA) = 7 GHz
	Opt507 (for EXA) = 7 GHz
	Opt508 = 8.5 GHz
	Opt513 = 13.8 GHz
	Opt526 = 26.5 GHz

	Opt532 = 32 GHz
	Opt543 = 43 GHz
	Opt544 = 44 GHz
	Opt550 = 50 GHz
Initial S/W Revision	A.13.00
Coupling	1. Disabled and hidden when Freq Mode is Fixed.
	2. Grayed out when Freq Mode lis List.

IF Stop Frequency

This command is used to set the IF stop frequency when DUT type is Converter (multi-stage). When Frequency Context is IF, user can use [:SENSe]:NFIGure:FREQuency:STOP or this command to set IF stop frequency; When Frequency Context is RF/LO, user can only use this command to set IF stop frequency.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:MCONverter:IF:FREQuency:STOP <freq>
	[:SENSe]:NFIGure:MODE:MCONverter:IF:FREQuency:STOP?
Example	NFIG:MODE:MCON:IF:FREQ:STOP 30MHz
Preset	3 GHz
State Saved	Saved in instrument state.
Range	2 Hz to 26.5 GHz
Min	2 Hz
Max	Hardware Dependent:
	Opt503 = 3.7 GHz
	Opt507 (for CXA) = 7 GHz
	Opt507 (for EXA) = 7 GHz
	Opt508 = 8.5 GHz
	Opt513 = 13.8 GHz
	Opt526 = 26.5 GHz
	Opt532 = 32 GHz
	Opt543 = 43 GHz
	Opt544 = 44 GHz
	Opt550 = 50 GHz
Initial S/W Revision	A.13.00
Coupling	1. Disabled and hidden when Freq Mode is Fixed.
	2. Grayed out when Freq Mode lis List.

IF Fixed Frequency

Set the fixed IF frequency. For Converter (multi-stage), this parameter is only available when Frequency Mode is set to Fixed.

Key Path	Mode Setup, DUT Setup, FORM
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:MCONverter:IF:FREQuency <freq>
	[:SENSe]:NFIGure:MODE:MCONverter:IF:FREQuency?
Example	NFIG:MODE:MCON:IF:FREQ 30MHz
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 26.4 GHz
Min	1 Hz
Max	Hardware Dependent:
	Opt503 = 3.7 GHz
	Opt507 (for CXA) = 7 GHz
	Opt507 (for EXA) = 7 GHz
	Opt508 = 8.5 GHz
	Opt513 = 13.8 GHz
	Opt526 = 26.5 GHz
	Opt532 = 32 GHz
	Opt543 = 43 GHz
	Opt544 = 44 GHz
	Opt550 = 50 GHz
Initial S/W Revision	A.13.00
Coupling	Available only when Freq Mode is Fixed.

External LO Configuration

Opens external LO setup menu.

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

The Ext LO Config menu allows you to maintain a list of available instruments, choose and setup the instrument that you want to use from the list as an External LO. It shows the currently selected instruments at the bottom of the screen.

The display while in the Ext LO Config menu is as follows:
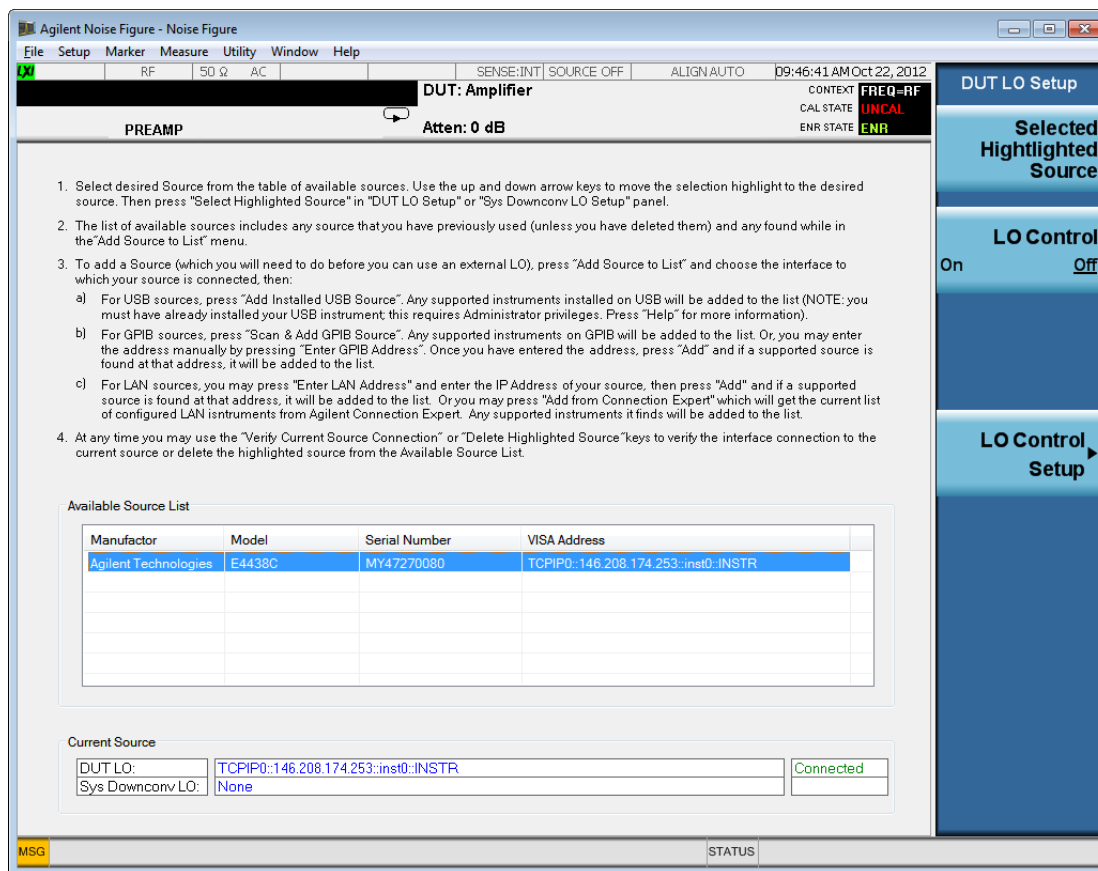
The text in the display is presented below.

1. Select desired source from the list of available sources. Use the up and down arrow keys to move the selection highlight to the desired source. Then press "Select Highlighted Source" in "DUT LO Setup" or "Sys LO Setup" panel.

2. The list of available sources includes any sources that you have previously used (unless you have deleted them) and any found while in the "Add Source to List" menu.

3. To add a source (which you will need to do before you can use an external source), press "Add Source to List" and choose the interface to which your Source is connected, then:

a)For USB sources press "Add Installed USB Sources". Any supported sources installed on USB will be added to the list (NOTE: you must have already installed your USB source; this requires Administrator privileges. Press "Help" for more information).

b)For GPIB sources, press "Scan & Add GPIB Sources." Any supported sources on GPIB will be added to the list. Or, you may enter the address manually by pressing "Enter GPIB Address." Once you have entered the address, press "Add" and if a supported source is found at that address, it will be added to the list.

c)For LAN sources, you may press "Enter LAN Address" and enter the IP Address of your source, then press "Add" and if a supported source is found at that address, it will be added to the list.   Or, you may press "Add from Connection Expert List" which will get the current list of configured LAN sources from Agilent Connection Expert. Any supported sources it finds in that list will be added to the list of available sources.

4. At any time you may use the "Verify Current Source Connection" or "Delete Highlighted Source" keys to verify the interface connection to the Current Source or delete the highlighted source from the Available Source List.

Add Source To List

This menu allows you to add to the list of available sources from various interfaces.

Key Path	Mode Setup, Ext LO Config,
Initial S/W Revision	A.13.00

USB

Sources on USB (once installed) can be added to the list by pressing "Add Installed USB Sources." Any supported source found will be added to the list.

See "Add Installed USB Sources" on page 260 for information on connecting and installing USB devices.

Key Path	Mode Setup, Ext LO Config, Add Source to List
Initial S/W Revision	A.13.00

Add Installed USB Sources

Press this key to add USB sources to the Available Source List. Note that this function will ONLY find sources that have previously been installed onto the USB. For information on how to install a USB source, see "Installing a USB source" on page 261.

Key Path	Mode Setup, Ext LO Config, Add Source to List, USB
Notes	If no installed USB device is found which is a supported source, an error message is generated – 310.1104
Initial S/W Revision	A.13.00

Installing a USB source

USB is the only interface which requires no runtime action by the user in the Select Source menu, but does require "installation" when a source is plugged in.

First, connect the USB source to the analyzer. You will get a dialog like this:
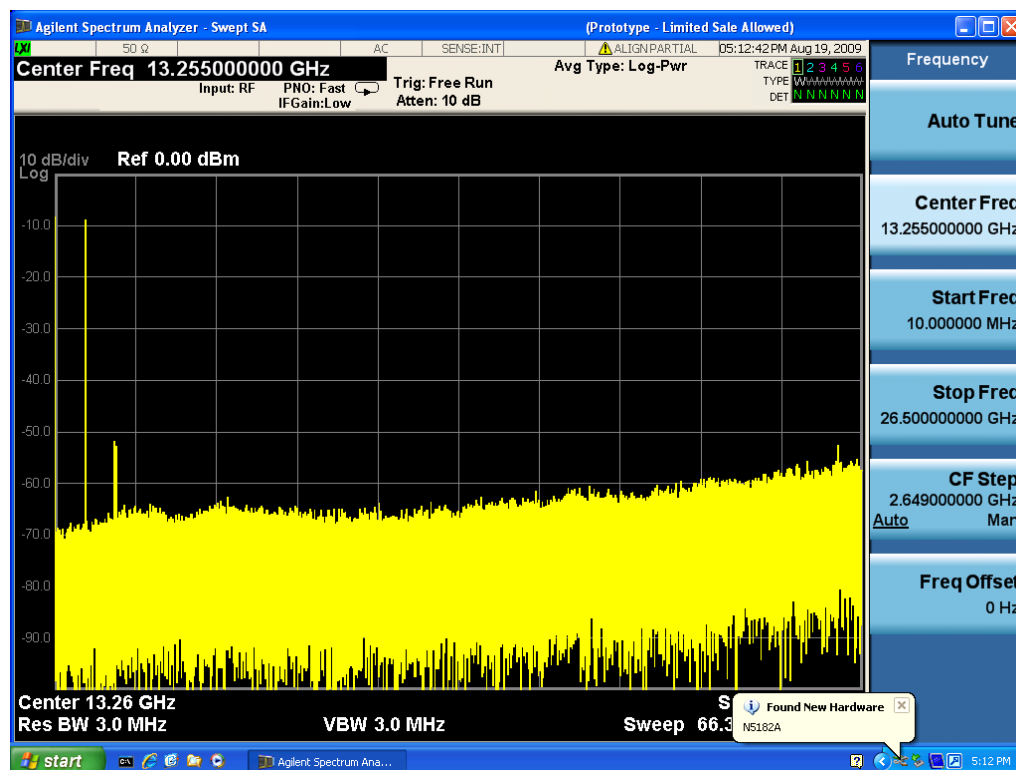
followed by this:
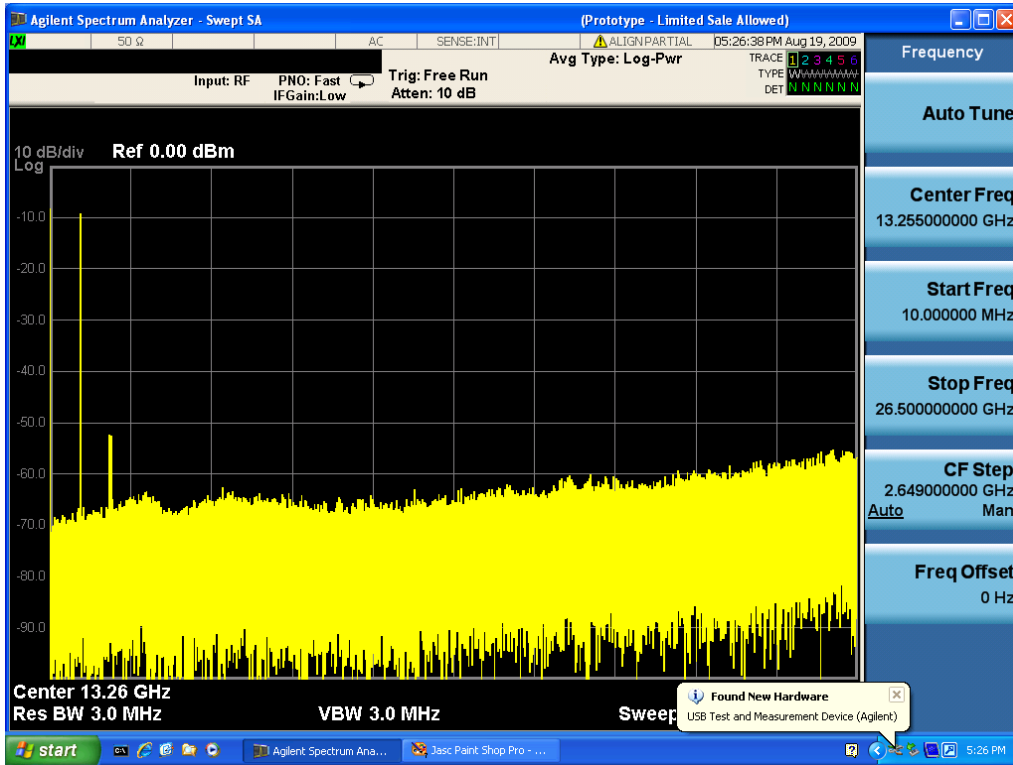
Then you are prompted to enter a username and password with administrator privileges:
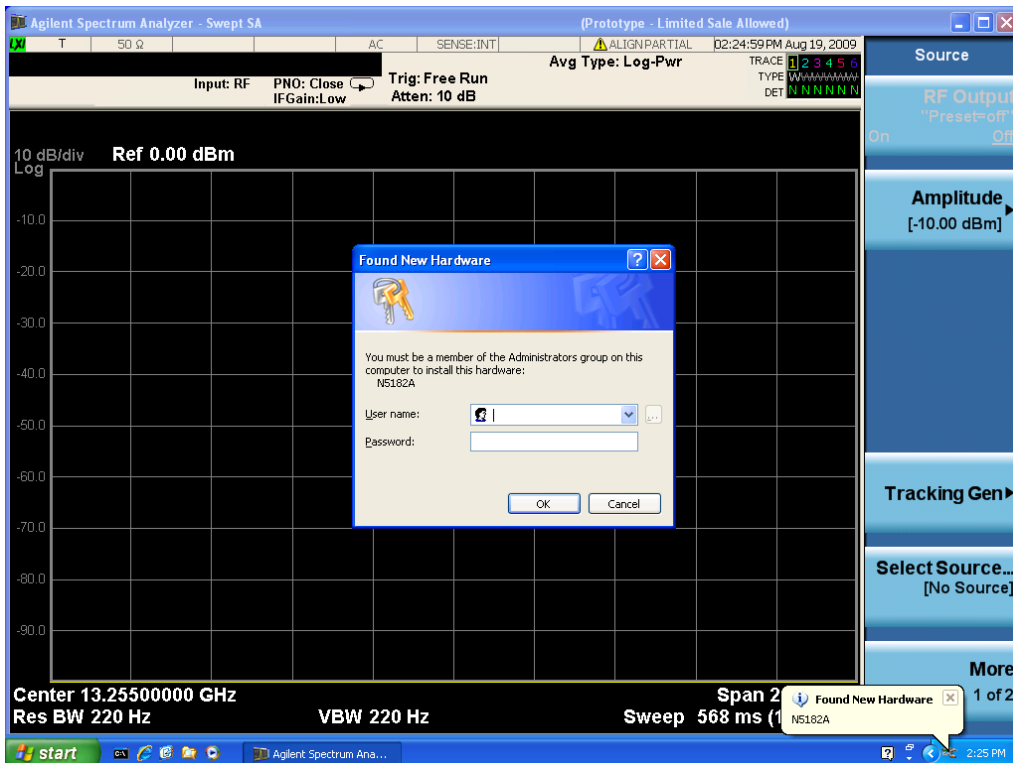
Enter the user name "administrator" and the password "agilent4u" and click OK:
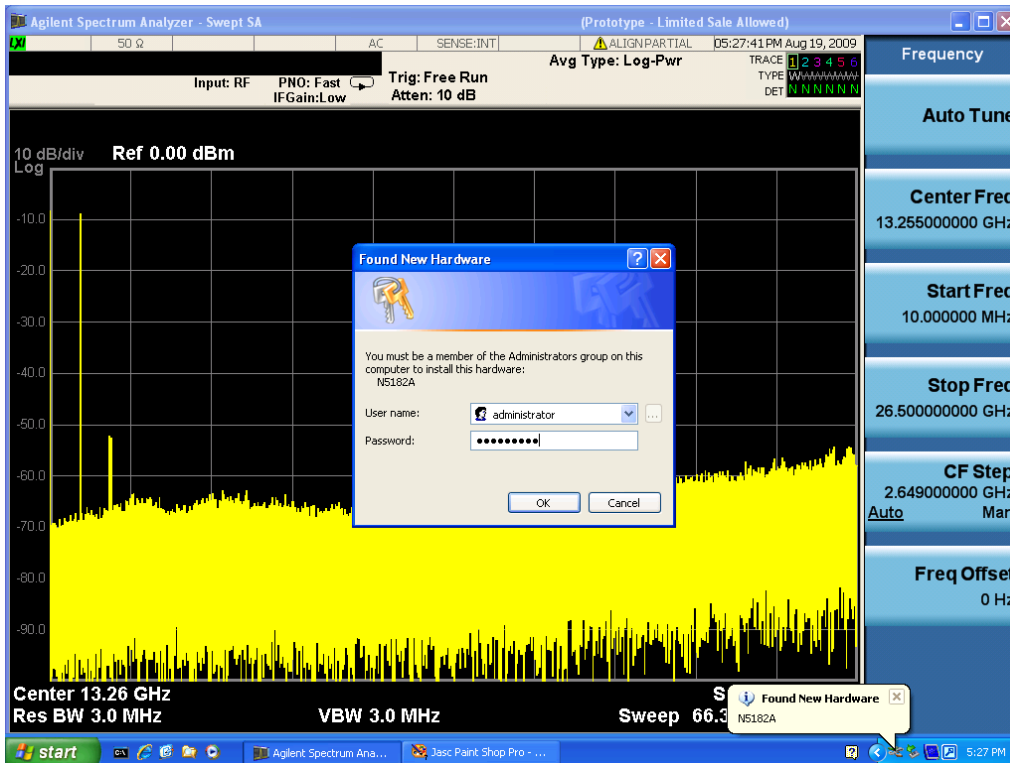
Now you will be presented with the New Hardware Wizard. Click **No, not this time**, **Next**>:
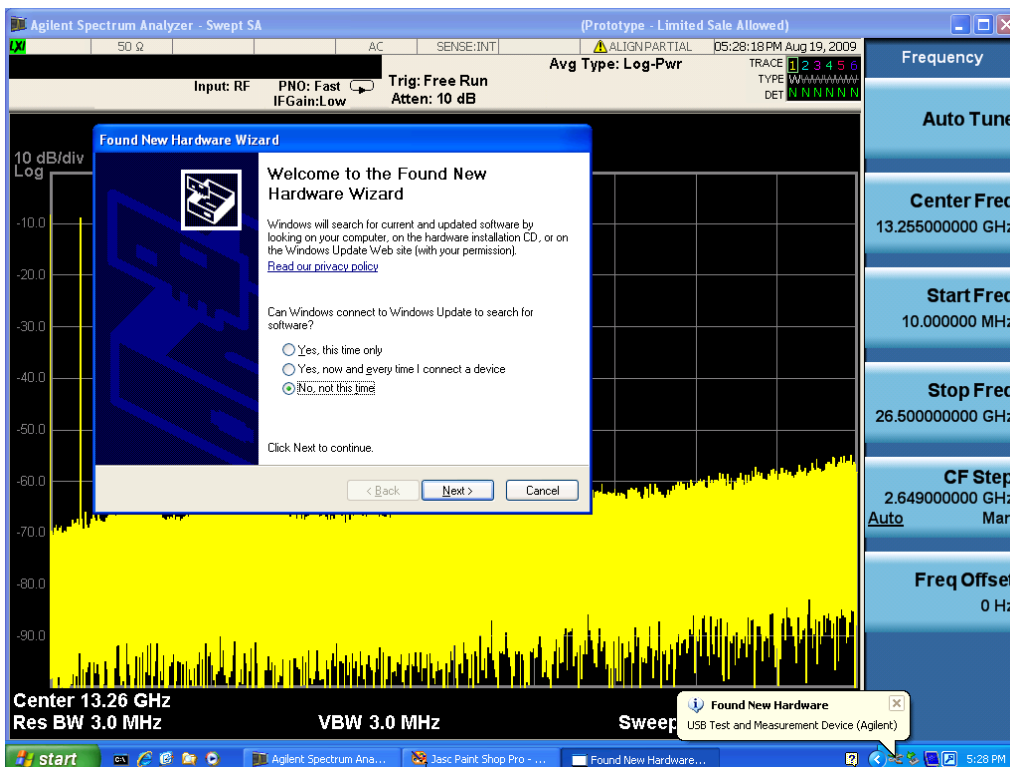
Click **Install the software automatically,** **Next**:
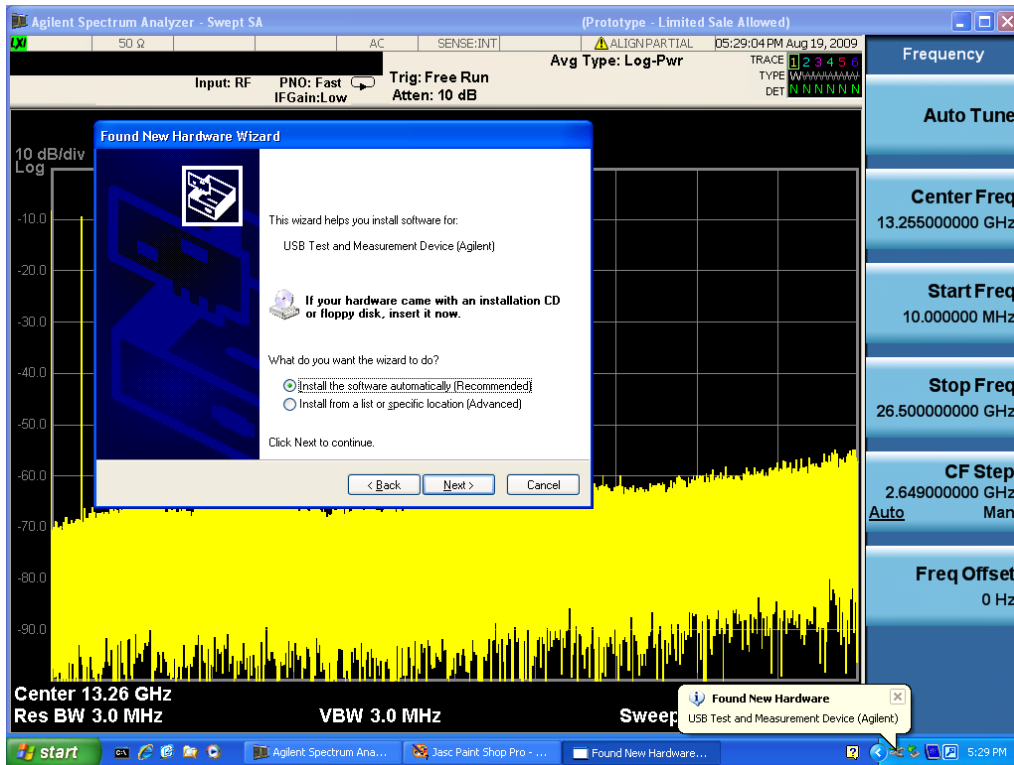
The driver software will install. When done, you will get this message:
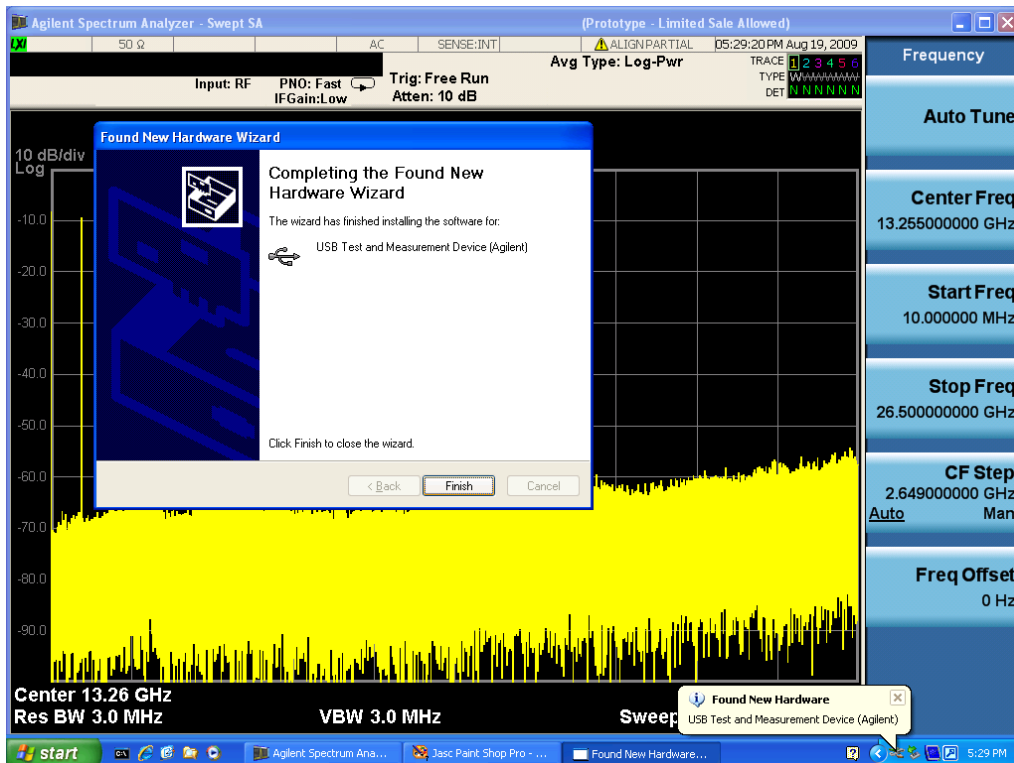
Click **Finish** and your source is installed.
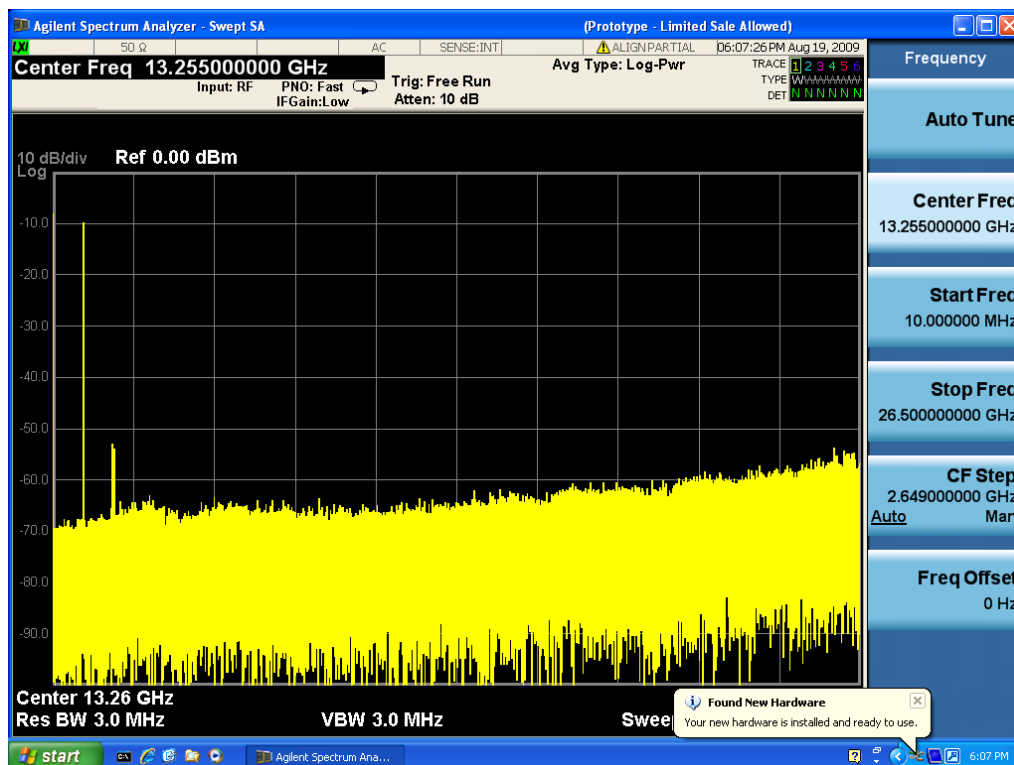
Once a given source is installed you should not have to repeat this procedure for that source.

GPIB

Lets you add GPIB sources to the Available Source List. Both GPIB-GPIB and USB-GPIB interfaces are supported.

For the GPIB-GPIB interface to work properly, it must be configured as a Controller. You can find this setting in the System menu under System, I/O Config, GPIB. Set the GPIB Controller function to Enabled.

Note that you must also make sure that the GPIB interface is not set to "Ignore" in the Agilent Connection Expert. If it is set to **Ignore**, then even if the GPIB Controller is set to **Enabled**, it is not possible for the analyzer to find a GPIB connected source. See below.

For the USB-GPIB interface, you do NOT need to set the GPIB Controller to Enabled.

Key Path	Mode Setup, Ext LO Config, Add Source to List
Initial S/W Revision	A.13.00

More Information

If you suspect that the GPIB interface is set to Ignore, run the Agilent Connection Expert (ACE). To run ACE, press Mode Setup, Ext LO Config, Add Source to List, LAN, Run Connection Expert. Look for the GPIB branch on the interface tree:
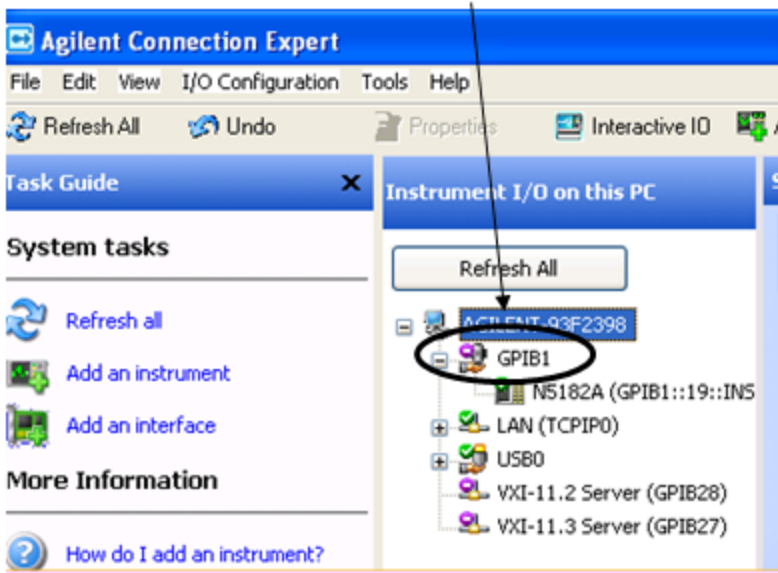
Right click on the GPIB branch (you will have to plug in a mouse to do this). You should see a dialog like the one below. If this dialog says **Stop Ignoring**, select **Stop Ignoring** and close ACE.
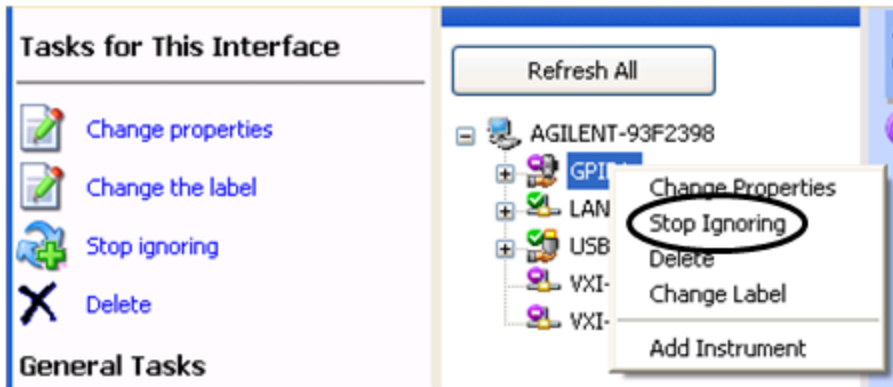
Scan & Add GPIB Sources

Sources on GPIB can be added by pressing Scan & Add GPIB Sources. Any supported source found will be added to the Available Source List.

NOTE   Both GPIB-GPIB and USB-GPIB connection are supported. If GPIB Controller is disabled, the following pop-up message will be displayed to inform the user only USB-GPIB sources will be added.

Add GPIB Sources

GPIB Controller is Disabled, only USB-GPIB sources will be added.
To add GPIB-GPIB source, please Enable GPIB Controller.

Press "OK" or "Enter" to continue, "Cancel" or "ESC" to close this dialog.

OK   Cancel
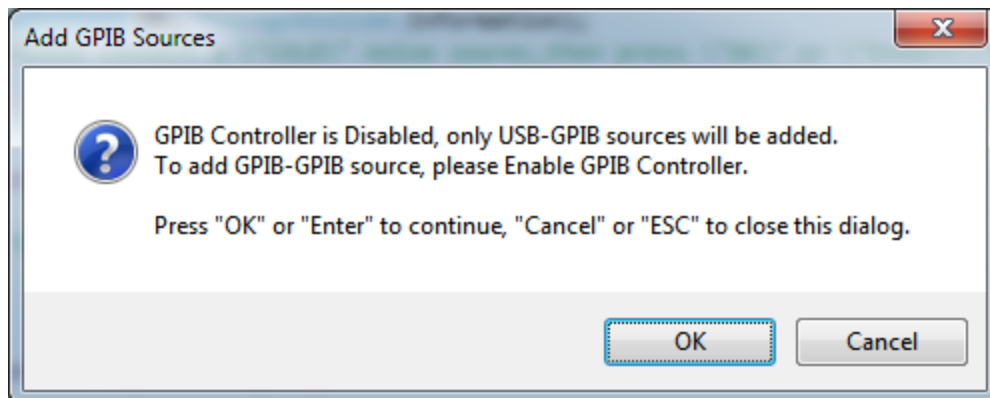
Key Path	Mode Setup, Ext LO Config, Add Source to List, GPIB
Notes	If no GPIB device is found which is a supported source, an error message is generated –310.1104
Initial S/W Revision	A.13.00

Enter GPIB Address

Opens up a menu which lets you enter the GPIB address of the desired source directly.

NOTE   For this to work properly, the GPIB interface must be configured as GPIB1. This is the default state and should normally be the case. To see how to verify this, see below.

Both GPIB-GPIB and USB-GPIB connection are supported. If GPIB Controller is disabled, the following pop-up message will be displayed to inform the user only USB-GPIB sources will be added.

Add GPIB Sources

GPIB Controller is Disabled, only USB-GPIB sources will be added.
To add GPIB-GPIB source, please Enable GPIB Controller.

Press "OK" or "Enter" to continue, "Cancel" or "ESC" to close this dialog.

OK   Cancel
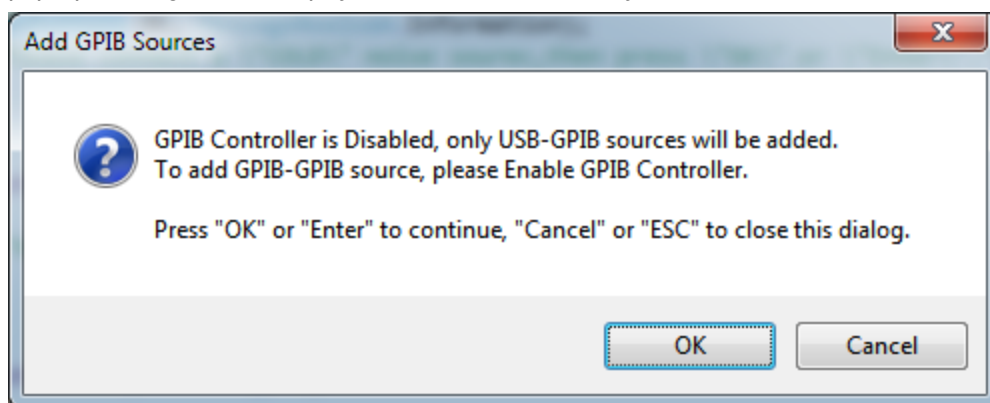
Key Path	Mode Setup, Ext LO Config, Add Source to List, GPIB
Initial S/W Revision	A.13.00

More Information

If you suspect that the GPIB interface is not set to GPIB1, run the Agilent Connection Expert (ACE). To run ACE, press Mode Setup, Ext LO Config, Add Source to List, LAN, Run Connection Expert. Look for the GPIB branch on the interface tree:
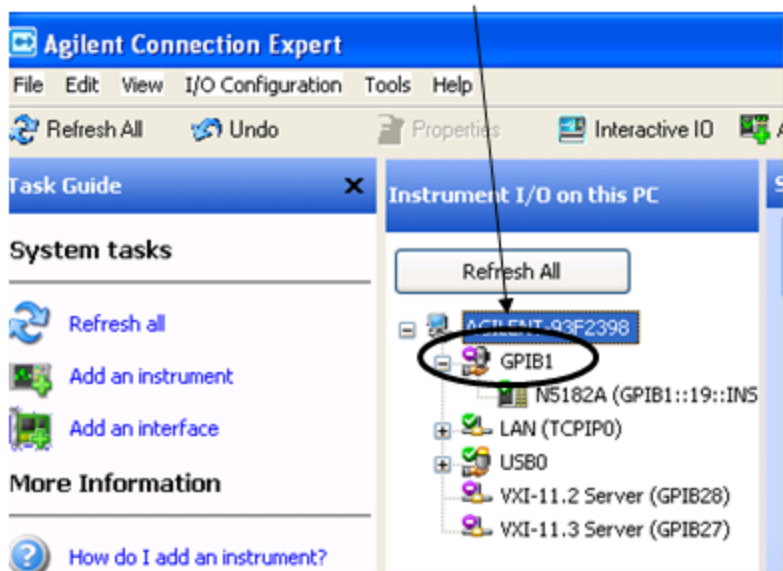
If this branch is not labeled **GPIB1**, right click on the GPIB branch (you will have to plug in a mouse to do this) and select **Change Properties**.
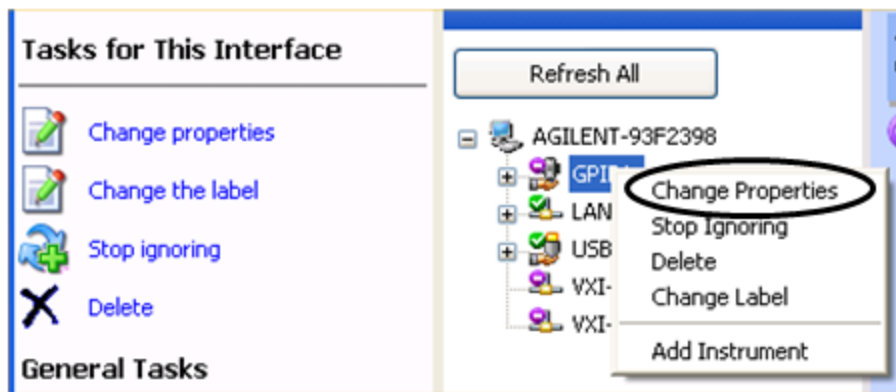
You should see a dialog like the one below. Click on the drop-down arrow under **VISA Interface ID,** select **GPIB1** and click **OK**
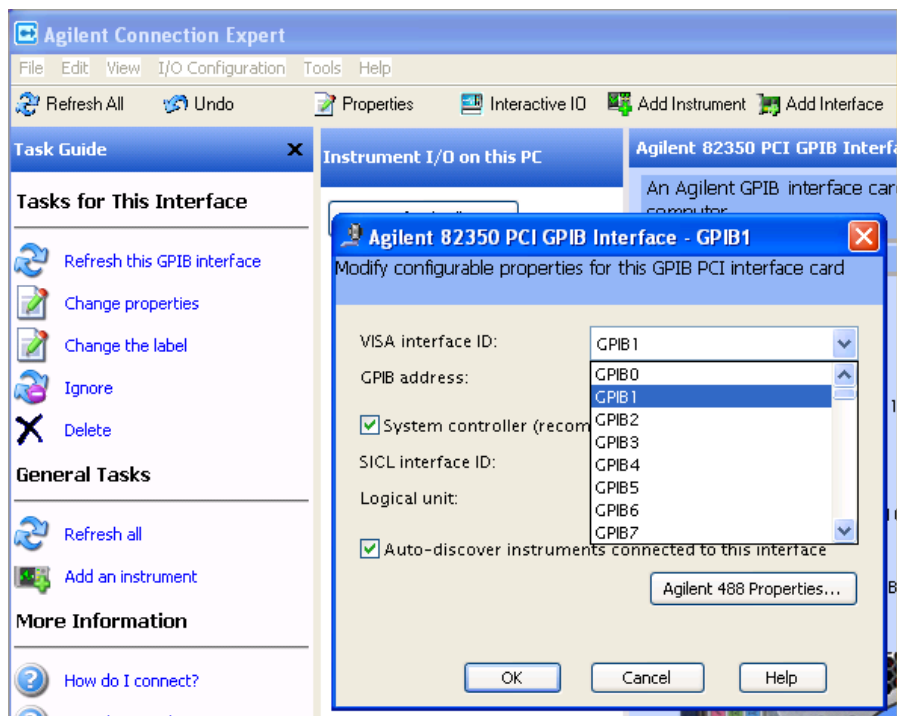
GPIB Address

Lets you enter the GPIB address. After you enter the address press Add to add the source at that address to the Available Source List.

Key Path	Mode Setup, Ext LO Config, Add Source to List, GPIB, Enter GPIB Address
Preset	Unaffected by Mode Preset but set to 19 by "Restore Input/Output defaults"
State Saved	No
Min	0
Max	30
Initial S/W Revision	A.13.00

Add

Add the source at the entered GPIB address to the Available Source List. If a supported source is found at that address it will be added to the list.

Key Path	Mode Setup, Ext LO Config, Add Source to List, GPIB, Enter GPIB Address
Notes	If no supported source is found at the specified address, an error message is generated –310.1104
Initial S/W Revision	A.13.00

LAN

The LAN cannot be scanned directly from the analyzer software, but you can import the list of currently configured devices from Agilent Connection Expert by pressing "Add From Connection Expert List." The Connection Expert List depends on which instruments have already been discovered by the Agilent Connection Expert application. Any connected, supported sources in that list will be added.

You can also enter the IP address and press "Add". If a supported source is found at that address it will be added.

If you want to discover sources on the LAN, you can open Connection Expert by pressing the "Run Connection Expert..." softkey.

Key Path	Mode Setup, Ext LO Config, Add Source to List
Initial S/W Revision	A.13.00

Enter LAN Address

Opens up a menu which lets you enter the IP address of the desired source directly.

Key Path	Mode Setup, Ext LO Config, Add Source to List, LAN
Initial S/W Revision	A.13.00

IP Address

Lets you enter the IP address of the desired source. After you enter the address you should press "Add" to add the source at that address to the Available Source List.

As this is an alphanumeric active function, normally this would bring up the Alpha Editor. However, all of the characters required are found on the numeric keypad and bringing up the Alpha Editor creates unnecessary confusion and complexity. I recommend we simply bring up an Enter softkey and do not put up the Alpha Editor, if this is possible.

Key Path	Source
Preset	Unaffected by Mode Preset but set to 0.0.0.0 by Restore Input/Output defaults
State Saved	No
Initial S/W Revision	A.13.00

Add

Adds the source at the entered IP address to the Available Source List. If a supported source is found at that address it will be added to the list.

Key Path	Source
Notes	If no supported source is found at the specified address, an error message is generated –310.1104
Initial S/W Revision	A.13.00

Run Connection Expert...

Runs the Agilent Connection Expert so that you can scan the LAN for sources.

Key Path	Mode Setup, Ext LO Config, Add Source to List, LAN
Initial S/W Revision	A.13.00

Add From Connection Expert List

You can import the list of currently configured devices from Agilent Connection Expert by pressing Add From Connection Expert List. The Connection Expert list depends on which instruments have already been discovered by the Agilent Connection Expert application. Any connected, supported sources in that list will be added.

Key Path	Mode Setup, Ext LO Config, Add Source to List, LAN
Notes	If no supported source is found in the Connection Expert list, an error message is generated – 310.1104
Initial S/W Revision	A.13.00

Delete Highlighted Source

Deletes the highlighted source from the list of available sources. You will be prompted with a dialog box to make sure you REALLY want to do this. The prompt says "The highlighted source will be permanently deleted from the list. Are you sure you want to do this? Press Enter to proceed, or Cancel (ESC) to cancel."

Key Path	Mode Setup, Ext LO Config
Initial S/W Revision	A.13.00

Verify Current Source Connection

This key verifies the interface connection to both the DUT LO and System downconverter LO (it does NOT verify any signal connections!)

If the previous status of the connection is "Connected", it will become "Disconnected" (in red) if the verification fails. It could take several sections to complete the verification if the connection is invalid. If the verification succeeds, it remains "Connected". If the previous status is "Disconnected", it will also become "Connected" if the verification succeeds.

Key Path	Mode Setup, Ext LO Config
Initial S/W Revision	A.13.00

DUT LO Setup

Brings up the Ext LO menu, which is used to set up the Ext LO that is connected to a DUT.

Key Path	Mode Setup, Ext LO Config
Mode	NFIGURE
Initial S/W Revision	A.13.00
Coupling	Disabled(grayed) when N/W9069A–2FP is not installed, and DUT type is AMPLifiler.

Select Highlighted Source

You can navigate up and down in the list with the up and down arrow keys, and select any entry by pressing the Select Highlighted Source key. The highlighted source becomes the Current source and is prominently displayed at the bottom of the screen.

Key Path	Mode Setup, Ext LO Config, DUT LO Setup, Sys Downconv Setup
Mode	NF
Remote Command	:SYSTem:COMMunicate:SOURce:DUT|SYSTem:ADDRess <address string>
	:SYSTem:COMMunicate:SOURce:DUT|SYSTem:ADDRess?
Example	Different examples for setting external source address
	:SYST:COMM:SOUR:DUT:ADDR "TCPIP0::MyHostName::INSTR"
	:SYST:COMM:SOUR:DUT:ADDR "TCPIP0::123.121.100.210::INSTR"
	:SYST:COMM:SOUR:DUT:ADDR "USB0::12212::32145::US1234567A::INSTR"
	:SYST:COMM:SOUR:DUT:ADDR "GPIB1::19::INSTR"
Notes	Empty string is allowed and means no source is defined or selected.
Dependencies	If no supported source, or no source at all is found at the specified address, the SCPI command generates an error message –310.1104
Initial S/W Revision	A.13.00
Coupling	This parameter is coupled to the Min Frequency and Max Frequency parameters if the address entered is that of a SCPI compliant Signal Source. In this case, the Min and Max Frequency parameters are set according to the results of a FREQ? MIN and FREQ? MAX query.
	1. If address tried is not responding then error message 167 will be displayed.
	2. If address tried is valid but not that of a valid source (e.g. the address of another instrument or PC), error message 167 will be displayed.
	3. If the address is not valid, error message –222.5000 displayed.

LO Control (on/off)

Toggles external LO control on/off.

Key Path	Mode Setup, Ext LO Config, DUT LO Setup | Sys Downconv Setup
Mode	NFIGURE

Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:CONTrol[:STATe] ON	OFF	1	0`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:CONTrol[:STATe]?`
Example	:NFIG:MODE:LOSC:DUT:CONT OFF
	:NFIG:MODE:LOSC:DUT:CONT?
Preset	OFF
State Saved	Saved in instrument state.
Range	On|Off
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	When set to On and there is no valid external source, then error message 153 will be displayed.

LO Control Setup

This menu is used to set up miscellaneous source functions, including Ext LO power level, settling time, minimum frequency, maximum frequency, etc.

Key Path	Mode Setup, Ext LO Config, DUT LO Setup	Sys Downconv Setup
Mode	NF
Initial S/W Revision	A.13.00

LO Power

Sets the fixed signal generator LO drive level into the frequency converter device.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:POWer[:LEVel] <float>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:POWer[:LEVel]?`
Example	:NFIG:MODE:LOSC:DUT:PAR:POW 22.25 dBm
	:NFIG:MODE:LOSC:DUT:PAR:POW?
Preset	0.00 dBm
State Saved	Saved in instrument state.
Range	−100 dBm to 100 dBm
Min	−100
Max	100
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Settling Time

Controls the grace period allocated for the LO to settle between issue of commands.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:SETTling[:TIME] <float>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:SETTling[:TIME]?`
Example	:NFIG:MODE:LOSC:DUT:PAR:SETT 150 ms
	:NFIG:MODE:LOSC:DUT:PAR:SETT?
Preset	100 ms
State Saved	Saved in instrument state.
Range	0 – 1000 ms
Min	0
Max	1000 ms
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Multiplier Numerator

This sets the External Local Oscillator frequency multiplier.If an external frequency divider is used in conjunction with the External Local Oscillator then the values of the multiplier denominator should be set to the external frequency divider's dividing factor.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:NUMerator <int>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:NUMerator?`
Example	:NFIG:MODE:LOSC:DUT:PAR:MULT:NUM 1000
	:NFIG:MODE:LOSC:DUT:PAR:MULT:NUMerator?
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Min	1
Max	20000000000
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Multiplier Denominator

This sets the External Local Oscillator frequency divider value. If an external frequency multiplier is used in conjunction with the External Local Oscillator then the values of the multiplier should be set to the external frequency multiplier's multiplying factor. Alternatively, this value can be used when custom commands are used to drive the External Local Oscillator and the frequency suffix is not 'Hz'. In this case enter the power of ten equivalent to the frequency scaling implied by the suffix. For example: if the suffix is "GHz" then enter 1000000000. The maximum is high in the case where you are using a non-SCPI source whose input is given in GHz. In such a case enter 1E9 here to convert between Hz (the units of the measurement) and GHz (the units of the source). However, if the source is followed by a doubler for high-frequency measurement, the proper conversion factor is 2E9, so enter that value.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:DENominator <int>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:DENominator?`
Example	:NFIG:MODE:LOSC:DUT:PAR:MULT:DEN 1000
	:NFIG:MODE:LOSC:DUT:PAR:MULT:DEN?
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Min	1
Max	20000000000
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

LO Commands

Allows the commands used to control the external LO to be customized.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Command Set

Selects the command set used to control the external LO. Standard SCPI commands are used by default and will work with all Agilent Signal Sources and other SCPI compliant sources. Non SCPI compliant sources may be controlled using custom commands defined by the LO Commands parameter. The custom commands will be stored with the State, but if you do not store the state prior to 'Restore Mode Defaults',

then the custom settings will be lost. If you change from using SCPI commands to using custom commands without saving the state of the intrument, the custom commands will be preserved and will be recalled when you move back to custom commands.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:TYPE SCPI	CUSTom`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:TYPE?`
Example	:NFIG:MODE:LOSC:DUT:TYPE CUST
	:NFIG:MODE:LOSC:DUT:TYPE?
Preset	SCPI
State Saved	Saved in instrument state.
Range	SCPI|Custom
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	LO Commands parameter is disabled when set to SCPI.

Power Prefix

Specifies a custom command to be used for setting external LO power.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:POWer:PREFix <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:POWer:PREFix?`
Example	:NFIG:MODE:LOSC:DUT:COMM:POW:PREF "power"
	:NFIG:MODE:LOSC:DUT:COMM:POW:PREF?
Preset	"POW"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI. If tried to be changed, then an advisory message will appear Settings conflict; custom LO commands only available when command set is custom." number –221 5505.

Power Suffix

Specifies a custom command to be used for setting external LO power units.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:POWer:SUFFix <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:POWer:SUFFix?
Example	:NFIG:MODE:LOSC:DUT:COMM:POW:SUFF "W"
	:NFIG:MODE:LOSC:DUT:COMM:POW:SUFF?
Preset	"DBM"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI

Freq Prefix

Specifies a custom command to be used for setting external LO frequency.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:PREFix <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:PREFix?
Example	:NFIG:MODE:LOSC:DUT:COMM:FREQ:PREF "FREQuency"
	:NFIG:MODE:LOSC:DUT:COMM:FREQ:PREF?
Preset	"FREQ"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI

Freq Suffix

Specifies a custom command to be used for setting external LO frequency units.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:SUFFix <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:SUFFix?
Example	:NFIG:MODE:LOSC:DUT:COMM:FREQ:SUFF "MHz"
	:NFIG:MODE:LOSC:DUT:COMM:FREQ:SUFF?
Preset	"Hz"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI

Auxiliary

Specifies a custom command to be used between setting the power and setting the frequency. By default it is used to ensure the RF signal is switched ON. Several commands can be chained together using the standard semicolon. The NFA allows this.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:AUXiliary <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:AUXiliary?
Example	:NFIG:MODE:LOSC:DUT:COMM:AUX "RF ON"
	:NFIG:MODE:LOSC:DUT:COMM:AUX?
Preset	"OUTP:STAT ON"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI

Command Set (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:TYPE SCPI|CUSTom

	[:SENSe]:NFIGure:MODE:LOSCillator:TYPE?
Example	:NFIG:MODE:LOSC:TYPE CUST
	:NFIG:MODE:LOSC:TYPE?
Preset	SCPI
State Saved	Saved in instrument state.
Range	SCPI|Custom
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:TYPE
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. LO Commands parameter is disabled when set to SCPI.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Command Set for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Command Set for System Downconverter.

Power Prefix (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:PREFix <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:PREFix?
Example	:NFIG:MODE:LOSC:COMM:POW:PREF "power"
	:NFIG:MODE:LOSC:COMM:POW:PREF?
Preset	"POW"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:COMMand:POWer:PREFix
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI. If tried to be changed, then an advisory message will appear Settings conflict; custom LO commands only available when command set is custom." number –221 5505.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Power Prefix for DUT.

4. When DUT type is AMPLifier, this command will set the Ext LO Power Prefix for System Downconverter.

Power Suffix (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:SUFFix <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:SUFFix?`
Example	`:NFIG:MODE:LOSC:COMM:POW:SUFF "W"`
	`:NFIG:MODE:LOSC:COMM:POW:SUFF?`
Preset	"DBM"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:COMMand:POWer:SUFFix`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Power Suffix for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Power Suffix for System Downconverter.

Freq Prefix (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:FREQuency:PREFix <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:FREQuency:PREFix?`
Example	`:NFIG:MODE:LOSC:COMM:FREQ:PREF "FREQuency"`
	`:NFIG:MODE:LOSC:COMM:FREQ:PREF?`
Preset	"FREQ"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:COMMand:FREQuency:PREFix`

Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Frequency Prefix for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Frequency Prefix for System Downconverter.

Freq Suffix (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:FREQuency:SUFFix <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:FREQuency:SUFFix?
Example	:NFIG:MODE:LOSC:COMM:FREQ:SUFF "MHz"
	:NFIG:MODE:LOSC:COMM:FREQ:SUFF?
Preset	"Hz"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:COMMand:FREQuency:SUFFix
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Frequency Suffix for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Frequency Suffix for System Downconverter.

Auxiliary (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:AUXiliary <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:AUXiliary?

Example	:NFIG:MODE:LOSC:COMM:AUX "RF ON"
	:NFIG:MODE:LOSC:COMM:AUX?
Preset	"OUTP:STAT ON"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:COMMand:AUXiliary`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Auxiliary for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Auxiliary for System Downconverter.

Min Freq

This value is used for user to enter the minimum frequency that the external source is capable of. Attempting to set the external source less than this will result in an error message and clipping to this value.

This value is automatically set when the minimum frequency of the external source is capable of being queried.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MINimum [:FREQuency] <freq>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MINimum [:FREQuency]?`
Example	:NFIG:MODE:LOSC:DUT:PAR:MIN 100 kHz
	:NFIG:MODE:LOSC:DUT:PAR:MIN?
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 324.999999999 GHz
Min	1 Hz
Max	324.999999999 GHz
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Coupling	1. Automatically populates when the address of a SCPI compliant source is selected and connected by pressing the Select Highlighted Source key.
	2. The LO frequency cannot be set to lower than this value.

Max Freq

This value is used for user to enter the maximum frequency that the external source is capable of. Attempting to set the external source greater than this will result in an error message and clipping to this value.

This value is automatically set when the maximum frequency of the external source is capable of being queried.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MAXimum[:FREQuency] <freq>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MAXimum[:FREQuency]?`
Example	:NFIG:MODE:LOSC:DUT:PAR:MAX 100 kHz
	:NFIG:MODE:LOSC:DUT:PAR:MAX?
Preset	10 MHz
State Saved	Saved in instrument state.
Range	2 Hz to 325 GHz
Min	2 Hz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Automatically populates when the address of a SCPI compliant source is selected and connected by pressing the Select Highlighted Source key.
	2. The LO frequency cannot be set to higher than this value.

LO Power(Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:POWer[:LEVel] <float>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:POWer[:LEVel]?`
Example	:NFIG:MODE:LOSC:PAR:POW 22.25 dBm

	:NFIG:MODE:LOSC:PAR:POW?
Preset	0.00 dBm
State Saved	Saved in instrument state.
Range	–100 dBm to 100 dBm
Min	–100
Max	100
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:PARameter:POWer[:LEVel]` (NFA)
	`:SOURce:EXTernal:POWer[:LEVel]` (FSP)
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Power Level for DUT.
	3. When DUT type is AMPLifier, this command will set the Ext LO Power Level for System Downconverter.

Settling Time (Remote only)

The following command is remote only and it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:SETTling[:TIME] <float>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:SETTling[:TIME]?`
Example	:NFIG:MODE:LOSC:PAR:SETT 150 ms
	:NFIG:MODE:LOSC:PAR:SETT?
Preset	100 ms
State Saved	Saved in instrument state.
Range	0 – 1000 ms
Min	0
Max	1000 ms
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:PARameter:SETTling[:TIME]`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.

Multiplier Numerator (Remote only)

The following command is remote only and it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MULTiplier:NUMerator <int>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MULTiplier:NUMerator?`
Example	:NFIG:MODE:LOSC:PAR:MULT:NUM 1000
	:NFIG:MODE:LOSC:PAR:MULT:NUMerator?
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Min	1
Max	20000000000
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:PARameter:MULTiplier (NFA)`
	`:SOURce:EXTernal:FREQuency[:FACTor]:NUMerator (FSP)`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Multiplier for DUT.
	3. When DUT type is AMPLifier, this command will set the Ext LO Multiplier for System Downconverter.

Multiplier Denominator (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MULTiplier:DENominator <int>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MULTiplier:DENominator?`
Example	:NFIG:MODE:LOSC:PAR:MULT:DEN 1000
	:NFIG:MODE:LOSC:PAR:MULT:DEN?
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Min	1
Max	20000000000
Backwards Compatibility SCPI	`:SOURce:EXTernal:FREQuency[:FACTor]:DENominator (FSP)`

Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Multiplier for DUT.
	3. When DUT type is AMPLifier, this command will set the Ext LO Multiplier for System Downconverter.

Min Freq (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MINimum[:FREQuency] <freq>
	[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MINimum[:FREQuency]?
Example	:NFIG:MODE:LOSC:PAR:MIN 100 kHz
	:NFIG:MODE:LOSC:PAR:MIN?
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 324.999999999 GHz
Min	1 Hz
Max	324.999999999 GHz
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:PARameter:MINimum[:FREQuency]
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Automatically populates when the address of a SCPI compliant source is selected and connected by pressing the Select Highlighted Source key.
	2. The LO frequency cannot be set to lower than this value.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	4. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Min Frequency for DUT.
	5. When DUT type is AMPLifier, this command will set the Ext LO Min Frequency for System Downconverter.

Max Freq (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MAXimum[:FREQuency] <freq>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MAXimum[:FREQuency]?`
Example	:NFIG:MODE:LOSC:PAR:MAX 100 kHz
	:NFIG:MODE:LOSC:PAR:MAX?
Preset	10 MHz
State Saved	Saved in instrument state.
Range	2 Hz to 325 GHz
Min	2 Hz
Max	325 GHz
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:PARameter:MAXimum[:FREQuency]`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Automatically populates when the address of a SCPI compliant source is selected and connected by pressing the Select Highlighted Source key.
	2. The LO frequency cannot be set to higher than this value.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	4. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Max Frequency for DUT.
	5. When DUT type is AMPLifier, this command will set the Ext LO Max Frequency for System Downconverter.

LO Control (on/off) (Remote only)

The following command is remote only and it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:CONTrol[:STATe] ON|OFF|1|0`
	`[:SENSe]:NFIGure:MODE:LOSCillator:CONTrol[:STATe]?`
Example	:NFIG:MODE:LOSC:CONT OFF
	:NFIG:MODE:LOSC:CONT?
Preset	OFF
State Saved	Saved in instrument state.
Range	On|Off
Backwards Compatibility SCPI	`:SYSTem[:NFIGure]:CONFigure:LOSCillator:CONTrol[:STATe]` (NFA/PSA)
	`:SYSTem:CONFigure:GENerator:CONTrol:STATe`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Sys Downconv LO Setup

Brings up the Ext LO menu, which is used to set up the Ext LO that is connected to the system downconverter.

Key Path	Mode Setup, Ext LO Config
Mode	NFIGURE
Initial S/W Revision	A.13.00
Coupling	Disabled(grayed) when N/W9069A–2FP is not installed and the DUT type is not AMPLifiler.

Select Highlighted Source

You can navigate up and down in the list with the up and down arrow keys, and select any entry by pressing the Select Highlighted Source key. The highlighted source becomes the Current source and is prominently displayed at the bottom of the screen.

Key Path	Mode Setup, Ext LO Config, DUT LO Setup, Sys Downconv Setup
Mode	NF
Remote Command	:SYSTem:COMMunicate:SOURce:DUT|SYSTem:ADDRess <address string>
	:SYSTem:COMMunicate:SOURce:DUT|SYSTem:ADDRess?
Example	Different examples for setting external source address
	:SYST:COMM:SOUR:DUT:ADDR "TCPIP0::MyHostName::INSTR"
	:SYST:COMM:SOUR:DUT:ADDR "TCPIP0::123.121.100.210::INSTR"
	:SYST:COMM:SOUR:DUT:ADDR "USB0::12212::32145::US1234567A::INSTR"
	:SYST:COMM:SOUR:DUT:ADDR "GPIB1::19::INSTR"
Notes	Empty string is allowed and means no source is defined or selected.
Dependencies	If no supported source, or no source at all is found at the specified address, the SCPI command generates an error message –310.1104
Initial S/W Revision	A.13.00
Coupling	This parameter is coupled to the Min Frequency and Max Frequency parameters if the address entered is that of a SCPI compliant Signal Source. In this case, the Min and Max Frequency parameters are set according to the results of a FREQ? MIN and FREQ? MAX query. 1. If address tried is not responding then error message 167 will be displayed. 2. If address tried is valid but not that of a valid source (e.g. the address of another instrument or PC), error message 167 will be displayed. 3. If the address is not valid, error message –222.5000 displayed.

LO Control (on/off)

Toggles external LO control on/off.

Key Path	Mode Setup, Ext LO Config, DUT LO Setup | Sys Downconv Setup
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:CONTrol[:STATe] ON | OFF | 1 | 0
	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:CONTrol[:STATe]?
Example	:NFIG:MODE:LOSC:DUT:CONT OFF
	:NFIG:MODE:LOSC:DUT:CONT?
Preset	OFF
State Saved	Saved in instrument state.
Range	On|Off
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	When set to On and there is no valid external source, then error message 153 will be displayed.

LO Control Setup

This menu is used to set up miscellaneous source functions, including Ext LO power level, settling time, minimum frequency, maximum frequency, etc.

Key Path	Mode Setup, Ext LO Config, DUT LO Setup | Sys Downconv Setup
Mode	NF
Initial S/W Revision	A.13.00

LO Power

Sets the fixed signal generator LO drive level into the frequency converter device.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:POWer[:LEVel] <float>
	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:POWer[:LEVel]?
Example	:NFIG:MODE:LOSC:DUT:PAR:POW 22.25 dBm
	:NFIG:MODE:LOSC:DUT:PAR:POW?
Preset	0.00 dBm
State Saved	Saved in instrument state.
Range	−100 dBm to 100 dBm
Min	−100
Max	100

Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Settling Time

Controls the grace period allocated for the LO to settle between issue of commands.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:SETTling[:TIME] <float>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:SETTling[:TIME]?`
Example	:NFIG:MODE:LOSC:DUT:PAR:SETT 150 ms
	:NFIG:MODE:LOSC:DUT:PAR:SETT?
Preset	100 ms
State Saved	Saved in instrument state.
Range	0 – 1000 ms
Min	0
Max	1000 ms
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Multiplier Numerator

This sets the External Local Oscillator frequency multiplier.If an external frequency divider is used in conjunction with the External Local Oscillator then the values of the multiplier denominator should be set to the external frequency divider's dividing factor.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:NUMerator <int>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:NUMerator?`
Example	:NFIG:MODE:LOSC:DUT:PAR:MULT:NUM 1000
	:NFIG:MODE:LOSC:DUT:PAR:MULT:NUMerator?
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Min	1

Max	20000000000
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Multiplier Denominator

This sets the External Local Oscillator frequency divider value. If an external frequency multiplier is used in conjunction with the External Local Oscillator then the values of the multiplier should be set to the external frequency multiplier's multiplying factor. Alternatively, this value can be used when custom commands are used to drive the External Local Oscillator and the frequency suffix is not 'Hz'. In this case enter the power of ten equivalent to the frequency scaling implied by the suffix. For example: if the suffix is "GHz" then enter 1000000000. The maximum is high in the case where you are using a non-SCPI source whose input is given in GHz. In such a case enter 1E9 here to convert between Hz (the units of the measurement) and GHz (the units of the source). However, if the source is followed by a doubler for high-frequency measurement, the proper conversion factor is 2E9, so enter that value.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:DENominator <int>
	[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MULTiplier:DENominator?
Example	:NFIG:MODE:LOSC:DUT:PAR:MULT:DEN 1000
	:NFIG:MODE:LOSC:DUT:PAR:MULT:DEN?
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Min	1
Max	20000000000
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

LO Commands

Allows the commands used to control the external LO to be customized.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Command Set

Selects the command set used to control the external LO. Standard SCPI commands are used by default and will work with all Agilent Signal Sources and other SCPI compliant sources. Non SCPI compliant sources may be controlled using custom commands defined by the LO Commands parameter. The custom commands will be stored with the State, but if you do not store the state prior to 'Restore Mode Defaults', then the custom settings will be lost. If you change from using SCPI commands to using custom commands without saving the state of the intrument, the custom commands will be preserved and will be recalled when you move back to custom commands.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:TYPE SCPI	CUSTom`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:TYPE?`
Example	:NFIG:MODE:LOSC:DUT:TYPE CUST
	:NFIG:MODE:LOSC:DUT:TYPE?
Preset	SCPI
State Saved	Saved in instrument state.
Range	SCPI|Custom
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	LO Commands parameter is disabled when set to SCPI.

Power Prefix

Specifies a custom command to be used for setting external LO power.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:POWer:PREFix <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:POWer:PREFix?`
Example	:NFIG:MODE:LOSC:DUT:COMM:POW:PREF "power"
	:NFIG:MODE:LOSC:DUT:COMM:POW:PREF?
Preset	"POW"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Coupling	Disabled when LO commands set to SCPI. If tried to be changed, then an advisory message will appear Settings conflict; custom LO commands only available when command set is custom." number –221 5505.

Power Suffix

Specifies a custom command to be used for setting external LO power units.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:POWer:SUFFix <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:POWer:SUFFix?`
Example	:NFIG:MODE:LOSC:DUT:COMM:POW:SUFF "W"
	:NFIG:MODE:LOSC:DUT:COMM:POW:SUFF?
Preset	"DBM"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI

Freq Prefix

Specifies a custom command to be used for setting external LO frequency.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:PREFix <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:PREFix?`
Example	:NFIG:MODE:LOSC:DUT:COMM:FREQ:PREF "FREQuency"
	:NFIG:MODE:LOSC:DUT:COMM:FREQ:PREF?
Preset	"FREQ"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI

Freq Suffix

Specifies a custom command to be used for setting external LO frequency units.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:SUFFix <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:FREQuency:SUFFix?`
Example	:NFIG:MODE:LOSC:DUT:COMM:FREQ:SUFF "MHz"
	:NFIG:MODE:LOSC:DUT:COMM:FREQ:SUFF?
Preset	"Hz"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI

Auxiliary

Specifies a custom command to be used between setting the power and setting the frequency. By default it is used to ensure the RF signal is switched ON. Several commands can be chained together using the standard semicolon. The NFA allows this.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup, LO Commands
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:AUXiliary <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:COMMand:AUXiliary?`
Example	:NFIG:MODE:LOSC:DUT:COMM:AUX "RF ON"
	:NFIG:MODE:LOSC:DUT:COMM:AUX?
Preset	"OUTP:STAT ON"
State Saved	Saved in instrument state.
Range	Alphanumeric
Readback Text	Value
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	Disabled when LO commands set to SCPI

Command Set (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:TYPE SCPI|CUSTom
	[:SENSe]:NFIGure:MODE:LOSCillator:TYPE?
Example	:NFIG:MODE:LOSC:TYPE CUST
	:NFIG:MODE:LOSC:TYPE?
Preset	SCPI
State Saved	Saved in instrument state.
Range	SCPI|Custom
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:TYPE
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. LO Commands parameter is disabled when set to SCPI.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Command Set for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Command Set for System Downconverter.

Power Prefix (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:PREFix <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:PREFix?
Example	:NFIG:MODE:LOSC:COMM:POW:PREF "power"
	:NFIG:MODE:LOSC:COMM:POW:PREF?
Preset	"POW"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:COMMand:POWer:PREFix
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI. If tried to be changed, then an advisory message will appear Settings conflict; custom LO commands only available when command set is custom."

number –221 5505.

2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.

3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Power Prefix for DUT.

4. When DUT type is AMPLifier, this command will set the Ext LO Power Prefix for System Downconverter.

Power Suffix (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:SUFFix <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:POWer:SUFFix?
Example	:NFIG:MODE:LOSC:COMM:POW:SUFF "W"
	:NFIG:MODE:LOSC:COMM:POW:SUFF?
Preset	"DBM"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:COMMand:POWer:SUFFix
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Power Suffix for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Power Suffix for System Downconverter.

Freq Prefix (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:FREQuency:PREFix <string>
	[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:FREQuency:PREFix?
Example	:NFIG:MODE:LOSC:COMM:FREQ:PREF "FREQuency"
	:NFIG:MODE:LOSC:COMM:FREQ:PREF?

Preset	"FREQ"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:COMMand:FREQuency:PREFix`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Frequency Prefix for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Frequency Prefix for System Downconverter.

Freq Suffix (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:FREQuency:SUFFix <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:FREQuency:SUFFix?`
Example	`:NFIG:MODE:LOSC:COMM:FREQ:SUFF "MHz"`
	`:NFIG:MODE:LOSC:COMM:FREQ:SUFF?`
Preset	"Hz"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:COMMand:FREQuency:SUFFix`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Frequency Suffix for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Frequency Suffix for System Downconverter.

Auxiliary (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:AUXiliary <string>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:COMMand:AUXiliary?`
Example	:NFIG:MODE:LOSC:COMM:AUX "RF ON"
	:NFIG:MODE:LOSC:COMM:AUX?
Preset	"OUTP:STAT ON"
State Saved	Saved in instrument state.
Range	Alphanumeric
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:COMMand:AUXiliary`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Disabled when LO commands set to SCPI
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Auxiliary for DUT.
	4. When DUT type is AMPLifier, this command will set the Ext LO Auxiliary for System Downconverter.

Min Freq

This value is used for user to enter the minimum frequency that the external source is capable of. Attempting to set the external source less than this will result in an error message and clipping to this value.

This value is automatically set when the minimum frequency of the external source is capable of being queried.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MINimum [:FREQuency] <freq>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MINimum [:FREQuency]?`
Example	:NFIG:MODE:LOSC:DUT:PAR:MIN 100 kHz
	:NFIG:MODE:LOSC:DUT:PAR:MIN?
Preset	10 MHz
State Saved	Saved in instrument state.

Range	1 Hz to 324.999999999 GHz
Min	1 Hz
Max	324.999999999 GHz
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Automatically populates when the address of a SCPI compliant source is selected and connected by pressing the Select Highlighted Source key.
	2. The LO frequency cannot be set to lower than this value.

Max Freq

This value is used for user to enter the maximum frequency that the external source is capable of. Attempting to set the external source greater than this will result in an error message and clipping to this value.

This value is automatically set when the maximum frequency of the external source is capable of being queried.

Key Path	Mode Setup, Ext LO Config, Ext LO Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MAXimum [:FREQuency] <freq>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:DUT|SYSTem:PARameter:MAXimum [:FREQuency]?`
Example	:NFIG:MODE:LOSC:DUT:PAR:MAX 100 kHz
	:NFIG:MODE:LOSC:DUT:PAR:MAX?
Preset	10 MHz
State Saved	Saved in instrument state.
Range	2 Hz to 325 GHz
Min	2 Hz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Automatically populates when the address of a SCPI compliant source is selected and connected by pressing the Select Highlighted Source key.
	2. The LO frequency cannot be set to higher than this value.

Multiplier Denominator (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MULTiplier:DENominator <int>
	[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MULTiplier:DENominator?
Example	:NFIG:MODE:LOSC:PAR:MULT:DEN 1000
	:NFIG:MODE:LOSC:PAR:MULT:DEN?
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Min	1
Max	20000000000
Backwards Compatibility SCPI	:SOURce:EXTernal:FREQuency[:FACTor]:DENominator (FSP)
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Multiplier for DUT.
	3. When DUT type is AMPLifier, this command will set the Ext LO Multiplier for System Downconverter.

Min Freq (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MINimum[:FREQuency] <freq>
	[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MINimum[:FREQuency]?
Example	:NFIG:MODE:LOSC:PAR:MIN 100 kHz
	:NFIG:MODE:LOSC:PAR:MIN?
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 324.999999999 GHz
Min	1 Hz
Max	324.999999999 GHz
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:PARameter:MINimum[:FREQuency]
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Coupling	1. Automatically populates when the address of a SCPI compliant source is selected and connected by pressing the Select Highlighted Source key.
	2. The LO frequency cannot be set to lower than this value.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	4. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Min Frequency for DUT.
	5. When DUT type is AMPLifier, this command will set the Ext LO Min Frequency for System Downconverter.

Max Freq (Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MAXimum[:FREQuency] <freq>
	[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MAXimum[:FREQuency]?
Example	:NFIG:MODE:LOSC:PAR:MAX 100 kHz
	:NFIG:MODE:LOSC:PAR:MAX?
Preset	10 MHz
State Saved	Saved in instrument state.
Range	2 Hz to 325 GHz
Min	2 Hz
Max	325 GHz
Backwards Compatibility SCPI	:SYSTem:CONFigure:LOSCillator:PARameter:MAXimum[:FREQuency]
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. Automatically populates when the address of a SCPI compliant source is selected and connected by pressing the Select Highlighted Source key.
	2. The LO frequency cannot be set to higher than this value.
	3. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	4. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Max Frequency for DUT.
	5. When DUT type is AMPLifier, this command will set the Ext LO Max Frequency for System Downconverter.

Multiplier Numerator (Remote only)

The following command is remote only and it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MULTiplier:NUMerator <int>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:MULTiplier:NUMerator?`
Example	:NFIG:MODE:LOSC:PAR:MULT:NUM 1000
	:NFIG:MODE:LOSC:PAR:MULT:NUMerator?
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Min	1
Max	20000000000
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:PARameter:MULTiplier (NFA)`
	`:SOURce:EXTernal:FREQuency[:FACTor]:NUMerator (FSP)`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Multiplier for DUT.
	3. When DUT type is AMPLifier, this command will set the Ext LO Multiplier for System Downconverter.

Settling Time (Remote only)

The following command is remote only and it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:SETTling[:TIME] <float>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:SETTling[:TIME]?`
Example	:NFIG:MODE:LOSC:PAR:SETT 150 ms
	:NFIG:MODE:LOSC:PAR:SETT?
Preset	100 ms
State Saved	Saved in instrument state.
Range	0 – 1000 ms
Min	0
Max	1000 ms
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:PARameter:SETTling[:TIME]`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.

LO Power(Remote only)

The following command is remote only, it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:POWer[:LEVel] <float>`
	`[:SENSe]:NFIGure:MODE:LOSCillator:PARameter:POWer[:LEVel]?`
Example	:NFIG:MODE:LOSC:PAR:POW 22.25 dBm
	:NFIG:MODE:LOSC:PAR:POW?
Preset	0.00 dBm
State Saved	Saved in instrument state.
Range	–100 dBm to 100 dBm
Min	–100
Max	100
Backwards Compatibility SCPI	`:SYSTem:CONFigure:LOSCillator:PARameter:POWer[:LEVel]` (NFA)
	`:SOURce:EXTernal:POWer[:LEVel]` (FSP)
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00
Coupling	1. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is ON, this command is invalid.
	2. When DUT type is DOWNconv, UPConv or MCONverter, and the System Downconverter is Off, this command will set the Ext LO Power Level for DUT.
	3. When DUT type is AMPLifier, this command will set the Ext LO Power Level for System Downconverter.

LO Control (on/off) (Remote only)

The following command is remote only and it is used for compatibility.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MODE:LOSCillator:CONTrol[:STATe] ON|OFF|1|0`
	`[:SENSe]:NFIGure:MODE:LOSCillator:CONTrol[:STATe]?`
Example	:NFIG:MODE:LOSC:CONT OFF
	:NFIG:MODE:LOSC:CONT?
Preset	OFF
State Saved	Saved in instrument state.
Range	On|Off
Backwards Compatibility SCPI	`:SYSTem[:NFIGure]:CONFigure:LOSCillator:CONTrol[:STATe]` (NFA/PSA)
	`:SYSTem:CONFigure:GENerator:CONTrol:STATe`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.13.00

Uncertainty Calculator Form (without N9069A–2FP option)

The uncertainty caluclator is based largely upon the Java uncertainty calculator that can be found on the customer facing website at:

http://sa.tm.agilent.com/noisefigure/NFUcalc.html

The figure below shows the layout of the uncertainty calculator.

Use the Tab key to move through each parameter of the form. Each parameter is highlighted when it is active.

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

Noise Source Model

Selects the noise source model in use and loads the appropriate ENR Uncertainty and Match values into the calculator. Alternatively, a "User Defined" model can be selected and the user can manually enter ENR uncertainty and match values.

The following noise source models are available for selection:

Model Number	ENR Uncertainty	Match
User Defined	N/A	N/A
Agilent 346A	0.20 dB	1.1500
Agilent 346B	0.20 dB	1.1500
Agilent 346C	0.20 dB	1.2500
Agilent N4000A	0.15 dB	1.1300
Agilent N4001A	0.15 dB	1.2000
Agilent N4002A	0.15 dB	1.2200

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce:TYPE USER	A346A	A346B	A346C	AN4000A	AN4001A	AN4002A`
	`:CALCulate:UNCertainty:SOURce:TYPE?`
Example	:CALC:UNC:SOUR:TYPE A346B
	:CALC:UNC:SOUR:TYPE?
Preset	A346B
State Saved	Saved in instrument state.
Range	USER	A346A	A346B	A346C	AN4000A	AN4001A	AN4002A
Initial S/W Revision	Prior to A.04.00
Coupling	Coupled to the ENR uncertainty and Match fields in the calculator.

ENR Uncertainty

Selects the ENR Uncertainty used in the uncertainty calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce:ENR <value>`
	`:CALCulate:UNCertainty:SOURce:ENR?`
Example	:CALC:UNC:SOUR:ENR 1.25dB
	:CALC:UNC:SOUR:ENR?
Preset	Noise Source Model Dependent. See Noise Source Model section.above.
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB

Initial S/W Revision	Prior to A.04.00
Coupling	Only enabled when Noise Source Model is set to 'User Defined'

Noise Source Match

Selects the match value used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce:MATCh <value>`
	`:CALCulate:UNCertainty:SOURce:MATCh?`
Example	:CALC:UNC:SOUR:MATC 5.55
	:CALC:UNC:SOUR:MATC?
Preset	Noise Source Model dependent. See Noise Source Model section.above.
State Saved	No
Range	−100 to 100
Min	−100
Max	100
Initial S/W Revision	Prior to A.04.00
Coupling	Only enabled when Noise Source Model is set to 'User Defined'

DUT Noise Figure

Selects the DUT noise figure to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:DUT:NFIGure <value>`
	`:CALCulate:UNCertainty:DUT:NFIGure?`
Example	:CALC:UNC:DUT:NFIG 25.2dB
	:CALC:UNC:DUT:NFIG?
Preset	3 dB
State Saved	No
Range	−100 dB to 100 dB
Min	−100 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00

Instrument Noise Figure

Selects the instrument noise figure to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument:NFIGure <value>`
	`:CALCulate:UNCertainty:INSTrument:NFIGure?`
Example	:CALC:UNC:INST:NFIG 25.2dB
	:CALC:UNC:INST:NFIG?
Preset	Platform dependent:
	PXA : 12.0 dB
	MXA: 11.0 dB
	EXA: 15.0 dB
	CXA: 13.0 dB
State Saved	No
Range	−100 dB to 100 dB
Min	−100 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00

Instrument Noise Figure Uncertainty

Selects the instrument noise figure uncertainty to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument:NFIGure:UNCertainty <value>`
	`:CALCulate:UNCertainty:INSTrument:NFIGure:UNCertainty?`
Example	:CALC:UNC:INST:NFIG:UNC 25.2dB
	:CALC:UNC:INST:NFIG:UNC?
Preset	0.03 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00

DUT Gain

Selects the DUT gain to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:DUT:GAIN <value>`
	`:CALCulate:UNCertainty:DUT:GAIN?`
Example	:CALC:UNC:DUT:GAIN 25.2dB
	:CALC:UNC:DUT:GAIN?
Preset	20 dB
State Saved	No
Range	–100 dB to 100 dB
Min	–100 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00

Instrument Gain Uncertainty

Selects the instrument gain uncertainty to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument:GAIN <value>`
	`:CALCulate:UNCertainty:INSTrument:GAIN?`
Example	:CALC:UNC:INST:GAIN 25.2dB
	:CALC:UNC:INST:GAIN?
Preset	Platform Dependent:
	PXA: 0.07 dB
	MXA:0.10 dB
	EXA: 0.15 dB
	CXA: 0.20 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00

DUT Input Match

Selects the DUT input match to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:DUT:MATCh[:INPut] <value>`
	`:CALCulate:UNCertainty:DUT:MATCh[:INPut]?`
Example	:CALC:UNC:DUT:MATC 25.5
	:CALC:UNC:DUT:MATC?
Preset	1.5
State Saved	No
Range	−100 to 100
Min	−100
Max	100
Backwards Compatibility SCPI	`:CALCulate:UNCertainty:DUT:MATCh:INPut`
Initial S/W Revision	Prior to A.04.00

Instrument Input Match

Selects the instrument input match to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument:MATCh[:INPut] <value>`
	`:CALCulate:UNCertainty:INSTrument:MATCh[:INPut]?`
Example	:CALC:UNC:INST:MATC 25.5
	:CALC:UNC:INST:MATC?
Preset	1.75
State Saved	No
Range	−100 to 100
Min	−100
Max	100
Backwards Compatibility SCPI	`:CALCulate:UNCertainty:INSTrument:MATCh`
Initial S/W Revision	Prior to A.04.00

DUT Output Match

Selects the DUT output match to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:DUT:MATCh:OUTPut <value>`
	`:CALCulate:UNCertainty:DUT:MATCh:OUTPut?`
Example	:CALC:UNC:DUT:MATC:OUTP 25.5
	:CALC:UNC:DUT:MATC:OUTP?
Preset	0.24 dB
State Saved	No
Range	−100 to 100
Min	−100
Max	100
Initial S/W Revision	Prior to A.04.00

RSS Uncertainty

Returns the RSS Uncertainty value – a simple +/- dB value that can be used to determine the overall uncertainty of the noise figure measurement. This value will be updated whenever any of the other parameters under the :CALCulate:UNCertainty scpi node change.

This parameter is never editable from the front panel or via SCPI but is auto calculated from the other parameters in the DUT setup form.

Key Path	Mode Setup, Uncertainty Calculator, FORM
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:RSS?`
Example	:CALC:UNC:RSS?
Remote Command Notes	Read only.
Preset	0.2 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	Automatically calculated from other uncertainty calculator values.
Coupling	Always read only – calculated from other uncertainty calculator values.

Uncertainty Calculator Form (with N9069A–2FP option)

The uncertainty calculator is based largely upon the Java uncertainty calculator that can be found on the customer facing website at:

The figure below shows the layout of the uncertainty calculator.

Use the Tab key to move through each parameter of the form. Each parameter is highlighted when it is active.

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

Automate Settings

The uncertainty calculator provides a function that can fill in the parameters automatically by checking this checkbox, unless the user sets the corresponding field to "Manual" or "None". The parameters are updated once at center frequency (CF) immediately when checkbox is changed from unchecked to checked. The user can press "Update at CF" key or "Update at Selected Freq" key to update the parameters at the frequency of interest at any time.

When this checkbox is checked, the DUT type will become non-editable and be updated from the DUT setup, i.e., if "Amplifier" is selected in DUT setup, the DUT type will be "Amplifier", otherwise it will be "Converter". The DUT parameters, including "DUT NF" and "DUT Gain" will become non-editable and be filled in using the latest measurement results. Pressing "Update" button in the form or from the softpanel will update these two parameters immediately.

Once this checkbox is changed from unchecked to checked,

1. The Noise Source type will be set to "Auto(SNS)" if an SNS is connected and the "Noise Source Preference" is set to SNS.

2. The Instrument type will be set to "Auto".

3. The Ext Preamp type will be set to "Auto" if an U7227x series USB preamplifier is connected.

The user has the flexibility to change Noise Source type, Instrument type or Ext Preamp type to "Manual" or "None" even when Automate Setting is enabled. The related parameters will not be updated automatically. Please refer to the descriptions of each parameter for details.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:PARameter:AUTO ON|OFF|1|0`
	`:CALCulate:UNCertainty:PARameter:AUTO?`
Example	:CALC:UNC:PAR:AUTO ON
Preset	OFF
State Saved	No
Range	ON|OFF|1|0
Initial S/W Revision	A.14.00
Coupling	See above for detailed information.

Update

When Automate settings is enabled, the user can press "Update at CF" or "Update at Selected Freq" to update the calculator parameters at the frequency of interest.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Update at CF

This function is enabled only when Automate Settings is enabled. Please note that CF is based on current Freq Context.

Pressing this key or mouse clicking the button will

1. Force the DUT parameters, including DUT NF and DUT Gain to be updated using the latest measurement results at CF. If CF is not measured, the values will be interpolated between the two closest results.

2. When the DUT type on DUT Setup view is Converter, and the start and stop frequencies of the current frequency context are equal, the calculator can not determine the NS Freq and Inst Freq. Error message "Settings conflict; Unable to interpolate NS and Inst Freq" will be displayed.

3. Force the NS Freq to be updated according to current DUT setup and CF if Noise Source type is Auto (SNS)/A346A/A346B/A346C. And then related NS parameters will be updated automatically.

4. Force the Inst Freq to be updated if Instrument type is Auto. And then related Inst parameters will be updated automatically.

5. Force the Ext PA parameters to be updated automatically if Ext Preamp type is Auto.

6. When the latest measurement results are invalid (a dirty marker is displayed), "---" will be displayed for DUT NF and DUT Gain.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:PARameter:FREQuency:CENTer:UPDate`
Example	`:CALC:UNC:PAR:FREQ:CENT:UPD`
Initial S/W Revision	A.14.00
Coupling	See above for detailed information.

Update at Selected Freq

This function is enabled only when Automate Settings is enabled. Please note that Selected Freq is based on current Freq Context. When the Selected Freq is out the measurement frequency range, error message "Settings conflict; Selected frequency is invalid" will be displayed.

Pressing this key or mouse clicking the button will

1. Force the DUT parameters, including DUT NF and DUT Gain to be updated using the latest measurement results at Selected Freq. If Selected Freq point is not measured, the values will be interpolated between the two closest results.

2. When the DUT type on DUT Setup view is Converter, and the start and stop frequencies of the current frequency context are equal, the calculator can not determine the NS Freq and Inst Freq if the Selected Freq is equal to start (or stop) frequency. Error message "Settings conflict; Unable to interpolate NS and Inst Freq" will be displayed.

3. Force the NS Freq to be updated according to current DUT setup and Selected Freq if Noise Source type is Auto(SNS)/A346A/A346B/A346C. And then related NS parameters will be updated automatically.

4. Force the Inst Frq to be updated if Instrument type is Auto. And then related Inst parameters will be updated automatically.

5. Force the Ext PA parameters to be updated automatically if Ext Preamp type is Auto.

6. When the latest measurement results are invalid (a dirty marker is displayed), "---" will be displayed for DUT NF and DUT Gain.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:PARameter:FREQuency:SELected:UPDate <freq>`
Example	`:CALC:UNC:PAR:FREQ:SEL:UPD`
Initial S/W Revision	A.14.00
Coupling	See above for detailed information.

Selected Freq

Set the selected frequency to be used when Update at Selected Freq key is pressed. This parameter is based on current Freq Context. If the context is RF, this frequency is a RF frequency. It also applies to LO and IF context.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:PARameter:FREQuency:SELected <freq>`
	`:CALCulate:UNCertainty:PARameter:FREQuency:SELected?`
Example	`:CALC:UNC:PAR:FREQ:SEL 3GHz`
Preset	1.505 GHz
State Saved	Saved in instrument state.
Range	0 – 325 GHz
Min	0 Hz
Max	325 GHz
Initial S/W Revision	A.14.00
Coupling	Enabled only when Automate Settings is enabled.

DUT

Set DUT type. Choose "Amplifier" if the DUT (device under test) has the same input and output frequencies, such as amplifier, attenuator and filter. Choose "Converter" for frequency-converting devices such as mixers.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:DUT AMPLifier|CONVerter`
	`:CALCulate:UNCertainty:DUT?`
Example	`:CALC:UNC:DUT AMPL`

Preset	AMPL
State Saved	No
Range	AMPLifier|CONVerter
Initial S/W Revision	A.14.00
Coupling	When Automate Settings is checked, the DUT type will become non-editable and be updated automatically from the DUT setup.

Noise Source

Set the Noise Source type. The calculator maintains a ENR uncertainty and a VSWR table for each Agilent noise source model. Choosing one of the listed noise sources from the drop-down menu conveniently sets values for NS parameters automatically from the table, based on current NS Freq setting.

For Agilent N4000 Smart Noise Source series, choose Auto(SNS) option. When there is no SNS connected, this option will be grayed out. For Agilent 346 series, choose the model number.

For other noise sources, or especially for the most accurate estimation of uncertainty, choose "Manual" option. This option can be selected whenever the actual value of the noise source calibration data is available. The user needs to enter values for NS ENR Uncert and NS Match values. There are two ways to estimate the ENR uncertainty: the Calibration Data Report (also known as the Calibration Certificate) for the noise source in use, at the frequency of interest; or from the noise source Operating and Service Manual. The Calibration Data Report gives the more accurate estimation of uncertainty.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce AUTO|MANual|A346A|A346B|A346C`
	`:CALCulate:UNCertainty:SOURce?`
Example	:CALC:UNC:SOUR MAN
Preset	MANual
State Saved	Saved in instrument state.
Range	AUTO|MANual|A346A|A346B|A346C
Initial S/W Revision	A.14.00
Coupling	1. Auto(SNS) is only available when an SNS is connected and Noise Source Preference is set to SNS. Otherwise, Auto(SNS) will be grayed out.
	2. Once Automate Settings is changed from unchecked to checked, it will be forced to Auto(SNS) when an SNS is connected and Noise Source Preference is set to SNS.
	3. When Auto(SNS) is selected, disconnecting the SNS will force it to Manual.
	4. When Manual is selected, NS Freq will be disabled and displayed as ---.
	5. When Auto(SNS)/A346A/A346B/A346C is selected, NS Freq will become non-editable if Automate Setting is checked, and can be filled in automatically by pressing "Update" button.

NS Freq

This frequency represents the frequency used in the measurement stage. The calculator uses this frequency to fill in NS ENR Uncertainty and Match parameters for standard Agilent Technologies noise sources.

When the Noise Source type is Manual, it will be disabled and displayed as ---.

When the Noise Source type is Auto(SNS)/A346A/A346B/A346C:

1. It can be set manually if Automate Setting is unchecked.

2. It will become non-editable if Automate Setting is checked, and be filled in automatically according to current DUT type, Freq context and the CF or selected Freq. Pressing "Update" button will update the NS Freq immediately.

Once the NS Freq is set manually or updated automatically, the NS ENR Uncertainty and Match parameters will be updated immediately.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce:FREQuency <freq>`
	`:CALCulate:UNCertainty:SOURce:FREQuency?`
Example	:CALC:UNC:SOUR:FREQ 3GHz
Preset	1.505 GHz
State Saved	Saved in instrument state.
Range	0 – 325 GHz
Min	0 Hz
Max	325 GHz
Initial S/W Revision	A.14.00
Coupling	See above.

Instrument

This parameter allows the user to decide whether the instrument parameters will be filled manually or automatically by the calculator.

The calculator maintains a specification table for each Agilent analyzer model. By default, this parameter is set to "Auto". The calculator conveniently sets values for instrument parameters automatically from the specification table based on the Inst Freq.

For most critical applications, the uncertainty is dominated by the ENR uncertainty of the noise source and only weakly dependent of instrument performance. Therefore, the convenience of using Auto is sufficient for most needs.

For the most accurate estimation of uncertainty, choose the "Manual" option and enter actual parameters to the extent known, at the frequency of interest. For example, the NF of the instrument at the exact operating frequency can be found by actual measurement or by reading graphs from the analyzer data

sheet or Specifications Guide. The analyzer match may be measured with a network analyzer, or with X-Series analyzers it can be estimated from graphs provided in the Specifications Guide, or for convenience in the PXA analyzer, the 95th percentile of the Rayleigh distribution of reflection coefficient can be taken from the Specifications Guide in the Preamplifier chapter. Instrument Uncertainty for NF and Instrument Uncertainty for Gain are both listed in the data sheets and Specifications Guides of Agilent analyzers. "NFE Improvement" is listed in the Specifications Guide for X-Series analyzers that have NFE available and thus are capable of Internal Cal.

With low gain or lossy devices, the instrument parameters can be significant or dominant contributors to uncertainty. Users can change these values by setting this parameter to Manual and modify values for instrument.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument AUTO|MANual`
	`:CALCulate:UNCertainty:INSTrument?`
Example	`:CALC:UNC:INST MAN`
Preset	AUTO
State Saved	Saved in instrument state.
Range	MANual|AUTO
Initial S/W Revision	A.14.00
Coupling	1. Once Automate Settings is changed from unchecked to checked, it will be forced to Auto.
	2. When Manual is selected, Inst Freq will be disabled and displayed as ---.
	3. When Auto is selected, Inst Freq will become non-editable if Automate Settings is checked, and can be filled in automatically by pressing "Update" button.

Inst Freq

This frequency represents the frequency used in the measurement stage. The calculator uses this frequency to fill in Inst parameters.

When the Instrument type is Manual, it will be disabled and displayed as ---.

When the Instrument type is Auto:

1. It can be set manually if Automate Setting is unchecked.

2. It will become non-editable if Automate Setting is checked, and be filled in automatically according to current DUT type, Freq context and the CF or selected Freq. Pressing "Update" button will update the Inst Freq immediately.

Once the Inst Freq is set manually or updated automatically, the Inst parameters will be updated immediately, and the Ext PA parameters will be updated immediately when Ext Preamp is Auto.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument:FREQuency <freq>`

	:CALCulate:UNCertainty:INSTrument:FREQuency?
Example	:CALC:UNC:INST:FREQ 3GHz
Preset	1.505 GHz
State Saved	Saved in instrument state.
Range	0 – 325 GHz
Min	0 Hz
Max	325 GHz
Initial S/W Revision	A.14.00
Coupling	See above.

Ext Preamp

This parameter allows the user to decide how to fill in the Ext PA parameters. If no external preamp is in use, "None" should be selected.

For other external preamplifiers and the most accurate estimation of uncertainty, choose the "Manual" option and enter actual parameters to the extent known, at the frequency of interest.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:EXTernal:PREamp AUTO|MANual|NONE
	:CALCulate:UNCertainty:EXTernal:PREamp?
Example	:CALC:UNC:EXT:PRE MAN
State Saved	Saved in instrument state.
Range	MANual|AUTO|NONE
Initial S/W Revision	A.14.00
Coupling	1. Auto is only available when an U7227x series Agilent USB preamplifier is connected to one of the analyzer's USB ports.
	2. Once Automate Settings is changed from unchecked to checked, it will be forced to Auto when an U7227x series Agilent USB preamplifier is connected.
	3. When Auto is selected, disconnecting the USB preamp will force it to None.
	4. When Auto is selected, the Ext PA parameters will be updated immediately once the Inst Freq is updated manually or automatically.
	5. When Auto or Manual is selected, the Inst Match parameters will be grayed out.

Specification Style

In combining sources of uncertainty, international standards usually call for using the method of the GUM (Guide to the expression of Uncertainty in Measurement).

The GUM calls for computing the "standard uncertainty" (standard deviation) of each contributor, then combining these using a root-sum-square computation to compute the "combined standard uncertainty," then multiplying by 2 (the coverage factor, k) to give the "expanded uncertainty." The expanded uncertainty is also often called the 95th percentile measurement uncertainty.

The documentation of each contributor may be given in different forms, such as median, mean, or 95th percentile, as shown in the drop-down list for those parameters where the user of the calculator might need to vary the style of the specification.

Distribution

The statistical distribution of contributors to the uncertainty depends on the contributor and our knowledge of that parameter. In many cases, the value is known, thus a "Fixed" distribution is appropriate. In other cases, such as Noise Source ENR Uncertainty, the distribution is known to be Gaussian.

DUT NF, NF1

This section includes the DUT noise figure settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

DUT NF, NF1

Selects the DUT noise figure to be used in the calculator.

It is best to set this to the best estimate of the NF, such as from the measurement itself. But changes in DUT NF only weakly effect the uncertainty.

When Automate Settings is enabled, this parameter will become non-editable and be filled in automatically from the measurement results at the frequency of interest. Pressing "Update" button will update this parameter immediately.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:DUT:NFIGure <value>
	:CALCulate:UNCertainty:DUT:NFIGure?
Example	:CALC:UNC:DUT:NFIG 25.2dB
	:CALC:UNC:DUT:NFIG?
Preset	3 dB
State Saved	No
Range	–100 dB to 100 dB
Min	–100 dB
Max	100 dB
Modified at S/W Revision	A.14.00

Coupling	1. Editable only when Automate Settings is disabled.
	2. Filled in automatically with from the measurement results at center frequency, when Automate Settings changes from unchecked to checked.
	3. When Automate settings is enabled, pressing "Update" button will update this parameter immediately from the measurement results at the frequency of interest.

DUT NF Specification Style

The specification style of DUT noise figure is "Fixed". It cannot be changed.

DUT Gain, G1

This section includes the DUT gain settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

DUT Gain, G1

Selects the DUT gain to be used in the calculator.

It is best to set this to the best estimate of the gain, such as from the measurement itself. But changes in DUT gain only weakly effect the uncertainty.

When Automate Settings is enabled, this parameter will become non-editable and be filled in automatically from the measurement results at the frequency of interest. Pressing "Update" button will update this parameter immediately.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:DUT:GAIN <value>`
	`:CALCulate:UNCertainty:DUT:GAIN?`
Example	:CALC:UNC:DUT:GAIN 25.2dB
	:CALC:UNC:DUT:GAIN?
Preset	20 dB
State Saved	No
Range	–100 dB to 100 dB
Min	–100 dB
Max	100 dB
Modified at S/W Revision	A.14.00
Coupling	1. Editable only when Automate Settings is disabled.
	2. Filled in automatically with from the measurement results at center frequency, when Automate

Settings changes from unchecked to checked.

3. When Automate settings is enabled, pressing "Update" button will update this parameter immediately from the measurement results at the frequency of interest.

DUT Gain Specification Style

The specification style of DUT gain is "Fixed". It cannot be changed.

DUT Input Match

This section includes the DUT input match settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

DUT Input Match

Selects the DUT input match to be used in the calculator.

The input match especially can have a significant, though rarely dominant, effect of the uncertainty of the measurement. Therefore, a measured value of the match gives the best estimate of the uncertainty by the calculator.

As noted in the on-calculator footnote, the match can be entered as a return loss (any number that is zero or negative is treated as return loss in decibels), as a reflection coefficient (any number between 0 and 1 is treated as the magnitude of the reflection coefficient) or as a voltage standing-wave ratio, VSWR (any number 1 or larger is treated as a VSWR).

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:DUT:MATCh[:INPut] <value>`
	`:CALCulate:UNCertainty:DUT:MATCh[:INPut]?`
Example	:CALC:UNC:DUT:MATC 25.5
	:CALC:UNC:DUT:MATC?
Preset	1.5
State Saved	No
Range	–100 to 100
Min	–100
Max	100
Backwards Compatibility SCPI	`:CALCulate:UNCertainty:DUT:MATCh:INPut`
Modified at S/W Revision	A.14.00

DUT Input Match Specification Style

Selects the DUT input match specification style to be used in the calculator.

The values used for the DUT match, whether read from a DUT data sheet or measured, is usually best treated as a value that is not statistically varying. So it is best to set to Fixed.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:DUT:MATCh[:INPut]:SPEC:STYLe MAXimum | PCT95 | PCT80 | MEDian | MEAN | FIXed
	:CALCulate:UNCertainty:DUT:MATCh[:INPut]:SPEC:STYLe?
Example	:CALC:UNC:DUT:MATC:SPEC:STYL FIX
	:CALC:UNC:DUT:MATC:SPEC:STYL?
Preset	FIXed
State Saved	No
Range	MAXimum|PCT95|PCT80|MEDian|MEAN|FIXed
Initial S/W Revision	A.14.00

DUT Input Match Distribution

Selects the DUT input match distribution to be used in the calculator.

The values used for the DUT match, whether read from a DUT data sheet or measured, is usually best treated as a value that is not statistically varying. So it is best to set to Fixed.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:DUT:MATCh[:INPut]:DISTribution RAYLeigh | FIXed | UNIForm
	:CALCulate:UNCertainty:DUT:MATCh[:INPut]:DISTribution?
Example	:CALC:UNC:DUT:MATC:DIST FIX
	:CALC:UNC:DUT:MATC:DIST?
Preset	FIXed
State Saved	No
Range	RAYLeigh|FIXed|UNIForm
Initial S/W Revision	A.14.00

DUT Output Match

This section includes the DUT output match settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

DUT Output Match

Selects the DUT output match to be used in the calculator.

As noted in the on-calculator footnote, the match can be entered as a return loss (any number that is zero or negative is treated as return loss in decibels), as a reflection coefficient (any number between 0 and 1 is treated as the magnitude of the reflection coefficient) or as a voltage standing-wave ratio, VSWR (any number 1 or larger is treated as a VSWR).

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:DUT:MATCh:OUTPut <value>
	:CALCulate:UNCertainty:DUT:MATCh:OUTPut?
Example	:CALC:UNC:DUT:MATC:OUTP 25.5
	:CALC:UNC:DUT:MATC:OUTP?
Preset	0.24 dB
State Saved	No
Range	−100 to 100
Min	−100
Max	100
Modified at S/W Revision	A.14.00

DUT Output Match Specification Style

Selects the DUT output match specification style to be used in the calculator.

The values used for the DUT match, whether read from a DUT data sheet or measured, is usually best treated as a value that is not statistically varying. So it is best to set to Fixed.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:DUT:MATCh:OUTPut:SPEC:STYLe MAXimum	PCT95	PCT80	MEDian	MEAN	FIXed
	:CALCulate:UNCertainty:DUT:MATCh:OUTPut:SPEC:STYLe?
Example	:CALC:UNC:DUT:MATC:OUTP:SPEC:STYL FIX
	:CALC:UNC:DUT:MATC:OUTP:SPEC:STYL?
Preset	FIXed

State Saved	No
Range	MAXimum|PCT95|PCT80|MEDian|MEAN|FIXed
Initial S/W Revision	A.14.00

DUT Output Match Distribution

Selects the DUT output match distribution to be used in the calculator.

The values used for the DUT match, whether read from a DUT data sheet or measured, is usually best treated as a value that is not statistically varying. So it is best to set to Fixed.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:DUT:MATCh:OUTPut:DISTribution RAYLeigh	FIXed	UNIForm`
	`:CALCulate:UNCertainty:DUT:MATCh:OUTPut:DISTribution?`
Example	:CALC:UNC:DUT:MATC:DIST FIX
	:CALC:UNC:DUT:MATC:DIST?
Preset	FIXed
State Saved	No
Range	RAYLeigh|FIXed|UNIForm
Initial S/W Revision	A.14.00

NS ENR Uncert

This section includes the noise source ENR uncertainty settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

NS ENR Uncert

Selects the ENR Uncertainty used in the uncertainty calculator.

For the most accurate estimation of uncertainty, set the NS ENR uncertainty manually. This option can be selected whenever the actual value of the noise source calibration data is available. The values are available at each frequency on the Calibration Data Report, also known as the Calibration Certificate. This allows the entry of the actual uncertainty of the ENR and the 50Ω match (in dB, VSWR or reflection coefficient).

The calibration data report gives the 95th percentile (two sigma) uncertainty of the ENR, which has a Gaussian probability density function.

Note: In frequency converting DUT applications and other two-noise-source applications, the ENR uncertainty and the Noise Source Match can be different for the two locations of usage of the noise source or noise sources. This calculator is not designed to handle that case ideally; we recommend you use the worse of the parameters of the two applications to get a conservative, instead of accurate, estimate of noise figure uncertainty.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce:ENR <value>`
	`:CALCulate:UNCertainty:SOURce:ENR?`
Example	:CALC:UNC:SOUR:ENR 1.25dB
	:CALC:UNC:SOUR:ENR?
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Modified at S/W Revision	A.14.00
Coupling	1. Can be manually set only when Noise Source type is Manual.
	2. Filled in automatically with the ENR uncertainty at frequency of measurement stage (NS Freq) when DUT type is Amplifier, and Noise Source type is Auto(SNS)/A346A/A346B/A346C.
	3. Filled in automatically with the ENR uncertainty at frequency of measurement stage (NS Freq) when DUT type is Converter, Automate Setting is unchecked, and Noise Source type is Auto(SNS)/A346A/A346B/A346C.
	4. Filled in automatically with the worse value of two ENR uncertainties at frequency of measurement stage (NS Freq) and calibration stage when DUT type is Converter, Automate Setting is checked, and Noise Source type is Auto(SNS)/A346A/A346B/A346C.

NS ENR Uncert Specification Style

The specification style of ENR Uncertainty is "95th percentile". It cannot be changed.

NS ENR Uncert Distribution

The distribution of ENR Uncertainty is Gaussian. It cannot be changed.

NS Match

This section includes the noise source match settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

NS Match

Selects the NS match value used in the calculator.

The match can come from the calibration report, too, in which case the specification style and distribution are both "fixed." If the match comes from the data sheet of the noise source, statistical study of the data has shown that for some models and frequency ranges, using "maximum" for the specifications style and "Rayleigh" for the distribution gives a very accurate estimation of the uncertainty. For all other models and bands, the use of maximum and Rayleigh gives a modestly conservative estimate of uncertainty. (Using the Rayleigh distribution and "Maximum" always results in a more accurate model than previous practice or the other distributions. Therefore, a recommended (and default) setting of the "Specification Style" column is Maximum and of "Distribution" is Rayleigh for Agilent Noise Sources.)

As noted in the on-calculator footnote, the match can be entered as a return loss (any number that is zero or negative is treated as return loss in decibels), as a reflection coefficient (any number between 0 and 1 is treated as the magnitude of the reflection coefficient) or as a voltage standing-wave ratio, VSWR (any number 1 or larger is treated as a VSWR).

Note: In frequency converting DUT applications and other two-noise-source applications, the ENR uncertainty and the Noise Source Match can be different for the two locations of usage of the noise source or noise sources. This calculator is not designed to handle that case ideally; we recommend you use the worse of the parameters of the two applications to get a conservative, instead of accurate, estimate of noise figure uncertainty.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce:MATCh <value>`
	`:CALCulate:UNCertainty:SOURce:MATCh?`
Example	:CALC:UNC:SOUR:MATC 5.55
	:CALC:UNC:SOUR:MATC?
State Saved	No
Range	–100 to 100
Min	–100
Max	100
Modified at S/W Revision	A.14.00
Coupling	1. Editable only when Noise Source type is Manual.
	2. Filled in automatically with the worse value of two states (On/Off) of NS when Noise Source type is Auto(SNS).
	3. Filled in automatically with the NS match at frequency of measurement stage (NS Freq) when DUT type is Amplifier, and Noise Source type is Auto(SNS)/A346A/A346B/A346C.
	4. Filled in automatically with the NS match at frequency of measurement stage (NS Freq) when DUT type is Converter, Automate Setting is unchecked, and Noise Source type is Auto(SNS)/A346A/A346B/A346C.
	5. Filled in automatically with the worse value of two NS matches at frequency of measurement stage (NS Freq) and calibration stage when DUT type is Converter, Automate Setting is checked, and Noise Source type is Auto(SNS)/A346A/A346B/A346C.

NS Match Specification Style

Selects the NS match specification style to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce:MATCh:SPEC:STYLe MAXimum | PCT95 | PCT80 | MEDian | MEAN | FIXed`
	`:CALCulate:UNCertainty:SOURce:MATCh:SPEC:STYLe?`
Example	`:CALC:UNC:SOUR:MATC:SPEC:STYL FIX`
	`:CALC:UNC:SOUR:MATC:SPEC:STYL?`
Preset	Maximum
State Saved	No
Range	MAXimum|PCT95|PCT80|MEDian|MEAN|FIXed
Initial S/W Revision	A.14.00
Coupling	Only enabled when Noise Source is set to Manual.

NS Match Distribution

Selects the NS match distribution to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:SOURce:MATCh:DISTribution RAYLeigh | FIXed | UNIForm`
	`:CALCulate:UNCertainty:SOURce:MATCh:DISTribution?`
Example	`:CALC:UNC:SOUR:MATC:DIST FIX`
	`:CALC:UNC:SOUR:MATC:DIST?`
Preset	RAYLeigh
State Saved	No
Range	RAYLeigh|FIXed|UNIForm
Initial S/W Revision	A.14.00
Coupling	Only enabled when Noise Source is set to Manual.

Inst NF, NF2

This section includes the instrument noise figure settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Inst NF, NF2

Selects the instrument noise figure to be used in the calculator.

For the most accurate estimation of uncertainty, enter the actual parameter to the extent known. For example, the NF of the instrument at the exact operating frequency can be found by actual measurement or by reading graphs from the analyzer data sheet or Specifications Guide.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument:NFIGure <value>`
	`:CALCulate:UNCertainty:INSTrument:NFIGure?`
Example	:CALC:UNC:INST:NFIG 25.2dB
	:CALC:UNC:INST:NFIG?
Preset	10 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Modified at S/W Revision	A.14.00
Coupling	1. Editable only when Instrument type is Manual.
	2. Filled in automatically at Inst Freq when Instrument type is Auto.

Inst NF Specification Style

The specification style of instrument noise figure is "Fixed". It cannot be changed.

Inst NF Uncert

This section includes the instrument input uncertainty settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Inst NF Uncert

Selects the instrument noise figure uncertainty to be used in the calculator.

When Instrument is Auto, the worse value of the Insturment NF Uncertainty at the calibration stage and measurement stage will be used.

For the most accurate estimation of uncertainty, enter the actual parameter to the extent known. Instrument Uncertainty for NF is listed in the data sheets and Specifications Guides of Agilent analyzers.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument:NFIGure:UNCertainty <value>`
	`:CALCulate:UNCertainty:INSTrument:NFIGure:UNCertainty?`
Example	:CALC:UNC:INST:NFIG:UNC 25.2dB
	:CALC:UNC:INST:NFIG:UNC?
Preset	0.03 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Modified at S/W Revision	A.14.00
Coupling	1. Editable only when Instrument type is Manual.
	2. Filled in automatically with the worse value of two Inst NF Uncertainties at ENR value of measurement stage (Measurement ENR) and calibration stage (Calibration ENR) when Automate Setting is checked, and Instrument type is Auto.

Inst NF Uncert Specification Style

The specification style of instrument noise figure uncertainty is "Maximum". It cannot be changed.

The specifications style for Instrument Uncertainty for NF, for Agilent Analyzers is always "worst case." Statistical study shows that treating these as 3 sigma specifications with Gaussian distribution is on the conservative side of an accurate estimation of uncertainty.

Inst NF Uncert Distribution

The distribution of instrument nosie figure uncertainty is "Gaussian". It cannot be changed.

Inst Gain Uncert

This section includes the instrument gain uncertainty settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Inst Gain Uncert

Selects the instrument gain uncertainty to be used in the calculator.

For the most accurate estimation of uncertainty, enter the actual parameters to the extent known. Instrument Uncertainty for Gain is listed in the data sheets and Specifications Guides of Agilent analyzers.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:INSTrument:GAIN <value>`
	`:CALCulate:UNCertainty:INSTrument:GAIN?`
Example	:CALC:UNC:INST:GAIN 25.2dB
	:CALC:UNC:INST:GAIN?
Preset	Platform Dependent:
	PXA: 0.07 dB
	MXA:0.10 dB
	EXA: 0.15 dB
	CXA: 0.20 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Modified at S/W Revision	A.14.00
Coupling	1. Editable only when Instrument type is Manual.
	2. Filled in automatically at Inst Freq when Instrument type is Auto.

Inst Gain Uncert Specification Style

The specification style of instrument gain uncertainty is "Maximum". It cannot be changed.

The specifications style for Instrument Uncertainty for Gain, for Agilent Analyzers is always "worst case." Statistical study shows that treating these as 3 sigma specifications with Gaussian distribution is on the conservative side of an accurate estimation of uncertainty.

Inst Gain Uncert Distribution

The distribution of instrument gain uncertainty is "Gaussian". It cannot be changed.

Inst Match

This section includes the instrument match settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Inst Match

Selects the instrument input match to be used in the calculator.

For the most accurate estimation of uncertainty, enter the actual parameters to the extent known. The analyzer match may be measured with a network analyzer, or with X-Series analyzers it can be estimated from graphs provided in the Specifications Guide, or for convenience in the PXA analyzer, the 95th percentile of the Rayleigh distribution of reflection coefficient can be taken from the Specifications Guide in the Preamplifier chapter.

As noted in the on-calculator footnote, the match can be entered as a return loss (any number that is zero or negative is treated as return loss in decibels), as a reflection coefficient (any number between 0 and 1 is treated as the magnitude of the reflection coefficient) or as a voltage standing-wave ratio, VSWR (any number 1 or larger is treated as a VSWR).

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:INSTrument:MATCh[:INPut] <value>
	:CALCulate:UNCertainty:INSTrument:MATCh[:INPut]?
Example	:CALC:UNC:INST:MATC 25.5
	:CALC:UNC:INST:MATC?
Preset	1.75
State Saved	No
Range	–100 to 100
Min	–100
Max	100
Backwards Compatibility SCPI	:CALCulate:UNCertainty:INSTrument:MATCh
Modified at S/W Revision	A.14.00
Coupling	1. Displayed as --- when Ext Preamp is selected (Auto or Manual), i.e., Ext PA Match parameters will be used under such condition.
	2. Editable only when Instrument type is Manual and Ext Preamp is not selected (None).
	3. Filled in automatically at Inst Freq when Instrument type is Auto.

Inst Match Specification Style

Selects the instrument match specification style to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:INSTrument:MATCh[:INPut]:SPEC:STYLe MAXimum | PCT95 | PCT80 | MEDian | MEAN | FIXed
	:CALCulate:UNCertainty:INSTrument:MATCh:SPEC:STYLe?
Example	:CALC:UNC:INST:MATC:SPEC:STYL FIX

	:CALC:UNC:INST:MATC:SPEC:STYL?
Preset	PCT95
State Saved	No
Range	MAXimum|PCT95|PCT80|MEDian|MEAN|FIXed
Initial S/W Revision	A.14.00
Coupling	Editable only when Instrument type is Manual and Ext Preamp is None.

Inst Match Distribution

Selects the instrument match specification style to be used in the calculator. With Agilent PXA, MXA and EXA analyzers, the distribution of the reflection coefficient is known to be a Rayleigh probability density function (pdf) with a different value in each band. The Agilent CXA does not have a Rayleigh distribution. Further information on the distribution of mismatch uncertainties is available in "Revisiting Mismatch Uncertainty with the Rayleigh Distribution," available in the Agilent website.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:INSTrument:MATCh[:INPut]:DISTribution RAYLeigh | FIXed | UNIForm
	:CALCulate:UNCertainty:INSTrument:MATCh:DISTribution?
Example	:CALC:UNC:INST:MATC:DIST FIX
	:CALC:UNC:INST:MATC:DIST?
Preset	Rayleigh
State Saved	No
Range	RAYLeigh|FIXed|UNIForm
Initial S/W Revision	A.14.00
Coupling	Editable only when Instrument type is Manual and Ext Preamp is None.

Inst NFE Impr

This section includes the instrument NFE improvement settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Inst NFE Impr

Selects the instrument NFE improvement to be used in the calculator.

For the most accurate estimation of uncertainty, enter the actual parameter to the extent known. "NFE Improvement" is listed in the Specifications Guide for X–Series analyzers that have NFE available and thus are capable of Internal Cal.

Note: This parameter will not appear on instruments that do not have an NFE or NF2 license.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:INSTrument:NFE[:IMPRovement] <value>
	:CALCulate:UNCertainty:INSTrument:NFE[:IMPRovement]?
Example	:CALC:UNC:INST:NFE 9.0
	:CALC:UNC:INST:NFE?
Preset	9.0
State Saved	No
Range	0 – 100
Min	0
Max	100
Initial S/W Revision	A.14.00
Coupling	1. Valid only when Ext Preamp type is None. Otherwise, should be displayed as ---.
	2. Editable only when Instrument type is Manual.
	3. Filled in automatically at Inst Freq when Instrument type is Auto.

Inst NFE Impr Specification Style

The specification style of instrument NFE improvement is "95th percentile". It cannot be changed.

Note: This parameter will not appear on instruments that do not have an NFE or NF2 license.

Inst NFE Impr Distribution

The distribution of instrument NFE improvement is "Gaussian". It cannot be changed.

Note: This parameter will not appear on instruments that do not have an NFE or NF2 license.

Ext Preamp NF

This section includes the external preamp noise figure settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Ext Preamp NF

Selects the external preamp noise figure to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:EXTernal:PREamp:NFIGure<value>
	:CALCulate:UNCertainty:EXTernal:PREamp:NFIGure?
Example	:CALC:UNC:EXT:PRE:NFIG 3.5
	:CALC:UNC:EXT:PRE:NFIG?
Preset	3.500 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Initial S/W Revision	A.14.00
Coupling	1. Editable only when Ext Preamp type is Manual.
	2. Filled in automatically at Inst Freq when Ext Preamp type is Auto.
	3. Invalid when Ext Preamp type is None.

Ext Preamp NF Specification Style

The specification style of external preamp noise figure is "Fixed". It cannot be changed.

Ext Preamp Gain

This section includes the external preamp gain settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Ext Preamp Gain

Selects the external preamp gain to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:EXTernal:PREamp:GAIN <value>
	:CALCulate:UNCertainty:EXTernal:PREamp:GAIN?
Example	:CALC:UNC:EXT:PRE:GAIN 21
	:CALC:UNC:EXT:PRE:GAIN?
Preset	21 dB

State Saved	No
Range	–100 dB – 100 dB
Min	–100
Max	100
Initial S/W Revision	A.14.00
Coupling	1. Editable only when Ext Preamp type is Manual.
	2. Filled in automatically at Inst Freq when Ext Preamp type is Auto.
	3. Invalid when Ext Preamp type is None.

Ext Preamp Gain Specification Style

The specification style of external preamp gain is "Fixed". It cannot be changed.

Ext Preamp Match

This section includes the external preamp match settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Ext Preamp Match

Selects the external preamp match to be used in the calculator.

As noted in the on-calculator footnote, the match can be entered as a return loss (any number that is zero or negative is treated as return loss in decibels), as a reflection coefficient (any number between 0 and 1 is treated as the magnitude of the reflection coefficient) or as a voltage standing-wave ratio, VSWR (any number 1 or larger is treated as a VSWR).

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:EXTernal:PREamp:MATCh <value>
	:CALCulate:UNCertainty:EXTernal:PREamp:MATCh?
Example	:CALC:UNC:EXT:PRE:MATC 1.3
	:CALC:UNC:EXT:PRE:MATC?
Preset	1.300
State Saved	No
Range	–100 – 100
Min	–100
Max	100

Initial S/W Revision	A.14.00
Coupling	1. Editable only when Ext Preamp type is Manual.
	2. Filled in automatically at Inst Freq when Ext Preamp type is Auto.
	3. Invalid when Ext Preamp type is None.

Ext Preamp Match Specification Style

Selects the external preamp match specification style to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:EXTernal:PREamp:MATCh:SPEC:STYLe MAXimum	PCT95	PCT80	MEDian	MEAN	FIXed`
	`:CALCulate:UNCertainty:EXTernal:PREamp:MATCh:SPEC:STYLe?`
Example	`:CALC:UNC:INST:EXT:PRE:SPEC:STYL FIX`
	`:CALC:UNC:INST:EXT:PRE:SPEC:STYL?`
Preset	FIXed
State Saved	No
Range	MAXimum|PCT95|PCT80|MEDian|MEAN|FIXed
Initial S/W Revision	A.14.00
Coupling	1. Editable only when Ext Preamp type is Manual.
	2. Filled in automatically at Inst Freq when Ext Preamp type is Auto.
	3. Invalid when Ext Preamp type is None.

Ext Preamp Match Distribution

Selects the external preamp match distribution to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	`:CALCulate:UNCertainty:EXTernal:PREamp:MATCh:DISTribution RAYLeigh	FIXed	UNIForm`
	`:CALCulate:UNCertainty:EXTernal:PREamp:MATCh:DISTribution?`
Example	`:CALC:UNC:EXT:PRE:MATC:DIST FIX`
	`:CALC:UNC:EXT:PRE:MATC:DIST?`
Preset	FIXed
State Saved	No
Range	RAYLeigh|FIXed|UNIForm
Initial S/W Revision	A.14.00

Coupling	1. Editable only when Ext Preamp type is Manual.
	2. Filled in automatically at Inst Freq when Ext Preamp type is Auto.
	3. Invalid when Ext Preamp type is None.

Ext Preamp NFE Impr

This section includes the external preamp NFE improvement settings.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Initial S/W Revision	A.14.00

Ext Preamp NFE Impr

Selects the external preamp NFE improvement to be used in the calculator.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:EXTernal:PREamp:NFE[:IMPRovement] <value>
	:CALCulate:UNCertainty:EXTernal:PREamp:NFE[:IMPRovement]?
Example	:CALC:UNC:EXT:PRE:NFE 9.0
	:CALC:UNC:EXT:PRE:NFE?
Preset	9.0
State Saved	No
Range	0 – 100
Min	0
Max	100
Initial S/W Revision	A.14.00
Coupling	1. Editable only when Ext Preamp type is Manual.
	2. Filled in automatically at Inst Freq when Ext Preamp type is Auto.
	3. Invalid when Ext Preamp type is None.

Ext Preamp NFE Impr Specification Style

The specification style of external preamp NFE improvement is "95th percentile". It cannot be changed.

Ext Preamp NFE Impr Distribution

The distribution of external preamp NFE improvement is "Gaussian". It cannot be changed.

Sweep

Parameter

Select the parameter to be swept. This calculator only supports DUT parameter sweeping. Please use Java (on-line at Agilent.com) calculator to sweep other parameters.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:SWEep:PARameter NFIGure | GAIN | INMatch | OUTMatch
	:CALCulate:UNCertainty:SWEep:PARameter?
Example	:CALC:UNC:SWE:PAR NFIG
Preset	NFIGure
State Saved	Saved in instrument state.
Range	NFIGure|GAIN|INMatch|OUTMatch
Initial S/W Revision	A.14.00

Lower Value

Set the lower value for the swept parameter.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:SWEep:STARt <value>
	:CALCulate:UNCertainty:SWEep:STARt?
Example	:CALC:UNC:SWE:STAR 1.0
	:CALC:UNC:SWE:STAR?
Preset	1.5
State Saved	No
Min	−9.9e37
Max	9.9e37
Initial S/W Revision	A.14.00
Coupling	See section 2.1.1.28.4 for detailed information.

Upper Value

Set the upper value for the swept parameter.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE

Remote Command	:CALCulate:UNCertainty:SWEep:STOP <value>
	:CALCulate:UNCertainty:SWEep:STOP?
Example	:CALC:UNC:SWE:STOP 10.0
	:CALC:UNC:SWE:STOP?
Preset	4.5
State Saved	No
Min	−100
Max	100
Initial S/W Revision	A.14.00
Coupling	See section 2.1.1.28.4 for detailed information.

Rules for lower and upper default values

To provide a reasonable sweeping range, the lower and upper values may change when the swept parameter or the value of the swept parameter changes. The lower and upper values follow the following rules. For DUT NF and Gain parameters, the following rules will be applied.

1)The lower value will be set to one-half of the current value of the swept parameter.

2)The upper value will be set to 1.5 times the current value of the swept parameter.

For the Match parameters, the following rules will be applied.

1)When the current value is negative, use the 0.5 times the value for lower value and 1.5 times for upper value.

2)When the current value is between 0 and 0.6, set the upper value to 1.5 times the value, and the lower value to 0.5 times.

3)When the current value is between 0.6 and 1.0, set the upper value to 0.75 plus 0.25 times the value. Set the lower value to twice the value minus the upper value.

4)When the current value is at 1.0 exactly, set the upper and lower value to 1.0.

5)When the current value is above 1.0, set the lower value to 0.5 plus half of the value, and the upper value to twice the value minus the lower value.

Note: When the user changes the lower or upper value manually for a swept parameter, these rules will be turned off for that parameter. They will be turned back on the next time there is a Mode Preset.

Points

Sets the number of sweep points. The points are distributed evenly between the lower and upper values.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:SWEep:POINts <value>
	:CALCulate:UNCertainty:SWEep:POINts?

Example	:CALC:UNC:SWE:POIN 100
	:CALC:UNC:SWE:POIN?
Preset	15
State Saved	No
Min	2
Max	501
Initial S/W Revision	A.14.00

Measurement Uncertainty

Measurement Uncertainty

When Sweep parameter is set to None, three 95th percentile measurement uncertainty are displayed on the result area, that can be used to determine the overall uncertainty of the noise figure measurement in different calibration types (User Cal, Internal Cal or Uncal). These values will be updated whenever any of the other parameters under the :CALCulate:UNCertainty scpi node change.

This parameter is never editable from the front panel or via SCPI but is auto calculated from the other parameters in the DUT setup form.

User Cal:	±0.574 dB
Internal Cal:	±0.576 dB
Uncal:	±0.726 dB

//show 95th percentile measurement uncertainty figure here!

User Cal Uncertainty

Returns 95th percentile measurement uncertainty result when calibration type is User Cal.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:USER?
Example	:CALC:UNC:USER?
Remote Command Notes	Read only.
Preset	0.2 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Backwards Compatibility SCPI	:CALCulate:UNCertainty:RSS?

Modified at S/W Revision	A.14.00
Coupling	Always read only – calculated from other uncertainty calculator values.
Restriction and Notes	Automatically calculated from other uncertainty calculator values.

Internal Cal Uncertainty

Returns 95th percentile measurement uncertainty result when calibration type is Internal Cal.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:INTernal?
Example	:CALC:UNC:INT?
Remote Command Notes	Read only.
Preset	0.2 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Initial S/W Revision	A.14.00
Restriction and Notes	Automatically calculated from other uncertainty calculator values.
Coupling	1. Always read only – calculated from other uncertainty calculator values.
	2. Returns NaN if the instrument doesn't support Internal Cal. '---' will be displayed on the form.

Uncalibrated Uncertainty

Returns 95th percentile measurement uncertainty result when the measurement is calibrated.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command	:CALCulate:UNCertainty:UNCal?
Example	:CALC:UNC:UNC?
Remote Command Notes	Read only.
Preset	0.2 dB
State Saved	No
Range	0 dB to 100 dB
Min	0 dB
Max	100 dB
Initial S/W Revision	A.14.00

Restriction and Notes	Automatically calculated from other uncertainty calculator values.
Coupling	Always read only – calculated from other uncertainty calculator values.

Sweep Uncertainty

Three traces will be displayed on the result area by default for different calibration types (User Cal, Internal Cal and Uncal). The trace may be hidden if the checkbox for a calibration type is unchecked.

Users can move a mouse on the trace, the value of the point will be shown on the upper left corner.
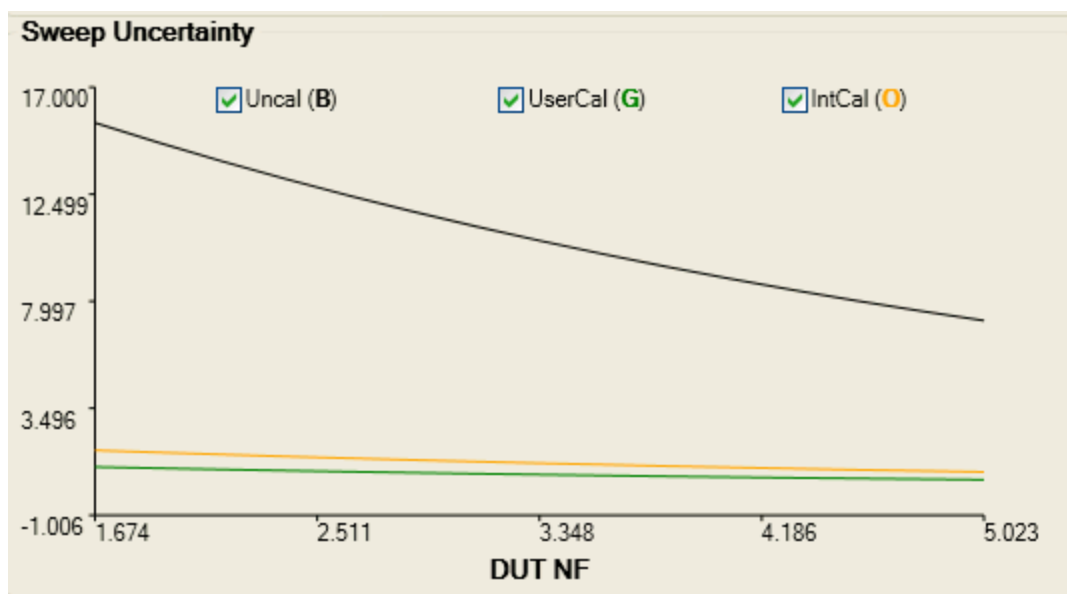
Sweep Result Array (remote command only)

Returns an array of the swept uncertainty for each calibration type. One value is returned for each point.

Remote Command	:CALCulate:UNCertainty:SWEep:ARRay:USER|INTernal|UNCal?
Initial S/W Revision	A.14.00

Sweep Trace Display

User Cal Trace

Selects whether displaying sweep results for User Cal.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command Notes	Front Panel Only
Preset	On

State Saved	Saved in instrument state.
Range	On|Off
Initial S/W Revision	A.14.00

Internal Cal Trace

Selects whether displaying sweep results for Intercal Cal.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command Notes	Front Panel Only
Preset	On
State Saved	Saved in instrument state.
Range	On|Off
Initial S/W Revision	A.14.00
Coupling	Disabled when NFE (and NF2) license is not installed and the Ext Preamp is not set to "Auto".

Uncal Trace

Selects whether displaying sweep results for Uncal.

Key Path	Mode Setup, Uncertainty Calculator
Mode	NFIGURE
Remote Command Notes	Front Panel Only
Preset	On
State Saved	Saved in instrument state.
Range	On|Off
Initial S/W Revision	A.14.00

Advanced

Accesses advanced features. These features are recommended for use only by advanced users.

Key Path	Mode Setup
Initial S/W Revision	A.06.00

Marker Compatibility

This parameter controls whether the marker readout is compatible with earlier instruments. When Marker Compatibility is on it affects the SCPI query response, as well as the marker display.

If this parameter is set to ON, when you query a marker you will get two comma separated values indicating the Noise Figure value first, followed by the Gain value. If this parameter is set to OFF, the response to a marker query will be a single value, for whichever trace the marker is on (Noise Figure or Gain).

In addition, this parameter affects the marker display at the top of the screen in the Overlaid Traces View. When Overlaid Traces is ON, the Marker value displays in the middle at the top of the screen, and displays only one value if Marker Compatibility is OFF, but displays both values (Noise Figure and Gain) if Marker Compatibility is ON.

In addition, this parameter affects the marker table display in the Overlaid Traces View. When Overlaid Traces is ON, the Marker Table has two columns for the Y value; one column is labeled Noise Figure and the other is labeled Gain. When Marker Compatibility is OFF, each column shows only one valid value, the one for the trace the Marker is on; the other column shows ---. But when Marker Compatibility is ON, both columns show valid values.

The Marker Compatibility setting is persistent and survives both a mode preset and power cycle, but is reset to Off by Restore Mode Defaults.

Key Path	Mode Setup, Advanced
Mode	Noise Figure
Remote Command	`:CALCulate[:NFIGure]:MARKer:COMPatible OFF|ON|0|1`
	`:CALCulate[:NFIGure]:MARKer:COMPatible?`
Example	CALC:MARK:COMP ON
	CALC:MARK:COMP?
Preset	OFF
State Saved	Saved in instrument state.
Range	On|Off
Initial S/W Revision	A.06.00

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 performing a Mode Preset.

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

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 opensin the My Documents directory for the current user.

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

Exit the File Explorer by clicking on the red X in the upper right corner, with a mouse
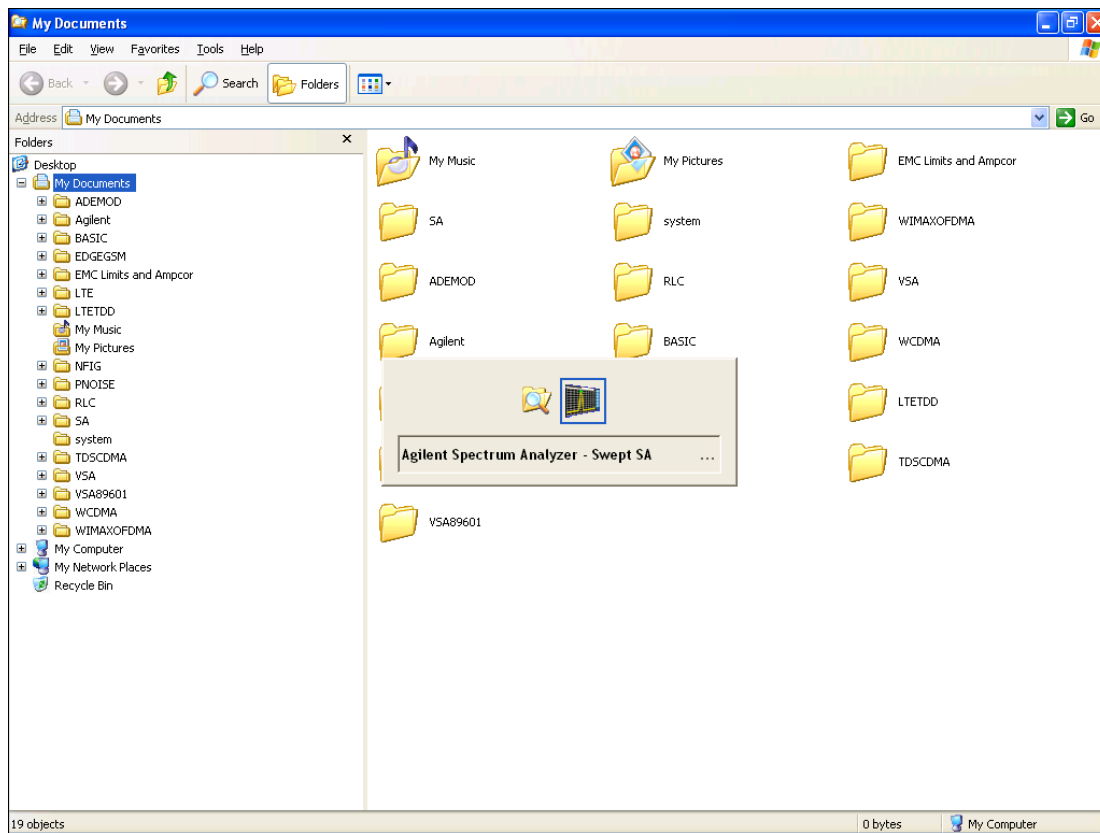
Or use Alt-Tab: press and hold the Alt key and press and release the Tab key until the Analyzer logo is showing in the window in the center of the screen, as shown above, then release the Alt key.

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

Page Setup

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

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

Paper size, the printer paper source, the page orientation and the margins are all settable. Just like any standard Windows dialog, you may navigate the dialog using the front-panel keys, or a mouse. There are no SCPI commands for controlling these parameters.
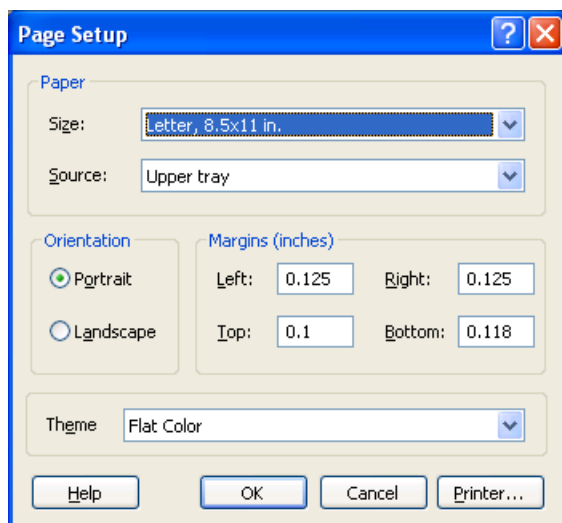
Also contained in this dialog is a drop-down control that lets you select the Theme to use when printing. For more on Themes, see information under View/Display, Display, System Display Settings, Theme. The Theme control has a corresponding SCPI command.

Parameter Name	Print Themes
Parameter Type	Enum
Mode	All
Remote Command	`:SYSTem:PRINt:THEMe TDColor|TDMonochrome|FCOLor|FMONochrome`
	`:SYSTem:PRINt:THEMe?`
Example	:SYST:PRIN:THEM FCOL
Setup	:SYSTem:DEFault MISC
Preset	FCOL; not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and

survives subsequent running of the modes.

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

Print

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

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

Key Path	Front-panel key
Remote Command	`:HCOPy[:IMMediate]`
Initial S/W Revision	Prior to A.02.00

Key Path	SCPI command only
Remote Command	`:HCOPy:ABORt`
Initial S/W Revision	Prior to A.02.00

Restore Down

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

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

Minimize

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

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

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

Exit

This key, when pressed, will exit the Instrument Application. A dialog box is used to confirm that you intended to exit the application:
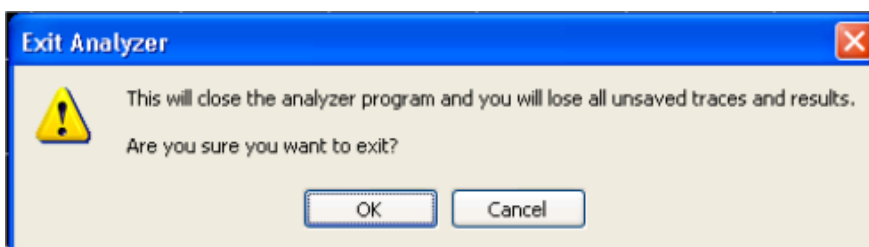
Key Path	File
Mode	All
Notes	
	The Instrument Application willclose. No further SCPI commands can be sent. Use with caution!
Initial S/W Revision	Prior to A.02.00

Print

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

Print

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

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

Key Path	Front-panel key
Remote Command	:HCOPy[:IMMediate]
Initial S/W Revision	Prior to A.02.00

Key Path	SCPI command only
Remote Command	:HCOPy:ABORt
Initial S/W Revision	Prior to A.02.00

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

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

Refresh

When pressed, refreshes the Show Errors display.

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

Clear Error Queue

This clears all errors in all error queues.

Note the following:

- Clear Error Queue does not affect the current status conditions.

- Mode Preset does not clear the error queue.

- Restore System Defaults will clear all error queues.

- *CLS only clears the queue if it is sent remotely and *RST does not affect any error queue.

- Switching modes does not affect any error queues.

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

Status

See .

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        Precison Frequency Reference
N9020A-P03        Preamp 3.6 GHz

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

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page menu key is grayed-out if the last page is information is presently displayed.

Key Path	System, Show

Mode	All
Example	SYST:SHOW SYST
Backwards Compatibility Notes	The hardware statistics that are displayed in the PSA Show System screen have been moved to a dedicated Show Hardware Statistics screen in the Service Menu.
Initial S/W Revision	Prior to A.02.00

Show System contents (Remote Command Only)

A remote command is available to obtain the contents of the Show System screen (the entire contents, not just the currently displayed page).

Remote Command	`:SYSTem:CONFigure[:SYSTem]?`
Example	:SYST:CONF?
Notes	The output is an IEEE Block format of the Show System contents. Each line is separated with a new-line character.
Initial S/W Revision	Prior to A.02.00

Computer System description (Remote Command Only)

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

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

Hardware

The show hardware screen is used to view details of the installed hardware. This information can be used to determine versions of hardware assemblies and field programmable devices, in the advent of future upgrades or potential repair needs.

The screen is formatted into two groupings: product descriptive information and hardware information. The hardware information is listed in a table format:

Hardware Information
MXA Signal Analyzer
Product Number: N9020A
Serial Number: US46220107
Firmware Revision: A.01.14

Assembly Name	Part #	Serial #	Matl Rev	Rev	OF Rev	Hw Id	Misc
Analog IF	E441060104	78060200131	003	0	C	15	
YIG Tuned Filter	50877305	11061500550	005	0	A	11	
Digital IF	E441060105	78060100559	003	0	F	14	
Front End Controller	E441060101	78060100147	004	2	A	8	
Low Band Switch	E441060170	78060800346	005	1	A	10	
LO Synthesizer	E441060102	78060100226	003	3	G	2	
Reference	E441060108	78060300420	004	1	C	16	
Front End	E441060154	13062800820	010	2	B	9	

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page menu key is grayed-out if the last page is information is presently displayed.

Key Path	System, Show
Mode	All
Example	SYST:SHOW HARD
Initial S/W Revision	Prior to A.02.00

LXI

This key shows you the product number, serial number, firmware revision, computer name, IP address, Host ID, LXI Class, LXI Version, MAC Address, and the Auto-MDIX Capability.

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

Power On

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

Key Path	System
Mode	All
Remote Command	`:SYSTem:PON:TYPE MODE|USER|LAST`
	`:SYSTem:PON:TYPE?`
Example	:SYST:PON:TYPE MODE
Preset	This is unaffected by a Preset but is set to Mode on a "Restore System Defaults->All"
State Saved	No
Backwards Compatibility SCPI	`:SYSTem:PON:TYPE PRESet`
	the "PRESet" parameter is supported for backward compatibility only and behaves the same as MODE.
Backwards Compatibility Notes	The Preset Type key in legacy analyzers has been removed, and the Power On toggle key has been replaced by this 1-of-N key in the System menu.
Initial S/W Revision	Prior to A.02.00

Mode and Input/Output Defaults

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

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

Key Path	System, Power On
Mode	All
Example	SYST:PON:TYPE MODE
Readback Text	Defaults
Initial S/W Revision	Prior to A.02.00

User Preset

Sets Power On to User Preset. When the analyzer is powered on in User Preset, it will User Preset each mode and switch to the power-on mode. Power On User Preset will not affect any settings beyond what a normal User Preset affects.

> **NOTE** An instrument could never power up for the first time in User Preset.

Key Path	System, Power On
Mode	All
Example	SYST:PON:TYPE USER
Readback Text	User Preset

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

Last State

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

> **NOTE**   An instrument can never power up for the first time in Last.
>
> If line power to the analyzer is interrupted, for example by pulling the line cord plug or by switching off power to a test rack, Power On Last State may not work properly. For proper operation, Power On Last State depends on you shutting down the instrument using the Standby key or the SYSTem:PDOWn SCPI command. This will ensure the last state of each mode is saved and can be recalled during a power up.

Key Path	System, Power On
Mode	All
Example	SYST:PON:TYPE LAST
Notes	Power on Last State only works if you have done a controlled shutdown prior to powering on in Last. If a controlled shutdown is not done when in Power On Last State, the instrument will power up in the last active mode, but it may not power up in the active mode's last state. If an invalid mode state is detected, a Mode Preset will occur. To control the shutdown under remote control use the :SYSTem:PDOWn command.
Readback Text	Last State
Backwards Compatibility Notes	It is no longer possible to power-up the analyzer in the last mode the analyzer was running with that mode in the preset state. (ESA/PSA SYST:PRESET:TYPE MODE with SYST:PON:PRESET) You can power-on the analyzer in the last mode the instrument was running in its last state (SYST:PON:TYPE LAST), or you can specify the mode to power-up in its preset state (SYST:PON:MODE ‹mode›).
Initial S/W Revision	Prior to A.02.00

Power On Application

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

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

Key Path	System, Power On
Mode	All
Remote Command	`:SYSTem:PON:MODE SA	BASIC	ADEMOD	NFIGURE	PNOISE	CDMA2K	TDSCDMA	VSA	VSA89601	WCDMA	WIMAXOFDMA`
	`:SYSTem:PON:MODE?`
Example	SYST:PON:MODE SA
Notes	The list of possible modes (and remote parameters) to choose from is dependent on which modes are installed in the instrument.
Preset	This is unaffected by a Preset but is set on a "Restore System Defaults->All" to:
	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:

Key Path	System, Power On
Example	:SYST:SHOW CAPP Displays the Config Applications screen
Initial S/W Revision	A.02.00

Preloading Applications

During runtime, if a Mode that is not preloaded is selected using the Mode menu or sending SCPI commands, there will be a pause while the Application is loaded. During this pause a message that says "Loading application, please wait ..." is displayed. Once loaded, the application stays loaded, so the next time you select it during a session, there is no delay.

Preloading enables you to "preload" at startup, to eliminate the runtime delay. Preloading an application will cause it to be loaded into the analyzer's memory when the analyzer program starts up. If you do this, the delay will increase the time it takes to start up the analyzer program, but this may be preferable to having to wait the first time you select an application. Note that, once an application is loaded into memory, it cannot be unloaded without exiting and restarting the analyzer program.

Note that there are more applications available for the X-Series than can fit into Windows Virtual Memory. By allowing you to choose which licensed applications to load at startup, the Configure Applications utility allows you to make optimal use of your memory.

Access to Configure Applications utility

A version of the utility runs the first time you power up the analyzer after purchasing it from 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.

Key Path	System, Power On, Configure Applications
Remote Command	`:SYSTem:PUP:PROCess`
Example	`:SYST:PUP:PROC` This is the SCPI command for restarting the analyzer. You must Wait after this command for the instrument application to restart
Notes	The softkey will be grayed-out when the virtual memory of the selected applications exceeds 100% of the limit.
Notes	You cannot use *WAI or *OPC? to synchronize operation after a restart. This command stops and restarts the instrument application, thus the SCPI operation is terminated and restarted. A remote program must use fixed wait time to resume sending commands to the instrument. The wait time will be dependent upon which applications are pre-loaded.
Initial S/W Revision	A.02.00
Modified at S/W Revision	A.04.00

Exit Without Saving

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

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

Restore Power On Defaults

This selection causes the Power On Type and Power On Application settings to be a reset to their default values. This level of Restore System Defaults does not affect any other system settings, mode settings and

does not cause a mode switch. The Power On key, under the Restore System Defaults menu, causes the same action.

Restore Poweron Settings

⚠️ This will reset Power On Type and Power On Mode to their factory default values. Calibration data will not be erased.

Are you sure you want to do this?

Press Enter to proceed, or ESC to Cancel
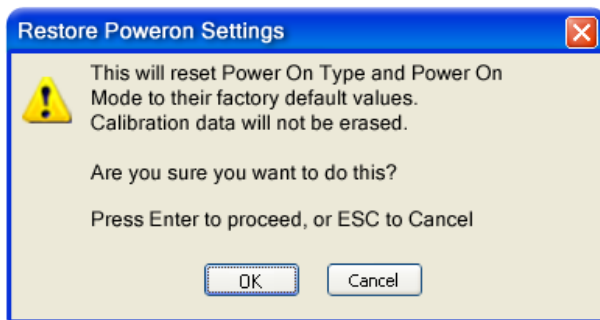
[OK]   [Cancel]

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 programa 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] 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 366

- "Configuration Memory Available (Remote Command Only)" on page 366

- "Configuration Memory Total (Remote Command Only)" on page 366

- "Configuration Memory Used (Remote Command Only)" on page 366

- "Configuration Application Memory (Remote Command Only)" on page 367

Configuration list (Remote Command Only)

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

Remote Command	:SYSTem:PON:APPLication:LLISt <string of INSTrument:SELect names>
	:SYSTem:PON:APPLication:LLISt?
Example	:SYST:PON:APPL:LLIS "SA,BASIC,WCDMA"
Notes	<string of INSTrument:SELect names> are from the enums of the :INSTrument:SELect command.
	The order of the <INSTrument:SELect names> is the order that the applications are loaded into memory, and the order that they appear in the Mode Menu.
	Error message –225 "Out of Memory" is reported when more applications are listed than can reside in Virtual Memory. When this occurs, the existing applications load list is unchanged.
Preset	Not affected by Preset
State Saved	Not saved in instrument state
Initial S/W Revision	A.02.00

Configuration Memory Available (Remote Command Only)

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

Remote Command	:SYSTem:PON:APPLication:VMEMory[:AVAilable]?
Example	:SYST:PON:APPL:VMEM?
Preset	Not affected by Preset
Initial S/W Revision	A.02.00

Configuration Memory Total (Remote Command Only)

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

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

Configuration Memory Used (Remote Command Only)

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

Remote Command	:SYSTem:PON:APPLication:VMEMory:USED?
Example	:SYST:PON:APPL:VMEM:USED?

Preset	Not affected by Preset
Initial S/W Revision	A.02.00

Configuration Application Memory (Remote Command Only)

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

Remote Command	:SYSTem:PON:APPLication:VMEMory:USED:NAME? <INSTrument:SELect name>
Example	: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.

⚠ ALIGN PARTIAL

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

Auto Align

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

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

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

Key Path	System, Alignments
Mode	All
Remote Command	:CALibration:AUTO ON|PARTial|OFF
	:CALibration:AUTO?
Example	:CAL:AUTO ON

Notes	While Auto Align is executing, bit 0 of Status Operation register is set.
Couplings	Auto Align is set to Off if Restore Align Data is invoked.
Preset	This is unaffected by Preset but is set to ON upon a "Restore System Defaults->Align".
State Saved	No
Status Bits/OPC dependencies	When Auto Align is executing, bit 0 in the Status Operational register is set.
Backwards Compatibility SCPI	`:CALibration:AUTO ALERt` Parameter ALERt is for backward compatibility only and is mapped to PARTial
Backwards Compatibility Notes	1. ESA SCPI for Auto Align is :CALibration:AUTO <Boolean>. The command for X-Series is an enumeration. Thus the parameters of "0" and "1" are not possible in X-Series. 2. Similarly, the ESA SCPI for :CALibration:AUTO? returned the Boolean value 1 or 0, in X-Series it is an Enumeration (string). Thus, queries by customer applications into numeric variables will result in an error 3. In PSA Auto Align OFF was not completely off, it is equivalent to PARTial in X-Series. In X-Series, OFF will be fully OFF. This means users of PSA SCPI who choose OFF may see degraded performance and should migrate their software to use PARTial.
Initial S/W Revision	Prior to A.02.00

Normal

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

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

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

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

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

interference" is reported, the Status Questionable Calibration bit 11 is set, and the alignment proceeds. When a subsequent alignment of the RF subsystem succeeds, either by the next cycle of automatic alignment or from an Align Now, RF, the Error Condition and Status Questionable Calibration bit 11 are cleared.

Initial S/W Revision	Prior to A.02.00

Partial

Auto Align, Partial disables the full automatic alignment and the maintenance of warranted operation for the benefit of improved measurement throughput. Accuracy is retained for the Resolution Bandwidth filters and the IF Passband, which is critical to FFT accuracy, demodulation, and many measurement applications. With Auto Align set to Partial, you are now responsible for maintaining warranted operation by updating the alignments when they expire. The Auto Align, Alert mechanism will notify you when alignments have expired. One solution to expired alignments is to perform the Align All, Now operation. Another is to return the Auto Align selection to Normal.

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

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

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

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

Off

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

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

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

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

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

All but RF

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

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

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

Alert

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

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

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

Time & Temperature

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

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

24 hours

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

For front-panel operation , confirmation is required to transition into this setting of Alert. The confirmation dialog is:
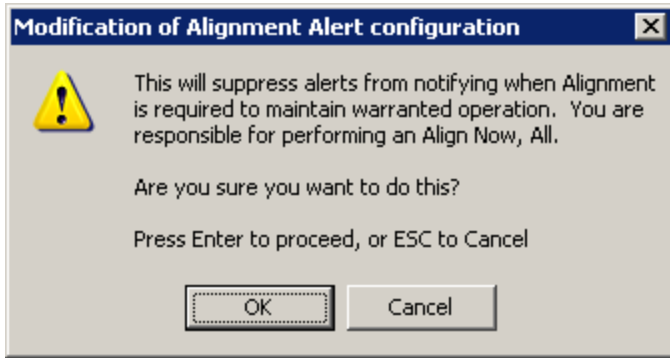
No confirmation is required when Alert is configured through a remote command.

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

7 days

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

For front panel operation, confirmation is required for the customer to transition into this setting of Alert. The confirmation dialog is:
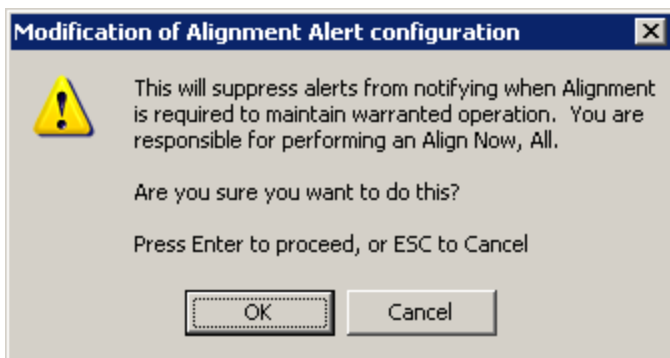
No confirmation is required when Alert is configured through a remote command.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
Example	:CAL:AUTO:ALER WEEK
Readback Text	7 days
Status Bits/OPC dependencies	Bit 14 is set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

None

With Auto Align Alert set to None the instrument will not signal an alert. This is provided for rare occasions where you are making a long measurement which cannot tolerate Auto Align interruptions, and must have the ability to capture a screen image at the end of the measurement without an alert posted to the display. 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:
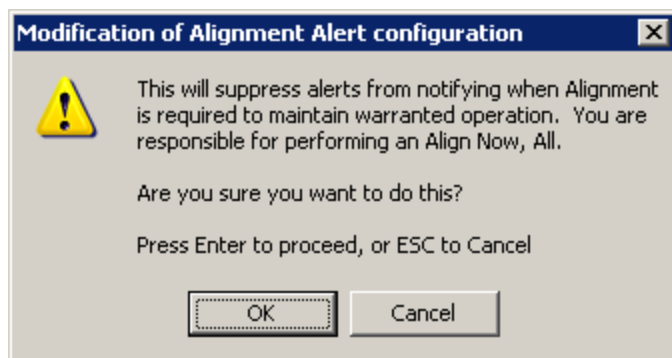
No confirmation is required when Alert is configured through a remote command.

Key Path	System, Alignments, Auto Align, Alert
Mode	All
Example	:CAL:AUTO:ALER NONE
Initial S/W Revision	Prior to A.02.00

Execute Expired Alignments (Remote Command Only)

Alignments can be expired in the situation where Auto Align is in the state of Partial or Off. This feature runs the alignments that have expired. This is different than performing an Align All, Now operation. 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.

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	`:CALibration[:ALL]`
	`:CALibration[:ALL]?`
Example	:CAL
Notes	:CALibration[:ALL]? returns 0 if successful
	:CALibration[:ALL]? returns 1 if failed
	:CALibration[:ALL]? is the same as *CAL?
	While Align Now, All is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register.
	This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command.
	Successful completion will clear bit 14 in the Status Questionable Calibration register.
	An interfering user signal is not grounds for failure of Align Now, All. However, bits 11 and 12 are set in the Status Questionable Calibration register to indicate Align Now, RF is required.
	An interfering user supplied signal will result in the instrument requiring an Align Now, RF with the interfering signal removed.
Couplings	Initializes the time for the Last Align Now, All Time.
	Records the temperature for the Last Align Now, All Temperature.
	If Align RF component succeeded, initializes the time for the Last Align Now, RF Time.
	If Align RF component succeeded, records the temperature for the Last Align Now, RF Temperature.
Status Bits/OPC dependencies	Bits 11, 12, or 14 may be set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

Mode	All
Remote Command	`*CAL?`
Example	*CAL?
Notes	*CAL? returns 0 if successful

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

All but RF

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

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

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

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

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

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

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

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

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

RF

(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

	:CALibration:RF? returns 1 if failed (including interfering user signal)
	While Align Now, RF is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register.
	This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command.
	Successful completion clears the Error Conditions "Align skipped: 50 MHz interference" and "Align skipped: 4800 MHz interference" and the Error Conditions "Align RF failed" and "Align Now, RF required", and clears bits 3, 11, and 12 in the Status Questionable Calibration register.
	A failure encountered during alignment will generate the Error Condition message "Align RF failed" and set bit 3 in the Status Questionable Calibration register.
	An interfering user signal will result in bits 11 and 12 to be set in the Status Questionable Calibration register to indicate Align Now, RF is required.
	An interfering user supplied signal will result in the instrument requiring an Align Now, RF with the interfering signal removed.
Couplings	Initializes the time for the Last Align Now, RF Time.
	Records the temperature for the Last Align Now, RF Temperature.
Status Bits/OPC dependencies	Bits 11, 12, or 14 may be set in the Status Questionable Calibration register.
Initial S/W Revision	Prior to A.02.00

External Mixer

Immediately executes an alignment of the External Mixer that is plugged into the USB port. The instrument stops any measurement currently underway, performs the alignment, then restarts the measurement from the beginning (similar to pressing the Restart key). As this alignment calibrates the LO power to the mixer, this is considered an LO alignment; and failure is classified as an LO alignment failure.

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

Key Path	System, Alignments, Align Now
Mode	All
Remote Command	:CALibration:EMIXer
	:CALibration:EMIXer?
Example	:CAL:EMIX
Notes	:CAL:EMIX? returns 0 if successful
	:CAL:EMIX? returns 1 if failed
	While Align Now, Ext Mix is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register.
	This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command.

A failure encountered during alignment will generate the Error Condition message "Align LO failed" and set bit 5 in the Status Questionable Calibration register. Successful completion will clear the "Align LO failed" message and bit 5 in the Status Questionable Calibration register.

Dependencies	This key does not appear unless option EXM is present and is grayed-out unless a USB mixer is plugged in to the USB.
Status Bits/OPC dependencies	Bit3 may be set in the Status Questionable Calibration Extended Failure register.
Initial S/W Revision	A.08.00

Show Alignment Statistics

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

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

An example of the Show Alignment Statistics screen would be similar to:
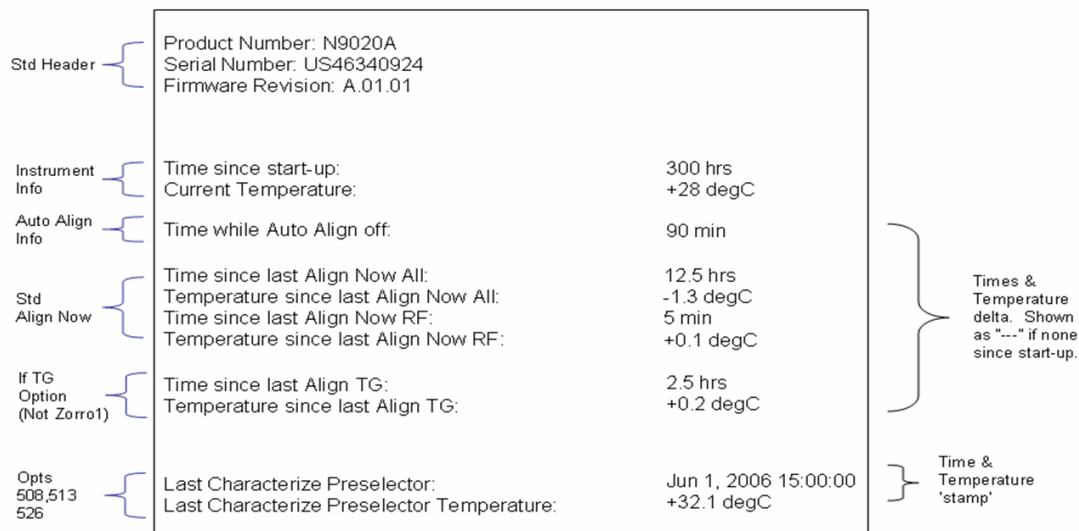
A successful Align Now, RF will set the Last Align RF temperature to the current temperature, and reset the Last Align RF time. A successful Align Now, All or Align Now, All but RF will set the Last Align Now All temperature to the current temperature, and reset the Last Align Now All time. A successful Align Now, All will also reset the Last Align RF items if the RF portion of the Align Now succeeded.

Key Path	System, Alignments
Mode	All

Notes	The values displayed on the screen are only updated upon entry to the screen and not updated while the screen is being displayed.
Initial S/W Revision	Prior to A.02.00

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

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:CURRent?`
Example	:CAL:TEMP:CURR?
Notes	Value is in degrees Centigrade.
	Value is invalid if using default alignment data (Align Now, All required)
State Saved	No
Initial S/W Revision	Prior to A.02.00

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

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

Notes	Value is in degrees Centigrade at which the last successful Align Now, All or Align Now, All but RF was executed.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TIME:LRF?`
Example	:CAL:TIME:LRF?
Notes	Value is the elapsed time, in seconds, since the last successful Align Now, RF was executed, either individually or as a component of Align Now, All.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:LRF?`
Example	:CAL:TEMP:LRF?
Notes	Value is in degrees Centigrade at which the last successful Align Now, RF was executed, either individually or as a component of Align Now, All.
State Saved	No
Initial S/W Revision	Prior to A.02.00

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

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:TEMPerature:LPReselector?`
Example	`:CAL:TEMP:LPR?`
Notes	Value is in degrees Centigrade at which the last successful Characterize Preselector was executed.
Dependencies	In models that do not include preselectors, this command is not enabled and any attempt to set or query will yield an error.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:AUTO:TIME:OFF?`
Example	`:CAL:AUTO:TIME:OFF?`
Notes	Value is the elapsed time, in seconds, since Auto Align has been set to Off or Off with Alert. The value is 0 if Auto Align is ALL or NORF.
State Saved	No
Initial S/W Revision	Prior to A.02.00

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

Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	`:CALibration:RFPSelector:SCHeduler:TIME:NEXT?` This query returns data using the following format "YYYY/MM/DD; HH:MM:SS"
Example	:CAL:RFPS:SCH:TIME:NEXT?

Notes	The next run time will be updated based on the start date/time and recurrence set by the users.
	
	 "date" is representation of the date the task will run in the form of "YYYY/MM/DD" where:
	
	    –YYYY is the four digit representation of year. (for example, 2009)
	    –MM is the two digit representation of month. (for example, 01 to 12)
	    –DD is the two digit representation of the day. (for example, 01 to 28, 29, 30 or 31 depending on the month and year)
	
	 "time" is a representation of the time of day the task will run in the form of "HH:MM:SS" where:
	
	    –HH is the two digit representation of the hour in 24 hour format
	    –MM is the two digit representation of minute
	    –SS is the two digit representation of seconds
	
	 For model N9038A only.

State Saved	No

Restore Align Defaults

Initializes the alignment user interface settings, not alignment data, to the factory default values. Align Now, All must be executed if the value of the Timebase DAC results in a change.

For front panel operation, you are prompted to confirm action before setting the alignment parameters to factory defaults:
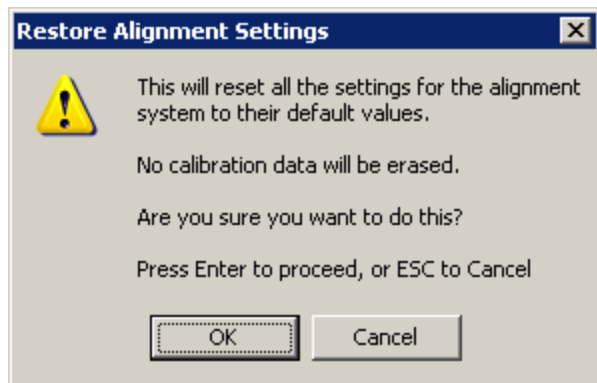
The parameters affected are:

Parameter	Setting
Timebase DAC	Calibrated
Timebase DAC setting	Calibrated value
Auto Align State	Normal (if the instrument is not operating with default alignment data, Off otherwise)
Auto Align All but RF	Off
Auto Align Alert	Time & Temperature

Key Path	System, Alignments
Mode	All
Example	:SYST:DEF ALIG
Notes	Alignment processing that results as the transition to Auto Alignment Normal will be executed sequentially; thus *OPC? or *WAI will wait until the alignment processing is complete.
Initial S/W Revision	Prior to A.02.00

Backup or Restore Align Data...

Opens the utility for backing-up or restoring the alignment data.

Alignment data for the instrument resides on the hard drive in a database. Agilent uses high quality hard drives; however it is highly recommended the alignment data be backed-up to storage outside of the instrument. Additionally, for customers who use multiple CPU Assemblies or multiple disk drives, the

alignment that pertains to the instrument must be transferred to the resident hard drive after a CPU or hard drive is replaced. This utility facilitates backing-up and restoring the alignment data.

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

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

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

Alignment Data Wizard

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

The following dialogue boxes operates without a mouse or external keyboard when you use the default file names.
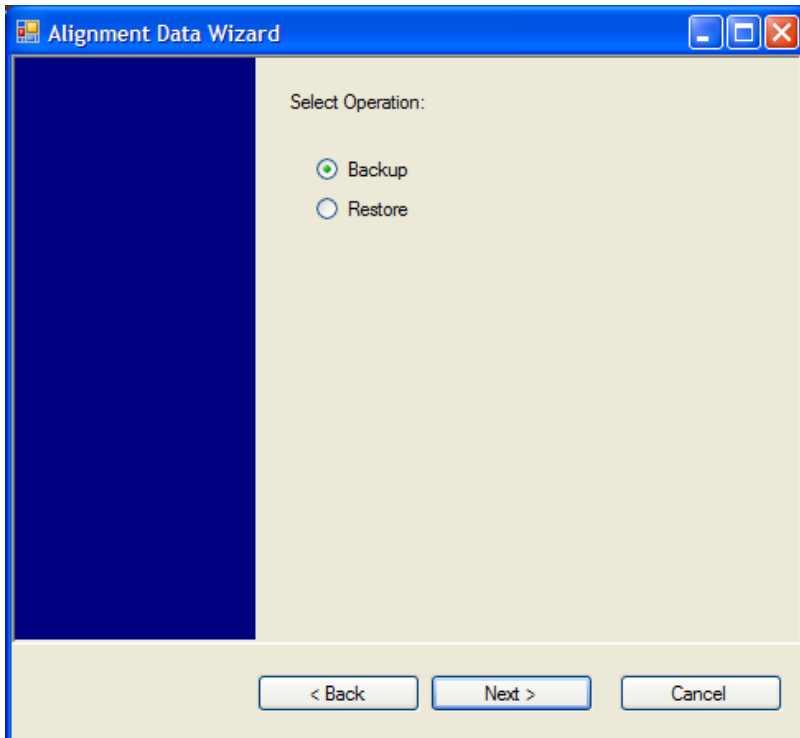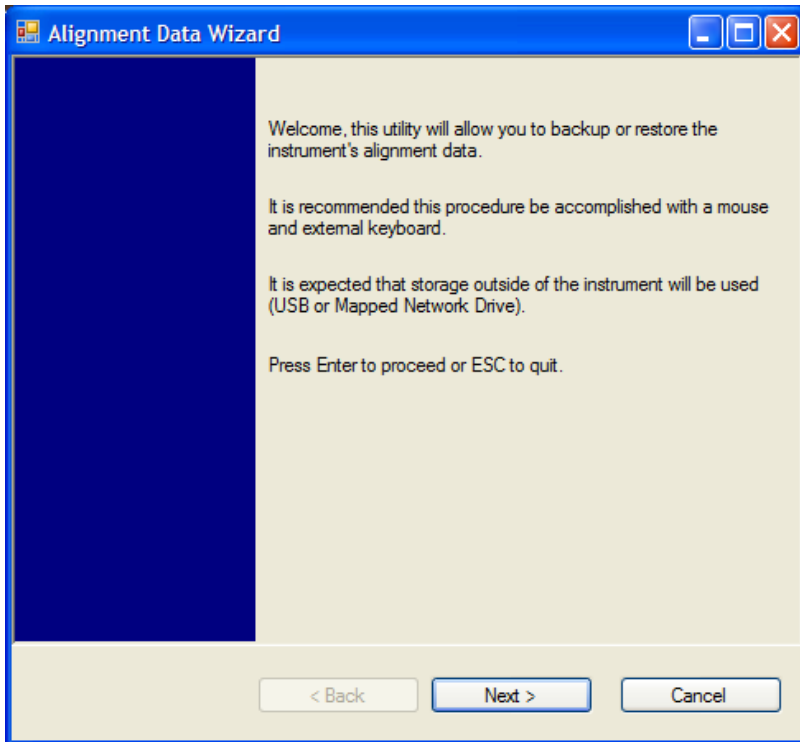
The backup screen indicates the approximate amount of space required to contain the backup file.

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

he 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.
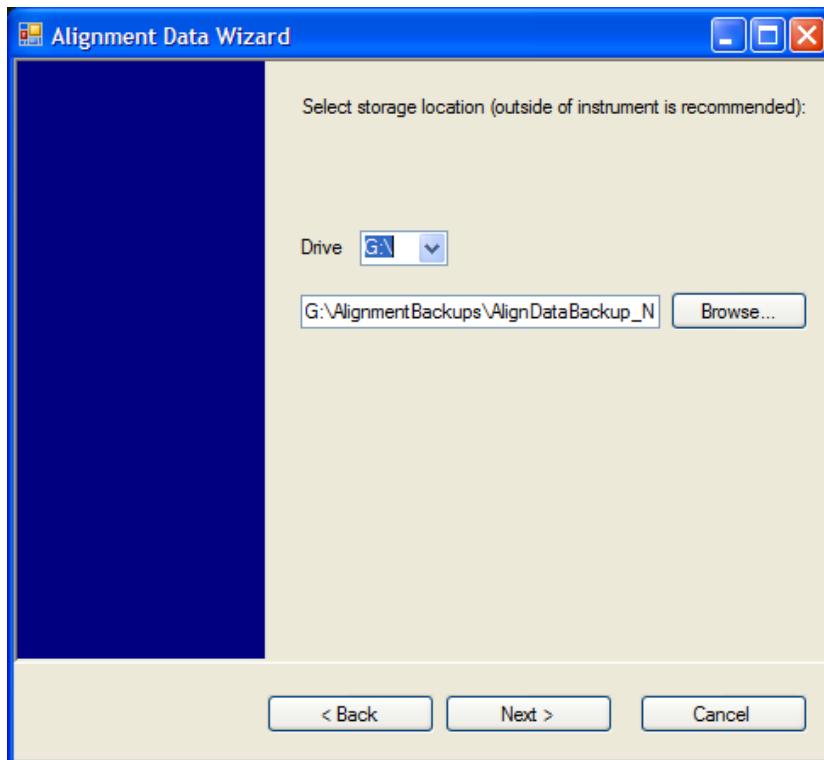
Changing the drive letter will also modify the path displayed in the box below. When this step is first loaded, the drive drop-down menu is populated with connected drives, which provide the user with write access. If there are many unreachable network drives connected to the instrument, this step can 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.
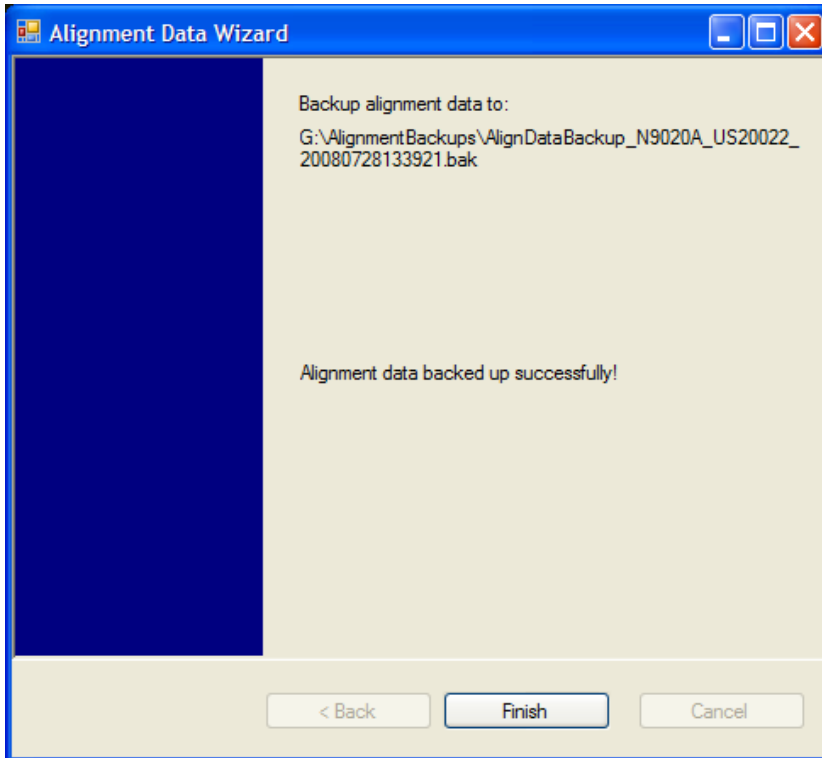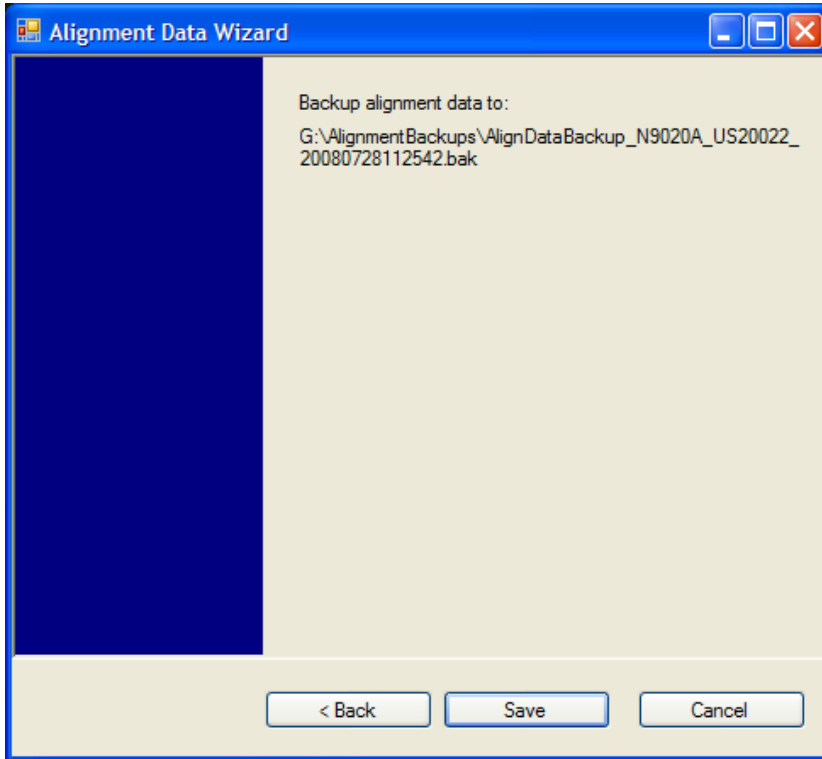
The restore operation checks the validity of the restore file using the database's built-in file validation. If the restore file is corrupt, the existing alignment data will remain in use.

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):
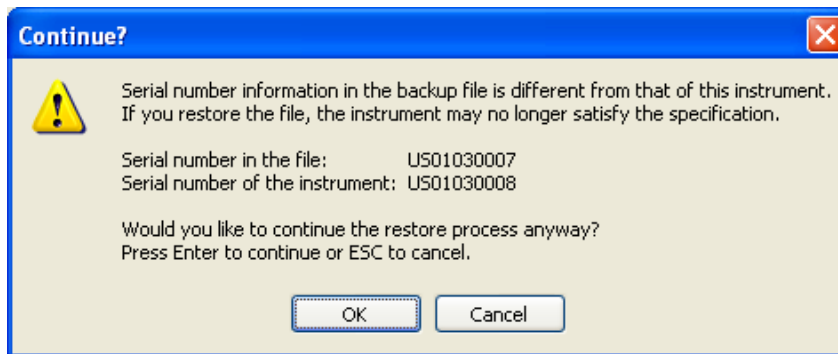
he default restore location will be first drive identified as an external drive (USB or LAN) if such is available; if not, the internal D: partition will be selected. The default restore file will be the most recent file that matches the default backup file name format: AlignDataBackup_<model number>_<serial number>_ <date>.bak
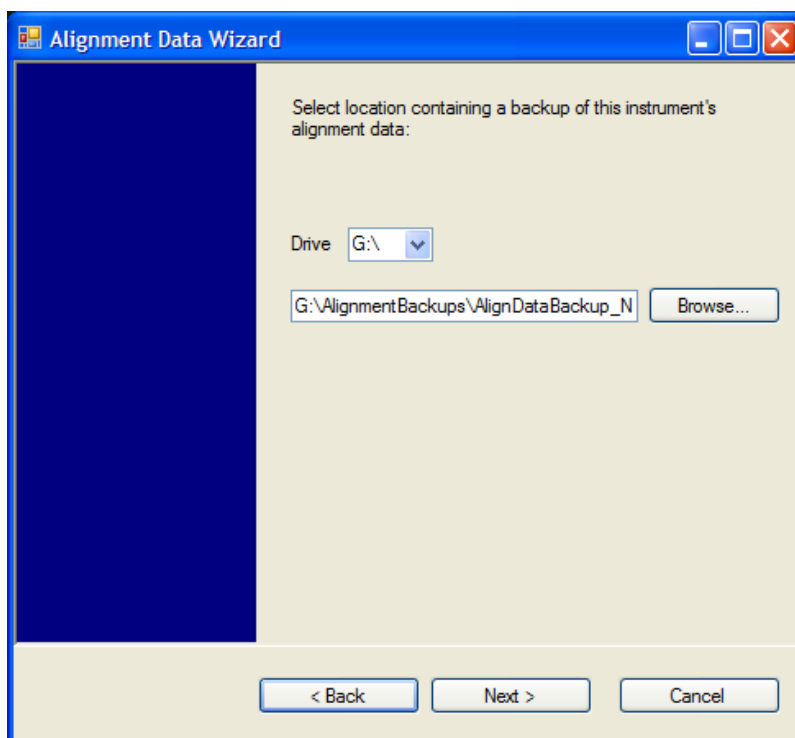
Changing the drive letter also modifies the path displayed in the box below. When this step is first loaded, the drive drop-down menu is populated with connected drives, which provide you with read access. The path defaults to the AlignBackups folder. The most recent *.bak file in the folder will also be selected by default.
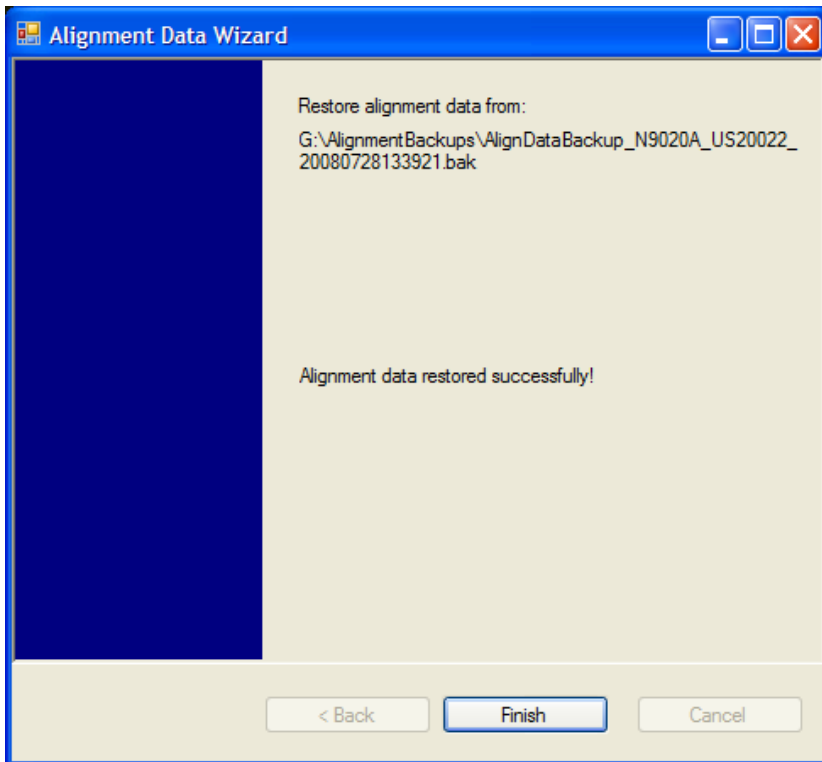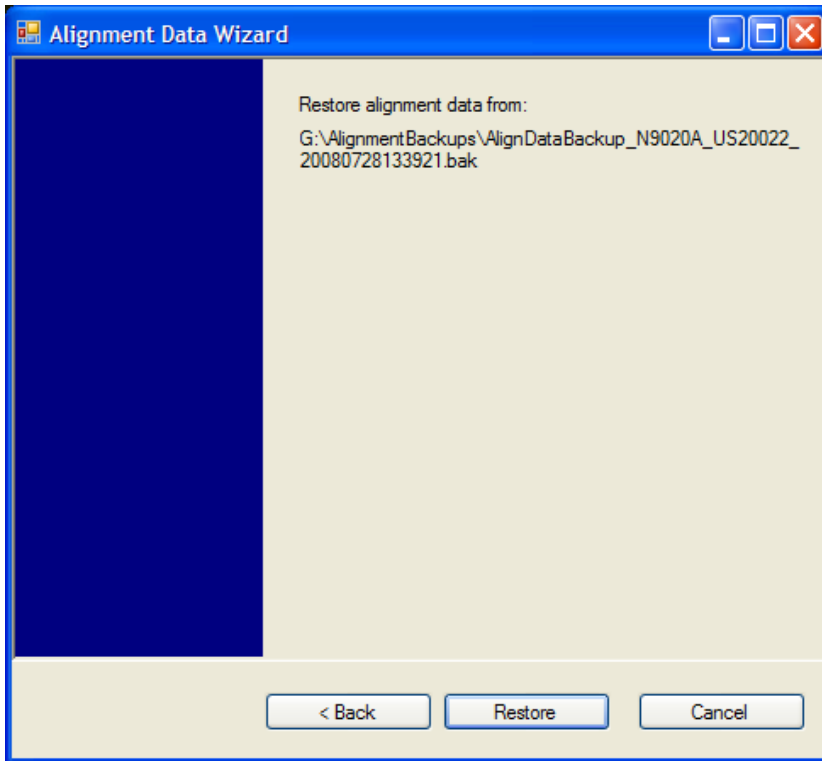
Perform Backup (Remote Command Only)

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).

Remote Command	:CALibration:DATA:BACKup <filename>
Example	:CAL:DATA:BACK "F:\AlignDataBackup_N9020A_US00000001_2008140100.bak"
Initial S/W Revision	A.02.00

Perform Restore (Remote Command Only)

Invokes an alignment data restore operation from the provided filename.

Remote Command	:CALibration:DATA:RESTore <filename>
Example	:CAL:DATA:REST "F:\ AlignDataBackup_N9020A_US00000001_2008140100.bak "
Initial S/W Revision	A.02.00

Advanced

Accesses alignment processes that are immediate action operations that perform operations that run until complete. Advanced alignments are performed on an irregular basis, or require additional operator interaction

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

Characterize Preselector

The Preselector tuning curve drifts over temperature and time. Recognize that the Amplitude, Presel Center function adjusts the preselector for accurate amplitude measurements at an individual frequency. Characterize Preselector improves the amplitude accuracy by ensuring the Preselector is approximately centered at all frequencies without the use of the Amplitude, Presel Center function. Characterize Preselector can be useful in situations where absolute amplitude accuracy is not of utmost importance, and the throughput savings or convenience of not performing a Presel Center is desired. Presel Center is required prior to any measurement for best (and warranted) amplitude accuracy.

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

Key Path	System, Alignments, Advanced
Mode	All

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

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

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

Parameter Name	Last Characterize Reference Clock
Key Path	Visual annotation in the Show Alignment Statistics screen
Parameter Type	String
Mode	All
Remote Command	`:CALibration:TIME:REFerence:CLOCk?`
Example	: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:
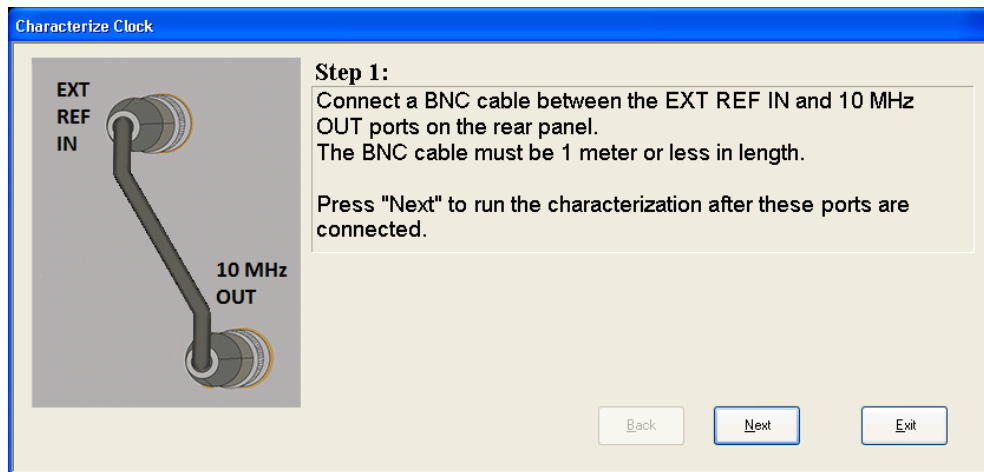
Step 2 of the guided calibration sequence:
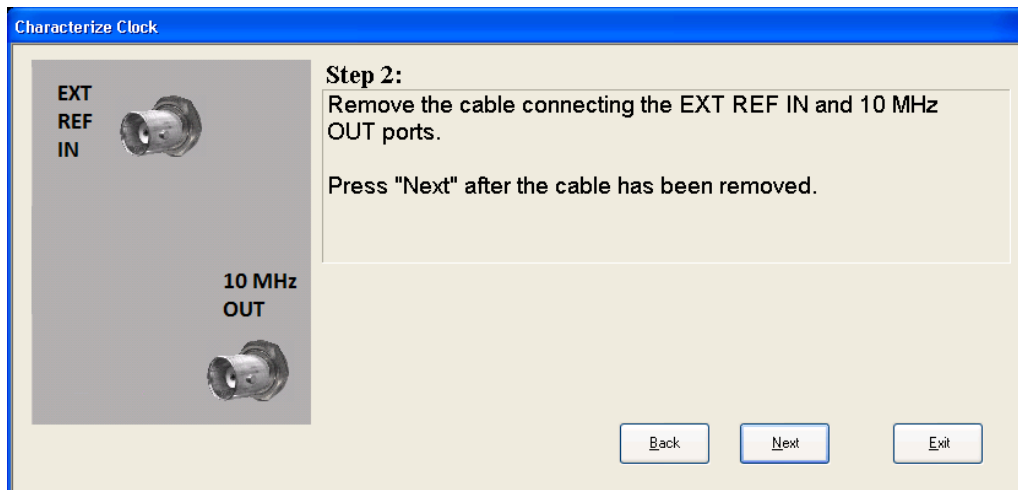
Step 3 of the guided calibration sequence:
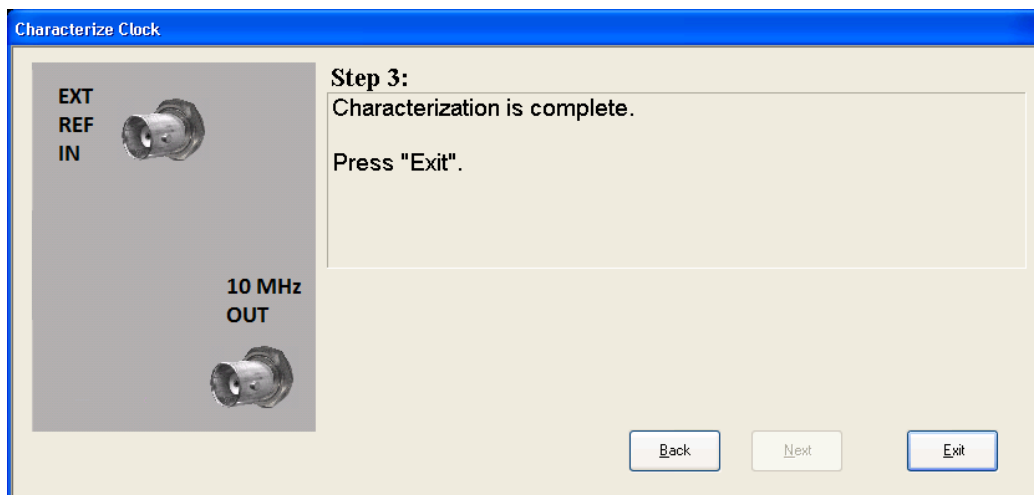
Characterize Noise Floor

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
Remote Command	`:CALibration:TEMPerature:NFLoor?`
Example	: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
Remote Command	`:CALibration:TIME:ELAPsed:NFLoor?`
Example	: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
Remote Command	:CALibration:FREQuency:REFerence:MODE CALibrated|USER
	:CALibration:FREQuency:REFerence:MODE?
Example	:CAL:FREQ:REF:MODE CAL
Notes	If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due.
	If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due.
Preset	This is unaffected by Preset but is set to CALibrated on a "Restore System Defaults->Align".
State Saved	No
Initial S/W Revision	Prior to A.02.00

Calibrated

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

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

User

Allows setting the Timebase DAC to a value other than the value established during the factory or field calibration. The value displayed on the menu key is the calibrated value.

Key Path	System, Alignments, Timebase DAC
Mode	All
Example	:CAL:FREQ:REF:MODE USER
Readback Text	xxx ‹ where xxx is the Timebase DAC setting
Initial S/W Revision	Prior to A.02.00

Key Path	System, Alignments, Timebase DAC
Mode	All
Remote Command	:CALibration:FREQuency:REFerence:FINE <integer>

	:CALibration:FREQuency:REFerence:FINE?
Example	:CAL:FREQ:REF:FINE 8191
Notes	If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due.
Couplings	Setting :CAL:FREQ:REF:FINE sets :CAL:FREQ:REF:MODE USER
Preset	This is unaffected by Preset but is set to the factory setting on a "Restore System Defaults->Align".
State Saved	No
Min	0
Max	16383
Backwards Compatibility SCPI	:CALibration:FREQuency:REFerence:COARse ESA hardware contained two DAC controls for the Timebase. In X-Series the command :CALibration:FREQuency:REFerence:FINE is the method for adjusting the timebase. The :COARse command is provided as an alias to :FINE.
Initial S/W Revision	Prior to A.02.00

Remote Command	:CALibration:FREQuency:REFerence:COARse <integer>
	:CALibration:FREQuency:REFerence:COARse?
Example	:CAL:FREQ:REF:COAR 8191
Notes	This is an alias for CAL:FREQ:REF:FINE any change to COARse is reflected in FINE and vice-versa. See CAL:FREQ:REF:FINE for description of functionality.
Couplings	Setting :CAL:FREQ:REF:COAR sets :CAL:FREQ:REF:MODE USER
Initial S/W Revision	Prior to A.02.00

I/O Config

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

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

GPIB

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

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

GPIB Address

Select the GPIB remote address.

Key Path	System, I/O Config, GPIB
Mode	All
Remote Command	`:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess <integer>`
	`:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess?`
Example	:SYST:COMM:GPIB:ADDR 17
Notes	Changing the Address on the GPIB port requires all further communication to use the new address.
Preset	This is unaffected by Preset but is set to 18 on a "Restore System Defaults->Misc"
State Saved	No
Range	0 to 30
Min	0
Max	30
Initial S/W Revision	Prior to A.02.00

GPIB Controller

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

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

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

Key Path	System, I/O Config, GPIB
Mode	All
Scope	Mode Global
Remote Command	`:SYSTem:COMMunicate:GPIB[1][:SELF]:CONTroller[:ENABle] ON | OFF | 0 | 1`
	`:SYSTem:COMMunicate:GPIB[1][:SELF]:CONTroller[:ENABle]?`
Example	:SYST:COMM:GPIB:CONT ON Will set GPIB port to Controller
Notes	When the instrument becomes the Controller bit 0 in the Standard Event Status Register is set (and when the instrument relinquishes Controller capability bit 0 is cleared in the Standard Event Status Register).
Preset	This is unaffected by Preset but is set to OFF on a "Restore System Defaults->Misc"

State Saved	No
Range	Disabled|Enabled
Initial S/W Revision	A.02.00

Disabled

Disables the GPIB Controller capability, this is the default (or normal) setting.

Key Path	System, I/O Config, GPIB, GPIB Controller	
Example	:SYST:COMM:GPIB:CONT OFF	Will set GPIB port to Device
Initial S/W Revision	A.02.00	

Enabled

Enables the GPIB Controller capability.

Key Path	System, I/O Config, GPIB, GPIB Controller	
Example	:SYST:COMM:GPIB:CONT ON	Will set GPIB port to Controller
Initial S/W Revision	A.02.00	

SCPI LAN

Activates a menu for identifying and changing the SCPI over a LAN configuration. There are a number of different ways to send SCPI remote commands to the instrument over LAN. It can be a problem to have multiple users simultaneously accessing the instrument over the LAN. These keys limit that somewhat by disabling the telnet, socket, and/or SICL capability.

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

SCPI Telnet

Turns the SCPI LAN telnet capability On or Off allowing you to limit SCPI access over LAN through telnet.

Key Path	System, I/O Config, SCPI LAN
Mode	All
Remote Command	:SYSTem:COMMunicate:LAN:SCPI:TELNet:ENABle OFF|ON|0|1
	:SYSTem:COMMunicate:LAN:SCPI:TELNet:ENABle?
Example	:SYST:COMM:LAN:SCPI:TELN:ENAB OFF
Preset	This is unaffected by Preset but is set to ON with a "Restore System Defaults->Misc"

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

SCPI Socket

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

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

SICL Server

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

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

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

Remote Command	`:SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle OFF|ON|0|1`
	`:SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle?`
Example	:SYST:COMM:LAN:SCPI:SICL:ENAB OFF
Preset	This is unaffected by Preset, but is set to ON with a "Restore System Defaults->Misc"
State Saved	No
Range	On	Off
Initial S/W Revision	Prior to A.02.00

HiSLIP Server

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

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

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

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

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

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

SCPI Socket Control Port (Remote Command Only)

Returns the TCP/IP port number of the control socket associated with the SCPI socket session. This query enables you to obtain the unique port number to open when a device clear is to be sent to the instrument. Every time a connection is made to the SCPI socket, the instrument creates a peer control socket. The port number for this socket is random. 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:
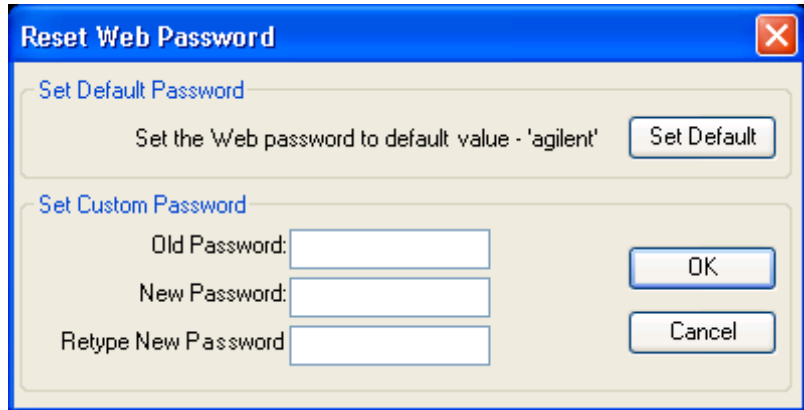
If this control is entered without an external keyboard or mouse connected, you can cancel the control by pressing the Cancel (ESC) front-panel key.

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

Device Identification (Remote Command Only)

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

Mode	All
Remote Command	`:LXI:IDENtify[:STATe] OFF|ON|0|1`
	`:LXI:IDENtify[:STATe]?`
Example	`:LXI:IDEN ON`
Preset	Not part of Preset, but reset to OFF on Restore System Defaults All
State Saved	No
Range	On	Off
Initial S/W Revision	A.12.50

System IDN Response

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

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

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

Key Path	System, I/O Config
Mode	All
Remote Command	`:SYSTem:IDN <string>`
	`:SYSTem:IDN?`
Notes	• This affects the response given in all Modes of the Analyzer, unless the current Mode has also specified a custom response, in which case the current Mode's custom IDN response takes precedence over the System's, but only while that Mode is the current Mode..

	• It survives shutdown and restart of the software and therefore survives a power cycle
	• Null string as parameter restores the Factory setting
Preset	This is unaffected by Preset but is set to the original factory setting on a "Restore System Defaults->Misc"
State Saved	No
Initial S/W Revision	A.06.00

Factory

This key selects the factory setting, for example:

"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
Example	:SYST:IDN "XYZ Corp, Model 12, 012345, A.01.01" user specified response
Initial S/W Revision	A.06.00

Query USB Connection (Remote Command Only)

Enables you to determine the speed of the USB connection.

Mode	All
Remote Command	:SYSTem:COMMunicate:USB:CONNection?
Example	:SYST:COMM:USB:CONN?
Notes	NONE – Indicates no USB connection has been made.

LSPeed – Indicates a USB low speed connection (1.5 Mbps).

This is reserved for future use, the T+M488 protocol is not supported on low speed connections.

HSPeed – Indicates that a USB high speed connection (480 Mbps) has been negotiated.

FSPeed – Indicates that a USB full speed connection (12 Mbps) has been negotiated.

State Saved	No
Range	NONE|LSPeed|HSPeed|FSPeed
Initial S/W Revision	Prior to A.02.00

USB Connection Status (Remote Command Only)

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

Mode	All
Remote Command	:SYSTem:COMMunicate:USB:STATus?
Example	:SYST:COMM:USB:STAT?
Notes	SUSPended – Indicates that the USB bus is currently in its suspended state. The bus is in the suspended state when:
	• The bus is not connected to any controller
	• The controller is currently powered off
	• The controller has explicitly placed the USB device into the suspended state.
	When in the suspended state, no USB 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
Remote Command	:SYSTem:COMMunicate:USB:PACKets?
Example	:SYST:COMM:USB:PACK?
Notes	Two integers are returned. The first is the number of packets received since application invocation, the second is the number of packets transmitted since application invocation. If no packets have been received or transmitted the response is 0,0.
	The packet count is initialized to 0,0 when the instrument application is started.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Restore Defaults

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

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

Restore Input/Output Defaults

Causes the group of settings and data associated with Input/Output front-panel key to be a reset to their default values. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch. .

Confirmation is required to restore the Input/Output setting. The confirmation dialog is:
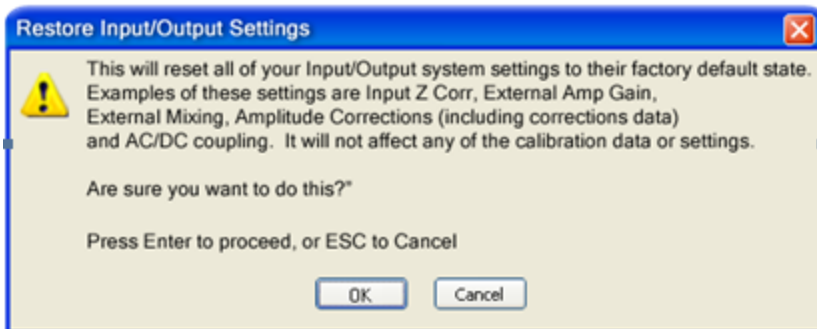
Key Path	System, Restore System Defaults
Example	:SYST:DEF INP
Initial S/W Revision	Prior to A.02.00

Restore Power On Defaults

This selection causes the Power On settings to be a reset to their default value. This level of Restore System Defaults does not affect any other system settings, mode settings and does not cause a mode switch. The Power On settings and their default values are Power On Type reset to Mode and Input/Output Defaults and Power On Application reset to whatever the factory set as its default value.

Confirmation is required to restore the factory default values. The confirmation dialog is:
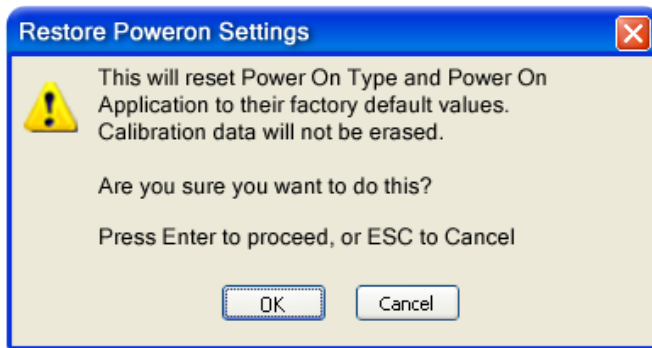
Key Path	System, Restore System Defaults
Example	:SYST:DEF PON
Initial S/W Revision	Prior to A.02.00

Restore Align Defaults

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

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

Confirmation is required to restore the factory default values. The confirmation dialog is:
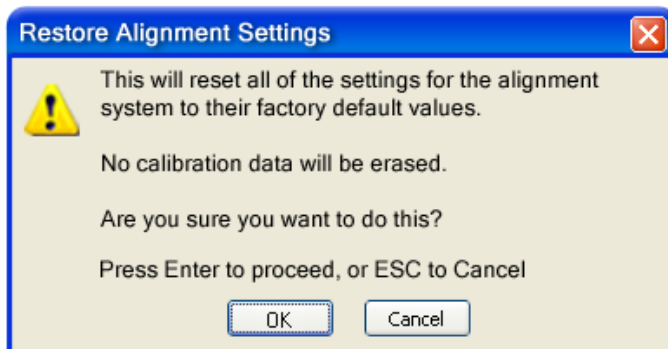
Key Path	System, Restore System Defaults
Example	:SYST:DEF ALIG
Initial S/W Revision	Prior to A.02.00

Restore Misc Defaults

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

Miscellaneous Setting	Default Value
Verbose SCPI	Off
The SYST:PRES:TYPE	MODE
Auto File Name Number	000
Save Type	State
State Save To	Register 1
Screen Save To	SCREEN000.png
DISP:ENABle	ON
Full Screen	Off
SCPI Telnet	ON
SCPI Socket	ON
SICL Server	ON
Softkey Language	English
System Annotation	ON
Display Theme	TDColor
System IDN Response	Factory result of *IDN?
Display Intensity	100
Display Backlight	ON
GPIB Address	18

Confirmation is required to restore the factory default values. The confirmation dialog is:
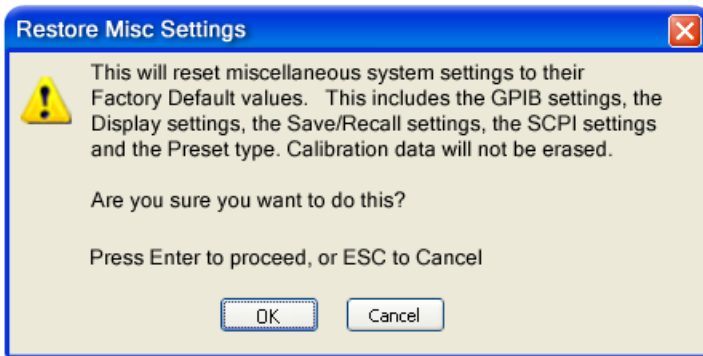
Key Path	System, Restore System Defaults
Example	:SYST:DEF MISC
Initial S/W Revision	Prior to A.02.00

Restore Mode Defaults (All Modes)

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

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

Key Path	System, Restore System Defaults
Example	:SYST:DEF MOD
Couplings	An All Mode will cause the currently running measurement to be aborted, mode switch to the power-on mode and activate the default measurement for the power-on mode.. It gets the mode to a consistent state with all of the default couplings set.
Initial S/W Revision	Prior to A.02.00

All

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

Confirmation is required to restore the factory default values. The confirmation dialog is:
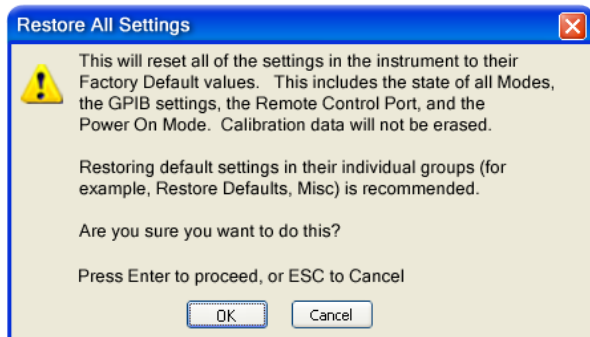
| NOTE | If you are using an Agilent USB External Mixer, then you will need to perform a Refresh USB Mixer Connection after Restoring All Defaults. |

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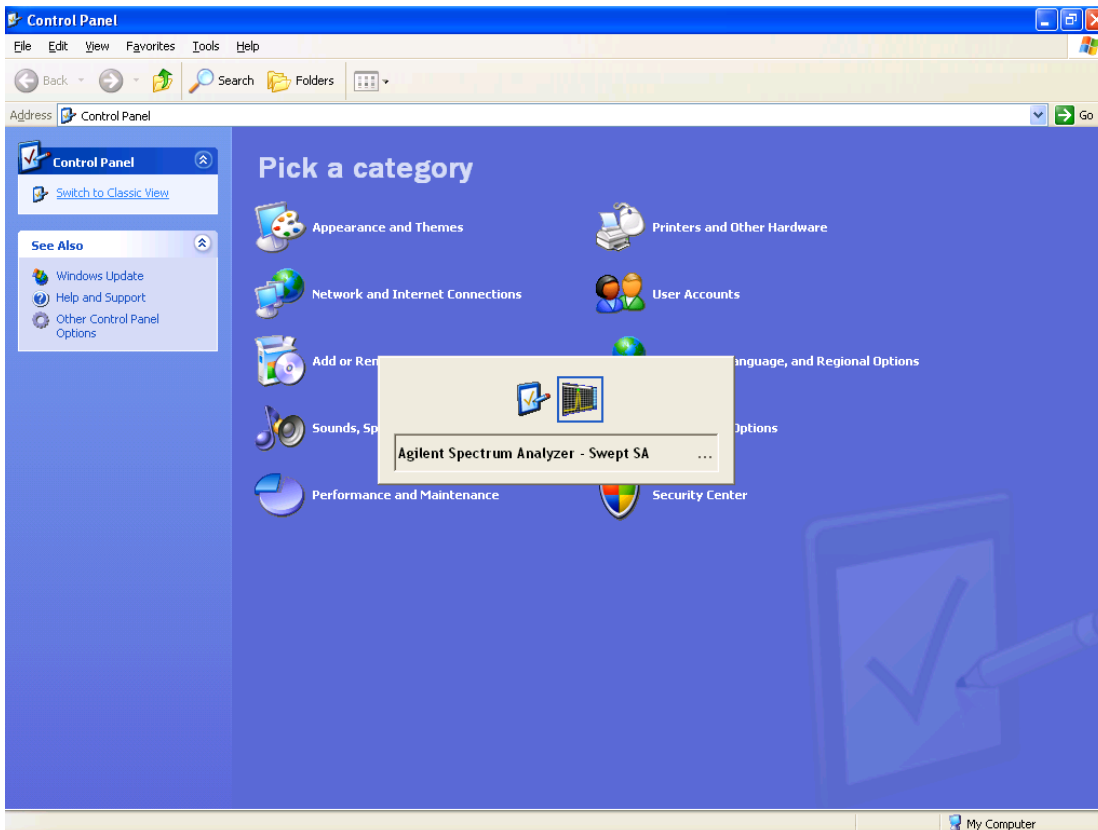
Or use Alt-Tab: press and hold the Alt [Menu (Alt)] key and press and release the Tab key until the Analyzer logo is showing in the window in the center of the screen, as above, then release the Alt key.

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

Remote Command	`:SYSTem:LKEY <"OptionInfo">, <"LicenseInfo">`
Example	SYST:LKEY "N9073A–1FP", "027253AD27F83CDA5673A9BA5F427FDA5E4F25AEB1017638211AC9F60D9C639FE539735909C551DE0A91"
Notes	The <"OptionInfo"> contains the feature and the version. You must specify the feature but can omit the version. If you omit the version, the system regards it as the latest one, since the system knows which version is supported for each feature.
	The <"LicenseInfo"> contains the signature, the expiration date, and serial number for transport if transportable. You must specify the signature, but you can omit the other information. If you omit the expiration date, the system regards it as permanent. If you omit the serial number, the system regards it as non-transportable. As a result, this supports reverse compatibility.
Initial S/W Revision	Prior to A.02.00

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

Remote Command	`:SYSTem:LKEY:LIST?`
Notes	
	Return Value:
	An <arbitrary block data> of all the installed instrument licenses.
	The format of each license is as follows.
	<Feature>,<Version>,<Signature>,<Expiration Date>,<Serial Number for Transport>
	Return Value Example:
	#3136
	N9073A–1FP,1.000,B043920A51CA
	N9060A–2FP,1.000,4D1D1164BE64

	N9020A–508,1.000,389BC042F920
	N9073A–1F1,1.000,5D71E9BA814C,13-aug–2005
	<arbitrary block data> is:
	#NMMM<data>
	Where:
	N is the number of digits that describes the number of MMM characters. For example if the data was 55 bytes, N would be 2.
	MMM would be the ASCII representation of the number of bytes. In the previous example, N would be 55.
	<data> ASCII contents of the data
Initial S/W Revision	Prior to A.02.00

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

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

Security

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

Key Path	System
Initial S/W Revision	A.04.00

USB

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

is a convenient way for the customer to disable write access to USB.

Key Path	System, Security
Mode	All
Scope	Mode Global
Remote Command	`:SYSTem:SECurity:USB:WPRotect[:ENABle] ON|OFF|0|1`
	`:SYSTem:SECurity:USB:WPRotect[:ENABle]?`
Example	`:SYST:SEC:USB:WPR ON` Will set USB ports to Read-only
Notes	When the USB ports are in Read-only mode then no data can be stored to USB, including the internal USB memory used for a back-up location for the calibration data.
Dependencies	This key is grayed-out unless the current user has administrator privileges.
Preset	This is unaffected by Preset or any Restore System Defaults. 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
Example	`:SYST:SEC:USB:WPR OFF` Will set USB ports to Read-Write
Initial S/W Revision	A.04.00

Read only

Selection for disabling write access to the USB ports.

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

Diagnostics

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

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

Show Hardware Statistics

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

- Mechanical relay cycles

- High and Low temperature extremes

- Elapsed time that the instrument has been powered-on (odometer)

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

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

Component Name	Value	
MechAtten #1 Count Total	457304	
Calibrator Switch Cycles	105953	
AC/DC Switch Cycles	114240	**In some CXA models this field is called "Fixed Aten"**
2 dB #1 Mechanical Atten Cycles	112655	
2 dB #2 Mechanical Atten Cycles	124456	
MechAtten #2 Count Total	472265	**Some CXA models omit these fields**
6 dB Mechanical Atten Cycles	115302	
10 dB Mechanical Atten Cycles	93602	
20 dB Mechanical Atten Cycles	144781	
30 dB Mechanical Atten Cycles	118580	
Low Noise Path Switch **Only shown if LNP installed**	45668	
Preselector Bypass Cycles **Only shown if MPB installed**	31133	
High temperature operating extreme	45.75	
Low temperature operating extreme	-23.9375	
Elapsed Time (On-Time)(hours)	134164	

The CXA models in which the AC/DC Switch field is called Fixed Atten and 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 queriedvia SCPI.

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>.

Remote Command	`:SYSTem:MRELay:COUNt?`
Example	`:SYST:MREL:COUN?`
Notes	Query Only
	The return value is a comma separated list of the individual counts for each mechanical relay.
	The position of the relays in the list is:
	"<Cal Signal>,<AC/DC>,<2dB #1 Atten>,<2dB #2 Atten>,<6dB Atten>,<10dB Atten>,<20dB Atten>,<30dB Atten>,<Fixed Atten>,<Low Noise Path Switch>,<Presel Bypass>,<N9038A Input2>, <N9038A Bypass>"
	Items in the list not pertaining to your particular hardware configuration will return as –999 for those items.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	A.08.00

Query the Operating Temperature Extremes

Returns the low operating temperature extreme value. The value survives a power-cycle and is the temperature extreme encountered since the value was reset by the factory or service center.

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

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

Query the Elapsed Time since 1st power on

Returns the elapsed on-time in minutes since 1st power-on.

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

Internet Explorer...

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

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

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

System Remote Commands (Remote Commands Only)

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

Initial S/W Revision	Prior to A.02.00

System Powerdown (Remote Command Only)

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

List installed Options (Remote Command Only)

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

Mode	All
Remote Command	`:SYSTem:OPTions?`
Example	`:SYST:OPT?`
Notes	The return string is a comma separated list of the installed options. For example: "503,P03,PFR" :SYSTem:OPTions? and *OPT? are the same.
State Saved	No
Initial S/W Revision	Prior to A.02.00

Lock the Front-panel keys (Remote Command Only)

Disables the instrument keyboard to prevent local input when the instrument is controlled remotely. Annunciation showing a "K" for 'Klock' (keyboard lock) alerts the local user that the keyboard is locked. Klock is similar to the GPIB Local Lockout function; namely that no front-panel keys are active with the exception of the Power Standby key. (The instrument is allowed to be turned-off if Klock is ON.) The Klock command is used in remote control situations where Local Lockout cannot be used.

Although primary intent of Klock is to lock-out the front panel, it will lock-out externally connected keyboards through USB. Klock has no effect on externally connected pointing devices (mice).

The front panel 'Local' key (Cancel/Esc) has no effect if Klock is ON.

Mode	All
Remote Command	`:SYSTem:KLOCk OFF|ON|0|1` `:SYSTem:KLOCk?`

Example	:SYST:KLOC ON
Notes	Keyboard lock remains in effect until turned-off or the instrument is power-cycled
Preset	Initialized to OFF at startup, unaffected by Preset
State Saved	No
Initial S/W Revision	Prior to A.02.00

List SCPI Commands (Remote Command Only)

Outputs a list of the valid SCPI commands for the currently selected Mode.

Remote Command	:SYSTem:HELP:HEADers?
Example	:SYST:HELP:HEAD?
Notes	The output is an IEEE Block format with each command separated with the New-Line character (hex 0x0A)
Initial S/W Revision	Prior to A.02.00

SCPI Version Query (Remote Command Only)

Returns the SCPI version number with which the instrument complies. The SCPI industry standard changes regularly. This command indicates the version used when the instrument SCPI commands were defined.

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

Date (Remote Command Only)

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

Sets or queries the date in the instrument.

Mode	All
Remote Command	:SYSTem:DATE "<year>,<month>,<day>"
	:SYSTem:DATE?
Example	:SYST:DATE "2006,05,26"
Notes	<year> is the four digit representation of year. (for example, 2006)
	<month> is the two digit representation of year. (for example. 01 to 12)
	<day> is the two digit representation of day. (for example, 01 to 28, 29, 30, or 31) depending on the

	month and year
	Unless the current account has Power User or 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
Remote Command	:SYSTem:TIME "<hour>,<minute>,<second>"
	:SYSTem:TIME?
Example	:SYST:TIME "13,05,26"
Notes	<hour> is the two digit representation of the hour in 24 hour format
	<minute> is the two digit representation of minute
	<second> is the two digit representation of second
	Unless the current account has Power User or 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

7 Trigger Functions

Trigger

No trigger functionality is supported in the Noise Figure measurement. Pressing this hardkey will display a blank Trigger menu.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

8 Noise Figure Measurement

The Noise Figure measurement makes a number of individual noise figure measurements over the range of frequencies specified by the frequency parameters. After each frequency point has been measured, the results are displayed on screen. See **Measurement Results** for more information.

Remote Commands:**The following commands are used to retrieve the measurement results:**

`:CONF:NFIGure`

`:INITiate:NFIGure`

`:FETCh:NFIGure?`

`:MEASure:NFIGure?`

`:READ:NFIGure?`

For more measurement related commands, see, "Remote Measurement Functions" on page 477.

Key Path	Meas
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

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Measurement Results

There are many types of measurement results.

Result Types
There are 6 result types supported by the Noise Figure measurement:
Noise Figure –Of an active device, over the bandwidth of interest, the contribution by the device itself to thermal noise at the device output. The noise figure is usually expressed in decibels (dB), and is with respect to thermal noise power at the system impedence, at a standard noise temperature (usually 290 K) over the bandwidth of interest. It is determined by (a) measuring (determining) the ratio, usually expressed in dB, of the thermal noise power at the output, to that at the input, and (b) subtracting from that result, the gain, in dB, of the system. Typical noise figures range from 0.5 dB for very low noise devices, to 4 to 8 dB. In some systems (for example: heterodyne systems) total output noise power includes noise from other than thermal sources, such as spurious contributions from image-frequency transformation, but noise from these sources is not considered in determining the noise figure. In this example, the noise figure is determined only with respect to that noise that appears in the output via the principal frequency transformation of the system, and excludes noise that appears via the image frequency transformation.
noise factor

Noise Factor - Noise Figure expressed using Linear units rather than dB.

Gain – The amplification factor, also called gain, is the extent to which an analog amplifier boosts the strength of a signal. Amplification factors are usually expressed in terms of power.

The decibel (dB), a logarithmic unit, is the most common way of quantifying the gain of an amplifier. For power, doubling the signal strength (an output-to-input power ratio of 2:1) translates into a gain of 3 dB; a tenfold increase in power (output-to-input ratio of 10:1) equals a gain of 10 dB; a hundredfold increase in power (output-to-input ratio of 100:1) represents 20 dB gain. If the output power is less than the input power, the amplification factor in decibels is negative. If the output-to-input signal power ratio is 1:1, then the amplification factor is 0 dB.

Power amplifiers typically have gain figures from a few decibels up to about 20 dB. Sensitive amplifiers used in wireless communications equipment can show gain of up to about 30 dB. If higher gain is needed, amplifiers can be cascaded, that is, hooked up one after another. But there is a limit to the amplification that can be attained this way. When amplifiers are cascaded, the later circuits receive noise at their inputs along with the signals. This noise can cause distortion. Also, if the amplification factor is too high, the slightest feedback can trigger oscillation, rendering an amplifier system inoperative.

Y-Factor – Y-factor is a ratio of two noise power levels, one measured with the noise source ON, and the other with the noise source OFF (for example: Y=NON/NOFF). Because noise power is proportional to noise

temperature, it can be stated that Y=TON/TOFF. The Y-factor measurement is the most common method of measuring the quantities required to calculate the noise figure and gain results.

Effective Temperature – All types of random noise can be expressed as the equivalent amount of thermal noise that would be generated at a physical temperature Te. Generally the word effective (or equivalent) is taken as understood, and the normal term is simply 'noise temperature'.

Hot/Cold Power Density – The level of the noise floor observed on a spectrum analyzer depends, in part, on the selected bandwidth of the measurement. The wider the bandwidth, the more noise is measured for each data point. If the instrument can display noise density, it simply normalizes the power measurements to a 1 Hz bandwidth and references it to kTB –173.88 dBm/Hz; the displayed function is equivalent to power spectral density referenced to kTB. For example: 15 dB would mean the power spectral density = –158.88 dBm/Hz.

Hot Power Density simply refers to the power density measured when the noise source is turned on, and Cold Power Density is the same thing but with the noise source turned off.

The calculation of these results is described in detail in the Agilent Application Note 57–2, literature number 5952–3706E.

Initiate (remote command only)

Sets the active measurement to the Noise Figure measurement when in Noise Figure mode.

Remote Command	`:INITiate:NFIGure`
Backwards Compatibility SCPI	`:INITiate[:NFIGure]`
Initial S/W Revision	Prior to A.04.00

Read/Meas/Fetch All (remote command only)

Returns 13 comma separated results of the last point from the last swept measurement, in the following order:

T cold Scalar Value

Corrected scalar results for:

Noise Figure

Noise Factor

Gain

Effective Temperature

Hot Power Density

Cold Power Density

Uncorrected scalar results for:

Noise Figure

Noise Factor

Y-Factor

Effective Temperature

Hot Power Density

Cold Power Density

Remote Command	`:FETCh|MEASure|READ:NFIGure?`
Backwards Compatibility SCPI	`:FETCh|MEASure|READ[:NFIGure]?`
Initial S/W Revision	Prior to A.04.00

T Cold

The most recently used T Cold value for a swept or fixed measurement can be accessed using the following commands.

This topic contains the following sections:

Array (remote command only)

Returns an array of the most recently used T Cold values from the last swept measurement. One value is returned for each frequency point measured.

Remote Command	`:FETCh|MEASure|READ:NFIGure[:ARRay][:DATA]:TCOLd?`
Backwards Compatibility SCPI	`:FETCh|MEASure|READ[:NFIGure][:ARRay][:DATA]:TCOLd?`
Initial S/W Revision	Prior to A.04.00

Scalar (remote command only)

Returns the most recently used T Cold value from the last fixed measurement.

Remote Command	`:FETCh|MEASure|READ:NFIGure:SCALar[:DATA]:TCOLd?`
Backwards Compatibility SCPI	`:FETCh|MEASure|READ[:NFIGure]:SCALar[:DATA]:TCOLd?`
Initial S/W Revision	Prior to A.04.00

Corrected Results

Invalid or incalculable results will be represented using the numerical 'SCPI Not-a-number' value. See Measurement Results for detailed descriptions.

See also:

Array (remote command only)

Returns an array of the most recently completed data from the last swept measurement, taking account of correction data. One value is returned for each frequency point measured.

Remote Command	`:FETCh|MEASure|READ:NFIGure[:ARRay][:DATA]:CORRected:NFIGure	NFACtor	GAIN	TEFFective	PHOT	PCOLd?`
Backwards Compatibility SCPI	`:FETCh|MEASure|READ[:NFIGure][:ARRay][:DATA]:CORRected:NFIGure	NFACtor	GAIN	TEFFective	PHOT	PCOLd?`
Initial S/W Revision	Prior to A.04.00

Scalar (remote command only)

Returns the most recently completed data from the last fixed measurement, taking account of correction data.

Remote Command	`:FETCh|MEASure|READ:NFIGure:SCALar[:DATA]:CORRected:NFIGure	NFACtor	GAIN	TEFFective	PHOT	PCOLd?`
Backwards Compatibility SCPI	`:FETCh|MEASure|READ[:NFIGure]:SCALar[:DATA]:CORRected:NFIGure	NFACtor	GAIN	TEFFective	PHOT	PCOLd?`
Initial S/W Revision	Prior to A.04.00

Uncorrected Results

Invalid or incalculable results will be represented using the numerical 'SCPI Not-a-number' value. See "Result Types" on page 426 for detailed descriptions.

See also:

Array (remote command only)

Returns an array of the most recently completed data from the last swept measurement. One value is returned for each frequency point measured.

Remote Command	`:FETCh|MEASure|READ:NFIGure[:ARRay][:DATA]:UNCorrected:NFIGure	NFACtor	YFACtor	TEFFective	PHOT	PCOLd?`
Backwards Compatibility SCPI	`:FETCh|MEASure|READ[:NFIGure][:ARRay][:DATA]:UNCorrected:NFIGure	NFACtor	YFACtor	TEFFective	PHOT	PCOLd?`
Initial S/W Revision	Prior to A.04.00

Scalar (remote command only)

Returns the most recently completed data from the last fixed measurement.

Remote Command	`:FETCh|MEASure|READ:NFIGure:SCALar[:DATA]:UNCorrected:NFIGure	NFACtor	YFACtor	TEFFective	PHOT	PCOLd?`
Backwards Compatibility SCPI	`:FETCh|MEASure|READ[:NFIGure]:SCALar[:DATA]:UNCorrected:NFIGure	NFACtor	YFACtor	TEFFective	PHOT	PCOLd?`
Initial S/W Revision	Prior to A.04.00

Remote Results For Meter View with N9069A/W9069A-AFP

We will get a minimum Noise Figure remote result and Noise Figure Array remote results:

Minimum Noise Figure – the current measured minimum Noise Figure value within 61 results in fixed freq mode, expressed in decibels (dB), this value only available in Fixed Freq Mode.

Noise Figure Array– the current measured 61 Noise Figure Values in fixed freq mode, expressed in decibels (dB), this array results only available in Fixed Freq Mode.

Minimum Noise Figure

Return the current measured minimum noise figure within 61 results in fixed freq mode

Remote Command	`:FETCh|READ[:NFIGure]:METer:MINimum?`
Couplings	If not in Fixed Freq Mode, this value will return NaN
Initial S/W Revision	A.10.01

Noise Figure Array

Return the measured 61 noise figure results in fixed freq mode

Remote Command	`:FETCh|READ[:NFIGure]:METer?`
Couplings	If not in Fixed Freq Mode, all return values will be NaN
Initial S/W Revision	A.10.01

AMPTD Y Scale (Amplitude/Y Scale)

Accesses a menu of functions that enable you to set the vertical scale parameters. These functions control how data on the vertical (Y) axis is displayed and control instrument settings that affect the vertical axis

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Select Trace

Selects the trace, 1 or 2, which the settings in the amplitude menu apply to. The values and units of the Ref Level, Scale/Div and Ref Position will be loaded according to which result type is currently displayed on the selected trace.

In Split Graph mode, this also toggles the next window function.

NOTE	Data1 is always shown on trace 1 and Data2 is always shown on trace 2.

Key Path	AMPTD Y Scale
Mode	NFIGURE
Preset	A
State Saved	Saved in instrument state.
Range	1|2
Initial S/W Revision	Prior to A.04.00

Ref Value

Sets the reference value to be used in the graph window specified by <result>. If the graph window is not currently visible (you need to be using the SCPI command), the new reference value will take effect next time the window is displayed. Values entered via SCPI here are in the default units only. The front panel allows you to enter log or linear units but converts these to the default unit for each result type. In the case of T effective you can only enter values of K or Kelvin.

Result	Noise Figure / Noise Factor	Gain	Y-Factor	T Effective	P hot	P cold
Default:	4.00 dB / 2.51189	15.00 dB	5.00 dB	1000.0 K	5.00 dB	5.00 dB
Range (Min):	–100.0 dB / 0	–100.0 dB	–100.0 dB	–100000000K	–100.0 dB	–100.0 dB
Range (Max):	100.0 dB / 1E9	100.0 dB	100.0 dB	100000000K	100.0 dB	100.0 dB
Step:	0.1 dB / 1, 1.5, 2, 3, 5,	0.1 dB	0.1 dB	1, 1.5, 2, 3, 5, 7.5, 10	0.1 dB	0.1 dB

	7.5, 10					
RPG:	0.01 dB / 1, 1.5, 2, 3, 5, 7.5, 10	0.01 dB	0.01 dB	1, 1.5, 2, 3, 5, 7.5, 10 ….	0.01 dB	0.01 dB
Resolution:	0.001 dB	0.001 dB	0.001 dB	2 decimal	0.001 dB	0.001 dB

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y[:SCALe]:RLEVel <value>`
	`:DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y[:SCALe]:RLEVel?`
Example	`:DISP:NFIG:TRAC:NFIG:Y:RLEV 10dB`
Preset	Depending on Type of Result
State Saved	Saved in instrument state.
Range	Depending on Type of Result
Min	Depending on Type of Result
Max	Depending on Type of Result
Initial S/W Revision	Prior to A.04.00

Mode	NFIGURE
Remote Command	`:DISPlay[:NFIGure]:TRACe:Y[:SCALe]:RLEVel:VALue NFACtor	GAIN	YFACtor	TEFFective	PHOT	PCOLd,<float>`
	`:DISPlay[:NFIGure]:TRACe:Y[:SCALe]:RLEVel:VALue? NFACtor	GAIN	YFACtor	TEFFective	PHOT	PCOLd`
Example	`:DISP:NFIG:TRAC:Y:RLEV:VAL? NFIG`
Initial S/W Revision	Prior to A.04.00

Ref Value (Noise Figure Result)

See for more information.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RLEVel <value>`
	`:DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RLEVel?`
Example	`:DISP:NFIG:TRAC:NFIG:Y:RLEV?`
Preset	4.0 dB

State Saved	Saved in instrument state.
Range	–100 dB to 100 dB
Min	–100 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00
Coupling	Noise Figure needs to be selected as one of the displayed results.

Ref Value (Noise Factor Result)

See "Ref Value" on page 432 for more information.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RLEVel <value>`
	`:DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RLEVel?`
Example	:DISP:NFIG:TRAC:NFAC:Y:RLEV?
Preset	2.5
State Saved	Saved in instrument state.
Range	0 to 1E9
Min	0
Max	1E9
Initial S/W Revision	Prior to A.04.00
Coupling	Noise Factor needs to be selected as one of the displayed results.

Ref Value (Gain Result)

See "Ref Value" on page 432 for more information.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RLEVel <value>`
	`:DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RLEVel?`
Example	:DISP:NFIG:TRAC:GAIN:Y:RLEV?
Preset	15 dB
State Saved	Saved in instrument state.
Range	–100 dB to 100 dB
Min	–100 dB
Max	100 dB

Initial S/W Revision	Prior to A.04.00
Coupling	Gain needs to be selected as one of the displayed results.

Ref Value (Y Factor Result)

See "Ref Value" on page 432 for more information.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:RLEVel <value>
	:DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:YFAC:Y:RLEV?
Preset	5 dB
State Saved	Saved in instrument state.
Range	–100 dB to 100 dB
Min	–100 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00
Coupling	Y Factor needs to be selected as one of the displayed results.

Ref Value (T Effective Result)

See "Ref Value" on page 432 for more information.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RLEVel <value>
	:DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:TEFF:Y:RLEV?
Preset	1000.0
State Saved	Saved in instrument state.
Range	–100000000K to 100000000K
Min	–100000000K
Max	100000000K
Initial S/W Revision	Prior to A.04.00
Coupling	T Effective needs to be selected as one of the displayed results.

Ref Value (P Hot Result)

See "Ref Value" on page 432 for more information.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RLEVel <value>
	:DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:PHOT:Y:RLEV?
Preset	5 dB
State Saved	Saved in instrument state.
Range	−100 dB to 100 dB
Min	−100 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00
Coupling	P Hot needs to be selected as one of the displayed results.

Ref Value (P Cold Result)

See "Ref Value" on page 432 for more information.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RLEVel <value>
	:DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:PCOL:Y:RLEV?
Preset	5 dB
State Saved	Saved in instrument state.
Range	−100 dB to 100 dB
Min	−100 dB
Max	100 dB
Initial S/W Revision	Prior to A.04.00
Coupling	P Cold needs to be selected as one of the displayed results.

Ref Value (Meter View with N9069A/W9069A-AFP)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:METer:Y[:SCALe]:RLEVel <value>

	`:DISPlay:NFIGure:TRACe:METer:Y[:SCALe]:RLEVel?`
Example	:DISP:NFIG:TRAC:MET:Y:RLEV 10dB
Preset	0.0 dB
State Saved	Saved in instrument state.
Range	–10.0 – 50 dB
Min	–10.0 dB
Max	50.0 dB
Initial S/W Revision	A.10.01

Scale/Div

Sets the scaling to be used in the graph window specified by <result>. If the graph window is not currently visible (you need to be using the SCPI command), the new scaling will take effect next time the window is displayed. Values entered via SCPI here are in the default units only. The front panel will allow log or linear units but will convert to the default unit for each result type. In the case of T effective, you can only enter values of Kelvin.

Result	Noise Figure/ Noise Factor	Gain	Y-Factor	T effective	P hot	P cold
Default:	1.00 dB / 0.71489	5.00 dB	1.00 dB	200.0 K	1.00 dB	1.00 dB
Min:	0.001 dB / 0.001	0.001 dB	0.001 dB	0.1 K	0.001 dB	0.001 dB
Max:	20.0 dB / 100	20.0 dB	20.0 dB	20000000 K	20.0 dB	20.0 dB
Step:	0.1 dB / 1, 1.5, 2, 3, 5, 7.5, 10	0.1 dB	0.1 dB	1, 1.5, 2, 3, 5, 7.5, 10 ….	0.1 dB	0.1 dB
RPG:	0.01 dB / 1, 1.5, 2, 3, 5, 7.5, 10	0.01 dB	0.01 dB	1, 1.5, 2, 3, 5, 7.5, 10 ….	0.01 dB	0.01 dB
Resolution	0.001 dB	0.001 dB	0.001 dB	2 decimal	0.001 dB	0.001 dB
Instrument S/W Revision	Prior to A.04.00					

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y [:SCALe]:PDIVision <value>`
	`:DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y`

	`[:SCALe]:PDIVision?`
Example	:DISP:NFIG:TRAC:NFIG:Y:PDIV 2dB
Preset	Depending on Type of Result
State Saved	Saved in instrument state.
Range	Depending on Type of Result
Min	Depending on Type of Result
Max	Depending on Type of Result
Initial S/W Revision	Prior to A.04.00

Mode	NFIGURE
Remote Command	`:DISPlay[:NFIGure]:TRACe:Y[:SCALe]:PDIVision NFIGure	NFACtor	GAIN	YFACtor	TEFFective	PHOT	PCOLd,<float>`
	`:DISPlay[:NFIGure]:TRACe:Y[:SCALe]:PDIVision? NFIGure	NFACtor	GAIN	YFACtor	TEFFective	PHOT	PCOLd`
Example	:DISP:NFIG:TRAC:Y:PDIV? NFIG
Initial S/W Revision	Prior to A.04.00

Scale/Div (Noise Figure Result)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:PDIVision <value>`
	`:DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:PDIVision?`
Example	:DISP:NFIG:TRAC:NFIG:Y:PDIV 2dB
Preset	1.0 dB
State Saved	Saved in instrument state.
Range	0.001 dB to 20 dB
Min	0. 001 dB
Max	20.0 dB
Initial S/W Revision	Prior to A.04.00
Coupling	Noise Figure needs to be selected as one of the displayed results.

Scale/Div (Noise Factor Result)

Key Path	Amplitude
Mode	NFIGURE

Remote Command	`:DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:PDIVision <value>`
	`:DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:PDIVision?`
Example	:DISP:NFIG:TRAC:NFAC:Y:PDIV 2
Preset	0.7
State Saved	Saved in instrument state.
Range	0.001 to 100
Min	0.001
Max	100
Initial S/W Revision	Prior to A.04.00
Coupling	Noise Factor needs to be selected as one of the displayed results.

Scale/Div (Gain Result)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:PDIVision <value>`
	`:DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:PDIVision?`
Example	:DISP:NFIG:TRAC:GAIN:Y:PDIV 3dB
Preset	1.0 dB
State Saved	Saved in instrument state.
Range	0.001 dB to 20 dB
Min	0.001 dB
Max	20.0 dB
Initial S/W Revision	Prior to A.04.00
Coupling	Gain needs to be selected as one of the displayed results.

Scale/Dive (Y Factor Result)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:PDIVision <value>`
	`:DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:PDIVision?`
Example	:DISP:NFIG:TRAC:YFAC:Y:PDIV 2dB
Preset	1.0 dB
State Saved	Saved in instrument state.
Range	0.001 dB to 20 dB

Min	0.001 dB
Max	20.0 dB
Initial S/W Revision	Prior to A.04.00
Coupling	Y Factor needs to be selected as one of the displayed results.

Scale/Div (T Effective Result)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:PDIVision <value>
	:DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:PDIVision?
Example	:DISP:NFIG:TRAC:TEFF:Y:PDIV 10K
Preset	200 K
State Saved	Saved in instrument state.
Range	0.1 K to 20000000 K
Min	0.1 K
Max	20000000 K
Initial S/W Revision	Prior to A.04.00
Coupling	T Effective needs to be selected as one of the displayed results.

Scale/Div (P Hot Result)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:PDIVision <value>
	:DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:PDIVision?
Example	:DISP:NFIG:TRAC:PHOT:Y:PDIV 2dB
Preset	1.0 dB
State Saved	Saved in instrument state.
Range	0.001 dB to 20 dB
Min	0.001 dB
Max	20.0 dB
Initial S/W Revision	Prior to A.04.00
Coupling	P Hot needs to be selected as one of the displayed results.

Scale/Div (P Cold Result)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:PDIVision <value>`
	`:DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:PDIVision?`
Example	:DISP:NFIG:TRAC:PCOL:Y:PDIV 2dB
Preset	1.0 dB
State Saved	Saved in instrument state.
Range	0.001 dB to 20 dB
Min	0.001 dB
Max	20.0 dB
Initial S/W Revision	Prior to A.04.00
Coupling	P Cold needs to be selected as one of the displayed results.

Scale/Div (Meter View with N9069A/W9069A-AFP)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:METer:Y[:SCALe]:PDIVision <value>`
	`:DISPlay:NFIGure:TRACe:METer:Y[:SCALe]:PDIVision?`
Example	:DISP:NFIG:TRAC:MET:Y:PDIV 2dB
Preset	1.0 dB
State Saved	Saved in instrument state.
Range	0.1 dB – 5 dB
Min	0.1 dB
Max	5 dB
Initial S/W Revision	A.10.01

Auto Scaling

Automatically sets the ref level and scale per division parameters based on the current trace data. These are set such that the trace fills 90% of the graticule.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:COUPle 0	1	OFF	ON`
	`:DISPlay:NFIGure:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:COUPle?`

Remote Command Notes	:DISP:NFIG:VIEW:WIND:TRAC:Y:COUP ON
	:DISP:NFIG:VIEW:WIND:TRAC:Y:COUP?
Preset	On
State Saved	Saved in instrument state.
Range	On|Off
Backwards Compatibility SCPI	`:DISPlay[:WINDow]:TRACe[1]|2:Y[:SCALe]:AUTO`
	`:DISPlay:WINDow1:TRACe[1]|2:Y[:SCALe]:AUTO`
Initial S/W Revision	Prior to A.04.00
Coupling	When Auto Scaling is On, and the Restart front–panel key is pressed, this function automatically determines the scale per division and reference values based on the measurement results.
	When you set a value to either Scale/Div or Ref Level manually, Auto Scaling automatically changes to Off.

Auto Scaling (Meter View with N9069A/W9069A-AFP)

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:VIEW3:WINDow[1]:TRACe:Y[:SCALe]:COUPle 0	1	OFF	ON`
	`:DISPlay:NFIGure:VIEW3:WINDow[1]:TRACe:Y[:SCALe]:COUPle?`
Remote Command Notes	:DISP:NFIG:VIEW3:WIND:TRAC:Y:COUP ON
	:DISP:NFIG:VIEW3:WIND:TRAC:Y:COUP?
Preset	On
State Saved	Saved in instrument state.
Range	On | Off
Initial S/W Revision	A.10.01
Coupling	When Auto Scaling is On, this function automatically determines the scale per division to be 1/8 of the highest value in the strip chart, and sets the Ref Level to 0.0 dB.
	When you set a value to either Scale/Div or Ref Level manually, Auto Scaling automatically changes to Off.

Attenuation

This key controls only the mechanical attenuator. The electronic attenuator – which is limited to below 3.6GHz – is disabled in the Noise Figure Application.

With FSA option	0 dB to 8 dB, and a step size of 4 dB
Without FSA option	0 dB to 10 dB, and a step size of 10 dB

In this application, the attenuators cannot autorange. There is therefore a risk of overdriving the analyzer. In most cases, 0 dB attenuation is adequate. To check for overdriving of the analyzer – that is, compression occurring at the preamp stage - set the attenuation to 0 dB and note the noise figure of your DUT. Now increase the attenuation by one step. If your noise figure changes by more than 0.5 dB, attenuation is required. Repeat this process until you have found the lowest level of attenuation that gives you a stable noise figure result, and use this attenuation level for your measurements.

Key Path	Amplitude
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:POWer[:RF]:ATTenuation <float>`
	`[:SENSe]:NFIGure:POWer[:RF]:ATTenuation?`
Example	:NFIG:POW:ATT 4dB
	:NFIG:POW:ATT?
Preset	0 dB
State Saved	Saved in instrument state.
Range	0 dB to 40 dB
Min	0 dB
Max	40 dB
Backwards Compatibility SCPI	`:INPut[:NFIGure]:ATTenuation:VALue`
	`[:SENSe][:NFIGure]:MANual:RF:FIXed`
	`[:SENSe][:NFIGure]:MANual:MWAVe:FIXed`
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	
	Attenuation steps depend on FSA option:
	With FSA – 4 dB.
	Without FSA – 4 dB.

Ref Position

Sets the reference position to be used in the graph window. The reference value is positioned relative to this point on the graph. If the graph window is not currently visible, the new reference position will take effect next time the window is displayed.

Key Path	Amplitude, More
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom`
	`:DISPlay:NFIGure:TRACe:NFIGure|NFACtor|GAIN|YFACtor|TEFFective|PHOT|PCOLd:Y[:SCALe]:RPOSition?`
Example	:DISP:NFIG:TRAC:NFIG:Y:RPOS TOP

Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP|CENTer|BOTTom
Initial S/W Revision	Prior to A.04.00

Ref Position (Noise Figure Result)

Key Path	Amplitude, More
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
	:DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RPOSition?
Example	:DISP:NFIG:TRAC:NFIG:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP|CENTer|BOTTom
Initial S/W Revision	Prior to A.04.00

Ref Position (Noise Factor Result)

Key Path	Amplitude, More
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
	:DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RPOSition?
Example	:DISP:NFIG:TRAC:NFAC:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP|CENTer|BOTTom
Initial S/W Revision	Prior to A.04.00

Ref Position (Gain Result)

Key Path	Amplitude, More
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
	:DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RPOSition?

Example	:DISP:NFIG:TRAC:GAIN:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP|CENTer|BOTTom
Initial S/W Revision	Prior to A.04.00

Ref Position (Y Factor Result)

Key Path	Amplitude, More
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:RPOSition TOP	CENTer	BOTTom
	:DISPlay:NFIGure:TRACe:YFACtor:Y[:SCALe]:RPOSition?
Example	:DISP:NFIG:TRAC:YFAC:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP|CENTer|BOTTom
Initial S/W Revision	Prior to A.04.00

Ref Position (T Effective Result)

Key Path	Amplitude, More
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RPOSition TOP	CENTer	BOTTom
	:DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RPOSition?
Example	:DISP:NFIG:TRAC:TEFF:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP|CENTer|BOTTom
Initial S/W Revision	Prior to A.04.00

Ref Position (P Hot Result)

Key Path	Amplitude, More
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RPOSition TOP	CENTer	BOTTom

	:DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RPOSition?
Example	:DISP:NFIG:TRAC:PHOT:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP|CENTer|BOTTom
Initial S/W Revision	Prior to A.04.00

Ref Position (P Cold Result)

Key Path	Amplitude, More
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RPOSition TOP | CENTer | BOTTom
	:DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RPOSition?
Example	:DISP:NFIG:TRAC:PCOL:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP|CENTer|BOTTom
Initial S/W Revision	Prior to A.04.00

Internal Preamp

Turning the Internal Preamp on gives a better noise figure and thus better uncertainties. In some cases, with high gain DUTs, especially when tested with wide RBWs, noise compression may occur. In this case, increasing the input attenuation or turning off the preamp are recommended. This key allows the user to set the Internal Preamp to Auto or turn the Internal Preamp on or off.

When Internal Preamp is set to Auto, and no USB Preamp is connected, the Internal Preamp will be turned on; if there is an USB Preamp connected, the Internal Preamp will be turned off to optimize the dymanic range over which the user calibration should be run.

If the current IF frequency range falls completely or partially outside the internal preamp range, a warning message "Hardware missing; Internal preamp not available at all frequency points" will be displayed.

Note that the default input attenuation calibration range is:

With FSA option	0 dB to 8 dB, and a step size of 4 dB
Without FSA option	0 dB to 10 dB, and a step size of 10 dB

Key Path	Amplitude, More
Mode	NFIGURE

Remote Command	[:SENSe]:NFIGure:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1
	[:SENSe]:NFIGure:POWer[:RF]:GAIN[:STATe]?
Example	POW:GAIN OFF
Preset	ON
State Saved	Saved in instrument state.
Range	ON|OFF|1|0
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:POWer[:RF]:GAIN[:STATe]
	:INPut:GAIN:STATe
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	A.14.00
Coupling	When in Auto, if there is an U7227 Series USB Preamp connected to one of the analyzer's USB ports, the Internal Preamp will be turned off to optimize the dynamic range; if no USB Preamp is connected, the Internal Preamp will be turned on to optimize the noise figure.

Auto

Activates the auto rules for Internal Preamp

Key Path	Amplitude, More
Remote Command	[:SENSe][:NFIGure]:POWer[:RF]:GAIN:AUTO OFF|ON|0|1
	[:SENSe][:NFIGure]:POWer[:RF]:GAIN:AUTO?
Example	POW:GAIN:AUTO ON
Preset	ON
Initial S/W Revision	A.14.00

On

Force Internal Preamp to On.

Key Path	Amplitude, Int Preamp
Example	POW:GAIN ON
State Saved	Saved in instrument state.
Readback	On
Initial S/W Revision	A.14.00

Off

Force Internal Preamp to Off.

Key Path	Amplitude, Int Preamp
Example	POW:GAIN OFF
State Saved	Saved in instrument state.
Readback	Off
Initial S/W Revision	A.14.00

Auto Couple

The Auto Couple feature provides a quick and convenient way to automatically couple multiple instrument settings. This helps ensure accurate measurements and optimum dynamic range. When the Auto Couple feature is activated, either from the front panel or remotely, all parameters of the current measurement that have an Auto/Manual mode are set to Auto mode and all measurement settings dependent on (or coupled to) the Auto/Man parameters are automatically adjusted for optimal performance.

However, the Auto Couple keyactions are confined to the current measurement only. It does not affect other measurements in the mode, and it does not affect markers, marker functions, or trace or display attributes.

See

Key Path	Front-panel key
Remote Command	`:COUPle ALL|NONE`
Example	:COUP ALL
Notes	:COUPle ALL puts all Auto/Man parameters in Auto mode (equivalent to pressing the Auto Couple key).
	:COUPLE NONE puts all Auto/Man parameters in manual mode. It decouples all the coupled instrument parameters and is not recommended for making measurements.
Initial S/W Revision	Prior to A.02.00

More Information

There are two types of functions that have Auto/Manual modes.

Auto/Man Active Function keys

An Auto/Man toggle key controls the binary state associated with an instrument parameter by toggling between Auto (where the parameter is automatically coupled to the other parameters it is dependent upon) and Man (where the parameter is controlled independent of the other parameters), as well as making the parameter the active function. The current mode is indicated on the softkey with either Auto or Man underlined as illustrated below.

Auto/Man 1-of-N keys

An Auto/Man 1-of-N key allows you to manually pick from a list of parameter values, or place the function in Auto, in which case the value is automatically selected (and indicated) as shown below. If in Auto, Auto is underlined on the calling key. If in manual operation, manual is indicated on the calling key. But the calling key does not actually toggle the function, it simply opens the menu.

X Axis Scale
Frequency ▶
Auto   Man

X Axis Scale

Auto

Frequency

Period

Time

Inverse Time

usd08
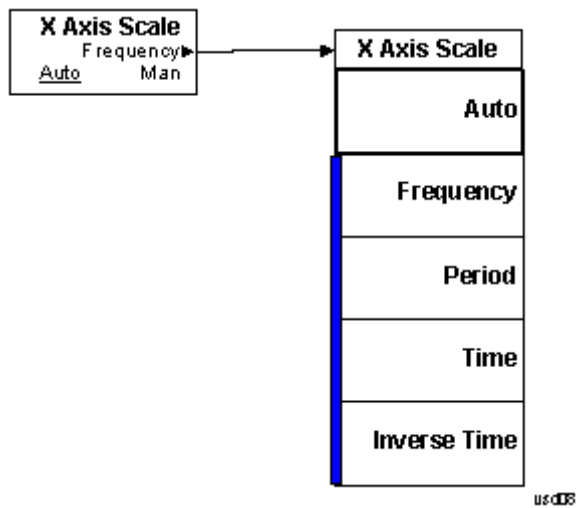
BW

Opens the menu containing the Instrument Bandwidth settings. In the Noise Figure measurement, only the Resolution Bandwidth can be altered.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Res BW (Auto/Man)

Determines control for setting the resolution bandwidth to automatic or manual.

When this function is set to Auto (default setting), the bandwidth is set automatically, and is dependent on the measurement frequency.

At measurement frequencies of 9.9 MHz or above, the resolution bandwidth is set automatically to 4 MHz.

At measurement frequencies less than 9.9 MHz, the resolution bandwidth is set automatically to approximately one third of the measurement frequency.

When the resolution bandwidth is set to manual (Man), you can manually specify the resolution bandwidth from a minimum of 1 Hz to a maximum of 8 MHz. The lower the resolution bandwidth setting, the longer the measurement will take. With a resolution bandwidth setting of 1 Hz, each measurement point may take up to 6000 seconds.

Refer to your X-Series measurement guide for more information on setting the resolution bandwidth.

Key Path	BW
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution] <freq>
	[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]?
	[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]:AUTO ON | OFF | 1 | 0
	[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]:AUTO?
Example	:BWID:RES 1 MHz
	NFIG:BWID:AUTO OFF
	NFIG:BWID?
Preset	4 MHz
	ON
State Saved	Saved in instrument state.
Range	1 Hz to 8 MHz
Min	1 Hz
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:BWIDth|BANDwidth[:RESolution] (Default RBW in PSA ESA apps was 1 MHz)
Initial S/W Revision	Prior to A.04.00
Coupling	When the IF freq goes lower than 9.9 MHz the Res BW needs to be reduced to prevent the LO feedthrough affecting results.

Cont (Continuous Measurement/Sweep)

Sets the analyzer for Continuous measurement operation. The single/continuous state is Meas Global so the setting will affect all measurements. If you are Paused, pressing Cont does a Resume.

Key Path	Front-panel key
Remote Command	`:INITiate:CONTinuous OFF|ON|0|1`
	`:INITiate:CONTinuous?`
Example	:INIT:CONT 0 puts analyzer in Single measurement operation.
	:INIT:CONT 1 puts analyzer in Continuous measurement operation
Preset	ON
	(Note that SYST:PRESet sets INIT:CONT to ON but *RST sets INIT:CONT to OFF)
State Saved	Saved in instrument state
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, there is no Cont hardkey, instead there is a Sweep Single/Cont key. In these analyzers, switching the Sweep Single/Cont key from Single to Cont restarts averages (displayed average count reset to 1), but does not restart Max Hold and Min Hold.
	The X-Series has Single and Cont keys in place of the SweepSingleCont key. In the X-Series, if in single measurement, the Cont key (and INIT:CONT ON) switches to continuous measurement, but never restarts a measurement and never resets a sweep.
Initial S/W Revision	Prior to A.02.00

In Swept SA Measurement (Spectrum Analysis Mode):

The analyzer takes repetitive sweeps, averages, measurements, etc., when in Continuous mode. When the average count reaches the Average/Hold Number the count stops incrementing, but the analyzer keeps sweeping. See the Trace/Detector section for the averaging formula used both before and after the Average/Hold Number is reached. The trigger condition must be met prior to each sweep. The type of trace processing for multiple sweeps, is set under the Trace/Detector key, with choices of Trace Average, Max Hold, or Min Hold.

In Other Measurements/Modes:

With Avg/Hold Num (in the Meas Setup menu) set to Off or set to On with a value of 1, a sweep is taken after the trigger condition is met; and the analyzer continues to take new sweeps after the current sweep has completed and the trigger condition is again met. However, with Avg/Hold Num set to On with a value >1, multiple sweeps (data acquisitions) are taken for the measurement. The trigger condition must be met prior to each sweep. The sweep is not stopped when the average count k equals the number N set for Avg/Hold Num is reached, but the number k stops incrementing. A measurement average usually applies to all traces, marker results, and numeric results. But sometimes it only applies to the numeric results.

If the analyzer is in Single measurement, pressing the Cont key does not change k and does not cause the sweep to be reset; the only action is to put the analyzer into Continuous measurement operation.

If it is already in continuous sweep:

the INIT:CONT 1 command has no effect

the INIT:CONT 0 command 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

Frequency (FREQ) Channel

Accesses the menu that enables you to set the desired frequency settings, including custom swept frequency lists.

The parameters defined in the frequency menu are used to construct a list of frequency points at which the measurement will be carried out. A separate set of frequency parameters and frequency lists exist for each frequency context (RF, IF, and LO). The parameters displayed under the frequency menu depend on the current context (selected under the Mode Setup, DUT Setup menu). The current context is displayed in the Noise Figure Settings Panel on the measurement bar.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

> **NOTE** When the selected calibration or measurement frequency is set below 10MHz, the AC coupling flag in the Meas Bar will display an exclamation mark. This indicates that the results are unreliable below 10MHz with AC coupling and that DC coupling should be enabled. To obtain the best result uncertainty, it is recommended that DC Coupling is used if any frequency is below 40MHz. This is due to the AC coupling effect becoming more significant within the Noise Figure measurement at frequencies below 40MHz. See the Noise Figure Measurement Personality chapter in the X-Series Specifications Guide for more details.

Freq Mode

The frequency mode determines how the list of frequencies to be measured is calculated. The options are:

Swept – Points are linearly distributed between Start and Stop Frequency, where the number of points is determined by the Points parameter. Start Freq, Stop Freq, Center Freq, and Span parameters are coupled.

In this mode, Fixed Freq is grayed out (disabled).

Fixed – A single frequency (supplied by the Fixed Freq parameter) is measured. Meter View is ideal for this mode.

In this mode, the Start/Stop/Center Freq, Span, and Points parameters are grayed out (disabled).

List – A user-specified list of frequencies is measured. The list of frequencies can be supplied using the respective SCPI commands, loading the frequency list from file, or by entering the data manually into the frequency list. Duplicate frequencies are not acceptable. See ""Table Editor Operation" on page 549" for more information on entering data manually.

In this mode, the Start/Stop/Center/Fixed Freq, Span, and Points parameters are grayed out (disabled).

> **NOTE** When DUT is MCONverter, user needs to specify RF, IF and LO (if DUT LO is Swept) frequency list respectively. Switching DUT type will not change the frequency lists for MCONverter, i.e. when user switchs to MCONverter from other DUT types, RF, IF and LO freuqnecy lists will be restored to the latest values. See "Selected Freq List" on page 462 and Edit for more details on how to specify the frequency for MCONverter.

When the Frequency Mode is LIST and the context changes, the list values are recalculated to satisfy the new context.

Key Path	Frequency
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:MODE SWEPt | FIXed | LIST`
	`[:SENSe]:NFIGure:FREQuency:MODE?`
Example	FREQ:MODE FIX
Remote Command Notes	SWEPt parameter replaces SWEep
Preset	SWEPt
State Saved	Saved in instrument state.
Range	SWEPt|FIXed|LIST
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:FREQuency:MODE`
Initial S/W Revision	Prior to A.04.00
Coupling	See above.

DUT Setup Form Interaction

The frequencies displayed under the DUT Setup form change depending on the Frequency Mode parameter.

• When in SWEpt mode, the RF, IF and LO frequencies are displayed as described in section

• When in FIXed mode, a RF, IF and LO fixed frequencies are all displayed. LO Frequency Mode is set to FIXed and disabled.

• If context=RF, RF and LO Fixed frequencies are enabled and IF is disabled.

• If context=IF, IF and LO Fixed frequencies are enabled and RF is disabled.

• When in LIST mode, all swept DUT Setup frequency parameters are grayed. The Start and Stop frequencies of the current context are taken from the frequency list (first and last entry in sorted frequency list). When DUT is not MCONverter, the frequencies of the other contexts are recalculated accordingly. The fixed frequency (IF or LO; determined by LO Freq Mode) is enabled. When DUT is MCONverter, users need to enter frequency list for other contexts (See and Edit).

Center Freq

Sets the Center Frequency that will be used when **Swept** is selected in the Freq Mode menu.

The Start, Stop, Center, and Span frequencies are all coupled. Altering one causes the others to be recalculated to satisfy the equations:

• Span = Stop - Start

• Center = Start + (Span / 2)

NOTE	Unless the number of Points is an odd number, the Center Frequency will not actually be measured since the measured points are evenly distributed between the Start and Stop Frequencies.

Key Path	Frequency
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:CENTer < freq >`
	`[:SENSe]:NFIGure:FREQuency:CENTer?`
Example	:NFIG:FREQ:CENT 1.5 GHz
Preset	1.505 GHz
State Saved	Saved in instrument state.
Range	−325 GHz to 325 GHz
Min	10.005 kHz
Max	There are a few conditions the max will be 325 Hz less half of the min span of 10 Hz.
	When DUT is an Amplifier with System Downconverter 'On' and the frequency context is set to "RF DUT Input"
	When DUT is a Downconverter and the frequency context is set to "RF DUT Input"
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:FREQuency:CENTer`
Initial S/W Revision	Prior to A.04.00
Coupling	This allows you to set the center frequency for a swept measurement. Active only when freq mode is set to Swept. Coupled to stop freq, center freq, and span.

Start Frequency

Sets the Start Frequency that will be used when the Swept key is selected in the Freq Mode menu, or when selecting the Fill Using Start and Stop Freq key in the Frequency List. A separate start frequency is maintained for each frequency context (RF, LO, IF). The softkey displays and controls the start frequency for the currentcontext.

The Start, Stop, Center, and Span frequencies are all coupled. Altering one causes the others to be recalculated to satisfy the equations:

- Span = Stop - Start

- Center = Start + (Span / 2)

Key Path	Frequency
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:STARt <freq>`
	`[:SENSe]:NFIGure:FREQuency:STARt?`
Example	NFIG:FREQ:STAR 11 MHz
Preset	10 MHz
State Saved	Saved in instrument state.

Range	–325 GHz to 325 GHz
Min	10 kHz
Max	There are a few conditions where the max will be 325 GHz less the min span of 10 Hz.
	When DUT is an Amplifier with System Downconverter 'On' and the frequency context is set to "RF DUT Input"
	When DUT is a Downconverter and the frequency context is set to "RF DUT Input"
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:FREQuency:STARt`
Initial S/W Revision	Prior to A.04.00
Coupling	This allows you to set the frequency at which the swept measurement starts. Active only when freq mode is set to Swept. Coupled to stop freq, center freq, and span.
	When the selected cal/meas freq goes below 10MHz the AC flag displays the exclaimation mark to warn you of inaccurate results.
	Mirror of Start Frequency for current context in DUT Setup Form.

Stop Freq

Sets the Stop Frequency that will be used when Freq Mode is set to 'Swept', or when using the 'Fill Using Start and Stop Freq' option in the Frequency List. A separate stop frequency is maintained for each frequency context (RF, LO, IF). The softkey displays and controls the stop frequency for the currentcontext.

The Start, Stop, Center, and Span frequencies are all coupled. Altering one causes the others to be recalculated to satisfy the equations:

- Span = Stop - Start

- Center = Start + (Span / 2)

Key Path	Frequency
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:STOP <freq>`
	`[:SENSe]:NFIGure:FREQuency:STOP?`
Example	NFIG:FREQ:STOP 11 MHz
Preset	3.0 GHz
State Saved	Saved in instrument state.
Range	–325 GHz to 325 GHz
Min	10.01 kHz
Max	There are a few conditions the max will be 325 GHz.
	When DUT is an Amplifier with System Downconverter 'On' and the frequency context is set to "RF DUT Input"
	When DUT is a Downconverter and the frequency context is set to "RF DUT Input"
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:FREQuency:STOP`

Initial S/W Revision	Prior to A.04.00
Coupling	Active only when freq mode is set to Swept. Coupled to stop freq, center freq and span.

Points

Sets the number of frequency points that will be used when Freq Mode (FREQ Channel menu) is set to 'Swept'. The frequency points are distributed evenly between the Start and Stop Frequencies (see section "Frequency (FREQ) Channel" on page 456).

Key Path	Frequency
Mode	NF
Remote Command	[:SENSe]:NFIGure:SWEep:POINts <integer>
	[:SENSe]:NFIGure:SWEep:POINts?
Example	SWE:POIN 201
Preset	11
State Saved	Saved in instrument state.
Min	2
Max	501
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:SWEep:POINts
Initial S/W Revision	Prior to A.04.00
Coupling	Coupled to max value of Position parameter (under View/Display key)

Fixed Freq

Sets the Fixed Frequency that will be measured when Freq Mode is set to 'Fixed'.

Key Path	Frequency
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:FREQuency:FIXed <freq>
	[:SENSe]:NFIGure:FREQuency:FIXed?
Example	:NFIG:FREQ:FIX 2 GHz
Preset	1.505 GHz
State Saved	Saved in instrument state.
Range	–325 GHz to 325 GHz
Min	10 kHz
Max	There are a few conditions the max will be 325 GHz less half of the min span of 10 Hz.
	When DUT is an Amplifier with System Downconverter 'On' and the frequency context is set to "RF

	DUT Input"
	When DUT is a Downconverter and the frequency context is set to "RF DUT Input"
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:FREQuency:FIXed`
Initial S/W Revision	Prior to A.04.00
Coupling	Active if freq mode is set to Fixed: Warning –221.5528 displayed otherwise.

Edit Frequency List

When frequency list mode is active, this menu allows the user to enter a list of frequencies to be measured. See Table Editor

Entered frequencies can be arbitrary values within the frequency range of the current frequency context. Values will be displayed in sorted order.

Once a new list is entered, the application will store this table in non-volatile memory, to allow restoring after a power cycle.

If the frequency context changes while Freq Mode is LIST, the frequency list values must be recalculated to satisfy the new context.

Duplicates are NOT allowed in the frequency list.

Frequency List
Frequency
1.000000000 GHz
1.100000000 GHz
1.200000000 GHz
1.300000000 GHz
1.400000000 GHz
1.500000000 GHZ
1.600000000 GHz

Key Path	Frequency
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Coupling	1. Error 171 is displayed if Freq Mode = LIST and there is no data in the table. Refer to the X-Series *Instrument Messages Guide* which can be accessed by pressing the green Help key, then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
	2. Table displayed dependent on frequency context.

Selected Freq List

This key is enabled when DUT is MCONverter. You can use this key to select which frequency list to be filled.

When Freq Mode is LIST and DUT type is MCONverter, you needs to enter the frequency list for RF, LO and IF. When DUT is not MCONverter, this key will be disabled.

Key Path	Frequency, Edit Freq List
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:LIST RF|LO|IF`
	`[:SENSe]:NFIGure:FREQuency:LIST?`
Example	NFIG :FREQ:LIST RF
Preset	IF
State Saved	Saved in instrument state.
Range	RF|LO|IF
Initial S/W Revision	A.13.00
Coupling	1. Only enabled when DUT is MCONverter.
	2. Selected Freq List will be coupled to Freq Context when Freq Context is changed.

RF

When RF is selected, user can fill or clear the RF frequency list by pressing "Fill Using Start and Stop Freq", "Edit" or "Clear Table" key.

Key Path	Frequency, Edit Freq List, Freq List
Initial S/W Revision	A.13.00

LO

When LO is selected, user can fill or clear the LO frequency list by pressing "Fill Using Start and Stop Freq", "Edit" or "Clear Table" key.

Key Path	Frequency, Edit Freq List, Freq List
Initial S/W Revision	A.13.00

IF

When IF is selected, user can fill or clear the IF frequency list by pressing "Fill Using Start and Stop Freq", "Edit" or "Clear Table" key.

Key Path	Frequency, Edit Freq List, Freq List
Initial S/W Revision	A.13.00

Fill Using Start and Stop Freq

No Equivalent SCPI Command (See ""Setting Frequency List Table Remotely (remote command only)" on page 466".

Clears the existing frequency list table, and replaces it with an auto-generated table based upon the 'Swept' Freq Mode settings. The frequency points will be linearly distributed, between the start and stop frequencies, and the number of points generated is determined by the current setting of the Points parameter.

> **NOTE** This function can be used to set the template frequencies which can then be modified for the exact "sweet spots" in the DUT.

Key Path	Frequency, Edit Frequency List
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Table Editor Operation

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

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

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

See also:

"Navigating" on page 508

"Editing" on page 509

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

Navigate

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

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	Navigate
State Saved	No
Range	Navigate | Frequency | Amplitude (optional)
	Range of enumerates can be 2 or 3, depending on current use, but first member will always be Navigate. Additional members are provided by the user of the Common Table Editor
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	• Note that the arrow keys always navigate between rows.

Frequency

No Equivalent SCPI Command (See Setting Frequency List Table Remotely below)

Enables you to enter the frequency.

Key Path	Frequency, Edit Frequency List, Edit
Mode	NFIGURE
Preset	10 kHz
State Saved	Saved in instrument state.
Range	10 kHz to 325 GHz
Min	10 kHz
Max	There are a few conditions the max will be 325 GHz less half of the min span of 10 Hz.
	1. When DUT is an Amplifier with System Downconverter 'On' and the frequency context is set to "RF DUT Input"
	2. When DUT is a Downconverter and the frequency context is set to "RF DUT Input"
Initial S/W Revision	Prior to A.04.00
Coupling	Parameter coupled to currently selected frequency in table.

Insert Point Below

Inserts point below the currently selected row.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	If the currently-selected point is being edited, the point is completed. A new point is inserted below the currently-selected point; the data in the new point is copied from the current point. The independent variable (usually Frequency) is highlighted for edit.

Delete Point

Deletes currently selected row in the table editor.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	It will immediately delete the currently-selected point, whether or not that point is being edited, and select Navigate. The point following the currently-selected point (or the point proceeding if there is none) will be selected.

Navigating

When navigate is highlighted, the selected row is highlighted, per the figure below.

Frequency	Amplitude
10.000000 MHz	15.39 dB
100.000000 MHz	15.47 dB
1.000000000 GHz	15.31 dB
2.000000000 GHz	15.15 dB

The Up arrow key moves up one row, while the down arrow keys move down one row. Enter moves down one row. The front-panel knob and Left and Right arrow keys are also available to navigate the table.

The blank row is automatically displayed if there are no points in the table. In this case, the default values are specified by the measurement (typically measurements will use the center frequency as the default value, and some benign default Y value such as 0 dB for correction data).

Editing

Frequency	Amplitude
10.000000 MHz	15.39 dB
100.000000 MHz	15.47 dB
1.000000000 GHz	15.31 dB
2.000000000 GHz	15.15 dB

When one of the column keys (for example: Frequency or Amplitude) is highlighted, the relevant field in the current row is highlighted.

Numeric keys, Up, Down, Left and Right arrow keys, and the front-panel knob change the data in the appropriate column. The step size for the front-panel knob and arrow keys, and the units for numeric entry, vary by application. The changes are immediately reflected in the active function area, and also in the table itself. In the case of numeric entry, changes to the table are not confirmed until the user presses "Enter" or a terminator key. Front-panel knob-initiated changes are confirmed immediately.

Confirmed changes to the independent variable (usually Frequency) immediately sorts the selected row into the appropriate position in the table. If another point has the same frequency, and duplicates are allowed, the new point maintains the same relative position in the table. For example, if you are editing point 1, and give it the same frequency as point 7, the row is sorted just before point 7. If you are editing point 9, and give it the same frequency as point 7, the row is sorted just after point 7.

If the user presses "Enter" or a terminator key, the next column in the table is edited. If the last column in the table is being edited, a new point is inserted (exactly as if the user had pressed "Insert Point Below").

The table is set up to disallow duplicate independent variables. For example: if you set a value for an independent variable that is the same as an already existing value, the duplicate is deleted upon completion of editing.

Setting Frequency List Table Remotely (remote command only)

The frequency list can be specified remotely. This command will clear any current Frequency List and overwrite it with the list specified. When DUT is MCONveter, this command will be set the values to the selected frequency list.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:LIST:DATA <frequency>, ([, <frequency>])*`
	`[:SENSe]:NFIGure:FREQuency:LIST:DATA?`
Example	NFIG:FREQ:LIST:DATA 1000000, 2000000, 3000000, 4000000
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:FREQuency:LIST:DATA`
Initial S/W Revision	Prior to A.04.00

Enters data into the current frequency list table. Once loaded the table can be stored in a file.

The list is provided as a comma separated list of frequency values, the units beinGHz. Up to 501 points will be accepted. See the above Frequency definition for the acceptable parameter ranges.

Table Entry Count (remote command only)

Returns an integer representing the number of frequency points that are currently loaded into the table. Min 0, Max 501. If the table is empty then the table size will be 0.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:FREQuency:LIST:COUNt?
Example	:NFIG:FREQ:LIST:COUN?
Preset	0
Range	0 to 501
Min	0
Max	501
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:FREQuency:LIST:COUNt?
Initial S/W Revision	Prior to A.04.00

Loading and Saving Frequency List Files

To save time entering the same data into multiple analyzers, or to store a set of data for later use- it is possible to save the current table to file or to load a table from an existing file. This file can be saved on the instrument's local storage or onto a USB flash drive for portability.

All Frequency List file formats used in the NFA, ESA and PSA can be recalled into the X-Series signal analyzer. The X-Series signal analyzer can only save in the comma separated value format (.csv) which is not compatible with older instruments. See for more information.

Clear Table

This function clears all data from the Frequency List.

Key Path	FREQ Channel, Edit Frequency List
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:FREQuency:LIST:DATA:DELete
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clears all entried in the Frequency List table. If in List Freq Mode, clear the freq list table will make the measurement hang, and "Insufficient Data; Frequency list empty" error will be prompted.

Input/Output

See "Input/Output" on page 120

Marker

Accesses menus that enables you to select, set up and control the markers for the current measurement.

Markers can be used on the graphical views (Overlaid Traces, split) in the Noise Figure measurement to show precise results at any frequency point or between two frequency points. Four markers can be active at any one time.

> **NOTE**   When the Noise Figure measurement is initialized, all markers are turned off. When the measurement is reloaded, all markers are restored to the state they were in when the measurement was last running.

See also:

"Marker X Axis Value (Remote Command only)" on page 473

"Marker X Axis Position (Remote Command only)" on page 473

"Marker Y Axis Value (Remote Command only)" on page 474

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Select Marker

Specifies the marker to be defined and/or acted upon. Four markers are supported in the Noise Figure measurement. All front panel operations are performed on the 'Selected Marker'. When using SCPI, the marker onto which the command is performed must be specified explicitly with each command sent.

Key Path	Marker, Properties
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	1
State Saved	Saved in instrument state.
Range	1|2|3|4
Readback Text	Readback selection
Initial S/W Revision	Prior to A.04.00

Marker Type

There are 3 settings for markers.

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.

Delta: Sets the control mode for the selected marker to Delta and turns on the active function for setting its delta value. If the selected marker was Off, it is placed at the center of the screen on the trace specified by the marker's Trace attribute.

In Delta mode the marker result shows the relative result between the selected (Delta) marker and its reference marker. A delta marker can be moved to any point on the X Axis by specifying its X Axis offset from a reference marker. Its absolute Y Axis value is then the value of the trace point at that X Axis value.

Off: Turns off the selected marker and its marker function setting, if any. However, Off does not affect which marker is selected.

Key Path	Marker
Remote Command	`:CALCulate:NFIGure:MARKer[1]|2|...|4:MODE POSition|DELTa|OFF`
	`:CALCulate:NFIGure:MARKer[1]|2|...|4:MODE?`
Example	CALC:NFIG:MARK:MODE POS
Remote Command Notes	This command (not the query) causes the specified marker to become selected
Preset	OFF
Backwards Compatibility SCPI	`:CALCulate[:NFIGure]:MARKer[1]|2|...|4:MODE`
Initial S/W Revision	Prior to A.04.00

Properties

Opens the properties menu for the currently selected marker.

Key Path	Marker
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Select Marker

Specifies the marker to be defined and/or acted upon. Four markers are supported in the Noise Figure measurement. All front panel operations are performed on the 'Selected Marker'. When using SCPI, the marker onto which the command is performed must be specified explicitly with each command sent.

Key Path	Marker, Properties
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	1
State Saved	Saved in instrument state.
Range	1|2|3|4
Readback Text	Readback selection
Initial S/W Revision	Prior to A.04.00

Relative To

Assigns the reference marker for a marker in Delta mode.

Key Path	Marker, Properties
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:REFerence <int>
	:CALCulate:NFIGure:MARKer[1]|2|...|4:REFerence?
Example	CALC:NFIG:MARK[3]:REF 2
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 4 which is relative to marker 1.
Preset	By default, marker X is relative to marker X+1 except for marker 4 which is relative to marker 1.
Initial S/W Revision	Prior to A.04.00

Marker Trace

Assigns the specified marker to one of the traces. A marker can be assigned to any trace.

Key Path	Marker, Properties
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:TRACe TRACe1|TRACe2
	:CALCulate:NFIGure:MARKer[1]|2|...|4:TRACe?
Example	CALC:NFIG:MARK2:TRAC TRACe2
	CALC:NFIG:MARK2:TRAC?
Preset	1
State Saved	Saved in instrument state.
Range	TRACe1|TRACe2
Readback Text	Readback selection
Initial S/W Revision	Prior to A.04.00

Marker Table

When turned on, the marker table is displayed below the current graph measurement.

Key Path	Marker
Initial S/W Revision	Prior to A.04.00

MKR	MODE	TRC	SCL	X	Y	
1	N	1	f	18.288 GHz	-32.77 dBm	
2				12.858 GHz	-66.10 dBm	
3						
4						
5						
6						
7						
8						
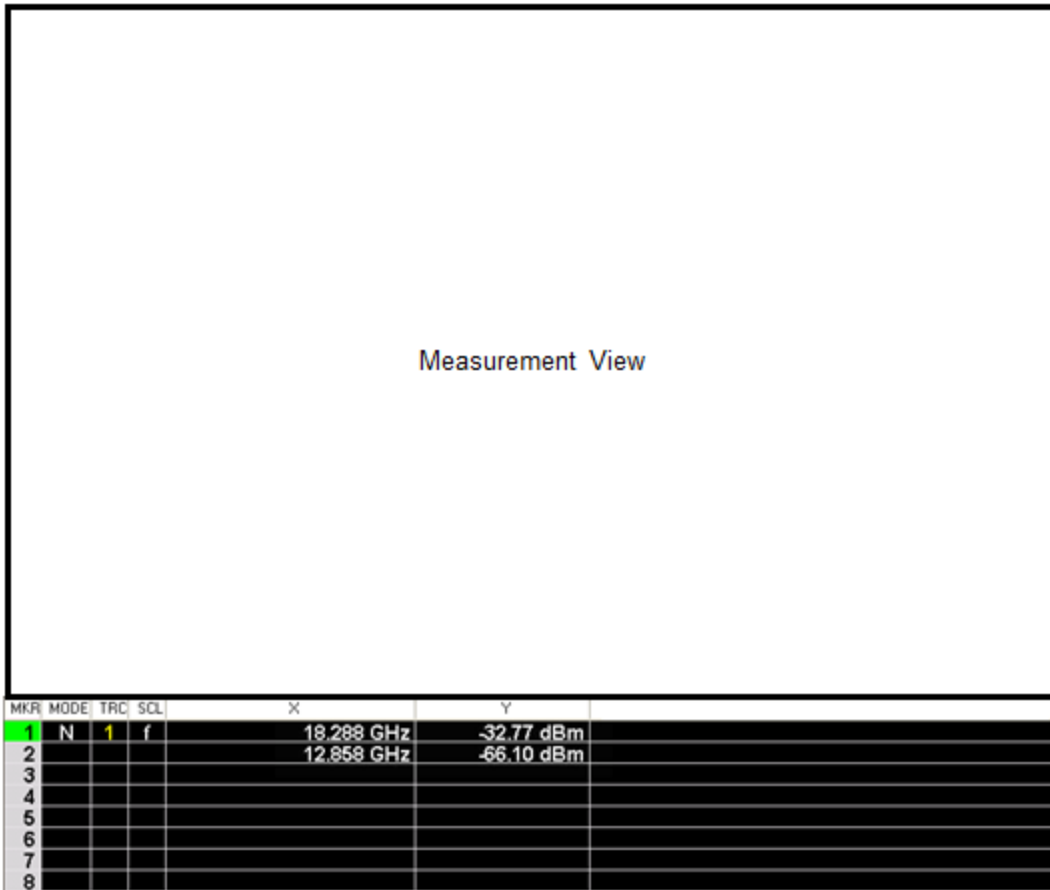
Each row in the marker table can display one marker result. Since no marker functions are available, the marker function columns in the table are not shown.

Couple Markers

Toggles the state of the markers to be coupled On or Off. When this function is true (On), moving any marker causes an "equal X Axis movement" of every other marker which is active. By "equal X Axis movement" we mean that we preserve the difference between each marker's X Axis value (in the fundamental x-axis units of the trace that marker is on) and the X Axis value of the marker being moved (in the same fundamental x-axis units).

This may result in markers going offscreen.

Key Path	Marker
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer:COUPle[:STATe] ON|OFF|1|0
	:CALCulate:NFIGure:MARKer:COUPle[:STATe]?
Example	CALC:NFIG:MARK:COUP ON
Preset	OFF
State Saved	Saved in instrument state.

Range	ON|OFF|0|1
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	Markers on both result graphs are coupled.

All Markers Off

Turns all markers off.

Key Path	Marker
Initial S/W Revision	Prior to A.04.00

Marker X Axis Value (Remote Command only)

The command below sets and queries a marker's X value.

Remote Command	`:CALCulate:NFIGure:MARKer[1]|2|...|4:X <freq>`
	`:CALCulate:NFIGure:MARKer[1]|2|...|4:X?`
Example	CALC:NFIG:MARK[2]:X 1GHz
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	Defaults to the current 'start frequency'.
Backwards Compatibility SCPI	`:CALCulate[:NFIGure]:MARKer[1]|2|...|4:X`
Initial S/W Revision	Prior to A.04.00
Coupling	If the marker X frequency value is not measured, marker X will be coupled to the last measured frequency which is less than the value.

Marker X Axis Position (Remote Command only)

Sets the marker X position in trace points. It has no effect if the control mode is Off, but is the SCPI equivalent of entering a value if the control mode is Normal or Delta - except in trace points rather than X Axis Scale units. The entered value is immediately translated into the current X Axis Scale units for setting the value of the marker.

Mode	NFIGURE
Remote Command	`:CALCulate:NFIGure:MARKer[1]|2|...|4:X:POSition <real>`
	`:CALCulate:NFIGure:MARKer[1]|2|...|4:X:POSition?`
Example	CALC:NFIG:MARK4:X:POS 0.0
Preset	After a preset, all Markers are turned OFF, so Marker X Axis Value query will return a not a number (NAN).

State Saved	No
Min	0
Max	'sweep points' value
Initial S/W Revision	Prior to A.04.00
Coupling	Coupled to number of sweep points.
Restriction and Notes	The query returns the marker's absolute X Axis value in trace points if the control mode is Normal,, or the offset from the marker's reference marker in trace points, if the control mode is Delta. The value is returned as a real number, not an integer, corresponding to the translation from X Axis Scale units to trace points (see "Fractional Trace Points", above). If the marker is Off the response is not a number (NAN).

Marker Y Axis Value (Remote Command only)

The command below queries a marker's Y axis value.

Remote Command	`:CALCulate:NFIGure:MARKer[1]|2|...|4:Y?`
Example	CALC:NFIG:MARK2:Y?
Remote Command Notes	The query is returned in the fundamental units for the current marker Y Axis scale.
Preset	Defaults to the measurement result at the default X value.
Backwards Compatibility SCPI	`:CALCulate:MARKer[1]|2|...|4:Y?`
Initial S/W Revision	Prior to A.04.00

Marker Function

This front-panel key has no function in the Noise Figure Measurement Application.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Marker To

This front-panel key has no function in the Noise Figure Measurement Application.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Meas

The information in this section is common to all measurements. For key and remote command information for a specific measurement, refer to the section that describes the measurement of interest.

Measurements available under the Meas key are specific to the current Mode.

When viewing Help for measurements, note the following:

> **NOTE**   Operation for some keys differs between measurements. The information displayed in Help pertains to the current measurement. To see how a key operates in a different measurement, exit Help (press the Cancel Esc key), select the measurement, then reenter Help (press the Help key) and press that key.

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

Remote Measurement Functions

This section contains the following topics:

Initial S/W Revision	Prior to A.02.00

Measurement Group of Commands

Measure Commands:

:MEASure:<measurement>[n]?

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

- Stops the current measurement (if any) and sets up the instrument for the specified measurement using the factory defaults

- Initiates the data acquisition for the measurement

- Blocks other SCPI communication, waiting until the measurement is complete before returning results.

- If the function does averaging, it is turned on and the number of averages is set to 10.

- After the data is valid it returns the scalar results, or the trace data, for the specified measurement. The type of data returned may be defined by an [n] value that is sent with the command.

- The scalar measurement results will be returned if the optional [n] value is not included, or is set to 1. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available.

- ASCII is the default format for the data output. (Older versions of Spectrum Analysis and Phase Noise mode measurements only use ASCII.) The binary data formats should be used for handling large blocks of data since they are smaller and faster than the ASCII format. Refer to the FORMat:DATA command for more information.

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

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

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

Configure Commands:

:CONFigure:<measurement>

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using

the factory default instrument settings. It does not initiate the taking of measurement data unless INIT:CONTinuous is ON. If you change any measurement settings after using the CONFigure command, the READ command can be used to initiate a measurement without changing the settings back to their defaults.

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

:CONFigure: <measurement>: NDEFault stops the current measurement and changes to the specified measurement. It does not change the settings to the defaults. It does not initiate the taking of measurement data unless INIT:CONTinuous is ON.

The CONFigure? query returns the current measurement name.

The CONFigure:CATalog? query returns a quoted string of all licensed measurement names in the current mode. For example, "SAN, CHP, OBW, ACP, PST, TXP, SPUR, SEM, LIST".

Fetch Commands:

:FETCh:<measurement>[n]?

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

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

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

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

INITiate Commands:

:INITiate:<measurement>

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

- Initiates a trigger cycle for the specified measurement, but does not output any data. You must then use the FETCh<meas> command to return data. If a measurement other than the current one is specified, the instrument will switch to that measurement and then initiate it.

- For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. If you send INIT:ACP? it will change from channel power to ACP and will initiate an ACP measurement.

- Does not change any of the measurement settings. For example, if you have previously started the ACP measurement and you send INIT:ACP? it will initiate a new ACP measurement using the same instrument settings as the last time ACP was run.

- If your selected measurement is currently active (in the idle state) it triggers the measurement, assuming the trigger conditions are met. Then it completes one trigger cycle. Depending upon the measurement and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle. It also holds off additional commands on GPIB until the acquisition is complete.

READ Commands:

:READ:<measurement>[n]?

- Does not preset the measurement to the factory default settings. For example, if you have previously initiated the ACP

measurement and you send READ:ACP? it will initiate a new measurement using the same instrument settings.

- Initiates the measurement and puts valid data into the output buffer. If a measurement other than the current one is specified, the instrument will switch to that measurement before it initiates the measurement and returns results.

- For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. Then you send READ:ACP? It will change from channel power back to ACP and, using the previous ACP settings, will initiate the measurement and return results.

- Blocks other SCPI communication, waiting until the measurement is complete before returning the results

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

Initial S/W Revision	Prior to A.02.00

Current Measurement Query (Remote Command Only)

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

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

Limit Test Current Results (Remote Command Only)

Queries the status of the current measurement limit testing. 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.

Remote Command	:CALCulate:CLIMits:FAIL?
Example	CALC:CLIM:FAIL? queries the current measurement to see if it fails the defined limits.
	Returns a 0 or 1: 0 it passes, 1 it fails.
Initial S/W Revision	Prior to A.02.00

Data Query (Remote Command Only)

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

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

This command uses the data setting specified by the FORMat:BORDer and FORMat:DATA commands and can return real or ASCII data. (See the format command descriptions under Input/Output in the Analyzer Setup section.)

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

Calculate/Compress Trace Data Query (Remote Command Only)

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

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

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

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

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

- 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)

$$\text{MEAN} = \frac{1}{n} \sum_{\text{Xi} \, \in \, \text{region(s)}} \text{Xi}$$

where Xi is a data point value, and n is the number of data points in the specified region(s).

Equation 2

Mean Value of I/Q Data Pairs for Specified Region(s)

$$\text{MEAN} = \frac{1}{n} \sum_{\text{Xi} \, \in \, \text{region(s)}} |\text{Xi}|$$

where |Xi| is the magnitude of an I/Q pair, and n is the number of I/Q pairs in the specified region(s).

- DMEan - 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)

$$\text{DME} = 10 \times \log_{10}\left[\frac{1}{n}\sum_{Xi\,\in\,\text{region(s)}} 10^{\frac{Xi}{10}}\right]$$

- RMS - returns a single value that is the average power on a root-mean-squared voltage scale (arithmetic rms) of the data point values for the specified region(s) of trace data. See the following equation.

> **NOTE** For I/Q trace data, the rms of the magnitudes of the I/Q pairs is returned. See the following equation. This function is very useful for I/Q trace data. However, if the original trace data is in dB, this function returns the rms of the log values which is not usually needed.

Equation 4

RMS Value of Data Points for Specified Region(s)

$$\text{RMS} = \sqrt{\frac{1}{n}\sum_{Xi\,\in\,\text{region(s)}} Xi^2}$$

where Xi is a data point value, and n is the number of data points in the specified region(s).

Equation 5

RMS Value of I/Q Data Pairs for Specified Region(s)

$$\text{RMS} = \sqrt{\frac{1}{n}\sum_{Xi\,\in\,\text{region(s)}} Xi\,Xi^*}$$

where Xi is the complex value representation of an I/Q pair, Xi* its conjugate complex number, and n is the number of I/Q pairs in the specified region(s).

Once you have the rms value for a region of trace data (linear or I/Q), you may want to calculate the mean power. You must convert this rms value (peak volts) to power in dBm:

$$10 \times \log[10 \times (\text{rms value})^2]$$

- SAMPle - 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)

$$\text{SDEV} = \sqrt{\frac{1}{n} \sum_{Xi \,\in\, region(s)} (Xi - \overline{X})^2}$$

where Xi is a data point value, X is the arithmetic mean of the data point values for the specified region(s), and n is the number of data points in the specified region(s).

$$\text{SDEV} = \sqrt{\frac{1}{n} \sum_{Xi \,\in\, region(s)} (|Xi| - \overline{X})^2}$$

where |Xi| is the magnitude of an I/Q pair, X is the mean of the magnitudes for the specified region(s), and n is the number of data points in the specified region(s).

- PPHase - 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:

    Power = 10 x log [10 x (RMS I/Q value)] + 10.

The RMS I/Q value (peak volts) is:

$$\sqrt{\frac{1}{n} \sum_{Xi \,\in\, region} Xi \, Xi^*}$$

where Xi is the complex value representation of an I/Q pair, Xi* its conjugate complex number, and n is the number of I/Q pairs in the specified region.

The arithmetic mean phase of the specified region may be expressed as:

$$\frac{1}{n} \sum_{Yi \,\in\, region} Yi$$

where Yi is the unwrapped phase of I/Q pair with applying frequency correction and n is the number of I/Q pairs in the specified region.

The frequency correction is made by the frequency offset calculated by the arithmetic mean of every specified region's frequency offset. Each frequency offset is calculated by the least square method against the unwrapped phase of I/Q pair.

Sample Trace Data - Constant Envelope

(See below for explanation of variables.)
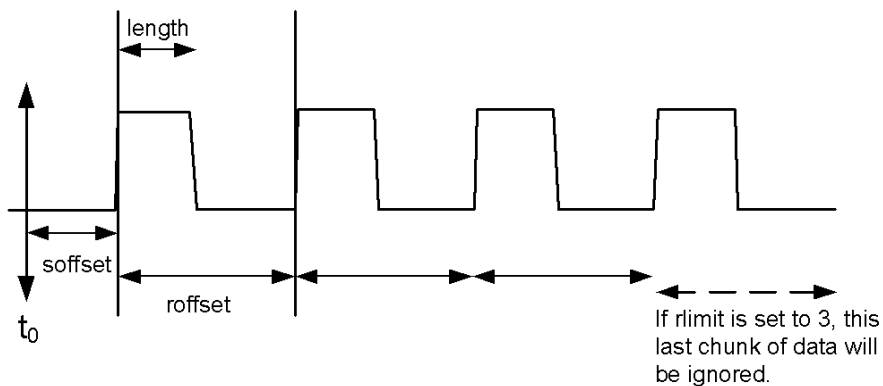
Sample Trace Data - Not Constant Envelope

(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)

Remote Command	For Swept SA measurement:
	`:CALCulate:DATA[1]|2|...|6:PEAKs? <threshold>,<excursion>[,AMPLitude	FREQuency	TIME[,ALL	GTDLine	LTDLine]]`
	For most other measurements:
	`:CALCulate:DATA[1]	2	...	6:PEAKs? <threshold>,<excursion>[,AMPLitude	FREQuency	TIME]`
Example	Example for Swept SA measurement in Spectrum Analyzer Mode:
	CALC:DATA4:PEAK? –40, 10, FREQ, GTDL This will identify the peaks of trace 4 that are above –40 dBm, with excursions of at least 10 dB. The peaks are returned in order of increasing frequency, starting with the lowest frequency. Only the peaks that are above the display line are returned.
	Query Results 1:
	With FORMat:DATA REAL, 32 selected, it returns a list of floating-point numbers. The first value in the list is the number of peak points that are in the following list. A peak point consists of two values: a peak amplitude followed by its corresponding frequency (or time).
	If no peaks are found the peak list will consist of only the number of peaks, (0).
Notes	<n> - is the trace that will be used
	<threshold> - is the level below which trace data peaks are ignored. Note that the threshold value is required and is always used as a peak criterion. To effectively disable the threshold criterion for this command, provide a substantially low threshold value such as –200 dBm. Also note that the threshold value used in this command is independent of and has no effect on the threshold value stored under the Peak Criteria menu.
	<excursion> - is the minimum amplitude variation (rise and fall) required for a signal to be identified as peak. Note that the excursion value is required and is always used as a peak criterion. To effectively disable the excursion criterion for this command, provide the minimum value of 0.0 dB. Also note that the excursion value used in this command is independent of and has no effect on the

excursion value stored under the Peak Criteria menu.

Values must be provided for threshold and excursion. The sorting and display line parameters are optional (defaults are AMPLitude and ALL).

Note that there is always a Y-axis value for the display line, regardless of whether the display line state is on or off. It is the current Y-axis value of the display line which is used by this command to determine whether a peak should be reportedSorting order:

AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)

FREQuency - lists the peaks in order of occurrence, left to right across the x-axis.

TIME - lists the peaks in order of occurrence, left to right across the x-axis.

Peaks vs. Display Line:

ALL - lists all of the peaks found (default if optional parameter not sent).

GTDLine (greater than display line) - lists all of the peaks found above the display line.

LTDLine (less than display line) - lists all of the peaks found below the display line.

Initial S/W Revision	Prior to A.02.00

Hardware-Accelerated Fast Power Measurement (Remote Command Only)

The Fast Power option (FP2) enables very fast channel power measurements for instruments with the prerequisite hardware (DP2 and/or B40). It accomplishes this by peforming real-time overlapped FFTs at the hardware layer, using software for basic post-processing before returning the result to the user. The upshot of this approach is improved throughput for user applications that require many sequential power measurements.

The analysis bandwidth of FP2 is limited by the licenses in the instrument, but its maximum overall analysis bandwidth per acquisition is 40 MHz.

FP2 is remote-only, which means the instrument does not switch to any particular mode or measurement. FP2 commands can be sent while another application is in use on the front panel.

Each Fast Power measurement can be predefined using an array index, and up to 1,000 measurements can be stored. In the following documentation, instances of [1,2,...,999] can be substituted with a particular measurement index, e.g. CALC:FPOW:POW1?, CALC:FPOW:POW2?, CALC:FPOW:POW134?. In this way, power measurements can be defined one time in a batch, and then executed multiple times without having to redefine them, similar to "list mode" on other measurements.

In addition to basic channel power measurements, there are a number of other measurement "functions" for each channel, including peak power, peak frequency, and power spectral density. See the Function parameter for more information.

Reset Fast Power Measurement (Remote Command Only)

Resets the measurement configuration to the defaults.

Mode	All
Remote Command	:CALCulate:FPOWer:POWer[1,2,…,999]:RESet
Example	:CALC:FPOW:POW1:RES

Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

Define Fast Power Measurement (Remote Command Only)

Fast Power acquisitions are configured using the DEFine command. This command accepts a comma-delimited string of configuration parameters and their appropriate values, which are all specified in the subsection below.

Mode	All
Remote Command	`:CALCulate:FPOWer:POWer[1,2,…,999]:DEFine "configuration string"`
Example	:CALC:FPOW:POW1:DEF "CenterFrequency=2e9, AcquisitionTime=0.005"
Notes	See below for a list of measurement variables that can be defined in the configuration string.
Initial S/W Revision	A.14.00

Acquisition Time

Value	Time (s)
Range	0 s to 1 s
Preset	0.001 s
Example	CALC:FPOW:POW1:DEF "AcquisitionTime=0.002"
Notes	The acquisition time parameter sets the time in which the entire spectrum is measured. An increase in the acquisition time yields an improvement in measurement repeatability.
Initial S/W Revision	A.14.00

Center Frequency

Value	Frequency (Hz)
Range	0 Hz to maximum instrument frequency
Preset	1 GHz
Example	CALC:FPOW:POW1:DEF "CenterFrequency=2e9"
Notes	The center frequency parameter sets the frequency in which the measurement is centered around. The OffsetFrequency parameter is calculated relative to the center frequency.
Initial S/W Revision	A.14.00

DC Coupled

Value	Boolean
Range	True (DC Coupled) or False (AC Coupled)
Preset	False
Example	CALC:FPOW:POW1:DEF "DCCoupled=True"
Notes	The DC coupled parameter allows the user to specify whether the DC blocking capacitor is utilized. Set parameter to true when measuring frequencies below 10 MHz.
Initial S/W Revision	A.14.00

DetectorType

Example	CALC:FPOW:POW1:DEF "DetectorType=Peak"
Notes	Option FP2 is required. The detector type parameter allows the user to choose whether a RMS average or peak value is used during the measurement.
Preset	RmsAverage
Range	RmsAverage, Peak
Initial S/W Revision	A.14.00

Do Noise Correction

Value	Boolean
Range	True (enable noise correction) or False (disable noise correction)
Preset	False
Example	CALC:FPOW:POW1:DEF "DoNoiseCorrection=True"
Notes	When noise correction is enabled, the linear noise power contributed by the analyzer is subtracted from all measurements. This effectively lowers the noise floor of the analyzer. When noise correction is enabled, the first measurement for a given set of input parameters will take extra time. This is because the analyzer takes an extra acquisition with the RF input disconnected from the analyzer's front end to measure the noise of just the analyzer. The measured noise floor is stored in a cache so the noise acquisition will occur only once for the same state settings. In other words, if noise correction was turned on and the analyzer made an acquisition at frequency A, then frequency B, and back again to frequency A, the hidden initial noise floor acquisition would only occur for the first acquisition at frequency A and the cached noise floor would be used the second time frequency A was measured.
Initial S/W Revision	A.14.00

Do Spur Suppression

Value	Boolean
Range	True (enable spur suppression) or False (disable spur suppression)
Preset	False
Example	CALC:FPOW:POW1:DEF "DoSpurSuppression=True"
Notes	When measuring very low level signals, or when large out-of-band inputs are input into the analyzer, sometimes unwanted spurs and residuals can appear in the measured spectrum. Spur suppression is a method to help minimize the levels of these internally generated spurs and residuals.
	When spur suppression is enabled, the analyzer will automatically take two acquisitions using two different internal analog LO frequencies. The FFT spectrums from both acquisitions are combined by taking the minimum power between both traces on a per FFT bin basis. External signals will have the same amplitude for both traces and therefore will return the expected amplitudes. However, low level spurs and residuals generated internally to the analyzer tend to move to different FFT bins depending on the internal analog LO frequency used, and therefore tend to be suppressed using this spur suppression method.
	Because two acquisitions, rather than a single acquisition, are made when spur suppression is enabled, the measurement time will always be slower when spur suppression is enabled.
Initial S/W Revision	A.14.00

Electronic Attenuator Bypass

Value	Boolean
Range	True (bypass electronic attenuator) or False (use electronic attenuator)
Preset	True
Example	CALC:FPOW:POW1:DEF "ElecAttBypass =False"
Notes	The electronic attenuation bypass parameter allows the user to either utilize or bypass the electronic attenuator. The electronic attenuator is only available for frequencies up to 3.6 GHz. Set parameter to true when using frequencies above 3.6 GHz and set the parameter to false when using the preamp.
Initial S/W Revision	A.14.00

Electronic Attenuation

Value	dB
Range	0 – 24 dB (1 dB steps)
Preset	0 dB
Example	CALC:FPOW:POW1:DEF "ElecAttenuation=10"
Notes	Option EA3 is required.
	The electronic attenuation value parameter sets the amount of electrical attenuation from 0 to 24 dB (1 dB steps).

	Set "ElecAttBypass=False" to make sure the electronic attenuator path is enabled.
Initial S/W Revision	A.14.00

IF Gain

Value	dB
Range	–6 – 16 dB (1 dB steps)
Preset	0 dB
Example	CALC:FPOW:POW1:DEF "IFGain=10"
Notes	The IF gain parameter allows the user to specify the gain at the IF stage anywhere from –6 to 16 dB (1 dB steps). This is an advanced feature, and for most cases this should remain at its default value of 0 dB.
Initial S/W Revision	A.14.00

IF Type

Example	CALC:FPOW:POW1:DEF "IFType=B25M"
Notes	The IF type parameter allows the user to select between different IF paths. For example, if the signal is less than 25 MHz wide, then the user can select the B25M path to take advantage of additional filtering on this analog IF path.
Preset	B40M
Range	B10M, B25M, B40M
Initial S/W Revision	A.14.00

Include Power Spectrum

Value	Boolean
Range	True (return both channel power and full power spectrum) or False (returns only channel power)
Preset	False
Example	CALC:FPOW:POW1:DEF "IncludePowerSpectrum=True"
Notes	The power spectrum parameter allows the user to read data on the entire spectrum for diagnostic purposes. It is not recommended for production use. See CALC:FPOW:POW[n]:READ2? for details on the binary format of the response.
Initial S/W Revision	A.14.00

Mechanical Attenuation

Value	dB
Range	0 – 70 dB (2 dB steps)
Preset	0 dB
Example	CALC:FPOW:POW1:DEF "MechAttenuation=10"
Notes	The mechanical attenuation value parameter sets the amount of mechanical attenuation anywhere from 0 to 70 dB (2 dB steps).
Initial S/W Revision	A.14.00

Preamp Mode

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The license for the appropriate preamp is required. The preamp mode parameter specifies whether the preamps are being utilized. Low allows any preamps up to 3.6 GHz, and Full allows all licensed preamps. Set "ElecAttBypass=True" in order to utilize any preamps.
Preset	Off
Range	Off, Low, Full
Initial S/W Revision	A.14.00

Resolution Bandwidth Mode

Example	CALC:FPOW:POW1:DEF "PreAmpMode=Low"
Notes	The resolution bandwidth mode parameter allows the user to choose whether the RBW filter is automatically or manually set. The BestSpeed value minimizes measurement time, while the Narrowest value minimizes RBW size (minimum of two FFT bins per RBW). To manually specify an RBW, set this parameter to Explicit, and set the ResolutionBW parameter to the desired value.
Preset	BestSpeed
Range	BestSpeed, Narrowest, Explicit
Initial S/W Revision	A.14.00

Resolution Bandwidth

Value	Hz
Preset	0 Hz

Example	CALC:FPOW:POW1:DEF "ResolutionBW=25e3"
Notes	The resolution bandwidth parameter sets the 3-dB bandwidth of the RBW filter. The ResolutionBWMode parameter must be set to Explicit in order to manually set the RBW.
Initial S/W Revision	A.14.00

Trigger Delay

Value	Seconds
Range	0 – 1 s
Preset	0 s
Example	CALC:FPOW:POW1:DEF "TriggerDelay=0.025"
Notes	The trigger delay parameter sets the time after an external trigger is detected until the measurement is performed.
Initial S/W Revision	A.14.00

Trigger Level

Value	Volts
Range	–5 to 5 V
Preset	1.2 V
Example	CALC:FPOW:POW1:DEF "TriggerLevel=2"
Notes	The trigger level parameter sets the voltage value at which an external trigger is detected.
Initial S/W Revision	A.14.00

Trigger Slope

Example	CALC:FPOW:POW1:DEF "TriggerSlope=Negative"
Notes	The trigger slope parameter indicates the direction of the edge trigger voltage for detection.
Preset	Positive
Range	Positive, Negative
Initial S/W Revision	A.14.00

Trigger Source

Example	CALC:FPOW:POW1:DEF "TriggerSource=Ext1"
Notes	The trigger source parameter allows the user to choose between measurement's triggering freely or controlled by an external input. Ext1 and Ext2 correspond to Trigger 1 In and Trigger 2 In, respectively.
Preset	Free
Range	Free, Ext1, Ext2
Initial S/W Revision	A.14.00

Trigger Timeout

Value	Seconds
Range	0 – 1 s
Preset	1 s
Example	CALC:FPOW:POW1:DEF "TriggerTimeout=0.1"
Notes	The trigger timeout parameter sets the time in which the analyzer will wait for a trigger before automatically performing the measurement.
Initial S/W Revision	A.14.00

Signal Input

Example	CALC:FPOW:POW1:DEF "SignalInput=Fp50MHzCW"
Notes	The signal input parameter allows the user to select between using the main RF input or the internal analyzer reference CW signal of 50 MHz.
Preset	FpMainRf
Range	FpMainRf, Fp50MHzCW
Initial S/W Revision	A.14.00

Use Preselector

Value	Boolean
Range	True (use preselector above 3.6 GHz), or False (preselector bypassed)
Preset	False
Example	CALC:FPOW:POW1:DEF "UsePreSelector=True"
Notes	The preselector parameter allows the user to either utilize or bypass the front end tunable filter at frequencies above 3.6 GHz. For frequencies below 3.6 GHz, the preselector is automatically

	bypassed, so you do not need to set this parameter to False in those cases.
Initial S/W Revision	A.14.00

Channel Bandwidth Array

Value	Hz
Range	0 to 40 MHz
Preset	[1e6]
Example	CALC:FPOW:POW1:DEF "Bandwidth=[3.84e6, 5e6, 3.84e6]"
Notes	The bandwidth parameter array defines the bandwidth of each channel that will be measured.
	All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.
Initial S/W Revision	A.14.00

Channel Filter Type Array

Example	CALC:FPOW:POW1:DEF "FilterType=[RRC, IBW, RRC]"
Notes	The filter type parameter allows the user to choose between an integration bandwidth (IBW) filter or a root-raised-cosine (RRC) filter. The integration bandwidth filter weighs all frequencies within the bandwidth equally. The root-raised-cosine filter has an associated shape parameter, defined by the FilterAlpha parameter.
	All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.
Preset	[IBW]
Range	IBW, RRC
Initial S/W Revision	A.14.00

Channel Filter Alpha Array

Example	CALC:FPOW:POW1:DEF "FilterAlpha=[0.5, 0.0, 0.5]"
Notes	The filter alpha parameter allows the user to adjust the alpha value associated with the root-raised-cosine (RRC) filter type. Set FilterType to RRC in order to utilize this parameter.
	All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single number with no square brackets can be used to define the parameter.
Preset	[0.22]
Range	0.0 – 1.0
Initial S/W Revision	A.14.00

Channel Measurement Function Array

Example	CALC:FPOW:POW1:DEF "Function=[BandPower, PeakPower, BandPower]"
Notes	This parameter array defines what measurement is being made for each individually-specified channel:
	BandPower: Total power within the specified bandwidth of the channel (dBm)
	BandDensity: Total power density within the specified bandwidth of the channel (dBm/Hz)
	PeakPower: The peak power value within the specified bandwidth of the channel (dBm)
	PeakFrequency: The frequency which corresponds to the peak power value within the specified bandwidth of the channel. This frequency is relative to the center frequency (Hz)
	XdBBandwidth: The half power (–3.01 dB) bandwidth of the highest amplitude signal that resides within the channel (Hz), dB is configurable using XdBBandwidth parameter
	OccupiedBandwidth: The bandwidth at which 99% of the total power resides within the channel (Hz), percentage configurable using OccupiedBandwidthPercent parameter
	All array parameters should have the same number of elements. Alternatively, if all the elements are the same value, a single value with no square brackets can be used to define the parameter.
Preset	[BandPower]
Range	BandPower, BandDensity, PeakPower, PeakFrequency, XdBBandwidth, OccupiedBandwidth
Initial S/W Revision	A.14.00

Channel Offset Frequency Array

Value	Hz
Range	0 to 20 MHz
Preset	[0]
Example	CALC:FPOW:POW1:DEF "OffsetFrequency=[–5e6, 0, 5e6]"
Notes	The offset frequency parameter array defines the difference between the center frequency to the center frequency of each channel.
	All array parameters should have the same number of elements.
Initial S/W Revision	A.14.00

Channel Occupied Bandwidth Percent Array

Example	CALC:FPOW:POW1:DEF "OccupiedBandwidthPercent =[0.95, 0.95, 0.95]"
Notes	This parameter only applies for channels whose Function is set to OccupiedBandwidth. The occupied bandwidth percent parameter specifies the percent of total power in these channels. The valid range for this parameter is 0.0 to 1.0, where 1.0 represents 100%. The default for this parameter is 0.99, which will return the bandwidth that contains 99% of the total channel power.

Preset	[0.99]
Range	0 – 1.0
Initial S/W Revision	A.14.00

Channel x-dB Bandwidth Array

Value	dB
Range	–200 to 0 dB
Preset	[–3.01]
Example	CALC:FPOW:POW1:DEF " XdBBandwidth =[–6.02, –3.01, –1.0]"
Notes	This parameter only applies for channels whose Function is set to XdBBandwidth. The X dB bandwidth parameter is used to specify the power relative to the peak channel power over which the bandwidth is calculated. The parameter value must be a negative number.
Initial S/W Revision	A.14.00

Define Fast Power Measurement Query (Remote Command Only)

The DEFine? command is used to retrieve a list of all defined parameters in an ASCII string format

M o d e	All
R e m o t e C o m m a n d	`:CALCulate:FPOWer:POWer[1,2,…,999]:DEFine?`
E x a m	:CALC:FPOW:POW1:DEF?

p l e	
N o t e s	This command query is used to retrieve a list of all defined parameters in an ASCII format.
	The following is an example of the returned results:
	"DCCoupled=False,ElecAttBypass=True,ElecAttenuation=0,IFGain=0,MechAttenuation=0,PreAmpMode=Off,PreSelectorOffset =0,UsePreSelector=False,ExternalReferenceFrequency=10000000,FrequencyReferenceSource=AutoExternalFrequencyRefer ence,IFType=B40M,LOMode=SLW,SignalInput=FpMainRf,AcquisitionTime=0.001,CenterFrequency=1000000000,Resolution BW=0,ResolutionBWMode=BestSpeed,DetectorType=RmsAverage,Bandwidth=[1000000],OffsetFrequency=[0],Function= [BandPower],FilterType=[IBW],FilterAlpha=[0.22],OccupiedBandwidthPercent=[0.99],XdBBandwidth=[– 3.01],DoNoiseCorrection=False,DoSpurSuppression=False,MeasurementMethod=HardwareFFT,IncludePowerSpectrum=Fals e,TriggerDelay=0,TriggerLevel=1.2,TriggerSlope=Positive,TriggerSource=Free,TriggerTimeout=1"
I n i t i a l S / W R e v i s i o n	A.14.00

Configure Fast Power Measurement (Remote Command Only)

The configure command begins hardware setup and returns immediately, with no acquisition made. This can be used in parallel with other hardware operations to effectively hide the hardware setup time.

Mode	All
Remote Command	:CALCulate:FPOWer:POWer[1,2,…,999]:CONFigure
Example	:CALC:FPOW:POW1:CONF
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

Initiate Fast Power Measurement (Remote Command Only)

The INITiate command begins an acquisition and returns immediately. The results of the measurement can be retrieved using FETCh.

Mode	All
Remote Command	`:CALCulate:FPOWer:POWer[1,2,…,999]:INITiate`
Example	:CALC:FPOW:POW1:INIT
Notes	Option FP2 is required.
Initial S/W Revision	A.14.00

Fetch Fast Power Measurement (Remote Command Only)

The FETCh command query is used to retrieve the results of an acquisition initiated by the INIT command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
Remote Command	`:CALCulate:FPOWer:POWer[1,2,…,999]:FETCh?`
Example	:CALC:FPOW:POW1:FETC?
Notes	Option FP2 is required.
	Returns m comma-separated ASCII values, where m corresponds to the number of bandwidths defined.
	1. Declared function return in the 1st specified channel
	2. Declared function return in the 2nd specified channel
	…
	m. Declared function return in the last specified channel
	The INIT and FETC? command sequence performs the same functionality of a single CALC:FPOW:POW[n]? query. Units of the returned values are dependent on the Function parameter for each channel.
Initial S/W Revision	A.14.00

Execute Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in ASCII string format. The string begins and ends with quotation marks.

Mode	All
Remote Command	`:CALCulate:FPOWer:POWer[1,2,…,999]?`
Example	:CALC:FPOW:POW1?
Notes	Option FP2 is required.
	See notes for Fast Power Fetch for return format.
Initial S/W Revision	A.14.00

Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format.

Mode	All
Remote Command	`:CALCulate:FPOWer:POWer[1,2,…,999]:READ?`
	`:CALCulate:FPOWer:POWer[1,2,…,999]:READ1?`
Example	:CALC:FPOW:POW1:READ?
	:CALC:FPOW:POW1:READ1?
Notes	Option FP2 is required.
	Returns m 4 byte floating point binary values (Little-Endian), where m corresponds to the number of bandwidths defined.
Initial S/W Revision	A.14.00

Diagnostic Binary Read Fast Power Measurement (Remote Command Only)

This command query is used as shorthand for an INIT command immediately followed by a FETC? command. The returned results are in a binary format. This command is used primarily for diagnostic purposes to test for ADC overloads and to visibly inspect the spectrum.

Mode	All
Remote Command	`:CALCulate:FPOWer:POWer[1,2,…,999]:READ2?`
Example	:CALC:FPOW:POW1:READ2?
Notes	Option FP2 is required.
	Note: Spectrum data is only returned if the IncludePowerSpectrum parameter is set to True. If IncludePowerSpectrum is False, the number of spectrum points will be zero (0).
	Units of the returned values are dependent on the Function parameter per channel (e.g. dBm for BandPower, Hz for PeakFrequency).
	Returns binary data (Little-Endian) that contains information on m amount of channels, along with ADC over range and full spectrum data.
	The following is the binary format of the response.
	Bandwidth Return Value
	1. Number of channels specified, m [4 byte int]
	2. Declared function result for the 1st specified channel [4 byte float]
	3. Declared function result for the 2nd specified channel [4 byte float]
	...
	(m + 1). Declared function result for the last (mth) specified channel [4 byte float]
	ADC Over Range
	1. ADC over-range occurred (1: true, 0: false) [2 byte short]

	Spectrum Data
	1. Number of points in the spectrum data, k [4 byte int]
	2. Start frequency of spectrum data (Hz) [8 byte double]
	3. Step frequency of spectrum data (Hz) [8 byte double]
	4. FFT bin at 1st point (dBm) [4 byte float]
	5. FFT bin at 2nd point (dBm) [4 byte float]
	...
	(k + 3). FFT bin at last (kth) point (dBm) [4 byte float]
Initial S/W Revision	A.14.00

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.

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

Meas Setup

Accesses menus that allow you to set measurement setup parameters.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Average Num

Sets the number of data acquisitions that will be averaged. Averaging can be turned on or off.

> **NOTE** During calibration the value you select for Average Count is translated into a sweep time for each point. An Average Count of 10 results in a sweep time of 160ms (160ms at each measurement point if you are using the default sweep time). There are 2 measurement points per freq point. One measurement for noise source Off and one for On. If Averages (under Meas Setup) is set to on, then for a Cal the app uses effectively point type averaging and for Meas, it reverts back to sweep type averaging.

Key Path	Meas Setup
Mode	NF
Remote Command	`[:SENSe]:NFIGure:AVERage:COUNt <integer>`
	`[:SENSe]:NFIGure:AVERage:COUNt?`
	`[:SENSe]:NFIGure:AVERage[:STATe] ON|OFF|1|0`
	`[:SENSe]:NFIGure:AVERage[:STATe]?`
Example	:NFIG:AVER:COUN 100
	:NFIG:AVER OFF
Preset	10
	OFF
State Saved	Saved in instrument state.
Min	1
Max	10000
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:AVERage:COUNt`
	`[:SENSe]:SWEep:COUNt`
Initial S/W Revision	Prior to A.04.00

ENR

Accesses a menu of functions that determines how you load the ENR data.

For more information refer to the following sections:

Key Path	Meas Setup
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

ENR Mode

Selects between Table and Spot ENR operation.

- Table – ENR values are taken from the ENR table(s).

- Spot – a single ENR value is applied at all frequencies.

- Both Table and Spot ENR data can be configured side-by-side and this function can be used to toggle between them.

Key Path	Meas Setup, ENR
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:MODE TABLe|SPOT`
	`[:SENSe]:NFIGure:CORRection:ENR:MODE?`
Example	NFIG:CORR:ENR:MODE TABL
Preset	TABLe
State Saved	Saved in instrument state.
Range	TABLe|SPOT
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:ENR:MODE`
Initial S/W Revision	Prior to A.04.00

Use Meas Table Data for Cal

When turned on, the ENR data for both measurement and calibration is sourced from a combined ENR table. When turned off, the measurement and calibration ENR data is sourced from separate tables (See).

Key Path	Meas Setup, ENR
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:COMMon[:STATe] ON|OFF|1|0`
	`[:SENSe]:NFIGure:CORRection:ENR:COMMon[:STATe]?`
Example	NFIG:CORR:ENR:COMM ON
Preset	ON
State Saved	Saved in instrument state.

Range	ON|OFF|1|0
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:ENR:COMMon[:STATe]`
Initial S/W Revision	Prior to A.04.00
Coupling	1. Cal table disabled when ON.
	2. Error message 171.0002 displayed if ON and no data in Meas Table or OFF and no data in Meas or Cal table.
	3. If Preference is set to SNS and Auto Load ENR is ON, upon connection of an SNS Use Meas Table Data for Cal will be switched ON.

Meas Table

Brings up the ENR Table editor (see section "Table Editor Operation" on page 549 for details), which should contain the data for the noise source that is currently being used for the measurement. If no valid meas ENR data exists, a warning message (will be displayed and the ENR status area will display 'ENR' in red.

If Use Meas Table Data for Cal is turned ON, the ENR data for calibration and measurement are taken from this ENR Table.

Note, when each parameter in the table is entered the table is saved. Once a new ENR Table is entered, the applicationn will store this table in non-volatile memory, to allow restoring after a power cycle.

Duplicates are NOT allowed in the frequency field of the Meas Table, but duplicate ENR values at different frequencies are acceptable.

Meas Table
Noise Source ID = 346B
Noise Source Serial = 3228A10653

Frequency	ENR Value
1.000000000 GHz	0.00 dB
1.100000000 GHz	10.80 dB
1.200000000 GHz	14.90 dB
1.300000000 GHz	16.20 dB
1.400000000 GHz	18.50 dB
1.500000000 GHZ	20.00 dB
1.600000000 GHz	21.40 dB

Key Path	Meas Setup, ENR
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Coupling	Error 171.0002 displayed if no data in table.

Serial

In order to obtain the best accuracy, ENR Data is uniquely derived for each noise source. This data can be found printed on the side of the source body in the case of Agilent Sources. It is a good idea to enter the serial number and model ID of the source into the table – this way you can tell 'at-a-glance' whether the data is valid for a specific source or not.

The Meas and Cal tables both have an independent serial number and model ID parameter.

Key Path	Meas Setup, ENR, Meas Table|Cal Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SERial:DATA <string>`
	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SERial:DATA?`
Example	NFIG:CORR:ENR:MEAS:TABL:SER:DATA "4015A05450"

Preset	""
State Saved	Saved in instrument state.
Range	a-zA-Z0–9
Initial S/W Revision	Prior to A.04.00

Model ID

In order to obtain the best accuracy, ENR Data is uniquely derived for each noise source. This data can be found printed on the side of the source body in the case of Agilent Sources. It is a good idea to enter the serial number and model ID of the source into the table – this way you can tell 'at-a-glance' whether the data is valid for a specific source or not.

The Meas and Cal tables both have an independent serial number and model ID parameter.

Key Path	Meas Setup, ENR, Meas Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:ID:DATA <string>`
	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:ID:DATA?`
Example	CORR:ENR:CAL:TABL:ID:DATA "346A"
Preset	""
State Saved	Saved in instrument state.
Range	a-zA-Z0–9
Initial S/W Revision	Prior to A.04.00

Table Editor Operation

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

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

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

See also:

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

Navigate

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

Key Path	• Freq, Edit Freq List, Edit • Meas Setup, ENR, Meas Table, Edit • Meas Setup, ENR, Cal Table, Edit • Meas Setup, Limits, Edit • Meas Setup, Loss Comp, Before DUT, Table, Edit • Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	Navigate
State Saved	No
Range	Navigate | Frequency | Amplitude (optional) Range of enumerates can be 2 or 3, depending on current use, but first member will always be Navigate. Additional members are provided by the user of the Common Table Editor
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	• Note that the arrow keys always navigate between rows.

Insert Point Below

Inserts point below the currently selected row.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	If the currently-selected point is being edited, the point is completed. A new point is inserted below the currently-selected point; the data in the new point is copied from the current point. The independent variable (usually Frequency) is highlighted for edit.

Delete Point

Deletes currently selected row in the table editor.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	It will immediately delete the currently-selected point, whether or not that point is being edited, and select Navigate. The point following the currently-selected point (or the point proceeding if there is none) will be selected.

Navigating

When navigate is highlighted, the selected row is highlighted, per the figure below.

Frequency	Amplitude
10.000000 MHz	15.39 dB
100.000000 MHz	15.47 dB
1.000000000 GHz	15.31 dB
2.000000000 GHz	15.15 dB

The Up arrow key moves up one row, while the down arrow keys move down one row. Enter moves down one row. The front-panel knob and Left and Right arrow keys are also available to navigate the table.

The blank row is automatically displayed if there are no points in the table. In this case, the default values are specified by the measurement (typically measurements will use the center frequency as the default value, and some benign default Y value such as 0 dB for correction data).

Editing

Frequency	Amplitude
10.000000 MHz	15.39 dB
100.000000 MHz	15.47 dB
1.000000000 GHz	15.31 dB
2.000000000 GHz	15.15 dB

When one of the column keys (for example: Frequency or Amplitude) is highlighted, the relevant field in the current row is highlighted.

Numeric keys, Up, Down, Left and Right arrow keys, and the front-panel knob change the data in the appropriate column. The step size for the front-panel knob and arrow keys, and the units for numeric entry, vary by application. The changes are immediately reflected in the active function area, and also in the table itself. In the case of numeric entry, changes to the table are not confirmed until the user presses "Enter" or a terminator key. Front-panel knob-initiated changes are confirmed immediately.

Confirmed changes to the independent variable (usually Frequency) immediately sorts the selected row into the appropriate position in the table. If another point has the same frequency, and duplicates are allowed, the new point maintains the same relative position in the table. For example, if you are editing point 1, and give it the same frequency as point 7, the row is sorted just before point 7. If you are editing point 9, and give it the same frequency as point 7, the row is sorted just after point 7.

If the user presses "Enter" or a terminator key, the next column in the table is edited. If the last column in the table is being edited, a new point is inserted (exactly as if the user had pressed "Insert Point Below").

The table is set up to disallow duplicate independent variables. For example: if you set a value for an independent variable that is the same as an already existing value, the duplicate is deleted upon completion of editing.

Fill Table From SNS

This softkey can be used to invoke population of the Meas Table or Cal Table from an SNS. It is only available when an SNS is connected to the analyzer.

Key Path	Meas Setup, ENR, Meas Table|Cal Table

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SNS`
Example	NFIG:CORR:ENR:TABL:SNS
Initial S/W Revision	Prior to A.04.00

Clear Table

Clear Meas ENR Table

This function clears all data from the Meas ENR table and removes the table's backup from persistent storage.

Key Path	Meas Setup, ENR, Meas Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR[:MEASurement]:TABLe:DATA:DELete`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clears all entried in the Meas ENR table, this operation will interrupt the current measurement immediately

Clear Cal ENR Table

This function clears all data from the ENR table and removes the table's backup from persistent storage.

Key Path	Meas Setup, ENR, Cal Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:CALibration:TABLe:DATA:DELete`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clears all entried in the Cal ENR table. If the Cal ENR table data is being used in measurement, clear all the content will interrupt the current measurement immediately

Title

The Meas Table should have a three line title:

Meas Table

Noise Source ID = ‹noise source ID›

Noise Source Serial = ‹noise source serial›

Where <noise source ID> is read from the Model ID parameter and <noise source serial> is read from the Serial # parameter.

Columns

The Meas Table has two columns. The first (and leftmost) is titled 'Frequency' and uses frequency terminators. The second is titled 'ENR Value' and uses power terminators.

Frequency

Enables you to enter the frequency component of a frequency/amplitude pair.

Key Path	Meas Setup, ENR, Meas Table, Edit
Mode	NFIGURE
Preset	10 Hz
State Saved	Saved in instrument state.
Range	10 kHz to 325 GHz
Min	10 kHz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00

ENR Value

Enables you to enter the amplitude component of a frequency/amplitude pair.

Key Path	Meas Setup, ENR, Meas Table, Edit
Mode	NFIGURE
Preset	0 dB
State Saved	Saved in instrument state.
Range	–200 to 200 dB
Min	–200 dB
Max	200 dB
Initial S/W Revision	Prior to A.04.00

Setting ENR Table Remotely (remote command only)

Data can be entered into the current measurement or calibration ENR table using SCPI. Parameters are provided in frequency/amplitude pairs, the units beinGHz and dB respectively. Up to 501 point-pairs will be accepted. See the above Frequency and ENR Value definitions for the acceptable parameter ranges.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:DATA <frequency>, <amplitude> ([, <frequency>, <amplitude>])
	[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:DATA?

Example	NFIG:CORR:ENR:CAL:TABL:DATA 1000, –10, 2000, –8, 3000, –6, 10000, 5

Remote Command Notes	Between 1 and 501 points must be entered.
Initial S/W Revision	Prior to A.04.00

ENR Table Entry Count (remote command only)

The number of frequency/amplitude point-pairs in the current measurement or calibration table can be obtained using SCPI. If the table is empty, the size returned is 0.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:COUNt?`
Example	NFIG:CORR:ENR:MEAS:TABL:COUNt?
Preset	0
Range	0 – 501
Min	0
Max	501
Initial S/W Revision	Prior to A.04.00

Loading and Saving ENR Data Files

Agilent Noise Sources are delivered complete with a floppy disk containing ENR Data particular to that source. It is possible to read this data directly into the measurement, and even save the data in the same format if changes are required, or if the disk has been lost. The ENR Data can be copied onto a USB flash drive for loading onto the instrument using a PC equipped with a floppy drive and USB support.

Once a new ENR Table is entered, the application should store this table in non-volatile memory, to allow restoring after a power cycle.

Refer to the section, "Entering Excess Noise Ratio (ENR) Data" in the Measurement Guide and Programming Examples Manual . This can be accessed by pressing the green Help key, then selecting the "Additional Documentation" page in the Table of Contents on the left side of the display. Scroll down to locate the Noise Figure section and you will see the Measurement Guide and Programming Examples button which when selected opens the PDF of this book.

Cal Table

Brings up the Cal Table editor (see section"Table Editor Operation" on page 549 for details), which should contain the calibration ENR data for the noise source that is currently being used.

This softkey is only available when Use Meas Table Data for Cal is turned off. Once a new Cal Table is entered, the application should store this table in non-volatile memory, to allow restoring after a power cycle.

Duplicates are NOT allowed in the frequency field of the Cal Table, but duplicate ENR values at different frequencies are acceptable.

Cal Table
Noise Source ID = 346B
Noise Source Serial = 3228A10653

Frequency	ENR Value
1.000000000 GHz	0.00 dB
1.100000000 GHz	10.80 dB
1.200000000 GHz	14.90 dB
1.300000000 GHz	16.20 dB
1.400000000 GHz	18.50 dB
1.500000000 GHZ	20.00 dB
1.600000000 GHz	21.40 dB

Key Path	Meas Setup, ENR
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Coupling	4. Only available when Use Meas Table Data for Cal is OFF.
	5. Error 171.0002 displayed if no data in table and Use Meas Table Data for Cal is OFF

Serial #

In order to obtain the best accuracy, ENR Data is uniquely derived for each noise source. This data can be found printed on the side of the source body in the case of Agilent Sources. It is a good idea to enter the serial number and model ID of the source into the table – this way you can tell 'at-a-glance' whether the data is valid for a specific source or not.

The Meas and Cal tables both have an independent serial number and model ID parameter.

Key Path	Meas Setup, ENR, Meas Table|Cal Table
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SERial:DATA <string>
	[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SERial:DATA?
Example	NFIG:CORR:ENR:MEAS:TABL:SER:DATA "4015A05450"

Preset	""
State Saved	Saved in instrument state.
Range	a-zA-Z0–9
Initial S/W Revision	Prior to A.04.00

Model ID

In order to obtain the best accuracy, ENR Data is uniquely derived for each noise source. This data can be found printed on the side of the source body in the case of Agilent Sources. It is a good idea to enter the serial number and model ID of the source into the table – this way you can tell 'at-a-glance' whether the data is valid for a specific source or not.

The Meas and Cal tables both have an independent serial number and model ID parameter.

Key Path	Meas Setup, ENR, Meas Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:ID:DATA <string>`
	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:ID:DATA?`
Example	CORR:ENR:CAL:TABL:ID:DATA "346A"
Preset	""
State Saved	Saved in instrument state.
Range	a-zA-Z0–9
Initial S/W Revision	Prior to A.04.00

Table Editor Operation

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

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

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

See also:

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

Navigate

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

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	Navigate
State Saved	No
Range	Navigate	Frequency	Amplitude (optional)
	Range of enumerates can be 2 or 3, depending on current use, but first member will always be Navigate. Additional members are provided by the user of the Common Table Editor
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	• Note that the arrow keys always navigate between rows.

Insert Point Below

Inserts point below the currently selected row.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	If the currently-selected point is being edited, the point is completed. A new point is inserted below the currently-selected point; the data in the new point is copied from the current point. The independent variable (usually Frequency) is highlighted for edit.

Delete Point

Deletes currently selected row in the table editor.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	It will immediately delete the currently-selected point, whether or not that point is being edited, and select Navigate. The point following the currently-selected point (or the point proceeding if there is none) will be selected.

Fill Table From SNS

This softkey can be used to invoke population of the Meas Table or Cal Table from an SNS. It is only available when an SNS is connected to the analyzer.

Key Path	Meas Setup, ENR, Meas Table|Cal Table
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:SNS
Example	NFIG:CORR:ENR:TABL:SNS
Initial S/W Revision	Prior to A.04.00

Clear Table

Clear Meas ENR Table

This function clears all data from the Meas ENR table and removes the table's backup from persistent storage.

Key Path	Meas Setup, ENR, Meas Table
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:ENR[:MEASurement]:TABLe:DATA:DELete
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clears all entried in the Meas ENR table, this operation will interrupt the current measurement immediately

Clear Cal ENR Table

This function clears all data from the ENR table and removes the table's backup from persistent storage.

Key Path	Meas Setup, ENR, Cal Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:CALibration:TABLe:DATA:DELete`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clears all entried in the Cal ENR table. If the Cal ENR table data is being used in measurement, clear all the content will interrupt the current measurement immediately

Title

The Meas Table should have a three line title:

Cal Table

Noise Source ID = <noise source ID>

Noise Source Serial = <noise source serial>

Where <noise source ID> is read from the Model ID parameter and <noise source serial> is read from the Serial # parameter.

Columns

The Cal Table has two columns. The first (and leftmost) is titled 'Frequency' and uses frequency terminators. The second is titled 'ENR Value' and uses power terminators.

Frequency

Enables you to enter the frequency component of a frequency/amplitude pair.

Key Path	Meas Setup, ENR, Cal Table, Edit
Mode	NFIGURE
Preset	10 Hz
State Saved	Saved in instrument state.
Range	10 kHz to 325 GHz
Min	10 kHz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00

ENR Value

Enables you to enter the amplitude component of a frequency/amplitude pair.

Key Path	Meas Setup, ENR, Cal Table, Edit

Mode	NFIGURE
Preset	0 dB
State Saved	Saved in instrument state.
Range	−200 to 200 dB
Min	−200 dB
Max	200 dB
Initial S/W Revision	Prior to A.04.00

Setting ENR Table Remotely (remote command only)

Data can be entered into the current measurement or calibration ENR table using SCPI. Parameters are provided in frequency/amplitude pairs, the units beinGHz and dB respectively. Up to 501 point-pairs will be accepted. See the above Frequency and ENR Value definitions for the acceptable parameter ranges.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:DATA <frequency>, <amplitude> ([, <frequency>, <amplitude>] )`
	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:DATA?`
Example	NFIG:CORR:ENR:CAL:TABL:DATA 1000, −10, 2000, −8, 3000, −6, 10000, 5
Remote Command Notes	Between 1 and 501 points must be entered.
Initial S/W Revision	Prior to A.04.00

ENR Table Entry Count (remote command only)

The number of frequency/amplitude point-pairs in the current measurement or calibration table can be obtained using SCPI. If the table is empty, the size returned is 0.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:MEASurement|CALibration:TABLe:COUNt?`
Example	NFIG:CORR:ENR:MEAS:TABL:COUNt?
Preset	0
Range	0 – 501
Min	0
Max	501
Initial S/W Revision	Prior to A.04.00

Loading and Saving ENR Data Files

Agilent Noise Sources are delivered complete with a floppy disk containing ENR Data particular to that source. It is possible to read this data directly into the measurement, and even save the data in the same format if changes are required, or if the disk has been lost. The ENR Data can be copied onto a USB flash drive for loading onto the instrument using a PC equipped with a floppy drive and USB support.

Once a new ENR Table is entered, the application should store this table in non-volatile memory, to allow restoring after a power cycle.

Refer to the section, "Entering Excess Noise Ratio (ENR) Data" in the Measurement Guide and Programming Examples Manual . This can be accessed by pressing the green Help key, then selecting the "Additional Documentation" page in the Table of Contents on the left side of the display. Scroll down to locate the Noise Figure section and you will see the Measurement Guide and Programming Examples button which when selected opens the PDF of this book.

SNS Setup

Accesses the Smart Noise Source setup menu.

Key Path	Meas Setup, ENR
Mode	NF
Initial S/W Revision	Prior to A.04.00
Modified by S/W Revision	A.13.00

Noise Source Preference

Selects the noise source preference. This feature allows you to select which noise source you would prefer to use (if present). If two noise sources are connected (SNS and Normal), this parameter will decide which one is used for measurement and calibration.

If set to SNS(Auto), an SNS noise source will be used if one is present. If an SNS is not present or preference is set to normal then a normal noise source will be used.

If set to NORMal, the SNS T cold and User T cold From SNS parameters are disabled.

On connection of an SNS when Preference is set to SNS, if Auto Load ENR is ON, Use Meas Table Data for Cal will be switched ON and the Meas Table will be automatically populated from the Noise Source. If SNS T cold is set to ON, the T cold parameter will also be populated automatically from the SNS before every sweep.

> **NOTE** This parameter is a *preference* and will not be altered automatically when an SNS is connected/disconnected.

Key Path	Meas Setup, ENR, SNS Setup
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:ENR:PREFerence NORMal|SNS
	[:SENSe]:NFIGure:CORRection:ENR:PREFerence?
Example	NFIG:CORR:ENR:PREF NORM

Remote Command Notes	:New SCPI – taken out of source node.
Preset	SNS
State Saved	Saved in instrument state.
Range	NORMal|SNS
Backwards Compatibility SCPI	`SOURce[:NFIGure]:NOISe[:PREFerence]`
Initial S/W Revision	Prior to A.04.00
Coupling	1. When set to SNS and Auto Load ENR is ON, connection of SNS to instrument sets Use Meas Table Data for Cal to ON.and populates Meas Table from SNS data.
	2. SNS T cold and User T cold From SNS parameters are disabled when set to NORMal
	3. See above for more details.

Auto Load ENR

If Preference is set to SNS and Auto Load ENR is ON, upon connection of an SNS Use Meas Table Data for Cal will be switched ON and ENR data will be automatically loaded into the Meas Table from the SNS, overwriting any existing data.

If set to OFF, the Use Meas Table Data for Cal ON/OFF parameter will not be modified and no data will be loaded into any ENR table automatically. ENR tables can still be populated from the SNS data using the 'Fill Table from SNS' softkey under the appropriate table softpanel.

Key Path	Meas Setup, ENR, SNS Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:AUTO[:STATe] OFF|ON|0|1`
	`[:SENSe]:NFIGure:CORRection:ENR:AUTO[:STATe]?`
Example	NFIG:CORR:ENR:AUTO OFF
	NFIG:CORR:ENR:AUTO?
Preset	ON
State Saved	Saved in instrument state.
Range	ON|OFF|1|0
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:ENR:AUTO[:STATe]`
Initial S/W Revision	Prior to A.04.00
Coupling	See above.

Noise Source State

Enables you to force the noise source to On or Off state. When this function is set to On or Off, the application will turn on/off the noise source and there will be no valid results provided. When noise source

is set to Normal (default setting), the application will control the noise source on/off automatically during measurement.

Noise Source Preference decides which noise source is controlled by this function. If Noise Source Preference is set to "SNS(Auto)", a SNS noise source will be controlled if one is present. If a SNS is not present or Noise Source Preference is set to "Norm", only a normal noise source will be controlled.

Key Path	Meas Setup, ENR, SNS Setup
Mode	NF
Remote Command	SOURce:NFIGure:NOISe:STATe NORMal|ON|OFF
	SOURce:NFIGure:NOISe:STATe?
Example	SOUR:NFIG:NOIS:STAT ON
Preset	NORMal
State Saved	Saved in instrument state.
Range	NORM|ON|OFF
Readback Text	Normal | On | Off
Initial S/W Revision	A.13.00
Coupling	When set to On/Off, "Calibration Now" will be disabled and grayed out.

Normal

The application controls the noise source on/off automatically during measurement.

Key Path	Meas Setup, ENR, SNS Setup, Noise Source State
Initial S/W Revision	A.13.00

On

Forces the noise source to ON. No valid results are provided.

Key Path	Meas Setup, ENR, SNS Setup, Noise Source State
Initial S/W Revision	A.13.00

Off

Forces the noise source to OFF. No valid results are provided.

Key Path	Meas Setup, ENR, SNS Setup, Noise Source State
Initial S/W Revision	A.13.00

SNS Attached (remote command only)

Returns 1 if an SNS is attached otherwise 0.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:SNS:ATTached?`
Example	NFIG:CORR:ENR:SNS:ATT?
Remote Command Notes	Query Only RUI only. :New SCPI – taken out of source node.
State Saved	Saved in instrument state.
Backwards Compatibility SCPI	`SOURce:NOISe:SNS:ATTached?`
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	If an SNS is present the command will return 1 otherwise it will return 0. This function does not consider the Noise Source Preference.

Spot

When the ENR Mode parameter is set to Spot, the parameters under this menu can be used to apply one value, either in dB or Kelvin, instead of an ENR table.

Key Path	Meas Setup, ENR
Mode	NFIGURE
Readback Text	Selected Spot Value (Spot ENR | Spot T hot)
Initial S/W Revision	Prior to A.04.00

Spot ENR

Set the ENR value used when the ENR Mode is Spot and the Spot State is ENR. Spot ENR values have units of decibels (dB).

ENR values are the best way to enter the noise of the most common noise sources, solid state noise sources. Solid state noise sources have an output noise that is the sum of the attenuated noise of a noise diode and the noise of the output attenuator. When the ambient temperature experienced by that output attenuator changes, it changes the output noise in both the cold (off) and hot states of the noise source by the same amount of power. ENR is defined in terms of the difference between Thot and Tcold, and thus remains constant as Tcold changes.

Key Path	Meas Setup, ENR, Spot
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:SPOT <value>`
	`[:SENSe]:NFIGure:CORRection:ENR:SPOT?`
Example	CORR:ENR:SPOT 10 dB

Preset	15.200 dB
State Saved	Saved in instrument state.
Range	–17 dB to 50 dB
Min	–17 dB
Max	50 dB
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:ENR:SPOT`
Initial S/W Revision	Prior to A.04.00

Spot T hot

Set the ENR value used when Spot State is THOT.

Setting Thot is the best way to enter the noise temperature of a noise source that has separate hot and cold loads. Such noise sources are commonly used in national standards laboratories but not by normal users.

Unlike the case with solid state noise sources, with hot and cold loads, the Thot does not change due to changes in Tcold. Therefore, when the user sets Thot, the analyzer does not adjust the Thot according to changes in Tcold.

Key Path	Meas Setup, ENR, Spot
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:ENR:THOT <temperature>`
	`[:SENSe]:NFIGure:CORRection:ENR:THOT?`
Example	NFIG:CORR:ENR:THOT 200.5 K
Preset	9892.80 K
State Saved	Saved in instrument state.
Range	0 K – 29650000 K
Min	0 K
Max	29650000 K
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:ENR:THOT`
Initial S/W Revision	Prior to A.04.00

Spot State

This parameter toggles the Spot value applied to the measurement between Spot ENR (in dB) and Spot Thot (in K).

Key Path	SCPI Only

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:SPOT:MODE ENR	THOT`
	`[:SENSe]:NFIGure:CORRection:SPOT:MODE?`
Example	NFIG:CORR:SPOT:MODE ENR
Preset	ENR
State Saved	Saved in instrument state.
Range	ENR	THOT
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:SPOT:MODE`
Initial S/W Revision	Prior to A.04.00

T Cold Mode

This parameter determines which T cold value is used in the measurement.

- User: a custom T cold value input by the user will be used.

- Default: the default T cold of 296.50 K will be used.

If an SNS is connected and SNS T Cold is ON, the T Cold value used for the NF measurement will be read from the SNS at the beginning of every sweep and the T Cold Mode parameter will be disabled. The User T cold value can also be read once from an SNS (if connected) using the 'User T cold from SNS' parameter.

Key Path	Meas Setup, ENR
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:TCOLd USER|DEFault`
	`[:SENSe]:NFIGure:CORRection:TCOLd?`
Example	NFIG:CORR:TCOL: DEF
Preset	DEFault
State Saved	Saved in instrument state.
Range	USER	DEFault
Readback Text	Second line reads back T cold value.
	Third line reads back T cold mode.
Initial S/W Revision	Prior to A.04.00
Coupling	When SNS T Cold is ON and SNS is connected, parameter (and selection keys) is Disabled.

User T cold Value

Sets the ambient temperature, Tcold, of the noise source. This is the temperature of the termination resistance inside the noise source. If this is set incorrectly, the error in temperature leads to a proportional error in the estimated noise power of that resistor. This error appears as an error in the apparent noise

power at the input of the DUT. This can be very significant for very low NF devices and negligible for high NF devices

Key Path	Meas Setup, ENR, T cold
Mode	NFIGURE
Remote Command	`[:SENSe][:NFIGure]:CORRection:TCOLd:USER:VALue <value>`
	`[:SENSe][:NFIGure]:CORRection:TCOLd:USER:VALue?`
Example	:NFIG:CORR:TCOL:USER:VAL 290K
Preset	296.50 K
State Saved	Saved in instrument state.
Range	0 K to 29650000 K
Min	0K
Max	29650000K
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:TCOLd:USER:VALue`
	`[:SENSe]:CORRection:TEMPerature`
Initial S/W Revision	Prior to A.04.00
Coupling	Disabled when SNS T Cold is ON and SNS is attached.
Note	When setting T cold with SCPI, three units can be used, K (Kelvin), CEL (Celsius) and FAR (Fahrenheit). When inputting with Celsius and Fahrenheit, front panel key will automaticlly convert it to Kelvin to display

SNS T Cold State

When set to ON and an SNS is connected, the T Cold values used in the NF measurement are read from the SNS at the beginning of every sweep. This parameter can be set to ON in anticipation of an SNS being connected (even when SNS is not currently connected). User and Default TCold mode selections are disabled when the is ON and SNS is connected.

Key Path	Meas Setup, ENR, T Cold
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:TCOLd:SNS[:STATe] ON|OFF|1|0`
	`[:SENSe]:NFIGure:CORRection:TCOLd:SNS[:STATe]?`
Example	CORR:TCOL:SNS ON
Preset	Off
State Saved	Saved in instrument state.
Range	ON|OFF|1|0
Readback Text	When ON and SNS is attached, TCold key reads back SNS temperature value and "SNS" and the SNS T Cold key will display the current SNS temperature on the key and in the Settings area.
	If ON and an SNS is not attached, "---" will be displayed on the softkey and the TCold mode parameter will be enabled and used for measurements.
Backwards	`[:SENSe][:NFIGure]:CORRection:TCOLd:SNS[:STATe]`

Compatibility SCPI	
Initial S/W Revision	Prior to A.04.00
Coupling	When ON and SNS is attached, TCold mode selections (USER, DEFault) are disabled.

User T cold From SNS

Takes a temperature reading from the SNS and sets the User T cold parameter. This is only available when T cold Mode is USER.

Key Path	Meas Setup, ENR, T cold
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:TCOLd:USER:SET`
Example	`:NFIG:CORR:TCOL:USER:SET`
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:TCOLd:USER:SET`
Initial S/W Revision	Prior to A.04.00
Coupling	1. Only enabled when SNS is connected.
	2. Only enabled when T cold Mode is USER.

Cal Setup

Opens a menu that enables you to configure the calibration setup.

Key Path	Meas Setup
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Apply Calibration

Enables or disables the application of calibration data to the measurement to derive corrected results. If User Cal is selected and no valid calibration data exists (for example: when a calibration has not been performed or when a frequency parameter is changed), this parameter will be grayed out and status message 0.2208 will alert the user that a "Calibrate Now" is required. This parameter will also be grayed out if a user cancels a User Calibration before it is completed.

Key Path	Meas Setup, Cal Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CALibration:STATe ON|OFF|1|0`
	`[:SENSe]:NFIGure:CALibration:STATe?`

Example	NFIG:CAL:STAT ON
Preset	OFF
State Saved	Saved in instrument state.
Range	ON|OFF|1|0
Backwards Compatibility SCPI	`:DISPlay[:NFIGure]:DATA:CORRections[:STATe]`
	`:DISPlay:DATA:CORRections[:STATe]`
	`[:SENSe]:CORRection[:STATe]`
Initial S/W Revision	Prior to A.04.00
Coupling	1. Only enabled when valid calibration data exists.
	2. Grayed out if a calibration is cancelled before it is completed.
	3. Set to ON when a calibration is successfully completed.
	4. Grayed out when internal cal is selected.
	5. If Cal Type is User Cal, Cal State in Meas bar displays "UNCAL" when OFF and message 0.2208 is displayed.
Restriction and Notes	, and different name.

Clear User Cal Data

This softkey clears any user cal data currently stored both in working memory and on the hard drive of the analyzer. The path for the Cal Data file is:

D:\User_My_Documents\Instrument\My Documents FIGure\state\Corr.STA.

An 'Are you sure?' dialogue is provided as a safety mechanism when this key is pressed.

Key Path	Meas Setup, Cal Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CALibration:DELete`
Example	:NFIG:CAL:DEL
Initial S/W Revision	Prior to A.04.00
Coupling	Grayed if no user calibration data exists: status message "No User Calibration data exists".

Cal Type

Selects the type of calibration to be used. User Cal or Internal cal types are available.

Key Path	There is no one softkey for this parameter. The two options can be selected under Meas Setup, Cal Setup, 1 and Meas Setup, Cal Setup, 2.
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CALibration:TYPE USER|INTernal`
Example	NFIG:CAL:TYPE INT

Remote Command Notes	Different From Legacy Apps – New SCPI. Internal Cal was not available.
	No Softkey
Preset	USER
State Saved	Saved in instrument state.
Range	USER|INTernal
Initial S/W Revision	Prior to A.04.00
Coupling	1. If changed from INTernal to USER and no user cal exists, Apply Calibrations is grayed out and message 0.2208 is displayed.
	2. When set to INTernal, Cal State annunciator in meas bar changes to INT CAL.
	3. When set to USER, Cal State annunciator in meas bar shows CAL when valid cal exists, UNCAL when cal is invalid (error 309) and ~CAL when cal is interpolated (error 311) or adjusted for RBW changes (error 313).
	4. See User Cal and Internal Cal Sections.

User Cal

User cal is the "normal" calibration technique which requires the user to connect the noise source directly to the analyzer input i.e. remove the DUT from the input circuit, and perform a calibration.

Once the calibration is complete, the DUT can be inserted back into the input circuit and the measurement can proceed using the acquired calibration data.

Key Path	Meas Setup, Cal Setup
Mode	NFIGURE
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.04.00
Coupling	1. When a calibration completes and is valid, "Apply Calibration" will be set to "YES", if previously NO.
	2. When the User Cal is selected and valid, the Cal State field in the Meas bar shows "CAL". When cal data is invalid "UNCAL" is shown in the Cal State field. When the User Cal has been interpolated or adjusted, the Cal State field will show "~CAL".
	3. If cal data changed from valid to invalid (for example, frequency param has changed since last user cal), "Apply Calibration" will be grayed out.
	4. See Cal Type section.

Invalidating User Cal

Should certain measurement parameters change when user cal is selected and valid, the current calibration data will become invalid and a new user calibration is required before calibrated measurements will result. If the User Cal is selected and invalid the results will show uncalibrated data.

In this case the Cal State in Meas bar changes from green "Cal" to red "UnCal".

Change To Parameters that will Invalidate User Cal:

1. **Frequency:** Setting the frequency outside the current valid user cal set (for example: If the current sweep range is 2 to 3GHz, then setting the start frequency to 1.9 GHz will invalidate the current user cal. Other frequency changes that will invalidate the user cal are:

a.If the cal was performed at a fixed frequency and you change this frequency.

b.If you are in "Freq List" mode and you change it to extend beyond the current user cal range. In this case you will see an error message.

2. **DUT Type**: If the DUT Type parameter changes, causing the measurement frequencies to be pushed outside the current cal.

3. **Attenuation**: If a setting of attenuator has been selected but not been cal'ed.

4. **Preamp**: If set to condition different from current cal settings for example: if cal'ed with preamp on, turning off will invalidate cal.

5. **Points:** Changing the number of measured frequency points can make the stored preselector offsets become inaccurate and hence invalidate the calibration: This occurs when all the following conditions exist:

a.A successful calibration has been performed.

b.Some measured freq points are > 3.6 GHz

c.The new points > 3.6 GHz are located more than 50 MHz away from the current calibration points

d.For freq pts. Measured above 3.6 GHz.

6. **USB Preamp:** Changing the USB Preamp can invalidate the calibration. This occurs when one of the following conditions exists:

a.The current USB Preamp in use is not the one which was used when the current calibration was performed.

b.Disconnecting an USB Preamp after a successful calibration with USB Preamp has been performed.

c.Connecting an USB Preamp after a successful calibration without USB Preamp has been performed.

Interpolating User Cal

The measurement has the ability to interpolate calibration. For example: if the frequency range changes it can 'guess' the correct values; however this will only work provided the new frequency range is a subset of the calibrated range.

In this case the Cal State in Meas bar will show in yellow as "~Cal" and a warning message will be displayed.

Change To Parameters that will Interpolate User Cal:

1. **Frequency**: If the frequency changes such that it is inside the current user cal settings. For example: if frequency sweep was from 1 to 2 GHz, and the user changed the start frequency to 1.1 GHz.

2. **Points**: Changing the number of measured frequency points will interpolate the calibration under the following two conditions:

a.All the frequencies are below 3.6 GHz.

b.Some measured freq points are above 3.6 GHz, the new points above 3.6 GHz are within 50 MHz of the current cal points.

Adjusting User Cal for RBW changes.

When you change the RBW away from the user cal setting, the cal data is adjusted. Each cal point is normalized to a 1 Hz BW and then multiplied by the new RBW to determine the *new* (interpolated) cal data.

In this case the Cal State in Meas bar again shows in yellow as "~Cal" and a warning message is displayed.

Min (RF/Microwave) Attenuation

To ensure the best accuracy at all times, the calibration process can be performed at multiple attenuation settings. Ideally it would be performed at all available attenuation settings, but in practice this would take far too long and is unnecessary for most applications. For this reason it is possible to limit the range of calibrated attenuation settings to a sensible range. This command operates in conjunction with Max RF Atten to set the range of attenuation used during the calibration process.

Refer to "Attenuation" on page 442 under the AMPTD/Y Scale menu) for more information.The default input attenuation calibration range is:

With FSA option	0 dB to 8 dB, and a step size of 4 dB
Without FSA option	0 dB to 10 dB, and a step size of 10 dB

Key Path	Meas Setup, Cal Setup, Input Cal
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CALibration:USER:ATTenuation:MINimum <integer>`
	`[:SENSe]:NFIGure:CALibration:USER:ATTenuation:MINimum?`
Example	:NFIG:CAL:USER:ATT:MIN 20 dB
Preset	0 dB
State Saved	Saved in instrument state.
Range	0 to 40 dB
Min	0
Max	40
Backwards Compatibility SCPI	`:INPut[:NFIGure]:ATTenuation[:RF][:MINimum]`
	`:INPut[:NFIGure]:ATTenuation:MWAVe[:MINimum]`
Initial S/W Revision	Prior to A.04.00
Coupling	If the set value exceeds the MAX attenuation setting, MAX attenuation is set so that MIN is always less than or equal to MAX.
Restriction and Notes	Attenuation steps depend on FSA option:
	With FSA – 4 dB.
	Without FSA – 10 dB.

Max (RF/Microwave) Attenuation

To ensure the best accuracy at all times, the calibration process is performed at multiple attenuation settings. Ideally it would be performed at all available attenuation settings, but in practice this would take far too long; and is overkill for most applications. For this reason it is possible to limit the range of calibrated attenuation settings to a sensible range. This command operates in conjunction with Min RF Atten to set the range of attenuation used during the calibration process.

Refer to "Attenuation" on page 442 under the AMPTD/Y Scale menu) for more information.The default input attenuation calibration range is:

With FSA option	0 dB to 8 dB, and a step size of 4 dB
Without FSA option	0 dB to 10 dB, and a step size of 10 dB

Key Path	Meas Setup, Cal Setup, Input Cal
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CALibration:USER:ATTenuation:MAXimum <integer>`
	`[:SENSe]:NFIGure:CALibration:USER:ATTenuation:MAXimum?`
Example	`:NFIG:CAL:USER:ATT:MAX 40dB`
Preset	For instrument without FSA option the default will be 10dB (2 cal stages not 3).
State Saved	Saved in instrument state.
Range	0 dB to 40 dB
Min	0
Max	40
Backwards Compatibility SCPI	`:INPut[:NFIGure]:ATTenuation[:RF]:MAXimum`
	`:INPut[:NFIGure]:ATTenuation:MWAVe:MAXimum`
Initial S/W Revision	Prior to A.04.00
Coupling	If the set value is below the MIN attenuation setting, MIN attenuation is set so that MAX is always greater than or equal to MIN.
Restriction and Notes	Attenuation steps depend on FSA option: With FSA – 4 dB. Without FSA – 4 dB.

Internal Cal

This cal type allows the user to skip the calibration phase of a noise figure measurement, hence removing the need to mechanically change connection settings. This will only be useful for users that would normally connect the noise source directly to the instrument RF port. Any test beds fixtures that would normally require calibrating out in the calibrate step cannot use this calibration type. In some cases the user could put the test bed fixture data into the Loss Comp tables, but would require precise measurement data from test fixture. Also for the case when "System Downconverter" is used, the "Internal Cal" choice will be disabled.

Internal Cal makes use of the internal Cal Files stored in the instrument during manufacturing and USB Preamp if connected. The information contained therein allows Aramis to calculate the Pcold and Phot levels normally obtained from a User Cal. These values are compensated for frequency and temperature. The RBW at each freq point is part of the algorithm to obtain the Phot and Pcold values. To obtain the Phot value, the user is still required to have valid ENR data before the measurement can proceed.

Instrument uncertainty specs will apply to the User Cal only, however Internal Cal will be very close assuming the conditions for using an internal cal are kept. Also this cal type will be valid in the hi band (>3.6GHz), but due to preselector uncertainties will not be as close to the specs for User cal. In summary – if user is very concerned about getting accurate data, then the "User Cal" should be used.

Key Path	Meas Setup, Cal Setup
Mode	NFIGURE
Remote Command Notes	Different From Legacy Apps – new feature
State Saved	Saved in instrument state.
Initial S/W Revision	A.04.00
Coupling	1. Couple to "Calibrate" part of the 1 of N – callback to Calibrate key.
	2. Disabled when System Downconverter is used: display error message –221.5523
	3. Apply Calibration will be grayed out when selected.
	4. See Cal Type section.
Restriction and Notes	Inst Uncert Spec's will apply to the User Cal only, however Internal Cal will be very close assuming the conditions for using an internal cal are kept.

Calibration Status (remote command only)

There are Cal, Uncal, ~Cal and Internal Cal (if NFE license is avaiable)status in NF, use this command to query a bit to determine the current status.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CALibration:CONDition?`
Example	NFIG:CAL:COND?
Remote Command Notes	If the instrument is calibrated but "Apply Calibration" is set to "No", this command will return "UnCal", not "Cal"
Preset	0
State Saved	Saved in instrument state.
Range	CAL	UNCAL	INTERPCAL	INTCAL
Initial S/W Revision	After to A.04.00

Calibrate Now

Performs a User Calibration on the current DUT setup using the ENR data in the Meas Table (if 'Use Meas Table Data for Cal' is ON) or the ENR data in the Cal Table (if 'Use Meas Table Data for Cal' is turned OFF).

Cal data will be collected for each attenuation setting set in the User Setup parameters. For example, in X-Series Analyzers, if Max Atten is set to 8dB and Min set to 0dB then a set of calibration data will be taken for 0dB, 4dB and 8dB. You can then choose any of these attenuation settings when the measurement is performed, and corrected results will be made. If you want attenuation settings outside this range, they need to be set in Max/Min prior to performing a Calibration.

During calibration the value you select for Average Count is translated into a sweep time for each point. So an Average Count of 10 results in a sweep time of 160 ms (160 ms at each measured frequency point if using the default sweep time).There are 2 measurement points per freq point. One measurement for noise source Off and one for On.

Once the calibration step has been performed successfully, the calibration data (including ENR cal data and USB Preamp serial number if in use) is stored in a 'power on persistent' state. A mode preset or power cycle will not erase the cal data. An advisory message will alert the user that cal is valid and they need to toggle "Apply Calibration" to 'On' to restore corrected data. If, after a mode preset, the DUT/measurement setup has changed such that the saved calibration data is invalid, the "Apply Calibration" setting is grayed out, but can be restored if setup during cal is set again, or the original setup with cal is stored in a state and recalled again.

> **NOTE** If any input frequencies are in high band, for example: above 3.6 GHz, then the "Calibrate Now" process optimizes the preselector at these frequencies and stores the preselector offset values. It uses these offsets in the cal acquisition results and also when acquiring the measurement results. This reduces the error for corrected results since the preselector is set at the same place for acquiring the cal and meas results. The 'Optimize Preselector' function allows the offset values to be collected again without the cal acquisition results
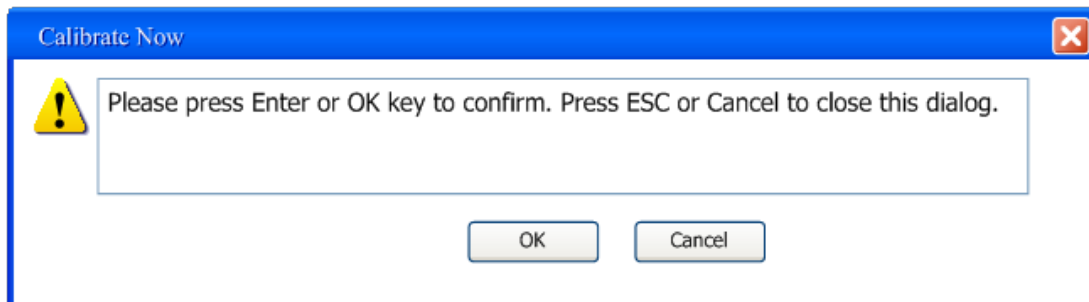
If the "Apply Calibration" key is set to "On", then the dialog box should read:

Calibrating.

Press ESC or Cancel to ABORT the User calibration.

If "Apply Calibration" is set to "Off", then the dialog box should read:

When completed successfully "Apply Calibration" will be changed to "On".

Once a calibration has completed sucessfully, Apply Calibrations is set to On.

To abort a Cal while it is running, press ESC or Cancel. This will stop the action and not store any data collected. The previous data is erased and the "Apply Calibration" parameter will be set to "Off". If a valid User Cal is still stored, the user can then turn Apply Calibration back on, by setting "Apply Calibration" to "On". Note that aborting the calibration operates in both Single and Continuous modes of use.

Key Path	Meas Setup
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CALibration:INITiate`
Example	:NFIG:CAL:INIT
Remote Command Notes	Error –221.5525 displayed when this command is issued and Cal Type is USER.
Initial S/W Revision	Prior to A.04.00
Coupling	1. When a calibration has completed, Apply Calibration will be set to On and Cal Type will be set to USER.
	2. If the calibration is canceled before it has completed, Apply Calibration will be set to Off.
	3. Attenuation min/max: calibration performed for each attenuation step (with FSA: 4 dB step; without FSA:10 dB step). Default would be 3 stages for instrument with FSA (0, 4, 8) and 2 for instruments without FSA (0, 10).
	4. Disabled if no valid ENR data (in Meas table when 'Use Meas Table Data for Cal' is ON or Cal table when OFF or Spot ENR): error message –221.5533.
	5. Disabled when "Noise Source State" is set to On/Off.

Cancel (frontpanel only)

To abort a Cal while it is running, press Cancel. This will stop the action and not store any data collected. The previous data will be unaffected and the "Apply Calibration" parameter will be set to "Off". If a valid User Cal is still stored, the user can then turn Apply Calibration back on, by setting "Apply Calibration" to "On".

Key Path	Meas Setup, Calibrate Now
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Loss Comp

The Loss Compensation menu controls the amount of loss compensation to be applied both before and after the Device Under Test. The loss compensation can be supplied as a fixed value for all frequencies, or a table of frequency/amplitude pairs that will be interpolated to find the most accurate compensation value for the measurement that is underway.

Key Path	Meas Setup
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Before DUT

Controls the type of Loss Compensation to be applied before the Device Under Test.

Key Path	Meas Setup, Loss Comp
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:LOSS:BEFore:MODE OFF|FIXed|TABLe
	[:SENSe]:NFIGure:CORRection:LOSS:BEFore:MODE?
Example	NFIG:CORR:LOSS:BEF:MODE FIX
	NFIG:CORR:LOSS:BEF:MODE?
Preset	OFF
State Saved	Saved in instrument state.
Range	OFF|FIXed |TABLe
Readback Text	Setting read back and fixed value (when set to FIXed): [Fixed: 3.00 dB]
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:CORRection:LOSS:BEFore:MODE
Initial S/W Revision	Prior to A.04.00

Off

Key Path	Meas Setup, Loss Comp, Before DUT,
Initial S/W Revision	Prior to A.04.00

Before DUT Fixed Value

Allows entry of a single loss compensation value that will be applied before the device under test at all measured frequencies. Will only take effect if the loss compensation before DUT is set to 'Fixed'.

Key Path	Meas Setup, Loss Comp, Before DUT
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:LOSS:BEFore:VALue <value>
	[:SENSe]:NFIGure:CORRection:LOSS:BEFore:VALue?
Example	:NFIG:CORR:LOSS:BEF:VAL 20 dB
Remote Command Notes	Error –221.5526 displayed if attempt to set Fixed value when Before DUT mode is LIST or OFF.
Preset	0 dB
State Saved	Saved in instrument state.
Range	–100 dB to 100 dB
Min	–100
Max	100
Backwards	[:SENSe][:NFIGure]:CORRection:LOSS:BEFore:VALue

Compatibility SCPI	[:SENSe]:CORRection:LOSS:INPut:SPOT
Initial S/W Revision	Prior to A.04.00
Coupling	Only active when Loss Compensation Before DUT Mode is FIXed.

Loss Table

The loss compensation tables are used as a means of entering correction data that will be used to improve the accuracy of measurements. Where a specific measured frequency does not have an exact match in the table, the loss compensation value will be interpolated linearly on the dB scale between the two closest data points.

The table will be displayed on the left side the current measurement in the format shown below. When number of entries in the table cannot all be displayed at once, the table can be navigated using the tab keys. The table will be sorted in ascending order using the frequency as a key. The table will disappear from view upon exit from the Loss Table menu.

Duplicates are NOT allowed in the frequency fields of the Loss Table but duplicate Loss Values at different frequencies are acceptable.

> **NOTE** Data entered into this table will have no effect unless the Loss Compensation Before/After Mode is set to TABLe.

Key Path	Meas Setup, Loss Comp, Before DUT, 3	Meas Setup, Loss Comp, After DUT
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Table Editor Operation

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

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

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

See also:

Key Path	Freq/Channel, Edit Freq List, EditMeas Setup, ENR, Meas Table, EditMeas Setup, ENR, Cal Table,

	EditMeas Setup, Limits, EditMeas Setup, Loss Comp, Before DUT, Table, EditMeas Setup, Loss Comp, After DUT, Table, Edit
Initial S/W Revision	Prior to A.04.00

Navigate

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

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	Navigate
State Saved	No
Range	Navigate | Frequency | Amplitude (optional)
	Range of enumerates can be 2 or 3, depending on current use, but first member will always be Navigate. Additional members are provided by the user of the Common Table Editor
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	• Note that the arrow keys always navigate between rows.

Frequency

Enables you to enter the frequency component of a frequency/amplitude pair.

Key Path	Meas Setup, Loss Comp, Before DUT | After DUT, Table
Mode	NFIGURE
Preset	<blank>
State Saved	Saved in instrument state.
Range	10 Hz to 325 GHz
Min	10 Hz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	Parameter coupled to currently selected frequency in table.

Loss Value

Enables you to enter the amplitude component of a frequency/amplitude pair.

Key Path	Meas Setup, Loss Comp, Before DUT	After DUT, Table
Mode	NFIGURE
Preset	0
State Saved	Saved in instrument state.
Range	–100 dB to 100 dB
Min	–100
Max	100
Initial S/W Revision	Prior to A.04.00
Coupling	Parameter coupled to currently selected Loss Value in table.

Insert Point Below

Inserts point below the currently selected row.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	If the currently-selected point is being edited, the point is completed. A new point is inserted below the currently-selected point; the data in the new point is copied from the current point. The independent variable (usually Frequency) is highlighted for edit.

Delete Point

Deletes currently selected row in the table editor.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit

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

Clear Table

Clear Loss Before DUT Table

This function clears all data from the Loss Comp table and removes the table's backup from persistent storage.

Key Path	Meas Setup, Loss Comp, Before DUT, Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:LOSS:BEFore:TABLe:DATA:DELete`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clear all entried in the Loss Before DUT Comp table. If current Loss Before DUT is selected "Table", clear the Loss Before DUT table contents will make the measurement hang, and "Insufficient Data; Loss table empty" error will be prompted.

Clear Loss After DUT Table

This function clears all data from the Loss Comp table and removes the table's backup from persistent storage.

Key Path	Meas Setup, Loss Comp, After DUT, Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:LOSS:AFTer:TABLe:DATA:DELete`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clears all entried in the Loss After DUT Comp table. If current Loss After DUT is selected "Table", clear the Loss After DUT table contents will make the measurement hang, and "Insufficient Data; Loss table empty" error will be prompted.

Setting Loss Compensation Table Remotely (remote command only)

Data can be entered into the current loss compensation table using SCPI. Parameters are provided in frequency/amplitude pairs, the units beinGHz and dB respectively. Up to 501 point-pairs will be accepted. See the above Frequency and Loss Value definitions for the acceptable parameter ranges.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:LOSS:BEFore|AFTer:TABLe:DATA <frequency>, <amplitude> ([, <frequency>, <amplitude>])*
	[:SENSe]:NFIGure:CORRection:LOSS:BEFore|AFTer:TABLe:DATA?
Example	:NFIG:CORR:LOSS:BEF:TABL:DATA 1000, –10, 2000, –8, 3000, –6, 10000, 5
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:CORRection:LOSS:BEFore|AFTer:TABLe:DATA
Initial S/W Revision	Prior to A.04.00

Table Entry Count (Remote Command Only)

The number of frequency/amplitude point-pairs in the current measurement or loss compensation table can be obtained using SCPI. If the table is empty, the size returned is 0.

Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:LOSS:BEFore|AFTer:TABLe:COUNt?
Example	:NFIG:CORR:ENR:MEAS:TABL:COUN?
Preset	0
Range	0 to 501
Min	0
Max	501
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:CORRection:LOSS:BEFore|AFTer:TABLe:COUNt?
Initial S/W Revision	Prior to A.04.00

Loading and Saving Loss Compensation Files

To save time entering the same data into multiple analyzers, or to store a set of data for later use- it is possible to save the current table to file; or to load a table from an existing file. This file can be saved on the instrument's local storage or onto a USB flash drive for portability.

Before DUT Temperature

Sets the before DUT correction temperature in units of Kelvin. In loss compensation if the user just puts in the gain loss (fixed value in dB), while setting the noise temperature of the attenuator to 0 K, then the noise figure of that loss is not taken into account. It is seen as a "purely reflective (non-dissipative)" loss. In most cases the loss is a dissipative loss hence the temperature at that loss is required and normally is set to 290K. For example if I have an attenuator of 3dB before the DUT and the "Before DUT Temp" is set to 0.0K then only the expected transmission gain to the noise source declines by 3dB in the results; any noise added by the attenuator is attributed to the DUT instead of the attenuator. If the "Before DUT Temp" is set to 290K, then the NF results are computed assuming a noise contribution from the attenuator. This is then equivalent to adding in a 3dB loss pad.

Key Path	Meas Setup, Loss Comp, Before DUT
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:TEMPerature:BEFore <temperature>
	[:SENSe]:NFIGure:CORRection:TEMPerature:BEFore?
Example	:NFIG:CORR:TEMP:BEF 0.15 K
Remote Command Notes	Only K unit suffix is supported
Preset	290.00
State Saved	Saved in instrument state.
Range	0 K to 29650000 K
Min	0 K
Max	29650000 K
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:CORRection:TEMPerature:BEFore
Initial S/W Revision	Prior to A.04.00

After DUT

Controls the type of Loss Compensation to be applied after the Device Under Test.

Key Path	Meas Setup, Loss Comp
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:LOSS:AFTer:MODE OFF|FIXed|TABLe
	[:SENSe]:NFIGure:CORRection:LOSS:AFTer:MODE?
Example	:NFIG:CORR:LOSS:AFT:MODE FIX
Preset	OFF
State Saved	Saved in instrument state.
Range	OFF|FIXed|TABLe
Readback Text	Setting read back and fixed value (when set to FIXed): [Fixed: 3.00 dB]
Backwards Compatibility SCPI	[:SENSe][:NFIGure]:CORRection:LOSS:AFTer:MODE
Initial S/W Revision	Prior to A.04.00

Off

Key Path	Meas Setup, Loss Comp, After DUT,
Initial S/W Revision	Prior to A.04.00

After DUT Fixed Value

Allows entry of a single loss compensation value that will be applied after the device under test at all measured frequencies. Will only take effect if the loss compensation after DUT is set to 'Fixed'.

Key Path	Meas Setup, Loss Comp, After DUT
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:LOSS:AFTer:VALue <value>`
	`[:SENSe]:NFIGure:CORRection:LOSS:AFTer:VALue?`
Example	:NFIG:CORR:LOSS:AFT:VAL 20 dB
Remote Command Notes	Error –221.5526 displayed if attempt to set Fixed value when After DUT mode is LIST or OFF.
Preset	0 dB
State Saved	Saved in instrument state.
Range	–100 dB to 100 dB
Min	–100
Max	100
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:LOSS:AFTer:VALue`
	`[:SENSe]:CORRection:LOSS:OUTPut:SPOT`
Initial S/W Revision	Prior to A.04.00
Coupling	Only active when Loss Compensation After DUT Mode is FIXed.
	Automatically sets After DUT Mode to ON.

Loss Table

The loss compensation tables are used as a means of entering correction data that will be used to improve the accuracy of measurements. Where a specific measured frequency does not have an exact match in the table, the loss compensation value will be interpolated linearly on the dB scale between the two closest data points.

The table will be displayed on the left side the current measurement in the format shown below. When number of entries in the table cannot all be displayed at once, the table can be navigated using the tab keys. The table will be sorted in ascending order using the frequency as a key. The table will disappear from view upon exit from the Loss Table menu.

Duplicates are NOT allowed in the frequency fields of the Loss Table but duplicate Loss Values at different frequencies are acceptable.

NOTE	Data entered into this table will have no effect unless the Loss Compensation Before/After Mode is set to TABLe.

Key Path	Meas Setup, Loss Comp, Before DUT, 3	Meas Setup, Loss Comp, After DUT
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Table Editor Operation

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

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

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

See also:

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

Navigate

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

Key Path	• Freq, Edit Freq List, Edit • Meas Setup, ENR, Meas Table, Edit • Meas Setup, ENR, Cal Table, Edit • Meas Setup, Limits, Edit • Meas Setup, Loss Comp, Before DUT, Table, Edit • Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	Navigate
State Saved	No
Range	Navigate | Frequency | Amplitude (optional) Range of enumerates can be 2 or 3, depending on current use, but first member will always be Navigate. Additional members are provided by the user of the Common Table Editor
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	• Note that the arrow keys always navigate between rows.

Frequency

Enables you to enter the frequency component of a frequency/amplitude pair.

Key Path	Meas Setup, Loss Comp, Before DUT	After DUT, Table
Mode	NFIGURE
Preset	<blank>
State Saved	Saved in instrument state.
Range	10 Hz to 325 GHz
Min	10 Hz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	Parameter coupled to currently selected frequency in table.

Loss Value

Enables you to enter the amplitude component of a frequency/amplitude pair.

Key Path	Meas Setup, Loss Comp, Before DUT	After DUT, Table
Mode	NFIGURE
Preset	0
State Saved	Saved in instrument state.
Range	–100 dB to 100 dB
Min	–100
Max	100
Initial S/W Revision	Prior to A.04.00
Coupling	Parameter coupled to currently selected Loss Value in table.

Insert Point Below

Inserts point below the currently selected row.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit

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

Delete Point

Deletes currently selected row in the table editor.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	It will immediately delete the currently-selected point, whether or not that point is being edited, and select Navigate. The point following the currently-selected point (or the point proceeding if there is none) will be selected.

Clear Table

Clear Loss Before DUT Table

This function clears all data from the Loss Comp table and removes the table's backup from persistent storage.

Key Path	Meas Setup, Loss Comp, Before DUT, Table
Mode	NFIGURE
Remote Command	[:SENSe]:NFIGure:CORRection:LOSS:BEFore:TABLe:DATA:DELete
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clear all entried in the Loss Before DUT Comp table. If current Loss Before DUT is selected "Table", clear the Loss Before DUT table contents will make the measurement hang, and "Insufficient Data; Loss table empty" error will be prompted.

Clear Loss After DUT Table

This function clears all data from the Loss Comp table and removes the table's backup from persistent storage.

Key Path	Meas Setup, Loss Comp, After DUT, Table
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:LOSS:AFTer:TABLe:DATA:DELete`
Initial S/W Revision	Prior to A.04.00
Modified at S/W Revision	After A.09.01
Restriction and Notes	Clears all entried in the Loss After DUT Comp table. If current Loss After DUT is selected "Table", clear the Loss After DUT table contents will make the measurement hang, and "Insufficient Data; Loss table empty" error will be prompted.

Setting Loss Compensation Table Remotely (remote command only)

Data can be entered into the current loss compensation table using SCPI. Parameters are provided in frequency/amplitude pairs, the units beinGHz and dB respectively. Up to 501 point-pairs will be accepted. See the above Frequency and Loss Value definitions for the acceptable parameter ranges.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:LOSS:BEFore|AFTer:TABLe:DATA <frequency>, <amplitude> ([, <frequency>, <amplitude>] )*`
	`[:SENSe]:NFIGure:CORRection:LOSS:BEFore|AFTer:TABLe:DATA?`
Example	:NFIG:CORR:LOSS:BEF:TABL:DATA 1000, –10, 2000, –8, 3000, –6, 10000, 5
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:LOSS:BEFore|AFTer:TABLe:DATA`
Initial S/W Revision	Prior to A.04.00

Table Entry Count (Remote Command Only)

The number of frequency/amplitude point-pairs in the current measurement or loss compensation table can be obtained using SCPI. If the table is empty, the size returned is 0.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:LOSS:BEFore|AFTer:TABLe:COUNt?`
Example	:NFIG:CORR:ENR:MEAS:TABL:COUN?
Preset	0
Range	0 to 501
Min	0
Max	501
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:LOSS:BEFore|AFTer:TABLe:COUNt?`
Initial S/W Revision	Prior to A.04.00

Loading and Saving Loss Compensation Files

To save time entering the same data into multiple analyzers, or to store a set of data for later use- it is possible to save the current table to file; or to load a table from an existing file. This file can be saved on the instrument's local storage or onto a USB flash drive for portability.

After DUT Temperature

Sets the After DUT correction temperature in units of Kelvin. In loss compensation if the user just puts in the gain loss (fixed value in dB), while setting the noise temperature of the attenuator to 0 K, then the noise figure of that loss is not taken into account. It is seen as a "purely reflective (non-dissipative)" loss. In most cases the loss is a dissipative loss hence the temperature at that loss is required and normally is set to 290K. For example if I have an attenuator of 3dB After the DUT and the "After DUT Temp" is set to 0.0K then only the expected transmission gain to the noise source declines by 3dB in the results; any noise added by the attenuator is attributed to the DUT instead of the attenuator. If the "After DUT Temp" is set to 290K, then the NF results are computed assuming a noise contribution from the attenuator. This is then equivalent to adding in a 3dB loss pad.

Key Path	Meas Setup, Loss Comp, After DUT
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:CORRection:TEMPerature:AFTer <value>`
	`[:SENSe]:NFIGure:CORRection:TEMPerature:AFTer?`
Example	:NFIG:CORR:TEMP:AFT 0.15 K
Preset	290.00 K
State Saved	Saved in instrument state.
Range	0 K to 29650000 K
Min	0 K
Max	29650000 K
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:CORRection:TEMPerature:AFTer`
Initial S/W Revision	Prior to A.04.00

Limits

Enables you to enter upper and lower limits for results data.

Key Path	Meas Setup, More
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Select Limit

Specifies the selected limit. The term "selected limit" is used throughout this section to specify which limit will be affected by the functions. Four limits are available for selection.

Key Path	Meas Setup, Limits,
Initial S/W Revision	Prior to A.04.00

Limit On/Off

Selects whether the limit and margin are displayed. If Test All Limits is on, this also determines whether the test trace will be tested against the limit. If Limit On/Off is on, the following occurs:

- The limit trace is displayed

- The trace is tested if Test Limits is on

Key Path	Meas Setup, Limits
Remote Command	:CALCulate:NFIGure:LLINe[1]|2|...|4:DISPlay OFF|ON|0|1
	:CALCulate:NFIGure:LLINe[1]|2|...|4:DISPlay?
Example	:CALC:NFIG:LLIN2:DISP ON
Couplings	Limit display ON selects the limit.
	Testing is done on all displayed limits if "Test All Limits" is ON.
Preset	Off (all limits)
State Saved	Saved in State.
Backwards Compatibility SCPI	CALCulate[:NFIGure]:LLINe[1]|2|...|4[:STATe]
	CALCulate[:NFIGure]:LLINe[1]|2|...|4:DISPlay[:STATe]
Initial S/W Revision	Prior to A.04.00

Properties

The properties of each limit line can be defined in this menu.

Key Path	Meas Setup, More, Limits
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Select Limit

Specifies the selected limit. The term "selected limit" is used throughout this section to specify which limit will be affected by the functions. Four limits are available for selection.

Key Path	Meas Setup, Limits,
Initial S/W Revision	Prior to A.04.00

Test Trace

Selects the trace you want the limit to test. A limit is applied to one and only one trace; each trace can have both an upper and a lower limit. When executing Limit Test, the limit is applied only to the specified trace.

Key Path	Meas Setup, Limits, Properties
Remote Command	:CALCulate:NFIGure:LLINe[1]|2|...|4:TRACe 1|2
	:CALCulate:NFIGure:LLINe[1]|2|...|4:TRACe?
Example	:CALC:NFIG:LLIN3:TRAC 2 applies limit 3 to trace 2.
Couplings	This matters when testing a trace or limit line for failure, via :CALC:NFIG:LLIN3:FAIL? or :CALC:NFIG:TRAC2:FAIL?
Preset	Limits 1 and 2 default to 1, Limits 3 and 4 default to 2,
	Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in State.
Readback	Trace 1|2
Initial S/W Revision	Prior to A.04.00

Limit Type

Selects whether the limit you are editing is an upper or lower limit. An upper limit fails if the trace exceeds the limit. A lower limit fails if the trace falls below the limit.

Key Path	Meas Setup, Limits, Properties
Remote Command	:CALCulate:LLINe[1]|2|...|4:TYPE UPPer|LOWer
	:CALCulate:LLINe[1]|2|...|4:TYPE?
Example	:CALC:NFIG:LLIN2:TYPE LOW sets limit line 2 to act as a lower limit.
Couplings	If a margin has already been set for this limit line, and this key is used to change the limit type, then the margin value will reverse sign.
Preset	Upper for Line 1, 3; Lower for Line 2, 4
	Not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in State.
Backwards Compatibility SCPI	:CALCulate[:NFIGure]:LLINe[1]|2|...|4:TYPE
Initial S/W Revision	Prior to A.04.00

Table Editor Operation

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

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

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

See also:

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

Navigate

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

Key Path	• Freq, Edit Freq List, Edit • Meas Setup, ENR, Meas Table, Edit • Meas Setup, ENR, Cal Table, Edit • Meas Setup, Limits, Edit • Meas Setup, Loss Comp, Before DUT, Table, Edit • Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	Navigate
State Saved	No
Range	Navigate	Frequency	Amplitude (optional) Range of enumerates can be 2 or 3, depending on current use, but first member will always be Navigate. Additional members are provided by the user of the Common Table Editor
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	• Note that the arrow keys always navigate between rows.

X Value

Enables you to enter the frequency component of a frequency/amplitude pair.

Key Path	Meas Setup, Limits, Edit
Mode	NFIGURE
Preset	<blank>
State Saved	Saved in instrument state.
Range	10 Hz to 325 GHz
Min	10 Hz
Max	325 GHz
Initial S/W Revision	Prior to A.04.00
Coupling	Parameter coupled to currently selected X value in table.

Y Value

Enables you to enter the amplitude component of a frequency/amplitude pair.

Key Path	Meas Setup, Limits, Edit
Mode	NFIGURE
Preset	0
State Saved	Saved in instrument state.
Range	–100 dB to 100 dB
Min	–100
Max	100
Initial S/W Revision	Prior to A.04.00
Coupling	Parameter coupled to currently selected Y value in table.

Insert Point Below

Inserts point below the currently selected row.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	If the currently-selected point is being edited, the point is completed. A new point is inserted below the currently-selected point; the data in the new point is copied from the current point. The independent variable (usually Frequency) is highlighted for edit.

Delete Point

Deletes currently selected row in the table editor.

Key Path	
	• Freq, Edit Freq List, Edit
	• Meas Setup, ENR, Meas Table, Edit
	• Meas Setup, ENR, Cal Table, Edit
	• Meas Setup, Limits, Edit
	• Meas Setup, Loss Comp, Before DUT, Table, Edit
	• Meas Setup, Loss Comp, After DUT, Table, Edit
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	It will immediately delete the currently-selected point, whether or not that point is being edited, and select Navigate. The point following the currently-selected point (or the point proceeding if there is none) will be selected.

Delete Limit

Deletes the currently selected limit line. Pressing Delete Limit purges the data from the limit line tables.

Limit data – including secondary parameters such as description, margin value, etc. - will be cleared and returned to factory preset settings.

Key Path	Meas Setup, More, Limits
Remote Command	:CALCulate:NFIGure:LLINe[1]|2|...|4:DELete
Example	:CALC:NFIG:LLIN2:DEL
Initial S/W Revision	Prior to A.04.00

Test All Limits

Selects whether displayed traces are tested against displayed limits (i.e. those for which Limit On/Off is set to On).

If two amplitude values are entered for the same frequency, a single vertical line is the result. In this case, if an upper line is chosen, the lesser amplitude is tested. If a lower line is chosen, the greater amplitude is tested.

Key Path	Meas Setup, More, Limits, More
Remote Command	:CALCulate:NFIGure:LLINe:TEST OFF|ON|0|1
	:CALCulate:NFIGure:LLINe:TEST?
Example	:CALC:NFIG:LLIN:TEST ON

Remote Command Notes	When the command below is used to turn and individual limit line test ON, the test for all limits will be turned ON. This is consistent with GPSA's behaviour.
Preset	On, not affected by Mode Preset, preset by Restore Mode Defaults.
State Saved	Saved in State
Backwards Compatibility SCPI	`:CALCulate[:NFIGure]:LLINe[1]|2|...|4:TEST[:STATe]`
Initial S/W Revision	Prior to A.04.00

Delete All Limits

Deletes all limit lines. Pressing Delete All Limits purges the data from all limit line tables.

All limit data will be cleared and returned to factory preset settings–.

Key Path	Meas Setup, More, Limits, More
Remote Command	`:CALCulate:NFIGure:LLINe:ALL:DELete`
Example	:CALC:NFIG:LLIN:ALL:DEL
Initial S/W Revision	Prior to A.04.00

Optimize Preselector

This key runs through the current setup's frequency points optimizing the preselector. This may be required if the calibration step was performed some time ago and the preselector drift is impacting the measurement (for example: higher errors than expected).

When selected the following pop-up box will appear, with an estimate of the time expected to complete.

Key Path	Meas Setup, More
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:PRESelector:OPTimize`
Example	:NFIG:PRES:OPT
Initial S/W Revision	Prior to A.04.00
Coupling	Disabled when instrument tuned frequencies are below 3.6 GHz, i.e. in low band
Restriction and Notes	This key will disappear in CXA and CXA-m platform

Noise Source Settling Time

The Noise Source Settling Time is a parameter that allows the user to enter a time for the DUT to settle to the transition time of the noise source when measuring each point. The required time for settling of the 346-series or SNS-series noise source is already allocated in the Noise Figure application. Therefore, with these noise sources, the Noise Source Settling Time is actually the excess settling time required of the

DUT. With other, unknown noise sources, this settling time should be set to allow adequate settling time for the noise source as well as the DUT.

For the 346 series of noise sources the switching speeds were:

Switching speed:

For repetitive operation (in previous state for less than 5 seconds):

Turn-on: <20 µs

Turn-off: <80 µs

For single-shot operation (in previous state more than 5 seconds):

Turn-on: <3 ms

Turn-off: <80 µs

The above times are set in the application, so for normal noise sources or DUT's that require longer settling times, the time would be entered in this parameter.

Key Path	Meas Setup, More
Mode	Noise figure
Remote Command	`[:SENSe]:NFIGure:NSSTime <time>`
	`[:SENSe]:NFIGure:NSSTime?`
Example	NFIG:SWE:NSST 64 ms
Preset	0 s
State Saved	Saved in instrument state.
Min	0 s
Max	5 sec
Backwards Compatibility SCPI	`SYST:CONF:DUT:STIM`
Initial S/W Revision	Prior to A.04.00

Meas Preset

Restores all the measurement local parameters to their default values, with the exception of ENR Tables, Limit Line Data, and Loss Comp Table Data. They remain unchanged, however the limit lines and loss comp will be turned off.

Key Path	Meas Setup
Mode	NFIGURE
Remote Command	`:CONFigure:NFIGure`
Example	CONF:NFIG
Initial S/W Revision	Prior to A.04.00

Coupling	Loads default values of all parameters.
Restrictions and Notes	Due to Base Infrastructure and CDF provided code we are unable to support the following command;
	[:SENSe]:CONFigure[:NFIGure]
	[:SENSe]:CONFigure:NFIGure

Mode

See "Mode" on page 198

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 558 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

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

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

Mode Setup

See

Peak Search

Accesses Peak Search settings and performs a peak search.

Key Path	Peak Search
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:MAXimum
Example	CALC:NFIG:MARK2:MAX
Initial S/W Revision	Prior to A.04.00

Next Peak

Moves the selected marker to the peak that has the next highest amplitude that is less than the marker's current value.

Key Path	Peak Search
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:MAXimum:NEXT
Example	CALC:NFIG:MARK2:MAX:NEXT
Initial S/W Revision	Prior to A.04.00

Next Pk Right

Moves the selected marker to the nearest peak to the right of the current marker, which meets all enabled peak criteria.

Key Path	Peak Search
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:MAXimum:RIGHt
Example	CALC:NFIG:MARK2:MAX:RIGH
Initial S/W Revision	Prior to A.04.00

Next Pk Left

Moves the selected marker to the nearest peak to the left of the current marker, which meets all enabled peak criteria.

Key Path	Peak Search
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:MAXimum:LEFT

Example	CALC:NFIG:MARK2:MAX:LEFT
Initial S/W Revision	Prior to A.04.00

Marker Delta

Performs the same function as the Delta 1-of-N selection key in the Marker menu. This sets the control mode for the selected marker to Delta mode.

Key Path	Peak Search
Initial S/W Revision	Prior to A.04.00

Peak Criteria

Selects the type of peak search to be performed when the 'Peak Search' front-panel key is pressed. Min performs a Min Search, Max performs a Max Search and PkToPk performs a Pk-Pk Search.

Key Path	Peak Search, More
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer:SEARch:TYPE
	:CALCulate:NFIGure:MARKer:SEARch:TYPE?
Example	CALC:NFIG:MARK:SEAR:TYPE MIN
Preset	MAXimum
State Saved	Saved in instrument state.
Range	MINimum|MAXimum|PTPeak
Backwards Compatibility SCPI	:CALCulate[:NFIGure]:MARKer:SEARch:TYPE
Initial S/W Revision	Prior to A.04.00
Coupling	Performing a PTPeak search will turn a marker's relative marker on if it is currently off.

Continuous Peak Search

Sets Continuous Peak Search to On or Off. When Continuous Peak Search is set to On, a peak search is automatically performed for the selected marker after each sweep. The rules for finding the peak are exactly the same as for Peak Search, including the peak criteria rules. If no valid peak is found, warning –200.2020 is generated after each sweep. If a valid peak is found, message 0.1400 is displayed after each sweep.

Key Path	Peak Search, More
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:CPEak[:STATe] ON | OFF | 1 | 0

	:CALCulate:NFIGure:MARKer[1]|2|...|4:CPEak[:STATe]?
Example	CALC:NFIG:MARK:CPE ON
Preset	OFF
State Saved	Saved in instrument state.
Range	Off|On
Backwards Compatibility SCPI	:CALCulate[:NFIGure]:MARKer[1]|2|...|4:SEARch:CONTinuous[:STATe]
Initial S/W Revision	Prior to A.04.00

Pk-Pk Search

Finds and displays the amplitude and frequency differences between the highest and lowest Y-axis value.

Key Path	Peak Search, More
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:PTPeak
Example	CALC:NFIG:MARK:PTP
Initial S/W Revision	Prior to A.04.00
Coupling	This key is not available (key is grayed out) when Coupled Markers is on.
Restriction and Notes	Turns on the Marker Δ active function.

Min Search

Moves the selected marker to the minimum y-axis value of the current trace.

Key Path	Peak Search, More
Mode	NFIGURE
Remote Command	:CALCulate:NFIGure:MARKer[1]|2|...|4:MINimum
Example	CALC:NFIG:MARK:MIN
Initial S/W Revision	Prior to A.04.00

Print

See "Print" on page 351

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	No remote command for this key specifically, but the :MMEM:LOAD command is available for specific file types. An example is :MMEM:LOAD:STATe ‹filename›.
	If you try to recall a State file for a mode that is not licensed or not available in the instrument, an error message will occur and the state will not change.
Backwards Compatibility Notes	In legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly (since User Preset is actually loading a state), it was possible to do a User Preset without affecting the trace data, limit lines or correction data.
	In the X-Series, "state" always includes all of this data; so whenever state is loaded, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.
Backwards Compatibility Notes	Recall for the X-Series supports backward compatibility in the sense that you can recall a state file from any X-Series model number and any version of X-Series software. This is only possible if part of the recalling process goes through a limiting step after recalling the mode settings, at least for settings that may vary with version number, model number, option and license differences. If you try to recall a state file onto an instrument with less capability than what was available on the instrument during the save, the recall will ignore the state it doesn't support and it will limit the recalled setting to what it allows.
	Example: if the saved state includes preamp ON, but the recalling instrument does not have a preamp; the preamp is limited to OFF. Conversely, if you save a state without a preamp, the preamp is OFF in the state file. When this saved file is recalled on an instrument with a licensed preamp, the preamp is changed to OFF. Another example is if the saved state has center frequency set to 20 GHz, but the instrument recalling the saved state is a different model and only supports 13.5 GHz. In this case, the center frequency is limited along with any other frequency based settings. Since the center frequency can't be preserved in this case, the recall limiting tries to at least preserve span to keep the measurement setup as intact as possible.
	It may be appropriate to issue a warning if the state is limited on the recall; warnings do not go out to SCPI so this would only affect the manual user.
	Note that there is no state file compatibility outside of the X-Series. For example, you cannot recall a state file from ESA or PSA.
Initial S/W Revision	Prior to A.02.00

State

The Recall State menu lets you choose a register or file from which to recall the state.

The content of a state file includes all of the settings and data required to return the analyzer as closely as possible to the Mode it was in, with the exact settings that were in place, when the save occurred. The Mode settings in each state file include the settings that are affected by Mode Preset, as well as the

additional settings affected by Restore Mode Defaults; all of the Mode's settings. In addition, all of the settings of the Input/Output system are included, even though they are outside of the Mode's state, because they are needed to restore the complete setup. Persistent System settings (for example, GPIB address) are not affected by either a Mode Preset or Restore Mode Defaults, nor are they included in a saved State file.

Since each state file is only for one Mode, the settings for other Modes are unaffected when it is loaded. Recall State will cause a mode switch if the state being recalled is not from the current active mode.

After the recall completes, the message "File <filename> recalled" or "Recalled State Register <register number>" is displayed.

For rapid recalls, the State menu lists 16 registers that you can choose from to recall. Pressing a Register key initiates the recall. You can also select a file from which to recall.

The default path for all State Files is:

My Documents\<mode name>\state

where <mode name> is the parameter used to select the mode with the INST:SEL command (for example, SA for the Spectrum Analyzer).

See .

Key Path	Recall
Mode	All
Remote Command	`:MMEMory:LOAD:STATe <filename>`
Example	:MMEM:LOAD:STAT "myState.state" This recalls the file myState.state on the default path
Example	MMEM:LOAD:STAT "MyStateFile.state" This loads the state file data (on the default file directory path) into the instrument state.
Notes	When you pick a file to recall, the analyzer first verifies that the file is recallable in the current instrument by checking the software version and model number of the instrument. If everything matches, a full recall proceeds by aborting the currently running measurement, clearing any pending operations, and then loading the State from the saved state file. You can open state files from any mode, so recalling a State file switches to the mode that was active when the save occurred. After switching to the mode of the saved state file, mode settings and data (if any for the mode) are loaded with values from the saved file. The saved measurement of the mode becomes the newly active measurement and the data relevant to the measurement (if there is any) is recalled. If there is a mismatch between file version or model number or instrument version or model number, the recall functiontries to recall as much as possible and returns a warning message. It may limit settings that differ based on model number, licensing or version number. After recalling the state, the Recall State function does the following: • Makes the saved measurement for the mode the active measurement. • Clears the input and output buffers. • Status Byte is set to 0. • Executes a *CLS If the file specified is empty an error is generated. If the specified file does not exist, another error is generated. If there is a mismatch between the file and the proper file type, an error is generated. If

there is a mismatch between file version or model number or instrument version or model number, a warning is displayed. Then it returns to the State menu and File Open dialog goes away.

After the Recall, the analyzer exits the Recall menu and returns to the previous menu.

| **Backwards Compatibility SCPI** | `:MMEMory:LOAD:STATe 1,<filename>`

For backwards compatibility, the above syntax is supported. The "1" is simply ignored. |
| Initial S/W Revision | Prior to A.02.00 |

More Information

In measurements that support saving Traces, for example, Swept SA, the Trace data is saved along with the State in the State file. When recalling the State, the Trace data is recalled as well. Traces are recalled exactly as they were stored, including the writing mode and update and display modes. If a Trace was updating and visible when the State was saved, it will come back updating and visible, and its data will be rewritten right away. When you use State to save and recall traces, any trace whose data must be preserved should be placed in View or Blank mode before saving.

The following table describes the Trace Save and Recall possibilities:

You want to recall state and one trace's data, leaving other traces unaffected.	Save Trace+State from 1 trace. Make sure that no other traces are updating (they should all be in View or Blank mode) when the save is performed.	On Recall, specify the trace you want to load the one trace's data into. This trace will load in View. All other traces' data will be unaffected, although their trace mode will be as it was when the state save was performed.
You want to recall all traces	Save Trace+State from ALL traces.	On Recall, all traces will come back in View (or Blank if they were in Blank or Background when saved)
You want all traces to load exactly as they were when saved.	Save State	On recall, all traces' mode and data will be exactly as they were when saved. Any traces that were updating 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.
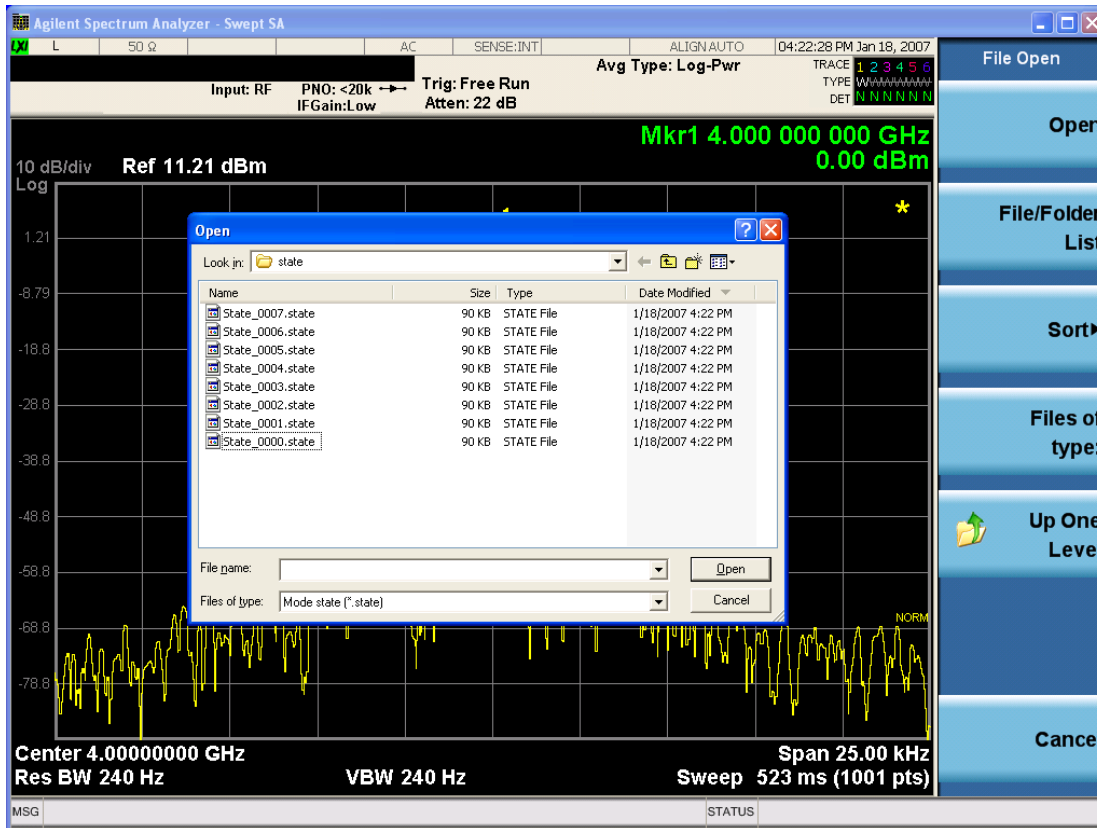
Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

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
Example	*RCL 1
Range	1–16 from front panel, 1–128 from SCPI
Readback	Date and time with seconds resolution are displayed on the key
	OR
	A custom name of up to 30 characters entered using the Save, State,Edit Register Names key
	OR
	"(empty)" if no prior save operation has been performed to this register.
Initial S/W Revision	Prior to A.02.00
Modified at S/W Revision	Prior to A.11.00

Data

Opens the menu where you can select the type of data you would like to import.

Key Path	Recall
Initial S/W Revision	Prior to A.04.00

Limits

This option sets the import file type to Limits and determines which limit the data is to be recalled to..

Key Path	Recall, Data
Mode	NFIGURE
Remote Command	:MMEMory:LOAD:LIMit LLINE1 | LLINE2 | LLINE3 | LLINE4, <file_name>
Example	:MMEM:LOAD:LIM LLINE1, "C:\Limit1.csv"
Initial S/W Revision	Prior to A.04.00

ENR Table

This option sets the import file type to ENR Meas Table or to ENR Cal Table.

Key Path	Recall, Data, More
Mode	NFIGURE
Remote Command	`:MMEMory: LOAD:ENR MEASurements|CALibration,<file_name>`
Example	:MMEM: LOAD:ENR MEAS,"C:\ENRTable.csv"
	:MMEM: LOAD:ENR CAL,"C:\CalTable.csv"
Remote Command Notes	:MMEMory: LOAD:ENR MEASurements,<file_name> used to Recall ENR Meas Table
	:MMEMory: LOAD:ENR CALibration,<file_name> used to Recall ENR Cal Table
Backwards Compatibility SCPI	`:MMEMory:LOAD:ENR`
Initial S/W Revision	Prior to A.04.00

Loss Comp

This option sets the import file type to Loss Compensation Before DUT Table or to Loss Compensation After DUT Table.

Key Path	Recall, Data, More
Mode	NFIGURE
Remote Command	`:MMEMory: LOAD:LOSS BEFore|AFTer,<file_name>`
Example	:MMEM: LOAD:LOSS BEF,"C:\LossBefore.csv"
	:MMEM: LOAD:LOSS AFT,"C:\LossAfter.csv"
Backwards Compatibility SCPI	`:MMEMory:LOAD:LOSS`
Initial S/W Revision	Prior to A.04.00

FreqList

This option sets the import file type to Frequency List. When a frequency list is imported, the frequency list is populated .

Key Path	Recall, Data, More
Mode	NFIGURE
Remote Command	`:MMEMory: LOAD:FREQuency <file_name>`
Example	:MMEM:LOAD:FREQ "C:\FrequencyList.csv"
Backwards	`:MMEMory:LOAD:FREQuency`

Compatibility SCPI

Initial S/W Revision	Prior to A.04.00

Open...

Opens a file open dialogue box where you can select the file you wish to import.

Key Path	Recall, Data
Initial S/W Revision	Prior to A.04.00

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

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.
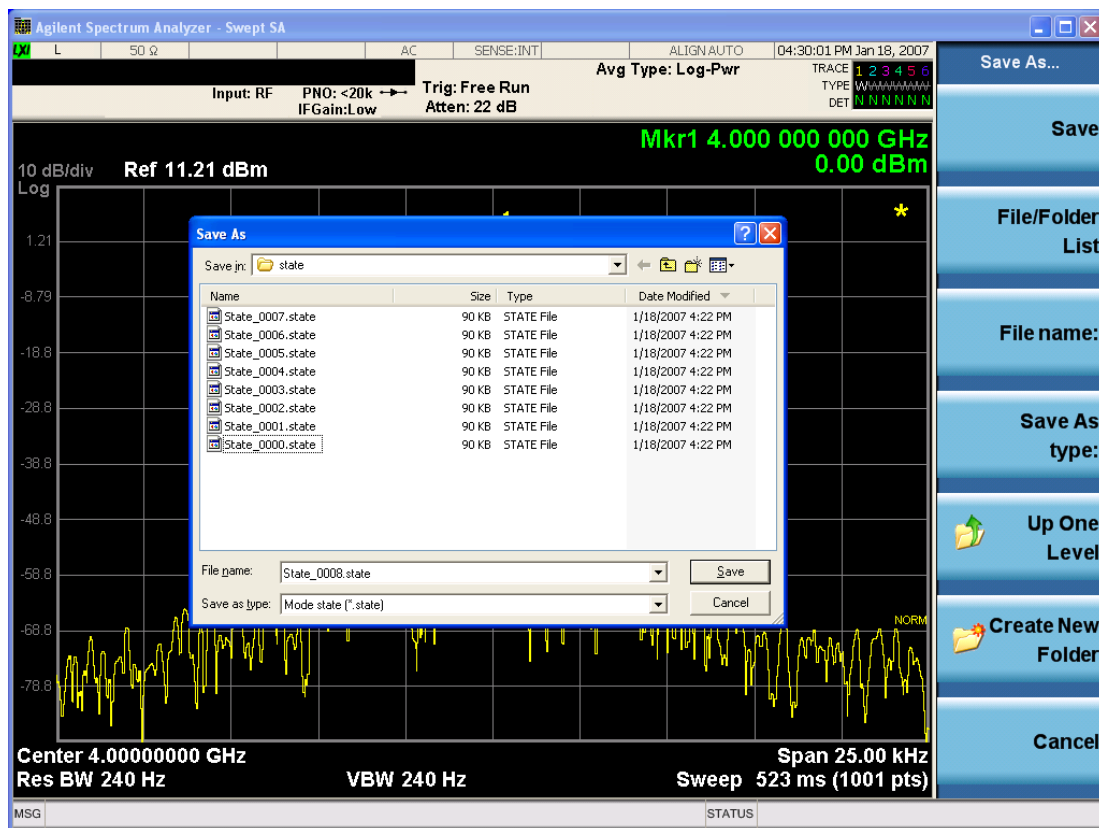
The Listed below are the functions of the various fields in the dialog, and the corresponding softkeys:

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 565 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

Key Path	Save, State
Mode	All
Remote Command	:MMEMory:REGister:STATe:LABel <reg number>,"label"
	:MMEMory:REGister:STATe:LABel? <reg number>
Example	:MMEM:REG:STAT:LAB 1,"my label"
Notes	<reg number> is an integer from 1 to 16. If the SCPI specifies an invalid register number an error message is generated, –222,"Data out of range;Invalid register label number"
	"label" is a string from 0 to 30 characters in length. If a label exceeds 30 characters, an error message is generated, –150,"String data error;Label clipped to 30 characters"
	"label" of length 0 erases the custom label and restores the default (time and date) label. E.g.: :MMEM:REG:STAT:LAB 1,""
Dependencies	N9060A–7FP or N9060B–2FP license required to edit the register names. When the feature is not licensed, sending this command generates an error, –221,"Settings conflict;Option not available"
Preset	The names are unaffected by Preset or power cycle but are set to the default label (time and date) on a "Restore System Defaults->Misc"
Initial S/W Revision	A.11.00

More Information

When you edit one of the register names, the time and date field will be replaced by the custom name.

If you delete all the characters in the custom name, it restores the default (time and date).

The register names are stored within the state files, but they are not part of the instrument state; that is, once you have edited a register name, loading a new state will not change that register name.Another consequence of this is that the names will be persistent through a power cycle. Also, if a named state file is transferred to another analyzer, it will bring its custom name along with it.

If you try to edit the name of an empty register, the analyzer will first save the state to have a file to put the name in. If you load a named state file into an analyzer with older firmware it will ignore the metadata.

The *SAV and *RCL commands will not be affected by the custom register names, nor will the MMEM commands.

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

Opens the menu where you can select the type of data you would like to export.

Key Path	Save
Initial S/W Revision	Prior to A.04.00

Export Limits

This option selects the Limit Line values to be exported for external viewing/editing or recall at a later date.

.

Key Path	Save, Data
Mode	NFIGURE
Remote Command	`:MMEMory:STORe:LIMit LLINE1	LLINE2	LLINE3	LLINE4, <file_name>`
Example	MMEM:STOR:LIM LLINE2, "C:\Limit2.csv"
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	Limit specified must contain data otherwise error –250.3007 will be displayed

Export Meas Results

Results are exported in .csv format. See the "List of Parameters " on page 584 which are saved as part of the measurement results.

Key Path	Save, Data
Mode	NFIGURE
Remote Command	`:MMEMory:STORe:RESults <file_name>`
Example	:MMEM:STORe:RESults "C:\MeasResults.csv"
Initial S/W Revision	Prior to A.04.00

Export ENR Data

This option selects :

– the current ENR Meas Table values to be exported for external viewing/editing or recall at a later date

or

– the current ENR Calibration Table values to be exported for external viewing/editing or recall at a later date.

Key Path	Save, Data, More
Mode	NFIGURE
Remote Command	`:MMEMory: STORe:ENR MEASurements|CALibration,<file_name>`
Example	:MMEM:STORe:ENR MEAS,"C:\ENRTable.csv"
	:MMEM:STORe:ENR CAL,"C:\CalTable.csv"
Remote Command Notes	:MMEMory: STORe:ENR MEASurements,<file_name> to Exporting ENR Meas Table
	:MMEMory: STORe:ENR CALibration,<file_name> used to Export ENR Cal Table
Backwards Compatibility SCPI	`:MMEMory:STORe:ENR`
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	Meas/Cal Table must contain data otherwise error –250.3007 will be displayed

Export Loss Comp

This option selects:

- the current Loss Compensation Before DUT values to be exported for external viewing/editing or recall at a later date

or

- the current Loss Compensation After DUT values to be exported for external viewing/editing or recall at a later date.

Key Path	Save, Data, More
Mode	NFIGURE
Remote Command	`:MMEMory: STORe:LOSS BEFore|AFTer,<file_name>`
Example	:MMEM: STOR:LOSS BEF,"C:\LossBefore.csv"
	:MMEM: STOR:LOSS AFT,"C:\LossAfter.csv"
Remote Command Notes	:MMEMory: STORe:LOSS BEFore,<file_name> used to export Loss Comp Before DUT
	:MMEMory: STORe:LOSS AFTer,<file_name> used to export Loss Comp After DUT
Backwards Compatibility SCPI	`:MMEMory:STORe:LOSS`
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	Loss Comp Before/After DUT Table must contain data otherwise error −250.3007 will be displayed.

Export Frequency List

This option selects the current Frequency List values to be exported for external viewing/editing or recall at a later date.

Key Path	Save, Data, More
Mode	NFIGURE
Remote Command	`:MMEMory: STORe:FREQuency <file_name>`
Example	:MMEM:STOR:FREQ "C:\FrequencyList.csv"
Backwards Compatibility SCPI	`:MMEMory:STORe:FREQuency`
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	Frequency List Table must contain data otherwise error −250.3007 will be displayed.

Export Measurement Uncertainty

This option selects the sweep measurement uncertainty to be exported for external viewing at a later date. The saved results cannot be recalled.

Key Path	Save, Data, More

Mode	NFIGURE
Remote Command	`:MMEMory:STORe:UNCertainty USER|INTernal|UNCal,<file_name>`
Example	:MMEM:STOR:UNC USER, "C:\SweepUncertaintyResultsUserCal.csv"
Remote Command Notes	:MMEMory: STORe:UNCertainty USER,<file_name> used to export the sweep measurement uncertainty for User cal. :MMEMory: STORe:UNCertainty INTernal,<file_name> used to export the sweep measurement uncertainty for Internal cal. :MMEMory: STORe:UNCertainty UNCal,<file_name> used to export the sweep measurement uncertainty for Uncal.
Initial S/W Revision	A.14.00

List of Parameters

Parameters appended with '*' are only saved when applicable to the current measurement. The result data is split into six sections as follows:

General Information:

- Application Name

- Measurement Name

- Date

- Time

DUT Setup Parameters:

- DUT Type

- System Downconverter Status*

- Side Band*

External LO Parameters*:

- Ext LO Control State*

- Ext LO Fixed Frequency*

- Ext LO Power*

- Ext LO Start Frequency*

- Ext LO Stop Frequency*

- LO Frequency Mode*

- Multiplier Demoninator*

- Multiplier Numerator*

- Noise Spurce Settling Time*

- Source Address*

Measurement Parameters:

- Average State

- Cal Tcold

- ENR Mode

- Ext LO Start Frequency

- Ext LO Stop Frequency

- Frequency Context*

- Frequency Mode

- Internal Preamp State

- Meas Tcold

- Number of Averages

- Resolution Bandwidth

- Spot State

- Spot ENR

- Spot Thot

- Sweep Points

Corrected Measurement Results*:
Measurement results after calibration data has been accounted for at each frequency point. Column headers are RF Frequency (Hz), IF Frequency (Hz), LO Frequency (Hz)**, Noise Figure (dB), Noise Factor (lin), Gain (dB), Effective Temperature (K), Phot (dB), Pcold (dB), T cold (K).

** Only reported when Freq Context = LO

Uncorrected Measurement Results:
Measurement results before calibration data has been accounted for at each frequency point. Column headers as above, with the exception of Gain. Uncorrected results will report Y Factor 9 (dB) in place of Gain.

Save As...

Opens a dialogue box that enables you to select the file you wish to save.

Key Path	Save, Data
Initial S/W Revision	Prior to A.04.00

Screen Image

Pressing Screen Image accesses a menu of functions that enable you to specify a format and location for the saved screen image. It brings up a menu that allows you to specify the color scheme of the Screen Image (Themes) or navigate to the Save As dialog to perform the actual save.

Screen Image files contain an exact representation of the analyzer display. They cannot be loaded back onto the analyzer, but they can be loaded into your PC for use in many popular applications.

The image to be saved is actually captured when the Save front panel key is pressed, and kept in temporary storage to be used if you ask for a Screen Image save. When the Screen Image key is pressed, a "thumbnail" of the captured image is displayed, as shown below:
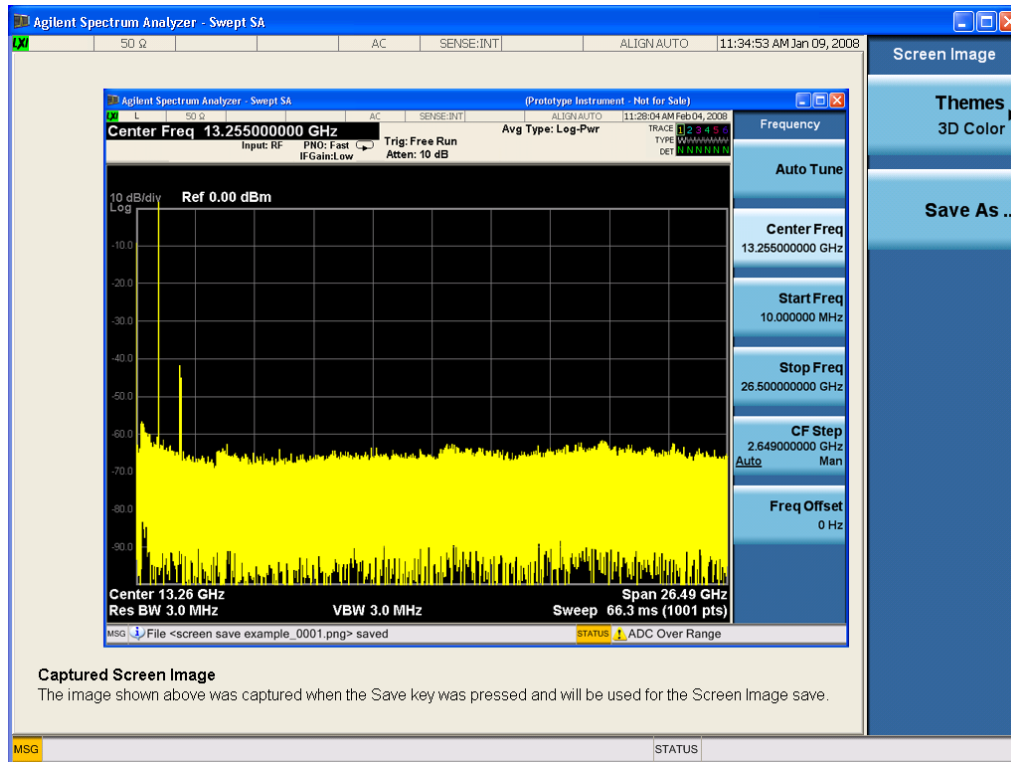
When you continue on into the Save As menu and complete the Screen Image save, the image depicted in the thumbnail is the one that gets saved, showing the menus that were on the screen before going into the Save menus. The save is performed immediately and does not wait until the measurement is complete.

After you have completed the save, the Quick Save front-panel key lets you quickly repeat the last save performed, using an auto-named file, with the current screen data.

| NOTE | For versions previous to A.01.55, if you initiate a screen image save by navigating through the Save menus, the image that is saved will contain the Save menu softkeys, not the menus and the active function that were on the screen when you first pressed the Save front panel key. |

Key Path	Save
Mode	All
Remote Command	`:MMEMory:STORe:SCReen <filename>`
Example	:MMEM:STOR:SCR "myScreen.png"
	This stores the current screen image in the file MyScreenFile.png in the default directory.
Initial S/W Revision	Prior to A.02.00

Themes

Accesses a menu of functions that enable you to choose the theme to be used when saving the screen image.

The **Themes** option is the same as the **Themes** option under the **Display** and **Page Setup** dialogs. It allows you to choose between themes to be used when saving the screen image.

Key Path	Save, Screen Image
Remote Command	:MMEMory:STORe:SCReen:THEMe TDColor | TDMonochrome | FCOLor | FMONochrome
	:MMEMory:STORe:SCReen:THEMe?
Example	:MMEM:STOR:SCR:THEM TDM
Preset	3D Color; Is not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.
Readback	3D Color | 3D Mono | Flat Color | Flat Mono
Backwards Compatibility Notes	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if 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
Example	MMEM:STOR:SCR:THEM TDC
Readback	3D Color
Initial S/W Revision	Prior to A.02.00

3D Monochrome

Selects a format that is like 3D color but shades of gray are used instead of colors.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM TDM
Readback	3D Mono
Initial S/W Revision	Prior to A.02.00

Flat Color

Selects a format that is best when the screen is to be printed on an ink printer.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
Initial S/W Revision	Prior to A.02.00

Flat Monochrome

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

Save As...

When you press "Save As", the analyzer brings up a Windows dialog and a menu entitled "**Save As."** This menu allows you to navigate to the various fields in the Windows dialog without using a keyboard or mouse. The Tab and Arrow keys can also be used for dialog navigation.

See 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

File Formats

Limits

The legacy .lim format is supported for Limit Line RECALL only. Limit Lines must be saved in the .csv format.

.lim Format

The .lim file format consists of the following data:

3. Comments

4. Required Fields

5. Limit Line Data

Comments are denoted by the # symbol. The required fields are file type, version and limit type and are enclosed in square brackets. The limit line data is stored as frequency/magnitude pairs. Below is an example of a valid .lim file.

Limit Line data file

Created by E4448A

Serial Number US20000002 Firmware Revision A.09.00 Rev.105(12 2006 10:27:45)

Application: Noise Figure Personality

Measurement: Noise Figure

Date: February21,1970

Time: 10:07:09

Format is: Frequency (Hz), Magnitude (unitless), connected (1 or 0)

[Filetype LIM]

[Version 1.0]

[Limittype UPPER]

10000000, 5.0000, 1

3000000000, 5.0000, 1

.csv Format

The required fields are:

6. Filetype

7. Version Number

8. Limit Type

9. Limit Trace

10. Limits Data

All other fields will be ignored. Below is a valid .csv file used to save and recall Limits data into the Instrument:

[Filetype Limits]

[Version 1.0]

[Limittype UPPER]

[Limittrace Trace1]

10000000, 13.087

100000000, 13.036

200000000, 13.056

300000000, 13.051

500000000, 14.974

Results

The .csv format used in previous Noise Figure releases will continue to be used with the addition of External LO Control parameters. Parameters appended with '*' are only saved when applicable to the current measurement. The result data is split into six sections as follows:

General Info

Application Name

Measurement Name

Date

Time

DUT Setup Parameters

DUT Type

System Downconverter Status*

Side Band*

External LO Parameters*

Ext LO Control State*

Ext LO Fixed Frequency*

Ext LO Power*

Ext LO Start Frequency*

Ext LO Stop Frequency*

LO Frequency Mode*

Multiplier Demoninator*

Multiplier Numerator*

Noise Spurce Settling Time*

Source Address*

Measurement Parameters

Average State

Cal Tcold

ENR Mode

Ext LO Start Frequency

Ext LO Stop Frequency

Frequency Context*

Frequency Mode

Internal Preamp State

Meas Tcold

Number of Averages

Resolution Bandwidth

Spot State

Spot ENR

Spot Thot

Sweep Points

Corrected Measurement Results*

Measurement results after calibration data has been accounted for at each frequency point. Column headers are RF Frequency (Hz), IF Frequency (Hz), LO Frequency (Hz)**, Noise Figure (dB), Noise Factor (lin), Gain (dB), Effective Temperature (K), Phot (dB), Pcold (dB), T cold (K).

** Only reported when Freq Context = LO

Uncorrected Measurement Results

Measurement results before calibration data has been accounted for at each frequency point. Column headers as above, with the exception of Gain. Uncorrected results will report Y Factor 9 (dB) in place of Gain.

Loss Compensation

The legacy .loss format is supported for Loss Compensation RECALL only. Loss Compensation data must be saved in the .csv format.

.loss Format

The .loss format used in Noise Figure on the PSA/ESA/NFA will be supported for backwards compatibility. The file format is as follows:

11. Comments

12. Required Fields

13. Loss Compensation Data

14. Comments are safely be ignored for recall purposes. Required fields include Filetype and Version information. The filetype must be LOS. The Loss Compensation Data consists of frequency (Hz) loss (dB) pairs. Below is a valid example of a .loss file.

Frequency Dependent Loss Data File

Created by E4440A

Serial Number US00000024 Firmware Revision A.10.00 Rev.006(20 2006 14:46:15)

Application: Noise Figure Personality

Measurement: Noise Figure

Date: February2,2007

Time: 14:43:57

Format is: Frequency (Hz), Loss (dB)

[Filetype LOS]

[Version 1.0]

10, 1.0000

20, 2.0000

30, 3.0000

40, 4.0000

50, 5.0000

60, 6.0000

.csv Format

The .csv format contains the following data:

15. File Type

16. Application Name:Measurement Name

17. Version and Model Number

18. Loss Comp Data

Below is an example of a valid .csv Loss Compensation file:

[Filetype LossCompensation]

[NF:NFIG]

Ver. ***, Model ***

10, 1.0000

20, 2.0000

30, 3.0000

40, 4.0000

50, 5.0000

60, 6.0000

ENR Meas/Cal Table

ENR data has previously been stored in an .enr file type. This is replaced in the X-Series Signal Analyzer with a .csv equivalent. The content of the .csv file is identical to that of the .enr files. Users can therefore use the .csv files produced by the X-Series Signal Analyzer on older instruments (PSA/ESA/NFA) by changing the file extension from .csv to .enr.

.csv Format

The required fields are:

1. Filetype

19. Version Number

20. Serial Number

21. Model

22. ENR Data

All other fields will be ignored. Below is a valid .csv file used to save and recall ENR data into the Instrument:

[Filetype ENR]

[Version 1.0]

[Serialnumber 4015A05185]

[Model 346C]

10000000, 13.087

100000000, 13.036

1000000000, 13.056

2000000000, 13.051

26500000000, 14.974

Frequency List + Context

The legacy .lst format is supported for Frequency List RECALL only. Frequency lists must be saved in the .csv format.

.lst Format

Below is a valid format for the .lst file used to load in frequency list data to the Instrument. This file format is supported for backwards compatibility with the PSA, ESA and NFA noise figure applications. When not present, the frequency context of the list is assumed to be the current context (frequency context is not stored in .lst files).

Frequency list data file

Created by E4448A

Serial Number US45300605 Firmware Revision A.09.00 Rev.108(14 2006 09:51:57)

Application: Noise Figure Personality

Measurement: Noise Figure

Date: November20,2006

Time: 01:44:50

Format is: Frequency (Hz)

[Filetype LST]

[Version 1.0]

4000000000

5000000000

6000000000

25000000000

26500000000

.csv Format

The .csv format replaces the legacy .lst format. It has the following required fields (note frequency context is now saved alongside the frequency list data):

1. Filetype

2. Application Name:Measurement Name

3. Version

4. Frequency List Data

5. MCON Frequency List Data (N9069A–2FP license is required)

a.RF Frequency List Data

b.LO Frequency List Data

c.IF Frequency List Data

Below is an example of a valid .csv Frequency List file:

[Filetype: FrequencyList]

[NF:NFIG]

Ver. ***.

4000000000

5000000000

6000000000

25000000000

26500000000

MCON frequency lists

RF

4000000000

5000000000

6000000000

25000000000

26500000000

LO

4000000000

5000000000

6000000000

25000000000

26500000000

IF

4000000000

5000000000

6000000000

25000000000

26500000000

Note: MCON frequency list data will not be saved without N9069A–2FP license.

Mass Storage Catalog (Remote Command Only)

Key path	SCPI Only
Remote Command	`:MMEMory:CATalog? [<directory_name>]`
Notes	The string must be a valid logical path.
	Queries disk usage information (drive capacity, free space available) and obtains a list of files and directories in a specified directory in the following format:
	‹numeric_value›,‹numeric_value›,{‹file_entry›}
	It returns two numeric parameters and as many strings as there are files and directories. The first parameter indicates the total amount of storage currently used in bytes. The second parameter indicates the total amount of storage available, also in bytes. The ‹file_entry› is a string. Each ‹file_ entry› indicates the name, type, and size of one file in the directory list:
	‹file_name›,‹file_type›,‹file_size›
	As the windows file system has an extension that indicates file type, ‹file_type› is always empty. ‹file_size› provides the size of the file in bytes. For directories, ‹file_entry› is surrounded by square brackets and both ‹file_type› and ‹file_size› are empty
Initial S/W Revision	Prior to A.02.00

Mass Storage Change Directory (Remote Command Only)

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.
Initial S/W Revision	Prior to A.02.00

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
Remote Command	: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
Remote Command	`:MMEMory:DELete <file_name>[,<directory_name>]`
Notes	The string must be a valid logical path.
	Removes a file from the specified directory. The <file_name> parameter specifies the file name to be removed. This command will generate an "access denied" error if the file is in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

Mass Storage Data (Remote Command Only)

Creates a file containing the specified data OR queries the data from an existing file.

Key path	SCPI Only
Remote Command	`:MMEMory:DATA <file_name>, <data>`
	`:MMEMory:DATA? <file_name>`
Notes	The string must be a valid logical path.
	The command form is MMEMory:DATA <file_name>,<data>. It loads <data> into the file <file_name>. <data> is in 488.2 block format. <file_name> is string data.
	The query form is MMEMory:DATA? <file_name> with the response being the associated <data> in block format.
Initial S/W Revision	Prior to A.02.00

Mass Storage Make Directory (Remote Command Only)

Key path	SCPI Only
Remote Command	`:MMEMory:MDIRectory <directory_name>`
Notes	The string must be a valid logical path.
	Creates a new directory. The <directory_name> parameter specifies the name to be created.
	This command will generate an "access denied" error if the new directory would be in a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

Mass Storage Move (Remote Command Only)

Key path	SCPI Only
Remote Command	`:MMEMory:MOVE <string>,<string>[,<string>,<string>]`
Notes	The string must be a valid logical path.
	Moves an existing file to a new file or an existing directory to a new directory.

	Two forms of parameters are allowed. The first form has two parameters. In this form, the first parameter specifies the source, and the second parameter specifies the destination.
	The second form has four parameters. In this form, the first and third parameters specify the source. The second and fourth parameters specify the directories. The first pair of parameters specifies the source. The second pair specifies the destination. An error is generated if the source doesn't exist or the destination file already exists.
	This command will generate an "access denied" error if the destination is a restricted folder (e.g., C:\Windows) and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

Mass Storage Remove Directory (Remote Command Only)

Key path	SCPI Only
Remote Command	`:MMEMory:RDIRectory <directory_name>`
Notes	The string must be a valid logical path.
	Removes a directory. The <directory_name> parameter specifies the directory name to be removed. All files and directories under the specified directory shall also be removed.
	This command will generate an "access denied" error if the folder is a restricted folder (e.g., C:\Windows) or is in a restricted folder and the current user does not have Power User or Administrator privileges.
Initial S/W Revision	Prior to A.02.00

Single (Single Measurement/Sweep)

Sets the analyzer for Single measurement operation. The single/continuous state is Meas Global, so the setting will affect all the measurements. If you are Paused, pressing Single does a Resume.

See "More Information" on page 599

Key Path	Front-panel key
Example	:INIT:CONT OFF
Notes	See Cont key description.
Backwards Compatibility Notes	For Spectrum Analysis mode in ESA and PSA, the Single hardkey and the INITiate:IMM switched from continuous measurement to single measurement and restarted sweeps and averages (displayed average count reset to 1), but did not restart Max Hold and Min Hold. In the X-Series, the Single hardkey and the INITiate:IMM command initiate a sweep/ measurement/ average sequence/hold sequence including MaxHold and MinHold.
	For Spectrum Analysis mode in ESA and PSA, the Single hardkey restarted the sweep regardless of whether or not you were in an active sweep or sweep sequence. In the X-Series, Restart does this but Single only restarts the sweep or sweep sequence if you are in the idle state.
	INIT[:IMM] in ESA & PSA Spectrum Analysis Mode does an implied ABORt. In some other PSA Modes, INIT[:IMM] is ignored if not in the idle state. . The X-Series follows the ESA/PSA SA Mode model, which may cause some Modes to have compatibility problems.
Initial S/W Revision	Prior to A.02.00

More Information

See "Restart" on page 575 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

If you wish to make manual Noise Figure measurements, switch to Spectrum Analyzer Mode and select the Noise Source softkey located under Meas Setup in the Swept SA Measurement.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

SPAN X Scale

The Span key activates the Span function and displays the menu of span functions.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Span

Sets the displayed frequency range symmetrically about the center frequency.

Key Path	Span
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:FREQuency:SPAN <freq>`
	`[:SENSe]:NFIGure:FREQuency:SPAN?`
Example	FREQ:SPAN 10 MHz
Preset	2.99GHz
State Saved	Saved in instrument state.
Range	–325 GHz to 325 GHz
Min	10 kHz
Max	There are a few conditions the max will be 325 GHz less the min span of 10 Hz.
	When DUT is an Amplifier with System Downconverter 'On' and the frequency context is set to "RF DUT Input"
	When DUT is a Downconverter and the frequency context is set to "RF DUT Input"
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:FREQuency:SPAN`
Initial S/W Revision	Prior to A.04.00
Coupling	This allows you to set the span at which the measurement sweeps. Active only when freq mode is set to Swept. Coupled to Start Freq, stop freq and center freq.

Sweep/Control

Accesses the functions to control the sweep.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Avg Time/Point Auto/Man

Avg Time/Pt is the measurement duration for each of the two states (noise source on and noise source off) that occur at each frequency point. Therefore, for one result trace, the time required will change by 2 times the number of frequency points times the change in the Avg Time/Pt.

Longer settings of Avg Time/Pt reduce the variance of the results, but slow the throughput. The Auto setting sets Avg Time/Pt according to this formula:

Avg Time/Pt = 64 ks / RBW

The default RBW is 4 MHz so the Avg Time/Pt default is 16 ms. At this sweep time, the variance of the trace point results under best-case circumstances (high DUT output noise levels) is such that 95% of all results will have an error due to this variance that is similar to the Instrument Uncertainty for Noise Figure. Therefore, the overall uncertainties do not improve much for longer averaging times. Averaging times much shorter than 16 ms will cause the throughput to be dominated by overheads of computation and settling. Thus, the default is often a good tradeoff between speed and variance.

One use of shorter settings of Avg Time/Pt is for testing DUTs that operate in a pulsed mode.

Avg Time/Pt is one way to reduce variance. Another is setting the "Avg Num" parameter in the Meas Setup menu. When averaging traces with the Avg Num set higher than one, the time to achieve a given variance is longer because the overhead time at each point is experienced during each sweep, thus increasing Avg Time/Pt is more efficient. But a shorter Avg Time/Pt with a higher Avg Num gives more interactive results, with an earlier first view of the results.

This trade-off between AvgTime/Pt and Avg Num is analogous to the trade-off between "point" and "sweep" averaging modes in the Agilent NFA.

Key Path	Sweep
Mode	Noise figure
Remote Command	`[:SENSe]:NFIGure:SWEep:TIME <time>`
	`[:SENSe]:NFIGure:SWEep:TIME?`
	`[:SENSe]:NFIGure:SWEep:TIME:AUTO ON|OFF|1|0`
	`[:SENSe]:NFIGure:SWEep:TIME:AUTO?`
Example	NFIG:SWE:TIME 64 ms
	:NFIG:SWE:TIME:AUTO OFF
Preset	16 ms
	ON
State Saved	Saved in instrument state.

Min	1 us
Max	6 ks
Backwards Compatibility SCPI	`[:SENSe]:SWEep:TIME`
Initial S/W Revision	Prior to A.04.00

Points

Sets the number of frequency points that will be used when Freq Mode (FREQ Channel menu) is set to 'Swept'. The frequency points are distributed evenly between the Start and Stop Frequencies (see section).

Key Path	Frequency
Mode	NF
Remote Command	`[:SENSe]:NFIGure:SWEep:POINts <integer>`
	`[:SENSe]:NFIGure:SWEep:POINts?`
Example	SWE:POIN 201
Preset	11
State Saved	Saved in instrument state.
Min	2
Max	501
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:SWEep:POINts`
Initial S/W Revision	Prior to A.04.00
Coupling	Coupled to max value of Position parameter (under View/Display key)

Manual Continue (Remote only) (N9069A/W9069A–2FP)

The following command is used to trigger manual calibration or manual measurement after the user connects a Cold or Hot noise source.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MANual:CONTinue`
Example	NFIG:MAN:CONT
Initial S/W Revision	A.13.00

Manual Abort (Remote only) (N9069A/W9069A–2FP)

The following command is used to abort current manual calibration or manual measurement.

Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:MANual:ABORt`
Example	NFIG:MAN:ABORt
Initial S/W Revision	A.13.00

System

See

Trace/Detector

Opens a menu that enables you to set the parameters for Trace and Detector.

Key Path	Trace/Detector
Mode	NFIGURE
Initial S/W Revision	Prior to A.04.00

Select Trace (frontpanel only)

This key select which trace other parameters under the Trace/Detector menu will apply to.

Key Path	Trace/Detector
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	1
State Saved	Saved in instrument state.
Range	1 | 2
Initial S/W Revision	Prior to A.04.00
Coupling	Coupled to 'Next Window' key in Split Graph view.

Select Readout (Meter View with N9069A/W9069A-AFP)

This key select which trace other parameters under the Trace/Detector menu will apply to.

Key Path	Trace/Detector
Mode	NFIGURE
Remote Command Notes	No SCPI. Front panel only.
Preset	1
State Saved	Saved in instrument state.
Range	1 | 2
Initial S/W Revision	Prior to A.04.00
Modified at SW Revision	A.10.01
Coupling	Coupled to 'Next Window' key in Split Graph view.
	If the current view is "Meter", the Softkey Label will be changed to "Select Readout"

Data (Result Type)

Sets the selected result to be displayed on the Selected Trace, or in the corresponding column in the table or meter views.

The result can be one of:

- NFIGure – Noise Figure

- NFACtor – Noise Factor (Linear Noise Figure)

- GAIN – Gain

- YFACtor – Y-Factor

- TEFFective – Effective Temperature

- PHOT – Hot Power Density

- PCOLd – Cold Power Density

After a preset Trace 1 defaults to Noise Figure and Trace 2 defaults to Gain.

Key Path	Trace/Detector
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:DATA:TRACe[1] | 2 NFIGure | NFACtor | GAIN | YFACtor | TEFFective | PHOT | PCOLd`
	`:DISPlay:NFIGure:DATA:TRACe[1]|2?`
Example	:DISP:NFIG:DATA:TRAC1 NFIG
Preset	NFIGure for Trace 1 and Gain for Trace 2
State Saved	Saved in instrument state.
Range	NFIGure | NFACtor | GAIN | YFACtor | TEFFective | PHOT | PCOLd
Backwards Compatibility SCPI	`:DISPlay[:NFIGure]:DATA:TRACe[1]|2[:RESult]`
Initial S/W Revision	Prior to A.04.00

View/Blank

This key lets you set the state of the two trace variables, Update and Display. The four choices available in this 1-of-N menu are:

- Trace On: Update and Display both On

- View: Update Off and Display On

- Blank: Update Off and Display Off

- Background: Update On, Display Off (this allows a trace to be blanked and continue to update "in the background", which was not possible in the past)

A trace with Display Off is indicated by a strikethrough thru the type letter in the trace annotation panel in the Measurement bar. A trace with Update Off is indicated by dimming the type letter in the trace annotation panel in the Measurement bar. So in the example below, Traces 3, 4, 5 and 6 have Update Off and Traces 4 and 6 have Display Off.

See "Trace Update State On/Off" on page 608.

See "Trace Display State On/Off" on page 609.

See "More Information" on page 609.

Key Path	Trace/Detector
Notes	The four states of this 1-of-N actually set two variables, Update and Display, to their four possible combinations:
	• Trace On: Update and Display both On
	• View: Update Off and Display On
	• Blank: Update Off and Display Off
	• Background: Update On, Display Off
	See tables below for detail on the SCPI to control these two variables.
Dependencies	When Signal ID is on, this key is grayed out.
Couplings	Selecting a trace type (Clear Write, Trace Average, Max Hold, Min Hold) for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that trace type was already selected.
	Selecting a detector for a trace (pressing the key or sending a [:SENS]:DET:TRAC command) puts the trace in Trace On (Update On and Display On), even if that detector was already selected.
	Selecting a math mode other than Off for a trace (pressing the key or sending the equivalent SCPI command) puts the trace in Trace On (Update On and Display On), even if that math mode was already selected.
	Loading a trace from a file puts that trace in View regardless of the state it was in when it was saved; as does being the target of a Copy or a participant in an Exchange.
Initial S/W Revision	Prior to A.02.00

Trace Update State On/Off

Key Path	Trace/Detector
Remote Command	`:TRACe[1]|2|...|6:UPDate[:STATe] ON|OFF|0|1`
	`:TRACe[1]|2|...|6:UPDate[:STATe]?`
Example	TRAC2:UPD 0 Makes trace 2 inactive (stops updating)
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards	`:TRACe:MODE VIEW`

Compatibility SCPI	sets :TRACe:UPDate OFF, :TRACe:DISPlay ON, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE VIEW command will yield its new equivalent, which is Update=Off, Display=On
Initial S/W Revision	Prior to A.02.00

Trace Display State On/Off

Key Path	Trace/Detector
Remote Command	:TRACe[1]|2|...|6:DISPlay[:STATe] ON|OFF|0|1
	:TRACe[1]|2|...|6:DISPlay[:STATe]?
Example	TRAC2:DISP,1 Makes trace 2 visible
	TRAC3:DISP,0 Blanks trace 3
Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	1|0|0|0|0|0 (On for Trace 1; Off for 2–6)
State Saved	Saved in instrument state
Backwards Compatibility SCPI	:TRACe:MODE BLANk
	sets :TRACe:UPDate OFF, :TRACe:DISPlay OFF, for the selected trace. In earlier analyzers, View and Blank were trace modes, set by TRACe:MODE command. In the X-Series, View and Blank are two of the states set by the :TRACe:UPDate and :TRACe:DISPlay commands. The TRACe:MODE BLANk command will yield its new equivalent, which is Update=Off, Display=Off
Initial S/W Revision	Prior to A.02.00

More Information

When a trace becomes inactive, the following things happen:

- Any update from the SENSe system (detectors) immediately stops (does not wait for end of sweep)

- the trace is displayed at half intensity (as long as it stays inactive)

Inactive traces display across the entire X Axis of the instrument. Their horizontal placement does not change even if X Axis settings subsequently are changed, although Y-axis settings will affect the vertical placement of data.

In most cases, inactive traces are static and unchanging; however, there are cases when an inactive trace will update, specifically:

- if data is written to that trace from remote

- if trace data is loaded from mass storage

- if the trace is the target of a Copy or participant in an Exchange

- if the trace is cleared using the Clear Trace function (below)

When a trace becomes active (Update=On), the trace is cleared, the average count is reset, and a new sweep is initiated.

Traces which are blanked (Display=off) do not display nor appear on printouts but are otherwise unaffected. They may be queried and markers may be placed on them.

Note that the action of putting a trace in Display=Off and/or Update=Off does not restart the sweep and does not restart Averaging or Hold functions for any traces.

Note also that whenever you set Update to On for any trace,Display is set to On for that trace.

All Traces On

This new key allows the user to set the NF measurement going again, without having the pain of having to select each trace and set to "Trace On".

Key Path	Sweep/Control
Mode	NFIGURE
Remote Command	`:TRACe:NFIGure:WRITe:ALL`
Example	:TRAC:NFIG:WRITE:ALL
Remote Command Notes	Immediate action. : New command Immediate Action, Set only.
Initial S/W Revision	Prior to A.04.00

Detector

This softkey is grayed out in Noise Figure Mode. This is a query only SCPI command.

Key Path	Trace/Det
Mode	NFIGURE
Remote Command	`[:SENSe]:NFIGure:DETector[:FUNCtion] AVERage`
	`[:SENSe]:NFIGure:DETector[:FUNCtion]?`
Example	:NFIG:DET AVER
	:NFIG:DET?
Remote Command Notes	Query Only
Preset	AVERage
State Saved	Saved in instrument state.
Range	AVERage
Backwards Compatibility SCPI	`[:SENSe][:NFIGure]:DETector[:FUNCtion]`
Initial S/W Revision	Prior to A.04.00
Restriction and Notes	Can only be set to AVERage. Command (not query) provided for BWCC.

Trigger

See "Trigger" on page 424

User Preset

Accesses a menu that gives you the following three choices:

- User Preset – recalls a state previously saved using the Save User Preset function.

- User Preset All Modes – presets all of the modes in the analyzer

- Save User Preset– saves the current state for the current mode

Key Path	Front-panel key
Backwards Compatibility Notes	User Preset is actually loading a state, and in legacy analyzers, it was possible to load a state without affecting the trace data, limit lines or correction data. Similarly it was possible to do a User Preset without affecting the trace data, limit lines or correction data.
	In the X-Series, "state" always includes all of this data; so whenever state is loaded, or User Preset is executed, all of the traces, limit lines and corrections are affected. Although this differs from previous behavior, it is desirable behavior, and should not cause adverse issues for users.
	On ESA and PSA, User Preset affected the entire instrument's state. In the X-Series, User Preset only recalls the state for the active mode. There is a User Preset file for each mode. User Preset can never cause a mode switch as it can in legacy analyzers. If you want to recall all modes to their user preset file state, you will need to do a User Preset after mode switching into each mode.
	User Preset recalls mode state which can now include data like traces; whereas on ESA and PSA, User Preset did not affect data.
Initial S/W Revision	Prior to A.02.00

User Preset

User Preset sets the state of the currently active mode back to the state that was previously saved for this mode using the Save User Preset menu key or the SCPI command, SYST:PRES:USER:SAV. It not only recalls the Mode Preset settings, but it also recalls all of the mode persistent settings, and the Input/Output system setting that existed at the time Save User Preset was executed.

If a Save User Preset has not been done at any time, User Preset recalls the default user preset file for the currently active mode. The default user preset files are created if, at power-on, a mode detects there is no user preset file. There will never be a scenario when there is no user preset file to restore. For each mode, the default user preset state is the same state that would be saved if a Save User Preset is performed in each mode right after doing a Restore Mode Default and after a Restore Input/Output Defaults.

The User Preset function does the following:

- Aborts the currently running measurement.

- Sets the mode State to the values defined by Save User Preset.

- Makes the saved measurement for the currently running mode the active measurement.

- Brings up the saved menu for the power-on mode.

- Clears the input and output buffers.

- Sets the Status Byte to 0.

Key Path	User Preset
Remote Command	`:SYSTem:PRESet:USER`
Example	:SYST:PRES:USER:SAVE:SYST:PRES:USER
Notes	:SYST:PRES:USER:SAVE is used to save the current state as the user preset state.
	Clears all pending OPC bits. The Status Byte is set to 0.
	Pressing the User Preset front-panel key while already in the User Preset menu will cause the User Preset to get executed
Couplings	A user preset will cause the currently running measurement to be aborted and cause the saved measurement to be active. Recalling a User Preset file has the same issues that recalling a Save State file has. Some settings may need to be limited and therefore re-coupled, since the capabilities of the mode may have changes when the User Preset file was last saved.
Initial S/W Revision	Prior to A.02.00

User Preset All Modes

Recalls all of the User Preset files for each mode, switches to the power-on mode, and activates the saved measurement from the power-on mode User Preset file.

> **NOTE** When the instrument is secured, all of the user preset files are converted back to their default user preset files.

The User Preset function does the following:

- Aborts the currently running measurement.
- Switches the Mode to the power-on mode.
- Restores the User Preset files for each mode.
- Makes the saved measurement for the power-on mode the active measurement.
- Brings up the saved menu for the power-on mode.
- Clears the input and output buffers.
- Sets the Status Byte to 0.

Key Path	User Preset
Remote Command	`:SYSTem:PRESet:USER:ALL`
Example	:SYST:PRES:USER:SAVE:SYST:PRES:USER:ALL
Notes	Clears all pending OPC bits. The Status Byte is set to 0.
	:SYST:PRES:USER:SAVE is used to save the current state as the user preset state.
Couplings	A user preset will cause the currently running measurement to be aborted, cause a mode switch to the power-on mode, and cause the saved measurement to be active in the power-on mode. Recalling a User Preset file has the same issues that recalling a Save State file has. Some settings may need to be limited and therefore re-coupled, since the capabilities of the mode may have changes when the User Preset file was last saved.
Initial S/W Revision	Prior to A.02.00

Save User Preset

Saves the currently active mode and its State. You can recall this User Preset file by pressing the User Preset menu key or sending the SYST:PRES:USER remote command. This same state is also saved by the Save State function.

Key Path	User Preset
Remote Command	`:SYSTem:PRESet:USER:SAVE`
Example	:SYST:PRES:USER:SAVE
Notes	:SYST:PRES:SAVE creates the same file as if the user requested a *SAV or a MMEM: STOR:STAT, except User Preset Save does not allow the user to specify the filename or the location of the file.
Initial S/W Revision	Prior to A.02.00

View/Display

Accesses a menu of functions that enable you to control the measurement views and instrument display.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Display

The Display menu is common to most measurements, and is used for configuring items on the display. Some Display menu settings apply to all the measurements in a mode, and some only to the current measurement. Those under the System Display Settings key apply to all measurements in all modes.

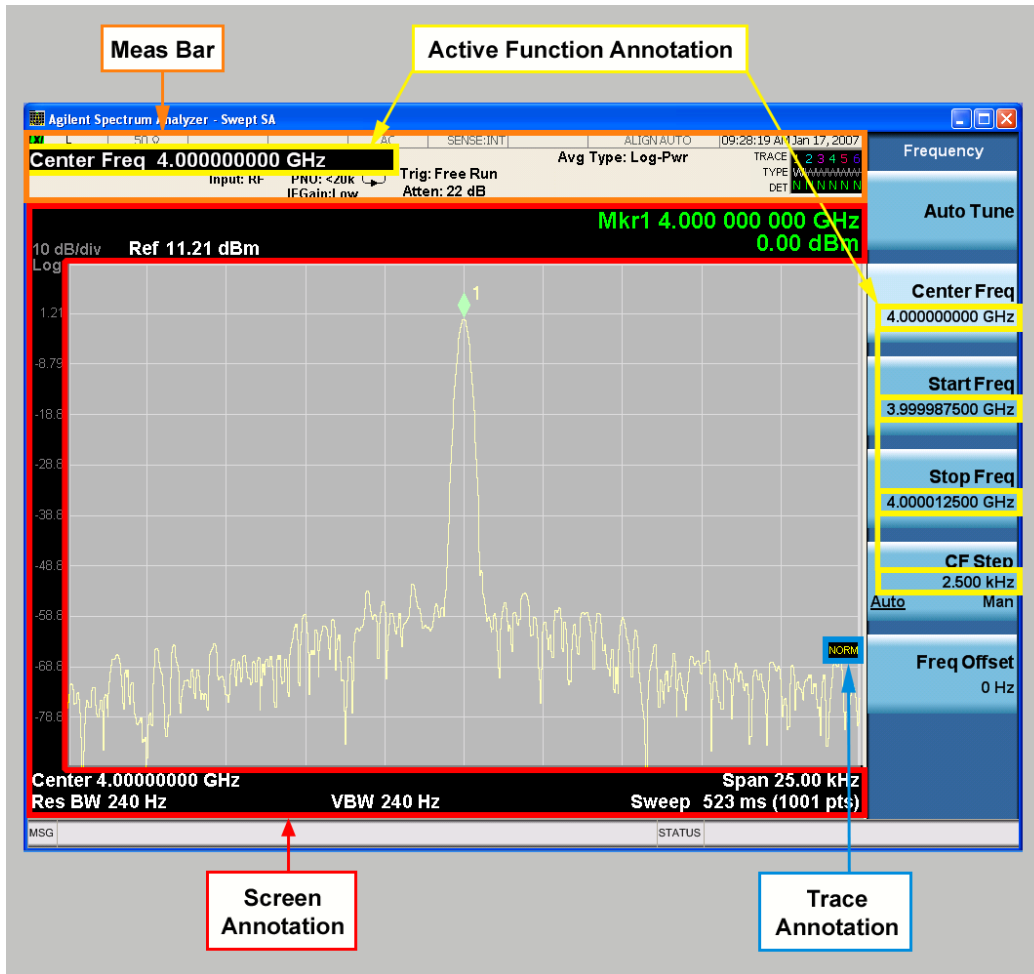| Key Path	Display
Key Path	View/Display
Initial S/W Revision	Prior to A.02.00

Annotation

Turns on and off various parts of the display annotation. The annotation is divided up into four categories:

1. Meas Bar: This is the measurement bar at the top of the screen. It does not include the settings panel or the Active Function. Turning off the Meas Bar turns off the settings panel and the Active Function. When the Meas Bar is off, the graticule area expands to fill the area formerly occupied by the Meas Bar.

2. Screen Annotation: this is the annotation and annunciation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) This does NOT include the marker number or the N dB result. When off, the graticule expands to fill the entire graticule area.

3. Trace annotation: these are the labels on the traces, showing their detector (or their math mode).

4. Active Function annotation: this is the active function display in the meas bar, and all of the active function values displayed on softkeys.

See the figure below. Each type of annotation can be turned on and off individually.

Key Path	View/Display, Display
Initial S/W Revision	Prior to A.02.00

Meas Bar On/Off

This function turns the Measurement Bar on and off, including the settings panel. When off, the graticule area expands to fill the area formerly occupied by the Measurement Bar.

Key Path	View/Display, Display, Annotation
Remote Command	`:DISPlay:ANNotation:MBAR[:STATe] OFF|ON|0|1`
	`:DISPlay:ANNotation:MBAR[:STATe]?`
Example	DISP:ANN:MBAR OFF
Dependencies	Grayed out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On
	This should remain Off through a Preset when System DisplaySettings, Annotation is set to Off.
State Saved	Saved in instrument state.
Initial S/W Revision	Prior to A.02.00

Screen

This controls the display of the annunciation and annotation around the graticule, including any annotation on lines (such as the display line, the threshold line, etc.) and the y-axis annotation. This does NOT include marker annotation (or the N dB result). When off, the graticule expands to fill the entire graticule area, leaving only the 1.5% gap above the graticule as described in the Trace/Detector chapter.
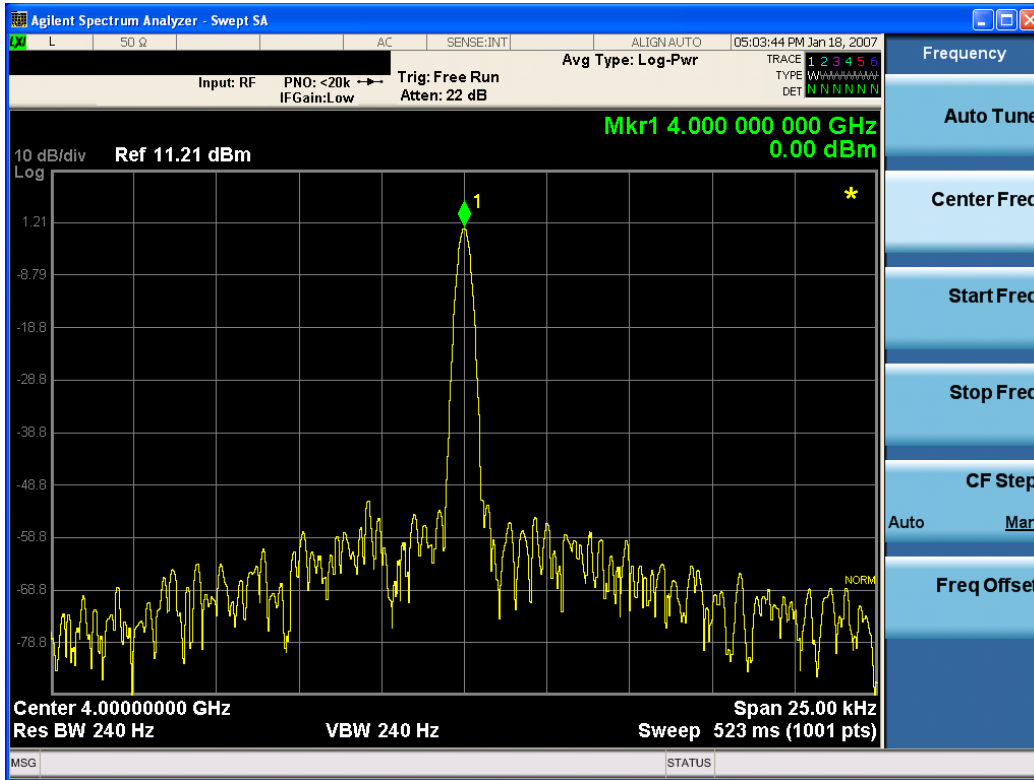
Key Path	View/Display, Display, Annotation
Remote Command	`:DISPlay:ANNotation:SCReen[:STATe] OFF|ON|0|1`
	`:DISPlay:ANNotation:SCReen[:STATe]?`
Example	DISP:ANN:SCR OFF
Dependencies	Grayed-out and forced to OFF when System Display Settings, Annotation is set to Off.
Preset	On
	This should remain Off 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

Annotation On/Off (remote command only, backwards compatibility only)

This command provides backwards compatibility for turning screen annotation on and off.

Mode	NFIGURE
Remote Command	:DISPlay[:NFIGure]:ANNotation[:STATe] ON|OFF|1|0
	:DISPlay[:NFIGure]:ANNotation[:STATe]?
Example	DISP:ANN OFF
Remote Command Notes	PSA/ESA BWCC

Preset	ON
State Saved	Saved in instrument state.
Range	ON|OFF|1|0
Initial S/W Revision	Prior to A.04.00
Coupling	Same as base instrument command :DISPlay:WINDow:ANNotation[:ALL].

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

Graticule On/Off (remote command only, backwards compatibility only)

This command provides backwards compatibility for turning the graticule on and off.

Mode	NFIGURE
Remote Command	`:DISPlay[:NFIGure]:GRATicule[:STATe] ON|OFF|1|0`
	`:DISPlay[:NFIGure]:GRATicule[:STATe]?`
Example	DISP:GRAT OFF
Remote Command Notes	PSA/ESA BWCC
Preset	ON
State Saved	Saved in instrument state.
Range	ON|OFF|1|0
Initial S/W Revision	Prior to A.04.00
Coupling	Same as base instrument command :DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe].

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.

Key Path	Save, Screen Image
Remote Command	`:MMEMory:STORe:SCReen:THEMe TDColor	TDMonochrome	FCOLor	FMONochrome`
	`:MMEMory:STORe:SCReen:THEMe?`
Example	`:MMEM:STOR:SCR:THEM TDM`
Preset	3D Color; Is not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes.
Readback	3D Color	3D Mono	Flat Color	Flat Mono
Backwards Compatibility Notes	In ESA and PSA we offer the choice of "Reverse Bitmap" or "Reverse Metafile" when saving screen images. This is much like the "Flat Color" theme available in X-Series. Also, if 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
Example	MMEM:STOR:SCR:THEM TDC
Readback	3D Color
Initial S/W Revision	Prior to A.02.00

3D Monochrome

Selects a format that is like 3D color but shades of gray are used instead of colors.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM TDM
Readback	3D Mono
Initial S/W Revision	Prior to A.02.00

Flat Color

Selects a format that is best when the screen is to be printed on an ink printer.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM FCOL
Readback	Flat Color
Initial S/W Revision	Prior to A.02.00

Flat Monochrome

Selects a format that is like Flat Color. But only black is used (no colors, not even gray), and no fill.

Key Path	Save, Screen Image, Themes
Example	MMEM:STOR:SCR:THEM FMON
Readback	Flat Mono
Initial S/W Revision	Prior to A.02.00

Backlight

Accesses the display backlight on/off keys. This setting may interact with settings under the Windows "Power" menu.

When the backlight is off, pressing ESC, TAB, SPACE, ENTER, UP, DOWN, LEFT, RIGHT, DEL, BKSP, CTRL, or ALT turns the backlight on without affecting the application. Pressing any other key will turn backlight on and could potentially perform the action as well.

Key Path	View/Display, Display, System Display Settings
Remote Command	:DISPlay:BACKlight ON|OFF
	:DISPlay:BACKlight?
Preset	ON (Set by Restore Misc Defaults)
Initial S/W Revision	Prior to A.02.00

Backlight Intensity

An active function used to set the backlight intensity. It goes from 0 to 100 where 100 is full on and 0 is off. This value is independent of the values set under the Backlight on/off key.

Key Path	View/Display, Display, System Display Settings
Remote Command	:DISPlay:BACKlight:INTensity <integer>
	:DISPlay:BACKlight:INTensity?
Example	DISP:BACK:INT 50
Preset	100 (Set by Restore Misc Defaults)
Min	0

Max	100
Initial S/W Revision	Prior to A.02.00

Zoom (remote command only, backwards compatibility only)

This command provides backwards compatibility for zooming on the split graph result view. In any view mode, using the UPPer parameter causes split view mode to be activated and the top graph to become zoomed and using LOWer causes the split graph view to be activated and the bottom graph to become zoomed. OFF turns all zooming off.

Mode	NFIGURE
Remote Command	:DISPlay[:NFIGure]:ZOOM:WINDow OFF|LOWer|UPPer
	:DISPlay[:NFIGure]:ZOOM:WINDow?
Example	DISP:ZOOM:WIND UPP
Remote Command Notes	PSA/ESA BWCC
State Saved	Saved in instrument state.
Range	OFF|LOWer|UPPer
Initial S/W Revision	Prior to A.04.00
Coupling	Same as base instrument command :DISPlay:WINDow:FORMat:ZOOM

Layout

Layout selects the format in which the measurement results should be displayed on screen. Results can be displayed in Graph, Table or Meter form. Auto option will make the layout coupled with Freq Mode.

Key Path	View
Mode	NFIGURE
Remote Command	:DISPlay:NFIGure:FORMat GRAPh|TABLe|METer
	:DISPlay:NFIGure:FORMat?
Example	:DISP:NFIG:FORM GRAP
Preset	GRAPh
State Saved	Saved in instrument state.
Range	GRAPh|TABLe|METer
Backwards Compatibility SCPI	:DISPlay[:NFIGure]:FORMat
Initial S/W Revision	Prior to A.04.00
Modified at SW Revision	A.10.01
Coupling	The Auto rules would select Graph when the Freq Mode is swept; use Table when Freq Mode is List and use Meter when Freq Mode is Fixed. If customer change the layout selection manually, the Auto selection will become Man, and there will be no coupling between Freq Mode and Layout anymore

Auto

Sets the Layout to Auto which will align the layout selection with the Freq Mode switch.

| Key Path	View/Display Layout
Mode	NF
Remote Command	:DISPlay:NFIGure:FORMat:AUTO OFF|ON|0|1
	:DISPlay:NFIGure:FORMat:AUTO?
Example	DISP:NFIG:FORM:AUTO ON
	DISP:NFIG:FORM:AUTO?
Couplings	The Auto rules would select Graph when the Freq Mode is swept; use Table when Freq Mode is List and use Meter when Freq Mode is Fixed. If customer change the layout selection manually, the Auto selection will become Man, and there will be no couples between Freq Mode and Layout anymore
Preset	ON
State Saved	Saved in instrument state.
Initial S/W Revision	A.10.01

Graph View
Graph View (Split)
This view draws the 'Data1 and 'Data2 results on two graphs in window 1 (top) and window 2 (bottom) respectively. A caret (^) is displayed below each trace at the position of the current measurement when the total sweep time exceeds 300 ms (total sweep time = avg sweep time per point * number of points).

In Graph View mode, "Data 1" and "Data 2" will show the current result type.

Graph View (Overlaid Traces)

This view draws both results as two traces on the same graph with two sets of Y-axis notation. This view can be useful for printing both results together on a bigger graph. A caret (^) is displayed below each trace at the position of the current measurement.
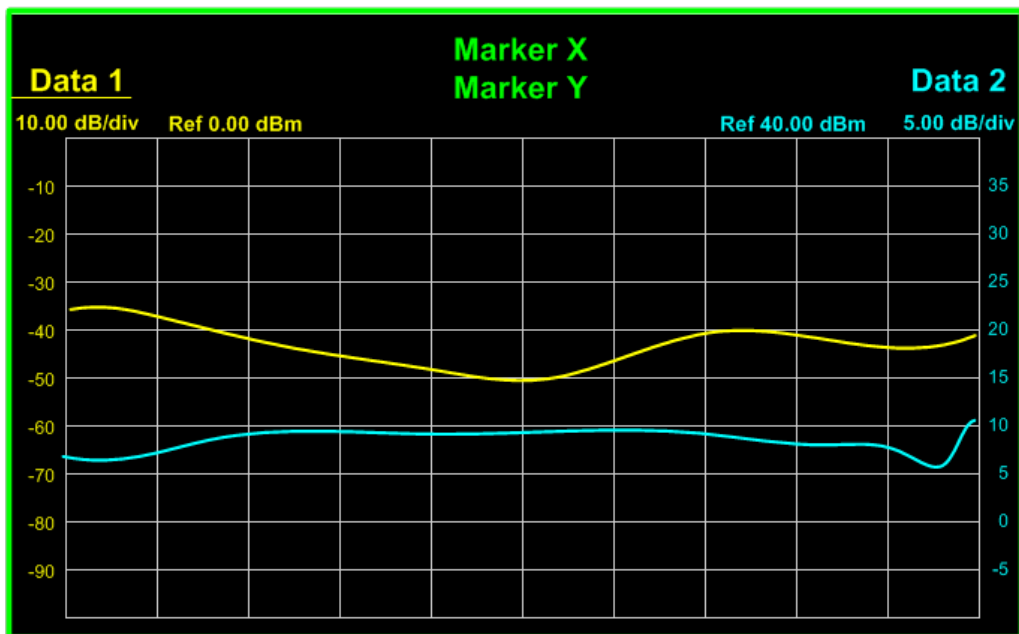
In Overlaid Traces view mode, "Data 1" and "Data 2" will show the current result type. All annotation in yellow refers to Trace 1 (displaying Data1) and all annotation in blue refers to Trace 2 (displaying Data2)

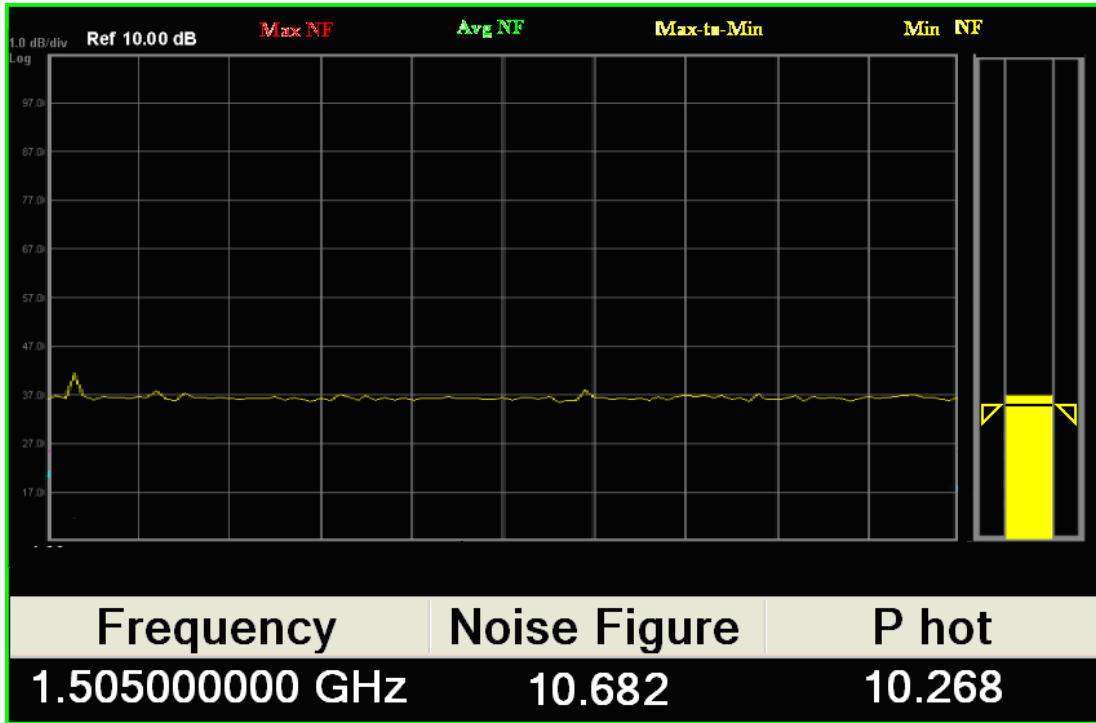| Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Table View

The table view shows discrete results for each frequency point in a tabular form. The 'Data 1' and 'Data 2' headings show the data types selected and the data within the table shows the results for each data type at the given frequency point. All values will be displayed according the their defined 'Display Format' (see appropriate SCPI table).

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Meter View (with N9069A/W9069A-AFP)

- The metric window shows the 'Data1 and 'Data2' results in a large font for one frequency point. The results are updated for each frequency in turn as they are measured. The 'Data 1' and 'Data 2' headings show the data type and the 'Data1' and 'Data2' fields show the results for each data type at the frequency point shown in the 'Freq' field. Note, only the latest measured Data1 and Data2 values will be displayed on the screen.

- The graphic window will contain two graphs, strip chart and bar graph, the displayed data is always Noise Figure, regardless of the selection of the two elements in the textual display, and both of the graphs will use the same Y-Axis Scale settings. Note, there is no horizontal scale in Strip chart, the displayed points will always be 61. The graph and strip chart will not update when Freq Mode is not Fixed.

- We will get 4 readouts on the strip chart's top area, they are "Max NF", "Avg NF", "Max-to-Min" and "Min NF". No marker will be provided in strip chart. All readouts will be only one line, with 0.001dB resolution, like "Max NF: 12.300 dB"

- The bar chart will draw a black line at the minimum level, and with two hollow yellow triangle indicator on the both sides. On the top of this bar, the min value of Noise Figure will be displayed, it can help customer to get the min value directly

- Trace/Detector menu, first key's text "Select Trace" will be changed to "Select Readout" if the current view layout is Meter View. And all "View/Blank" settings only take effect for Readout Results, not affect the strip chat and bar graph.

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Meter View (without N9069A/W9069A-AFP)

The Meter view shows the 'Data1 and 'Data2' results in a large font for one frequency point. The results are updated for each frequency in turn as they are measured. The 'Data 1' and 'Data 2' headings show the data type and the 'Data1' and 'Data2' fields show the results for each data type at the frequency point shown in the 'Freq' field. All values will be displayed according the their defined 'Display Format' (see appropriate SCPI table).

Key Path	Front-Panel
Initial S/W Revision	Prior to A.04.00

Table Position

This function sets the view position in the current measurement. This has different visual effects for each Meas View.

In Graph View (Overlaid Traces or Split), this parameter has no effect.

In Table View, this parameter controls the selected row in the table. If the selected row is not currently displayed on-screen, the table will automatically scroll so that the selected row is centered.

In Meter View, this parameter controls the frequency point and corresponding results currently shown on the meter display.

Key Path	View/Display
Mode	NFIGURE
Preset	1
State Saved	No
Range	1 – #Frequency Points
Min	1
Max	Dependent on Frequency Points parameter (under FREQ Channel key)
Initial S/W Revision	Prior to A.04.00
Coupling	Max value coupled to Frequency Points parameter (under FREQ Channel key)

Overlaid Traces

Toggles Overlaid Traces On/Off. This switches between the Split graph view and Overlaid Traces graph view. This is available when the Layout parameter is set to Graph.

If Overlay Trace is ON, it will have the current two traces on the screen, yellow one will represent trace 1 and blue one will represent trace 2. Each trace will have its own data type name on the right side of the trace, and two sets of graph annotation will use the same color as its trace.

Key Path	View
Mode	NFIGURE
Remote Command	`:DISPlay:NFIGure:TRACe:COMBined[:STATe] OFF|ON|0|1`
	`:DISPlay:NFIGure:TRACe:COMBined[:STATe]?`
Example	:DISP:NFIG:TRAC:COMB:STAT ON
Preset	OFF
State Saved	Saved in instrument state.
Range	On | Off
Backwards Compatibility SCPI	`:DISPlay[:NFIGure]:TRACe:COMBined[:STATe]`
Initial S/W Revision	A.06.00
Modified at SW Revision	A.10.01
Coupling	Only enabled when Layout is set to Graph or the Layout is set to Auto and Freq Mode is set to Swept.

Data Display

Allows the user to select which trace to be displayed.

When "Current Trace" is selected, it displays the current measurement trace. This is the default setting.

When "Memory" is selected, it displays the measurement trace you saved to memory when the Current Trace->Memory menu key was pressed.

When "Current Trace+Memory" is selected, it displays both the measurement trace you saved to memory when the Current Trace->Memory menu key was pressed and the current measurement trace. This allows you to compare two traces.

If the measurement frequencies are changed after the reference trace was saved, and there is an overlapped area of the current frequency range and the frequency range when the reference trace was saved, the reference trace in the overlapped frequency range will be displayed. If there is on overlap, only a "Reference" label will be displayed to indicate that the reference trace is enabled, but out of the current frequency range.

When the current measurement frequency range is wider than the reference trace, the start and stop frequencies of the reference trace will be displayed.

Key Path	View/Display

Mode	NFIGURE
Remote Command	Front panel only
Preset	Data
State Saved	Saved in instrument state.
Range	Current Trace	Memory	Current Trace+Memory
Initial S/W Revision	A.14.00
Coupling	1. "Memory" and "Current Trace+Memory" keys only become available after you pressed the Current Trace->Memory menu key.
	2. When sweep points changes, "Memory" and "Current Trace+Memory" options will be displayed.
Restriction and Notes	This key is only avaiable when 2FP license is installed.

Current Trace->Memory

Stores the current trace in memory and remains there until change the sweep points, or press the Current Trace->Memory menu key again saving another trace. After you have pressed the Current Trace->Memory menu key the Data Display menu key becomes available. The Current Trace->Memory menu key is only available after a complete sweep of data is made.

Stores the current trace in memory and remains there until change the frequency context, preset the measurement,, or press the Current Trace->Memory menu key again saving another trace. After you have pressed the Current Trace->Memory menu key the Data Display menu key becomes available. The Current Trace->Memory menu key is only available after a complete sweep of data is made.

Key Path	View/Display
Mode	NFIGURE
Remote Command	Front panel only
State Saved	No
Initial S/W Revision	A.14.00
Coupling	This key only becomes available after a complete sweep of data is made.
Restriction and Notes	This key is only avaiable when 2FP license is installed.

Display

NOTE   This function is useful when you have information which you do not wish to show or print.