

N9069A Noise Figure User's and Programmer's Reference

Agilent MXA and EXA Signal Analyzers

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

**MXA Signal Analyzer N9020A
EXA Signal Analyzer N9010A**



Agilent Technologies

Manufacturing Part Number: N9069-90001

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The following safety symbols are used throughout this manual. Familiarize yourself with the symbols and their meaning before operating this analyzer.

WARNING

***Warning* denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**

CAUTION

Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the analyzer. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

NOTE

Note calls out special information for the user's attention. It provides operational information or additional instructions of which the user should be aware.

Additional Information

For the latest information about this analyzer, including firmware upgrades, application information, and product information, see the following URL:

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

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1 Introduction

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

What Does Noise Figure Mode Do?

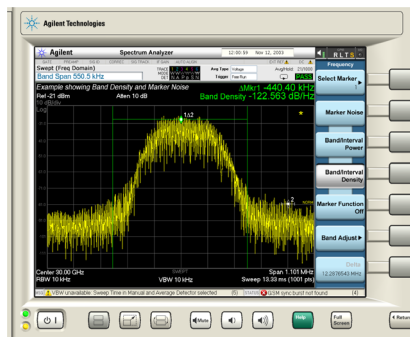
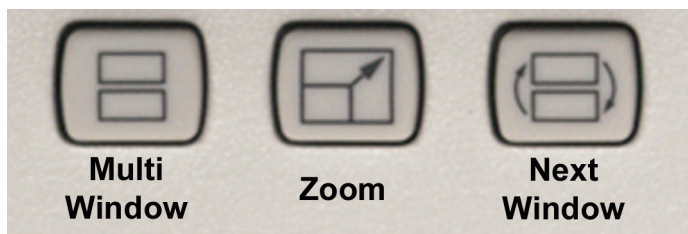
The Noise Figure mode enables you to make a number of individual noise figure measurements over the range of frequencies specified by the frequency parameters. After each frequency point has been measured, the results are displayed.

The measurement includes the following functionality:

- Averaging
- Storage of a comma delimited results file to disk
- Multiple data views; Graphic, Meter and Table
- Result types including Noise Figure, Gain, Y-Factor, Effective Temp, P hot and P cold
- Supports Smart Noise Sources (SNS)
- Supports external source control using LAN

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.



Zoom

Zoom is a toggle function. Pressing once Zooms the selected window; pressing again un-zooms.

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.

The state of zoom, and which window is zoomed, is saved in State.

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

NOTE Expanding the graph to a single window with this key results in a loss of the start and stop frequency information at the bottom of the screen. If you want to see this information as well as enlarge the graph, you can do so using a USB mouse. Connect the mouse to one of the USB ports, navigate to the divider line between the two graphs, and drag this line to enlarge the desired graph and retain the frequency information.

Remote Command :DISPlay:WINDow:FORMat:TILE|ZOOM

Example :DISP:WIND:FORM:ZOOM sets zoomed
:DISP:WIND:FORM:TILE sets un-zoomed

Preset TILE

Multi-Window

The **Multi Window** front-panel key is not used at this time. It is there to support future functionality.

Key Path	Front-panel key
----------	-----------------

Next Window

This key selects the next window of the current view. When this key is selected in Help Mode, it toggles focus between the table of contents window and the topic pane window.

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>

Selected Window

One and only one window is always selected. The selected window has the focus; as far as the user is concerned, all key presses are going to that window.

If a window is not selected, its boundary is gray. The selected window has a green boundary.

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.

Navigating Windows

When the Next Window key is pressed, the next window in the order of precedence (see below) becomes selected. If the selected window was zoomed, the next window will also be zoomed.

The window navigation does NOT use the arrow and select keys. Those are reserved for

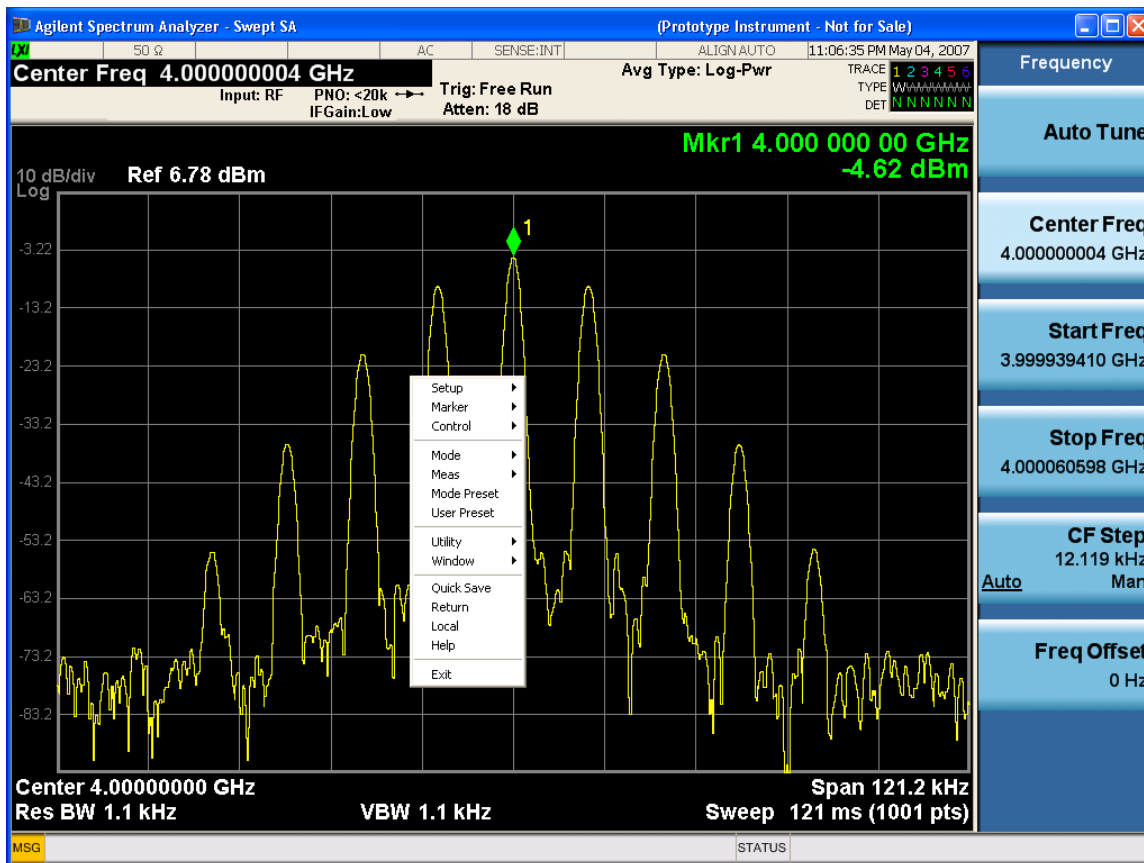
navigation within a window.

Mouse and Keyboard Control

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

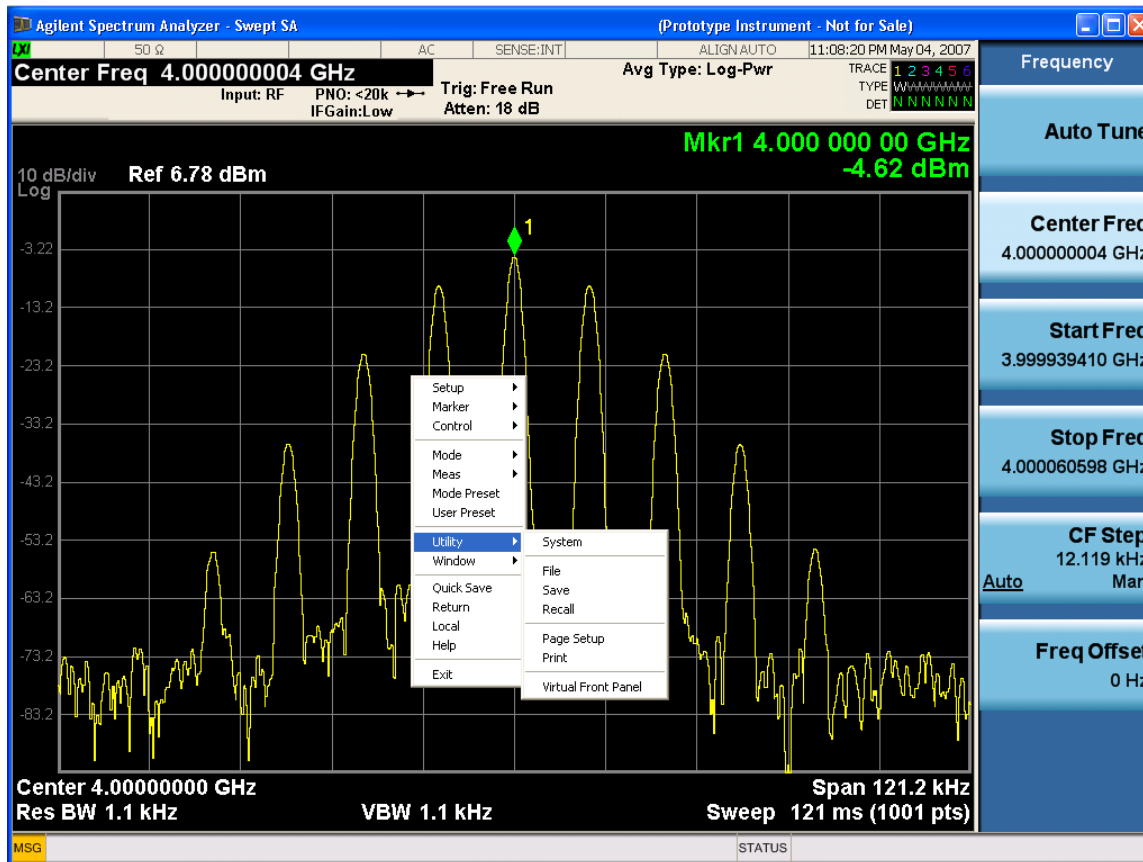
Right-Click

If the user plugs in a mouse and right-clicks on the analyzer screen, a menu will appear as below:



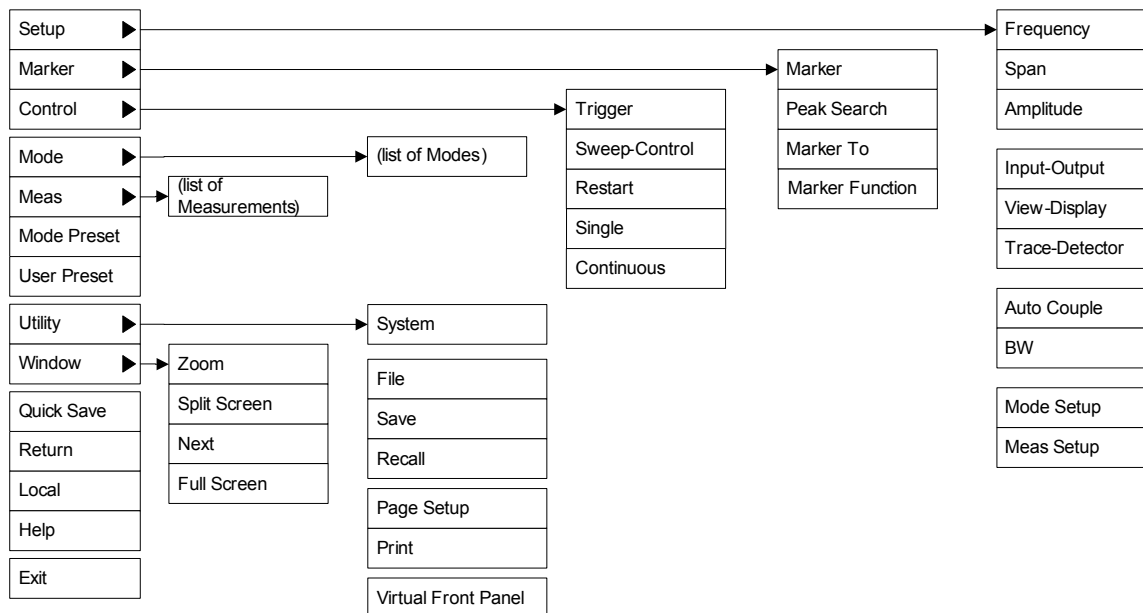
Placing the mouse on one of the rows marked with a right arrow symbol will cause that row to expand, as for example below where the mouse is hovered over the “Utility” row:

Utility Functions Mouse and Keyboard Control



This method can be used to access any of the front-panel keys by using a mouse; as for example if the user is 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:

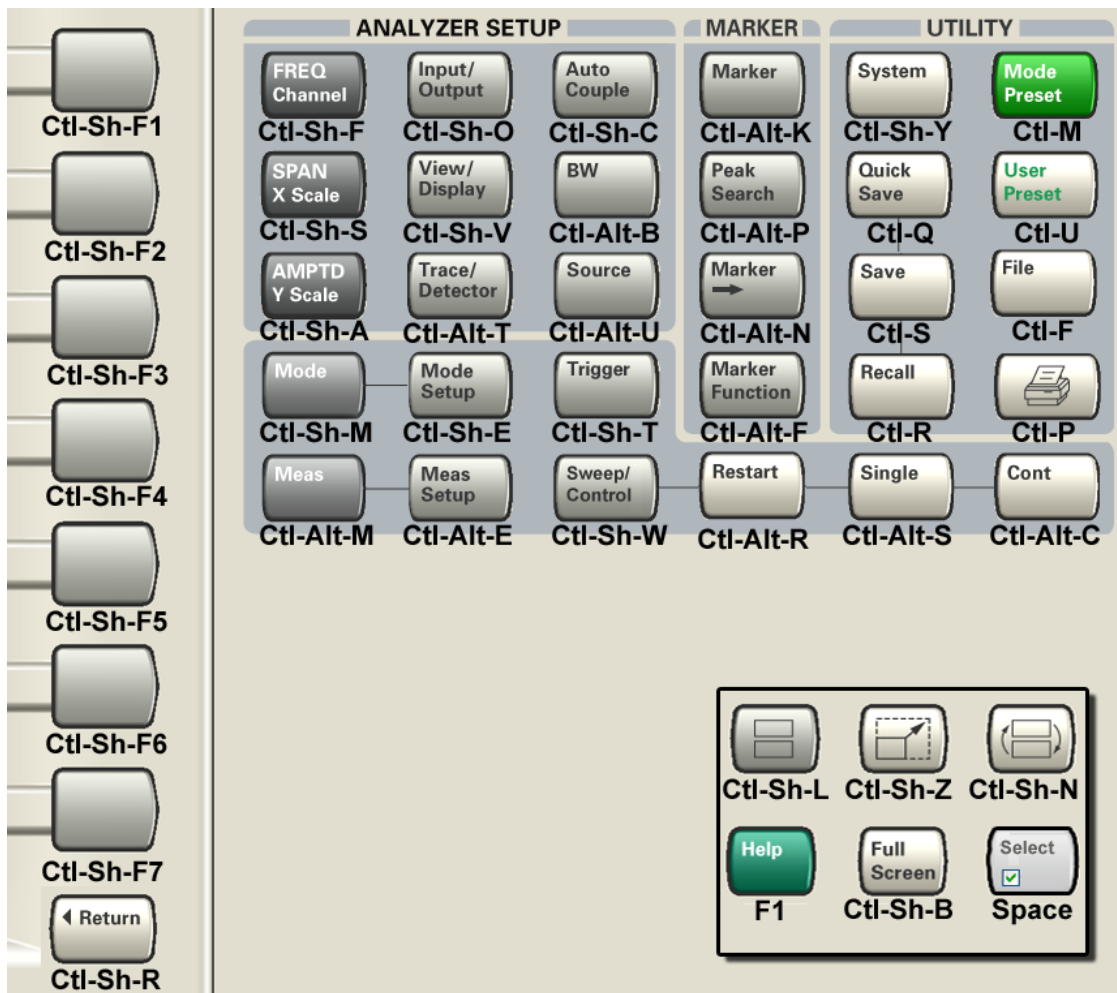
Frequency	CTRL+SHIFT+F
Span	CTRL+SHIFT+S
Amplitude	CTRL+SHIFT+A
Input/Output	CTRL+SHIFT+O
View/Display	CTRL+SHIFT+V
Trace/Detector	CTRL+ALT+T
Auto Couple	CTRL+SHIFT+C
Bandwidth	CTRL+ALT+B
Source	CTRL+SHIFT+E
Marker	CTRL+SHIFT+K
Peak Search	CTRL+SHIFT+P
Marker To	CTRL+ALT+N
Marker Function	CTRL+ALT+F
System	CTRL+SHIFT+Y
QuickSave	CTRL+SHIFT+Q
Save	CTRL+S
Recall	CTRL+R
Mode Preset	CTRL+M
User Preset	CTRL+U
Print	CTRL+P
File	CTRL+F
Mode	CTRL+SHIFT+M
Measure	CTRL+ALT+M
Mode Setup	CTRL+ALT+E
Meas Setup	CTRL+ALT+U
Trigger	CTRL+SHIFT+T
Sweep/Control	CTRL+SHIFT+W
Restart	CTRL+ALT+R

Utility Functions
Mouse and Keyboard Control

Single	CTRL+ALT+S
Cont	CTRL+ALT+C
Zoom	CTRL+SHIFT+Z
NextWindow	CTRL+SHIFT+N
SplitScreen	CTRL+SHIFT+L
FullScreen	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 key1	CTRL+SHIFT+F1
Menu key2	CTRL+SHIFT+F2
Menu key3	CTRL+SHIFT+F3
Menu key4	CTRL+SHIFT+F4
Menu key5	CTRL+SHIFT+F5
Menu key6	CTRL+SHIFT+F6
Menu key7	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

Here is a pictorial view of the table above:



System

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

Remote Command Notes	No remote command for this key specifically.
Key Path	Front-panel key

Show

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

Mode	All
Remote Command	:SYSTem:SHOW OFF ERRor SYSTem HARDware LXI HWStatistics ALIGNment SOFTware :SYSTem:SHOW?
Example	:SYST:SHOW SYST
Remote Command 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
Key Path	System

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 button 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 time is displayed to the second.

The fields on the Errors display are:

Type (unlabelled) - 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. In other words, 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.

Mode	All
Remote Command	:SYSTem:ERRor [:NEXT] ?
Example	:SYST:ERR?
Restriction and Notes	The return string has the format: “<Error Number>,<Error>” Where <Error Number> and <Error> are defined in the Master Error Messages document.
State Saved	No
Key Path	System, Show

Next Page

Next Page and Previous Page menu keys move the user 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, Show Errors
----------	----------------------------------

Previous Page See Next Page.

History

Key Path **System, Power On**

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 could never power up for the first time in Last.

NOTE: 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 will not work properly. For more information see Power Standby (Instrument Shutdown).

Mode	All
Example	SYST:PON:TYPE LAST
Restriction and Notes	Power on Last State only works if the user has 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 <code>:SYSTem:PDOWn</code> command.
Key Path	System, Power On

Power On Mode

This menu key brings up a Mode Menu that lists the available modes and lets you select which Mode to be the power-on mode. This Mode Menu is a 1-of-N list of available modes; not the Mode Menu under the Mode front-panel key. They will look the same, but have very different behavior.

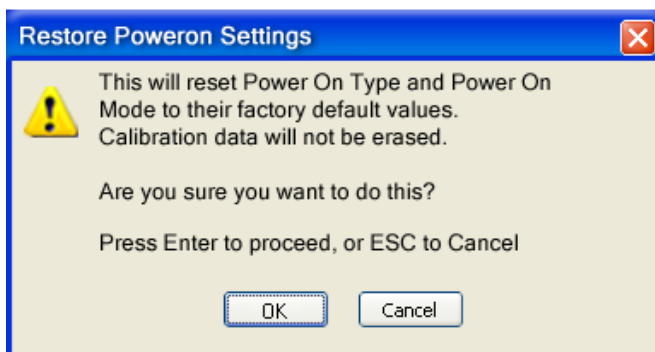
This Mode will be used for Power On Mode and Input/Output Defaults and Restore System Defaults All.

Mode All

Remote Command	:SYSTem: PON: MODE SA PNOISE EDGE GSM BASIC WIMAX OFDMA PNOISE WCDMA VSA VSA89601 :SYSTem: PON: MODE?
Example	SYST: PON: MODE SA
Restriction and 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 Preset but is set on a “Restore System Defaults->All” to SA unless Spectrum Analysis mode is not installed in the instrument in which case the factory will load the default power-on mode.
State Saved	No
Key Path	System, Power On

Restore Power On Defaults

This selection causes the Power On Type and Power On Mode 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 menu key under the Restore System Defaults menu causes the same action.



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

Example	:SYST: DEF PON
Key Path	System, Power On

Alignments

The Alignments Menu controls and displays the automatic alignment of the instrument, and provides the ability to restore the default alignment values.

Key Path **System**

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**.

Mode	All
Remote Command	:CALibration:AUTO ON PARTial OFF ALERT :CALibration:AUTO?
Example	:CAL:AUTO ON
Restriction and Notes	While Auto Align is executing, bit 0 of Status Operation register is set.
Dependencies/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
Key Path	System, Alignments
SCPI Status Bits/OPC Dependencies	When Auto Align is executing Bit 0 in the Status Operational register is set.

Normal

Auto Align, Normal turns on the automatic alignment of all measurement systems. **Auto Align, Normal** 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:

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

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 personalities. 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 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:



Mode	All
Example	:CAL:AUTO PART
Restriction and Notes	Auto Align Partial begins the elapsed time counter for Auto Align Off time.
Key Path	System, Alignments, Auto Align

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 **Off** 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:

Mode	All
Example	:CAL:AUTO OFF
Restriction and Notes	Auto Align Off begins the elapsed time counter for Auto Align Off time.
Dependencies/Couplings	Auto Align is set to Off if Restore Align Data is invoked.
Key Path	System, Alignments, Auto Align

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):

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
Key Path	System, Alignments, Auto Align

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.

Mode	All
Remote Command	:CALibration:AUTO:ALERT TTEMPerature DAY WEEK NONE :CALibration:AUTO:ALERT?
Example	:CAL:AUTO:ALER TTEM

Remote Command 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
Key Path	System, Alignments, Auto Align
SCPI Status Bits/OPC Dependencies	The alert is the Error Condition “Align Now, All required” and bit 14 is set in the Status Questionable Calibration register.

Time & Temperature

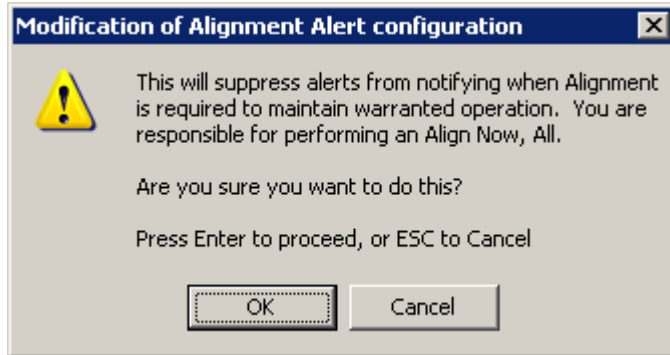
With Auto Align Alert set to **Time & Temperature** the instrument will signal an alert when alignments expire due to the combination of the passage of time and changes in temperature. The alert is the Error Condition “Align Now, All required”. If this choice for Alert is selected, the absence of an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

Mode	All
Example	:CAL:AUTO:ALERTTEM
Key Path	System, Alignments, Auto Align, Alert
SCPI Status Bits/OPC Dependencies	Bit 14 is set in the Status Questionable Calibration register.

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 “Align Now, All required”.

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



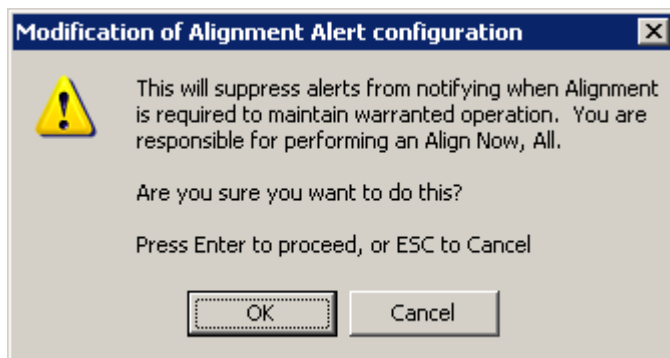
No confirmation is required when Alert is configured through a remote command.

Mode	All
Example	:CAL:AUTO:ALER DAY
Key Path	System, Alignments, Auto Align, Alert
SCPI Status Bits/OPC Dependencies	Bit 14 is set in the Status Questionable Calibration register.

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 “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.

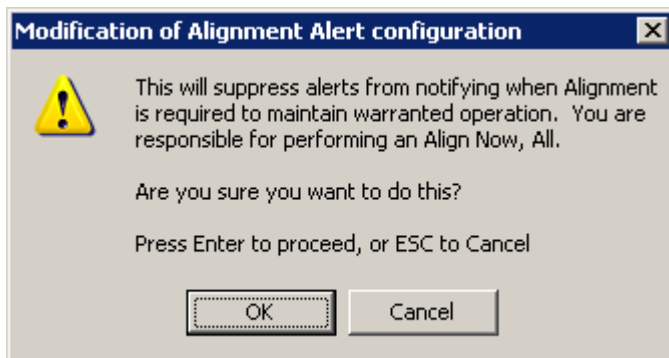
Mode	All
------	-----

Example	:CAL:AUTO:ALER WEEK
Key Path	System, Alignments, Auto Align, Alert
SCPI Status Bits/OPC	Bit 14 is set in the Status Questionable Calibration register.
Dependencies	

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.

Mode	All
Example	:CAL:AUTO:ALER NONE
Key Path	System, Alignments, Auto Align, Alert

Align Now

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

Key Path	System, Alignments
----------	---------------------------

All

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

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

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

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

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

Align Now, All can be interrupted by pressing the Cancel (ESC) front panel key or remotely with Device Clear followed by the :ABORT SCPI command. When this occurs the Error Condition “Align Now, All required” is set, 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.

Mode	All
Remote Command	:CALibration[:ALL] :CALibration[:ALL]?
Example	:CAL
Restriction and Notes	An interfering user supplied signal will result in the instrument requiring an Align Now, RF with the interfering signal removed.

Dependencies/Couplings	<p>Initializes the time for the Last Align Now, All Time.</p> <p>Records the temperature for the Last Align Now, All Temperature.</p> <p>If Align RF component succeeded, initializes the time for the Last Align Now, RF Time.</p> <p>If Align RF component succeeded, records the temperature for the Last Align Now, RF Temperature.</p>
Remote Command Notes	<p>:CALibration[:ALL]? returns 0 if successful</p> <p>:CALibration[:ALL]? returns 1 if failed</p> <p>:CALibration[:ALL]? is the same as *CAL?</p> <p>While Align Now, All is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register.</p> <p>This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command.</p> <p>Successful completion will clear bit 14 in the Status Questionable Calibration register.</p> <p>An interfering user signal is not grounds for failure of Align Now, All. However, bits 11 and 12 are set in the Status Questionable Calibration register to indicate Align Now, RF is required.</p>
Key Path	System, Alignments, Align Now
SCPI Status Bits/OPC Dependencies	Bits 11, 12 or 14 may be set in the Status Questionable Calibration register.
Mode	All
Remote Command	*CAL?
Example	*CAL?
Restriction and Notes	Everything about :CALibration[:ALL]? is synonymous with *CAL? including all conditions, status register bits, and couplings
Remote Command Notes	<p>*CAL? returns 0 if successful</p> <p>*CAL? returns 1 if failed</p> <p>:CALibration[:ALL]? is the same as *CAL?</p> <p>See additional remarks described with :CALibration[:ALL]?</p>

All but RF

Immediately executes an alignment of all subsystems except the RF subsystem. The instrument will stop any measurement currently underway, perform the alignment, 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 “Align Now, RF required” is asserted 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 “Align Now, All required” is set, 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.

Mode	All
Remote Command	:CALibration:NRF :CALibration:NRF?
Example	:CAL:NRF
Dependencies/Couplings	Initializes the time for the Last Align Now, All Time. Records the temperature for the Last Align Now, All Temperature.

Remote Command	:CALibration:NRF? returns 0 if successful
Notes	: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”.
Key Path	System, Alignments, Align Now
SCPI Status Bits/OPC Dependencies	Bits 12 or 14 may be set in the Status Questionable Calibration register.

RF

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

This operation might be desirable if the alignments had been set to not include RF alignments, or if previous RF alignments could not complete because of interference which has since been removed.

If an interfering user signal is present at the RF Input, the alignment will terminate and raise the Error Condition “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.

A failure encountered during alignment will set the Error Condition “Align RF failed” and set bit 3 in the Status Questionable Calibration register.

Successful completion of **Align Now, RF** 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. It will also 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 “Align Now, RF required” is set, and bit 12 is set in the Status Questionable Condition register. None of the new alignment data is used.

Characterize Preselector (Only with Option 507, 508, 513, or 526)

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 set the Error Condition “Characterize YTF failed” and set bit 9 in the Status Questionable Calibration register.

Successful completion of **Advanced, Characterize Preselector** will clear the Error Condition “Characterize YTF failed”, and clear bit 9 in the Status Questionable Calibration register. 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 must survive across the power cycle as this operation is performed infrequently.

Advanced, Characterize Preselector 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.

Mode	All
Remote Command	:CALibration:YTF :CALibration:YTF?
Example	:CAL:YTF
Restriction and Notes	For Option 507, 508, 513, and 526 only.
Dependencies/Couplings	Initializes the time for the Last Characterize Preselector Time. Records the temperature for the Last Characterize Preselector Temperature.

Remote Command	:CALibration:YTF? returns 0 if successful
Notes	<p>:CALibration:YTF? returns 1 if failed (including interfering user signal)</p> <p>While Advanced, Characterize Preselector is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register.</p> <p>This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the :ABORt command.</p> <p>Successful completion will clear bit 9 in the Status Questionable Calibration register.</p> <p>A failure encountered during alignment will set the Error Condition “Characterize Preselector failed” and set bit 9 in the Status Questionable Calibration register.</p>
Key Path	System, Alignments, Align Now

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 which access this information obtain current values.

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

Utility Functions System

Std Header	Product Number: N9020A Serial Number: US46340924 Firmware Revision: A.01.01	
Instrument Info	Time since start-up: Current Temperature:	300 hrs +28 degC
Auto Align Info	Time while Auto Align off:	90 min
Std Align Now	Time since last Align Now All:	12.5 hrs
	Temperature since last Align Now All:	-1.3 degC
	Time since last Align Now RF:	5 min
If TG Option (Not Zorro1)	Temperature since last Align Now RF:	+0.1 degC
	Time since last Align TG:	2.5 hrs
Opts 508,513 526	Temperature since last Align TG:	+0.2 degC
	Last Characterize Preselector:	Jun 1, 2006 15:00:00
	Last Characterize Preselector Temperature:	+32.1 degC

Times & Temperature delta. Shown as "---" if none since start-up.

Time & Temperature 'stamp'

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

Mode	All
Example	SYST:SHOW ALIGN
Restriction and Notes	The values displayed on the screen are only updated upon entry to the screen and not updated while the screen is being displayed.
State Saved	No
Key Path	Visual annotation in the Show Alignment Statistics screen
Mode	All
Remote Command	:SYSTem: PON: TIME?
Example	:SYST: PON: TIME?
Restriction and Notes	Value is the time since the present application start-up in seconds.
State Saved	No
Key Path	Visual annotation in the Show Alignment Statistics screen

Mode	All
Remote Command	:CALibration:TEMPerature:CURRent?
Example	:CAL:TEMP:CURR?
Restriction and Notes	Value is in degrees Centigrade. Value is invalid if using default alignment data (Align Now, All required)
State Saved	No
Key Path	Visual annotation in the Show Alignment Statistics screen

Mode	All
Remote Command	:CALibration:TIME:LALL?
Example	:CAL:TIME:LALL?
Restriction and 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
Key Path	Visual annotation in the Show Alignment Statistics screen

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

Mode	All
Remote Command	:CALibration:TIME:LRF?
Example	:CAL:TIME:LRF?

Restriction and 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

Key Path **Visual annotation in the Show Alignment Statistics screen**

Mode All

Remote Command :CALibration:TEMPerature:LRF?

Example :CAL:TEMP:LRF?

Restriction and 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

Key Path **Visual annotation in the Show Alignment Statistics screen**

Mode All

Remote Command :CALibration:TIME:LPreselector?

Example :CAL:TIME:LPR?

Restriction and Notes Value is 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.

State Saved No

Key Path **Visual annotation in the Show Alignment Statistics screen**

Mode All

Remote Command :CALibration:TEMPerature:LPreselector?

Example :CAL:TEMP:LPR?

Restriction and Notes Value is in degrees Centigrade at which the last successful Characterize Preselector was executed.

State Saved No

Key Path **Visual annotation in the Show Alignment Statistics screen**

Mode	All
Remote Command	:CALibration:AUTO:TIME:OFF?
Example	:CAL:AUTO:TIME:OFF?
Restriction and 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
Key Path	Visual annotation in the Show Alignment Statistics screen

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.

Mode	All
Remote Command	:CALibration:FREquency:REFerence:MODE CALibrated USER :CALibration:FREquency:REFerence:MODE?
Example	:CAL:FREQ:REF:MODE CAL
Restriction and Notes	If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due.
Remote Command Notes	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
Key Path	System, Alignments

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.

Mode	All
Example	:CAL:FREQ:REF:MODE CAL
Key Path	System, Alignments, Timebase DAC

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.

Mode	All
Example	:CAL:FREQ:REF:MODE USER
Key Path	System, Alignments, Timebase DAC

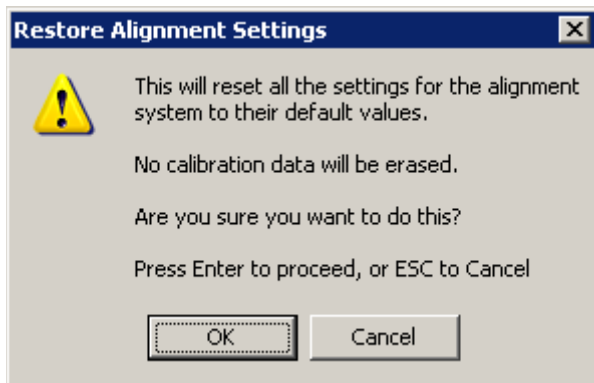
Mode	All
Remote Command	:CALibration:FREQuency:REFeRence:FINE <integer> :CALibration:FREQuency:REFeRence:FINE?
Example	:CAL:FREQ:REF:FINE 8191
Restriction and Notes	If the value of the timebase is changed the alignment system automatically performs an alignment or alerts that an alignment is due.
Dependencies/Couplings	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
Key Path	System, Alignments, Timebase DAC

Remote Command	:CALibration:FREQuency:REFerence:COARse <integer> :CALibration:FREQuency:REFerence:COARse?
Example	:CAL:FREQ:REF:COAR 8191
Dependencies/Couplings	Setting :CAL:FREQ:REF:COAR sets :CAL:FREQ:REF:MODE USER
Remote Command 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.

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:

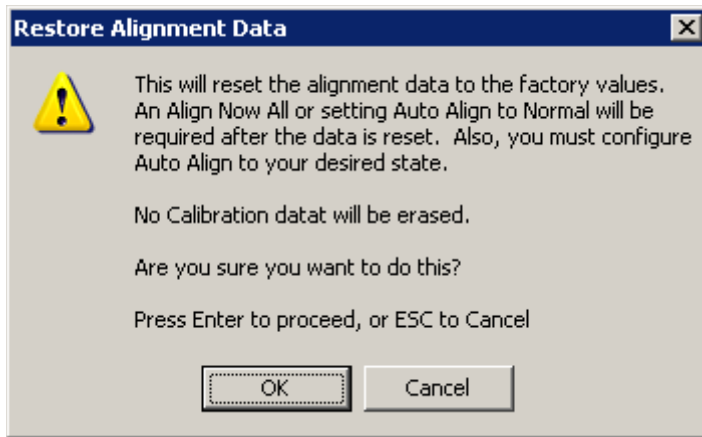
Parameter	Setting
Timebase DAC	Calibrated
Timebase DAC setting	Calibrated value
Auto Align State	Normal (if the instrument is not operating with default alignment data, Off otherwise)
Auto Align All but RF	Off
Auto Align Alert	Time & Temperature

Mode	All
Example	:SYST:DEF ALIG
Restriction and Notes	Alignment processing that results as the transition to Auto Align Normal will be executed sequentially; thus *OPC? or *WAI will wait until the alignment processing is complete.
Key Path	System, Alignments

Restore Align Data

Initializes the alignment data to the factory default values. This action is normally not necessary. It is recommended if alignment errors occur. If alignment errors continue to occur after Restore Align Data, the instrument is in need of repair. Align Now, All must be executed to regain warranted operation, and the user is responsible for configuring Auto Align thereafter.

For front panel operation, confirmation is required before setting the alignment data to factory defaults. The confirmation dialog is:



The Error Condition “Align Now, All required” is set, and bit 14 in the Status Questionable Calibration register is set. Auto Align is set to Off.

Mode	All
Remote Command	:CALibration:DATA:DEFault
Example	:CAL:DATA:DEF
Dependencies/Couplings	Sets Auto Align to Off. Sets bit 14 in the Status Questionable Calibration register. The Error Condition “Align Now, All required” is set.
Key Path	System, Alignments

LAN through telnet.

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 on a “Restore System Defaults->Misc”
State Saved	No
Range	On Off
Key Path	System, I/O Config, SCPI LAN

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.

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 Preset but is set to ON on a “Restore System Defaults->Misc”
State Saved	No
Range	On Off
Key Path	System, I/O Config, SCPI LAN

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

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

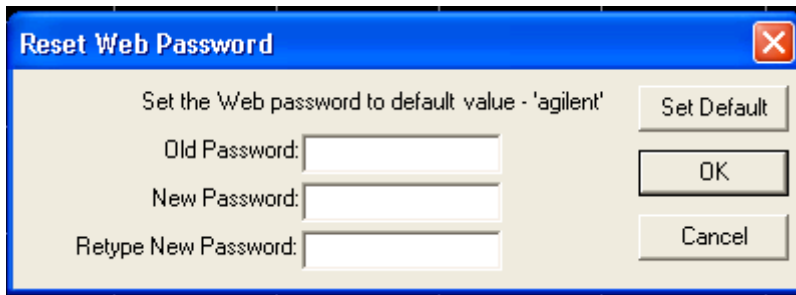
Mode	All
Remote Command	:SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle OFF ON 0 1 :SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle?
Example	:SYST:COMM:LAN:SCPI:SICL:ENAB OFF
Preset	This is unaffected by Preset, but is set to ON on a “Restore System Defaults->Misc”
State Saved	No

Range On | Off
Key Path **System, I/O Config, SCPI LAN**

Reset Web Password

The embedded webserver 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. An external 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) hardkey.

Mode All
Key Path **System, I/O Config**

Query USB Connection (Remote Command Only)

Enables you to determine the speed of USB connection.

Mode All
Remote Command :SYSTem:COMMunicate:USB:CONNecion?
Example :SYST:COMM:USB:CONN?

Remote Command	NONE – Indicates no USB connection has been made.
Notes	<p>LSPeed – Indicates a USB low speed connection (1.5 Mbps).</p> <p>Note: this is reserved for future use, the T+M488 protocol is not supported on low speed connections.</p> <p>HSPeed – Indicates that a USB high speed connection (480 Mbps) has been negotiated.</p> <p>FSPeed – Indicates that a USB full speed connection (12 Mbps) has been negotiated.</p>
State Saved	No
Range	NONE LSPeed HSPeed FSPeed

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?
Remote Command Notes	<p>SUSPended – Indicates that the USB bus is currently in its suspended state. The bus is in the suspended state when:</p> <p>The bus is not connected to any controller</p> <p>The controller is currently powered off</p> <p>The controller has explicitly placed the USB device into the suspended state.</p> <p>When in the suspended state, no USB activity, including start of frame packets are received.</p> <p>ACTive – Indicates that the USB device is in the active state. When the device is in the active state, it is receiving periodic start of frames but it isn't necessarily receiving or transmitting data.</p>
State Saved	No
Range	SUSPended ACTive

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?
Remote Command 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

Restore Defaults

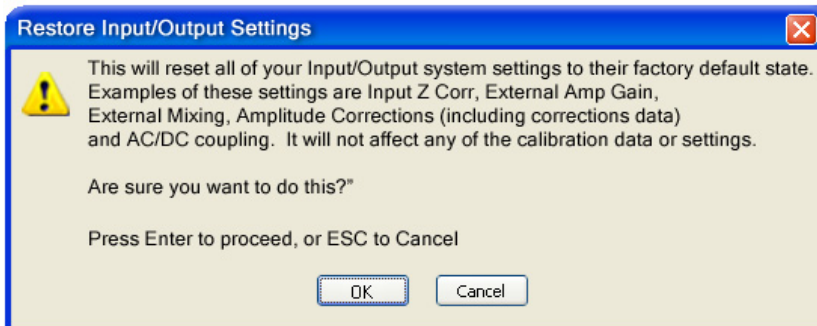
Provides incremental initialization of the system setting groups along with supporting a comprehensive reset of the entire instrument back to a factory default state. The menu selections are the groups of system settings and when one is selected, that particular group of system settings is reset back to their default values. The menu options are: Input/Output Settings, Power On, Alignments, Misc, All Modes, and All.

Mode	All
Remote Command	:SYSTem:DEFault [ALL] ALIGn INPut MISC MODes PON
Example	SYST:DEF
State Saved	No
Key Path	System

Input/Output Settings

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:

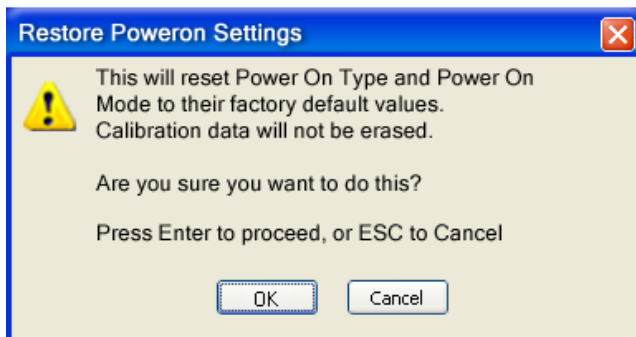


Example :SYST:DEF INP
Key Path **System, Restore System Defaults**

Power On

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 Mode reset to whatever the factory set as its default value.

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



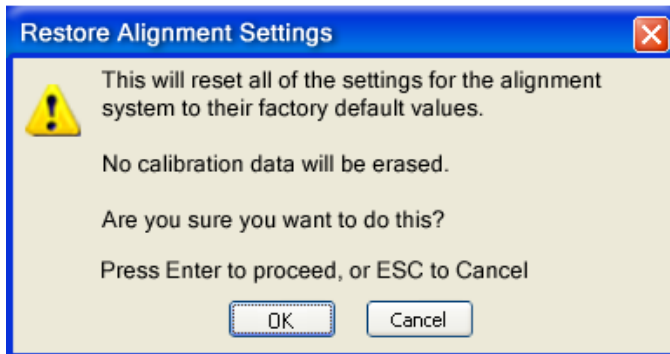
Example :SYST:DEF PON
Key Path **System, Restore System Defaults**

Align

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:



Example :SYST:DEF ALIG
Key Path **System, Restore System Defaults**

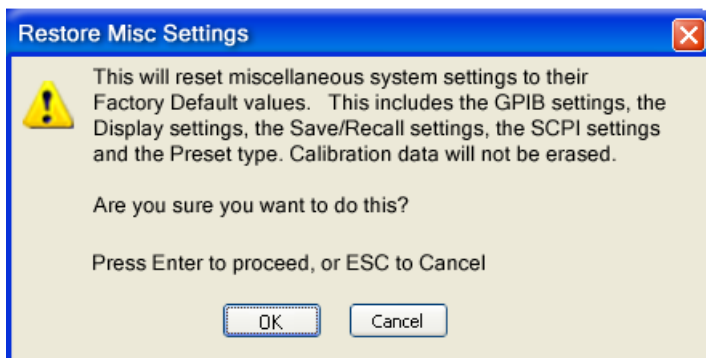
Misc

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

Miscellaneous Setting	Default Value
Verbose SCPI	Off
GPIB Address	18
Auto File Name Number	000
Save Type	State
State Save To	Register 1

Screen Save To	SCREEN000.png
DISP:ENABle	ON
Full Screen	Off
SCPI Telnet	ON
SCPI Socket	ON
SILC Server	ON
Display Intensity	100
Display Backlight	ON
Display Theme	TDColor
System Annotation	ON
The SYST:PRES:TYPE	MODE

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

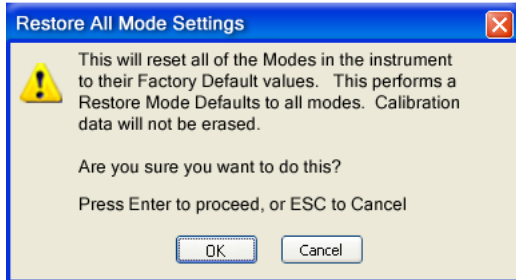


Example	:SYST:DEF MISC
Key Path	System, Restore System Defaults

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:



Example :SYST:DEF MOD

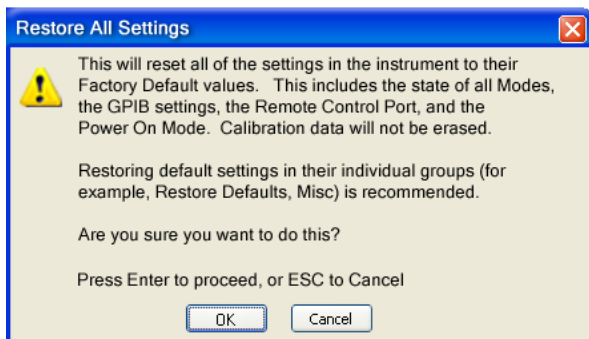
Dependencies/Couplings An All Mode will cause the currently running measurement to be aborted, mode switch to the power-on mode and activate the default measurement for the power-on mode. It gets the mode to a consistent state with all of the default couplings set.

Key Path **System, Restore System Defaults**

All

This is the catastrophic function that does 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:



Example :SYST:DEF ALL

Dependencies/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.

Key Path **System, Restore System Defaults**

Control Panel...

Opens the Windows Control Panel.

Pressing any key will cause the Control Panel to exit.

Remote Command No remote command for this key.
Notes

Key Path **System**

Licensing...

Opens the license explorer.

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

Remote Command No equivalent remote command for this key.
Notes

Key Path **System**

There are five remote commands available for licensing.

Remote Command :SYSTem:LKEY <"OptionInfo">, <"LicenseInfo">

Example SYST:LKEY "N9073A-1FP", "B043920A51CA"

SYST:LKEY "N9073A-1F1,1.000",
"5D71E9BA814C,13-aug-2005"

SYST:LKEY "N9000-001,1.000",
"8BEDC0B6D4AE,05-apr-2005,SN=0"

Remote Command 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 backward compatibility.

Remote Command :SYSTem:LKEY:DELeTe <"OptionInfo">,<"LicenseInfo">

Example SYST:LKEY:DEL "N9073A-1FP", "B043920A51CA"
SYST:LKEY:DEL "N9073A-1F1,1.000", "5D71E9BA814C,
13-aug-2005"

Remote Command 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 backward compatibility.

Remote Command :SYSTem:LKEY:LIST?

Remote Command 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

Remote Command :SYSTem:LKEY? <"OptionInfo">

Example SYST:LKEY? "N9073A-1FP"

Remote Command 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"

Remote Command :SYSTem:HID?

Remote Command Notes Return value is the host ID as a string

Diagnostics

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

Key Path **System, More**

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.

Utility Functions
System

Std Header	Product Number: N9020A Serial Number: US46340924 Firmware Revision: A.01.01																		
Mechanical relays	<table> <tr> <td>Calibrator Switch Cycles:</td> <td>1800</td> </tr> <tr> <td>AC/DC Switch Cycles:</td> <td>60</td> </tr> <tr> <td>2 dB #1 Mechanical Atten Cycles</td> <td>23489</td> </tr> <tr> <td>2 dB #2 Mechanical Atten Cycles</td> <td>23400</td> </tr> <tr> <td>6 dB Mechanical Atten Cycles</td> <td>500000</td> </tr> <tr> <td>10 dB Mechanical Atten Cycles</td> <td>1000000</td> </tr> <tr> <td>20 dB Mechanical Atten Cycles</td> <td>2500</td> </tr> <tr> <td>30 dB Mechanical Atten Cycles</td> <td>60000</td> </tr> <tr> <td></td> <td>4339</td> </tr> </table>	Calibrator Switch Cycles:	1800	AC/DC Switch Cycles:	60	2 dB #1 Mechanical Atten Cycles	23489	2 dB #2 Mechanical Atten Cycles	23400	6 dB Mechanical Atten Cycles	500000	10 dB Mechanical Atten Cycles	1000000	20 dB Mechanical Atten Cycles	2500	30 dB Mechanical Atten Cycles	60000		4339
Calibrator Switch Cycles:	1800																		
AC/DC Switch Cycles:	60																		
2 dB #1 Mechanical Atten Cycles	23489																		
2 dB #2 Mechanical Atten Cycles	23400																		
6 dB Mechanical Atten Cycles	500000																		
10 dB Mechanical Atten Cycles	1000000																		
20 dB Mechanical Atten Cycles	2500																		
30 dB Mechanical Atten Cycles	60000																		
	4339																		
	<table> <tr> <td>High operating temperature extreme:</td> <td>+37.2degC</td> </tr> <tr> <td>Low operating temperature extreme</td> <td>+18.1degC</td> </tr> </table>	High operating temperature extreme:	+37.2degC	Low operating temperature extreme	+18.1degC														
High operating temperature extreme:	+37.2degC																		
Low operating temperature extreme	+18.1degC																		
Odometer	Elapsed Time (on time) (hours): 1600																		

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.

Mode	All
Restriction and Notes	The values displayed on the screen are only updated upon entry to the screen and not updated while the screen is being displayed.
Key Path	System, Diagnostics

Each of the hardware statistic items can be queried via SCPI. Query the Mechanical Relay Cycle Count

Returns the count of mechanical relay cycles.

Remote Command	:SYSTem:MRELay:COUNT?
Example	:SYST:MREL:COUN?

Restriction and Notes 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>”

Remote Command Query Only
Notes

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?

Restriction and Notes Value is in degrees Celsius at which the lowest operating temperature has been recorded since 1st power-up.

State Saved No

Returns the high operating temperature extreme value. The value survives a power-cycle and is the temperature extreme encountered since the value was reset by the factory or service center.

Mode All

Remote Command :SYSTem:TEMPerature:HEXTreme?

Example :SYST:TEMP:HEXT?

Restriction and Notes Value is in degrees Celsius at which the highest operating temperature has been recorded since 1st power-up.

State Saved No

Query the Elapsed Time since 1st power on

Returns the elapsed on-time since 1st power-on (odometer).

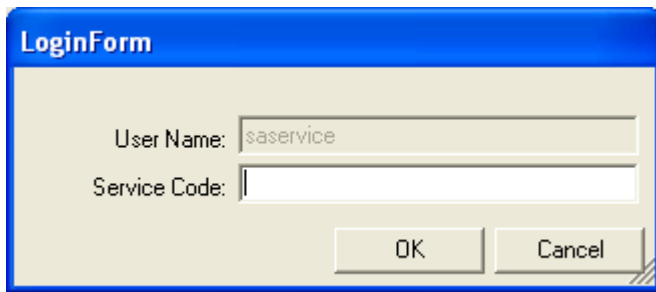
Remote Command :SYSTem:PON:ETIMe?

Example :SYST:PON:ETIM?

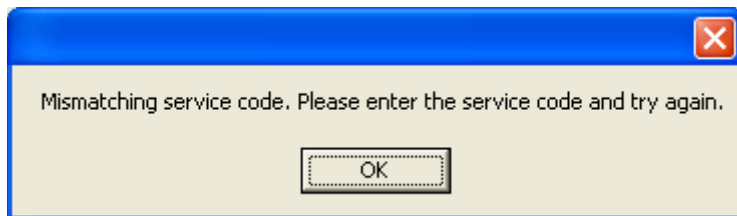
Remote Command Query Only
Notes

Advanced

Accesses advanced diagnostic capabilities performed in the factory or under instructions from repair procedures. This menu key is only visible when the logged-in user is “saservice”. The first access to the Advanced Diagnostic Menu after invoking the instrument application will require an authentication, which is to enter the Service Code. Subsequent accesses to the Advanced Diagnostic Menu are unimpeded. The Authentication dialog looks like:



“OK” is the default key thus the Enter key is used to complete the entry. If invalid Service Code is entered authentication is not granted and the user is provided the following dialog:



Restriction and Notes **Password is required to access this menu.**
Key Path **System, Diagnostics**

Service

Accesses capabilities performed in the factory or under instructions from repair procedures. This menu key is only visible when the logged-in user is “advanceduser” or “saservice”. The first access to the Service Menu after invoking the instrument application will require an authentication Service Code.

Key Path	System
----------	---------------

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?
Restriction and 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

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

Remote Command 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

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?
Remote Command Notes	The output is an IEEE Block format with each command separated with the New-Line character (hex 0x0A)

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?

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"

Remote Command
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

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"

Remote Command
Notes

<hour> is the two digit representation of the hour in 24 hour format

<minute> is the two digit representation of minute

<day> is the two digit representation of second

Preset

Mode Preset

The Mode preset is the most common way to get the active mode back to a known state. It will keep you in the currently active mode and reset the mode settings to their mode preset state. It will never cause a mode switch. It does a partial preset. It does not affect any mode persistent settings or any system settings.

The **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 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.

Remote Command	:SYSTem:PRESet
Example	:SYST:PRES
Restriction and Notes	Clears all pending OPC bits. The Status Byte is set to 0.
Dependencies/Couplings	A Mode Preset will cause the currently running measurement to be aborted and cause the default measurement to be active. Mode Preset gets the mode to a consistent state with all of the default couplings set.
Remote Command 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.
Key Path	Front-panel key

How-To Preset

The table below shows all possible presets, their corresponding SCPI commands and front panel access. Instrument settings depend on the current measurement context. Some settings are local to the current measurement, some are global (common) across all the measurement 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.

The Auto Couple front panel key is a Meas local key. It sets all Auto/Man parameter couplings in the measurement to Auto. Any Auto/Man selection that is local to the other measurements in the mode will not be affected by Auto Couple.

The Meas Preset key is a Meas local key. Meas Preset resets all the variables local to the current measurement except the persistent ones.

The Mode Preset (front-panel key on front panel) resets all the current mode's Meas local and Meas global variables except the persistent ones.

The Restore Mode Defaults key 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

Restore Mode Defaults

Restore Mode Defaults resets the state for the currently active mode by resetting the mode persistent settings to their factory default values, clearing mode data and by performing a Mode Preset. This function will never cause a mode switch. This function performs a full preset for the currently active mode; whereas, Mode Preset performs a partial preset. Restore Mode Defaults does not affect any system settings. System settings are reset by Restore System Defaults. This function does reset mode data; as well as settings.

Remote Command	:INSTrument:DEFault
Example	:INST:DEF
Restriction and Notes	A pop-up message comes up saying: “If you are sure, press key again”.
Dependencies/Couplings	A Restore Mode Defaults will cause the currently running measurement to be aborted and causes the default measurement to be active. It gets the mode to a consistent state with all of the default couplings set.
Remote Command Notes	Clears all pending OPC bits. The Status Byte is set to 0.
Key Path	Mode Setup

*RST (Remote Command Only)

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

Remote Command	*RST
Example	*RST
Restriction and Notes	Clears all pending OPC bits and the Status Byte is set to 0.
Dependencies/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.
Remote Command Notes	Sequential

User Preset

The User Preset key opens up a menu that gives you three choices – execute the **User Preset** by pressing the **User Preset** softkey, User Preset all of the modes in the analyzer by pressing the **User Preset All Modes** softkey, and save the current state for the current mode by pressing the **Save User Preset** softkey.

User Preset

User Preset behaves similarly to **Recall State** in that it recalls a hidden Save State file. However, since each Mode has its own **User Preset** file, **User Preset** will never cause a mode switch, whereas recalling a Save State file may cause a mode switch, if the Save State file was saved while in a different mode.

The User Preset file is a Save State file. **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`. So for any given Mode, the only way to perform a User Preset is from that Mode, not from any other Mode. The user has no control over the user preset filename and has no direct access to the user preset file.

User Preset recalls a mode's state which includes all of the variables affected by doing a Mode Preset. It not only recalls Mode Preset settings, but it also recalls all of the mode persistent settings. User Preset also recalls all of the Input/Output system settings 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, so 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.

User Preset 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.

Remote Command `:SYSTem:PRESet:USER`

Example	: SYST: PRES: USER: SAVE : SYST: PRES: USER
Restriction and Notes	Clears all pending OPC bits. The Status Byte is set to 0.
Dependencies/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.
Remote Command Notes	: SYST: PRES: USER: SAVE is used to save the current state as the user preset state.
Key Path	User Preset

User Preset All Modes

User Preset All Modes behaves similarly to Power On User Preset, since it 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.

User Preset 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.

Remote Command	: SYSTem: PRESet : USER: ALL
Example	: SYST: PRES: USER: SAVE : SYST: PRES: USER: ALL
Restriction and Notes	Clears all pending OPC bits. The Status Byte is set to 0.

Dependencies/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.
Remote Command Notes	:SYST:PRES:USER:SAVE is used to save the current state as the user preset state.
Key Path	User Preset

Save User Preset

Save User Preset saves the currently active mode and its state. The way the user recalls this User Preset file is 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.

Remote Command	:SYSTem:PRESet:USER:SAVE
Example	:SYST:PRES:USER:SAVE
Restriction and 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.
Key Path	User Preset

File

Opens a menu of keys which access various standard and custom Windows dialogs. Pressing any other front-panel key exits any of these dialogs.

File Explorer

Opens the standard Windows File Explorer. Pressing any front panel key closes the Explorer application.

File Explorer opens up in My Documents.

Page Setup

Refer to your Microsoft Windows Operating System manual.

Print Theme – Remote Command

The graphical user interface contains a selection for choosing the Theme to use when printing. An equivalent remote command is provided. Refer to the View/Display section for more detail on Themes.

Mode	All
Remote Command	:SYSTem:PRINT:THEMe TDColor TDMonochrome FCOLor FMONochrome :SYSTem:PRINT:THEMe?
Example	:SYST:PRIN:THEM FCOL
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

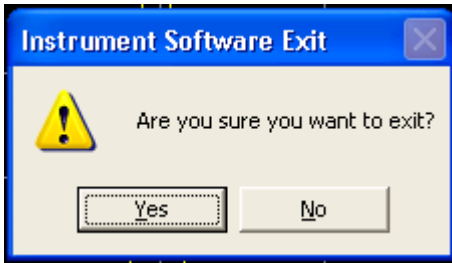
Print

Refer to your Microsoft Windows Operating System manual.

Exit

This key, when pressed, will exit the Instrument Application. A dialog box will be used to

confirm that the user intended to exit the application:



Mode	All
Key Path	File, Exit

Print

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

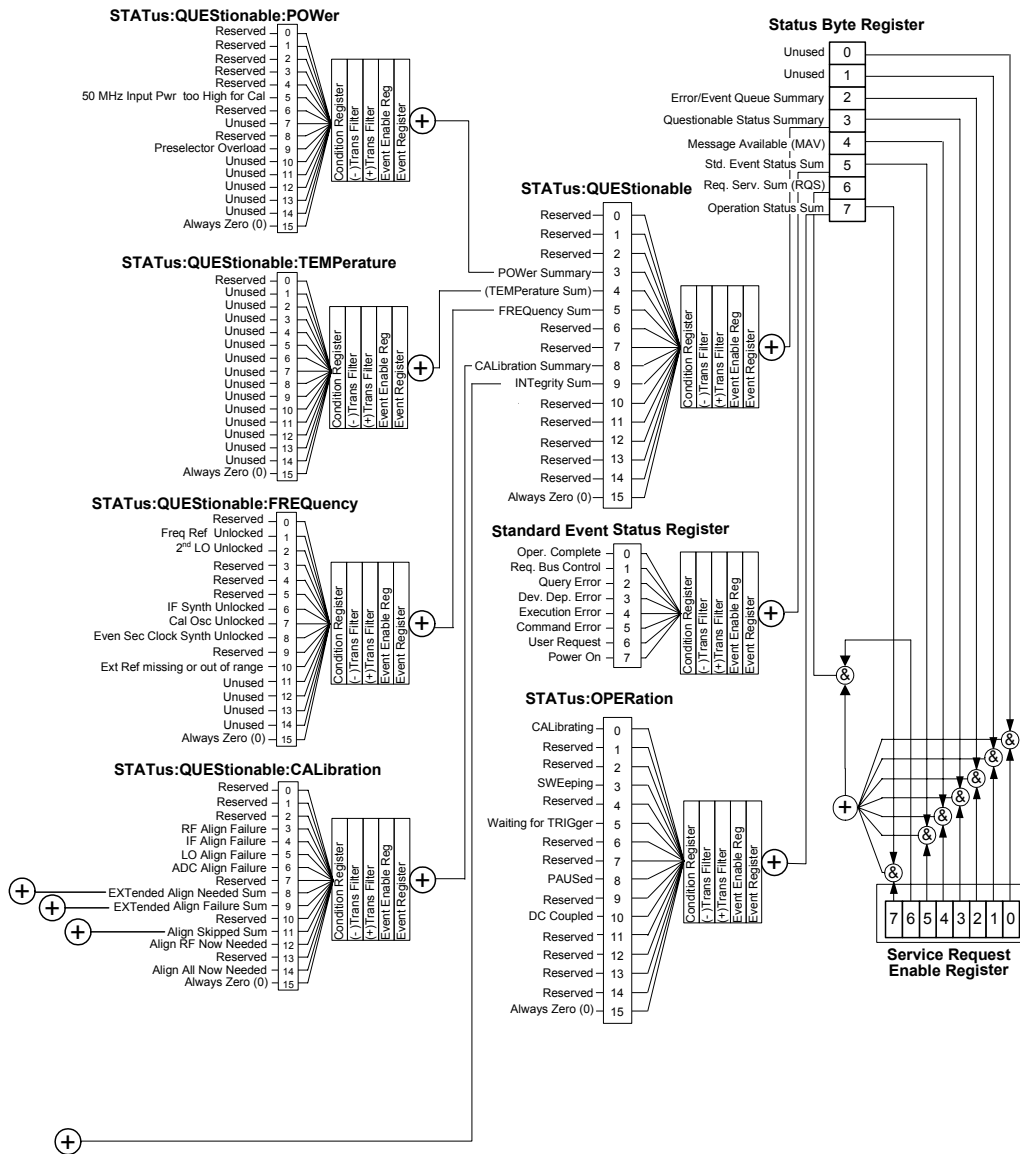
Key Path

Front-panel key

STATUS Subsystem (No equivalent front panel keys)

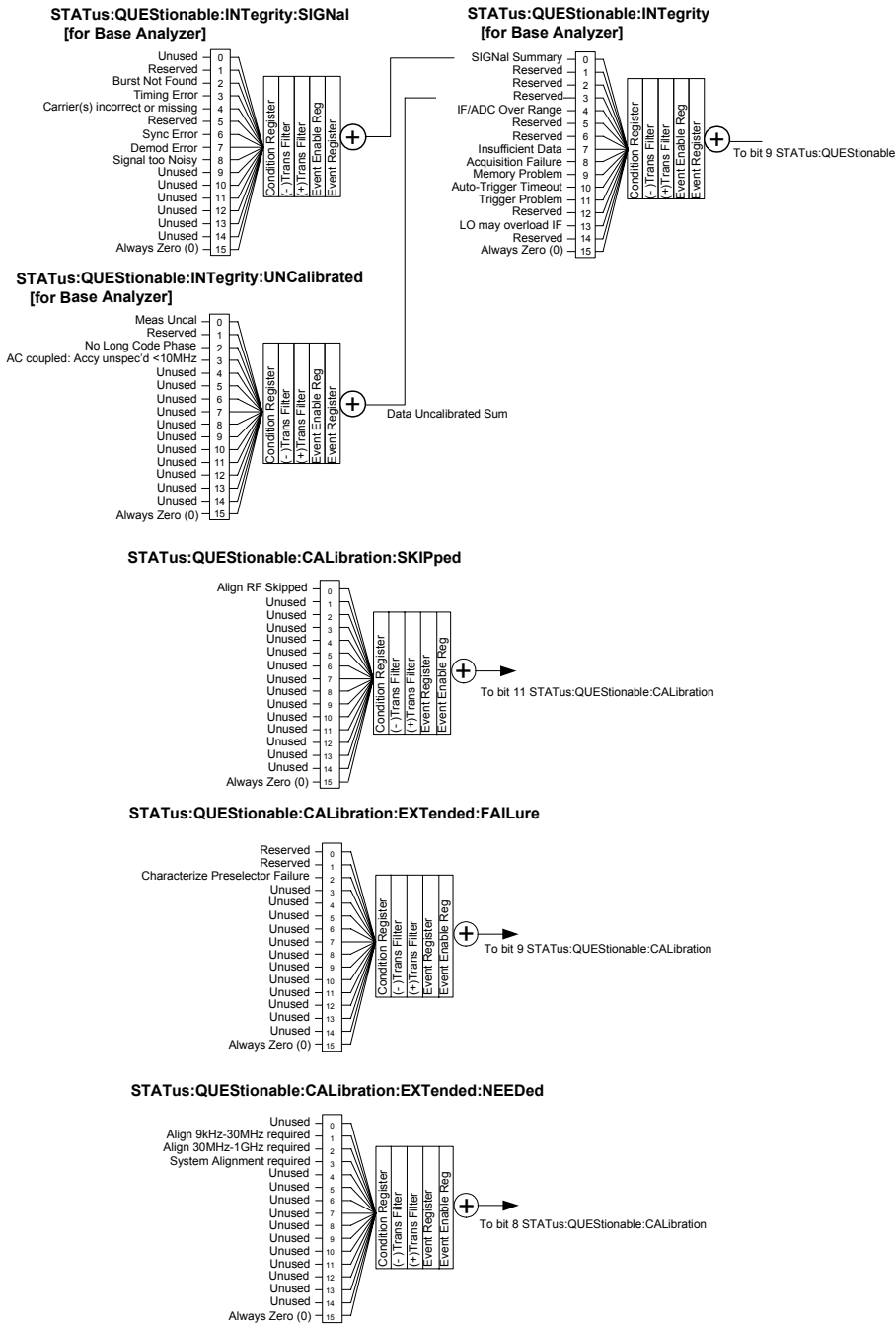
The following graphics show the current MXA Status Register Subsystem implementation.

MXA Status Byte Register System



Utility Functions
STATUS Subsystem (No equivalent front panel keys)

Additional Registers:



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.

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:
 1. Determine which register contains the bit that reports the condition.
 2. Send the unique SCPI query that reads that register.
 3. Examine the bit to see if the condition has changed.

You can monitor conditions in different ways.

- Check the current instrument hardware and firmware status.

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

- Monitor a particular condition (bit).

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

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

Using a Status Register

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

Figure: Status Register Bit Values

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

STATus:OPERation:ENABle <num>
 STATus:OPERation:ENABle?

Standard Operation Event Enable Register

ck730a

Bit 15 is not used to report status.

Example 1:

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

Example 2:

1. Suppose you want to know if an Auto-trigger Timeout occurs, but you only cared about that specific condition. So you would want to know what was happening with bit 10 in the Status Questionable Integrity register, and not about any other bits.
2. It's usually a good idea to start by clearing all the status registers with *CLS.
3. Sending the STAT:QUES:INT:ENAB 1024 command lets you monitor only bit 10 events, instead of the default monitoring all the bits in the register. The register default is for positive transition events (0 to 1 transition). That is, when an auto-trigger timeout occurs. If instead, you wanted to know when the Auto-trigger timeout condition is cleared, then you would set the STAT:QUES:INT:PTR 0 and the STAT:QUES:INT:NTR 32767.
4. So now the only output from the Status Questionable Integrity register will come from a bit 10 positive transition. That output goes to the Integrity Sum bit 9 of the Status Questionable register.

5. You can do a similar thing with this register to only look at bit 9 using, STAT:QUES:ENAB 512.
6. The Status Questionable register output goes to the “Status Questionable Summary” bit 3 of the Status Byte Register. The output from this register can be enabled using the *SRE 8 command.
7. Finally, you would use the serial polling functionality available for the particular bus/software that you are using to monitor the Status Byte Register. (You could also use *STB? to poll the Status Byte Register.)

Using the Service Request (SRQ) Method

Your language, bus and programming environment must be able to support SRQ interrupts. (For example, BASIC used with VXI–11.3 (GPIB over LAN). When you monitor a condition with the SRQ method, you must:

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

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

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

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

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

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

requires service.

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

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

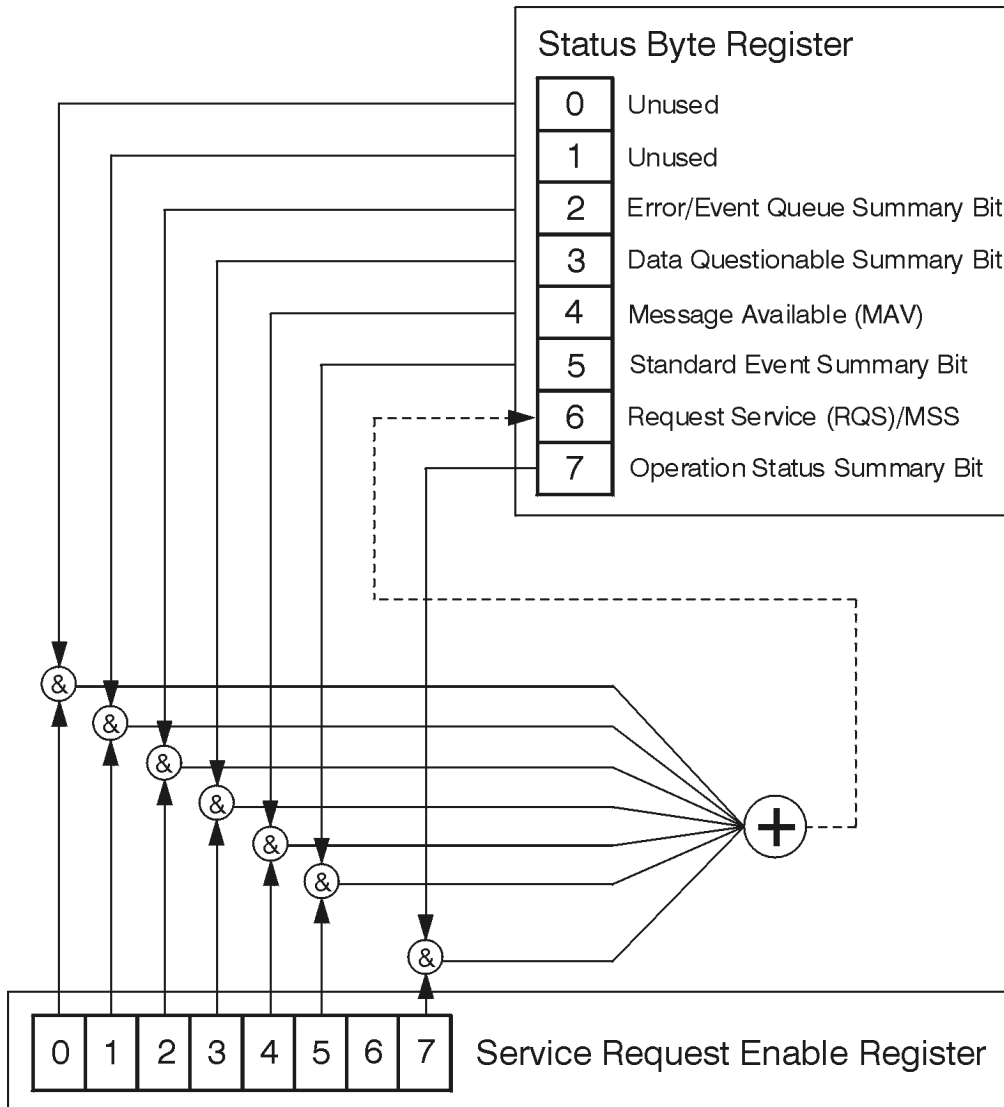
If the status register is configured to SRQ on end-of-measurement and the measurement is in continuous mode, then restarting a measurement (INIT command) can cause the measuring bit to pulse low. This causes an SRQ when you have not actually reached the "end-of-measurement" condition. To avoid this:

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

Status Register System

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

The Status Byte Register



ck776a

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

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

*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. |

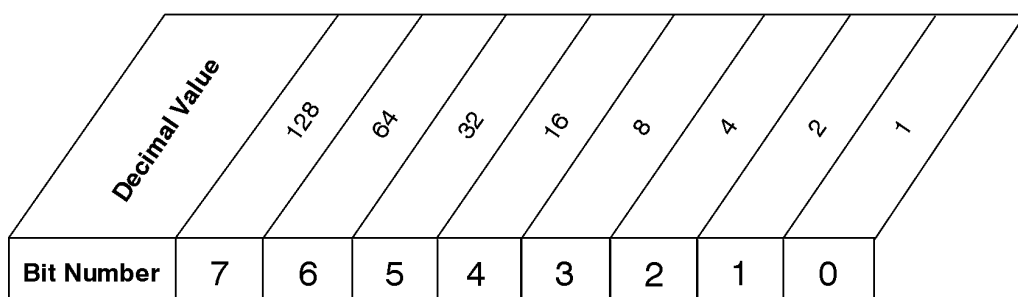
To query the status byte register, send the command *STB?. The response will be the decimal sum of the bits which are set to 1. For example, if bit number 7 and bit number 3 are set to 1, the decimal sum of the 2 bits is 128 plus 8. So the decimal value 136 is returned. The *STB command does not clear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

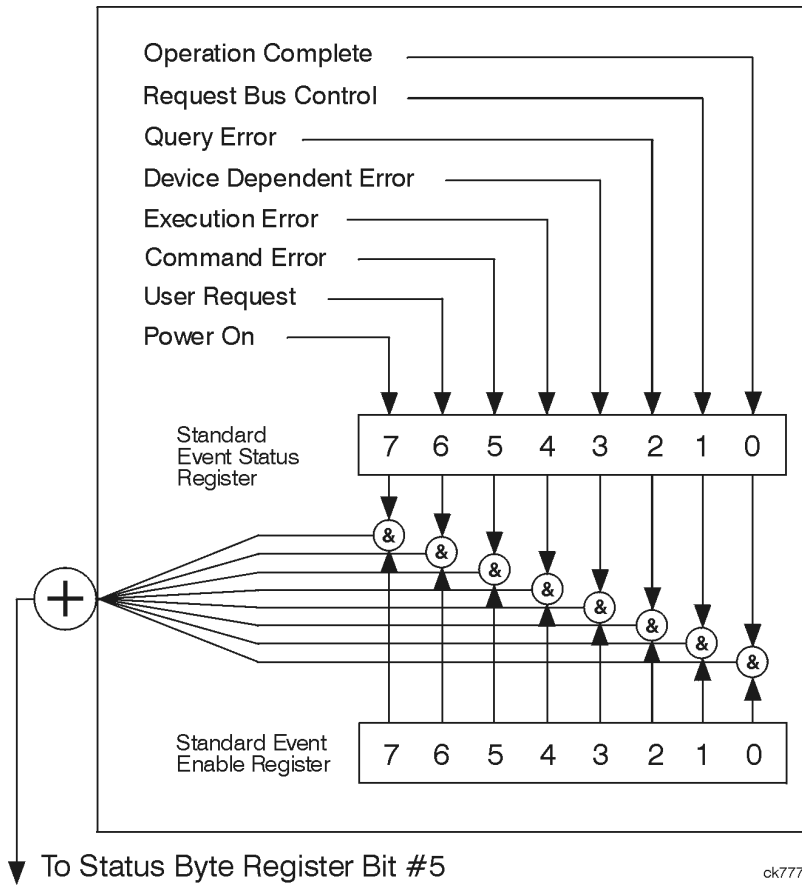


`*SRE <num>`
`*SRE?`

Service Request Enable Register

ck726a

Standard Event Status Register



The standard event status register contains the following bits:

Bit Number	7	6	5	4	3	2	1	0
Description	Power On	Reserved	Command Error	Execution Error	Device Dependent Error	Query Error	Request Control	Operation Complete

*ESR?

Standard Event Status Register

ck727a

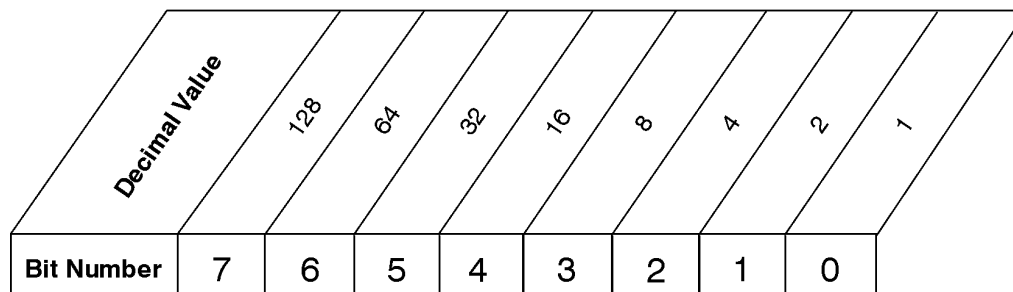
Bit Description

- 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 currently only valid for Modes: Spectrum Analyzer, and Noise Figure.
5	Waiting for trigger	The instrument is waiting for the trigger conditions to be met, then it will trigger a sweep or measurement.

Questionable Status Register

The questionable status register monitors the instrument's condition to see if anything questionable has happened to it. It is looking for anything that might cause an error or a bad measurement like a hardware problem, an out of calibration situation, or a unusual

signal. All the bits are summary bits from lower-level event registers.

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

STATus Subsystem Command Descriptions

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

Numeric values for bit patterns can be entered using decimal or hexadecimal representations. (i.e. 0 to 32767 is equivalent to #H0 to #H7FFF. It is also equal to all ones, 11111111111111) See the SCPI Basics information about using bit patterns for variable parameters.

Operation Register

Operation Condition Query

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

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
SCPI Status Bits/OPC Dependencies	Sequential command

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.

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.

R&D: There is little reason to have any bits enabled for typical manufacturing tests. Enabling bits in this register would be of more value during test development.

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
SCPI Status Bits/OPC Dependencies	Sequential command

Operation Event Query

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

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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

Questionable Register

Questionable Condition

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

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

SCPI Status Bits/OPC Sequential command
Dependencies

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.

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	<code>:STATus:QUESTionable:ENABle 16</code> Sets the register so that temperature summary will be reported to the Status Byte Register
	<code>:STATus:QUESTionable:ENABle?</code>
Example	STAT:OPER:PTR 1 Align Now operation beginning will be reported to the Status Byte Register.
Preset	0
Min	0
Max	32767
SCPI Status Bits/OPC Dependencies	Sequential command

Questionable Event Query

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

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	<code>:STATus:QUESTionable[:EVENT]?</code>
Example	STAT:QUES?
Preset	0
SCPI Status Bits/OPC Dependencies	Sequential command

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	<code>:STATus:QUESTionable:NTRansition 16</code> Temperature summary 'questionable cleared' will be reported to the Status Byte Register.
	<code>:STATus:QUESTionable:NTRansition?</code>

Example	STAT:QUES:NTR 16 Temperature summary 'questionable cleared' will be reported to the Status Byte Register.
Preset	0
Min	0
Max	32767
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

Questionable Calibration Register

Questionable Calibration Condition

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

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

Questionable Calibration Extended Failure Register

Questionable Calibration Extended Failure Condition

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

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

Mode	All
Remote Command	:STATus:QUEStionable:CALibration:EXTended:FAILure:CONDition?
Example	STAT:QUES:CAL:EXT:FAIL:COND?
Preset	0
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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

SCPI Status Bits/OPC Sequential command

Dependencies

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

SCPI Status Bits/OPC Sequential command

Dependencies

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.

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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.
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Mode	All
Remote Command	:STATus:QUESTionable:FREQuency[:EVENT]?
Example	STAT:QUES:FREQ?
Preset	0
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC	Sequential command
Dependencies	

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
SCPI Status Bits/OPC	Sequential command
Dependencies	

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC	Sequential command
Dependencies	

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.
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Mode	All
Remote Command	:STATus:QUEStionable:INTEgrity:SIGNal[:EVENT]?
Example	STAT:QUES:INT:SIGN?
Preset	0
SCPI Status Bits/OPC	Sequential command
Dependencies	

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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

SCPI Status Sequential command

Bits/OPC

Dependencies

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

SCPI Status Bits/OPC Sequential command

Dependencies

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

Questionable Power Register

Questionable Power Condition T

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

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
SCPI Status Bits/OPC Dependencies	Sequential command

IEEE Common GPIB Commands

Numeric values for bit patterns can be entered using decimal or hexi-decimal representations. (i.e. 0 to 32767 is equivalent to #H0 to #H7FFF).

Calibration Query

*CAL? Performs a full alignment and returns a number indicating the success of the alignment. A zero is returned if the alignment is successful. A one is returned if any part of the alignment fails. The equivalent SCPI command is CALibrate[:ALL]?

See section Alignments for details of *CAL?.

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.

Remote Command	*CLS
Example	*CLS Clears the error queue and the Status Byte Register.
Remote Command Notes	For related commands, see the SYSTem:ERRor[:NEXT]? command. See also the STATus:PRESet command and all commands in the STATus subsystem.
Key Path	No equivalent key. Related key System, Show Errors, Clear Error Queue
SCPI Status Bits/OPC Dependencies	Resets all bits in all event registers to 0, which resets all the status byte register bits to 0 also.

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.

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.
Remote Command 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
Key Path	No equivalent key. Related key System, Show Errors, Clear Error Queue
SCPI Status Bits/OPC Dependencies	Event Enable Register of the Standard Event Status Register.

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.
SCPI Status Bits/OPC Dependencies	Standard Event Status Register (bits 0 – 7).
Remote Command Notes	For related commands, see the STATus subsystem commands.
Preset	0
Min	0
Max	255

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

Remote Command	*IDN?
Example	*IDN? Returns instrument identification information, such as: Agilent Technologies,N9020A,US01020004,A.01.02
Key Path	No equivalent key. See related key System, Show System.

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.
SCPI 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.

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?

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.

Restriction and Notes Registers 0 through 6 are accessible from the front panel in menu keys for Recall Registers.

SCPI Status Bits/OPC Dependencies The command is sequential.

Min 0

Max 127

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.
Restriction and Notes	Registers 0 through 6 are accessible from the front panel in menu keys for Save Registers.
SCPI Status Bits/OPC Dependencies	The command is sequential.
Min	0
Max	127

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.
SCPI Status Bits/OPC Dependencies	Service Request Enable Register (all bits, 0 – 7).
Remote Command Notes	For related commands, see the STATus subsystem and SYSTem:ERRor[:NEXT]? commands.
Preset	255
Min	0
Max	255

Status Byte Query

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

Remote Command	*STB?
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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.
SCPI Status Bits/OPC Dependencies	Status Byte Register (all bits, 0 – 7).
Remote Command Notes	See related command *CLS.

Trigger

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

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

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.

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
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Utility Functions
IEEE Common GPIB Commands

Example	INIT:CONT OFF; INIT;*WAI Sets the instrument to single sweep. Starts a sweep and waits for its completion.
SCPI 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.

Quick Save

The Quick Save front-panel key repeats the most recent save which was performed from the Save menu, with some qualification:

Quick Save pays no attention to register saves. Register saves are not remembered as Saves for the purpose of Quick Save

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 in the last save directory by creating a unique filename using the Auto File Naming algorithm described in the Save section.

If Quick Save is pressed after startup before any qualified Save has been performed, the Quick Save 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.

Remote Command Notes No remote command for this key specifically.

Key Path **Front-panel key**

Save

Save functionality is common across multiple Modes and Measurements. These common features are described in this section.

The Save feature prompts you to essentially answer the questions: What do you want to save? And where do you want to save it? Once these questions are answered the save can occur. The options in this menu answer the question, “What do you want to save?”

Accesses a menu that provides the save type options. The **Save Type** options are **State**, **Trace**, **Data**, or a **Screen Image** depending on the active mode.

Mode	All
Key Path	Save
Remote Command Notes	No remote command for this key specifically.

State

Selects **State** as the save type and accesses a menu that provides the options of where to save. You can save either to a register or a file. This menu key will not actually cause the save until the location is chosen.

Saving the state is the only way to save this exact measurement context for the current active mode. The entire state of the active mode is saved in a way that when a recall is requested, the mode will return to as close as possible the context in which the save occurred. This includes all settings and data for only the current active mode.

It should be noted that the Input/Output settings will be saved when saving State, since these settings plus the state of the mode best characterize the current context of the mode, but the mode independent System settings will not be saved.

This softkey will not actually cause the save, since the save feature still needs to know where to save the state. Pressing this key will bring up the Save State menu that provides the user with these options.

For rapid saving, the State menu lists registers to save to, or the user can select a file to save to. Once they pick the destination of the save in the State menu, the save will occur.

Mode	All
Example	MMEM:STOR:STATe "MyStateFile.state" This stores the current instrument state data in the file MyStateFile.state in the default directory.
Remote Command Notes	See .
Key Path	Save

Save

Register 1 thru Register 6

Selecting any one of these register menu keys causes the State of the currently active mode to be saved to the specified Register. Only the State save type supports writing to registers. The other save types can only write to files. 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.

These 6 registers are all that is available from the front panel for all modes in the instrument. There are not 6 registers available for each mode. From remote, 127 Registers are available. Registers are files that are visible to the user in the same folder as other State Files.

Mode	All
Example	*SAV 1
Key Path	Save, State

Mode	All
Example	*SAV 2
Key Path	Save, State

Mode	All
Example	*SAV 3
Key Path	Save, State

Mode	All
Example	*SAV 4
Key Path	Save, State

Mode	All
Example	*SAV 5
Key Path	Save, State

Mode	All
Example	*SAV 6
Key Path	Save, State

To File . . .

Accesses a menu that enables you to select the location for saving the State. This menu is similar to a standard Windows® **Save As** dialog.

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). This path is the **Save In:** path in the **Save As** dialog for all State Files when they first enter this dialog.

Mode	All
Key Path	Save, State

Save As . . .

This menu lets you select the location where you can save the State. This menu is a standard Windows® dialog with Save As menu keys. The "File Name" field in the Save As dialog 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 softkey. See the Quick Save key documentation for more on the automatic file naming algorithm.

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).

When you first enter this dialog, the path in the **Save In:** field depends on the data type. The only files that are visible are the *.state files and the Save As type is *.state, since

Save

.state is the file suffix for the State Save Type.

Mode	All
Key Path	Save, State

Save

Saves all of the State of the currently active mode plus the system level Input/Output settings to the specified file.

While the save is being performed, the floppy icon shows up in the settings bar near the Continuous/Single sweep icon. After the save completes, the Advisory Event “File <register number> saved” is displayed.

Mode	All
SCPI Command	:MMEMory:STORe:STATe <filename>
Example	:MMEM:STOR:STAT “myState.state” saves the file myState.state on the default path
Key Path	Save, State, To File...
Restriction and Notes	If the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during a instrument software upgrade. Both single and double quotes are supported for any filename parameter over remote. Auto return to the State menu and the Save As dialog goes away.

Data

Opens the menu where you can select the type of data you would like to export.

Key Path	Save
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Export Limits

This option selects the Limit Line values to be exported for external viewing/editing or recall at a later date.

Mode	NF
Remote Command	:MMEMory:STORe:LIMit LLINE1 LLINE2 LLINE3 LLINE4, <file_name>

Example	MMEM:STOR:LIM LLINE2, "C:\Limit2.csv"
Restriction and Notes	Limit specified must contain data otherwise an error message is displayed. Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
Key Path	Save, Data

Export Meas Results

Results are exported in .csv format. See the [List of Parameters: on page 161](#) which are saved as part of the measurement results.

Mode	NF
Remote Command	:MMEMory:STORe:RESults <file_name>
Example	:MMEM:STORe:RESults "C:\MeasResults.csv"
Key Path	Save, Data

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*

Save

- 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.

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.

Mode	NF
Remote Command	:MMEMory: STORe:ENR MEASurements CALibration,<file_name>
Example	:MMEM:STORe:ENR MEAS,"C:\ENRTable.csv" :MMEM:STORe:ENR CAL,"C:\CalTable.csv"
Restriction and Notes	Meas/Cal Table must contain data otherwise an error message is displayed. Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
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
Key Path	Save, Data, More

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.

Mode	NF
Remote Command	:MMEMory: STORe:LOSS BEFOre AFTer,<file_name>
Example	:MMEM: STOR:LOSS BEF,"C:\LossBefore.csv" :MMEM: STOR:LOSS AFT,"C:\LossAfter.csv"

Save

Restriction and Notes	Loss Comp Before/After DUT Table must contain data otherwise an error message is displayed. Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
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
Key Path	Save, Data, More

Export Frequency List

This option selects the current Frequency List values and current frequency context to be exported for external viewing/editing or recall at a later date.

Mode	NF
Remote Command	:MMEMory: STORe:FREQuency <file_name>
Example	:MMEM:STOR:FREQ "C:\FrequencyList.csv"
Restriction and Notes	Frequency List Table must contain data otherwise an error message is displayed. Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
Key Path	Save, Data, More

Save As...

Opens a dialogue box that enables you to select the file you wish to save.

Key Path	Save, Data
----------	-------------------

Screen Image

Accesses a menu of functions that enable you to specify a format and location for the saved screen image.

Pressing **Screen Image** brings up a menu which 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.

NOTE	For some software versions, if you initiate a screen image save by navigating through the Save menus, then 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. For this reason the Quick Save front-panel key is provided, which repeats the last save performed, using an auto-named file. To get an exact image of the screen just the way you want it, set up the Quick Save by first performing a Screen Image save through the menus under the Save front-panel key. Then any subsequent press of Quick Save will grab an immediate snapshot of what is on the screen and automatically assign it a file name. (You may then discard the initial save, if desired.)
-------------	--

Mode	All
Example	MMEM:STOR:SCR "MyScreenFile.png" This stores the current screen image in the file MyScreenFile.png in the default directory.
Key Path	Save

Themes

Accesses a menu of function 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 the user to pick between themes to be used when saving the screen image.

Key Path	Save, Screen Image, 1
SCPI Name	Themes

Save

SCPI Command	<code>:MMEmory:STORe:SCReen:THEME TDColor TDMonochrome FCOLor FMONochrome :MMEmory:STORe:SCReen:THEME?</code>
Setup	<code>:SYSTem:DEFault MISC</code>
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
Example	<code>MMEM:STOR:SCR:THEM TDM</code>

3D Color

Selects a standard color theme with each object filled, shaded and colored as designed.

Key Path	Save, Screen Image, Themes, 1
Example	<code>MMEM:STOR:SCR:THEM TDC</code>

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, 2
Example	<code>MMEM:STOR:SCR:THEM TDM</code>

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, 3
Example	<code>MMEM:STOR:SCR:THEM FCOL</code>

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, 4
Example	<code>MMEM:STOR:SCR:THEM FMON</code>

Save As...

Accesses a menu that enables you to select the location where you can save the Screen Image. This menu is a standard Windows® dialog with Save As menu keys. The **Save As** dialog is loaded with the file information related to the Screen Image Type. The filename is filled in using the auto file naming algorithm for the Screen Image Type and is highlighted. The only files that are visible are the *.png files and the Save As Type is *.png, since .png is the file suffix for the Screen Image Type.

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).

This path is the **Save In:** path in the **Save As** dialog for all Screen Files when the user first enters this dialog.

Key Path	Save, Screen Image, 2
Restriction and Notes	Brings up Save As dialog for saving a Screen Image Save Type

Save

Saves the screen image to the specified file using the selected theme. The image that is saved is the measurement display prior to when the **Save As** dialog appeared. The save is performed immediately and does not wait until the measurement is complete.

SCPI Command	:MMEMory:STORe:SCReen <filename>
Example	:MMEM:STOR:SCR "myScreen.png"
Restriction and Notes	If the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during a instrument software upgrade. Both single and double quotes are supported for any filename parameter over remote. Auto return to the Screen Image menu and the Save As dialog goes away. Advisory Event "File <file name> saved" after save is complete.
Key Path	Save, Screen Image, Save As..., 1

Save

Recall

Recall functionality is common across multiple Modes and Measurements. These common features are described in this section.

The Recall feature prompts you to answer the questions: What do you want to recall? And to where do you want to recall it? Once these questions are answered the recall can occur. The options in this menu answer the question "What do you want to Recall?" The options are **State**, **Trace** and **Data**. (**Screen Image** can be saved, but not recalled.) The default paths for **Recall** are data type dependent and are the same as for **Save**.

Key Path	Recall
Remote Command Notes	No remote command directly controls the Recall Type that this key controls. The Recall type is a node in the :MMEM:LOAD command. An example is :MMEM:LOAD:STATe <filename>.

State

Accesses a menu that enables you to recall a Stated that has previously been saved. Recalling a saved state returns the analyzer as close as possible to the mode context and may cause a mode switch if the file selected is not for the current active mode. A State file can be recalled from either a register or a file. Once you pick the source of the recall in the State menu, the recall will occur.

When this key is pressed, the user has determined what they want to recall is **State**. Recalling **State** is used to return as close as possible to the mode context of the save. Recalling State may cause a mode switch if the file selected is not for the currently active mode. This menu key will not actually cause the recall, since the recall feature still needs to know from where to recall the state. **State** can be recalled from either a register or a file. Pressing this key will bring up the State menu that provides the user with the options of where to retrieve the state. For quick recalls, the State menu lists 6 registers to recall from or the user can select a file to recall from.

Mode	All
Key Path	Recall
Example	MMEM:LOAD:STAT "MyStateFile.state" This loads the state file data (on the default file directory path) into the instrument state.
Remote Command Notes	See .

Recall

Register 1 thru Register 6

Selecting any one of these register keys causes the State of the mode from the specified Register to be recalled. Only the Recall Type of State supports reading from registers. The other Recall Types can only read from files. Each of the register keys annotates whether it is empty or at what date and time it was last modified.

Registers are shared by all modes, so recalling from any one of the 6 registers may cause a mode switch to the mode that was active when the save to the Register occurred.

After the recall completes, the message “Register <register number> recalled” appears in the message bar.

Selecting any one of these register menu keys: **Register 1**, **Register 2**, **Register 3**, **Register 4**, **Register 5**, **Register 6** causes the state of the mode from the specified Register to be recalled. The registers are provided for easy saving and recalling, since the user does not have to specify a filename or navigate to a specific file. The date will follow the format specified in the Date Format setting under the **Control Panel**. The time will show hours, minutes and seconds.

Key Path Recall, State

Example *RCL 1

Key Path Recall, State

Example *RCL 2

Key Path Recall, State

Example *RCL 3

Key Path Recall, State

Example *RCL 4

Key Path Recall, State

Example *RCL 5

Key Path	Recall, State
Example	*RCL 6

From File\ File Open

Brings up the **File Open** standard Windows® dialog and its corresponding **File Open** key menu.

When you first enter this dialog, the State File default path is in the **LookIn:** box in this File Open dialog. The File Open dialog is loaded with the file information related to the State Save Type. The first *.state file is highlighted. The only files that are visible are the *.state files and the Files of type is *.state, since .state is the file suffix for the State Save Type.

Key Path	Recall, State
Restriction and Notes	Brings up Open dialog for recalling a State Save Type

Open

Recalling State function first must verify 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, and then loading the State from the saved state file to as close as possible to the context in which the save occurred. 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 still tries to recall as much as possible and it returns a warning message of what it did.

NOTE	No Trace data is loaded when recalling a State File. Measurements that support loading of trace data will include a Trace key in the Recall menu.
-------------	---

SCPI Command	:MMEMemory:LOAD:STATE <filename>
---------------------	----------------------------------

Recall

Example :MMEM:LOAD:STAT "myState.state" recalls the file myState.state on the default path

Key Path **Recall, State, From File...**

The state of a mode includes all of the variables affected by doing a full preset. It not only recalls Mode Preset settings, but it also recalls all of the mode persistent settings and data if the mode has either. Each mode determines whether data is part of mode state and if the mode has any persistent settings. **Recall State** also recalls all of the **Input/Output** system settings, since they are saved with each State File for each mode.

The **Recall State** function does the following:

Verifies that the file is recallable on this instrument using the version number and model number.

Aborts the currently running measurement.

Clears any pending operations.

Switches to the mode of the selected Save State file.

Sets mode State and Input/Output system settings to the values in the selected Saved State file.

Limits settings that differ based on model number, licensing or version number.

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

Data

Opens the menu where you can select the type of data you would like to import.

Key Path **Recall**

Limits

This option sets the import file type to Limits and determines which limit the data is to be recalled to..

Mode NF

Remote Command :MMEMory:LOAD:LIMit LLINE1 | LLINE2 | LLINE3 | LLINE4 ,
<file_name>

Example :MMEM:LOAD:LIM LLINE1, "C:\Limit1.csv"

Key Path **Recall, Data**

ENR Table

This option sets the import file type to ENR Meas Table or to ENR Cal Table.

Mode	NF
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
Key Path	Recall, Data, More

Loss Comp

This option sets the import file type to Loss Compensation Before DUT Table or to Loss Compensation After DUT Table.

Mode	NF
Remote Command	:MMEMory: LOAD:LOSS BEFore AFter,<file_name>
Example	:MMEM: LOAD:LOSS BEF,"C:\LossBefore.csv" :MMEM: LOAD:LOSS AFT,"C:\LossAfter.csv"
Key Path	Recall, Data, More

FreqList

This option sets the import file type to Frequency List. When a frequency list is imported, the frequency list is populated and the context is set to the stored values. If the Frequency List file does not contain a context, the frequency context parameter is not changed.

Mode	NF
Remote Command	:MMEMory: LOAD:FREQuency <file_name>
Example	:MMEM:LOAD:FREQ "C:\FrequencyList.csv"
Key Path	Recall, Data, More

Recall

Open...

Opens a file open dialogue box where you can select the file you wish to import.

Key Path	Recall, Data
----------	--------------

File Open Dialog and Menu

The **File Open** is a standard Windows dialog and has a **File Open** key menu. Each key in this menu corresponds to the selectable items in the **File Open** dialog box. The menu keys can be used for easy navigation between the selections within the dialog or the standard **Tab** and **Arrow** keys can be used for dialog navigation. When you navigate to this selection, you have already limited the file recall type and now you want to specify which file to open.

Open

This selection and the **Enter** key when a filename has been selected or specified actually cause the load to occur. **Open** loads the specified or selected file to the previously selected recall type of either **State** or a specific import data type.

Restriction and Notes	Advisory Event "File <file name> recalled" after recall is complete.
-----------------------	--

File/Folder List

This menu key navigates to the center of the dialog that contains the list of files and folders. Once here the user can get information about the file.

Key Path	Recall, <various>, Open...
Restriction and Notes	Pressing this key navigates the user to the files and folders list in the center of the dialog.

Sort

Pressing this key brings up the Sort menu that allows the user a way to sort the files within the File Open scope. Only one sorting type can be selected at a time and the sorting happens immediately.

Key Path	Recall, <various>, Open...
----------	----------------------------

Remote Command Notes No SCPI command directly controls the sorting.

By Date

This allows the user to sort the list of files within the scope of the **File Open** dialog in ascending or descending data order. The date is the last data modified.

Key Path	Recall, <various>, Open..., Sort
Restriction and Notes	Files in File Open dialog are sorted immediately in the selected order

By Name

This allows the user to sort the list of files within the scope of the **File Open** dialog in ascending or descending order based on the filename.

Key Path	Recall, <various>, Open..., Sort
Restriction and Notes	Files in File Open dialog are sorted immediately in the selected order

By Extension

This allows the user to sort the list of files within the scope of the **File Open** dialog in ascending or descending order based on the file extension for each file.

Key Path	Recall, <various>, Open..., Sort
Restriction and Notes	Files in File Open dialog are sorted immediately in the selected order

By Size

This allows the user to sort the list of files within the scope of the **File Open** dialog in ascending or descending order based on file size.

Key Path	Recall, <various>, Open..., Sort
Restriction and Notes	Files in File Open dialog are sorted immediately in the selected order

Recall

Ascending

This causes the display of the file list to be sorted, according to the sort criteria above, in Ascending order.

Key Path	Recall, <various>, Open..., Sort
Restriction and Notes	Files in File Open dialog are sorted immediately in the selected order

Descending

This causes the display of the file list to be sorted, according to the sort criteria above, in Descending order.

Key Path	Recall, <various>, Open..., Sort
Restriction and Notes	Files in File Open dialog are sorted immediately in the selected order

Files Of Type

This menu key corresponds to the Files Of Type selection in the dialog. It follows the standard Windows supported Files Of Type behavior. It shows the current file suffix that corresponds to the type of file the user has selected to save. If the user navigated here from recalling State, “State File (*.state)” is in the dialog selection and is the only type available in the pull down menu. If the user navigated here from importing a data file, “Data File (*.csv)” is in the dialog and is the only type available in the pull down menu. Modes can have other data file types and they would also be listed in the pull down menu.

Key Path	Recall, <various>, Open...
Restriction and Notes	Pressing this key causes the pull down menu to list all possible file types available in this context.

Up One Level

This menu key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. It follows the standard Windows supported **Up One Level** behavior. When pressed, it causes the file and folder list to navigate up one level in the directory structure.

Key Path	Recall, <various>, Open...
----------	----------------------------

Restriction and Notes When pressed, the file and folder list is directed up one level of folders and the new list of files and folders is displayed.

Cancel

This menu key corresponds to the **Cancel** selection in the dialog. It causes the current **File Open** request to be cancelled. It follows the standard Windows supported **Cancel** behavior.

Key Path Recall, <various>, Open...

Restriction and Notes Pressing this key causes the Open dialog to go away and auto return.

Recall

3

Analyzer Setup Functions

This section describes functionality that is unique to the Noise Figure measurement application mode. These functions are context dependent and can change depending on the current settings of Mode Setup and Meas Setup.

The remote commands are mode dependent. Most are only available when the Noise Figure mode is selected. (INSTRument:SElect NFIGURE)

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**

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.

Mode NF
 Preset A
 State Saved Saved in instrument state.
 Range 1 | 2
 Key Path **AMPTD Y Scale**

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

AMPTD Y Scale (Amplitude/Y Scale)

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, 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

Mode NF

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

Key Path **Amplitude**

Mode NF

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

Ref Value (Noise Figure Result)

See [Ref Value](#) for more information.

Mode NF

Remote Command :DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALE]:RLEVel
<value>
:DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALE]:RLEVel?

Example :DISP:NFIG:TRAC:NFIG:Y:RLEV?

Dependencies/Couplings Noise Figure needs to be selected as one of the displayed results.

Preset 4.0 dB

State Saved	Saved in instrument state.
Range	-100 dB to 100 dB
Key Path	Amplitude

Ref Value (Noise Factor Result)

See [Ref Value](#) for more information.

Mode	NF
Remote Command	:DISPlay:NFIGure:TRACe:NFACTOR:Y[:SCALe]:RLEVel <value> :DISPlay:NFIGure:TRACe:NFACTOR:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:NFAC:Y:RLEV?
Dependencies/Couplings	Noise Factor needs to be selected as one of the displayed results.
Preset	2.51189
State Saved	Saved in instrument state.
Range	0 to 1E9
Key Path	Amplitude

Ref Value (Gain Result)

See [Ref Value](#) for more information.

Mode	NF
Remote Command	:DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RLEVel <value> :DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:GAIN:Y:RLEV?
Dependencies/Couplings	Gain needs to be selected as one of the displayed results.
Preset	15 dB
State Saved	Saved in instrument state.
Range	-100 dB to 100 dB
Key Path	Amplitude

Ref Value (Y Factor Result)

See [Ref Value](#) for more information.

Mode	NF
------	----

AMPTD Y Scale (Amplitude/Y Scale)

Remote Command	:DISPlay:NFIGure:TRACe:YFACTOR:Y[:SCALe]:RLEVel <value> :DISPlay:NFIGure:TRACe:YFACTOR:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:YFAC:Y:RLEV?
Dependencies/Couplings	Y Factor needs to be selected as one of the displayed results.
Preset	5 dB
State Saved	Saved in instrument state.
Range	-100 dB to 100 dB
Key Path	Amplitude

Ref Value (T Effective Result)

See [Ref Value](#) for more information.

Mode	NF
Remote Command	:DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RLEVel <value> :DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:TEFF:Y:RLEV?
Dependencies/Couplings	T Effective needs to be selected as one of the displayed results.
Preset	1000.0
State Saved	Saved in instrument state.
Range	-100000000K to 100000000K
Key Path	Amplitude

Ref Value (P Hot Result)

See [Ref Value](#) for more information.

Mode	NF
Remote Command	:DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RLEVel <value> :DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RLEVel?
Example	:DISP:NFIG:TRAC:PHOT:Y:RLEV?
Dependencies/Couplings	P Hot needs to be selected as one of the displayed results.
Preset	5 dB
State Saved	Saved in instrument state.
Range	-100 dB to 100 dB

Key Path **Amplitude**

Ref Value (P Cold Result)

See [Ref Value](#) for more information.

Mode NF

Remote Command :DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RLEVel <value>
 :DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RLEVel?

Example :DISP:NFIG:TRAC:PCOL:Y:RLEV?

Dependencies/Couplings P Cold needs to be selected as one of the displayed results.

Preset 5 dB

State Saved Saved in instrument state.

Range -100 dB to 100 dB

Key Path **Amplitude**

Attenuation

This key controls only the mechanical attenuator. The electronic attenuator - which is limited to below 3.6 GHz - is disabled in the Noise Figure Application.

The default input attenuation calibration range is:

MXA	0 dB to 8 dB, and a step size of 4 dB
EXA	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.

See the measurement guide for more information about setting the input attenuation.

Mode NF

Remote Command [:SENSe]:NFIGure:POWer[:RF]:ATTenuation <float>
 [:SENSe]:NFIGure:POWer[:RF]:ATTenuation?

Example :NFIG:POW:ATT 4dB
 :NFIG:POW:ATT?

AMPTD Y Scale (Amplitude/Y Scale)

Restriction and Notes	Attenuation steps are HW Dependent: MXA - Can only be set to multiples of 4. EXA - Can only be set to multiples of 10
Preset	0 dB
State Saved	Saved in instrument state.
Range	0 dB to 40 dB
Key Path	Amplitude

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 must 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

Mode NF

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
Key Path	Amplitude
Mode	NF
Remote Command	:DISPlay[:NFIGure]:TRACe:Y[:SCALE]:PDIVision:VALue NFACTOR GAIN YFACTOR TEFFective PHOT PCOLd,<float> :DISPlay[:NFIGure]:TRACe:Y[:SCALE]:PDIVision:VALue? NFACTOR GAIN YFACTOR TEFFective PHOT PCOLd
Example	:DISP:NFIG:TRAC:Y: PDIV:VAL? NFIG

AMPTD Y Scale (Amplitude/Y Scale)

Scale/Div (Noise Figure Result)

Mode	NF
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
Dependencies/Couplings	Noise Figure needs to be selected as one of the displayed results.
Preset	1.0 dB
State Saved	Saved in instrument state.
Range	0.001 dB to 20 dB
Key Path	Amplitude

Scale/Div (Noise Factor Result)

Mode	NF
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
Dependencies/Couplings	Noise Factor needs to be selected as one of the displayed results.
Preset	0.71489
State Saved	Saved in instrument state.
Range	0.001 to 100
Key Path	Amplitude

Scale/Div (Gain Result)

Mode	NF
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
Dependencies/Couplings	Gain needs to be selected as one of the displayed results.
Preset	1.0 dB
State Saved	Saved in instrument state.

Range 0.001 dB to 20 dB
Key Path **Amplitude**

AMPTD Y Scale (Amplitude/Y Scale)

Scale/Dive (Y Factor Result)

Mode	NF
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
Dependencies/Couplings	Y Factor needs to be selected as one of the displayed results.
Preset	1.0 dB
State Saved	Saved in instrument state.
Range	0.001 dB to 20 dB
Key Path	Amplitude

Scale/Div (T Effective Result)

Mode	NF
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
Dependencies/Couplings	T Effective needs to be selected as one of the displayed results.
Preset	200 K
State Saved	Saved in instrument state.
Range	0.1 K to 20000000 K
Key Path	Amplitude

Scale/Div (P Hot Result)

Mode	NF
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
Dependencies/Couplings	P Hot needs to be selected as one of the displayed results.
Preset	1.0 dB
State Saved	Saved in instrument state.

Range 0.001 dB to 20 dB

Key Path **Amplitude**

Scale/Div (P Cold Result)

Mode NF

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

Dependencies/Couplings P Cold needs to be selected as one of the displayed results.

Preset 1.0 dB

State Saved Saved in instrument state.

Range 0.001 dB to 20 dB

Key Path **Amplitude**

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.

Mode NF

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

Key Path **Amplitude, More 2 of 2**

AMPTD Y Scale (Amplitude/Y Scale)

Ref Position (Noise Figure Result)

Mode	NF
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
Key Path	Amplitude, More 2 of 2

Ref Position (Noise Factor Result)

Mode	NF
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
Key Path	Amplitude, More 2 of 2

Ref Position (Gain Result)

Mode	NF
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
Key Path	Amplitude, More 2 of 2

Ref Position (Y Factor Result)

Mode	NF
Remote Command	:DISPlay:NFIGure:TRACe:YFACTOR:Y[:SCALE]:RPOStion TOP CENTer BOTTom :DISPlay:NFIGure:TRACe:YFACTOR:Y[:SCALE]:RPOStion?
Example	:DISP:NFIG:TRAC:YFAC:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP CENTer BOTTom
Key Path	Amplitude, More 2 of 2

Ref Position (T Effective Result)

Mode	NF
Remote Command	:DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALE]:RPOStion n TOP CENTer BOTTom :DISPlay:NFIGure:TRACe:TEFFective:Y[:SCALE]:RPOStion? n?
Example	:DISP:NFIG:TRAC:TEFF:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP CENTer BOTTom
Key Path	Amplitude, More 2 of 2

Ref Position (P Hot Result)

Mode	NF
Remote Command	:DISPlay:NFIGure:TRACe:PHOT:Y[:SCALE]:RPOStion TOP CENTer BOTTom :DISPlay:NFIGure:TRACe:PHOT:Y[:SCALE]:RPOStion?
Example	:DISP:NFIG:TRAC:PHOT:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP CENTer BOTTom
Key Path	Amplitude, More 2 of 2

AMPTD Y Scale (Amplitude/Y Scale)

Ref Position (P Cold Result)

Mode	NF
Remote Command	:DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RPOStion TOP CENTer BOTTom :DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RPOStion?
Example	:DISP:NFIG:TRAC:PCOL:Y:RPOS TOP
Preset	CENTer
State Saved	Saved in instrument state.
Range	TOP CENTer BOTTom
Key Path	Amplitude, More 2 of 2

Auto Scaling

Automatically sets the ref level and scale per division parameters based on the current trace data. These should be set such that the trace fills 90% of the graticule.

Mode	NF
Remote Command	:DISPlay:NFIGure:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:C OUPle 0 1 OFF ON :DISPlay:NFIGure:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:C OUPle?
Dependencies/Couplings	When Auto Scaling is On, and the Restart front-panel key is pressed, this function automatically determines the scale per division and reference values based on the measurement results. When you set a value to either Scale/Div or Ref Level manually, Auto Scaling automatically changes to Off.
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
Key Path	Amplitude

Internal Preamp

Allows the user to turn the internal preamp on or off. 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..

If the current IF frequency range falls completely or partially outside the internal preamp range, a warning message is displayed.

Note that the default input attenuation calibration range is:

MXA	0 dB to 8 dB, and a step size of 4 dB
EXA	0 dB to 10 dB, and a step size of 10 dB

Mode	NF
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
Key Path	Amplitude, More 2 of 2

AMPTD Y Scale (Amplitude/Y Scale)

AMPTD Y Scale (Amplitude/Y Scale)

AUTO COUPLE

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**

Res BW (Auto/Man)

Determines control for setting the resolution bandwidth to automatic or manual.

When the resolution bandwidth is set to Auto (default setting), the bandwidth is set automatically, and is dependent on the measurement frequency.

At measurement frequencies of 8 MHz or above, the resolution bandwidth is set automatically to 4 MHz.

At measurement frequencies less than 8 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 Agilent X-Series measurement guide for more information on setting the resolution bandwidth.

Mode	NF
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?
Dependencies/Couplings	When the IF freq goes lower than 8 MHz the Res BW needs to be reduced to prevent the LO feedthrough affecting results. When AvgTime/Pt is set to Auto the RBW automatically sets the Avg Time/Pt value, which is why the measurement may take up to 6000 seconds.
Preset	4 MHz ON

BW

State Saved	Saved in instrument state.
Range	1 Hz to 8 MHz
Key Path	BW

FREQ Channel (Frequency)

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
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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 Application chapter in the X-Series Specifications Guide for more details.
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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 313](#) for more information on entering data manually.

In this mode, the Start/Stop/Center/Fixed Freq, Span, and Points parameters are grayed

FREQ Channel (Frequency)

out (disabled).

When the Frequency Mode is LIST and the context changes, the list values are recalculated to satisfy the new context.

Mode	NF
Remote Command	[:SENSE] :NFIGure:FREQuency:MODE SWEpt FIXed LIST [:SENSE] :NFIGure:FREQuency:MODE?
Example	FREQ:MODE FIX
Dependencies/Couplings	See above.
Remote Command Notes	SWEpt parameter replaces SWEep
Preset	SWEpt
State Saved	Saved in instrument state.
Range	SWEpt FIXed LIST
Key Path	Frequency

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 current context.

The Start, Stop, Center, and Span frequencies are all coupled. Altering one causes the others to be recalculated to satisfy the equations:

$$\text{Span} = \text{Stop} - \text{Start}$$

$$\text{Center} = \text{Start} + (\text{Span} / 2)$$

Mode	NF
Remote Command	[:SENSE] :NFIGure:FREQuency:STARt <freq> [:SENSE] :NFIGure:FREQuency:STARt?
Example	NFIG:FREQ:STAR 11 MHz
Dependencies/Couplings	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 exclamation mark to warn you of inaccurate results. Mirror of Start Frequency for current context in DUT Setup Form.

Preset	10 MHz
State Saved	Saved in instrument state.
Range	-325 GHz to 325 GHz
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"
Key Path	Frequency

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 current.

The Start, Stop, Center, and Span frequencies are all coupled. Altering one causes the others to be recalculated to satisfy the equations:

$$\text{Span} = \text{Stop} - \text{Start}$$

$$\text{Center} = \text{Start} + (\text{Span} / 2)$$

Mode	NF
Remote Command	[:SENSe] :NFIGure:FREQuency:STOP <freq> [:SENSe] :NFIGure:FREQuency:STOP?
Example	NFIG:FREQ:STOP 11 MHz
Dependencies/Couplings	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. Mirror of Stop Frequency of current context in DUT Setup Form.
Preset	3.0 GHz
State Saved	Saved in instrument state.
Range	-325 GHz to 325 GHz
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"

FREQ Channel (Frequency)

Key Path **Frequency**

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:

$$\text{Span} = \text{Stop} - \text{Start}$$

$$\text{Center} = \text{Start} + (\text{Span} / 2)$$

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.

Mode NF

Remote Command [:SENSe]:NFIGure:FREQuency:CENTer < freq >
 [:SENSe]:NFIGure:FREQuency:CENTer?

Example :NFIG:FREQ:CENT 1.5 GHz

Dependencies/Couplings 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.

Preset 1.505 GHz

State Saved Saved in instrument state.

Range -325 GHz to 325 GHz

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"

Key Path **Frequency**

Points

This is a shortcut to the parameter, "[Points](#)" on page 364 which is under the Sweep/Control front-panel key.

Key Path **Frequency**

Fixed Freq

Sets the Fixed Frequency that will be measured when Freq Mode is set to 'Fixed'.

Mode	NF
Remote Command	[:SENSe] :NFIGure:FREQuency:FIXed <freq> [:SENSe] :NFIGure:FREQuency:FIXed?
Example	:NFIG:FREQ:FIX 2 GHz
Dependencies/Couplings	Active if freq mode is set to Fixed: Warning -221.5528 displayed otherwise.
Preset	1.505 GHz
State Saved	Saved in instrument state.
Range	-325 GHz to 325 GHz
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"
Key Path	Frequency

Edit Frequency List

When frequency list mode is active, this menu allows the user to enter a list of frequencies to be measured. The current entries in the frequency list will be using the table editor (see section [Table Editor Operation on page 313](#)).

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.

FREQ Channel (Frequency)

Frequency List
Frequency
1.000000000 GHz
1.100000000 GHz
1.200000000 GHz
1.300000000 GHz
1.400000000 GHz
1.500000000 GHz
1.600000000 GHz

Mode NF

Dependencies/Couplings 1. Error – 171 is displayed if Freq Mode = LIST and there is no data in the table.

Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.

2. Table displayed dependent on frequency context.

Key Path **Frequency**

Edit

Opens the frequency list editor softkey menu which enables you to enter discrete values into the frequency list. See section [Table Editor Operation on page 313](#) for information regarding the keys in the Edit menu.

Mode NF

Dependencies/Couplings Error –171 displayed if Freq Mode = LIST and no data in table.

Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.

Key Path **Frequency, isency List**

Frequency

No Equivalent SCPI Command (See Setting Frequency List Table Remotely below)

Lets you enter the frequency.

Mode	NF
Dependencies/Couplings	Parameter coupled to currently selected frequency in table.
Preset	10 kHz
State Saved	Saved in instrument state.
Range	10 kHz to 325 GHz
Max	There are a few conditions the max will be 325 GHz less half of the min span of 10 Hz. <ol style="list-style-type: none"> 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"
Key Path	Frequency, isuency List, Edit

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.

Mode	NF
Remote Command	[:SENSe] :NFIGure:FREQuency:LIST:DATA <frequency>, ([, <frequency>]) * [:SENSe] :NFIGure:FREQuency:LIST:DATA?
Example	NFIG:FREQ:LIST:DATA 1000000, 2000000, 3000000, 4000000

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	NF
Remote Command	[:SENSe] :NFIGure:FREQuency:LIST:COUNT?
Example	:NFIG:FREQ:LIST:COUN?
Preset	0
Range	0 to 501

Fill Using Start and Stop Freq

No Equivalent SCPI Command (See [“Setting Frequency List Table Remotely \(remote command only\)”](#) on page 209.)

FREQ Channel (Frequency)

Clears the existing frequency list table, and replaces it with an auto-generated table based upon the 'Swept' Freq Mode settings. The frequency points are 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.
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Mode	NF
Key Path	Frequency, isuency List

Clear Table

This function clears all data from the Frequency List.

Mode	NF
Restriction and Notes	Clears all entried in the Frequency List table.
Key Path	FREQ Channel, isuency List

FREQ Channel (Frequency)

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 softkeys that control the Input/Output parameters of the instrument.

Input choices include the RF input and the Amplitude Reference (50 MHz, 4.8 GHz or 300 MHz comb signal). You can also specify the input impedance for unit conversions.

Other functions related to the input/output connections can be found under **Trig** (trigger input controls) and **System** (LAN and other I/O bus configurations) and **Amplitude** (optional internal preamp).

NOTE The functions in the Input/Output menu are common to all Modes (applications). They are “global”. But individual functions are only available in a mode if they makes sense. They will be grayed out.

SCPI Command	<code>[:SENSe] :FEED RF AREFERENCE</code> <code>[:SENSe] :FEED?</code>
Preset	This setting is unaffected by a Preset or power cycle. It survives 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 state

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 Preset and 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

Input/Output

selected, pressing this key accesses the RF input setup functions.

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

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 less than 10 MHz but the amplitude accuracy is not specified. To accurately see a signal of less than 10 MHz, you must switch to DC coupling.

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 External Mixer 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).

Selecting Input Coupling

N9020A Option	AC Frequency Range	DC Frequency Range
Option 503	10 MHz to 3.6 GHz	3 Hz to 3.6 GHz
Option 507	10 MHz to 7.0 GHz	3 Hz to 7.0 GHz
Option 508	10 MHz to 8.4 GHz	3 Hz to 8.4 GHz
Option 513	10 MHz to 13.6 GHz	3 Hz to 13.6 GHz
Option 526	10 MHz to 26.5 GHz	3 Hz to 26.5 GHz

SCPI Command :INPut:COUPling AC|DC
 :INPut:COUPling?

Example INP:COUP DC
Preset AC
State Saved Saved in State
Key Path Input/Output, RF

Restore Input/Output Defaults

This selection causes the group of *settings* and *data* associated with **Input/Output** key to be a reset to their default values. 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.

Example	:SYST:DEF INP presets all the Input/Output variables to their factory default values.
Remote Command Notes	Please refer to the Utility Functions section for information about Restore System Defaults and the complete description of the :SYSTem:DEFault INPut: command.
Key Path	Input/Output

Freq Ref In

Specifies the frequency reference as being the internal reference, external reference or sensing the presence of an external reference. When the frequency reference is set to internal, the internal 10 MHz reference is used even if an external reference is connected.

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

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

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

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.

SCPI Command	[:SENSe] :ROSCillator:SOURCE:TYPE INTERNAL EXTERNAL SENSE [:SENSe] :ROSCillator:SOURCE:TYPE?
Preset	This is unaffected by Preset but is set to SENSE on a "Restore Input/Output Defaults" or "Restore System Defaults->All".
State Saved	Saved in State.

Input/Output

Key Path	Input/Output
SCPI Status Bits/OPC Dependencies	STATus:QUEStionable:FREQuency bit 2 set if unlocked.
SCPI Command	<code>[[:SENSE]:ROSCillator:SOURce?</code>
Remote Command Notes	The query <code>[SENSE]:ROSCillator:SOURce?</code> returns the current switch setting. This means: <ol style="list-style-type: none">1. If it was set to <code>SENSE</code> but there is no external reference so the instrument is actually using the internal reference, then this query returns <code>INTernal</code> and not <code>SENSE</code>.2. If it was set to <code>SENSE</code> and there is an external reference present, the query returns <code>EXTernal</code> and not <code>SENSE</code>.3. If it was set to <code>EXTernal</code>, then the query returns “<code>EXTernal</code>”4. If it was set to <code>INTernal</code>, then the query returns <code>INTernal</code>
Preset	<code>SENSE</code>

Sense

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

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

Internal

The internal reference is used.

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

External

The external reference is used.

Example :ROSC:SOUR:TYPE EXT
 Key Path Input/Output, Freq Ref In

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 or external reference.)

For the instrument to stay locked, the value entered must be within 5 ppm of the actual ext ref 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.

SCPI 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.
Preset	This is unaffected by Preset but is set to 10 MHz on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
Min	EXA: 10 MHz MXA: 1 MHz
Max	EXA: 10 MHz MXA: 50 MHz
Key Path	Input/Output, Freq Ref In
Default Terminator	Hz

Output Config

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

Trig Out (1 and 2)

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

SCPI Command	:TRIGger TRIGger1 TRIGger2[:SEQuence]:OUTPut HSWP MEASuring MAIN GATE GTRigger OEVEN OFF :TRIGger TRIGger1 TRIGger2[:SEQuence]:OUTPut?
Example	TRIG:OUTP HSWP
Preset	Trigger 1: Sweeping (HSWP) Trigger 2: Gate This is unaffected by 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
Key Path	Input/Output, Output Config

Polarity

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

SCPI 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 Preset but is set to POSitive on a “Restore Input/Output Defaults” or “Restore System Defaults->All”
State Saved	Saved in state
Key Path	Input/Output, Output Config, Trig 1 Output

Sweeping (HSWP)

Selects the Sweeping trigger signal to be output to the Trig 1 Out connector. This signal

has historically been known as “HSWP” but care should be taken to understand that in this analyzer, its function does not exactly match other products behavior.

Example	TRIG1:OUTP HSWP
Key Path	Input/Output, Output Config, Trig 1 Output

Measuring

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

Example	TRIG1:OUTP MEAS
Key Path	Input/Output, Output Config, Trig 1 Output

Main Trigger

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

Example	TRIG1:OUTP MAIN
Key Path	Input/Output, Output Config, Trig 1 Output

Gate Trigger

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

Example	TRIG1:OUTP GTR
Key Path	Input/Output, Output Config, Trig 1 Output

Gate

Selects the gate signal to be output to the Trig 1 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 represents the time the gate is configured to pass the signal.

Example	TRIG1:OUTP GATE
Key Path	Input/Output, Output Config, Trig 1 Output

Odd/Even Trace Point

Selects either the odd or even trace points as the signal to be output to the Trig 1 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.

Example	TRIG1:OUTP OEV
Key Path	Input/Output, Output Config, Trig 1 Output

Off

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

Example	TRIG1:OUTP OFF
Key Path	Input/Output, Output Config, Trig 1 Output

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.

SCPI Command	<code>:FORMat[:TRACe][:DATA] ASCii REAL,32 REAL,64</code> <code>:FORMat[:TRACe][:DATA]?</code>
---------------------	---

Remote Command Notes The query response is:

ASCii: ASC,8
REAL,32: REAL,32
REAL,64: REAL,64

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 mdBm (.001 dBm).

Dependencies	Sending a data format spec with an invalid number (for example, <code>INT, 48</code>) 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.
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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

Source

SPAN X Scale

The Span key activates the Span function and displays the menu of span functions.

Key Path **Front-Panel**

Span

Sets the displayed frequency range symmetrically about the center frequency.

Mode	NF
Remote Command	[:SENSe] :NFIGure:FREQuency:SPAN <freq> [:SENSe] :NFIGure:FREQuency:SPAN?
Example	FREQ:SPAN 10 MHz
Dependencies/Couplings	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.
Preset	2.99GHz
State Saved	Saved in instrument state.
Range	10 Hz to 324.5 GHz
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"
Key Path	Span

SPAN X Scale

Trace/Detector

Opens a menu that enables you to set the parameters for Trace and Detector.

Mode	NF
Key Path	Trace/Detector

Select Trace (frontpanel only)

This key select which trace other parameters under the Trace/Detector menu will apply to.

Mode	NF
Dependencies/Couplings	Coupled to 'Next Window' key in Split Graph view.
Remote Command	No SCPI. Front panel only.
Notes	
Preset	1
State Saved	Saved in instrument state.
Range	1 2
Key Path	Trace/Detector

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.

Trace/Detector

Mode	NF
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
Key Path	Trace/Detector

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)

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 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 Whenever you set **Update** to **On** for any trace, **Display** is set to **On** for that trace.

Dependencies/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 View (**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 View (**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 View (**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**.

Key Path **Trace/Detector**

Remote Command :TRACe [1] | 2 | 3 | 4 | 5 | 6 :UPDate [:STATE] ON|OFF|0|1
:TRACe [1] | 2 | 3 | 4 | 5 | 6 :UPDate [:STATE] ?

Example TRAC2:UPD 0 Makes trace 2 inactive (stops updating)

Dependencies/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

Key Path **Trace/Detector**

Remote Command :TRACe [1] | 2 | 3 | 4 | 5 | 6 :DISPlay [:STATE] ON|OFF|0|1
:TRACe [1] | 2 | 3 | 4 | 5 | 6 :DISPlay [:STATE] ?

Example TRAC2:DISP,1 Makes trace 2 visible

TRAC3:DISP,0 Blanks trace 3

Trace/Detector

Dependencies/Couplings	Whenever you set Update to On for any trace, the Display is set to On for that trace.
Preset	11010101010 (On for Trace 1; Off for 2–6)
State Saved	Saved in Instrument State
Key Path	Trace/Detector

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".

Mode	NF
Remote Command	:TRACe:NFIGure:WRITe:ALL
Example	:TRAC:NFIG:WRITE:ALL
Remote Command Notes	Immediate action. : New command Immediate Action, Set only.
Key Path	Sweep/Control

Detector

This softkey is grayed out in Noise Figure Mode. This is a query only SCPI command.

Mode	NF
Remote Command	[[:SENSe]:NFIGure:DETEctor[:FUNction] AVERAge [:SENSe]:NFIGure:DETEctor[:FUNction]?
Example	:NFIG:DET AVER :NFIG:DET?
Restriction and Notes	Can only be set to AVERAge. Command (not query) provided for BWCC.
Remote Command Notes	Query Only
Preset	AVERAge
State Saved	Saved in instrument state.
Range	AVERAge
Key Path	Trace/Det

View/Display

Key Path Front-Panel

Display

This is a menu common to all measurements for configuring items on the display. Keys not relevant to a given measurement should be grayed out. Keys not relevant to any measurement in a mode should be blanked. The Display menu settings are specific to the measurement selected under the **Meas** key, except for those settings under the **System Display Settings** key.

Key Path View/Display

Annotation

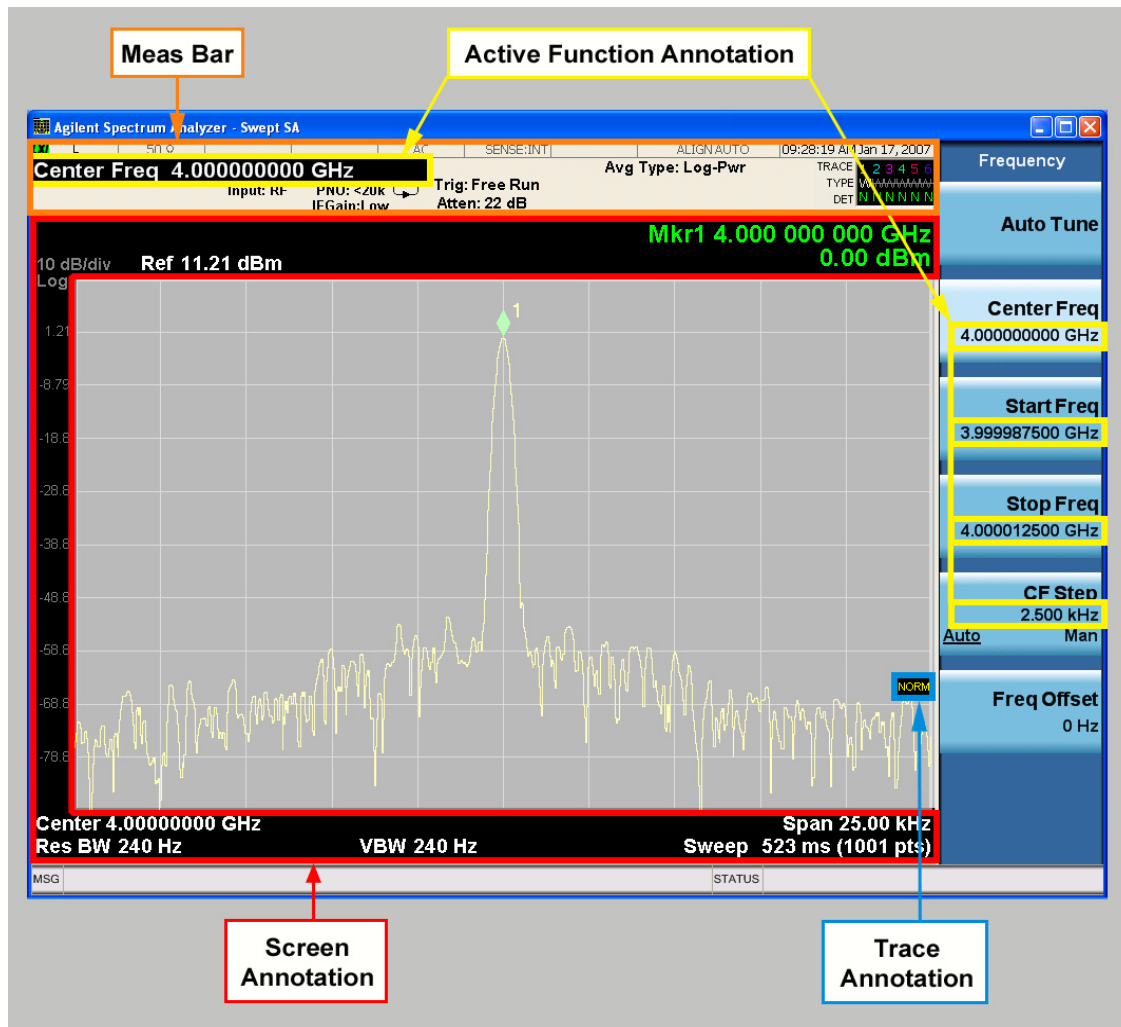
Turns on/off various parts of the display annotation. The annotation is divided up into four categories:

1. Meas Bar: This is the measurement bar at the top of the screen. 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.

NOTE This function is useful when you have sensitive information that you do not wish to show or print.

See figure below. Each type of annotation can be turned on and off individually.

View/Display



Key Path

View/Display, Display

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.

SCPI 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 Display Settings, Annotation is set to Off.
State Saved	Saved in instrument state.
Key Path	View/Display, Display, Annotation

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.

SCPI 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 Display Settings, Annotation is set to Off
State Saved	Saved in instrument state.
Key Path	View/Display, Display, Annotation

Trace

Turns on and off the labels on the traces, showing their detector (or their math mode) as described in the Trace/Detector section.

If trace math is being performed with a trace, then the trace math annotation will replace the detector annotation.

SCPI Command	:DISPlay:ANNOtation:TRACe[:STATe] ON OFF 1 0 :DISPlay:ANNOtation:TRACe[:STATe] ?
Example	DISP:ANN:TRAC OFF
Preset	Off
State Saved	Saved in instrument state.

Active Function Values On/Off

Turns on/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.

SCPI 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 Display Settings, Annotation is set to Off
State Saved	Saved in instrument state.
Key Path	View/Display, Display, Annotation

Title

Displays menu keys that enable you to change or clear a title on your display.

Key Path	View/Display, Display
----------	-----------------------

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**.

Mode	All
Example	DISP:<your_measurement>:ANN:TITL:DATA “This Is My Title”

State Saved Saved in instrument state.
 Key Path View/Display, Display, Title

Mode SA, with Swept SA Measurement active

SCPI Command :DISPlay:ANNotation:TITLe:DATA <string>
 :DISPlay:ANNotation:TITLe:DATA?

Example DISP:ANN:TITL:DATA “This Is My Title”

Sets the title to: This Is My Title

This example is for the Swept SA measurement in the Spectrum Analyzer mode. The SANalyzer <measurement> name is not used.

Preset No title (measurement name instead)

State Saved Saved in instrument state.

Key Path View/Display, Display, Title

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.

Example DISP:ANN:TITL:DATA “” clears any existing title characters.

Remote Command Notes Use the :DISPlay:ANNotation:TITLe:DATA <string> command with an empty string.

Preset Performed on Preset.

Key Path View/Display, Display, Title

Graticule

Pressing Graticule turns the display graticule On or Off. It also turns the graticule y-axis annotation on and off.

SCPI 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

View/Display

Preset	On
State Saved	saved in instrument state
Key Path	View/Display, Display

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, System Display Settings
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Annotation Local Settings/All Off

This is a Mode Global override of the meas local annotation settings. When it is **All Off**, it forces Screen Annotation, Meas Bar, Trace and Active Function Values settings to be off for all measurements in all modes. In this case, **Screen, Meas Bar, Trace** and **Active Function Values** keys under the **Display, Annotation** menu are grayed out and forced to OFF. This provides the security based “annotation off” function of previous analyzers, hence it uses the legacy SCPI command.

When **Local Settings** has been selected, you are able to set the local annotation settings on a measurement by measurement basis.

SCPI Command	:DISPlay:WINDow[1]:ANNotation[:ALL] OFF ON 0 1 :DISPlay:WINDow[1]:ANNotation[:ALL]?
Example	:DISP:WIND:ANN OFF
Setup	:SYSTem:DEFault MISC
Preset	On (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Key Path	View/Display, Display, System Display Settings , Annotation

Theme

This key allows you to change the Display theme. This is similar to the **Themes** selection

under **Page Setup** and **Save Screen Image**. The four themes are detailed below.

SCPI Command	:DISPlay:THEME TDColor TDMonochrome FCOLor FMONochrome :DISPlay:THEME?
Setup	:SYSTem:DEFault MISC
Preset	TDColor (Set by Restore Misc Defaults)
State Saved	Not saved in instrument state.
Key Path	View/Display, Display, System Display Settings
Remote Command Notes	TDColor – 3D is the standard color theme with filling and shading TDMonochrome – is similar to 3D color, but only black is used FCOLor – flat color is intended for inkjet printers to conserve ink. It uses a white background instead of black. FMONochrome – is like flat color, but only black is used
Example	DISP:THEM TDM sets the display theme to 3D Monochrome.

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.

SCPI Command	:DISPlay:BACKlight ON OFF :DISPlay:BACKlight?
Setup	:SYSTem:DEFault MISC
Preset	ON (Set by Restore Misc Defaults)
Key Path	View/Display, Display, System Display Settings

On

Turns the display backlight on.

View/Display

Example	DISP:BACK ON
Key Path	View/Display, Display, System Display Settings, Backlight

Off

Turns the display backlight off.

Example	DISP:BACK OFF
Key Path	View/Display, Display, System Display Settings, Backlight

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.

SCPI Command	:DISPlay:BACKlight:INTensity <integer> :DISPlay:BACKlight:INTensity?
Example	DISP:BACK:INT 50
Setup	:SYSTem:DEFault MISC
Preset	100 (Set by Restore Misc Defaults)
Min	0
Max	100
Key Path	View/Display, Display, System Display Settings

Layout

Meas View selects the format in which the measurement results should be displayed on screen. Results can be displayed in Graph, Table or Meter form.

Mode	NF
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
Key Path	View

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.

Mode	NF
Dependencies/Couplings	Max value coupled to Frequency Points parameter (under FREQ Channel key)
Preset	1
State Saved	No
Range	1 – #Frequency Points
Key Path	View/Display

View/Display

View/Display

Marker

Accesses menus that enables you to select, set up and control the markers for the current measurement.

Markers can be used on graph view 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 \(Remote Command only\)](#)

[Marker X Axis Position \(Remote Command only\)](#)

[Marker Y Axis Value \(Remote Command only\)](#)

Key Path	Front-Panel
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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.

Mode	NF
Remote Command Notes	No SCPI. Front panel only.
Preset	1
State Saved	Saved in instrument state.
Range	1 2 3 4
Key Path	Marker

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 left-most point 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 left-most point 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 deselects all markers.

Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4 :MODE POSition DELTA OFF :CALCulate:NFIGure:MARKer [1] 2 3 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
Key Path	Marker

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 3 4 :X <freq> :CALCulate:NFIGure:MARKer [1] 2 3 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'.

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	NF
------	----

Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4 :X:POSition <real> :CALCulate:NFIGure:MARKer [1] 2 3 4 :X:POSition?
Example	CALC:NFIG:MARK4:X:POS 0.0
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. If the marker is Off the response is not a number (NAN).
Dependencies/Couplings	Coupled to number of sweep points.
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

Marker Y Axis Value (Remote Command only)

The command below queries a marker's Y axis value.

Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 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.

Properties

Opens the properties menu for the currently selected marker.

Mode	NF
Key Path	Marker

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.

Mode	NF
Remote Command Notes	No SCPI. Front panel only.
Preset	1
State Saved	Saved in instrument state.
Range	1 2 3 4
Key Path	Marker, Properties

Relative To

Assigns the reference marker for a marker in Delta mode.

Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4:REFerence <int> :CALCulate:NFIGure:MARKer [1] 2 3 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.
Key Path	Marker, Properties

Marker Trace

Assigns the specified marker to one of the traces. A marker can be assigned to any trace.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4:TRACe TRACe1 TRACe2 :CALCulate:NFIGure:MARKer [1] 2 3 4:TRACe?
Example	CALC:NFIG:MARK2:TRAC TRACe2 CALC:NFIG:MARK2:TRAC?
Preset	1
State Saved	Saved in instrument state.
Range	Trace 1 Trace 2
Key Path	Marker, Properties

Marker Table

When turned on, the marker table is displayed below the current graph measurement.

Key Path **Marker**

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.

This may result in markers going offscreen.

Mode NF

Remote Command :CALCulate:NFIGure:MARKer:COUPle[:STATE] ON|OFF|1|0
 :CALCulate:NFIGure:MARKer:COUPle[:STATE]?

Example CALC:NFIG:MARK:COUP ON

Restriction and Notes Markers on both result graphs are coupled.

Preset OFF

State Saved Saved in instrument state.

Range ON|OFF|0|1

Key Path **Marker**

All Markers Off

Turns all markers off.

Key Path **Marker**

Marker Function

This front-panel key has no function in the Noise Figure Application.

Key Path

Front-Panel

Marker To

This front-panel key has no function in the Noise Figure Application.

Key Path

Front-Panel

Peak Search

Accesses Peak Search settings and performs a peak search.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4:MAXimum
Example	CALC:NFIG:MARK2:MAX
Key Path	Peak Search

Next Peak

Moves the selected marker to the peak that has the next highest amplitude that is less than the marker's current value.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4:MAXimum:NEXT
Example	CALC:NFIG:MARK2:MAX:NEXT
Key Path	Peak Search

Next Pk Right

Performs a peak search with the current peak criteria in the region to the right of the right of the marker.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4:MAXimum:RIGHT
Example	CALC:NFIG:MARK2:MAX:RIGH
Key Path	Peak Search

Next Pk Left

Performs a peak search with the current peak criteria in the region to the left of the right of the marker.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4:MAXimum:LEFT
Example	CALC:NFIG:MARK2:MAX:LEFT
Key Path	Peak Search

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**

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.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer:SEARch:TYPE :CALCulate:NFIGure:MARKer:SEARch:TYPE?
Example	CALC:NFIG:MARK:SEAR:TYPE MIN
Dependencies/Couplings	Performing a PTPeak search will turn a marker's relative marker on if it is currently off.
Preset	MAXimum
State Saved	Saved in instrument state.
Range	MINimum MAXimum PTPeak
Key Path	Peak Search, More

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.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4 :CPEak [:STATE] ON OFF 1 0 :CALCulate:NFIGure:MARKer [1] 2 3 4 :CPEak [:STATE] ?
Example	CALC:NFIG:MARK:CPE ON
Preset	OFF
State Saved	Saved in instrument state.
Range	Off On
Key Path	Peak Search, More

Pk-Pk Search

Performs a maximum peak search with the selected marker and a minimum peak search with the corresponding reference marker, effectively displaying the frequency and amplitude difference between the highest and lowest Y-axis value.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4 :PTPeak
Example	CALC:NFIG:MARK:PTP
Restriction and Notes	Turns on the Marker active function.
Key Path	Peak Search, More

Min Search

Moves the selected marker to the minimum y-axis value of the current trace.

Mode	NF
Remote Command	:CALCulate:NFIGure:MARKer [1] 2 3 4 :MINimum
Example	CALC:NFIG:MARK:MIN
Key Path	Peak Search, More

5

Measurement Functions

Some of the content described in this section is not directly applicable to the Noise Figure Mode because the descriptions are shared by multiple modes. This is common analyzer functionality information that can be used as reference material.

Meas

The information in this section is common to all measurements. See [“Noise Figure ” on page 367](#) for information specific to the measurement in this Mode.

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 differ 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.

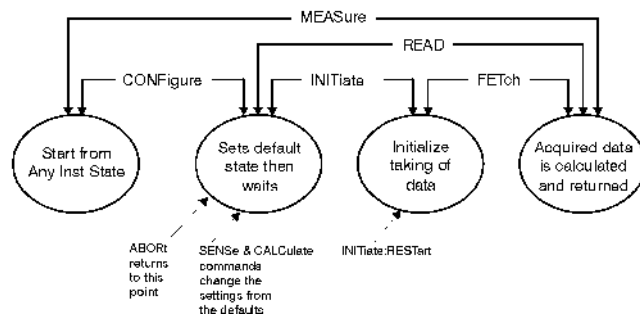
Key Path

Front-panel key

Command Interactions: MEASure, CONFigure, FETCh, INITiate and READ

Each one-button measurement has a group of commands that work together to make the measurement fast, but flexible.

Figure 5-1 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 (for example: 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:NDEfault<measurement> 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.

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 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**)

Current Measurement Query (Remote Command Only)

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

Remote Command :CONFigure?

Example CONF?

Test current results against all limits (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.

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.

Calculate/Compress Trace Data Query

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.

Parameter Name	Calculate/Compress Trace/Data Query
SCPI Command	:CALCulate:DATA<n>:COMPRESS? BLOCK CFIT MAXimum MINimum MEAN DMEan RMS SAMPLE SDEVIatio n PPHase [,<soffset>[,<length>[,<roffset>[,<rlimit>]]]]
SCPI 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.
Example	To query the mean power of a set of GSM bursts: <ol style="list-style-type: none"> 1. Supply a signal that is a set of GSM bursts. 2. Select the IQ Waveform measurement (in IQ Analyzer Mode). 3. Set the sweep time to acquire at least one burst. 4. Set the triggers such that acquisition happens at a known position relative to a burst. 5. 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.)

- **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, 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 (x,y pair) 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 (x,y pair) 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 5-1 Mean Value of Data Points for Specified Region(s)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i$$

where X_i is a data point value, and n is the number of data points in the specified region(s).

Equation 5-2 Mean Value of I/Q Data Pairs for Specified Region(s)

$$\text{MEAN} = \frac{1}{n} \sum_{X_i \in \text{region}(s)} |X_i|$$

where $|X_i|$ is the magnitude of an I/Q pair, and n is the number of I/Q pairs in the specified region(s).

- *DMEan* - returns a single value that is the mean power (in dB/dBm) of the data point values for the specified region(s) of trace data. See the following equation:

Figure 5-2 DMEan Value of Data Points for Specified Region(s)

$$\text{DME} = 10 \times \log_{10} \left(\frac{1}{n} \sum_{X_i \in \text{region}(s)} \left(\frac{X_i}{10} \right) \right)$$

- *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.

For I/Q trace data, the rms of the magnitudes of the I/Q pairs is returned. See the following equation.

Note: 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 5-3 RMS Value of Data Points for Specified Region(s)

$$\text{RMS} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i^2}$$

where X_i is a data point value, and n is the number of data points in the specified region(s).

Equation 5-4 RMS Value of I/Q Data Pairs for Specified Region(s)

$$\text{RMS} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} X_i X_i^*}$$

where X_i is the complex value representation of an I/Q pair, X_i^* its conjugate complex number, and n is the number of I/Q pairs in the specified region(s).

Once you have the rms value for a region of trace data (linear or I/Q), you may want to calculate the mean power. You must convert this rms value (peak volts) to power in dBm.

$$10 \times \log[10 \times (\text{rms value})^2]$$

- *SAMPLE* - returns the first data value (x,y pair) for the specified region(s) of trace data. For I/Q trace data, the first I/Q pair is returned.
- *SDEViation* - returns a single value that is the arithmetic standard deviation for the data point values for the specified region(s) of trace data. See the following equation.

For I/Q trace data, the standard deviation of the magnitudes of the I/Q pairs is returned. See the following equation.

Equation 5-5 Standard Deviation of Data Point Values for Specified Region(s)

$$\text{SDEV} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} (X_i - \bar{X})^2}$$

where X_i is a data point value, \bar{X} is the arithmetic mean of the data point values for the specified region(s), and n is the number of data points in the specified region(s).

Equation 5-6 Standard Deviation of I/Q Data Pair Values for Specified Region(s)

$$\text{SDEV} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}(s)} (|X_i| - \bar{X})^2}$$

where $|X_i|$ is the magnitude of an I/Q pair, \bar{X} is the mean of the magnitudes for the specified region(s), and n is the number of data points in the specified region(s).

- *PPHase* - returns the x,y pairs of both rms power (dBm) and arithmetic mean phase (radian) for every specified region and frequency offset (Hz). The number of pairs is defined by the specified number of regions. This parameter can be used for I/Q vector ($n=0$) in Waveform (time domain) measurement and all parameters are specified by data point in PPHase.

The rms power of the specified region may be expressed as:

$$\text{Power} = 10 \times \log [10 \times (\text{RMS I/Q value})] + 10.$$

$$\text{The RMS I/Q value (peak volts)} = \sqrt{\frac{1}{n} \sum_{X_i \in \text{region}} X_i X_i^*}$$

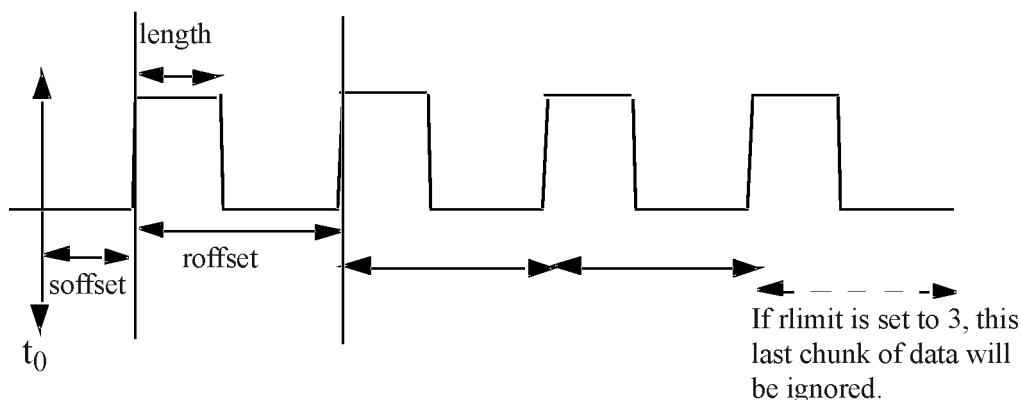
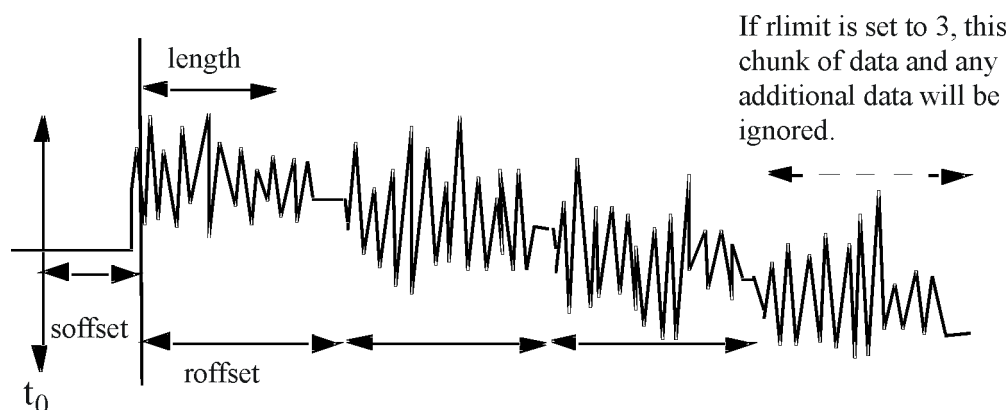
where X_i is the complex value representation of an I/Q pair, X_i^* its conjugate complex number, and n is the number of I/Q pairs in the specified region.

The arithmetic mean phase of the specified region may be expressed as:

$$\text{Phase} = \frac{1}{n} \sum_{Y_i \in \text{region}} Y_i$$

Where Y_i is the unwrapped phase of I/Q pair with applying frequency correction and n is the number of I/Q pairs in the specified region.

The frequency correction is made by the frequency offset calculated by the arithmetic mean of every specified region's frequency offset. Each frequency offset is calculated by the least square method against the unwrapped phase of I/Q pair.

Figure 5-3 Sample Trace Data - Constant Envelope**Figure 5-4 Sample Trace Data - Not Constant Envelope**

<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 :CALCulate:DATA [1] | 2 | 3 | 4 | 5 | 6:PEAKs?
<real>, <real> [, AMPLitude | FREQuency | TIME [, ALL | GTDLine | LTD
Line]]

Remote Command For Swept SA measurement:
:CALCulate:DATA [1] | 2 | 3 | 4 | 5 | 6:PEAKs?
<threshold>, <excursion> [, AMPLitude | FREQuency | TIME [, ALL | G
TDLine | LTDLine]]

For most other measurements:

:CALCulate:DATA [1] | 2 | 3 | 4 | 5 | 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 the its corresponding frequency (or time).

If no peaks are found the peak list will consist of only the number of peaks, (0).

Dependencies/Couplings

Values must be provided for threshold and excursion. The sorting and display line parameters are optional (defaults are `AMPLitude` and `ALL`).

Note that there is always a Y-axis value for the display line, regardless of whether the display line state is on or off. It is the current Y-axis value of the display line which is used by this command to determine whether a peak should be reported.

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 0.0dB. 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.

Sorting order:

AMPLitude - lists the peaks in order of descending amplitude, with the highest peak first (default if optional parameter not sent)

FREQuency - lists the peaks in order of occurrence, left to right across the x-axis.

TIME - lists the peaks in order of occurrence, left to right across the x-axis.

Peaks vs. Display Line:

ALL - lists all of the peaks found (default if optional parameter not sent).

GTDLine (greater than display line) - lists all of the peaks found above the display line.

LTDLine (less than display line) - lists all of the peaks found below the display line.

Meas

Meas Setup

Accesses menus that allow you to set measurement setup parameters.

Key Path **Front-Panel**

Average Num

Sets the number of data acquisitions that will be averaged. Averaging can be turned on or off.

See [“Avg Time/Point \(Auto/Man\)” on page 363](#).

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.

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
Key Path	Meas Setup

ENR

Accesses a menu of functions that determines how you load the ENR data.

Meas Setup

See also:

[Setting ENR Table Remotely \(remote command only\)](#)

[ENR Table Entry Count \(remote command only\)](#)

Mode	NF
Key Path	Meas Setup

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.

Mode	NF
Remote Command	<code>[[:SENSE]:NFIGure:CORRection:ENR:MODE TABLE SPOT [:SENSe]:NFIGure:CORRection:ENR:MODE?</code>
Example	<code>NFIG:CORR:ENR:MODE TABL</code>
Preset	TABLE
State Saved	Saved in instrument state.
Range	TABLE SPOT
Key Path	Meas Setup, ENR

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 [Meas Table](#) and [Cal Table](#)).

Mode	NF
Remote Command	<code>[[:SENSE]:NFIGure:CORRection:ENR:COMMOn[:STATe] ON OFF 1 0 [:SENSe]:NFIGure:CORRection:ENR:COMMOn[:STATe]?</code>
Example	<code>NFIG:CORR:ENR:COMM ON</code>

Dependencies/Couplings	Cal table disabled when ON. Error message 171 is displayed if ON and no data in Meas Table or OFF and no data is Meas or Cal table. Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
Preset	ON
State Saved	Saved in instrument state.
Range	ON OFF 1 0
Key Path	Meas Setup, ENR

Meas Table

Brings up the ENR Table editor (see section [Table Editor Operation on page 313](#) for details), which contains 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 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 application 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

Mode	NF
Dependencies/Couplings	Error 171 is displayed if no data in table and Use Meas Table for Cal is ON. Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
Key Path	Meas Setup, ENR

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.

Mode	NF
Preset	10 Hz
State Saved	Saved in instrument state.
Range	10 kHz to 325 GHz
Key Path	Meas Setup, ENR, Meas Table, Edit

ENR Value Enables you to enter the amplitude component of a frequency/amplitude pair.

Mode	NF
Preset	0 dB

State Saved	Saved in instrument state.
Range	-200 to 200 dB
Key Path	Meas Setup, ENR, Meas Table, Edit

Cal Table

Brings up the Cal Table editor (see section [Table Editor Operation on page 313](#) 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 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

Mode	NF
Dependencies/Couplings	Only available when Use Meas Table for Cal is OFF. Error 171 is displayed if no data in table and Use Meas Table for Cal is OFF Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
Key Path	Meas Setup, ENR

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.

Meas Setup

Frequency Enables you to enter the frequency component of a frequency/amplitude pair.

Mode	NF
Preset	10 Hz
State Saved	Saved in instrument state.
Range	10 kHz to 325 GHz
Key Path	Meas Setup, ENR, Cal Table, Edit

ENR Value Enables you to enter the amplitude component of a frequency/amplitude pair.

Mode	NF
Preset	0 dB
State Saved	Saved in instrument state.
Range	-200 to 200 dB
Key Path	Meas Setup, ENR, Cal Table, Edit

Editing the ENR Tables Selecting the 'Edit' key opens either ENR table for editing. This is displayed on the lefthand side of the current measurement view.

Mode	NF
Key Path	Meas Setup, ENR, Meas Table Cal 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.

Mode	NF
Remote Command	<code>[:SENSE] :NFIGure:CORRection:ENR:MEASurement CALibrat ion:TABLE:SERial:DATA <string></code> <code>[:SENSE] :NFIGure:CORRection:ENR:MEASurement CALibrat ion:TABLE:SERial:DATA?</code>
Example	<code>NFIG:CORR:ENR:MEAS:TABL:SER:DATA "4015A05450"</code>
Preset	""
State Saved	Saved in instrument state.
Range	a-zA-Z0-9

Key Path **Meas Setup, ENR, Meas Table|Cal Table**

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.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:ENR:MEASurement CALibrat ion:TABLE:ID:DATA <string></code> <code>[:SENSe] :NFIGure:CORRection:ENR:MEASurement CALibrat ion:TABLE:ID:DATA?</code>
Example	<code>CORR:ENR:CAL:TABL:ID:DATA "346A"</code>
Preset	""
State Saved	Saved in instrument state.
Range	a-zA-Z0-9
Key Path	Meas Setup, ENR, Meas Table

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.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:ENR:MEASurement CALibrat ion:TABLE:SNS</code>
Example	<code>NFIG:CORR:ENR:TABL:SNS</code>
Key Path	Meas Setup, ENR, Meas Table Cal Table

Clear Table This function clears all data from the ENR table and removes the table’s backup from persistent storage.

Mode	NF
Restriction and Notes	Clears all entries in the ENR table.
Key Path	Meas Setup, ENR, Meas Table

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 being GHz and dB respectively. Up to 501 point-pairs will be accepted. See the above Frequency and ENR Value definitions for the acceptable

Meas Setup

parameter ranges.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:ENR:MEASurement CALibrat ion:TABLE:DATA <frequency>, <amplitude> ([, <frequency>, <amplitude>])</code> <code>[:SENSe] :NFIGure:CORRection:ENR:MEASurement CALibrat ion:TABLE:DATA?</code>
Example	<code>NFIG:CORR:ENR:CAL:TABL:DATA 1000, -10, 2000, -8, 3000, -6, 10000, 5</code>
Remote Command Notes	Between 1 and 501 points must be entered.

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	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:ENR:MEASurement CALibrat ion:TABLE:COUNT?</code>
Example	<code>NFIG:CORR:ENR:MEAS:TABL:COUNT?</code>
Preset	0
Range	0 – 501

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 stores 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.

Mode	NF
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Key Path **Meas Setup, ENR**

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 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.

Mode	NF
Remote Command	[:SENSe] :NFIGure:CORRection:ENR:PREFeRence NORMal SNS [:SENSe] :NFIGure:CORRection:ENR:PREFeRence?
Example	NFIG:CORR:ENR:PREF NORM
Dependencies/Couplings	When set to SNS and Auto Load ENR is ON, connection of SNS to instrument sets Use Meas Table for Cal to ON.and populates Meas Table from SNS data. SNS T cold and User T cold From SNS parameters are disabled when set to NORMal See above for more details.
Remote Command Notes	:New SCPI – taken out of source node.
Preset	SNS
State Saved	Saved in instrument state.
Range	NORMal SNS
Key Path	Meas Setup, ENR, SNS Setup

Auto Load ENR If Preference is set to SNS and Auto Load ENR is ON, upon connection of an SNS Use Meas Table for Cal is switched ON and ENR data is automatically loaded into the Meas Table from the SNS, overwriting any existing data.

If set to OFF, the Use Meas Table for Cal ON/OFF parameter is not modified and data is not loaded into the ENR table automatically. ENR tables can still be populated from the

Meas Setup

SNS data using the 'Fill Table from SNS' softkey under the appropriate table softpanel.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:ENR:AUTO [:STATe] ON OFF 1 0</code> <code>[:SENSe] :NFIGure:CORRection:ENR:AUTO [:STATe] ?</code>
Example	<code>NFIG:CORR:ENR:AUTO OFF</code> <code>NFIG:CORR:ENR:AUTO?</code>
Dependencies/Couplings	See above.
Preset	ON
State Saved	Saved in instrument state.
Range	ON OFF 1 0
Key Path	Meas Setup, ENR, SNS Setup

SNS Attached (remote command only) Returns 1 if an SNS is attached otherwise 0.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:ENR:SNS:ATTached?</code>
Example	<code>NFIG:CORR:ENR:SNS:ATT?</code>
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.
Remote Command Notes	Query Only RUI only. :New SCPI – taken out of source node.
State Saved	Saved in instrument state.

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.

Mode	NF
Key Path	Meas Setup, ENR

Spot State This parameter toggles the Spot value applied to the measurement between Spot ENR (in dB) and Spot Thot (in K). The Spot ENR parameter cannot be used to enter values equivalent to temperatures below 290K. The Spot Thot parameter can enter temperature values below 290K.

Mode	NF
------	----

Remote Command	<code>[:SENSe] :NFIGure:CORRection:SPOT:MODE ENR THOT</code> <code>[:SENSe] :NFIGure:CORRection:SPOT:MODE?</code>
Example	<code>NFIG:CORR:SPOT:MODE ENR</code>
Preset	ENR
State Saved	Saved in instrument state.
Range	ENR THOT
Key Path	Meas Setup, ENR

Spot ENR Set the ENR value used when Spot State is ENR. Spot ENR values can be entered as power (dB) or temperature (K | °C | °F). Temperature values are translated to the equivalent power value.

This command would normally be used to enter ENR values above 290K. See the Spot Thot for a method of entering ENR values below 290K.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:ENR:SPOT <value></code> <code>[:SENSe] :NFIGure:CORRection:ENR:SPOT?</code>
Example	<code>CORR:ENR:SPOT 10 dB</code>
Preset	15.200 dB
State Saved	Saved in instrument state.
Range	-7 dB to 50 dB
Key Path	Meas Setup, ENR, Spot

Spot T hot Set the ENR value used when Spot State is THOT.

This command would normally be used to enter ENR values below 290K. See the Spot ENR for a method of entering ENR values above 290K.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:ENR:THOT <temperature></code> <code>[:SENSe] :NFIGure:CORRection:ENR:THOT?</code>
Example	<code>NFIG:CORR:ENR:THOT 200.5 K</code>
Preset	9892.80 K
State Saved	Saved in instrument state.
Range	0 K – 29650000 K
Key Path	Meas Setup, ENR, Spot

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 is used.

Default: the default T cold of 296.50 K is used.

If an SNS is connected and SNS T Cold is ON, the T Cold value used for the NF measurement is read from the SNS at the beginning of every sweep and the T Cold Mode parameter is disabled. The User T cold value can also be read once from an SNS (if connected) using the 'User T cold from SNS' parameter.

Mode	NF
Remote Command	[:SENSe] :NFIGure:CORRection:TCOLd USER DEFault [:SENSe] :NFIGure:CORRection:TCOLd?
Example	NFIG:CORR:TCOL: DEF
Dependencies/Couplings	When SNS T Cold is ON and SNS is connected, parameter (and selection keys) is Disabled.
Preset	DEFault
State Saved	Saved in instrument state.
Range	USER DEFault
Key Path	Meas Setup, ENR

User T cold Value Sets the T cold value which is applied when adjusting the ENR values for the current temperature.

Mode	NF
Remote Command	[:SENSe] [:NFIGure] :CORRection:TCOLd:USER:VALue <value> [:SENSe] [:NFIGure] :CORRection:TCOLd:USER:VALue?
Example	:NFIG:CORR:TCOL:USER:VAL 290K
Dependencies/Couplings	Disabled when SNS T Cold is ON and SNS is attached.
Preset	296.50 K
State Saved	Saved in instrument state.
Range	0 K to 29650000 K
Key Path	Meas Setup, ENR, T cold

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.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:TCOLd:SNS [:STATe] ON OFF 1 0</code> <code>[:SENSe] :NFIGure:CORRection:TCOLd:SNS [:STATe] ?</code>
Example	CORR:TCOL:SNS ON
Dependencies/Couplings	When ON and SNS is attached, TCold mode selections (USER, DEFault) are disabled.
Preset	Off
State Saved	Saved in instrument state.
Range	ON OFF 1 0
Key Path	Meas Setup, ENR, T Cold

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.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:TCOLd:USER:SET</code>
Example	:NFIG:CORR:TCOL:USER:SET
Dependencies/Couplings	Loads User T cold from any connected SNS. Sets T cold Mode to ON. Only enabled when SNS is connected. Only enabled when T cold Mode is USER.
Key Path	Meas Setup, ENR, T cold

Cal Setup

Opens a menu that enables you to configure the calibration setup.

Mode	NF
Key Path	Meas Setup

User Cal

User cal is the "normal" calibration technique which requires you to connect the noise source directly to the analyzer input. For example: 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.

Mode	NF
Dependencies/Couplings	<ol style="list-style-type: none">1. When a calibration completes and is valid, "Apply Calibration" is set to "YES", if previously NO.2. When the User Cal is selected and valid, the NF Status field in the Meas bar shows "CAL". When cal data is invalid "UNCAL" is shown in the NF Status field. When the User Cal has been interpolated or adjusted, the NF Status field will show "~CAL".
State Saved	Saved in instrument state.
Key Path	Meas Setup, Cal Setup

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 Noise Figure State Meas bar flag 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:

- If the cal was performed at a fixed frequency and you change this frequency.
- 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.

Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.

2. **DUT Type:** If the DUT Type parameter changes, causing the measurement frequencies to be pushed outside the current cal.
3. **Attenuation:** If an attenuation setting is selected but has not been calibrated.
4. **Preamp:** If set to condition different from current cal settings, for example: if calibrated with the preamp on, turning it off will invalidate the 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 the following conditions exist:
 - A successful calibration has been performed.

Meas Setup

Restriction and Notes	Attenuation steps are HW Dependent: MXA: Can only be set to multiples of 4. EXA: Can only be set to multiples of 10.
Dependencies/Couplings	If the set value exceeds the MAX attenuation setting, MAX attenuation is set so that MIN is always less than or equal to MAX.
Preset	0 dB
State Saved	Saved in instrument state.
Range	0 to 40 dB
Key Path	Meas Setup, Cal Setup, Input Cal

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 185](#) (under the AMPTD/Y Scale menu) for more information. The default input attenuation calibration range is:

MXA	0 dB to 8 dB, and a step size of 4 dB
EXA	0 dB to 10 dB, and a step size of 10 dB

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CALibration:USER:ATTenuation:MAXimum <integer></code> <code>[:SENSe] :NFIGure:CALibration:USER:ATTenuation:MAXimum?</code>
Example	<code>:NFIG:CAL:USER:ATT:MAX 40dB</code>
Restriction and Notes	Attenuation steps are HW Dependent: MXA: Can only be set to multiples of 4. EXA: Can only be set to multiples of 10.
Dependencies/Couplings	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.
Preset	For EXA the default is 10dB (2 cal stages not 3).
State Saved	Saved in instrument state.
Range	0 dB to 40 dB
Key Path	Meas Setup, Cal Setup, Input Cal

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 is disabled and a status message tells you that a "Calibrate Now" is required. This parameter will also be set to OFF if a user cancels a User Calibration before it is completed.

Mode	NF
Remote Command	<code>[:SENSe] :NFIgure:CALibration:STATe ON OFF 1 0</code> <code>[:SENSe] :NFIgure:CALibration:STATe?</code>
Example	<code>NFIg:CAL:STAT ON</code>
Restriction and Notes	, and different name.
Dependencies/Couplings	<ol style="list-style-type: none"> 1. Only enabled when valid calibration data exists. 2. Set to OFF if a calibration is cancelled before it is completed. 3. Set to ON when a calibration is successfully completed. 4. Warning message –221 is displayed when set to Yes and no valid cal exists. 5. NF Status panel displays "UNCAL" when OFF and an instrument message is displayed. <p>Note: 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.</p>
Preset	OFF
State Saved	Saved in instrument state.
Range	ON OFF 1 0
Key Path	Meas Setup, Cal Setup

Clear User Cal Data

This softkey clears any user cal data currently stored both in working memory and on the instrument's persistent storage. The path for the cal data file is:

D:\User_My_Documents\Instrument\My Documents\NFIgure\state\Corr.STA.

An 'Are you sure?' dialogue is provided as a safety mechanism when this key is pressed.

Mode	NF
Remote Command	<code>[:SENSe] :NFIgure:CALibration:DELeTe</code>
Example	<code>:NFIg:CAL:DEL</code>

Meas Setup

Dependencies/Couplings Grayed if no user calibration data exists: status message "No User Calibration data exists".

Key Path **Meas Setup, Cal Setup**

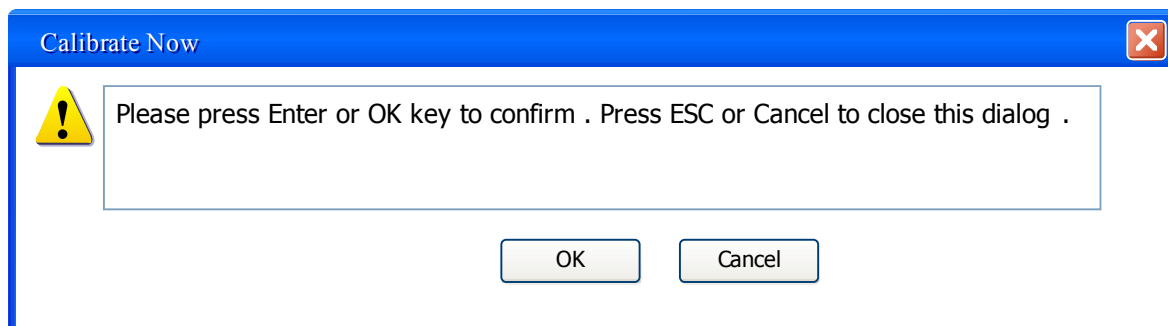
Calibrate Now

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 is 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 is set to 0dB then a set of calibration data is taken for 0dB, 4dB and 8dB. You can then choose any of these attenuation settings when the measurement is performed, and corrected results are 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) 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 set to "No", 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.



Once a calibration has completed successfully, Apply Calibrations is set to YES.

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 is set to "No". If a valid User Cal is still stored, the user can then turn Apply Calibration back on, by setting "Apply Calibration" to "Yes". Note that aborting the calibration operates in both Single and Continuous modes of use.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CALibration:INITiate</code>
Example	<code>:NFIG:CAL:INIT</code>
Dependencies/Couplings	<ol style="list-style-type: none"> 1. When a calibration has completed, Apply Calibration will be set to YES and Cal Type will be set to USER. 2. If the calibration is canceled before it has completed, the previous date is erased and "Apply Calibration" is set to NO. 3. Attenuation min/max: calibration performed for each attenuation step (MXA: 4dB step; EXA:10dB step). Default would be 3 stages for MXA (0, 4, 8) and 2 for EXA (0, 10). 4. Disabled if no valid ENR data (in Meas table when 'Use Meas Table for Cal Data' is ON or Cal table when OFF or Spot ENR): An error message is displayed. <p>Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.</p>
Remote Command Notes	An error message is displayed when this command is issued and Cal Type is USER.
Key Path	Meas Setup

Cal Progress

Cancel (frontpanel only) To abort a Cal while it is running, press Cancel. This stops the action and no data is collected or stored. The previous data is erased and the "Apply Calibration" parameter is set to "No". If a valid User Cal is still stored, the user can then turn Apply Calibration back on, by setting "Apply Calibration" to "Yes".

Mode	NF
Key Path	Meas Setup, Calibrate Now

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

Meas Setup

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.

NOTE	You may not use List mode to set loss compensation.
-------------	---

Mode	NF
Key Path	Meas Setup

Before DUT

Controls the type of Loss Compensation to be applied before the Device Under Test.

Mode	NF
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
Key Path	Meas Setup, Loss Comp

Off

Key Path	Meas Setup, Loss Comp, Before DUT,
----------	---

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'.

Mode	NF
Remote Command	[:SENSe] :NFIGure:CORRection:LOSS:BEFore:VALue <value> [:SENSe] :NFIGure:CORRection:LOSS:BEFore:VALue?
Example	:NFIG:CORR:LOSS:BEF:VAL 20 dB
Dependencies/Couplings	Only active when Loss Compensation Before DUT Mode is FIXed.

Remote Command Notes	An error message is displayed if attempt to set Fixed value when Before DUT mode is LIST or OFF. Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
Preset	0 dB
State Saved	Saved in instrument state.
Range	-100 dB to 100 dB
Key Path	Meas Setup, Loss Comp, Before DUT

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 at T_0 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 loss before temp = T_0 = 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.

Mode	NF
Remote Command	<code>[:SENSe]:NFIGure:CORRection:TEMPerature:BEFORE <temperature></code> <code>[:SENSe]:NFIGure:CORRection:TEMPerature:BEFORE?</code>
Example	<code>:NFIG:CORR:TEMP:BEF 0.15 K</code>
Remote Command Notes	Only K unit suffix is supported
Preset	290.00
State Saved	Saved in instrument state.
Range	0 K to 29650000 K
Key Path	Meas Setup, Loss Comp, Before DUT

After DUT

Controls the type of Loss Compensation to be applied after the Device Under Test.

Mode	NF
------	----

Meas Setup

Remote Command	<code>[:SENSe] :NFIGure:CORRection:LOSS:AFTer:MODE OFF FIXed TABLE</code> <code>[:SENSe] :NFIGure:CORRection:LOSS:AFTer:MODE?</code>
Example	<code>:NFIG:CORR:LOSS:AFT:MODE FIX</code>
Preset	OFF
State Saved	Saved in instrument state.
Range	OFF FIXed TABLE
Key Path	Meas Setup, Loss Comp

Off

Key Path	Meas Setup, Loss Comp, After DUT,
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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'.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:LOSS:AFTer:VALue <value></code> <code>[:SENSe] :NFIGure:CORRection:LOSS:AFTer:VALue?</code>
Example	<code>:NFIG:CORR:LOSS:AFT:VAL 20 dB</code>
Dependencies/Couplings	Only active when Loss Compensation After DUT Mode is FIXed. Automatically sets After DUT Mode to ON.
Remote Command Notes	An error message is displayed if attempt to set Fixed value when After DUT mode is LIST or OFF. Note: Refer to the X-Series "Instrument Messages" book for more information on error messages. This is available by pressing the green Help key (if you're not already in the Help window), then selecting the "Additional Documentation" page in the table of contents pane of the Help window.
Preset	0 dB
State Saved	Saved in instrument state.
Range	-100 dB to 100 dB
Key Path	Meas Setup, Loss Comp, After DUT

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 at To 290K. For example, if you 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 loss After temp = 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..

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:CORRection:TEMPerature:AFTer <value></code> <code>[:SENSe] :NFIGure:CORRection:TEMPerature:AFTer?</code>
Example	<code>:NFIG:CORR:TEMP:AFT 0.15 K</code>
Preset	290.00 K
State Saved	Saved in instrument state.
Range	0 K to 29650000 K
Key Path	Meas Setup, Loss Comp, After DUT

Loss Table

The loss compensation tables are used as a means of entering correction data that is 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 is interpolated linearly on the dB scale between the two closest data points.

The table is displayed on the left side the current measurement in the format shown below. When number of entries in the table are not all displayed, the table can be navigated using the tab keys. The table is sorted in ascending order using the frequency as a key. The table disappears 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.

Mode	NF
Key Path	Meas Setup, Loss Comp, Before DUT

Editing the Loss Table Selecting the 'Edit' key opens the Loss Compensation table for

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editing. This is displayed on the lefthand side of the current measurement view.

Mode	NF
Key Path	Meas Setup, Loss Comp, Before DUT, Table

Frequency Enables you to enter the frequency component of a frequency/amplitude pair.

Mode	NF
Dependencies/Couplings	Parameter coupled to currently selected frequency in table.
Preset	<blank>
State Saved	Saved in instrument state.
Range	10 Hz to 325 GHz
Key Path	Meas Setup, Loss Comp, Before DUT After DUT, Table

Loss Value

Enables you to enter the amplitude component of a frequency/amplitude pair.

Mode	NF
Dependencies/Couplings	Parameter coupled to currently selected Loss Value in table.
Preset	0
State Saved	Saved in instrument state.
Range	-100 dB to 100 dB
Key Path	Meas Setup, Loss Comp, Before DUT After DUT, Table

Clear Table

This function clears all data from the Loss Comp table and removes the table's backup from persistent storage.

Mode	NF
Restriction and Notes	Clears all entried in the Loss Comp table.
Key Path	Meas Setup, Loss Comp, Before DUT, Table

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	NF
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

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	NF
Remote Command	[:SENSe]:NFIGure:CORRection:LOSS:BEFore AFTer:TABLE:COUNT?
Example	:NFIG:CORR:ENR:MEAS:TABL:COUN?
Preset	0
Range	0 to 501

Limits

Enables you to enter upper and lower limits for results data.

Mode	NF
Key Path	Meas Setup, More

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,
----------	----------------------------

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

Meas Setup

The trace is tested if Test Limits is on

Remote Command	:CALCulate:NFIGure:LLINE [1] 2 3 4 :DISPlay OFF ON 0 1 :CALCulate:NFIGure:LLINE [1] 2 3 4 :DISPlay?
Example	:CALC:NFIG:LLIN2:DISP ON
Dependencies/Couplings	Limit display ON selects the limit. Testing is done on all displayed limits if "Test All Limits" is ON. Entering the limit menu from the GUI turns on the selected limit.
Preset	Off (all limits)
State Saved	Saved in State.
Key Path	Meas Setup, Limits,

Properties

The properties of each limit line can be defined in this menu.

Mode	NF
Key Path	Meas Setup, More, Limits

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,
----------	----------------------------

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.

Remote Command	:CALCulate:NFIGure:LLINE [1] 2 3 4 :TRACe 1 2 :CALCulate:NFIGure:LLINE [1] 2 3 4 :TRACe?
Example	:CALC:NFIG:LLIN3:TRAC 2 applies limit 3 to trace 2.
Dependencies/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.
Key Path	Meas Setup, Limits, Properties

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.

Remote Command	:CALCulate:LLINE [1] 2 3 4 :TYPE UPPER LOWER :CALCulate:LLINE [1] 2 3 4 :TYPE?
Example	:CALC:NFIG:LLIN2:TYPE LOW sets limit line 2 to act as a lower limit.
Dependencies/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.
Key Path	Meas Setup, Limits, Properties

Edit Limit Line

Opens the Table Editor for the selected limit line. See [Table Editor Operation on page 313](#) for details.

NOTE	If a limit freq point is outside the current displayed freq range of measurement, the line connecting this point to the next one does not appear on the display. Please adjust all limit freq points to be within the current measurement range
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Dependencies/Couplings	A remote user can enter or access limit line data via :CALCulate:NFIGure:LLINe[1] 2 3 4:DATA
Example	To setup a straight line, simple 3 dB limit from 1 to 3 GHz, send this command: :CALCulate:NFIGure:LLINe1:DATA 1e9, 3, 1, 3e9, 3, 1
Key Path	Meas Setup, More, Limits

Columns

The Limits Table has two columns. The first (and leftmost) is titled "X" and uses frequency terminators. The second is titled "Y" and uses power terminators.

X Value Enables you to enter the frequency component of a frequency/amplitude pair.

Mode	NF
Dependencies/Couplings	Parameter coupled to currently selected X value in table.
Preset	<blank>

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State Saved	Saved in instrument state.
Range	10 Hz to 325 GHz
Key Path	Meas Setup, Limits, Edit

Y Value Enables you to enter the amplitude component of a frequency/amplitude pair.

Mode	NF
Dependencies/Couplings	Parameter coupled to currently selected Y value in table.
Preset	0
State Saved	Saved in instrument state.
Range	-100 dB to 100 dB
Key Path	Meas Setup, Limits, Edit

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.

Remote Command	:CALCulate:NFIGure:LLINE[1] 2 3 4 :DELeTe
Example	:CALC:NFIG:LLIN2:DEL
Key Path	Meas Setup, More, Limits

Test All Limits

Selects whether displayed traces are tested against displayed limits (i.e. those for which Limit On/Off is set to On).

For each displayed trace, a message will be displayed in the upper-left corner of the graticule to notify whether the trace passes or fails the limits.

If the trace is at or within the bounds of all applicable limits and margins, the text "TRACE 1|2|3|4 PASS <list>" will be displayed in green, where <list> is a comma-separated list of the numbers (1 through 4) of all tested limits.

If the trace is outside the bounds of some applicable limits, the text "TRACE 1|2|3|4 FAIL" will be displayed. If the trace has no applicable displayed limits, no message is displayed for that trace.

If two amplitude values are entered for the same frequency, a single vertical line is the result. In this case, if an upper line is chosen, the lesser amplitude is tested. If a lower line is chosen, the greater amplitude is tested.

This command only affects the display, and has no impact on remote performance.

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 an 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
Key Path	Meas Setup, More, Limits, More

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.

Remote Command	:CALCulate:NFIGure:LLINe:ALL:DELeTe
Example	:CALC:NFIG:LLIN:ALL:DEL
Key Path	Meas Setup, More, Limits, More

Optimize Preselector

This key runs through the current setup's frequency points optimising 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).

Interpolation of the cal can only be performed if the new freq points are within 50MHz of the cal points. To overcome this problem, change the number of freq points back to match cal points or perform another user cal.

Mode	NF
Remote Command	[:SENSe] :NFIGure:PRESelector:OPTimize
Example	:NFIG:PRES:OPT
Dependencies/Couplings	Disabled when instrument tuned frequencies are below 3.6GHz, i.e. in low band When instrument tuned frequencies are above 3.6GHz but don't span > 50MHz, then one YTF adjust parameter will be obtained and used for all frequencies in high band. When instrument tuned frequencies are above 3.6GHz and span > 50MHz, then a table of YTF adjust parameters will be obtained and used for each frequency in high band.

Key Path **Meas Setup, More**

Noise Source Settling Time

SNS's delays are taken into account internally. When an SNS is used, this would only apply to a DUT that requires a delay.

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 s

Turn-off: <80 s

For single-shot operation (in previous state more than 5 seconds):

Turn-on: < 3 ms

Turn-off: <80 s

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.

Mode	Noise figure
Remote Command	<code>[:SENSE] :NFIGure:NSSTime <time></code> <code>[:SENSE] :NFIGure:NSSTime?</code>
Example	<code>NFIG:SWE:NSST 64 ms</code>
Preset	0 s
State Saved	Saved in instrument state.
Min	0 s
Max	5 s
Key Path	Meas Setup, More

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 are turned off

Mode	NF
Remote Command	<code>:CONFIGure:NFIGure</code>
Example	<code>CONF:NFIG</code>

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
Dependencies/Couplings	Loads default values of all parameters.
Key Path	Meas Setup

Table Editor Operation

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

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

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

See also:

[Navigating](#)

[Editing](#)

Key Path	Freq/Channel, Edit Freq List, 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

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

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moves down one row. The front-panel knob and Left and Right arrow keys also are 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.

Navigate

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

Mode	NF
Restriction and Notes	Note that the arrow keys always navigate between rows.
Remote Command	No SCPI. Front panel only.
Notes	

Preset	Navigate
State Saved	No
Range	Navigate Frequency Amplitude (optional) Range of enumerates can be 2 or 3, depending on current use, but first member will always be Navigate. Additional members are provided by the user of the Common Table Editor
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

Insert Point Below

Inserts point below the currently selected row.

Mode	NF
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.
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

Delete Point

Deletes currently selected row in the table editor.

Mode	NF
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.

Meas Setup

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

The Mode key allows you to select the available measurement applications. The application software must be loaded and license for it to be available. Measurement applications are a collection of measurement capabilities packaged together to provide an instrument personality that is specific to your measurement needs. Each mode software product is ordered separately by Model Number. The default measurement mode is the first listing in the menu.

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.

A list of the valid mode choices is returned with the INST:CAT? Query. Once an instrument mode is selected, only the commands that are valid for that mode can be executed.

Key Path	Mode
SCPI Command	:INSTrument [:SElect] SA BASIC ADEMOD NFIGURE PNOISE CDMA2K TDSCDMA VSA VSA8960 1 WCDMA WIMAXOFDMA :INSTrument [:SElect] ?
Example	:INST SA
Remote Command 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. Once an instrument mode is selected, only the commands that are valid for that mode can be executed.
Preset	Not affected by Preset. Set to SA following Restore System Defaults, if SA is the default mode.
State Saved	Saved in state

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.

Mode	:INSTrument:NSElect <integer>	:INSTrument[:SElect] <parameter>
Analog Demod	234	ADEMOD
cdma2000	10	CDMA2K

Mode

GSM & EDGE	13	EDGE GSM
I/Q Analyzer (Basic)	8	BASIC
Noise Figure	219	NFIGURE
Phase Noise	14	PNOISE
Spectrum Analyzer	1	SA
TD-SCDMA	211	TDSCDMA
89601X VXA Signal Analyzer	100	VSA
89601 VSA	101	VSA89601
WCDMA with HSDPA/HSUPA	9	WCDMA
802.16 OFDMA (WiMAX/WiBro)	75	WIMAXOFDMA

SCPI Command	:INSTrument:NSElect <integer> :INSTrument:NSElect?
Example	:INST:NSEL 1
Preset	Not affected by Preset. Set to default mode (1 for SA mode) following Restore System Defaults.
State Saved	Saved in state

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.

SCPI Command	:INSTrument:CATalog?
Example	:INST:CAT?
Remote Command Notes	Query returns a quoted string of the installed and licensed modes separated with a comma. Example: "SA,PNOISE,WCDMA"

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 which is the Model Number of the currently selected application (mode).

SCPI Command	:SYSTem:APPLication[:CURRent] [:NAME] ?
Example	:SYST:APPL?
Remote Command Notes	Query returns a quoted string which 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 Save is done.

Current Application Revision

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

SCPI Command	:SYSTem:APPLication[:CURRent] :REVision?
Example	:SYST:APPL:REV?
Remote Command Notes	Query returns a quoted string which 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 Preset
State Saved	Not saved in state, the value will be the selected application when Save is done.

Current Application Options

Returns a string which is the Options list of the currently selected application (mode).

SCPI Command	:SYSTem:APPLication[:CURRent] :OPTion?
---------------------	--

Mode

Remote Command Notes	Query returns a quoted string which 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 Preset
State Saved	Not saved in state per se, value will be the selected application when Save is invoked
Example	:SYST:APPL:OPT?

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).

SCPI Command	:SYSTem:APPLication:CATalog[:NAME]:COUNT?
Example	:SYST:APPL:CAT:COUN?
Preset	Not affected by Preset
State Saved	Not saved in state.

Application Catalog Model Numbers

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

SCPI Command	:SYSTem:APPLication:CATalog[:NAME]?
Example	:SYST:APPL:CAT?
Remote Command 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”

Preset	Not affected by Preset
State Saved	Not saved in state.

Application Catalog Revision

Returns the Revision of the provided Model Number.

SCPI Command	:SYSTem:APPLication:CATalog:REVision? <model>
Example	:SYST:APPL:CAT:REV? 'N9060A'
Remote Command 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 Preset
State Saved	Not saved in state.

Application Catalog Options

Returns a list of Options for the provided Model Number

SCPI Command	:SYSTem:APPLication:CATalog:OPTion? <model>
Example	:SYST:APPL:CAT:OPT? 'N9060A'
Remote Command 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 Preset
State Saved	Not saved in state.

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

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

Phase Noise

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

Key Path	Mode
Example	INST:SEL PNOISE
	or
	INST:NSEL 14

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
	Or
	INST:NSEL 219

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 ADEMOM
	INST:NSEL 234

W-CDMA with HSDPA/HSUPA

Selects the W-CDMA with HSDPA/HSUPA 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

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

GSM with EDGE

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 EDGE GSM
	INST:NSEL 13

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

TD-SCDMA

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

Vector Signal Analyzer

The 89601X VXA Measurement Application provides vector signal analysis measurement capability. It provides 3 main measurements that allow you to measure the signal quality of all varieties of RF modulation:

- Digital Demodulation
- Analog Demodulation
- Vector Signal Analysis

There are advanced modulation analysis and troubleshooting capabilities including support for the following communications formats: AM, FM, PM, WiMAX, W-CDMA, 2G, 3G, 3.5G, WLAN, digital video, and more. It also provides standard-specific measurements for analysis of iDEN, WiDEN, and MotoTalk signals with Option H09.

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

89601A VSA

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

Over 30 general-purpose analog and digital demodulators ranging from 2FSK to 1024QAM

Standards specific modulation analysis including:

- Cell: GSM, cdma2000, WCDMA, TD-SCDMA and more

Mode

- Wireless networking: 802.11a/b/g, 802.11n, 802.16 WiMax (fixed/mobile), UWB
- RFID
- Digital satellite video and other satellite signals, radar, LMDS
- Up to 400K bin FFT, for the highest resolution spectrum analysis

A full suite of time domain analysis tools, including signal capture and playback, time gating, and CCDF measurements

Six simultaneous trace displays and the industry's most complete set of marker functions

Easy-to-use Microsoft® Windows® graphical user interface

For more information see the Agilent 89600 Series VSA web site at www.agilent.com/find/89600

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

Key Path	Mode
Example	INST:SEL VSA89601
	INST:NSEL 101

Mode

Mode Setup

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

Key Path Front panel

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.

Mode Noise Figure

Key Path Mode Setup

The screenshot displays the Mode Setup interface with the following configuration options:

- DUT:** Down Converter
- Ext LO Control:** Off
- Sys Downconverter:** Off
- Ext LO Power:** 10.00 dBm
- Sideband:** LSB
- Freq Mode:** Swept
- LO Freq Mode:** Fixed
- Freq Context:** RF - DUT Input

The **Diagram** section shows a measurement setup with a **Noise Src** connected to the **RF Input** of the device. A **Frequency Plot** shows peaks for **IF**, **RF**, and **LO** frequencies.

Parameter fields are shown below the diagram:

- RF:** Start: 200.000000 MHz, Stop: 290.000000 MHz
- LO:** Fixed: 300.000000 MHz
- IF:** Start: 100.000000 MHz, Stop: 10.0000000 MHz

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

Mode Setup

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 situated near the DUT input. Similarly for IF and LO, the eye ball will be near the Analyzer's Input and the DUT LO input respectively.

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, Up Converter, and Down Converter .

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:DUT AMPLifier UPConv DOWNconv</code> <code>[:SENSe] :NFIGure:MODE:DUT?</code>
Example	<code>:NFIG:MODE:DUT AMPL</code> <code>:NFIG:MODE:DUT?</code>
Dependencies/Couplings	<ol style="list-style-type: none">1. Ext LO Frequency, Power Level, Control, Sideband and Frequency Context are disabled (grayed) when DUT is AMPLifier and System Downconverter = Off.2. System Downconverter is disabled (grayed) when DUT is UPConv or DOWNconv.3. When DUT is UpConverter, the DSB sideband option is disabled.
Preset	AMPLifier
State Saved	Saved in instrument state.
Range	AMPLifier UPConv DOWNconv
Key Path	Mode Setup

Amplifier Straightforward device that performs no internal frequency conversion. Can be used with or without an external system downconverter.

Key Path **Mode Setup, Dut**

Up Converter Device performs internal frequency upconversion. Cannot be used in conjunction with a system downconverter.

Key Path **Mode Setup, Dut**

Down Converter Device performs internal frequency downconversion. Cannot be used in conjunction with a system downconverter.

Key Path **Mode Setup, Dut**

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 amplifiers outside the range of the signal analyzer or possibly to move the frequencies into the range of specified (not nominal specs) signal analyzer frequencies.

Mode	NF
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?
Dependencies/Couplings	1. Disabled (grayed) when DUT is DOWNconv or UPConv.
Preset	OFF
State Saved	Saved in instrument state.
Range	ON OFF 1 0
Key Path	Mode Setup, DUT Setup, FORM

External LO Frequency Mode

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

Mode	NF
Remote Command	[:SENSe] :NFIGure:MODE:DUT:LOSCillator FIXed SWEPT [:SENSe] :NFIGure:MODE:DUT:LOSCillator?
Example	:NFIG:MODE:DUT:LOSC FIX :NFIG:MODE:DUT:LOSC?

Mode Setup

Dependencies/Couplings	<ol style="list-style-type: none">1. When set to SWEPT (hence IF is fixed), the Frequency Context parameter is set to RF.2. When changed from SWEPT to FIXEd and DUT = Up or Down, then the frequency context gets set to IF.3. When set to SWEPT and context = RF, External LO Frequency start stop are auto calculated from the RF and IF frequencies. When the context is LO, then the RF frequencies are auto calculated from the RF and IF frequencies.
Preset	FIXEd
State Saved	Saved in instrument state.
Range	FIXEd SWEPT
Key Path	Mode Setup, DUT Setup, FORM

External LO Control (on/off)

Toggles external LO control via LAN on/off. This softkey provides a shortcut to [External LO Control \(on/off\) on page 334](#).

External LO Power

This softkey provides a shortcut to the 'External LO Power Level' .

Sideband

Sets the LO offset of the device specified by the above SCPI command (DOWNconv | SYSTEM | UPConv):

LSB – Lower Sideband (Signal Frequency < LO Frequency)

USB – Upper Sideband (Signal Frequency > LO Frequency)

DSB – Double Sideband (Only available either when DUT = DownConv, or when DUT = Amplifier + System Downconvertor = On). Double sideband means both upper and lower sidebands.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:DOWNconv SYSTEM UPConv:LOSCillator:OFFSet LSB USB DSB</code> <code>[:SENSe] :NFIGure:MODE:DOWNconv SYSTEM UPConv:LOSCillator:OFFSet?</code>
Example	<code>:NFIG:MODE:DOWN:LOSC:OFFS LSB</code> <code>:NFIG:MODE:DOWN:LOSC:OFFS?</code>

Dependencies/Couplings	<ol style="list-style-type: none"> 1. Disabled (grayed) when DUT is Amplifier and system downconverter is turned off. 2. DSB choice is disabled when the DUT is an Up converter. 3. When Sideband, context and LO Frequency are disabled and tried to be set remotely, then an advisory message will appear "Settings conflict; Parameter only available when frequency converter is in use." number –221 5502. 4. When DSB is selected, advisory msg 0.2191 is shown. 5. IF DSB is selected and DUT changes to Upconverter, LSB is selected by default.
Preset	LSB
State Saved	Saved in instrument state.
Range	LSB DSB USB
Key Path	Mode Setup, DUT Setup, FORM

Frequency Mode

This softkey provides a shortcut to the [Freq Mode on page 203](#) parameter.

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 system downconverters, this means before the downconverter. In the case of Sideband = DSB measurements, the RF frequencies represented are only that of the LSB Start and Stop range. If a freq 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 and enter the analyzer after the frequency conversion takes place. These are the frequencies that the analyzer is physically measuring. In the case of a system downconverter, this means after the downconverter.

LO – Frequencies at the external LO are displayed. These are NOT the frequencies that the analyzer is physically measuring. This context enables you review the LO frequencies required to program the external LO or those set by the analyzer. LO context is only selectable when the LO mode is SWEPT

Mode	NF
Remote Command	[:SENSe]:NFIGure:MODE:FREQuency:CONText RF IF LO [:SENSe]:NFIGure:MODE:FREQuency:CONText?

Mode Setup

Example	<code>:NFIG:MODE:FREQ:CONT RF</code> <code>:NFIG:MODE:FREQ:CONT?</code>
Dependencies/Couplings	<ol style="list-style-type: none">1. Disabled (grayed) when DUT is Amplifier and system downconverter is turned off. Context in this case defaults to RF.2. When system downconv is turned on the context is enabled and defaults to RF.3. When DUT is set to DownConv or UpConv, and LO is fixed then the context defaults to IF. When LO is Swept, the context defaults to RF.4. Coupled with the 'eye' in the Calibration/Setup Diagram.5. 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.6. Only when External LO State is set to SWEPT, and DUT is a freq converter, can the context be set to LO. Annunciator in the Meas Bar displays the context.
Preset	RF (Amplifier & System Down Conv), IF (Downconv Fixed LO), RF (Downconv, Swept LO) IF (Upconv, fixed LO), RF (Upconv Swept LO)
Range	IF RF LO
Key Path	Mode Setup, DUT Setup, FORM

Diagram

Opens a menu that enables you to select either the Calibration or Measurement diagram. See [Connecting Different Device Types on page 337](#) for more information.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:DIAGram CALibration </code> <code>MEASurement</code> <code>[:SENSe] :NFIGure:MODE:DIAGram?</code>
Example	<code>:NFIG:MODE:DIAG CAL</code> <code>:NFIG:MODE:DIAG?</code>
Remote Command Notes	
Preset	Measurement
State Saved	No

Range	CALibration MEASurement
Key Path	Mode Setup, DUT Setup, FORM

Connecting Different Device Types

LO Start Frequency Sets the start frequency for a swept LO.

Mode	NF
Remote Command	[:SENSe] :NFIGure:FREQuency:STARt <freq> [:SENSe] :NFIGure:FREQuency:STARt?
Example	FREQ:NFIG:STAR 11 MHz
Dependencies/Couplings	Disabled and hidden when LO Frequency Mode is FIXed. Coupled to IF and RF frequencies.
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
Key Path	Mode Setup, DUT Setup, FORM

LO Stop Frequency Sets the stop frequency for a swept LO.

Mode	NF
Remote Command	[:SENSe] :NFIGure:FREQuency:STOP <freq> [:SENSe] :NFIGure:FREQuency:STOP?
Example	FREQ:NFIG:STOP 11 MHz
Dependencies/Couplings	Disabled and hidden when LO Frequency Mode is FIXed. Coupled to IF and RF frequencies.
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
Key Path	Mode Setup, DUT Setup, FORM

External LO Fixed Frequency Sets the External LO frequency when the LO Freq Mode is set to Fixed, and when measuring frequency converting devices, or when a system downconverter is in use. This parameter should be set to the same value as the LO in the system downconverter, or the DUT's LO, otherwise the wrong calibration/ENR values are used (and the wrong range of frequencies measured).

When using a fixed LO, this parameter becomes active along with the frequency in context (RF or

Mode Setup

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.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:DOWNconv SYSTem UPConv:LOSCillator:FREQuency <freq></code> <code>[:SENSe] :NFIGure:MODE:DOWNconv SYSTem UPConv:LOSCillator:FREQuency?</code>
Example	<code>:NFIG:MODE:DOWN:LOSC:FREQ 10 MHz</code> <code>:NFIG:MODE:DOWN:LOSC:FREQ?</code>
Dependencies/Couplings	Disabled (grayed) when DUT is Amplifier and system downconverter is turned off. Only available when External LO Frequency Mode is FIXEd Coupled to IF and RF frequencies.
Preset	30 GHz
State Saved	Saved in instrument state.
Range	1 Hz to 325 GHz
Key Path	Mode Setup, DUT Setup, FORM

IF

IF Start Frequency Sets the start frequency for a swept IF. This parameter is only available when LO Frequency Mode = FIXEd and RF/IF Frequency mode = SWEPT.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:FREQuency:STARt <freq></code> <code>[:SENSe] :NFIGure:FREQuency:STARt?</code>
Example	<code>FREQ:NFIG:STAR 11 MHz</code>
Dependencies/Couplings	Disabled and hidden when LO Frequency Mode is SWEPT. Disabled and/or hidden when the frequency mode is Fixed. Coupled to RF and LO frequencies. Grayed out when Frequency Mode is LIST.
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 26.4 GHz
Key Path	Mode Setup, DUT Setup, FORM

IF Stop Frequency Sets the stop frequency for a swept IF. This parameter is only available when LO Frequency Mode = FIXed and RF/IF Frequency mode = SWEpt.

Mode	NF
Remote Command	[:SENSE] :NFIGure:FREQuency:STOP <freq> [:SENSE] :NFIGure:FREQuency:STOP?
Example	FREQ:NFIG:STOP 11 MHz
Dependencies/Couplings	Disabled and hidden when LO Frequency Mode is SWEpt. Disabled and/or hidden when frequency mode is Fixed. Coupled to RF and LO frequencies. Grayed out when Frequency Mode is LIST.
Preset	3 GHz
State Saved	Saved in instrument state.
Range	2 Hz to 26.5 GHz
Key Path	Mode Setup, DUT Setup, FORM

IF Fixed Frequency Sets the tuned frequency at the input of the Analyzer. This parameter is only available when External LO Frequency is SWEpt or Freq Mode is set to Fixed.

Mode	NF
Remote Command	[:SENSe] :NFIGure:MODE:DOWNconv UPConv SYSTem:IF:FREQ uency <freq> [:SENSe] :NFIGure:MODE:DOWNconv UPConv SYSTem:IF:FREQ uency?
Example	:NFIG:MODE:SYST:IF:FREQ 15 GHz :NFIG:MODE:SYST: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 X-Series Options purchased.
Min	1 Hz
Max	Depends on the frequency range of purchased model.
Key Path	Mode Setup, DUT Setup, FORM

External LO Configuration

Opens external LO setup menu.

Mode	Noise Figure
Key Path	Mode Setup

Source Address

Allows you to input the IP address of the source. To confirm the IP address, select the **Done** softkey. Following the entry on an IP address, `:*IDN?`, `:FREQ? MAX` and `:FREQ? MIN` SCPI commands are sent. The model number of an Agilent source or the first six characters after the first "," of any other source are displayed as readback text. If a valid (real number) reply is received for MIN and MAX, the Min Frequency and Max Frequency parameters are automatically populated with the appropriate values.

Mode	NF
Remote Command	<code>:SYSTem:COMMunicate:LAN:SOURce:EXTernal:IP <string></code> <code>:SYSTem:COMMunicate:LAN:SOURce:EXTernal:IP?</code>
Example	<code>SYST:COMM:LAN:SOUR:EXT:IP "192.168.0.1"</code> <code>SYST:COMM:LAN:SOUR:EXT:IP?</code>
Restriction and Notes	String entered must correspond to a valid IP address i.e. X.X.X.X where 0 X 255.
Dependencies/Couplings	This parameter is coupled to the Min Frequency and Max Frequency parameters if the IP 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 <code>FREQ? MIN</code> and <code>FREQ? MAX</code> query.
Preset	""
State Saved	Saved in instrument state.
Range	Numeric
Key Path	Mode Setup, External L.O. Control

External LO Control (on/off)

Toggles external LO control via LAN on/off.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:LOSCillator:CONTRol [:STATe]</code> <code>ON OFF 1 0</code> <code>[:SENSe] :NFIGure:MODE:LOSCillator:CONTRol [:STATe] ?</code>

Example	:NFIG:MODE:LOSC:CONT OFF :NFIG:MODE:LOSC:CONT?
Preset	OFF
State Saved	Saved in instrument state.
Range	ON OFF
Key Path	Mode Setup, DUT Setup, FORM

External LO Power Level

Sets the fixed signal generator LO drive level into the frequency converter device.

Mode	NF
Remote Command	[:SENSe] :NFIGure:MODE:LOSCillator:PARAmeter:POWer [:L EVel] <float> [:SENSe] :NFIGure:MODE:LOSCillator:PARAmeter:POWer [:L EVel] ?
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
Key Path	Mode Setup, DUT Setup, FORM

Settling Time

Controls the grace period allocated for the LO to settle between issue of commands.

Mode	NF
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
Key Path	Mode Setup, Ext LO Control

Multiplier Numerator

This sets the External Local Oscillator frequency multiplier. 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.

Mode	NF
Remote Command	<code>[[:SENSe]:NFIGure:MODE:LOSCillator:PARAmeter:MULTiplier:NUMerator <int></code> <code>[[:SENSe]:NFIGure:MODE:LOSCillator:PARAmeter:MULTiplier:NUMerator?</code>
Example	<code>:NFIG:MODE:LOSC:PAR:MULT:NUM 1000</code> <code>:NFIG:MODE:LOSC:PAR:MULT:NUMerator?</code>
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000
Key Path	Mode Setup, Ext LO Control

Multiplier Denominator

This sets the External Local Oscillator frequency divider value. 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.

Mode	NF
Remote Command	<code>[[:SENSe]:NFIGure:MODE:LOSCillator:PARAmeter:MULTiplier:DENominator <int></code> <code>[[:SENSe]:NFIGure:MODE:LOSCillator:PARAmeter:MULTiplier:DENominator?</code>
Example	<code>:NFIG:MODE:LOSC:PAR:MULT:DEN 1000</code> <code>:NFIG:MODE:LOSC:PAR:MULT:DEN?</code>
Preset	1
State Saved	Saved in instrument state.
Range	1 – 20000000000

Key Path **Mode Setup, Ext LO Control**

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 instrument, the custom commands will be preserved and will be recalled when you move back to custom commands.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:LOSCillator:TYPE SCPI CUSTom</code> <code>[:SENSe] :NFIGure:MODE:LOSCillator:TYPE?</code>
Example	<code>:NFIG:MODE:LOSC:TYPE CUST</code> <code>:NFIG:MODE:LOSC:TYPE?</code>
Dependencies/Couplings	LO Commands parameter is disabled when set to SCPI.
Preset	SCPI
State Saved	Saved in instrument state.
Range	SCPI CUSTom
Key Path	Mode Setup, External LO Control

LO Commands

Allows the commands used to control the external LO to be customized.

Mode	NF
Key Path	Mode Setup, Ext LO Control

Power Prefix Specifies a custom command to be used for setting external LO power.

Mode	NF
------	----

Mode Setup

Remote Command	<code>[:SENSe] :NFIGure:MODE:LOSCillator:COMManD:POWer:PREF ix <string></code> <code>[:SENSe] :NFIGure:MODE:LOSCillator:COMManD:POWer:PREF ix?</code>
Example	<code>:NFIG:MODE:LOSC:COMM:POW:PREF "power"</code> <code>:NFIG:MODE:LOSC:COMM:POW:PREF?</code>
Dependencies/Couplings	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.
Preset	"POW"
State Saved	Saved in instrument state.
Range	Alphanumeric
Key Path	Mode Setup, Ext LO Control, LO Commands

Power Suffix Specifies a custom command to be used for setting external LO power units.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:LOSCillator:COMManD:POWer:SUFF ix <string></code> <code>[:SENSe] :NFIGure:MODE:LOSCillator:COMManD:POWer:SUFF ix?</code>
Example	<code>:NFIG:MODE:LOSC:COMM:POW:SUFF "W"</code> <code>:NFIG:MODE:LOSC:COMM:POW:SUFF?</code>
Dependencies/Couplings	Disabled when LO commands set to SCPI
Preset	"DBM"
State Saved	Saved in instrument state.
Range	Alphanumeric
Key Path	Mode Setup, Ext LO Control, LO Commands

Frequency Prefix Specifies a custom command to be used for setting external LO frequency.

Mode	NF
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?
Dependencies/Couplings	Disabled when LO commands set to SCPI
Preset	"FREQ"
State Saved	Saved in instrument state.
Range	Alphanumeric
Key Path	Mode Setup, Ext LO Control, LO Commands

Frequency Suffix Specifies a custom command to be used for setting external LO frequency units.

Mode	NF
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?
Dependencies/Couplings	Disabled when LO commands set to SCPI
Preset	"Hz"
State Saved	Saved in instrument state.
Range	Alphanumeric
Key Path	Mode Setup, Ext LO Control, LO Commands

Mode Setup

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.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:LOSCillator:COMManD:AUXiliary <string></code> <code>[:SENSe] :NFIGure:MODE:LOSCillator:COMManD:AUXiliary?</code>
Example	<code>:NFIG:MODE:LOSC:COMM:AUX "RF ON"</code> <code>:NFIG:MODE:LOSC:COMM:AUX?</code>
Dependencies/Couplings	Disabled when LO commands set to SCPI
Preset	"OUTP:STAT ON"
State Saved	Saved in instrument state.
Range	Alphanumeric
Key Path	Mode Setup, Ext LO Control, LO Commands

Min Frequency

Sets the minimum frequency of the external source. Attempting to set the external source less than this will result in an error message and clipping to this value.

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure:MODE:LOSCillator:PARAmeter:MINimum[:FREQuency] <freq></code> <code>[:SENSe] :NFIGure:MODE:LOSCillator:PARAmeter:MINimum[:FREQuency] ?</code>
Example	<code>:NFIG:MODE:LOSC:PAR:MIN 100 kHz</code> <code>:NFIG:MODE:LOSC:PAR:MIN?</code>
Dependencies/Couplings	<ol style="list-style-type: none">1. Automatically populates when the IP address of a SCPI compliant source is entered into the Source Address parameter.2. The LO frequency cannot be set to lower than this value.
Preset	10 MHz
State Saved	Saved in instrument state.
Range	1 Hz to 324.999999999 GHz
Key Path	Mode Setup, External LO Control

Max Frequency

Sets the maximum frequency of the external source. Attempting to set the external source greater than this will result in an error message and clipping to this value.

Mode	NF
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?
Dependencies/Couplings	<ol style="list-style-type: none"> 1. Automatically populates when the IP address of a SCPI compliant source is entered into the Source Address parameter. 2. The LO frequency cannot be set to higher than this value.
Preset	10 MHz
State Saved	Saved in instrument state.
Range	2 Hz to 325 GHz
Key Path	Mode Setup, External LO Control

Uncertainty Calculator Form

The uncertainty calculator is based largely upon the Java uncertainty calculator that can be found on the customer-facing website at <http://www.tm.agilent.com/data/static/eng/tmo/Notes/interactive/an-NFUCal/NFUcalc.html>.

The figure below shows the layout of the uncertainty calculator form.

Mode Setup

Noise Source

Noise Source Model: Agilent 346B ENR Uncertainty: 0.20 dB Match *: 1.15000

	DUT	Instrument
Noise Figure:	3.00 dB	6.00 dB
Noise Figure Uncertainty:		0.05 dB
Gain:	20.00 dB	
Gain Uncertainty:		0.17 dB
Input Match *:	1.5000	1.60000
Output Match *:	1.5000	

RSS Noise Figure Uncertainty

0.24 dB

Contributors

$\frac{F12}{F1}$	Noise Source -> DUT Mismatch MXA Noise Figure Meas Uncert	0.1336 dB
$\frac{F2}{F1G1}$	Noise Source -> MXA Mismatch MXA Noise Figure Meas Uncert	0.0030 dB
$\frac{F2-1}{F1G1}$	Noise Source -> DUT Mismatch Noise Source -> MXA Mismatch DUT -> MXA Mismatch MXA Gain Meas Uncert	0.0071 dB
$\frac{F12}{F1} - \frac{F2}{F1G1}$	Noise Source ENR Uncert	0.1990 dB

* May be entered as Return Loss (-xx.x dB), VSWR or Refl Coefficient

As the fields are tab'ed through on the form the parameters become the active functions, and if the field's parameter is on the second page, the second soft panel will appear.

Mode Noise Figure
Key Path **Mode Setup**

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
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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
Mode	NF	
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?	
Dependencies/Couplings	Coupled to the ENR uncertainty and Match fields in the calculator.	
Preset	A346B	
State Saved	Saved in instrument state.	
Range	USER A346A A346B A346C AN4000A AN4001A AN4002A	
Key Path	Mode Setup, Uncertainty Calculator, FORM	

ENR Uncertainty

Selects the ENR Uncertainty used in the uncertainty calculator.

Mode	NF
Remote Command	:CALCulate:UNCertainty:SOURce:ENR <value> :CALCulate:UNCertainty:SOURce:ENR?
Example	:CALC:UNC:SOUR:ENR 1.25dB :CALC:UNC:SOUR:ENR?
Dependencies/Couplings	Only enabled when Noise Source Model is set to 'User Defined'
Preset	Noise Source Model Dependent. See Noise Source Model section.above.

Mode Setup

State Saved	No
Range	0 dB to 100 dB
Key Path	Mode Setup, Uncertainty Calculator, FORM

Noise Source Match

Selects the match value used in the calculator.

Mode	NF
Remote Command	:CALCulate:UNCertainty:SOURce:MATCh <value> :CALCulate:UNCertainty:SOURce:MATCh?
Example	:CALC:UNC:SOUR:MATC 5.55 :CALC:UNC:SOUR:MATC?
Dependencies/Couplings	Only enabled when Noise Source Model is set to 'User Defined'
Preset	Noise Source Model dependent. See Noise Source Model section.above.
State Saved	No
Range	-100 to 100
Key Path	Mode Setup, Uncertainty Calculator, FORM

DUT Noise Figure

Selects the DUT noise figure to be used in the calculator.

Mode	NF
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
Key Path	Mode Setup, Uncertainty Calculator, FORM

Instrument Noise Figure

Selects the instrument noise figure to be used in the calculator.

Mode	NF
Remote Command	:CALCulate:UNCertainty:INSTrument:NFIGure <value> :CALCulate:UNCertainty:INSTrument:NFIGure?
Example	:CALC:UNC:INST:NFIG 25.2dB :CALC:UNC:INST:NFIG?
Preset	9 dB
State Saved	No
Range	-100 dB to 100 dB
Key Path	Mode Setup, Uncertainty Calculator, FORM

Instrument Noise Figure Uncertainty

Selects the instrument noise figure uncertainty to be used in the calculator.

Mode	NF
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	0.05 dB
State Saved	No
Range	0 dB to 100 dB
Key Path	Mode Setup, Uncertainty Calculator, FORM

Mode Setup

DUT Gain

Selects the DUT gain to be used in the calculator.

Mode	NF
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
Key Path	Mode Setup, Uncertainty Calculator, FORM

Instrument Gain Uncertainty

Selects the instrument gain uncertainty to be used in the calculator.

Mode	NF
Remote Command	:CALCulate:UNCertainty:INSTrument:GAIN <value> :CALCulate:UNCertainty:INSTrument:GAIN?
Example	:CALC:UNC:INST:GAIN 25.2dB :CALC:UNC:INST:GAIN?
Preset	0.15 dB
State Saved	No
Range	0 dB to 100 dB
Key Path	Mode Setup, Uncertainty Calculator, FORM

DUT Input Match

Selects the DUT input match to be used in the calculator.

Mode	NF
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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
Key Path	Mode Setup, Uncertainty Calculator, FORM

Instrument Input Match

Selects the instrument input match to be used in the calculator.

Mode	NF
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	1.6
State Saved	No
Range	-100 to 100
Key Path	Mode Setup, Uncertainty Calculator, FORM

DUT Output Match

Selects the DUT output match to be used in the calculator.

Mode	NF
Remote Command	:CALCulate:UNCertainty:DUT:MATCh:OUTPut <value> :CALCulate:UNCertainty:DUT:MATCh:OUTPut?

Mode Setup

Example	:CALC:UNC:DUT:MATC:OUTP 25.5 :CALC:UNC:DUT:MATC:OUTP?
Preset	0.24 dB
State Saved	No
Range	-100 to 100
Key Path	Mode Setup, Uncertainty Calculator, FORM

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.

Mode	NF
Remote Command	:CALCulate:UNCertainty:RSS?
Example	:CALC:UNC:RSS?
Restriction and Notes	Automatically calculated from other uncertainty calculator values.
Dependencies/Couplings	Always read only – calculated from other uncertainty calculator values.
Remote Command Notes	Read only.
Preset	0.2 dB
State Saved	No
Range	0 dB to 100 dB
Key Path	Mode Setup, Uncertainty Calculator, FORM

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
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Mode Setup

Restart

The Restart function restarts the current sweep, or measurement, or set of averaged/hold sweeps or measurements.

The Restart function is accessed in several ways:

- Pressing the Restart key
- Sending the remote command INIT:IMMEDIATE
- Sending the remote command INIT:RESTART

SCPI Command	:INITiate[:IMMEDIATE]
Example	:INIT:IMM
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.
Remote Command Notes	:INITiate:RESTART :INITiate:IMMEDIATE Either of the above commands perform exactly the same function.
SCPI 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.
SCPI Command	:INITiate:RESTART
Example	:INIT:REST
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.
Remote Command Notes	:INITiate:RESTART :INITiate:IMMEDIATE Either of the above commands perform exactly the same function.

Restart

SCPI 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.
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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`.

Certain conditions may cause an implicit restart to be performed. These are detailed in section "Measurement Related Instrument Settings" in the Swept SA measurement PD.

Single (Single Measurement/Sweep)

Single 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.

Example	: INIT:CONT OFF
Remote Command Notes	See Cont key description.
Key Path	Front panel key

See Restart 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). 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.

Single (Single Measurement/Sweep)

Cont (Continuous Measurement/Sweep)

Cont 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.

SCPI 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
Key Path	Front panel key

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 Number** (in **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 Number** 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 Number 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 **Continuous** 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's already in continuous sweep:

the INIT:CONT 1 command has no effect

Cont (Continuous Measurement/Sweep)

the `INIT:CONT 0` command will place the analyzer in Single Sweep but will have no effect on the current sequence until $k=N$, at which point the current sequence will stop and the instrument will go to the idle state.

Sweep/Control

Accesses the functions to control the sweep.

Key Path **Front-Panel**

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:

$$\text{Avg Time/Pt} = 64 \text{ ks} / \text{RBW}$$

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.

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

Sweep/Control

State Saved	Saved in instrument state.
Min	1 us
Max	6 ks
Key Path	Sweep

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 [FREQ Channel \(Frequency\) on page 203](#)).

Mode	NF
Remote Command	<code>[:SENSe] :NFIGure :SWEep :POINts <integer></code> <code>[:SENSe] :NFIGure :SWEep :POINts?</code>
Example	SWE:POIN 201
Dependencies/Couplings	Coupled to max value of Position parameter (under View/Display key)
Preset	11
State Saved	Saved in instrument state.
Min	2
Max	501
Key Path	Frequency

Trigger

No trigger functionality is supported in the Noise Figure measurement. Pressing this hardkey will display a blank Trigger menu.

Key Path

Front-Panel

Trigger

6

Noise Figure

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.

Mode	Noise Figure
Key Path	Meas

Remote Command Results:

The following commands are used to retrieve the measurement results:

CONF:NFIGure

FETCh:NFIGure

INITiate:NFIGure?

MEASure:NFIGure?

READ:NFIGure?

See also:

Result Types

Initiate (remote command only)

Read/Meas/Fetch All (remote command only)

T Cold

Corrected Results

Uncorrected 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 impedance, 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 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 T_e . 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 i.e. 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

Read/Meas/Fetch All (remote command only)

Returns 13 comma separated results 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?

T Cold

The most recently used T Cold value for a swept or fixed measurement can be accessed using the following commands.

See also:

Array (remote command only)

Scalar (remote command only)

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?

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?

Corrected Results

Invalid or incalculable results will be represented using the numerical ‘SCPI Not-a-number’ value. See Result Types for detailed descriptions.

See also:

Array (remote command only)

Scalar (remote command only)

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?

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?

Uncorrected Results

Invalid or incalculable results will be represented using the numerical 'SCPI Not-a-number' value. See Result Types for detailed descriptions.

See also:

Array (remote command only)

Scalar (remote command only)

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]:UNCorrect
 ed:NFIGure|NFACTor|YFACTor|TEFFective|PHOT|PCOLd?

Scalar (remote command only)

Returns the most recently completed data from the last fixed measurement.

Remote Command :FETCh|MEASure|READ:NFIGure:SCALar[:DATA]:UNCorrecte
 d:NFIGure|NFACTor|YFACTor|TEFFective|PHOT|PCOLd?