User's and Programmer's Reference
IQ Analyzer Mode
N9060A Spectrum Analyzer Measurement Application

For use with the MXA & EXA Signal Analyzers

Agilent Technologies

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1 Introduction

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

What Does IQ Analyzer Mode Do?

IQ Analyzer Mode makes frequency domain and time domain measurements. These immurement often use alternate hardware signal paths then a comparable 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.

- Spectrum Measurement (Frequency Domain)

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

- Waveform Measurement (Time Domain)

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

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

- **Option EA3** provides an alternate attenuator that switches electronically. It has a maximum of 40 dB in 1 dB steps. (The standard attenuator is 70 dB maximum attenuation in 2 dB steps.). This hardware may be accessed from within IQ Analyzer Mode, but only with the narrowband IF path. It cannot be used with the N9020AK B25 wideband path.
- **Option N9020AK B25** provides an alternate wideband digital IF signal path with a maximum bandwidth of 25 MHz. This hardware can only be accessed from within IQ Analyzer Mode.

Using the Electronic Attenuator Hardware (Option EA3)

Option EA3 is required for many of the optional measurement personalities. This optional attenuator does the fast switching necessary to accommodate the complicated multiple-sweep, averaged measurements required for digital communication systems testing. The hardware is specified for measurements up to a maximum of 3.6 GHz and works with many different measurement personalities. These additional measurement personalities are purchased separately and are accessed using the **Mode** key. See "Installing Application Software" on page 32 for information about loading measurement instrument software.

Using the Wideband Analysis Hardware (Option N9020AK B25)

Option N9020AK B25 hardware enables up to 25 MHz of capture bandwidth. IQ Analyzer Mode is provided to access this wideband hardware.

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

- The wideband functionality is only available in IQ Analyzer Mode. It cannot be accessed from the Spectrum Analysis Mode nor from other optional measurement modes.
- If this wideband hardware is installed, IQ Analyzer Mode will always make measurements above 3.6 GHz using the wideband path. The standard “narrowband” path is not available in IQ Analyzer Mode above 3.6 GHz.
- Option N9020AK EA3 (1 dB electronic attenuator for digital communications) is not required for operation of the wideband option (N9020AK B25).
- If the wideband hardware is installed, but the electronic attenuator (N9020AK EA3) is *not* installed, then the wideband input path will be used for all measurements in IQ Analyzer Mode. Since the standard “narrowband” path is not available in IQ Analyzer Mode without Option EA3, only the Option B25 specifications will apply.
- The preamp options (N9020AK P03, P08, P13, P26) cannot be used in IQ Analyzer Mode with Option the wideband option N9020AK B25.

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

Installing Application Software

When you want to install a measurement application after your initial hardware purchase, you actually only need to license it. All of the available applications are loaded in your analyzer at the time of purchase.

So when you purchase an application, you will receive an entitlement certificate that is used to obtain a license key for that particular measurement application. Enter the license key that you obtain into the N9020A Signal Analyzer to activate the new measurement application. See below for more information.

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

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

Viewing a License Key

Measurement personalities purchased with your instrument have been installed and activated at the factory before shipment. The instrument requires a unique **License Key** for every measurement application purchased. The license key is a hexadecimal string that is specific to your measurement application, instrument model number and serial number. It enables you to install, or reactivate that particular application.

Press **System**, **Show**, **System** to display which measurement applications are currently licensed in your analyzer.

Press **System**, **More**, **Licensing . . .** to view the license keys for the installed measurement applications.

NOTE You may want to keep a copy of your license key in a secure location. You can print out a copy of the display showing the license numbers to do this. If you should lose your license key, call your nearest Agilent Technologies service or sales office for assistance.

Obtaining and Installing a License Key

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

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

Installing a license key can also be done manually using the license management application in the instrument. It is found through the instrument front panel keys at **System**, **Licensing. . .**, or internally at C:\Programming Files\Agilent\Licensing.

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

Missing and Old Measurement Application Software

All the software applications were loaded at the time of original instrument manufacture. It is a good idea to regularly update your software with the latest available version. This assures that you get any improvements and expanded functionality that is available.

Because the software was loaded at the initial purchase, there may be additional measurement applications that are now available. If the application you are interested in licensing is not available, you will need to do a software update. (Press **System**, **Show**, **System**.)

Check the Agilent internet website for the latest software versions available for downloading:

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

You must load the updated software package into the analyzer from a USB drive, or directly from the internet. An automatic loading program is included with the files.

2 Utility Functions

The front-panel key functions in this section are accessible when you are using any of the measurements available in this application.

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.

Key Path	**System**

Errors

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

Errors 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 (unlabeled)

Displays the icon identifying the event or condition as an error or warning.

ID

Displays the error number.

Message

Displays the message text.

Repeat (RPT)

This field shows the number of consecutive instances of the event, uninterrupted by other events. 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
Key Path	**System, Show**

Saved State	No
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.

Next Page

Next Page and Previous Page softkeys 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 The History and Status keys select the Errors view. The Status key has a second line which shows a number in [square brackets]. This is the number of currently open status items.

Key Path	**System, Show, Show Errors**

Status

See History.

Verbose SCPI On/Off

This is a capability that will allow the SCPI data stream to be displayed when a SCPI error is detected, showing the characters which stimulated the error and several of the characters preceding the error.

Mode	All
Remote Command	`:SYSTem:ERRor:VERBose OFF|ON|0|1` `:SYSTem:ERRor:VERBose?`
Example	:SYST:ERR:VERB ON
Preset	This is unaffected by Preset but is set to OFF on a “Restore System Defaults->Misc”
State Saved	No
Range	On | Off
Key Path	**System, Show, Show Errors**

Refresh

When pressed, refreshes the Show Errors display.

Key Path	**System, Show, Show Errors**

Clear Error Queue

This clears all errors in all error queues.

NOTE

Clear Error Queue does not affect the current status conditions.

Mode Preset does not clear the error queue.

Restore System Defaults will clear all error queues.

*CLS only clears the queue if it is sent remotely and *RST does not affect any error queue.

Switching modes does not affect any error queues.

Key Path	**System, Show, Show Errors**

System

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

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

N9020A-503	Frequency Range to 3.6 GHz	
N9020A-PFR	Precison Frequency Reference	
N9020A-P03	Preamp 3.6 GHz	
N9060A-2FP	Spectrum Analysis Measurement Suite	1.0.0.0
N9073A-1FP	WCDMA	1.0.0.0
N9073A-2FP	WCDMA with HSDPA	1.0.0.0

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page softkey is grayed-out if the last page is information is presently displayed.

Mode	All
Preset	OFF
State Saved	No
Range	On | Off
Key Path	**System, Show**

Show Hardware

The Hardware screen is used to view details of the installed hardware. The screen is formatted into two groupings: product descriptive information and hardware information. The hardware information is listed in a table format:

<Product Name> <Product Description>
Product Number: N9020A
Serial Number: US44240924
Firmware Revision: A.01.01
Computer name: <hame>
Host ID: N9020A,US44220924

Assembly Name	Part #	Serial #	Matl Rev	Bd Rev	OF Rev	Hw Id	Misc
Analog IF	E441060104	7804400066	003	0	A	15	1.0.0.0

The Previous Page is grayed-out if the first page of information is presently displayed. The Next Page softkey is grayed-out if the last page is information is presently displayed.

Mode	All
Preset	OFF
State Saved	No
Range	On ❘ Off
Key Path	**System, Show**

LXI

This key shows you the product number, serial number, firmware revision, computer name, IP address, Host ID, LXI Class, LXI Version, MAC Address, and the Auto-MDIX Capability.

Key Path	**System, Show**

LAN Reset This key resets the LAN connection.

Key Path	**System, Show, LXI**

Power On

The Power On softkey enables you to select how the instrument should power on. The options are: Mode Preset, User Preset and Last State.

Mode	All
Remote Command	`:SYSTem:PON:TYPE MODE	USER	LAST	PRESet` `:SYSTem:PON:TYPE?`
Example	`:SYST:PON:TYPE MODE`
Preset	This is unaffected by Preset but is set to Mode on a “Restore System Defaults->All”
State Saved	No
Key Path	**System**

Mode Preset

Sets **Power On** to **Mode Preset**. When the analyzer is powered on in Mode Preset, it will perform a Mode Preset to all modes in the instrument and it will wake up in the power-on mode. It will not affect any settings beyond what a normal Mode Preset affects.

Mode	All
Example	SYST:PON:TYPE MODE
Key Path	**System, Power On**

User Preset

Sets **Power On** to **User Preset**. When the analyzer is powered on in User Preset, it will User Preset each mode and switch to the power-on mode. Power On User Preset will not affect any settings beyond what a normal User Preset affects. NOTE: An instrument could never power up for the first time in User Preset.

Mode	All
Example	SYST:PON:TYPE USER

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 SYSTem:PDOWn command.
Key Path	**System, Power On**

Power On Mode

This softkey brings up a Mode Menu that lists the available modes and enables the user to 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.

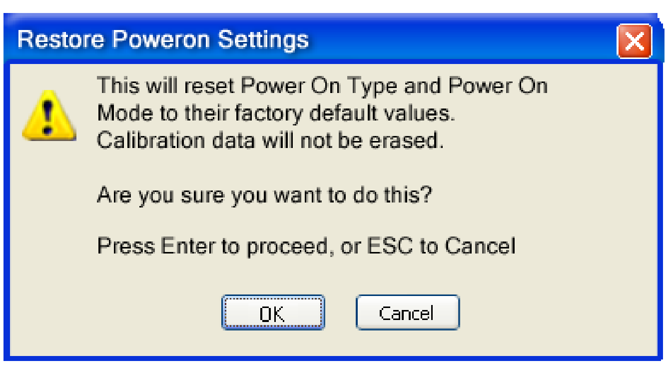
This Mode will be used for Power On Mode Preset and Restore System Defaults All. The factory will load a default power-on mode using what modes are installed in the instrument and the precedence table documented in the Power-On Mode section.

NOTE When measurement applications are loaded, this Mode Menu contains a softkey for each loaded application. Under the Service subsystem, there is a way to change the factory default Power On Mode.

Mode	All
Remote Command	`:SYSTem:PON:MODE SA|PNOISE|EDGEGSM|BASIC|WIMAXOFDMA|PNOISE|WCDMA|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 softkey 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. Highest measurement throughput is obtained with Auto Align Off, however the user assumes responsibility for warranted measurements by periodically performing an Align Now, All. The instrument will inform the user that an alignment is needed based on the Alert setting.

When Auto Align is executing Bit 0 in the Status Operational register is set.

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**

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 a full alignment and clear the “Align Now, All required” condition before beginning the auto alignment processing.

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.

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	Alignment processing as a result of the transition to Normal will be executed sequentially. Thus, *OPC? or *WAI following CAL:AUTO ON will return when the alignment processing is complete. The presence of an external signal may interfere with the RF portion of the alignment. If so, the Error Condition “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.
Key Path	**System, Alignments, Auto Align**

Partial

Auto Align, Partial disables thorough automatic alignment and the maintenance of warranted operation for the benefit of improved measurement throughput, with accuracy retained for the Resolution Bandwidths. With Auto Align set to Partial, the operator is responsible for maintaining warranted operation by performing Align Now, All on a periodic basis. The Auto Align, Alert mechanism will notify the operator when an Align Now, All should be performed.

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 (warning icon is intended to inform the operator they are responsible for the 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, the operator is responsible for maintaining warranted operation by performing Align Now, All on a periodic basis. The Auto Align, Alert mechanism will notify the operator when and Align Now, All should be performed.

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

When Auto Align, Off is selected the Settings Panel indicates ALIGN OFF with a warning icon (warning icon is intended to inform the operator they are responsible for the 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 changes in the input impedance between measurements, which could cause input device instability.) When Auto Align, All but RF ON is selected, the operator is responsible for performing an Align Now, RF with every 3 degrees Celsius temperature change, or a time span of 24 hours since the last Align Now, RF. The Auto Align, Alert mechanism will notify the operator to perform an Align Now, All when the time expires or 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 the user will need to perform a full alignment (for example, Align Now, All). The alert is the Error Condition “Align Now, All required” and bit 14 is set in the Status Questionable Calibration register.

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 as 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**

Time & Temperature

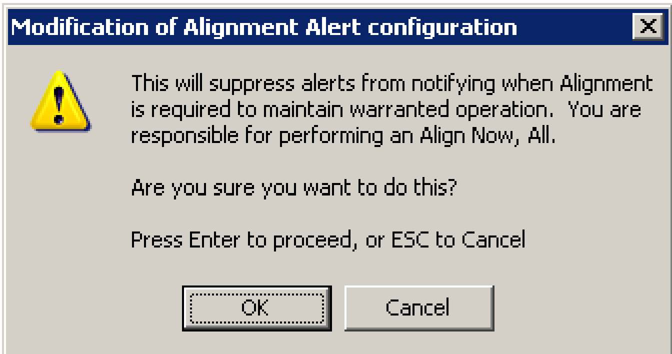
With Auto Align Alert set to Time & Temperature the instrument will signal an alert after 3 degrees Celsius temperature change or a time span of 24 hours since the last successful full alignment (for example, Align Now, All or completion of a thorough Auto Align). The alert is the Error Condition "Align Now, All required" and bit 14 is set in the Status Questionable Calibration register

Mode	All
Example	:CAL:AUTO:ALER TTEM
Key Path	**System, Alignments, Auto Align, Alert**

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 thorough Auto Align). An operator may choose this selection in an environment where the temperature is stable on a daily basis. The alert is the Error Condition "Align Now, All required" and bit 14 is set in the Status Questionable Calibration register.

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



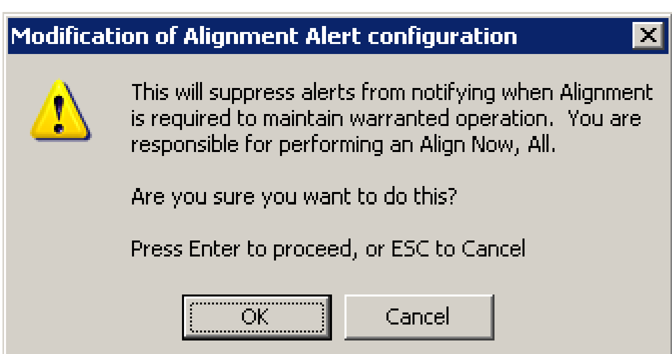
No confirmation is required when Alert is configured through a remote command.

Mode	All
Example	:CAL:AUTO:ALER DAY
Key Path	**System, Alignments, Auto Align, Alert**

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 thorough Auto Align). An operator may choose this selection in an environment where the temperature is stable on a weekly basis. The alert is the Error Condition “Align Now, All required” and bit 14 is set in the Status Questionable Calibration register.

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.

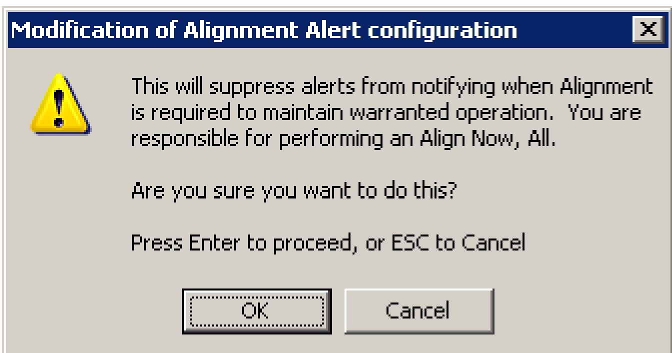
Mode	All
Example	:CAL:AUTO:ALER WEEK

Key Path	**System, Alignments, Auto Align, Alert**

None

With Auto Align Alert set to None the instrument will not signal an alert. This is provided for rare occasions where the operator is 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.

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 that perform complete operations that run until 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.

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	Initializes the time for the Last Align Now, All Time.
	Records the temperature for the Last Align Now, All Temperature.
	If Align RF component succeeded, initializes the time for the Last Align Now, RF Time.
	If Align RF component succeeded, records the temperature for the Last Align Now, RF Temperature.

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

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	*CAL? returns 0 if successful *CAL? returns 1 if failed :CALibration[:ALL]? is the same as *CAL? See additional remarks described with CALibration[:ALL]?

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 signal.

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 employed for an individual subsystem, but not a cohesive 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 Notes	:CALibration:NRF? returns 0 if successful :CALibration:NRF? returns 1 if failed While Align Now, All but RF is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the ABORt command. Successful completion will clear bit 14 in the Status Questionable Calibration register and set bit 12 if invoked with “Align Now, All required”.
Key Path	**System, Alignments, Align Now**

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).

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. No new alignment data is employed.

Mode	All
Remote Command	`:CALibration:RF`
	`:CALibration:RF?`
Example	:CAL:RF
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	Initializes the time for the Last Align Now, RF Time.
	Records the temperature for the Last Align Now, RF Temperature.

Remote Command Notes	:CALibration:RF? returns 0 if successful :CALibration:RF? returns 1 if failed (including interfering user signal) While Align Now, RF is performing the alignment, bit 0 in the Status Operation register is set. Completion, or termination, will clear bit 0 in the Status Operation register. This command is sequential; it must complete before further SCPI commands are processed. Interrupting the alignment from remote is accomplished by invoking Device Clear followed by the ABORt command. Successful completion will clear bits 3, 11, and 12 in the Status Questionable Calibration register. A failure encountered during alignment will set the Error Condition “Align RF failed” and set bit 3 in the Status Questionable Calibration register. An interfering user signal will result in bits 11 and 12 to be set in the Status Questionable Calibration register to indicate Align Now, RF is required.
Key Path	**System, Alignments, Align Now**

Advanced

Advanced accesses alignment processes that are immediate action operations that perform operations that run until complete. Advanced alignments are performed on an irregular basis, or require additional operator interaction

Key Path	**System, Alignments**

Characterize Preselector (Only with Option 508, 513, or 526) The Preselector tuning curve drifts over temperature and time. 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. Character Preselector is used 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 amplitude accuracy.

Characterize Preselector immediately executes a characterization of the Preselector. 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. No new characterization data is employed.

NOTE

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

Show Alignment Statistics

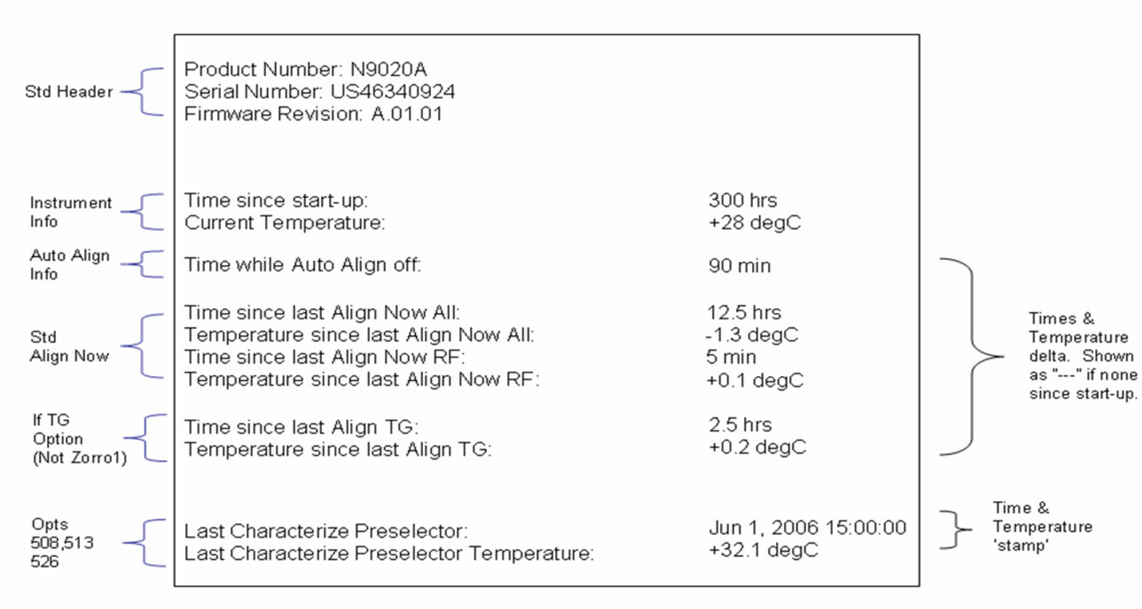
Shows alignment information you can use to ensure that the instrument is operating in a specific manner. The Show Alignment Statistics screen is where you can view time and temperature information.

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.

The screen for Show Alignment Statistics is a Text Screen similar to Show System or Show Errors. Previous Page and Next Page softkey selections are available in conformance with the Text Screen standard.

The screen contents can be printed. The Show Alignment Statistics screen will be exited in conformance with the Text Screen standard.

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



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

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, Alignments**

Saved State	No
Mode	All
Remote Command	`:SYSTem:PON:TIME?`
Example	:SYST:PON:TIME?
Restriction and Notes	Value is the time since the present application start-upon in seconds.
Key Path	**Visual annotation in the Show Alignment Statistics screen**

Saved State	No
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)
Key Path	**Visual annotation in the Show Alignment Statistics screen**

Saved State	No
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. Returns NaN if no Align Now, All or Align Now, All but RF executed since power-up.
Key Path	**Visual annotation in the Show Alignment Statistics screen**

Saved State	No
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. Returns NaN if no Align Now, All or Align Now, All but RF executed since power-up.
Key Path	**Visual annotation in the Show Alignment Statistics screen**
Saved State	No
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. Returns NaN if no Align Now, RF executed since power-up.
Key Path	**Visual annotation in the Show Alignment Statistics screen**
Saved State	No
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. Returns NaN if no Align Now, RF executed since power-up.
Key Path	**Visual annotation in the Show Alignment Statistics screen**
Saved State	No

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

Saved State	No
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. Returns NaN if no Characterize Preselector has ever been performed on the instrument.
Key Path	**Visual annotation in the Show Alignment Statistics screen**

Saved State	No
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.
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 softkey 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 softkey 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**

NOTE

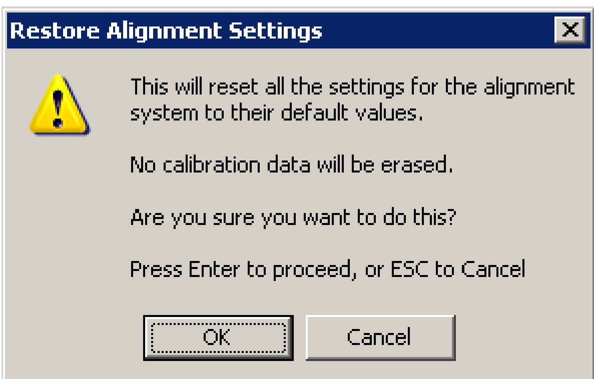
Remote Command	`:CALibration:FREQuency:REFerence:COARse <integer>` `:CALibration:FREQuency:REFerence:COARse?`
Example	:CAL:FREQ:REF:COAR 8191
Dependencies/Couplings	Setting CAL:FREQ:REF:COAR sets CAL:FREQ:REF:MODE USER

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, the operator is 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

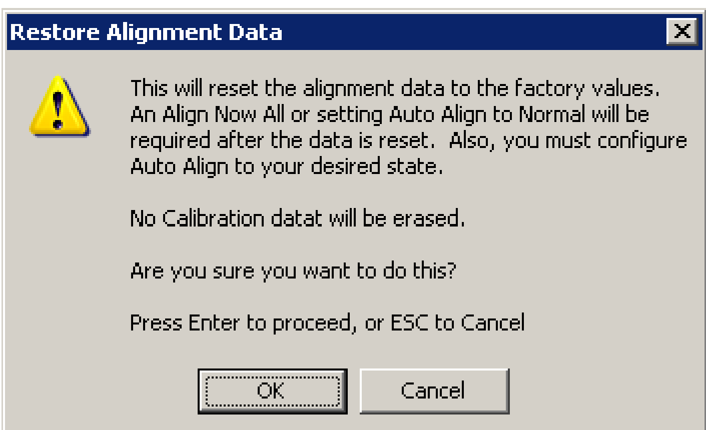
Mode	All

Example	:SYST:DEF ALIG
Restriction and Notes	Alignment processing that results as the transition to Auto Alignment 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**

I/O Config

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

Key Path	**System**

GPIB Address (Remote Only)

Select the GPIB remote address.

Mode	All
Remote Command	`:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess <integer>` `:SYSTem:COMMunicate:GPIB[1][:SELF]:ADDRess?`
Example	:SYST:COMM:GPIB:ADDR 17
Remote Command Notes	NOTE: Changing the Address on the GPIB port requires all further communication to use the new address.
Preset	This is unaffected by Preset but is set to 18 on a “Restore System Defaults->Misc”
State Saved	No
Range	0 to 30
Key Path	**System, I/O Config**

SCPI LAN Menu

Activates a menu for identifying and changing the SCPI over LAN configuration. There are a number of different ways to send SCPI remote commands to the instrument over LAN. It can be a problem to have multiple users simultaneously accessing the instrument over the LAN. These keys limit that somewhat by disabling the telnet, socket, and/or SICL capability.

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

SCPI Telnet Turns the SCPI LAN telnet capability On or Off allowing you to limit SCPI access over 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.)

PSA Manual Table 4–1 SCPI Default Settings

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

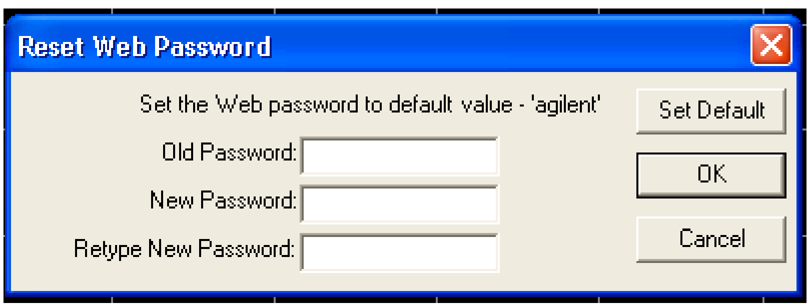
Mode	All
Remote Command	`:SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle OFF|ON|0|1` `:SYSTem:COMMunicate:LAN:SCPI:SICL:ENABle?`
Example	:SYST:COMM:LAN:SCPI:SICL:ENAB OFF

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) front-panel key.

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

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

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

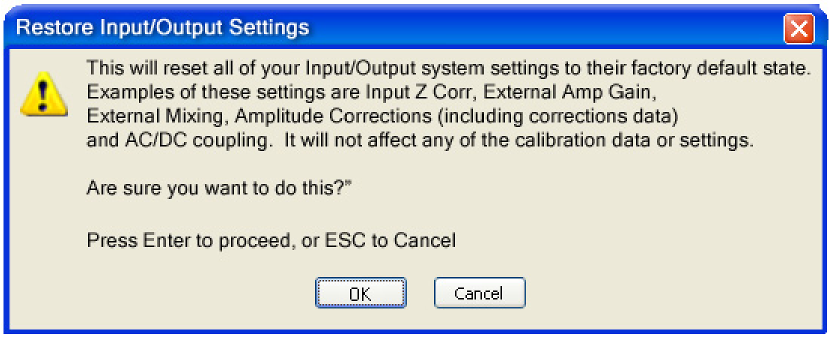
Provides incremental initialization of the system setting groups along with supporting a comprehensive reset of the entire instrument back to a factory default state. The menu selections are the groups of system settings and when one is selected, that particular group of system settings is reset back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

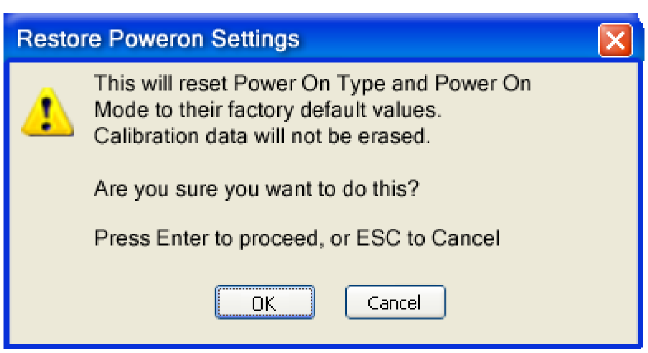


Example	:SYST:DEF INP
Key Path	**System, Restore System Defaults**

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 Preset 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:



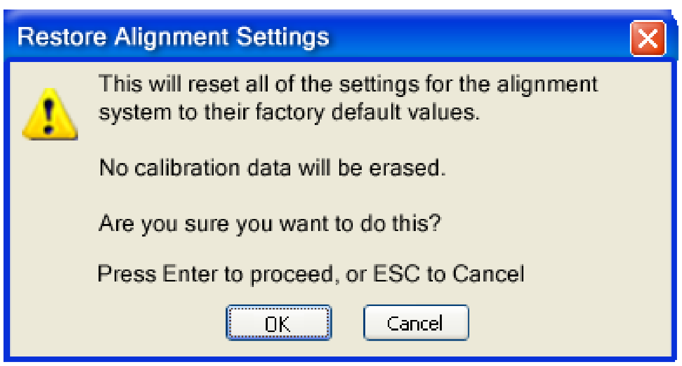
Example	:SYST:DEF PON
Key Path	**System, Restore System Defaults**

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:



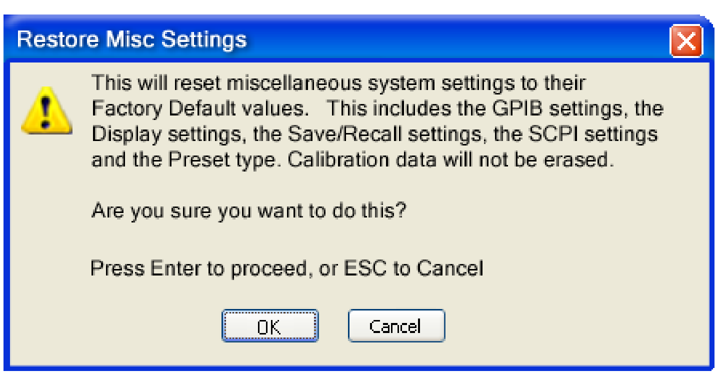
Example	:SYST:DEF ALIG
Key Path	**System, Restore System Defaults**

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

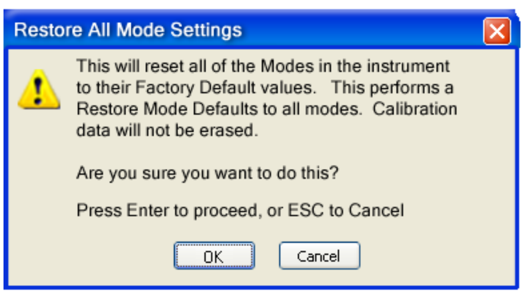
Confirmation is required to restore the factory default values. The confirmation dialog is:



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:



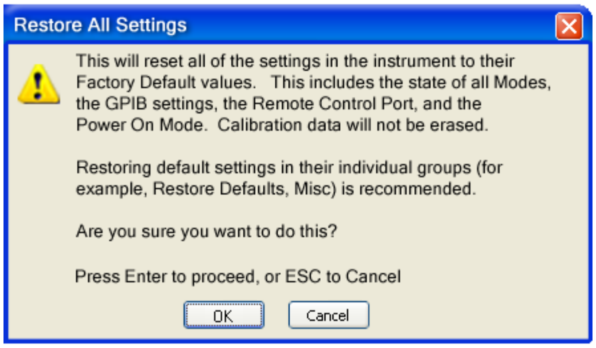
.

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 Notes	No remote command for this key.
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 Notes	No remote command for this key.
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. Because 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 an <IEEBlock> format. The format of an IEEBlock 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

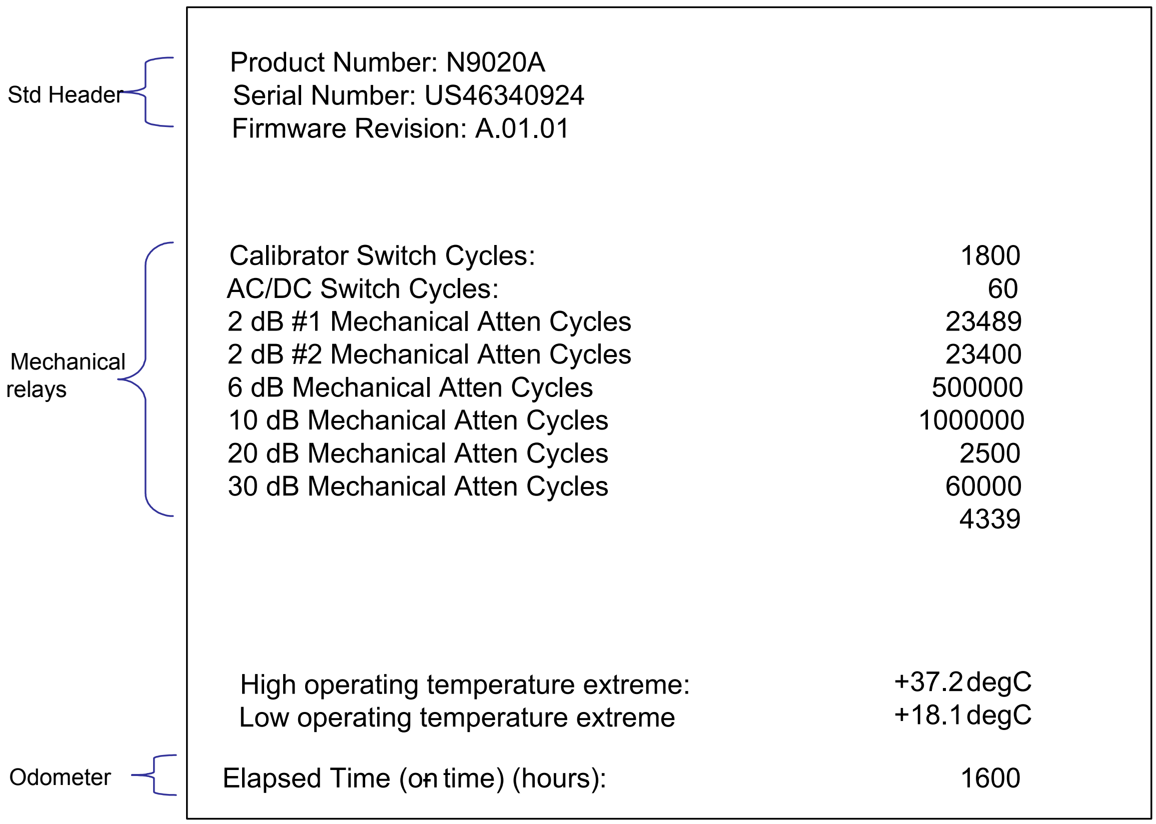
Provides a display of various hardware statistics. The statistics include the following:

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.



The data will be updated only when the Show Hardware Statistics softkey 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 Notes	Query Only

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.

Saved State	No
Mode	All
Remote Command	:SYSTem:TEMPerature:LEXTreme?
Example	:SYST:TEMP:LEXT?
Restriction and Notes	Value is in degrees Centigrade at which the lowest operating temperature has been recorded since 1st power-up.

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.

Saved State	No
Mode	All
Remote Command	:SYSTem:TEMPerature:HEXTreme?
Example	:SYST:TEMP:HEXT?

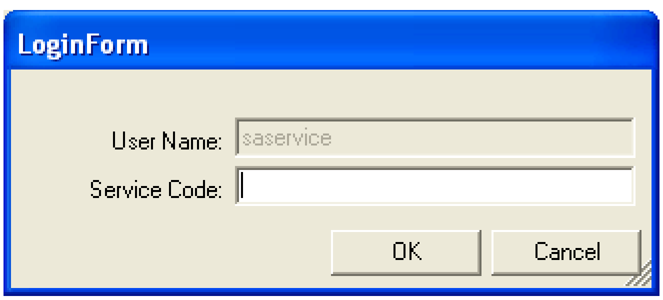
Restriction and Notes	Value is in degrees Centigrade at which the highest operating temperature has been recorded since 1st power-up.

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 Notes	Query Only

Advanced

Accesses advanced diagnostic capabilities performed in the factory or under instructions from repair procedures. This softkey 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 traverse into this menu.**
Key Path	**System, Diagnostics**

Service

Accesses capabilities performed in the factory or under instructions from repair procedures. This softkey 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 analyzer.

Saved State	No
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,FPR” :SYSTem:OPTions? and *OPT? are synonymous.

Lock the Front Panel keys (Remote Command Only)

Disables the instrument keyboard to prevent local input when the instrument is controlled remotely. An annunciator reading “K” for ‘Klock” 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 Timezone 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

Quick Save

The Quick Save front-panel key repeats the last save in the directory. If the last save was to a register, Quick Save saves the State of the currently active mode to the next register. If the last register was register 6, it wraps around to register 1.

If the last save was to a file, Quick Save repeats the last type of save in the last save directory by creating a unique filename using the Auto File Naming algorithm. If the Quick Save is pressed when the instrument is powered up for the first time prior to pressing the Save front panel key, the Quick Save saves State to Register 1.

Remote Command Notes	No remote command for this key specifically.
Key Path	**Quick Save**

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.

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 softkey 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.

Key Path	**Save**

Register 1 thru Register 6

Selecting any one of these register softkeys 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 softkeys 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.

Key Path	Save, State
Example	*SAV 1

Key Path	Save, State
Example	*SAV 2

Key Path	Save, State
Example	*SAV 3

Key Path	Save, State
Example	*SAV 4

Key Path	Save, State
Example	*SAV 5

Key Path	Save, State
Example	*SAV 6

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.

The **Save As** dialog is loaded with the file information related to the State Save Type. The filename is filled in using the auto file naming algorithm for the State Save Type and is highlighted. Also, the only files that are visible are the `*.state` files and the Save As type is `*.state`, since `.state` is the file suffix for the State Save Type.

Key Path	**Save, State**
Restriction and Notes	Brings up Save As dialog for saving a State Save Type

Save As…

Accesses a menu that enables you to select the location where you can save the State. This menu is a standard Windows® dialog with Save As softkeys. The **Save As** dialog is loaded with the file information related to the State Save Type. The filename is filled in using the auto file naming algorithm for the State Save Type and is highlighted.

The **Save As** dialog is loaded with the file information related to the State Save Type. The filename is filled in using the auto file naming algorithm for the State Save Type and is highlighted.

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.

The only files that are visible are the *.state files and the Save As type is *.state, since .state is the file suffix for the State Save Type.

Key Path	**Save, State**
Restriction and Notes	Brings up Save As dialog for saving a State Save Type

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.

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.

Trace (+State)

Selects a state file which includes trace data for recalling as the save type and accesses a menu that enables you to select which trace to save. Not all modes support saving trace data with the state; and for modes that do, not all measurements do. This key is grayed out for measurements that do not support trace saves. It is blanked for modes that do not support trace saves. Saving **Trace** is identical to saving **State** except a .trace extension is used on the file instead of .state, and internal flags are set in the file indicating which trace was saved. You may also select to save ALL traces.

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

Key Path	**Save, 2**

From Trace

Accesses a menu that enables you to select the trace to be saved. You can choose either **1**, **2**, **3**, **4**, **5**, **6** or **All**. Once a trace is selected, the key returns back to the Save Trace menu and the selected trace number is annotated on the key. The default is **Trace 1**. To save the Trace you must select **Save As**.

These softkeys let you pick which trace to save. Now you have selected exactly what needs to be saved. In order to trigger a save of the selected **Trace**, you must select the **Save As** key in the Save Trace menu.

Key Path	**Save, Trace + State,**

Save As…

Accesses a menu that enables you to select the location where you can save the Trace. This menu is a standard Windows® dialog with Save As softkeys. The Save As dialog is loaded with the file information related to the Trace Save Type. The filename is filled in using the auto file naming algorithm for the State Save Type and is highlighted.

The **Save As** dialog is loaded with the file information related to the Trace Save Type. The filename is filled in using the auto file naming algorithm for the State Save Type and is highlighted.

The default path for all State Files including .trace 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.

The only files that are visible are the *.trace files and the Save As type is *.trace, since .trace is the file suffix for the Trace Save Type.

Key Path	**Save, Trace (+State), 7**
Restriction and Notes	Brings up Save As dialog for saving a Trace Save Type

Save

This key initiates the save of the .trace file. All of the State of the currently active mode plus the system level Input/Output settings are saved to the specified file as well as all of the trace data, including internal flags set in the file indicating which trace is to be saved.

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.

SCPI Command	`:MMEMory:STORe:TRACe TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6|ALL,<filename>`

Example	:MMEM:STOR:TRAC TRACE1,“myState.trace” saves the file myState.trace on the default path and flags it as a “single trace” file with Trace 1 as the single trace (even though all of the traces are in fact stored). :MMEM:STOR:TRAC ALL,“myState.trace” saves the file myState.trace on the default path and flags it as an “all traces” file
Remote Command Notes	This command actually performs a save state, which in the Swept SA measurement includes the trace data. However it flags it (in the file) as a “save trace” file of the specified trace (or all traces).
Key Path	**Save, Trace, Save As…**
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 (Mode Specific)

Accesses a menu that enables you to select the type of data to export. Each mode determines what data it will allow to be exported and imported based on what data it produces. Exporting **Data** stores measurement data to the specified file which can then be imported into Excel, Matlab and other PC applications for viewing and manipulation. The data that is typically available in all modes is **Measurement Results** and this data type will not only be mode specific, but also measurement specific. An example of mode specific Export Data is **Traces** which is a data types typically only associated with the Spectrum Analyzer mode.

Selecting an Export Data softkey will not actually cause the exporting to occur, since the export feature still needs to know where to save the data. Pressing the **Save As** key in this menu brings up the **Save As** dialog and Save As menu that provides the user with the options of where to save the data. Once a filename has been selected or entered in the **Save As** menu, the save will occur.

Key Path	Save
Remote Command Notes	No SCPI command directly controls the Data Type that this key controls. The Data Type is included in the MMEM:STORe commands.

Dependencies	If a file type is not used by a certain measurement, that type is grayed out for that measurement. The key for a file type will not show if there are no measurements in Mode that supports it.
Preset	<mode specific>; Is not affected by Preset, but is reset during Restore Mode Defaults and survives subsequent running of the mode. (Refer to the mode Save/Recall PD for this Preset value).

Trace

Pressing this key selects the **Traces** as the data type to be exported with this save request. This key brings up the Trace Menu that allows you to select which Trace to save. This key is grayed out when SA measurements are running that do not support trace exporting.

Dependencies	Trace data is not available from all Measurements. In that case, the key will be grayed out. The key will not show if no measurements in the Mode support it.
Preset	1; not part of Preset, but is reset by Restore Mode Defaults and survives power cycles
State Saved	Saved in State
Key Path	**Save, Data**

Trace 1, 2, 3, 4, 5, 6

These softkey selections let you pick which Trace to save; either **1**, **2**, **3**, **4**, **5**, or **6**. The default is **1**. Once selected, the key returns back to the Export Data menu and the selected trace number is annotated on the key. Now you have selected exactly what needs to be saved. In order to trigger a save of the selected trace, you must select the **Save As** key in the Export Data menu.

An example of using this menu is: If you select 4, Trace 4 is saved to the file selected or entered in **File Name** option in the **Save As** dialog.

Key Path	**Save, Data, Trace**

Measurement Results

Measurement results are not available for all measurements Also, different types of results are available from the different measurements. For example, this key is grayed out in the Spectrum Analyzer Mode while the active measurement is Swept SA.

Key Path	Save, Data
Dependencies	The key will not show if no measurements in the Mode support it.

Zone Map

A map file contains zone definitions that will help simplify making measurements of frequently used signals. The OFDMA frame structure can contain multiple-zone definitions for the uplink and downlink subframes and multiple data burst allocations. You can store map files in which you have saved complicated OFDMA frame analysis zone definitions. This can save you time and ensure the accuracy of repeated measurements. Map files are also useful for recreating measurement settings so they can be used by other users.

Key Path	Save, Data, 6

Capture Buffer

Capture Buffer functionality is not available for all measurements. The captured data is raw data (unprocessed).

Key Path	Save, Data

Save As…

Accesses a menu that enables you to select the location where you can save the Data Type. This menu is a standard Windows® dialog with Save As softkeys. The **Save As** dialog is loaded with the file information related to the Data Type. The filename is filled in using the auto file naming algorithm for the specific Data Type and is highlighted. The “auto file name” feature automatically generates a file name for use when saving a file.

When you navigate to this selection, you have already determined that you are saving Data and now you want to specify to which file to direct the save.

When you first enter this dialog, the path in the **Save In:** field in this **Save As** dialog depends on which export data type you navigated here from. The only files that are visible are the files with the corresponding data type suffix, and the **Save As** type lists the same suffix.

For example, if the Data Type is **Amplitude Corrections**, the file suffix is .csv and the *.csv files are the only visible files in the **Save As** dialog and .csv is the Save As Type.

The default path for saving files is:

For all of the Trace Data Files:

```
My Documents\<mode name>\data\traces
```

For all of the Limit Data Files:

```
My Documents\<mode name>\data\limits
```

For all of the Measurement Results Data Files:

```
My Documents\<mode name>\data\<measurement name>\results
```

For all of the Capture Buffer Data Files:

```
My Documents\<mode name>\data\captureBuffer
```

Key Path	**Save, Data**
Restriction and Notes	Brings up Save As dialog for saving a <mode specific> Save Type

Save

Saves the specified Data Type. This section describes any specific save behavior relevant to Data that is common to all modes.

When a **Save** of a specific Data File is requested, the specified data is saved to the specified or selected file. The save is performed immediately and does not wait until the measurement is complete.

If the file already exists, a dialog will popup that allows you to replace the existing file by selecting an **OK** or you can **Cancel** the request.

While the save is being performed, the floppy icon will show up in the settings bar near the Continuous/Single icon. After a register save completes, the corresponding register softkey annotation is updated with the date the time and an advisory message that the file was saved appears in the message bar.

Key Path	**Save, Data, Save As…, 1**
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.

SCPI Command	`:MMEMory:STORe:RESults <filename>`
Example	:MMEM:STOR:RES “myResults.csv” saves the results from the current measurement to the file myResults.csv in the default path. :MMEM:STOR:RES “MyDocuments\Basic\data\ComplexSpectrum\results\myResults.xml” saves the results from the current measurement (Complex Spectrum) to the file myResults.xml in the default path for IQ Analyzer (Basic) Mode.
Remote Command Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over remote.

SCPI Command	`:MMEMory:STORe:TRACe:DATA TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6,<filename>`
Example	:MMEM:STOR:TRAC:DATA TRACE2,”myTrace2.csv” exports the 2nd trace to the file myTrace2.csv in the default path.
Remote Command Notes	If the save is initiated via SCPI, and the file already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk of being overwritten during an instrument software upgrade. Both single and double quotes are supported for any filename parameter over remote.

SCPI Command	`:MMEMory:STORe:ZMAP <filename>`
Example	:MMEM:STOR:ZMAP “myZoneMap.omf” saves current Zone Map as 89601 compatible file type.
Key Path	**Save, Data, Zone Map**

Restriction and Notes	If a file with the same name already exists, the file will be overwritten. Using the C: drive is strongly discouraged, since it runs the risk overwriting the file during a instrument software upgrade. Both single and double quotes are supported for any filename parameter over remote. Once a save is complete, the Export Data menu will appear, and the Save As dialog will disappear. The message “File <file name> saved” will appear after the save is complete.

SCPI Command	`:MMEMory:STORe:CAPTured <filename>`
Example	:MMEM:STOR:CAPT “MyDocuments\WCDMA\data\captureBuffer\myCaptureBuffer.bin” saves the capture buffer data from the current measurement to the file myCaptureBuffer.bin in the default path.
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.
Key Path	Save, Data, Save As

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 the 2 key dialogs and their corresponding menu – **Themes** and **Save As**. When the user navigates to this selection, they have already determined they are saving a **Screen Image** and now they want to specify how to layout the page prior to saving and to which file to direct the save. The resulting screen image file cannot be recalled.

Key Path	**Save, 3**

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
SCPI Command	`:MMEMory:STORe:SCReen:THEMe TDColor|TDMonochrome|FCOLor|FMONochrome` `:MMEMory:STORe:SCReen:THEMe?`
Setup	`:SYSTem:DEFault MISC`
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	`MMEM:STOR:SCR:THEM TDM`

3D Color

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

Key Path	Save, Screen Image, Themes, 1
Example	`MMEM:STOR:SCR:THEM TDC`

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	`MMEM:STOR:SCR:THEM TDM`

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	`MMEM:STOR:SCR:THEM FCOL`

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	`MMEM:STOR:SCR:THEM FMON`

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 softkeys. 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 As Dialog and Menu

The **Save As** is a standard Windows dialog and has Save As softkey menu. Each key in this softkey menu corresponds to the selectable items in the **Save As** dialog box. The softkeys 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 the user navigates to this selection, they have already constrained their Save Type and now they want to specify to which file to direct the save.

The **Save As** dialog is loaded with the file information related to whatever Save Type the user has previously specified. The filename is filled in using the auto file naming algorithm for the specific Save Type.

The **Save As** dialog will have the last path loaded into the **Save In:** for the specific save file type. User specified paths are remembered and persist through subsequent runs of the mode. These remembered paths are mode specific and are reset back to the default using **Restore Mode Defaults**.

Save

Performs the actual save to the specified file of the selected type. The act of saving does not affect the currently running measurement and does not require you to be in single measurement mode to request a save. It performs the save as soon as the currently running measurement is in the idle state; when the measurement completes. This ensures the State or Data that is saved includes complete data for the current settings. The save only waits for the measurement to complete when the state or data that depends on the measurement setup is being saved. The save happens immediately when exporting corrections or when saving a screen image.

If the file already exists, a dialog box will popup with corresponding softkeys that allows you to replace the existing file with an **Yes** or to stop the save with **No**. If you stop the save, then you can rename the file and continue with the file save operation.

While the save is being performed, the floppy icon shows up in the settings bar near the

Continuous/Single icon. After the save completes, the corresponding register softkey annotation is updated with the date the time and the message “File <file name> saved” appears in the message bar.

Restriction and Notes	If the file already exists, the File Exist dialog pops up and allows the user to replace it or not by selecting the Yes or No softkeys that appear with the dialog. Then the key causes an auto return and Save As dialog goes away. Advisory Event “File <file name> saved” after save is complete.

File/Folder List

Enables you to navigate to the center of the dialog that contains the list of files and folders. Once here you can get information about the file.

Key Path	Save, <various>, Save As…, 2
Restriction and Notes	Pressing this key navigates the user to the files and folders list in the center of the dialog.

File Name

Brings up the Alpha Editor as shown in the screen image. Use the knob to choose the letter to add and the **Enter** front panel key to add the letter to the file name. In addition to the list of alpha characters, this editor includes a **Space** softkey and a **Done** softkey. The **Done** softkey completes the filename, removes the Alpha Editor and returns back to the **File Open** dialog and menu, but does not cause the save to occur. You can also use **Enter** to complete the file name entry and this will cause the save to occur.

Key Path	Save, <various>, Save As…, 3
Restriction and Notes	Brings up the Alpha Editor. Editor created file name is loaded in the File name field of the Save As dialog.

Save As Type

This key corresponds to the **Save As Type** selection in the dialog. It follows the standard

Windows® supported **Save As Type** behavior. It shows the current file suffix that corresponds to the type of file you have selected to save. If you navigated here from saving State, “State File (*.state)” is in the dialog selection and is the only type available under the pull down menu. If you navigated here from saving Trace, “Trace+State File (*.trace)” is in the dialog selection and is the only type available under the pull down menu. If you navigated here from exporting a data file, “Data File (*.csv)” is in the dialog and is 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	Save, <various>, Save As…, 4
Restriction and Notes	Pressing this key causes the pull down menu to list all possible file types available in this context. All types available are loaded in a 1-of-N softkey for easy navigation.

Up One Level

This key corresponds to the icon of a folder with the up arrow that is in the tool bar of the dialog. 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	Save, <various>, Save As…, 5
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

Create New Folder

This key corresponds to the icon of a folder with the “*” that is in the tool bar of the dialog. It follows the standard Windows® supported **Create New Folder** behavior. When pressed, a new folder is created in the current directory with the name **New Folder** and allows you to enter a new folder name using the Alpha Editor.

Key Path	Save, <various>, Save As…, 6
Restriction and Notes	Creates a new folder in the current folder and lets the user fill in the folder name using the Alpha Editor.

Cancel

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

Key Path	Save, <various>, Save As…, 7
Restriction and Notes	Pressing this key causes the Save As dialog to go away and auto return.

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 Imag**e 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 softkey 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.

Key Path	**Recall, 1**
Remote Command Notes	No remote command directly controls the recall type that this key controls. The recall type is a parameter in the MMEM:LOAD command. An example is MMEM:LOAD:STATe <filename>.

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 softkeys: **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, 1
Example	*RCL 1

Key Path	Recall, State, 2
Example	*RCL 2

Key Path	Recall, State, 3
Example	*RCL 3

Key Path	Recall, State, 4
Example	*RCL 4

Key Path	Recall, State, 5
Example	*RCL 5

Key Path	Recall, State, 6

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, 7**
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 and will load State + Trace data from .trace files under that key.

SCPI Command	`:MMEMory:LOAD:STATe <filename>`
Example	:MMEM:LOAD:STAT “myState.state” recalls the file myState.state on the default path

Remote Command Notes	Although the trace data is included in the .state file it is not recalled; that is left for .trace files only for measurements that support recalling of trace data. Errors are generated if the specified file is empty or does not exist, or there is a file type mismatch.
Key Path	**Recall, State, From File…, 1**

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

Trace (+State)

When this key is pressed, the user has determined what they want to recall is **Trace**. Trace files include the state of the mode they were saved from as well as the trace data, with internal flags to indicate which trace the user was trying to save which may include ALL traces. They are otherwise identical to State files. Recalling **Trace** may cause a mode switch if the file selected is not for the currently active mode.

Not all modes support saving of trace data with the state; and for modes that do, not all measurements do. The **Trace** key is grayed out for measurements that do not support trace recall. It is blanked for modes that do not support trace recall.

This softkey will not actually cause the recall, since the recall feature still needs to know from which file to recall the trace and which trace to recall it into. Pressing this key will bring up the Recall Trace menu that provides the user with the options of where to retrieve the trace.

Key Path	**Recall, 2**

To Trace

These softkey selections let you pick which Trace to recall the saved trace into; either 1, 2, 3, 4, 5, or 6. The default is 1. If the .trace file is an “all trace” file, “**To Trace**” is ignored and the traces each go back to the trace they were saved from.

Once selected, the key returns back to the Recall Trace menu and the selected Trace number is annotated on the key. Now you have selected exactly where the trace needs to be recalled. In order to trigger a recall of the selected Trace, you must select the **Open** key in the Recall Trace menu.

Key Path	**Save, Data, Trace**

Open…

Pressing **Open** brings up the File Open standard Windows dialog and its corresponding File Open softkey menu. When the user navigates to this selection, they have already determined they are recalling **Trace** and now they want to specify from which file to do the recall.

When the user first enters 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 *.trace file is highlighted. Also, the only files that are visible are the *.trace `files` and the Files of type is *.trace, since .trace is the file suffix for the Trace Save Type.

Key Path	**Recall, Trace, 7**
Restriction and Notes	Brings up Open dialog for recalling a Trace Save Type

Open

Recalling **Trace** first must verify the file is recallable in this instrument by checking instrument software version and model number, since it includes State. If everything matches, a full recall proceeds by aborting the currently running measurement, loads the state from the saved state file to as close as possible to the context in which the save occurred. Users can open .trace files from any mode that supports them, so recalling a Trace 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 and the saved measurement of the mode becomes the newly active measurement and the data relevant to the measurement (if there is any) is recalled.

Once the state is loaded the trace data must be loaded. The internal flags are consulted to see which trace to load and the “To Trace” setting to see where to load it. Trace data is always loaded with the specified trace set to View, so that the data is visible and not updating (so as not to wipe out the recalled data). If the file is an “all trace” file, all traces are loaded with the saved data (to the original trace the data was saved from) and set to View. Traces whose data is not loaded are restored to the update state that existed when they were saved.

In every other way a Trace load is identical to a State load. See section “Open” on page 108 for details.

Key Path	**Recall, Trace, Open..., 1**
Restriction and Notes	Auto return to the Trace menu and the Open dialog goes away. Advisory Event “Recalled File <file name>” after recall is complete.
SCPI Command	`:MMEMory:LOAD:TRACe TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6,<filename>`
Example	`:MMEM:LOAD:TRAC TRACE2,"myState.trace"` recalls the file myState.trace on the default path; if it is a “single trace” save file, that trace is loaded to trace 2, and will is set to be not updating.

Data (Mode Specific)

Importing a data file is a way to replace current measurement data with data that was previously saved from this measurement or from other measurements that produce the same type of data. This import feature also allows the user to import data from different modes that produce the same type of data. The Import Menu will only includes Data Types that are supported by the current mode. And, Based on the currently active measurement, Data Types that are not relevant to the currently active measurement may be grayed out in the menu.

Since the commonly exported data files are in .csv format, the data can be edited by the user prior to importing. This allows the user to export a data file, manipulate the data in Excel (the most common PC Application for manipulating .csv files) and then import it.

When this key is pressed, the user has determined that they want to Import Data. Each mode determines what data it will allow to be exported and imported based on what data it produces. Importing **Data** loads measurement data from the specified file into the destination implied by the Import Data Type selected. The one data type that is available to all modes is **Amplitude Corrections**. The other data that is typically available in all modes is **Measurement Results**, but **Measurement Results** can not be imported. Other examples of mode specific Import Data are **Traces** and **Limits** which are Import Data associated with the

Swept SA measurement in Spectrum Analyzer mode.

The mode specific Import Data can be grayed out depending on the specific measurement that is running within the mode. For example, when in the SA mode and in the ACP measurement, the Trace Import Data is grayed out, since a trace (Trace1, Trace2, …) is not relevant when the ACP measurement is running.

Selecting an Import Data softkey will not actually cause the importing to occur, since the recall feature still needs to know from where to get the data. Pressing the **Open** key in this menu brings up the **Open** dialog and **Open** menu that provides you with the options from where to recall the data. Once a filename has been selected or entered in the **Open** menu, the recall will occur.

Key Path	Recall, 2
Remote Command Notes	No SCPI command directly controls the Data Type that this key controls. The Data Type is included in the MMEM:LOAD commands.
Preset	<mode specific>; Is not affected by Preset, but is reset during Restore Mode Defaults and survives subsequent running of the mode.

Trace

This key selects the **Traces** as the data type to be imported with this recall request. It brings up the Trace Menu that lets you select which Trace to import the data into

This key is grayed out when measurements are running that do not support trace importing.

Dependencies	Trace data is not available from all Measurements. In that case, the key will be grayed out. The key will not show if no measurements in the Mode support it.
Preset	1; not part of Preset, but is reset by Restore Mode Defaults and survives power cycles
State Saved	Saved in State
Key Path	**Recall, Data**

Trace 1, 2, 3, 4, 5, 6

These keys let you pick which Trace to import the data into; either **1**, **2**, **3**, **4**, **5** or **6**. The default is **1**.

Once selected, the key returns back to the Import Data menu and the selected Trace number is annotated on the key. Now you have selected exactly what needs to be imported.

In order to trigger a import of the selected trace, you must select the **Open** key in the Import Data menu.

An example of using this menu is: If you select 4 and continue to the File Open dialog, then import Trace 4 from the file selected or entered in **File Name** option in the File Open dialog.

Key Path	**Recall, Data, Trace**

Zone Map

A map file contains zone definitions that will help simplify making measurements of frequently used signals. The OFDMA frame structure can contain multiple-zone definitions for the uplink and downlink subframes and multiple data burst allocations. You can recall map files in which you have saved complicated OFDMA frame analysis zone definitions; this can save you time and ensure the accuracy of repeat measurements. Map files are also useful for recreating measurement settings so they can be used by other users.

Key Path	Recall, Data
Dependencies	Zone map data is not available from all Measurements. In that case, the key will be grayed out. The key will not show if no measurements in the Mode support it.

Capture Buffer

Capture Buffer functionality is not available for all measurements. The captured data is raw data (unprocessed).

Key Path	Recall, Data
Dependencies	Capture buffer data is not available from all Measurements. In that case, the key will be grayed out. The key will not show if no measurements in the Mode support it.

Open…

Pressing **File Open** brings up the File Open standard Windows dialog and the File Open key menu. When the user navigates to this selection, they have already determined they are recalling a specific Data Type and now they want to specify which file to open.

When you first enter this dialog, the path is in the **Look In:** field in this **File Open** dialog depends on which import data type you navigated here from.

The only files that are visible are those specific to the file type being recalled.

Key Path	**Recall, Data**
Restriction and Notes	Brings up Open dialog for recalling a <mode specific> Save Type

Open

The import starts by checking for errors. Then the import can start. For all data types, the actual import starts by aborting the currently running measurement. Then the import does data type specific behavior:

Trace Import: A trace cannot be imported if the trace points in the file do not match the sweep points in the mode. If this happens, an error is generated. When a trace is imported, then **Trace Update** is always turned OFF for that trace and **Trace Display** is always turned ON. The trace file has meta data. If the meta data in the file does not match the corresponding SA state, the dirty marker is displayed.

SCPI Command	`:MMEMory:LOAD:TRACe:DATA TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6,<filename>`
Example	:MMEM:LOAD:TRAC DATA TRACE2,"myTrace2.csv" imports the 2nd trace from the file myTrace2.csv in the default path.
Remote Command Notes	Errors are reported if the file is empty or missing, or if the file type does not match.

SCPI Name	Recall Zone Map
SCPI Command	`:MMEMory:LOAD:ZMAP <filename>`
Example	:MMEM:LOAD:ZMAP "myZoneMap.omf" recalls the Zone Map data from the file myZoneMap.omf on the default directory to the Custom Map for Modulation Analysis measurement.
Key Path	**Recall, Data, Zone Map**

Recall captured data for reuse in demod measurements using the Load Capture Buffer functionality. This function is enabled for 'Code Domain' and 'Modulation Accuracy' measurements only.

SCPI Command	`:MMEMory:LOAD:CAPTured <filename>`

Restriction and Notes	Errors are reported if the file is empty or missing, or if the file type does not match.
Key Path	**Recall, Data, File Open**
Example	:MMEM:LOAD:CAPT "My Documents\WCDMA\data\IQ\captureBuffer\myCaptureBuffer.bin"

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 softkeys 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 softkey 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

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 softkey 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 recalling Trace, “Trace+State File (*.trace)” is in the dialog selection and is the only type available under 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 softkey 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 softkey 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.

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 (bc)	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

User Preset behaves similarly to **Recall State** in that it recalls a hidden Save State file with the exception that **User Preset** will never cause a mode switch. Recalling a Save State file may cause a mode switch, if the Save State file was saved while in a different mode. There is a User Preset file per mode. The User Preset file is a Save State file. **User Preset** sets the state of currently active mode back to the state that was previously saved for this mode using the **Save User Preset** softkey or the `SYST:PRES:USER:SAVE` command. Each mode will have no knowledge of another user preset file from any other mode or how to invoke them. 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.

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 at power-on when each 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 Settings Defaults.

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.
- 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 softkey 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. (Note: My Documents must be located on the user data partition.).

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.

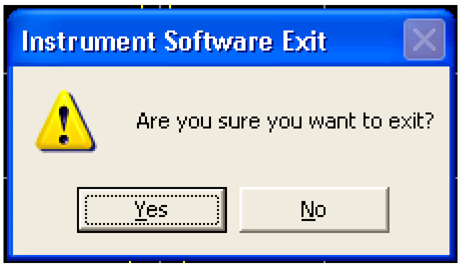
Mode	All
Remote Command	`:SYSTem:PRINt:THEMe TDColor | TDMonochrome | FCOLor | FMONochrome` `:SYSTem:PRINt:THEMe?`
Example	`:SYST:PRIN:THEM FCOL`
Preset	FCOL; not part of Preset, but is reset by Restore Misc Defaults or Restore System Defaults All and survives subsequent running of the modes
State Saved	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**

Window Control Keys

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

Multi-Window

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

Key Path	**Front-panel key**

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.

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.

Selected Window

One and only one primary 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.

Only primary windows may be selected.

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

If you have a mouse and you click on a window, that window is selected.

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.

Window precedence

The standard precedence that is used for primary windows is left/right top/bottom; that is, in the 4 primary-window case, window 1 is the top left, window 2 is the top right, window 3 is the bottom left, window 4 is the bottom right.

Select Display Format Tiled (remote command only)

Sets the display format for the current measurement to “un-zoomed”. This is the preset state of all measurements.

Remote Command	`:DISPlay:WINDow:FORMat:TILE`
Example	:DISP:WIND:FORM:TILE

Select Display Format Zoomed (remote command only)

Sets the display format for the current measurement to “zoomed”. Zooms the currently selected window.

Remote Command	`:DISPlay:WINDow:FORMat:ZOOM`
Example	:DISP:WIND:FORM:ZOOM

Window Focus Move Control (remote command only)

Selects a window for control and zooming for the current measurement.

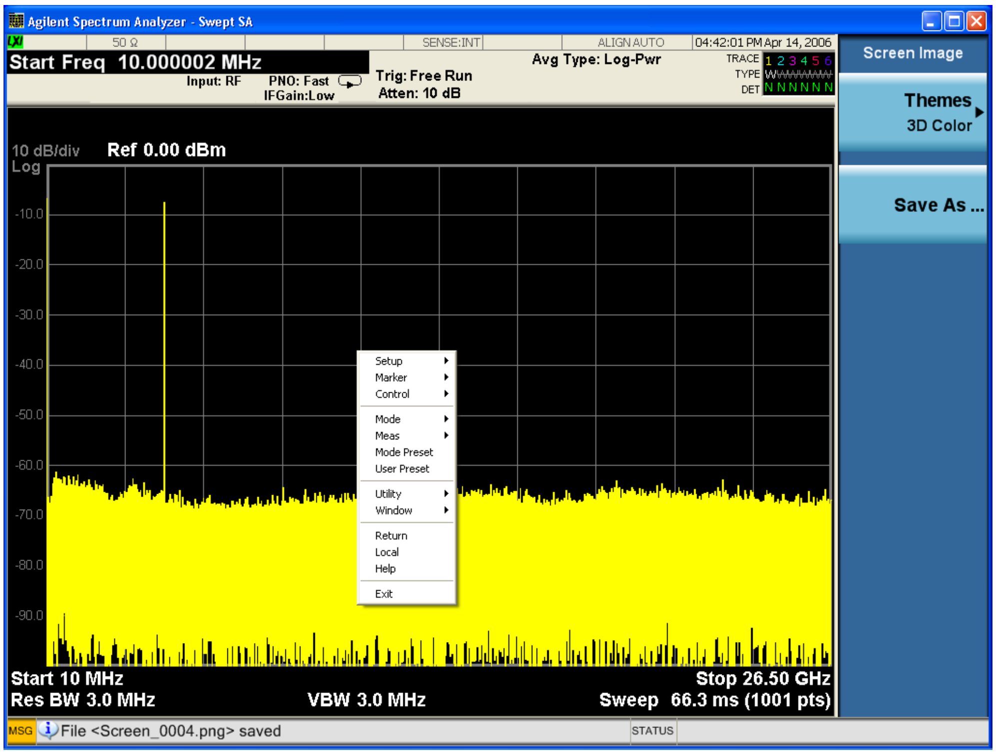
Remote Command	`:DISPlay:WINDow[:SELect] <number>` `:DISPlay:WINDow[:SELect]?`
Example	:DISP:WIND 1
Preset	1
Min	1
Max	If <number> is greater than the number of windows, limit to <number of windows>

Mouse and Keyboard Control

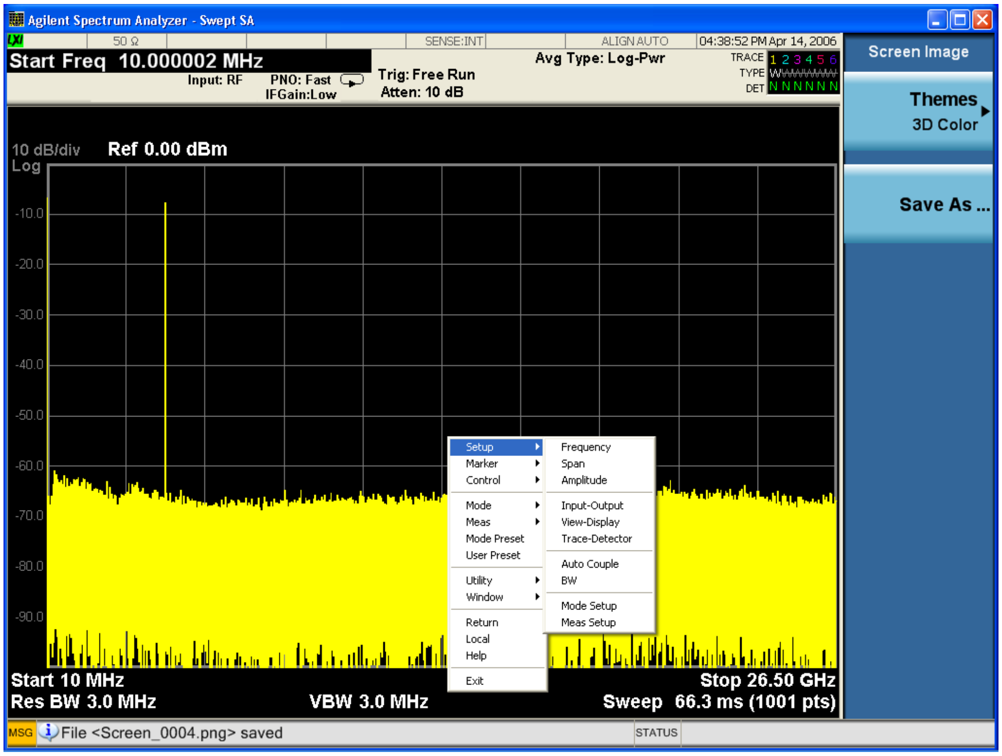
If you do not have access to the instrument front-panel, there are several ways that a mouse and PC Keyboard can give you access to functions normally accessed using the front panel keys.

Right-Click

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

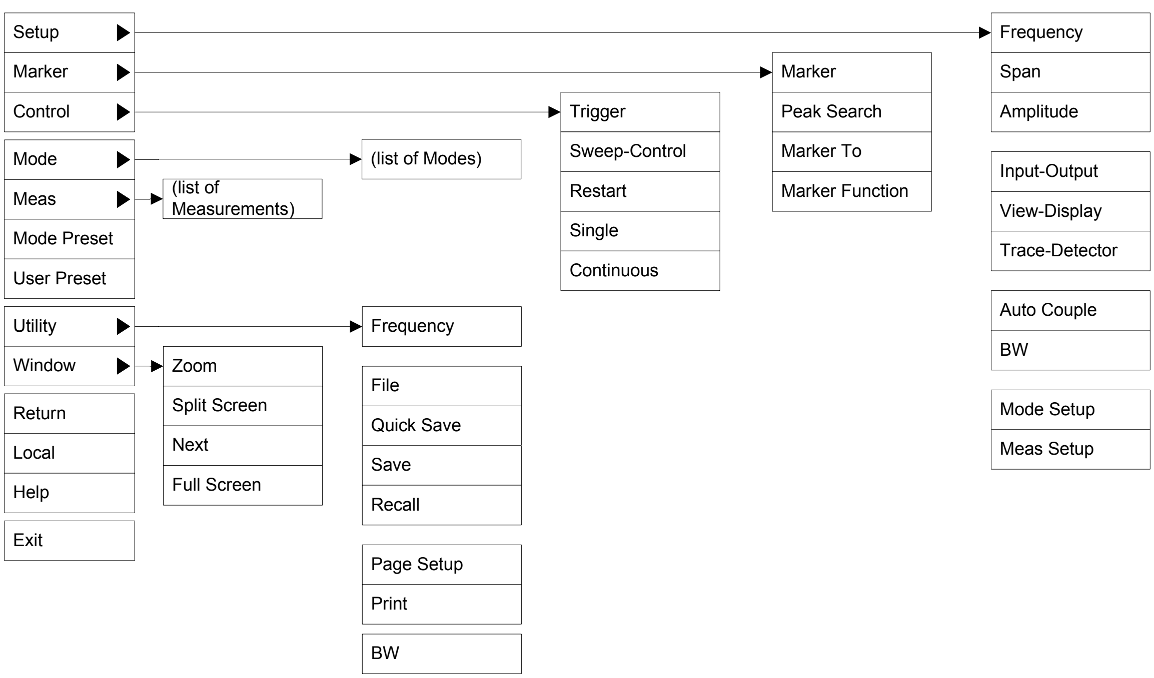


Placing the mouse on one of the rows marked with a right arrow symbol will cause that row to expand, as for example below where the mouse is hovered over the “Setup” row:



This method can be used to access any of the front-panel keys on the front panel 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

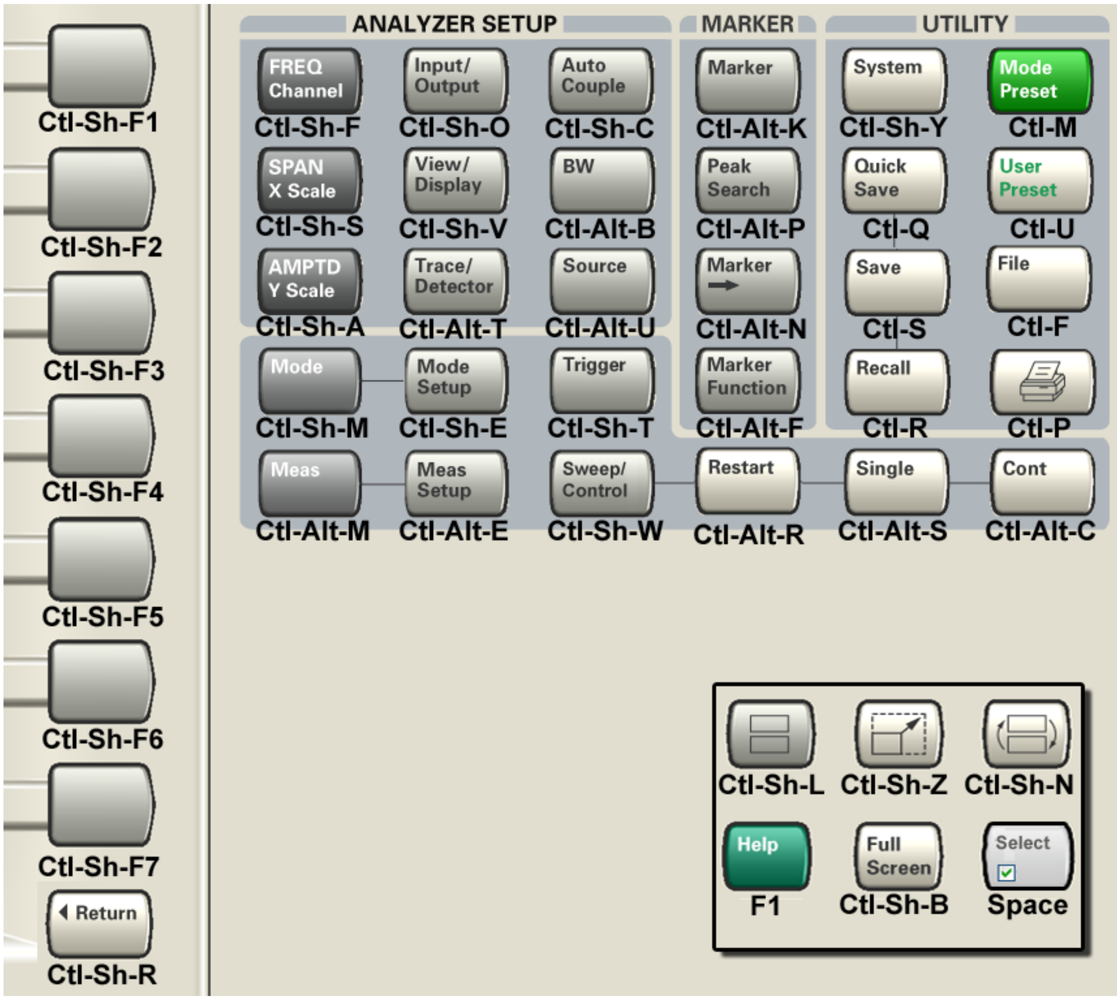
If you have a PC keyboard plugged in (or via Remote Desktop), certain keycodes on the PC keyboard map to front-panel keys on the GPSA front panel. These keycodes are shown below:

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
Quick Save	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

Single	CTRL+ALT+S
Cont	CTRL+ALT+C
Zoom	CTRL+SHIFT+Z
Next Window	CTRL+SHIFT+N
Split Screen	CTRL+SHIFT+L
Full Screen	CTRL+SHIFT+B
Return	CTRL+SHIFT+R
Mute	Mute
Inc Audio	Volume Up
Dec Audio	Volume Down
Help	F1
Control	CTRL
Alt	ALT
Enter	Return
Cancel	Esc
Del	Delete
Backspace	Backspace
Select	Space
Up Arrow	Up
Down Arrow	Down
Left Arrow	Left
Right Arrow	Right
Menu 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

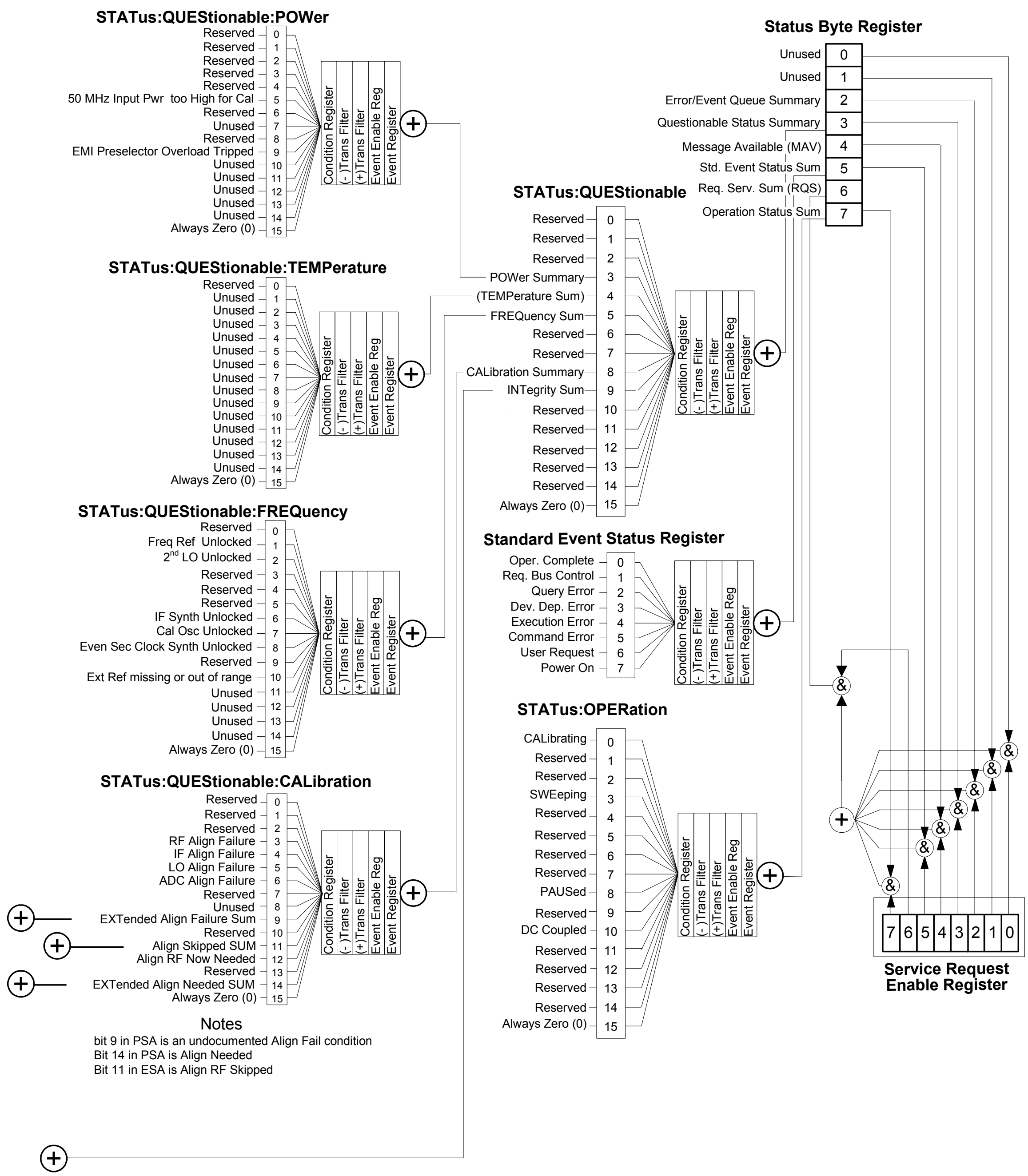
Here is a pictorial view of the table above:


ANALYZER SETUP
MARKER
UTILITY
Ctl-Sh-F1
Ctl-Sh-F2
Ctl-Sh-F3
Ctl-Sh-F4
Ctl-Sh-F5
Ctl-Sh-F6
Ctl-Sh-F7
Return
Ctl-Sh-R
FREQ Channel
Ctl-Sh-F
Input/ Output
Ctl-Sh-O
Auto Couple
Ctl-Sh-C
Marker
Ctl-Alt-K
System
Ctl-Sh-Y
Mode Preset
Ctl-M
SPAN X Scale
Ctl-Sh-S
View/ Display
Ctl-Sh-V
BW
Ctl-Alt-B
Peak Search
Ctl-Alt-P
Quick Save
Ctl-Q
User Preset
Ctl-U
AMPTD Y Scale
Ctl-Sh-A
Trace/ Detector
Ctl-Alt-T
Source
Ctl-Alt-U
Marker →
Ctl-Alt-N
Save
Ctl-S
File
Ctl-F
Mode
Ctl-Sh-M
Mode Setup
Ctl-Sh-E
Trigger
Ctl-Sh-T
Marker Function
Ctl-Alt-F
Recall
Ctl-R
Ctl-P
Meas
Ctl-Alt-M
Meas Setup
Ctl-Alt-E
Sweep/ Control
Ctl-Sh-W
Restart
Ctl-Alt-R
Single
Ctl-Alt-S
Cont
Ctl-Alt-C
Ctl-Sh-L
Ctl-Sh-Z
Ctl-Sh-N
Help
F1
Full Screen
Ctl-Sh-B
Select
Space

STATus Subsystem (No equivalent front panel keys)

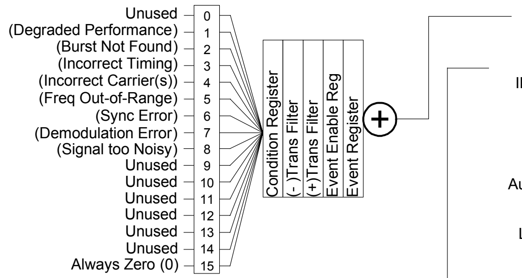
The following graphs show the Overall Status Subsystem.

Overall Status Byte Register System

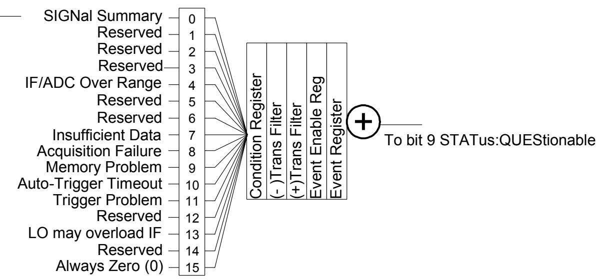


Additional Registers:

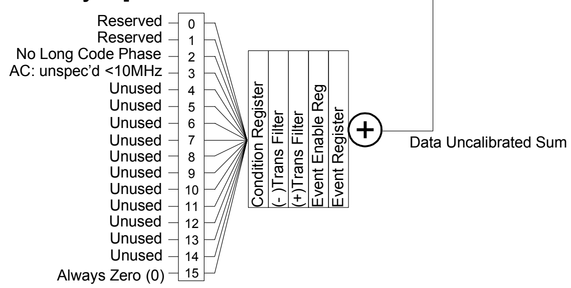
STATus:QUEStionable:INTegrity:SIGNal [for Base Analyzer]



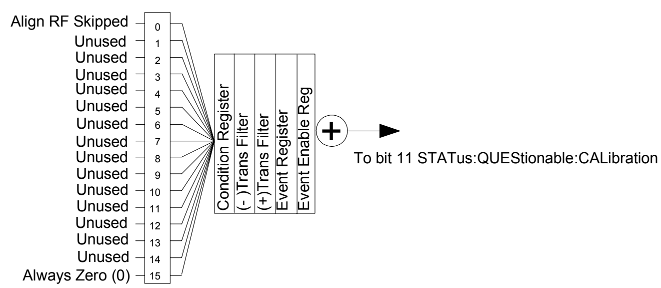
STATus:QUEStionable:INTegrity [for Base Analyzer]



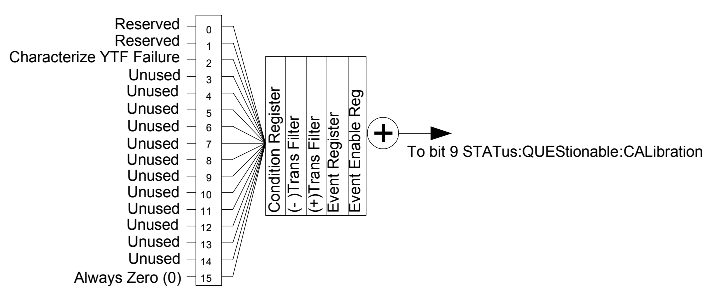
STATus:QUEStionable:INTegrity:UNCalibrated [for Base Analyzer]



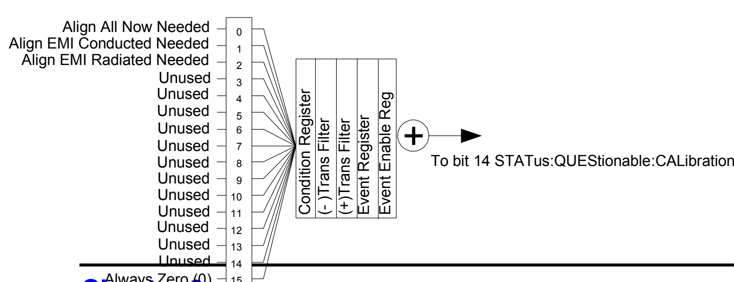
STATus:QUEStionable:CALibration:SKIPped



STATus:QUEStionable:CALibration:EXTended:FAILure



STATus:QUEStionable:CALibration:EXTended:NEEDed



Detailed Description

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

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

What Are Status Registers

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

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

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

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

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

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

What Are Status Register SCPI Commands

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

- *CLS (clear status) clears the status byte by emptying the error queue and clearing all the event registers.
- *ESE, *ESE? (event status enable) sets and queries the bits in the enable register part of the standard event status register.
- *ESR? (event status register) queries and clears the event register part of the standard event status register.
- *OPC, *OPC? (operation complete) sets the standard event status register to monitor the completion of all commands. The query stops any new commands from being processed until the current processing is complete, then returns a ‘1’.
- *PSC, *PSC? (power-on state clear) sets the power-on state so that it clears the service request enable register and the event status enable register at power on.
- *SRE, *SRE? (service request enable) sets and queries the value of the service request enable register.
- *STB? (status byte) queries the value of the status byte register without erasing its contents.

How to Use the Status Registers

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

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

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

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

Use the SRQ method when:

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

Use polling when:

- your programming language/development environment does not support SRQ interrupts
- you want to write a simple, single-purpose program and don't want the added complexity of setting up an SRQ handler
- To monitor a condition:

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).

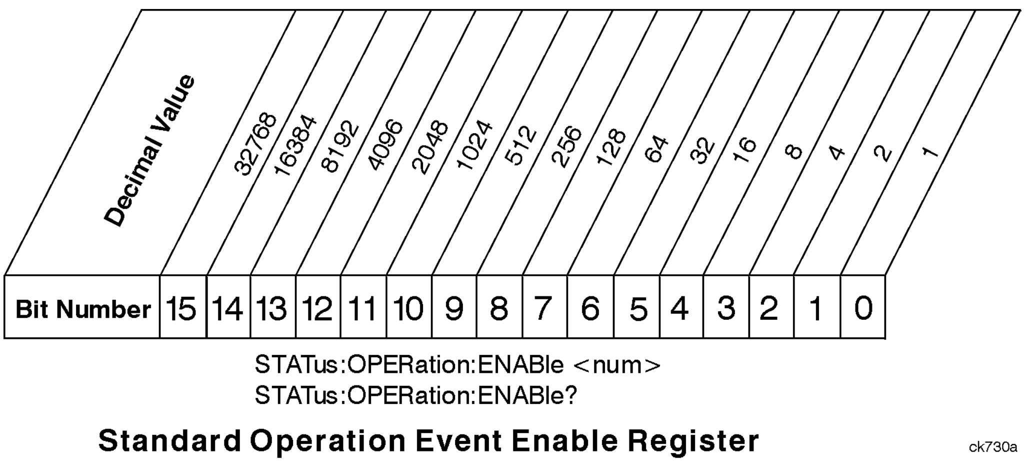
— It can also be set for both types of transitions occurring.

— 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



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.

NOTE 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.

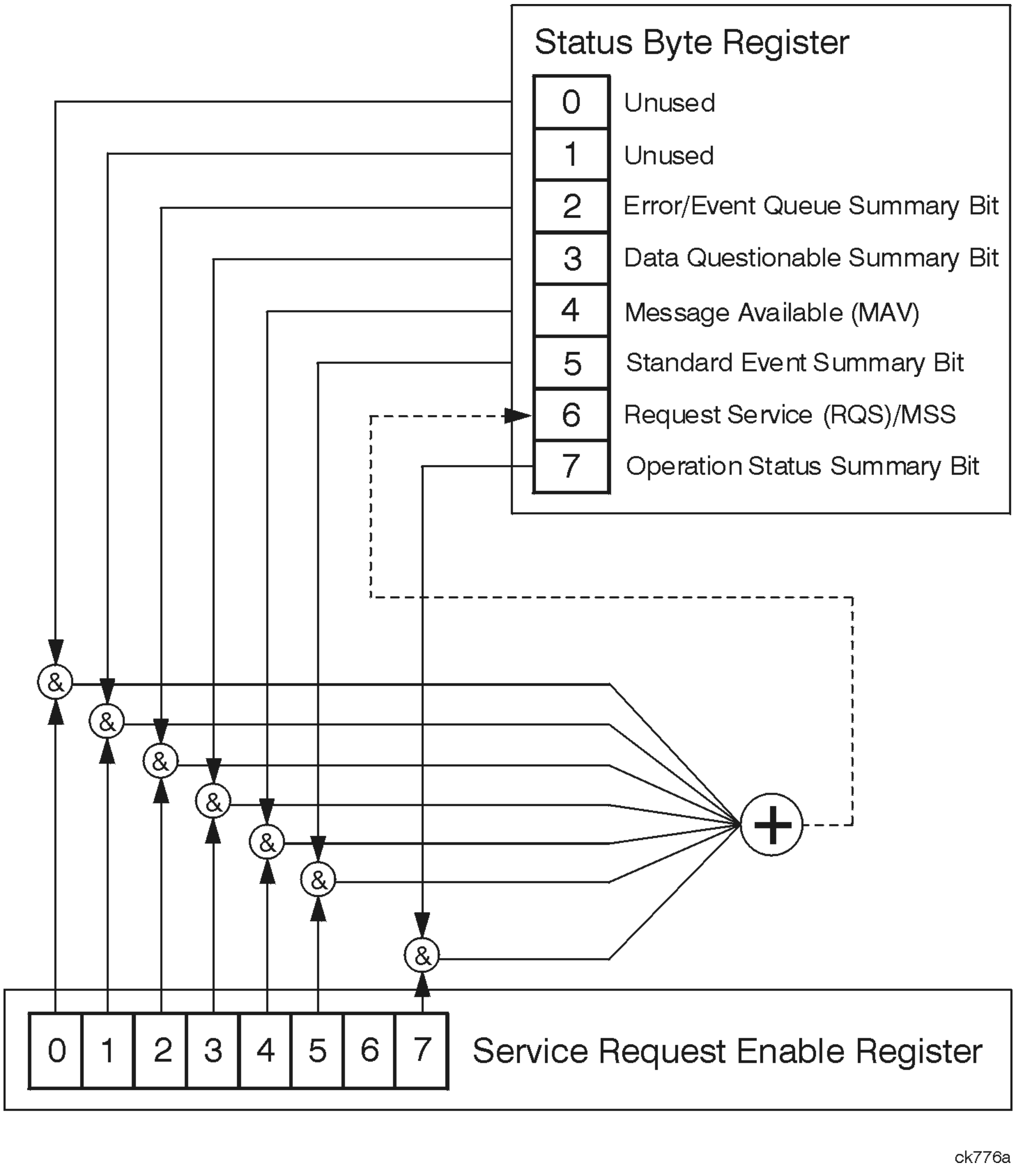
2. Set/enable the status registers.

3. Restart the measurement (send INIT).

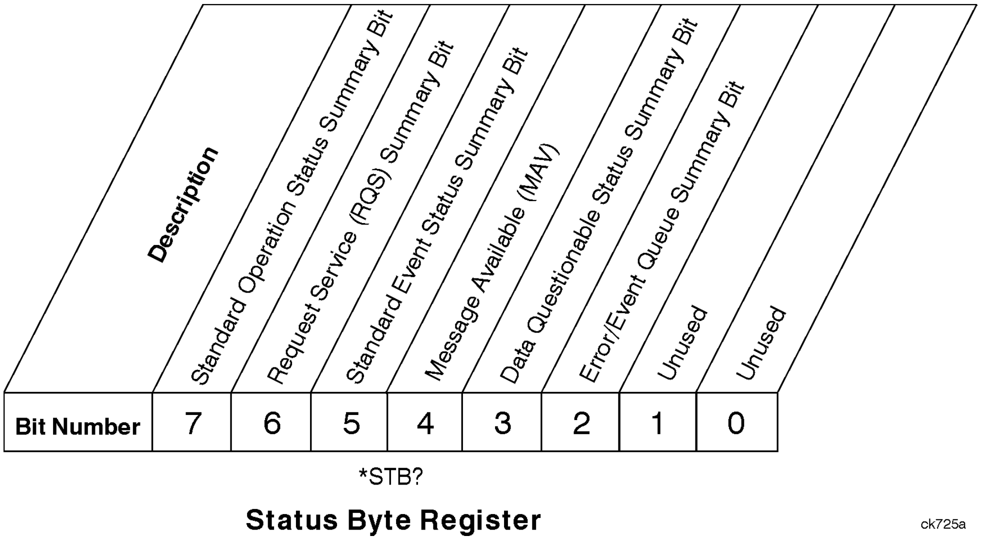
Status Register System

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



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.



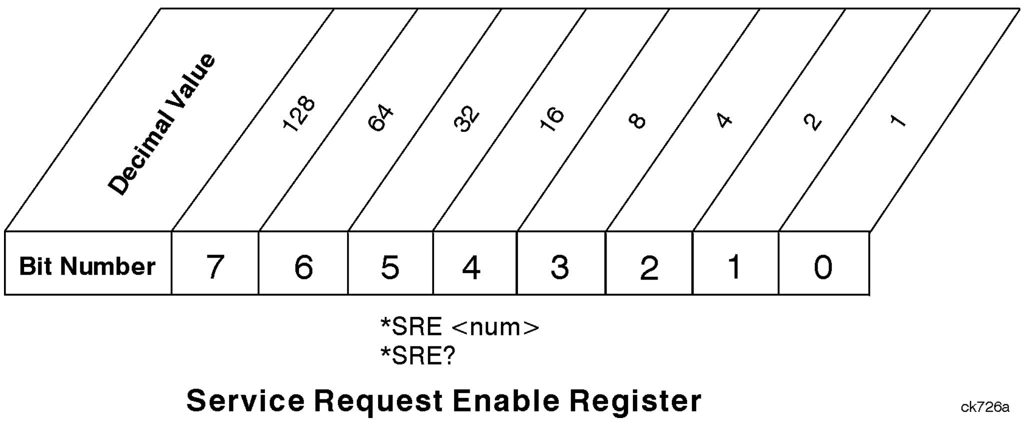
Bit	Description
0, 1	These bits are always set to 0.
2	A 1 in this bit position indicates that the SCPI error queue is not empty which means that it contains at least one error message.
3	A 1 in this bit position indicates that the data questionable summary bit has been set. The data questionable event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

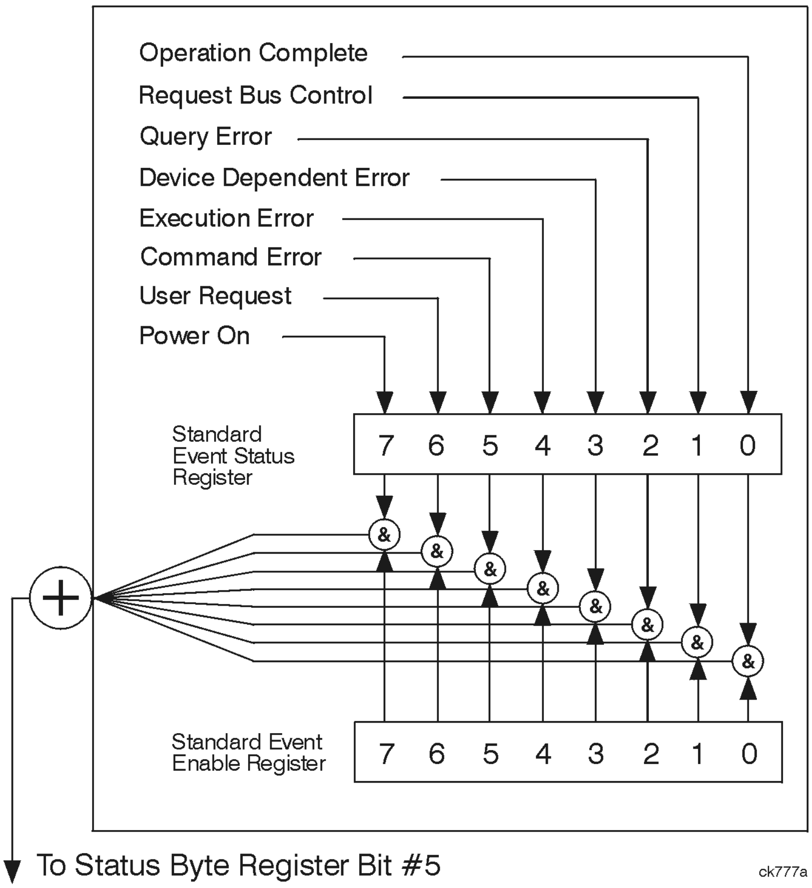
In addition to the status byte register, the status byte group also contains the service request enable register. This register lets you choose which bits in the status byte register will trigger a service request.

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.

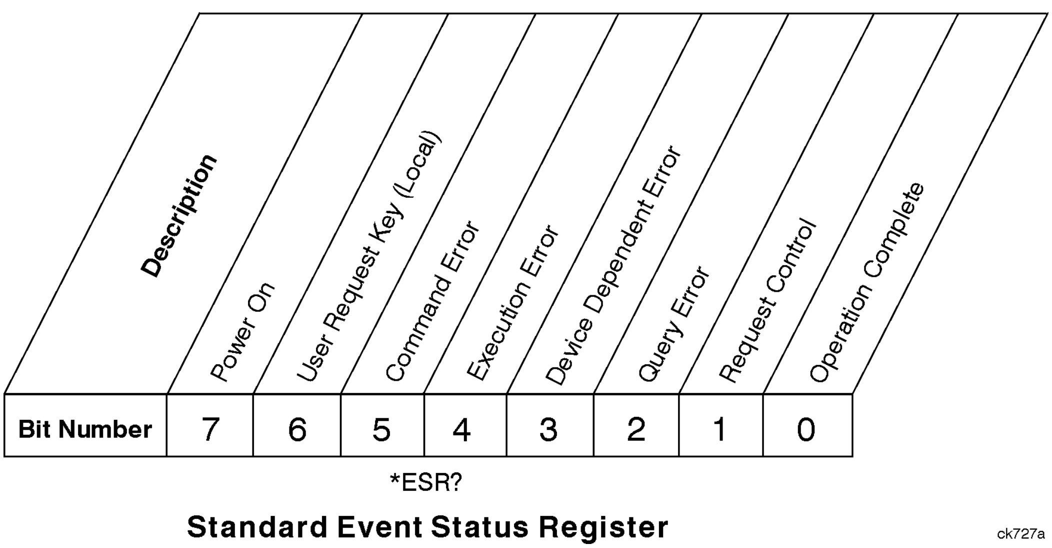
The service request enable register presets to zeros (0).



Standard Event Status Register



The standard event status register contains the following bits:



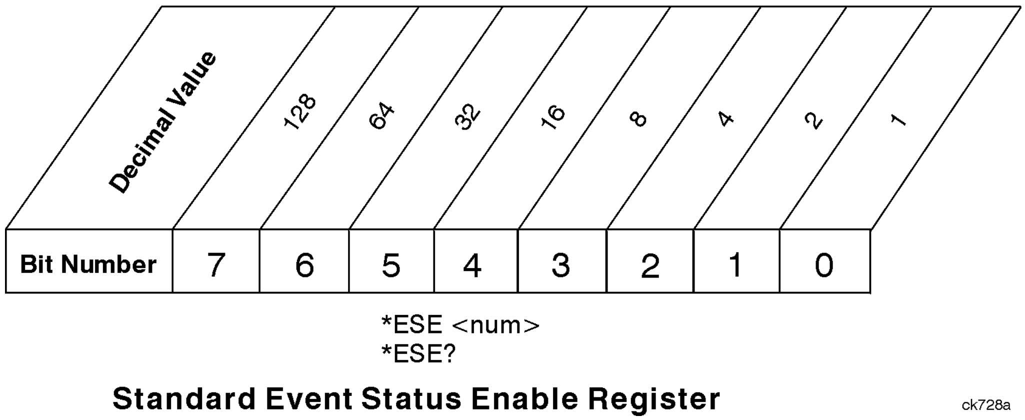
Bit	Description
0	A 1 in this bit position indicates that all pending operations were completed following execution of the *OPC command.

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).



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: ESA/PSA: Spectrum Analysis, Phase Noise, and ESA: Bluetooth, cdmaOne, GSM
5	Waiting for trigger	The instrument is waiting for the trigger conditions to be met, then it will trigger a sweep or measurement.
8	Paused	The instrument is paused (waiting) because you have pressed the Pause Meas Control key or send the INITiate:PAUSe command. Bit is currently only valid for Modes: ESA/PSA: Spectrum Analysis, Phase Noise, and ESA: Bluetooth, cdmaOne, GSM

Questionable Status Register

The questionable status register monitors the instrument’s condition to see if anything questionable has happened to it. It is looking for anything that might cause an error or a bad measurement like a hardware problem, an out of calibration situation, or a unusual signal. All the bits are summary bits from lower-level event registers.

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

STATus Subsystem Command Descriptions

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

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

Operation Register

Operation Condition Query 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.

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

Mode	All
Remote Command	`:STATus:OPERation:ENABle <integer>`
	`:STATus:OPERation:ENABle?`
Example	STAT:OPER:ENAB 1 Sets the register so that Align Now operation will be reported to the Status Byte Register.
Preset	0
Min	0
Max	32767
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 Dependencies	Sequential command

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	`:STATus:QUEStionable:ENABle 16 Sets the register so that temperature summary will be reported to the Status Byte Register` `:STATus:QUEStionable:ENABle?`
Example	STAT:OPER:PTR 1 Align Now operation beginning will be reported to the Status Byte Register.
Preset	0
Min	0
Max	32767
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	`:STATus:QUEStionable[:EVENt]?`
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	`:STATus:QUEStionable:NTRansition 16 Temperature summary 'questionable cleared' will be reported to the Status Byte Register.` `:STATus:QUEStionable:NTRansition?`
Example	STAT:QUES:NTR 16 Temperature summary 'questionable cleared' will be reported to the Status Byte Register.
Preset	0
Min	0
Max	32767
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 Dependencies	Sequential command

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 Dependencies	Sequential command

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

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

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:NEEDed[:EVENt]?`
Example	STAT:QUES:CAL:EXT:NEED?
Preset	0
SCPI Status Bits/OPC Dependencies	Sequential command

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

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

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

Mode	All
Remote Command	`:STATus:QUEStionable:CALibration:EXTended:NEEDed:PTRansition <integer>` `:STATus:QUEStionable:CALibration:EXTended:NEEDed:PTRansition?`
Example	STAT:QUES:CAL:EXT:NEED:PTR 2 Align EMI conducted is required.
Preset	32767
Min	0
Max	32767
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.

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 Dependencies	Sequential command

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 Dependencies	Sequential command

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 Dependencies	Sequential command

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

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

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

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 Bits/OPC Dependencies	Sequential command

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 Dependencies	Sequential command

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 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 Commands

Numeric values for bit patterns can be entered using decimal or hexidecimal 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]?

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,US00000713,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,FPR”. 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 softkeys for Recall Registers.
SCPI Status Bits/OPC Dependencies	The command is sequential.

Min	0
Max	127

Reset

This command does a Mode Preset and selects single sweep/measurement. It does not change the mode, and only resets the parameters for the current mode. And it does not do a *CLS which would clear the STATus bits and the error queue.

Remote Command	`*RST`
Example	*RST Presets the settings of the current mode.
Restriction and Notes	See the Mode Preset key description for more details about the implementation.

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 softkeys 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?`
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`
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.

•

3 Analyzer Setup Functions

This section describes both common analyzer setup functionality and functionality that is unique to the IQ Analyzer measurement application mode. These functions are context dependent and can change depending on the current settings at the Mode and Measurement levels. Some of the content is not directly applicable to the IQ Analyzer mode. This common analyzer functionality information is provided as reference material to better understand some of the unique features that are available in this mode.

The remote commands are mode dependent. Most are only available when the IQ Analyzer mode is selected. (INSTrument:SELect BASIC)

AMPTD, Y Scale

Some Amplitude 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 Amplitude front-panel key activates the Amplitude menu and selects Reference Level as the active function.

Attenuation

This menu controls both the electrical and mechanical attenuators and their interactions. The value read back on the key in square brackets is the current Total (Elec + Mech) attenuation. Note that when in “Pre-Adjust for Min Clip” this value can change at the start of every measurement.

All parameters in the Attenuation menus are Meas Global, meaning they are common to all the measurements and are unaffected by Meas Preset.

Key Path	AMPTD

Mech Atten Auto/Man

You can modify the mechanical attenuation applied to the RF input signal path with this feature. This value is normally auto coupled to the Ref Level, the Internal Preamp Gain, any External Gain that is entered, and the Max Mixer Level, as described in the table below. However, when the electrical attenuator is enabled, there is no Auto/Man functionality for the mechanical attenuator, and the third line of the key disappears. The Auto/Man state of the key is remembered and restored when the electrical attenuator is once again disabled.

SCPI Command	[:SENSe]:POWer[:RF]:ATTenuation <rel_ampl> [:SENSe]:POWer[:RF]:ATTenuation?
SCPI Command	[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1 [:SENSe]:POWer[:RF]:ATTenuation:AUTO?
Example	POW:ATT 20 Sets the attenuator to manual mode, and sets the value to 20 dB.

Dependencies	When the electrical attenuator is enabled, the mechanical attenuator has no auto setting and Auto/Man line on the key disappears. The state of Auto/Man is remembered and restored when the electrical attenuator is once again disabled. If it is restored to Man, the mechanical attenuation is set to the sum of the current values of mechanical and electrical attenuation, but if it is restored to Auto it recouples according to the Couplings, below.
Couplings	When the Input Attenuator is in 'auto', it uses the following algorithm to determine a value. Calculate a new value = ReferenceLevel + PreAmpGain + ExternalGain – RefLevelOffset - MaxMixerLevel + IF Gain. Limit this new value to be between 6 and 70 dB (no value below 6 dB can ever be chosen by Auto) The resulting value should be rounded up to the largest value possible given the attenuation step setting. That is, 50.01 dB would change to 60 dB (for a 10dB attenuation step).
Preset	Auto (usually 10 dB, On)
State Saved	Saved in State
Min	0 dB The mechanical attenuation cannot be decreased below 6 dB with the knob or step keys. To get to a value below 6 dB it has to be directly entered from the keypad or via SCPI. This protects from adjusting the attenuation to a dangerously small value which can put the instrument at risk of damage to input circuitry. However, if the current mechanical attenuation is below 6 dB it can be increased with the knob and step keys, but not decreased.
Max	70 dB
Key Path	AMPTD, Attenuation

Enable Elec Atten

You can enable or disable the Electrical Attenuator. The Electrical Attenuator offers no significant advantage over the Mechanical Attenuator for front-panel operation. Therefore it is assumed you will use the Mechanical Attenuator when operating the analyzer from the front-panel.

The electronic attenuator is unavailable above 3.6 GHz. Therefore, if the Stop Frequency of the analyzer is > 3.6 GHz then Enable Elec Atten is grayed out. If the Elec Atten is enabled, then the Stop Freq of the analyzer is limited to 3.6 GHz, which is to say the UI start, stop, center frequency and span values are all limited to a maximum of 3.6 GHz + Frequency Offset.

SCPI Command	`[:SENSe]:POWer[:RF]:EATTenuation:STATe OFF|ON|0|1` `[:SENSe]:POWer[:RF]:EATTenuation:STATe?`
Example	POW:EATT:STAT ON

Dependencies	The electronic attenuator is unavailable above 3.6 GHz. Therefore, if the Stop Frequency of the analyzer is > 3.6 GHz then the Elec Atten is grayed out. If the Elec Atten is enabled, then the Stop Freq of the analyzer is limited to 3.6 GHz.
Preset	OFF
State Saved	Yes
Key Path	AMPTD, Attenuation

When the Electrical Attenuator is enabled, the Mechanical Attenuator transitions to a state in which it has no Auto function. Here are the rules for transitioning the Mechanical Attenuator:

When the Electrical Attenuator is enabled:

- The Mechanical Attenuator is initialized to 10 dB (this is its optimal performance setting). You can then set it as desired with SCPI, numeric keypad, step keys, or RPG, and it behaves as it normally would in manual mode
- The Auto/Man state of Mech Atten is saved
- The Auto/Man line on the Mech Atten softkey disappears and the auto rules are disabled
- The Electrical Attenuator is set to 10 dB less than the previous value of the Mechanical Attenuator, within the limitation that it must stay within the range of 0 to 24 dB of attenuation.

Examples:

- Mech Atten at 20 dB. Elec Atten enabled, Mech Atten set to 10 dB, Elect Atten set to 10 dB. New total attenuation equals value before Elec Atten enabled.
- Mech Atten at 0 dB. Elec Atten enabled, Mech Atten set to 10 dB, Elect Atten set to 0 dB. New total attenuation does not equal value before Elec Atten enabled.
- Mech Atten at 40 dB. Elec Atten enabled, Mech Atten set to 10 dB, Elect Atten set to 24 dB. New total attenuation does not equal value before Elec Atten enabled.

When the Electrical Attenuator is disabled:

- The Elec Atten key is grayed out
- The Auto/Man state of Mech Atten is restored
- If now in Auto, Mech Atten recouples
- If now in Man, Mech Atten sets to the value of total atten that existed before the Elec Atten was disabled. The resulting value should be rounded up to the smallest value possible given the Mech Atten Step setting - (That is, 57 dB would change to 58 dB when Mech Atten Step is 2 dB.)

Elec Atten

You can modify the electrical attenuation using this function

SCPI Command	`[:SENSe]:POWer[:RF]:EATTenuation <rel_ampl>` `[:SENSe]:POWer[:RF]:EATTenuation?`
Restriction and Notes	Electrical Attenuation's spec is defined only when Mechanical Attenuation is 6 dB.
Dependencies	When Enable Elec Atten is off, Elec Atten key is grayed out.
Preset	0 dB
State Saved	Yes
Min	0 dB
Max	24 dB
Key Path	AMPTD, Attenuation

Adjust Atten for Min Clip

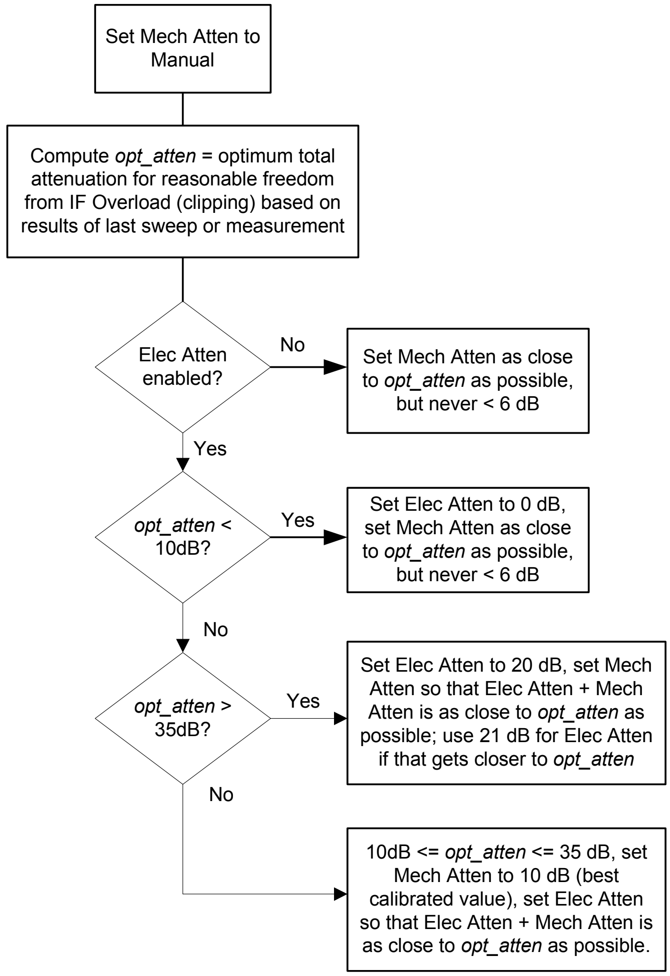
This function is similar to the "Optimize Ref Level" function in some measurements. Its purpose is to set the combination of mechanical and electrical attenuation based on the current measured signal level so that clipping will be at a minimum.

This is a "one-time" function, that is, it executes once, when the key is pressed.

This key is grayed out in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

SCPI Command	`[:SENSe]:POWer[:RF]:RANGe:OPTimize IMMediate`
Key Path	AMPTD, Attenuation

The algorithm to be used is as follows:



Pre-Adjust for Min Clip

This adjustment executes each time a measurement restarts. Therefore, in Continuous, it only executes before the first measurement.

This key is grayed out in measurements that do not support this functionality. The spectrum analyzer measurement, Swept SA, does not support this functionality.

SCPI Command	`[:SENSe]:POWer[:RF]:RANGe:OPTimize:ATTenuation OFF|ELECtrical|COMBined` `[:SENSe]:POWer[:RF]:RANGe:OPTimize:ATTenuation?`
Preset	
State Saved	Saved in State
Key Path	AMPTD, Attenuation

SCPI Command	`[:SENSe]:POWer[:RF]:RANGe:AUTO ON|OFF|1|0` `[:SENSe]:POWer[:RF]:RANGe:AUTO?`
Remote Command Notes	ON aliases to "Elec Atten Only" OFF aliases to "Off" The query returns true if not "Off"

Off

Example	:POW:RANGe:OPT:ATT OFF
Key Path	AMPTD, Attenuation, Pre-Adjust for Min Clip

Elec Atten Only

Example	:POW:RANGe:OPT:ATT ELEC
Key Path	AMPTD, Attenuation, Pre-Adjust for Min Clip

Mech + Elec Atten

Example	:POW:RANGe:OPT:ATT COMB
Key Path	AMPTD, Attenuation, Pre-Adjust for Min Clip

Mech Atten Step

This controls what step size is used when making adjustments to the Input Attenuation.

SCPI Command	[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement] 10dB | 2dB [:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement]?
Example	POW:ATT:STEP 2
Couplings	When the attenuation step size changes, the current mechanical attenuation value is adjusted (if necessary) to be quantized to the new step size. That is, if step is set to 10 dB, mech atten is increased if necessary so it is a multiple of 10 dB

Remote Command Notes	Note this feature works like a 1-N choice from the front panel, but it takes a specific value (in dB) when used remotely. The only valid values are 2 and 10.
Preset	2 dB
State Saved	Saved in State
Key Path	AMPTD, Attenuation

Max Mixer Level

The Max Mixer Level controls the limitation on the Ref Level for a given attenuation setting, and therefore also interacts with the Auto rules for selecting the attenuation as a coupling from the reference level.

SCPI Command	[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <real>
	[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer]?
Example	POW:MIX:RANG -15 dBm
Preset	-10 dBm
State Saved	Saved in State
Min	-50 dBm
Max	-10 dBm
Key Path	AMPTD, Attenuation
Default Terminator	Depends on the current selected Y axis unit, see Swept SA discussion of Y Axis Unit

Presel Center

When this key is pressed, the centering of the preselector filter is adjusted to optimize the amplitude accuracy at the frequency of the selected marker. If the selected marker is not on when Presel Center is pressed, the analyzer will turn on the selected marker, perform a peak search, then perform centering on the marker’s center frequency. If the selected marker is already on, and between the start and stop frequencies of the analyzer, the analyzer performs the preselector calibration on that marker’s frequency. If the selected marker is already on, but outside the frequency range between Start Freq and Stop Freq, the analyzer will first perform a peak search, then perform centering on the marker’s center frequency.

A number of considerations should be observed to ensure proper operation:

1. If the selected marker is already on, the analyzer will attempt the centering at that marker’s frequency.
2. There is no preselector for signals below about 3.6 GHz

3. The preselector can be bypassed (see **Input/Output, Preselector On/Off**). If it is bypassed, no centering will be attempted in that range.

When centering the preselector, *OPC will not return true until the process is complete and a subsequent measurement has completed, nor will results be returned to a READ or MEASure command. Note further that if the box is in a measurement such as averaging when this happens, the act of centering the preselector will restart averaging but the first average trace will not be taken until the centering is completed.

SCPI Command	`[:SENSe]:POWer[:RF]:PCENter`
SCPI Example	POW:PCEN
Dependencies	• Grayed out if microwave preselector is off (see **Input/Output, Microwave Preselector On/Off**) • If the selected marker's frequency is below Band 1, advisory 0.5001 is generated and no action is taken. • Grayed out if entirely in Band 0.. • Blank in models that do not include a preselector, such as option 503. If the SCPI is sent in such models, it generates an error.
Couplings	Active marker position determines where the centering will be attempted.
SCPI Notes	Note that the rules outlined above under the key description apply for the remote command as well as the key. Hence, the result of the command is dependent on marker position, etc. Any message shown by the keypress is also shown in response to the remote command.
Key Path	AMPTD
SCPI Status Bits/OPC Dependencies	The Measuring bit should remain set while this command is operating and should not go false until the subsequent sweep/measurement has completed.

Preselector Adjust

Allows you to manually adjust the preselector filter frequency to optimize its response to the signal of interest. This function is only available when **Presel Center** is available.

For general purpose signal analysis, using Presel Center is recommended. Centering the filter minimizes the impact of long-term preselector drift. Presel Adjust can be used instead to manually optimize the preselector. One application of manual optimization would be to peak the preselector response, which both optimizes the signal-to-noise ratio and minimizes amplitude variations due to small (short-term) preselector drifting.

Preselector Adjust is a Meas Global parameter.

SCPI Command	`[:SENSe]:POWer[:RF]:PADJust <freq>` `[:SENSe]:POWer[:RF]:PADJust?`
SCPI Example	POW:PADJ 100KHz POW:PADJ?
Dependencies	• Grayed out if microwave preselector is off (see **Input/Output, Microwave Preselector On/Off**) • Grayed out if entirely in Band 0. • Blank in models that do not include a preselector, such as option 503. If the SCPI is sent in these instruments, it generates an error.
Preset	0 MHz
State Saved	The **Presel Adjust** value set by **Presel Center**, or by manually adjusting **Presel Adjust**, is not saved in Instrument State, and does not survive Preset or power cycle.
Min	-500 MHz
Max	500 MHz
Key Path	AMPTD
Default Terminator	Hz

Internal Preamp

Accesses keys that control the internal preamps. Turning on the preamp gives a better noise figure, but a poorer TOI to noise floor dynamic range. You can optimize this setting for your particular measurement.

Preamp on/off and Preamp Band are Meas Global parameters.

SCPI Command	[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1 [:SENSe]:POWer[:RF]:GAIN[:STATe]?
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown.
Preset	OFF
State Saved	Saved in state
Key Path	AMPTD

SCPI Command	[:SENSe]:POWer[:RF]:GAIN:BAND LOW|FULL [:SENSe]:POWer[:RF]:GAIN:BAND?
Dependencies	Preamp is not available on all hardware platforms. If the preamp is not present or is unlicensed, the key is not shown.
Preset	OFF
State Saved	Saved in state
Key Path	AMPTD, Internal Preamp

Off

Turns the internal preamp off

Example	:POW:GAIN OFF
Key Path	AMPTD, Internal Preamp

Low Band

Sets the internal preamp to use only the low band (0-3 GHz)

Example	:POW:GAIN ON :POW:GAIN:BAND LOW
Key Path	AMPTD, Internal Preamp

Full Range

Sets the internal preamp to use its full range. The low band (0-3) GHz is supplied by the low band preamp and the frequencies above 3.6 GHz are supplied by the high band preamp.

The instrument compensates for the preamp gain(s) as it sweeps. For the value of “Int Preamp Gain” in the Ref Level equations, we assume a preamp gain of 20 dB in Low Band Preamp mode and 35 dB in Full Range preamp mode. These gain rules are not dependent on start and stop frequencies. These gains are the maximum gain of the preamp hardware; we will always have the same or less actual gain, providing clipping margin.

The frequency range of the installed (optional) preamp is displayed in square brackets on the key label. If the high band option is not installed the Full Range key does not appear.

Example	:POW:GAIN ON
	:POW:GAIN:BAND FULL
Key Path	AMPTD, Internal Preamp

AUTO COUPLE

The Auto Couple feature provides a quick and convenient way to automatically couple multiple instrument settings. This helps ensure accurate measurements and optimum dynamic range. When the Auto Couple feature is activated, either from the front panel or remotely, all parameters of the current measurement which have an Auto/Manual mode are set to Auto mode and all measurement settings dependent on (or coupled to) the Auto/Man parameters are automatically adjusted for optimal performance.

However, the **Auto Couple** key is meas local key, so its actions are confined to the current measurement only. It does not affect other measurements in the mode, and it does not affect markers, marker functions, or trace or display attributes.

Example	:COUP ALL
Remote Command Notes	:COUPle ALL puts all Auto/Man parameters in Auto mode (equivalent to pressing the **Auto Couple** key). :COUPLE NONE puts all Auto/Man parameters in Manual mode. It decouples all the coupled instrument parameters and is not recommended for making measurements.

BW

Bandwidth features are unique to each Measurement. See the specific Measurement for more information.

The front panel key accesses keys to control measurement bandwidth settings.

Key Path	Front panel key

FREQ Channel

Pressing this key allows you to select frequency or Channel Number settings, depending on the measurement.

Key Path	**Front panel key**

Center Freq

Specify the frequency that an analyzer acquires the IQ waveform.

Mode	BASIC
Remote Command	`[:SENSe]:FREQuency:CENTer <freq>` `[:SENSe]:FREQuency:CENTer?`
Remote Command Notes	This command is the same in all modes, but the parameter is Measurement Global. So the value is independent in each mode and common across all the measurements in the mode.
Preset	1.0 GHz
State Saved	Saved in instrument state.
Min	–79.999995 MHz
Max	Hardware Dependent: Opt503 = 3.699999995 GHz Opt508 = 8.499999995 GHz Opt513 = 13.799999995 GHz Opt526 = 26.999999995 GHz
Key Path	**Frequency/Channel**

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	`[:SENSe]:FEED RF|AREFerence` [:SENSe]:FEED?
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 selected, pressing this key accesses the RF input setup functions.

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

Input Z Correction

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

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

SCPI Command	[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude] 50|75
	[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]?
Example	CORR:IMP 75 sets the input impedance correction to 75 ohms.
	CORR:IMP?
Preset	This is unaffected by Preset but is set to 50 Ω on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
	Some instruments/options my have 75 Ω available.
State Saved	Saved in State
Key Path	Input/Output, RF

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.

This key is not available for instruments with options 544 and 550 (44 & 50 GHz). The coupling is always DC.

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

N6020A 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
Dependencies	Not available on 44 GHz or 50 GHz analyzers (Options 544 and 550). Grayed out when External Mixer is selected
Remote Command Notes	In instruments with options 544 and 550, the SCPI query INP:COUP? Always returns a DC
Preset	AC
State Saved	Saved in State
Key Path	Input/Output, RF

RF Calibrator

Lets you choose a calibrator signal to look at or turns the calibrator “off” (meaning switches back to the selected input). If one of the three calibrator signals (50 MHz, -25 dBm, the 4.8 GHz internal amplitude reference or the 300 MHz comb signal) is chosen (as opposed to OFF), the analyzer routes the selected internal amplitude reference as the input signal, while leaving the input selection in the menus (RF, Ext Mix or I/Q) unchanged.

The 50 MHz internal reference and the 300 MHz comb signal are available with all the frequency options. The 4.8 GHz internal reference is only available with 508, 513, 526.

This function presets to OFF on a Mode Preset, which causes the internal circuitry to switch back to the selected input (RF, Ext Mix or I/Q).

SCPI Command	[:SENSe]:FEED:AREFerence REF50|REF4800|COMB|OFF [:SENSe]:FEED:AREFerence?
Example	FEED:AREF REF50 selects the 50 MHz amplitude reference as the signal input. FEED:AREF REF4800 selects the 4.8GHz amplitude reference as the signal input FEED:AREF COMB selects the 300 MHz comb modulated signal as the signal input FEED:AREF OFF turns the calibrator “off” (meaning switches back to the selected input – RF, ExtMix or I/Q)
Dependencies	Selecting an input (RF, Ext Mix or I/Q) turns the Calibrator OFF. This is true whether the input is selected by the softkeys or with the [:SENSe]:FEED command.
Preset	OFF
State Saved	Saved in State
Key Path	Input/Output

50 MHz

Selects the 50 MHz internal reference as the input signal. This choice is available in all options: 503, 508, 513, 526.

Key Path	Input/Output, RF Calibrator

4.8 GHz

Selects the 4.8 GHz internal reference as the input signal.

Key Path	Input/Output, Amptd Ref

Comb

Selects the 300 MHz comb modulated signal as the input signal. This choice is available in all options: 503, 508, 513, 526.

Key Path	Input/Output, RF Calibrator

Off

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

Key Path	Input/Output, RF Calibrator

External Gain

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

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

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

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

Couplings	The Ext Preamp, MS and BS keys may be grayed out depending on which measurement is currently selected. If any of the grayed out keys are pressed, or the equivalent SCPI command is sent, an advisory message is generated.
Key Path	Input/Output

Ext Preamp

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

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

SCPI Command	[:SENSe]:CORRection:SA[:RF]:GAIN <rel_ampl>
	[:SENSe]:CORRection:SA[:RF]:GAIN?
Example	CORR:SA:GAIN 10 sets the Ext Gain value to 10 dB
	CORR:SA:GAIN -10 sets the Ext Gain value to -10 dB (that is, an attenuation of 10 dB)
Dependencies	The reference level limits are determined in part by the External Gain/Atten, Max Mixer Level, RF Atten.
	This key is grayed out in many application Modes.
Preset	This is unaffected by Preset but is set to 0 dB on a “Restore Input/Output Defaults” or “Restore System Defaults->All”
State Saved	Saved in State
Min	-81.90 dB
Max	81.90 dB
Key Path	Input/Output, Ext Gain

MS

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

SCPI Command	[:SENSe]:CORRection:MS[:RF]:GAIN <rel_ampl>
	[:SENSe]:CORRection:MS[:RF]:GAIN?
Example	CORR:MS:GAIN 10 sets the Ext Gain value to 10 dB
	CORR:MS:GAIN -10 sets the Ext Gain value to -10 dB (that is, a loss of 10 dB.)

Dependencies	The reference level limits are determined in part by the External Gain, Max Mixer Level, RF Atten This key is grayed out in the SA Mode.
Preset	This is unaffected by Preset but is set to 0 dB on a “Restore Input/Output Defaults” or “Restore System Defaults->All”
State Saved	Saved in State
Min	-50 dB
Max	50 dB
Key Path	Input/Output, Ext Gain

BTS

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

SCPI Command	[:SENSe]:CORRection:BTS[:RF]:GAIN <rel_ampl> [:SENSe]:CORRection:BTS[:RF]:GAIN?
Example	CORR:BTS:GAIN 10 sets the Ext Gain value to 10 dB CORR:BTS:GAIN -10 sets the Ext Gain value to -10 dB (that is, a loss of 10 dB.)
Dependencies	The reference level limits are determined in part by the External Gain, Max Mixer Level, RF Atten This key is grayed out in the SA Mode.
Preset	This is unaffected by Preset but is set to 0 dB on a “Restore Input/Output Defaults” or “Restore System Defaults->All”
State Saved	Saved in State
Min	-50 dB
Max	50 dB
Key Path	Input/Output, Ext Gain

Restore Input/Output Defaults

This selection causes the group of *settings* and *dat*a 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

Data Source

Gives you the choice of either using a hardware input signal as the input or raw data stored in a data storage buffer from an earlier acquisition. You can also share raw data across certain measurements that support this feature. The measurements must be capable of storing raw data. There are three choices under this menu. You can select "Inputs" which is the same as selecting one of the inputs from the input port, for example RF, AREF, I/Q, EXTMixer or IFALign. Selecting "Capture Buffer" allows you to use data that has been stored earlier in the same measurement or from a previous measurement using the "Current Meas -> Capture Buffer" feature.

SCPI Command	`[:SENSe]:FEED:DATA INPut|STORed` [:SENSe]:FEED:DATA?
Dependencies	Not all inputs are available in all modes. Unavailable keys are grayed out.
Remote Command Notes	INPuts = Inputs STORed = Capture Buffer
Preset	This is unaffected by Preset but is set to INPut on a "Restore Input/Output Defaults" or "Restore System Defaults->All"
State Saved	Saved in state
Key Path	Input/Output

Inputs

Sets the measurement to use the input selections (RF, AREF, EXTMix, I/Q)

Example	FEED:DATA INP causes the measurement to look at the input selection
Key Path	Input/Output, Data **Source**

Capture Buffer

Some WCDMA and demod measurements support this feature. This allows sharing of the raw data across certain measurements. If you want to make another measurement on the same signal, you would store that raw data using the “Current Meas -> Capture Buffer” key. Then the data is available for the next measurement to use. You must have raw data stored in the instrument memory before the Capture Buffer choice is available for use.

If you switch to a measurement that does not support this feature, then the instrument switches to use “Inputs” and grays out this key. If the grayed out key is pressed, it generates a message.

Example	FEED:DATA STOR causes stored measurement data to be used with a different measurement that supports this.
Dependencies	Grayed out in the SA measurement.
Key Path	Input/Output, Data **Source**

Current Meas -> Capture Buffer

Pressing this key stores the raw data of one measurement in the internal memory of the instrument where it can then be used by a different measurement by pressing “Stored Data”. When raw data is stored, then data source selection switch automatically changes to “Stored Data”. Stored raw data cannot be directly accessed by a user. There is no save/recall function to save the raw data in an external media. However if you want to get the stored raw data, you must first perform a measurement using the stored raw data. Now you can access the used raw data, which is the same as stored raw data, using the FETch or READ commands.

SCPI Command	[:SENSe]:FEED:DATA:STORe
Example	FEED:DATA:STOR stores recorded data
Dependencies	Grayed out in the SA measurement.
Remote Command Notes	This is command only, there is no query
Key Path	Input/Output, Data Source

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.
Key Path	Input/Output
SCPI Status Bits/OPC Dependencies	STATus:QUEStionable:FREQuency bit 2 set if unlocked.

SCPI Command	`[:SENSe]:ROSCillator:SOURce?`
Remote Command Notes	The query [SENSe]:ROSCillator:SOURce? returns the current switch setting. This means: 1. If it was set to SENSe but there is no external reference so the instrument is actually using the internal reference, then this query returns INTernal and not SENSe. 2. If it was set to SENSe and there is an external reference present, the query returns EXTernal and not SENSe. 3. If it was set to EXTernal, then the query returns "EXTernal" 4. If it was set to INTernal, then the query returns INTernal
Preset	SENSe

Sense

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

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

Internal

The internal reference is used.

Example	:ROSC:SOUR:TYPE INT
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	10 MHz
Max	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 legacy 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	:FORMat[:TRACe][:DATA] ASCii|REAL,32 |REAL,64 :FORMat[:TRACe][:DATA]?
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, INT,48) generates no error. The analyzer simply uses the default (8 for ASCii, 32 for INTeger, 32 for REAL). Sending data to the analyzer which does not conform to the current FORMat specified, results in an error.
Preset	ASCii

The specs for each output type follow:

ASCii - Amplitude values are in ASCII, in the current Y Axis Unit, one ASCII character per digit, values separated by commas, each value in the form:

SX.YYYYYEsZZ

Where:

S=sign (+ or -)

X=one digit to left of decimal point

Y=5 digits to right of decimal point

E=E, exponent header

s=sign of exponent (+ or -)

ZZ=two digit exponent

REAL,32 - Binary 32-bit real values in the current Y Axis Unit, in a definite length block.

REAL,64 - Binary 64-bit real values in the current Y Axis Unit, in a definite length block.

Format Data: Byte Order (Remote Command Only)

This command selects the binary data byte order for data transfer and other queries. It controls whether binary data is transferred in normal or swapped mode. This command affects only the byte order for setting and querying trace data for the TRACe[:DATA], TRACe[:DATA]?, CALCulate:DATA[n]?, and FETCh:SANalyzer[n]? commands and queries.

By definition any command that says it uses `FORMat:DATA` uses any format supported by `FORMat:DATA`.

The NORMal order is a byte sequence that begins with the most significant byte (MSB) first, and ends with the least significant byte (LSB) last in the sequence: 1|2|3|4. SWAPped order is when the byte sequence begins with the LSB first, and ends with the MSB last in the sequence: 4|3|2|1.

Parameter Name	Byte Order
SCPI Command	`:FORMat:BORDer NORMal|SWAPped`
	`:FORMat:BORDer?`
Preset	NORMal

Source

This mode does not have any Source control functionality.

Key Path	Front panel key

SPAN, X Scale

Span features are unique to each Measurement. See the specific Measurement for more information.

The front panel key accesses keys to control span (or X-axis) settings.

Key Path	Front panel key

Trace/Detector

There are no Trace/Detector functions for IQ Analyzer (Basic) mode.

Key Path	**Front Panel**

View/Display

The View/Display key opens up the View menu for the current measurement. This menu includes the **Display** key for controlling items on the display. The Display functions are common across multiple Modes and Measurements and are described in this section. See each measurement description for information on data views that are unique to that Measurement.

Views are different ways of looking at data, usually different ways of looking at the same data, especially when the data represents a time record that is being digitally processed with an FFT and/or other digital signal processing algorithms. In some modes, like the Spectrum Analyzer mode, we are mostly concerned with swept spectrum analysis, and those views may represent different ways of looking at the same signal.

Key Path	Front-panel key

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.

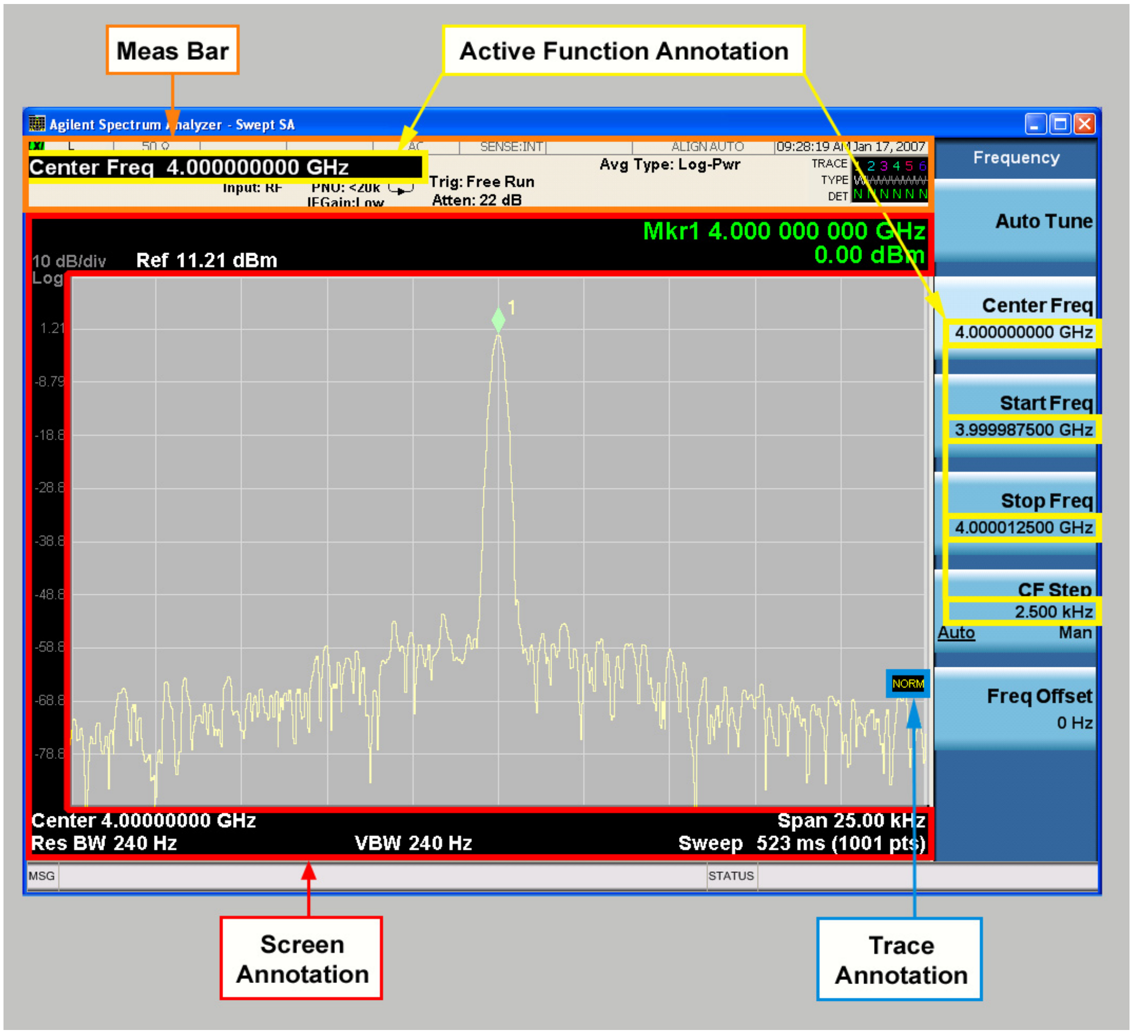
Key Path	View/Display

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.

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



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 softkeys 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**.

Pressing this key cancels any active function.

When a title is edited the previous title remains intact (it is not cleared) and the cursor goes at the end so that characters can be added or BKSP can be used to go back over previous characters.

Mode	SA
SCPI Command	`:DISPlay:<measurement>:ANNotation:TITLe:DATA <string>` `:DISPlay:<measurement>: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
Preset	On
State Saved	saved in instrument state

Key Path	View/Display, Display

Display Line

Activates an adjustable horizontal line that is used as a visual reference line. The line's vertical position corresponds to its amplitude value. The value of the display line (for example, "-20.3 dBm") appears above the line itself on the right side of the display in the appropriate font.

The display line can be adjusted using the step keys, knob, or numeric keypad. The unit of the Display Line is determined by the **Y axis unit** setting under **Amplitude**. If more than one window has a display line, the display line of the selected window is controlled.

If the display line is off the screen, it shows as a line at the top/bottom of the screen with an arrow pointing up or down. As with all such lines (Pk Thresh, Trigger Level, etc.) it is drawn on top of all traces.

The display line is unaffected by Auto Couple.

SCPI Command	`:DISPlay:WINDow[1]:TRACe:Y:DLINe <ampl>` `:DISPlay:WINDow[1]:TRACe:Y:DLINe?`
SCPI Command	`:DISPlay:WINDow[1]:TRACe:Y:DLINe:STATe OFF|ON|0|1` `:DISPlay:WINDow[1]:TRACe:Y:DLINe:STATe?`
Example	DISP:WIND:TRAC:Y:DLIN:STAT ON DISP:WIND:TRAC:Y:DLIN:STAT -32 dBm
Preset	Set the Display Line to Off and -25 dBm on Preset. When the Display Line goes from Off to On, if it is off screen, set it to either the top or bottom of screen, depending on which direction off screen it was. The Display Line's value does not change when it is turned off.
State Saved	Saved in instrument state.
Min	– ∞ (minus infinity) in current units
Max	+ ∞ (plus infinity) in current units
Key Path	View/Display, Display
Default Terminator	Depends on the current selected Y axis unit, for more information, refer to the *User's and Programmer's Reference*.

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**

Annotation On/Off

This is a Mode Global override of the meas local annotation settings. When it is OFF, it forces Screen Annotation, Meas Bar, Trace and Active Function Values settings to be OFF for all measurements in all modes. This provides the security based "annotation off" function of previous analyzers, hence it uses the legacy SCPI. Command.

When it is OFF, **Screen, Meas Bar, Trace** and **Active Function Values** keys under the **Display, Annotation** menu are grayed out and forced to OFF. When it is ON, it allows the local annotation settings to be set on a measurement by measurement basis.

To implement this feature properly will require overriding but not changing the local settings for the current measurement. If the measurement changes, the settings for the new measurement must likewise be overridden but not changed. Then if this function turns off, the settings will be returned to their local values.

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 On/Off

Allows you to turn the backlight on or off. This setting interacts 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.

Note that pressing this softkey (Backlight On/Off) will turn the backlight back on, simply because a key has been pressed, and then will turn it back off as the key action is taken. So the display will flash and go back to being off.

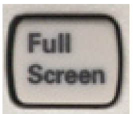
SCPI Command	`:DISPlay:BACKlight ON|OFF` `:DISPlay:BACKlight?`
Setup	`:SYSTem:DEFault MISC`
Preset	ON (Set by Restore Misc Defaults)
Key Path	View/Display, Display, **System Display Settings**

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**

Full Screen



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

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

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

Full Screen is a Mode Global function. Therefore it is not cancelled by the Preset key.

SCPI Command	`:DISPlay:FSCReen[:STATe] OFF|ON|0|1`
	`:DISPlay:FSCReen[:STATe]?`
Preset	Off
	Set by SYST:DEF MISC
State Saved	Not saved in state.
Key Path	Display

Display Enable (Remote Command Only)

Turns the display on/off, including the display drive circuitry and the backlight. The goals of turning the display off are three:

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

If you have turned off the display:

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

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

SCPI Command	`:DISPlay:ENABle OFF|ON|0|1`
	`:DISPlay:ENABle?`
Example	DISP:ENAB OFF
Couplings	DISP:ENAB OFF turns Backlight OFF and DISP:ENAB ON turns Backlight ON. However, settings of Backlight do not change the state of DISP:ENAB
Preset	On
	Set by SYST:DEF MISC, but Not affected by *RST or SYSTem:PRESet.
State Saved	Not saved in instrument state.

4 Marker Functions

Marker

Some Marker operation is 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 Marker key accesses the Marker menu. A marker can be placed on a trace to allow the value of the trace at the marker point to be determined precisely. The functions in this menu include a 1-of-N selection of the control mode Normal, Delta, Fixed, or Off for the selected marker. If the selected marker is Off, pressing Marker sets it to Normal and places it at the center of the screen on the trace determined by the Marker Trace rules.

Markers may also be used in pairs to read the difference (or delta) between two data points. They can be used in Marker Functions to do advanced data processing, or to specify operating points in functions like Signal Track and N dB Points.

Marker Fctn

Some Marker Functions 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 Marker Function key opens up a menu of keys that allow you to control the Marker Functions of the instrument. Marker Functions perform post-processing operations on marker data. Band Functions are Marker Functions that allow you to define a band of frequencies around the marker. The band defines the region of data used for the numerical calculations. These marker functions also allow you to perform mathematical calculations on trace and marker data and report the results of these calculations in place of the normal marker result.

NOTE	Unlike regular markers, marker function markers are not placed directly on the trace. They are placed at a location which is relative to the result of the function calculation.

Marker To

Some Marker operation is 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.

Peak Search

Pressing the Peak Search key displays the Peak Search menu and places the selected marker on the trace point with the maximum y-axis value for that marker's trace. The Peak Search features allow you to define specific search criteria to determine which signals can be considered peaks, excluding unwanted signals from the search.

If **Same as "Next Peak" Criteria** is selected, and either **Pk Excursion** or **Pk Threshold** are on, a signal must meet those criteria. If no valid peak is found, a message is generated and the marker is not moved. When **Highest Peak** is on, or both **Pk Excursion** and **Pk Threshold** are off, the marker is always placed at the point on the trace with the maximum y-axis value, even if that point is on the very edge of the trace (exception: negative frequencies and signals close to the LO are not searched at all).

Pressing Peak Search with the selected marker off causes the selected marker to be set to **Normal** at the center of the screen, then a peak search is immediately performed.

5 Measurement Functions

Some of the content described in this section is not directly applicable to the IQ Analyzer Mode. This is common analyzer functionality information that can be used as reference material. It provides additional information about some of the unique features that are available in the measurements in this mode.

Meas

The information in this section is common to all measurements. For key and remote command information on each measurement, refer to the section which describes the measurement of interest.

Measurements available under the **Meas** key are specific to the current Mode.

When viewing Help for measurements, note the following:

NOTE You cannot get help for a measurement by pressing one of the measurement softkeys. One way to get help for a measurement is through the Help table of contents, which contains a book for each measurement. To see help for a measurement, click its book in the table of contents. For example, click the “ACP Measurement” book in the table of contents to display help for the ACP measurement.

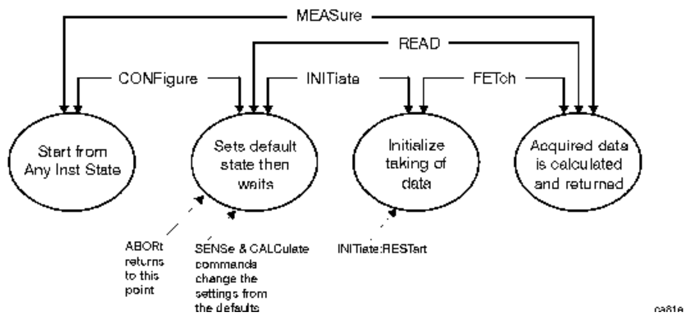
NOTE Operation for some keys differ between measurements. The information displayed in Help pertains to the current measurement. To see how a key operates in a different measurement, exit Help (press the Cancel Esc key), select the measurement, then reenter Help (press the Help key) and press that key.

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 (e.g. radio standard) that you have currently selected.

- Stops the current measurement (if any) and sets up the instrument for the specified measurement using the factory defaults
- Initiates the data acquisition for the measurement
- Blocks other SCPI communication, waiting until the measurement is complete before returning results.
- If the function does averaging, it is turned on and the number of averages is set to 10.
- After the data is valid it returns the scalar results, or the trace data, for the specified measurement. The type of data returned may be defined by an [n] value that is sent with the command.

  The scalar measurement results will be returned if the optional [n] value is not included, or is set to 1. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available.

  ASCII is the default format for the data output. (Older versions of Spectrum Analysis and Phase Noise mode measurements only use ASCII.) The binary data formats should be used for handling large blocks of data since they are smaller and faster than the ASCII format. Refer to the FORMat:DATA command for more information.

If you need to change some of the measurement parameters from the factory default settings you can set up the measurement with the CONFigure command. Use the commands in the SENSe:<measurement> and CALCulate:<measurement> subsystems to change the settings. Then you can use the READ? command to initiate the measurement and query the results.

If you need to repeatedly make a given measurement with settings other than the factory defaults, you can use the commands in the SENSe:<measurement> and CALCulate:<measurement> subsystems to set up the measurement. Then use the READ? command to initiate the measurement and query results.

Measurement settings persist if you initiate a different measurement and then return to a previous one. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to the default settings, use MEASure:<measurement>?.

Configure Commands:

:CONFigure:<measurement>

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using the factory default instrument settings. It does not initiate the taking of measurement data unless INIT:CONTinuous is ON. If you change any measurement settings after using the CONFigure command, the READ command can be used to initiate a measurement without changing the settings back to their defaults.

In the Swept SA measurement in Spectrum Analyzer mode the CONFigure command also turns the averaging function on and sets the number of averages to 10 for all measurements.

:CONFigure: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 then 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 then 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 in each measurement section for information about what data is returned for the subopcodes.

Remote Command	`:CALCulate:DATA[n]?`
Notes	The return trace depends on the measurement. In CALCulate:DATA[n], n is any valid subopcode for 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:<measname>? 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|SDEViation|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: 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 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 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 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)

  $$\mathrm{MEAN} = \frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} Xi$$

where Xi 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)

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

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

- *DMEan* - returns 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)

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

- *RMS* - returns 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)

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

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

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

$$\mathrm{RMS} = \sqrt{\frac{1}{n} \sum_{Xi \in \mathrm{region(s)}} Xi\, Xi^*}$$

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

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

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

- *SAMPle* - returns the first data value for the specified region(s) of trace data. For I/Q trace data, the first I/Q pair is returned.
- *SDEViation* - returns 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)

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

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

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

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

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

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

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

  Power = 10 x log [10 x (RMS I/Q value)] + 10.

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

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

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

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

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

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

Figure 5-3 **Sample Trace Data - Constant Envelope**

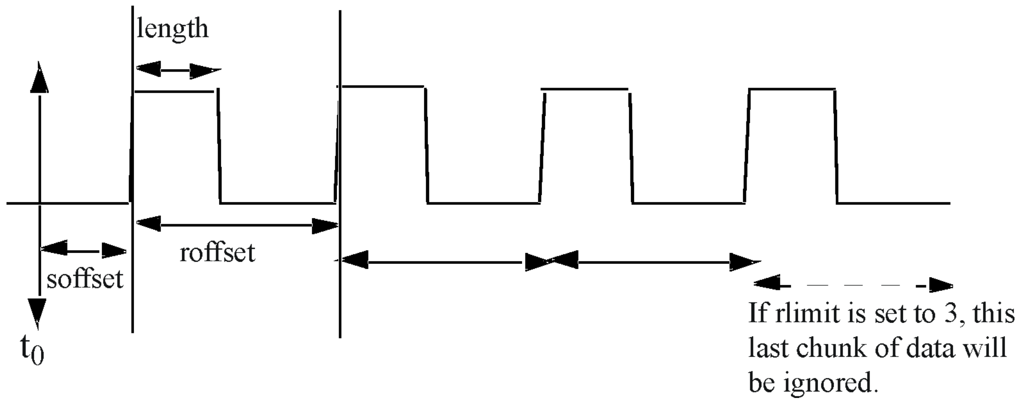
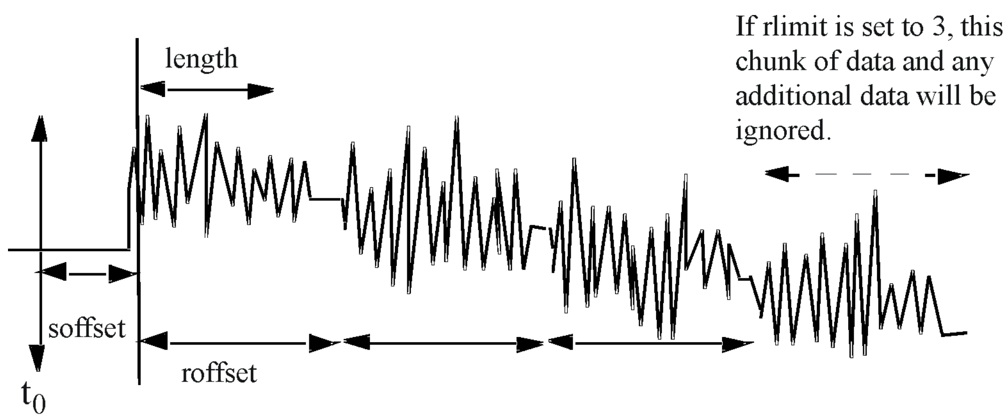


Figure 5-4 **Sample Trace Data - Not Constant Envelope**



<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:<measname> 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|LTDLine]]`
Remote Command	For Swept SA measurement: `:CALCulate:DATA[1]|2|3|4|5|6:PEAKs? <threshold>,<excursion>[,AMPLitude|FREQuency|TIME[,ALL|GTDLine|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 0.0 dB. Also note that the excursion value used in this command is independent of and has no effect on the excursion value stored under the Peak Criteria menu.

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 Setup

Meas Control features are unique to each Measurement. See the specific Measurement for more information.

Key Path	Front panel key

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|PNOISE|EDGEGSM|BASIC|WIMAXOFDMA|PNOISE|WCDMA|VSA89601` `: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>
Spectrum Analyzer	1	SA
I/Q Analyzer (Basic)	8	BASIC

WCDMA with HSDPA/HSUPA	9	WCDMA
Phase Noise	14	PNOISE
802.16 OFDMA (WiMAX/WiBro)	75	WIMAXOFDMA
89601 VSA	101	VSA89601

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?`

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.

Mode Setup

There are no Mode Setup functions for IQ Analyzer (Basic) mode.

Key Path	**Front Panel**

Restart

The Restart function restarts the current sweep, or measurement, or set of averaged/held 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.

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.

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.

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, pressing the **Single** key in the middle of a sweep or if the sweep is not in the idle state (for instance, if you are taking a very slow sweep, or the analyzer is waiting for a trigger) results in a message.

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`.

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.

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

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

This section describes the keys in the Sweep, Control and Capture menu that are common to multiple Modes and Measurements. See the Measurement descriptions for information on features that are unique.

NOTE	The Meas Uncal (measurement uncalibrated) warning is given in the Status Bar in the lower right corner of the screen when the manual sweep time entered is shorter than what is computed by the instrument.

Key Path	Front panel key

Pause/Resume

Pauses a measurement after the current data acquisition is complete.

When Paused, the label on the key changes to Resume. Pressing Resume un-pauses the measurement.

SCPI Command	`INITiate:PAUSe`
Dependencies	Grayed out in Measurements that don't support Pausing. Blanked in Modes that don't support Pausing
Key Path	Sweep/Control

SCPI Command	`INITiate:RESume`
Dependencies	Grayed out in Measurements that don't support Pausing. Blanked in Modes that don't support Pausing
Key Path	Sweep/Control

Abort (Remote Command Only)

This command is used to stop the current measurement. It aborts the current measurement as quickly as possible, resets the sweep and trigger systems, and puts the measurement into an "idle" state. If the analyzer is in the process of aligning when `ABORt` is sent, the alignment finishes before the abort function is performed. So `ABORt` does not abort an alignment.

If the analyzer is set for Continuous measurement, it sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met.

If the analyzer is set for Single measurement, it remains in the "idle" state until an `INIT:IMM` command is received.

SCPI Command	:ABORt
Example	:ABOR
Remote Command Notes	If `INITiate:CONTinuous` is `ON`, then a new continuous measurement will start immediately; with sweep (data acquisition) occurring once the trigger condition has been met. If `INITiate:CONTinuous` is `OFF`, then `INITiate:IMMediate` is used to start a single measurement; with sweep (data acquisition) occurring once the trigger condition has been met.
SCPI Status Bits/OPC Dependencies	The STATus:OPERation register bits 0 through 8 are cleared. The STATus:QUEStionable register bit 9 (INTegrity sum) is cleared. Since all the bits that feed into OPC are cleared by the ABORt, the ABORt will cause the *OPC query to return true.

Gate

The Gate key in the Sweep/Control menu accesses a menu that enables you to control the gating function.

The Gate functionality is used to view signals best viewed by qualifying them with other events. Gate setup parameters are meas global, so the settings will be the same in all the measurements.

Note that Sweep Time autocoupling rules and annotation are changed by Gate being on.

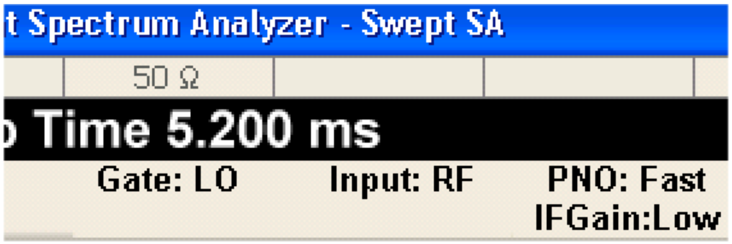
Key Path	Sweep/Control

Gate On/Off

Turns the gate function on and off.

When the Gate Function is on, the selected Gate Method is used along with the gate settings and the signal at the gate source to control the sweep and video system with the gate signal. Not all measurements allow every type of Gate Methods.

When Gate is on, the annunciation in the Meas Bar reflects that it is on and what method is used, as seen in the "Gate: LO" annunciator below.



SCPI Command	[:SENSe]:SWEep:EGATe[:STATe] OFF|ON|0|1
	[:SENSe]:SWEep:EGATe[:STATe]?
Example	SWE:EGAT ON
	SWE:EGAT?
Dependencies	The function is unavailable (grayed out) and Off when:
	Gate Method is LO or Video and FFT Sweep Type is manually selected.
	Gate Method is FFT and Swept Sweep Type is manually selected.
	Marker Count is ON.
Coupling	When Meas Method is RBW or FAST, this function is unavailable and the key is grayed out.
	Whenever Gate is on, Meas Method, RBW or FAST is unavailable and keys for those are grayed out.
	When Gate is on, Offset Res BW and Offset Video BW is ignored (if user sets these values) and measurement works like as all Offset Res BW and all Offset Video BW are coupled with Res BW and Video BW under BW menu. When Gate is on, Offset BW key in Offset/Limit menu is grayed out.
Preset	SA, WCDMA, C2K: OFF
	WIMAX OFDMA: ON
Range	On|Off
State Saved	Saved in State
Key Path	Sweep/Control, **Gate**

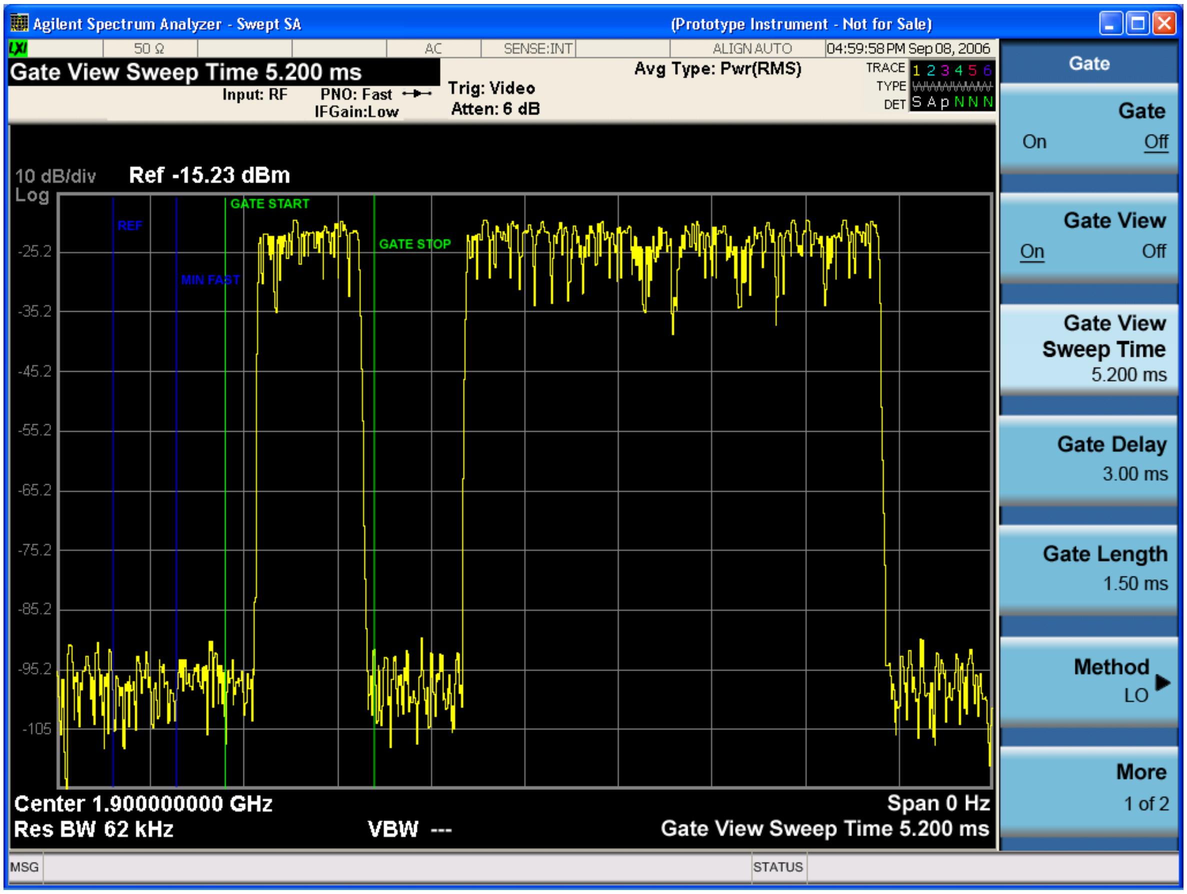
Gate View On/Off

Turning on Gate View in the Swept SA measurement provides a single-window gate view display.

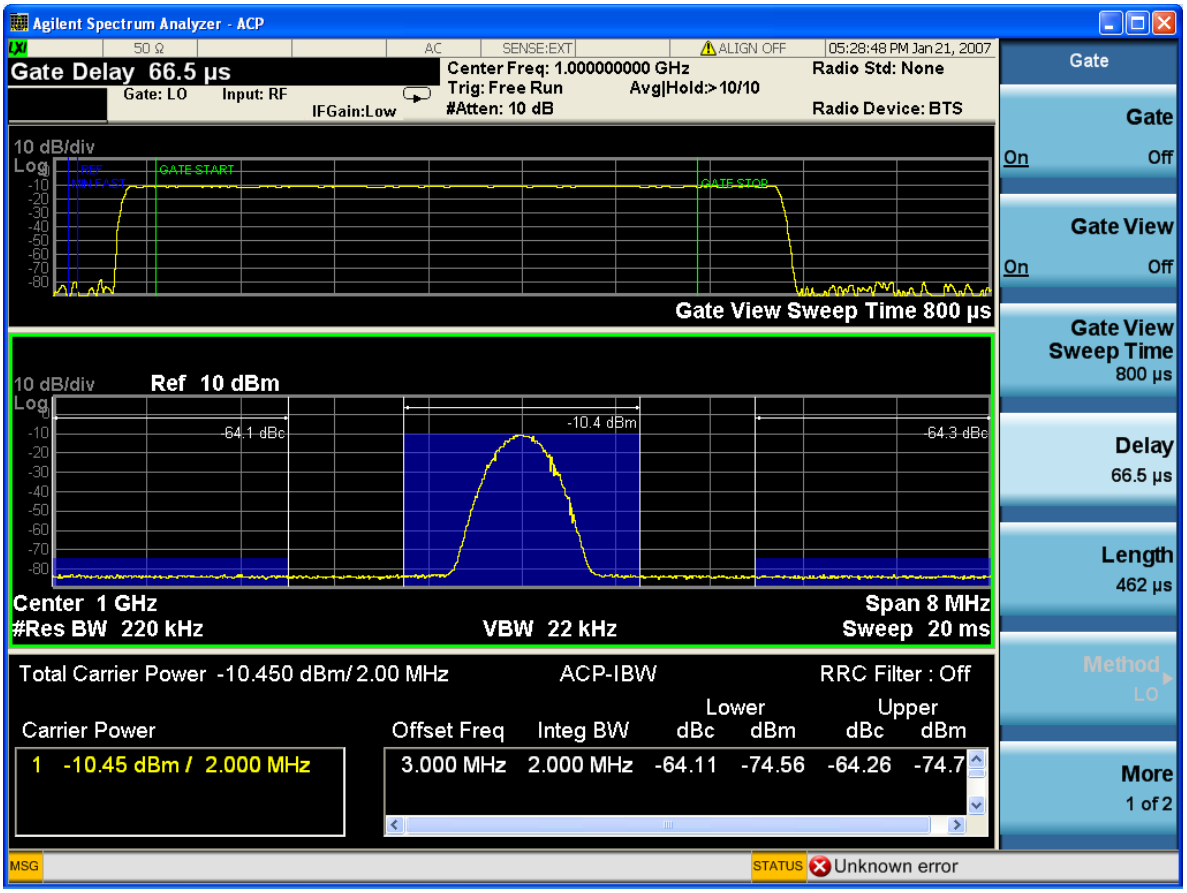
Turning on Gate View in other measurements shows the split-screen Gate View. In these measurements, when the Gate View is on, the regular view of the current measurement traces and results are reduced vertically to about 70% of the regular height. The Zero Span window showing the positions of the Gate is shown between the Measurement Bar and the reduced measurement window. By reducing the height of the measurement window, some of the annotation on the Data Display may not fit and is not shown.

Key Path	Sweep/Control, Gate
SCPI Command	`[:SENSe]:SWEep:EGATe:VIEW ON|OFF|1|0` `[:SENSe]:SWEep:EGATe:VIEW?`
Couplings	These couplings apply to the Swept SA measurement: • When Gate View is turned on, the instrument is set to Zero Span. • Gate View automatically turns off whenever a Span other than Zero is selected. • Gate View automatically turns off if the user presses **Last Span** while in **Gate View, and** the instrument returns to the Span it was in before entering **Gate View** (even if that is Zero Span). • When Gate View is turned on from a non-zero span, the sweep time, used is the gate view sweep time. This is set according to the rules above. • When Gate View is turned on from Zero Span, the Gate View Sweep Time is updated with the current value of Sweep Time. • When Gate View is turned off, Sweep Time is set to the Swept window sweep time even if the analyzer ends up in Zero-Span. • If Gate View is on and Gate is off, then turning on Gate turns off Gate View.
Dependencies	In the Swept SA measurement: In Gate View, the regular Sweep Time key is grayed out, to avoid confusing the user who wants to set Gate View Sweep Time. In the other measurements: When you turn Gate View on, the lower window takes on the current state of the instrument. Upon leaving Gate View, the instrument takes on the state of the lower window. When you turn Gate View on, the upper window Sweep Time is set to the gate view sweep time.
Preset	OFF
State Saved	Saved in state
Range	On|Off

A sample of the Gate View screen in the Swept SA measurement is shown below:



A sample of the Gate View screen in other measurements is shown below. This example is for the ACP measurement:



Turning Gate View off returns the analyzer to the Normal measurement view.

In the Swept SA, the normal measurement view is the single-window Swept SA view. When returning to this view, the Swept SA measurement returns to the Span it was in before entering **Gate View** (even if that is Zero Span).

The **Gate View** window is triggered from the Gate Source, with zero trigger delay. Also, when updating the **Gate View** window, the Gate itself must not operate. So it is internally shut off while the gate view window is being updated. For the Swept SA measurement, this means that the Gate is internally shut off whenever the gate view window is displayed. The Meas Bar and softkeys continue to show the Trigger source for the main sweep window and give no indication that the Gate is shut off or that the Gate View window is triggered from the Gate Source.

When in **Gate View**, vertical lines are displayed in the Gate View window as follows:

- Green lines are displayed at the gate edges as follows: in Edge Gate, a line is shown for Delay and one for the end of the Gate period (defined by Length, even in FFT. In Level Gate a line is shown only for Delay. You can adjust the position of the green lines by adjusting the gate length and the gate delay. These lines update in the Gate View window as the active function changes, even if the window is not being updated. In Gated LO, these lines are positioned relative to the *delay reference* line (*not* relative to 0 time). In Gated Video and Gated FFT, their location is relative to the left edge of the screen.

- A blue line is displayed showing the *delay* reference, that is, the reference point for the Gate Delay within the Zero Span window. The blue line represents where (in time) the effective location of the gate start would be if the gate were programmed to zero delay.
- The second blue line is labeled “MIN FAST” as shown in the figure above because it represents the minimum Gate Delay for fast gated LO operation. This line is only displayed in Gated LO. You cannot scroll (knob) or decrement (down key) the Gate Delay to less than that represented by the position of this line, it can only be set below this position manually, although once there it can be moved freely with the knob while below the line.
- A yellow line represents the edge of a display point (bucket). Normally in Gated Video, the bucket length must be selected so that it exceeds the off time of the burst. There is another way to use the analyzer in Gated Video measurements, and that is to set the bucket width much shorter than the off time of the burst. Then use the Max Hold trace function to fill in “missing” buckets more slowly. This allows you to see some of the patterns of the Gated Video results earlier, though seeing a completely filled-in spectrum later.

For this function to work properly, a gate signal must be present at the selected Gate Source.

Gate View Sweep Time

Controls the sweep time in the Gate View window. Since this variable is used to calculate Gate Length and Gate Delay increments, it must be maintained even when not in Gate View. It is initialized when Gate View turns on and every time the Gate Method is set while Gate View is on. Not all Gate methods are available for all modes.

- In Gated LO, set it to 1.2 x (gate delay + gate length), rounded up to nearest in 1, 1.5, 2, 3, 5, 7.5 series.
- In Gated Video, set it to 1.2 x (gate delay + gate length) + Blength, rounded up to nearest in 1, 1.5, 2, 3, 5, 7.5 series. Blength is the bucket length for the swept trace, which is given by the sweep time for that trace divided by NBuck – 1, where NBuck is the number of buckets (Points, in UI terms).
- In Gated FFT, use same rules as for gated LO, noting that gate length is determined for Gated FFT by the RBW and is displayed accordingly on the Gate Length key.

SCPI Command	`[:SENSe]:SWEep:EGATe:TIME <time>` `[:SENSe]:SWEep:EGATe:TIME?`
Example	SWE:EGAT:TIME 500 ms
Preset	519.3 µs
State Saved	Saved in state
Min	1 µs
Max	6000 s
Key Path	Sweep/Control, Gate

Gate Delay

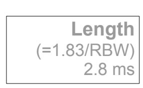
Controls the length of time from the time the gate condition goes True until the gate is turned on.

SCPI Command	`[:SENSe]:SWEep:EGATe:DELay <time>` `[:SENSe]:SWEep:EGATe:DELay?`
Example	SWE:EGAT:DELay 500ms SWE:EGAT:DELay?
Remote Command Notes	Units of time are required or no units; otherwise an invalid suffix error will be generated. See error -131.
Preset	57.7us
State Saved	Saved in state
Min	0.0 µs
Max	100 s
Key Path	Sweep/Control, Gate

Gate Length

Controls the length of time that the gate is on after it opens.

SCPI Command	`[:SENSe]:SWEep:EGATe:LENGth <time>` `[:SENSe]:SWEep:EGATe:LENGth?`
Example	SWE:EGAT:LENG 1 SWE:EGAT:LENG?
Dependencies	Grayed out when Gate Method is set to FFT in which case the label changes to that shown below.



	The key is also grayed out if Gate Control = Level.
Remote Command Notes	Units of time are required or no units; otherwise an invalid suffix will be generated.
Preset	461.6 µs

State Saved	Saved in state
Min	100 ns
Max	5 s
Key Path	Sweep/Control, Gate

Method

This lets you choose one of the three different types of gating. Not all types of gating are available for all measurements.

SCPI Command	`[:SENSe]:SWEep:EGATe:METHod LO|VIDeo|FFT` `[:SENSe]:SWEep:EGATe:METHod?`
Example	SWE:EGAT:METH FFT
Preset	LO
State Saved	Saved in state
Key Path	Sweep/Control, Gate

LO

When set to Gate (On), the LO sweeps whenever the gate conditions as specified in the Gate menu are satisfied by the signal at the **Gate Source.**

This form of gating is more sophisticated, and results in faster measurements. With Gated LO, the analyzer only sweeps while the gate conditions are satisfied. This means that a sweep could take place over several gate events. It would start when the gate signal goes true and stop when it goes false, then continue when it goes true again. But since the LO is sweeping as long as the gate conditions are satisfied, the sweep typically finishes much more quickly than with Gated Video.

Dependencies	Key is unavailable when Gate is On and FFT Sweep Type manually selected. When selected, Sweep Type is forced to Swept and the FFT key in Sweep Type is grayed out.
Key Path	Sweep/Control, Gate, Method

Video

When set to Gate (On), the video signal is allowed to pass through whenever the gate conditions as specified in the Gate menu are satisfied by the signal at the **Gate Source**.

This form of gating may be thought of as a simple switch, which connects the signal to the input of the spectrum analyzer. When the gate conditions are satisfied, the switch is closed, and when the gate conditions are not satisfied, the switch is open. So we only look at the signal while the gate conditions are satisfied.

With this type of gating, you usually set the analyzer to sweep very slowly. In fact, a general rule is to sweep slowly enough that the gate is guaranteed to be closed at least once per bucket (data measurement interval). Then if the peak detector is used, each bucket will represent the peak signal as it looks with the gate closed.

Dependencies	Key is unavailable when Gate is On and FFT Sweep Type manually selected. When selected, Sweep Type is forced to Swept and the FFT key in Sweep Type is grayed out
Key Path	Sweep/Control, Gate, Method

FFT

When set to Gate (On), the an FFT is performed whenever the gate conditions as specified in the Gate menu are satisfied by the signal at the **Gate Source.** This is an FFT measurement which begins when the gate conditions are satisfied. Since the time period of an FFT is approximately 1.83/RBW, you get a measurement which starts under predefined conditions and takes place over a predefined period. So, in essence, this is a gated measurement. You have limited control over the gate length but it works in FFT sweeps, which the other two methods do not.

The Gate Length will be 1.83/RBW.

This is a convenient way to make a triggered FFT measurement under control of an external gating signal.

Dependencies	Key is unavailable when Gate is On and Swept Sweep Type manually selected. When selected, Sweep Type is forced to FFT and the Swept key in Sweep Type is grayed out Forces Gate Length to 1.83/RBW (see Length key description above)
Key Path	Sweep/Control, Gate, Method

Gate Source

The menus under the Gate Source key are a duplicate of the Trigger setup keys. Any trigger settings changes made under Gate Source also affect settings under Trigger, and vice versa. However the selected

Trigger Source does not have to match the Gate Source.

SCPI Command	`[:SENSe]:SWEep:EGATe:SOURce EXTernal1|EXTernal2 |LINE|FRAMe|RFBurst|TV` `[:SENSe]:SWEep:EGATe:SOURce?`
Preset	EXTernal 1

Control

Sets the method of controlling the gating function from the gating signal.

Edge

In Edge triggering, the gate opens (after the Delay) on the selected edge (for example, positive) of the gate signal and closes on the alternate edge (for example, negative).

Level

In Level triggering, the gate opens (after the Delay) when the gate signal has achieved a certain level and stays open as long as that level is maintained.

SCPI Command	`[:SENSe]:SWEep:EGATe:CONTrol EDGE|LEVel` `[:SENSe]:SWEep:EGATe:CONTrol?`
Example	SWE:EGAT:CONT EDGE
Dependencies	If the Gate Method is FFT the Control key is grayed out and Edge is selected. If the Gate Source is TV, Frame or Line, the Control key is grayed out and Edge is selected.
Preset	EDGE
State Saved	Saved in stat
Key Path	Sweep/Control, Gate

Min Fast Position Query (Remote Command Only)

This command queries the position of the MIN FAST line, relative to the delay reference (REF) line. See section Gate View On/Off.

Parameter Name	Backwards Compatibility External Gate Level
SCPI Command	[:SENSe]:SWEep:EGATe:MINFast?

Example SWE:EGAT:MIN?

Trigger

The Trig front panel key accesses the **Trigger** menu which contains keys to control the selection of the Trigger source and settings.

The Trigger settings are common for all Measurements and these features are described in this section. The selection of the Trigger Source is unique for each Measurement. See the measurement description for information on trigger source and any other unique features.

Key Path	Front-panel key
SCPI Status Bits/OPC Dependencies:	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).

The trigger functions let you select the trigger settings for a sweep or measurement. When using a trigger source other than Free Run, the analyzer will begin a sweep only with the selected trigger conditions are met. A trigger event is defined as the point at which your trigger source signal meets the specified trigger level and polarity requirements (if any). In FFT measurements, the trigger controls when the data is acquired for FFT conversion.

For each source in the Trigger menu, a setup menu exists which can be accessed by pressing the key for that trigger source a second time. For example, one press of Video selects the Video trigger as the source. The Video key becomes highlighted and the hollow arrow on the key turns black. Now a second press of the key takes you into the Video Trigger Setup menu. The setup menus (there is one for each trigger source) allow you to set all of the settings for that trigger source as desired. Each source’s trigger settings (for example, level, delay and slope) are the same for the **Trigger** menu, the **Gate Source** menu, and the **Sync Source** menu that is part of the **Periodic Timer Trigger Setup** menu. That is, if **Ext1** trigger level is set to 1 v in the **Trigger** menu, it will appear as 1 v in both the **Gate Source** and the **Sync Source** menus. For this reason, the only SCPI node that exists for the settings is the TRIGger[:SEQuence] menu.

The trigger settings are common to all applications (modes). However, each application may have its own ranges and default value settings. Also, some applications may have trigger features that are unavailable because they don’t make sense for that particular application.

NOTE

The trigger source is uniquely selected for each measurement in the application. The trigger source setting is the only trigger parameter that is meas local, applying only to the current measurement.

The trigger source SCPI commands below are only for the Swept SA measurement. Other measurements will have a similar command using the measurement syntax (for example, TRIGger:<measurement name>:SOURce or TRIG:ACP:SOUR).

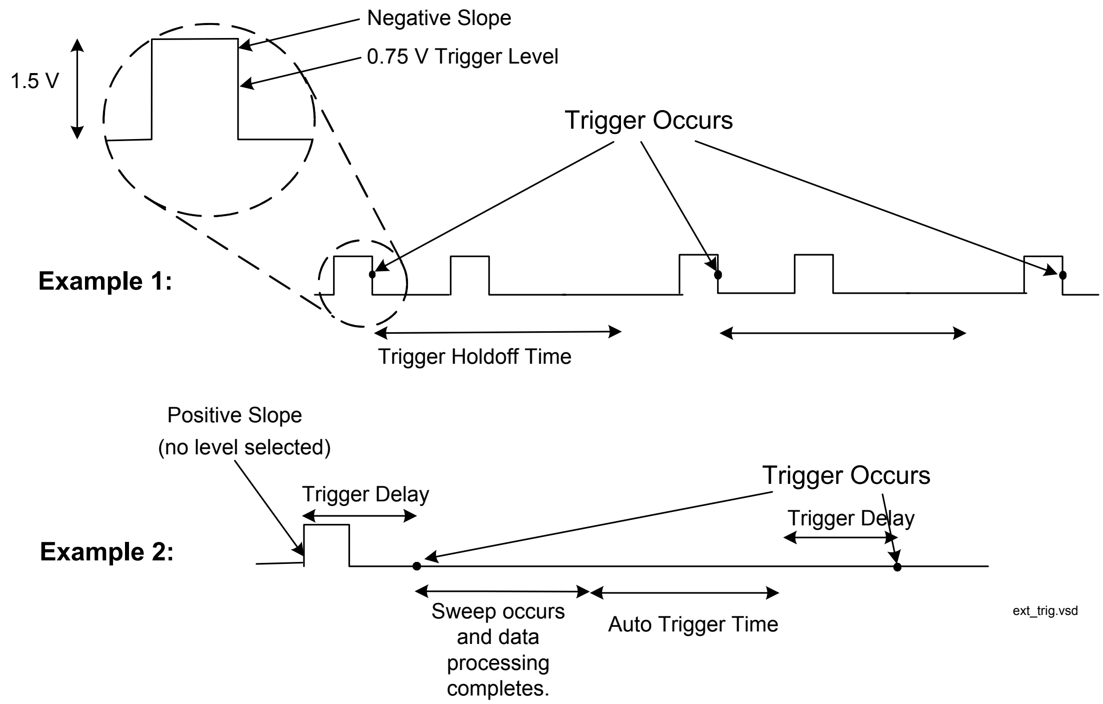
Remote Command	`:TRIGger:<measurement>[:SEQuence]:SOURce EXTernal1|EXTernal2|IMMediate|LINE|FRAMe|RFBurst|VIDeo|TV` `:TRIGger[:SEQuence]:<measurement>:SOURce?`
Example	TRIG:SOUR VID selects video triggering for the SANalyzer measurement in the Spectrum Analyzer mode. TRIG:ACP:SOUR EXT1 selects the external 1 trigger input for the ACP measurement in the current mode.
Remote Command Notes	Not all measurements have all the trigger sources available to them. Check the trigger source documentation in your specific measurement to see what is available. Possible sources include: IMMediate - free run triggering VIDeo - triggers on the video signal level LINE - triggers on the power line signal EXTernal1 - triggers on an externally connected trigger source on the rear panel EXTernal2 - triggers on an externally connected trigger source on the front panel FRAMe - triggers on the periodic timer RFBurst - triggers on the bursted frame TV (television) - triggers on the selected line of a TV frame Other trigger-related commands are found in the INITiate and ABORt SCPI command subsystems. *OPC should be used after requesting data. This will hold off any subsequent changes to the selected trigger source, until after the sweep is completed and the data is returned.

Trigger Setup Parameters:

The following examples show trigger setup parameters using an external trigger source.

Example 1 illustrates the trigger conditions with negative slope and no trigger occurs during trigger Holdoff time.

Example 2 illustrates the trigger conditions with positive slope, trigger delay, and auto trigger time.



Free Run

Pressing this key, when it is not selected, selects free-run triggering. Free run triggering occurs immediately after the sweep/measurement is initiated.

Example	TRIG:<meas>:SOUR IMM
State Saved	Yes
Key Path	Trig
SCPI Status Bits/OPC Dependencies	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).

Video

Pressing this key, when it is not selected, selects the video signal as the trigger. The Video trigger condition is met when the video signal (the filtered and detected version of the input signal, including both RBW and VBW filtering) crosses the video trigger level.

NOTE	When the detector selected for all active traces is the average detector, the video signal for triggering does not include any VBW filtering.

The video trigger level is shown as a labeled line on the display. The line is displayed as long as video is the selected trigger source.

Pressing this key, when it is already selected, accesses the video trigger setup functions.

Example	TRIG:<meas>:SOUR VID selects video triggering.
Remote Command Notes	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).
Dependencies	Video trigger is allowed in average detector mode.
State Saved	Yes
Key Path	Trig
SCPI Status Bits/OPC Dependencies	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).

Trigger Level

Sets a level for the video signal trigger. When the video signal crosses this level, with the chosen slope, the trigger occurs. This level is displayed with a horizontal line only if **Video** is the selected trigger source.

SCPI Command	`:TRIGger[:SEQuence]:VIDeo:LEVel <ampl>` `:TRIGger[:SEQuence]:VIDeo:LEVel?`
Example	TRIG:VID:LEV -40 dBm
Couplings	This same level is used for the Video trigger source in the Trigger menu and for the Video selection in the Gate Source menu.
Dependencies	The range of the Video Trigger Level is dependent on the Reference Level.
Preset	Set the Video Trigger Level -25 dBm on Preset. When the Video Trigger Level becomes the active function, if the value is off screen, set it to either the top or bottom of screen, depending on which direction off screen it was.
State Saved	Yes
Min	Same as reference level

Max	Same as reference level
Key Path	Trig, Video
Default Terminator	depends on the current selected Y axis unit

Trig Slope

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

SCPI Command	`:TRIGger[:SEQuence]:VIDeo:SLOPe POSitive|NEGative`
	`:TRIGger[:SEQuence]:VIDeo:SLOPe?`
Example	TRIG:VID:SLOP NEG
Preset	POSitive
State Saved	Yes
Key Path	Trig, Video

Trig Delay

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

SCPI Command	`:TRIGger[:SEQuence]:VIDeo:DELay <time>`
	`:TRIGger[:SEQuence]:VIDeo:DELay?`
SCPI Command	`:TRIGger[:SEQuence]:VIDeo:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:VIDeo:DELay:STATe?`
Example	TRIG:VID:DEL:STAT ON
	TRIG:VID:DEL 100 ms
Preset	Off, 1 us
State Saved	Yes
Min	-150 ms
Max	+500 ms
Key Path	Trig, Video

Default Terminator	s

Line

Pressing this key, when it is not selected, selects the line signal as the trigger. A new sweep/measurement will start synchronized with the next cycle of the line voltage. Pressing this key, when it is already selected, access the line trigger setup menu.

Example	TRIG:<meas>:SOUR LINE selects line triggering.
Dependencies	Line trigger is not available when operating from a “dc power source”, for example, when the instrument is powered from batteries.
State Saved	Yes
Key Path	Trig
SCPI Status Bits/OPC Dependencies	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).

Trig Slope

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

SCPI Command	`:TRIGger[:SEQuence]:LINE:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:LINE:SLOPe?`
Example	TRIG:LINE:SLOP NEG
Preset	POSitive
State Saved	Yes
Key Path	Trig, Line

Trig Delay

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

spans.

SCPI Command	`:TRIGger[:SEQuence]:LINE:DELay <time>` `:TRIGger[:SEQuence]:LINE:DELay?`
SCPI Command	`:TRIGger[:SEQuence]:LINE:DELay:STATe OFF|ON|0|1` `:TRIGger[:SEQuence]:LINE:DELay:STATe?`
Example	TRIG:LINE:DEL:STAT ON TRIG:LINE:DEL 100 ms
Preset	Off, 1.000 us
State Saved	Yes
Min	-150 ms
Max	500 ms
Key Path	Trig, Line
Default Terminator	S

External 1

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 1 input connector on the rear panel.

Pressing this key, when it is already selected, accesses the external 1 trigger setup menu.

Example	TRIG:<meas>:SOUR EXT1 This selects the external 1 trigger input on the rear panel.
State Saved	Yes
Key Path	Trig
SCPI Status Bits/OPC Dependencies	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).

Trigger Level

Sets the value where the external 1 trigger input will trigger a new sweep/measurement.

SCPI Command	`:TRIGger[:SEQuence]:EXTernal1:LEVel <level>` `:TRIGger[:SEQuence]:EXTernal1:LEVel?`
Example	TRIG:EXT1:LEV 0.4 V
Couplings	This same level is used for the Ext1 trigger source in the Trigger menu, for the Ext1 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext1 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Yes
Min	-5 V
Max	5 V
Key Path	Trig, External 1
Default Terminator	V

Trig Slope

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

SCPI Command	`:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:EXTernal1:SLOPe?`
Example	TRIG:EXT1:SLOP NEG
Couplings	This same slope is used in the Ext1 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Yes
Key Path	Trig, External 1

Trig Delay

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

spans.

SCPI Command	`:TRIGger[:SEQuence]:EXTernal1:DELay <time>`
	`:TRIGger[:SEQuence]:EXTernal1:DELay?`
SCPI Command	`:TRIGger[:SEQuence]:EXTernal1:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:EXTernal1:DELay:STATe?`
Example	TRIG:EXT1:DEL:STAT ON
	TRIG:EXT1:DEL 100 ms
Preset	Off, 1.000 us
State Saved	Yes
Min	-150 ms
Max	+500 ms
Key Path	Trig, External 1
Default Terminator	s

External 2

Pressing this key, when it is not selected, selects an external input signal as the trigger. A new sweep/measurement will start when the external trigger condition is met using the external 2 input connector. The external trigger 2 input connector is on the rear panel.

Pressing this key, when it is already selected, accesses the external 2 trigger setup menu.

Example	TRIG:<meas>:SOUR EXT2 This selects the rear panel external 2 trigger input.
State Saved	Yes
Key Path	Trig
SCPI Status Bits/OPC Dependencies	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).

Trigger Level

Sets the value where the external 2 trigger input will trigger a new sweep/measurement.

SCPI Command	`:TRIGger[:SEQuence]:EXTernal2:LEVel` `:TRIGger[:SEQuence]:EXTernal2:LEVel?`
Example	TRIG:EXT2:LEV 1.1 V
Couplings	This same level is used for the Ext2 trigger source in the Trigger menu, for the Ext2 selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext2 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Yes
Min	-5 V
Max	5 V
Key Path	Trig, External 2
Default Terminator	V

Trig Slope

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

SCPI Command	`:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:EXTernal2:SLOPe?`
Example	TRIG:EXT2:SLOP NEG
Couplings	This same slope is used in the Ext2 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Yes
Key Path	Trig, External 2

Trig Delay

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

spans. See the range limitation note in section

SCPI Command	`:TRIGger[:SEQuence]:EXTernal2:DELay <time>`
	`:TRIGger[:SEQuence]:EXTernal2:DELay?`
SCPI Command	`:TRIGger[:SEQuence]:EXTernal2:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:EXTernal2:DELay:STATe?`
Example	TRIG:EXT2:DEL:STAT ON
	TRIG:EXT2:DEL 100 ms
Preset	Off, 1.000 us
State Saved	Yes
Min	-150 ms
Max	500 ms
Key Path	Trig, External 2
Default Terminator	s

RF Burst (Wideband)

Pressing this key, when it is not selected, selects the RF Burst as the trigger. A new sweep/measurement will start when an RF burst envelope signal is identified from the signal at the RF Input connector. Pressing this key, when it is already selected, accesses the RF Burst trigger setup menu.

Example	TRIG:<meas>:SOUR RFB
Key Path	Trig
State Saved	Yes
SCPI Status Bits/OPC Dependencies	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).

Trigger Level

Sets the absolute trigger level for the RF burst envelope. See key notes regarding the relative trigger level.

SCPI Command	`:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>` `:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?`
Couplings	This same level is used for the RF Burst trigger source in the Trigger menu, for the RF Burst selection in the Periodic Timer sync source (in the Trigger menu and in the Gate Source menu), and also for the RF Burst selection in the Gate Source menu.
Preset	-20 dBm
State Saved	Yes
Min	-200 dBm
Max	100 dBm
Key Path	Trig, RF Burst
Default Terminator	Absolute trig level: depends on the current selected amplitude units, for more information, refer to the *User's and Programmer's Reference*.

Trigger Slope

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

SCPI Command	`:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:RFBurst:SLOPe?`
Example	TRIG:RFB:SLOP NEG
Couplings	This same slope is used in the RF Burst selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Yes
Key Path	Trig, RF Burst

Trig Delay

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

spans.

SCPI Command	`:TRIGger[:SEQuence]:RFBurst:DELay <time>`
	`:TRIGger[:SEQuence]:RFBurst:DELay?`
SCPI Command	`:TRIGger[:SEQuence]:RFBurst:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:RFBurst:DELay:STATe?`
Example	TRIG:RFB:DEL:STAT ON
	TRIG:RFB:DEL 100 ms
Preset	Off, 1.000 us
State Saved	Yes
Min	-150 ms
Max	500 ms
Key Path	Trig, RF Burst
Default Terminator	s

Periodic Timer (Frame Trigger)

Pressing this key, when it is not selected, selects the internal periodic timer signal as the trigger. Triggering occurrences are set by the **Period** parameter, which is modified by the **Sync Source** and **Offset**. Pressing this key, when it is already selected, accesses the periodic timer trigger setup functions.

If you do not have a sync source selected (it is Off), then the internal timer will not be synchronized with any external timing events.

Example	TRIG:<meas>:SOUR FRAM
State Saved	Yes
Key Path	Trig
SCPI Status Bits/OPC Dependencies	The Status Operation Register bit 5 “Waiting for Trigger” is set at the same time as the Sweeping or Measuring bit is set. It is cleared when the trigger actually occurs (that is, after the trigger event occurs and all the applicable trigger criteria have been met).

Periodic Timer Triggering:

This feature selects the internal periodic timer signal as the trigger. Trigger occurrences are set by the **Periodic Timer** parameter, which is modified by the **Sync Source** and **Offset**.

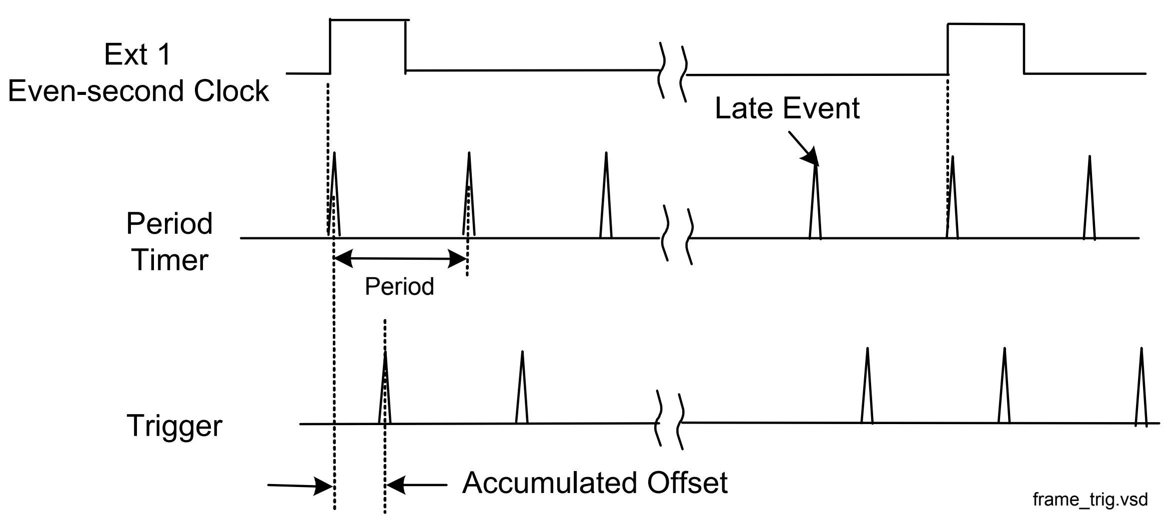
The figure below shows the action of the periodic timer trigger. Before reviewing the figure, we’ll explain some uses for the periodic trigger.

A common application is measuring periodic burst RF signals for which a trigger signal is not easily available. For example, we might be measuring a TDMA radio which bursts every 20 ms. Let's assume that the 20 ms period is very consistent. Let's also assume that we do not have an external trigger source available that is synchronized with the period, and that the signal-to-noise ratio of the signal is not high enough to provide a clean RF burst trigger at all of the analysis frequencies. For example, we might want to measure spurious transmissions at an offset from the carrier that is larger than the bandwidth of the RF burst trigger. In this application, we can set the **Periodic Timer** to a 20.00 ms period and adjust the offset from that timer to position our trigger just where we want it. If we find that the 20.00 ms is not exactly right, we can adjust the period slightly to minimize the drift between the period timer and the signal to be measured.

A second way to use this feature would be to use **Sync Source** temporarily, instead of **Offset**. In this case, we might tune to the signal in a narrow span and use the **RF Burst** trigger to synchronize the periodic timer. Then we would turn the sync source off so that it would not mis-trigger. Mis-triggering can occur when we are tuned so far away from the RF burst trigger that it is no longer reliable.

A third example would be to synchronize to a signal that has a reference time element of much longer period than the period of interest. In some CDMA applications, it is useful to look at signals with a short periodicity, by synchronizing that periodicity to the "even-second clock" edge that happens every two seconds. Thus, we could connect the even-second clock trigger to Ext1 and use then Ext1 as the sync source for the periodic timer.

The figure below illustrates this third example. The top trace represents the even-second clock. It causes the periodic timer to synchronize with the leading edge shown. The analyzer trigger occurs at a time delayed by the accumulated offset from the period trigger event. The periodic timer continues to run, and triggers continue to occur, with a periodicity determined by the analyzer time base. The timer output (labeled "late event") will drift away from its ideal time due to imperfect matching between the time base of the signal being measured and the time base of the analyzer, and also because of imperfect setting of the period parameter. But the synchronization is restored on the next even-second clock event. ("Accumulated offset" is described in the in the **Offset** function section.)



Period

Sets the period of the internal periodic timer clock. For digital communications signals, this is usually set to the frame period of your current input signal. In the case that sync source is not set to OFF, and the external sync source rate is changed for some reason, the periodic timer is synchronized at the every external synchronization pulse by resetting the internal state of the timer circuit.

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:PERiod <time>` `:TRIGger[:SEQuence]:FRAMe:PERiod?`
Example	TRIG:FRAM:PER 100 ms
Dependencies	The invalid data indicator turns on when the period is changed, until the next sweep/measurement completes.
Couplings	The same period is used in the Gate Source selection of the period timer.
Preset	20 ms
State Saved	Yes
Min	100.000 ns
Max	559.0000 ms
Key Path	Trig, Periodic Timer
Default Terminator	S

Offset

Adjusts the accumulated offset between the periodic timer events and the trigger event. Adjusting the accumulated offset is different than setting an offset, and requires explanation.

The periodic timer is usually not synchronized with any external events, so the timing of its output events has no absolute meaning. Since the timing relative to external events (RF signals) is important, you need to be able to adjust (offset) it. However, you have no direct way to see when the periodic timer events occur. All that you can see is the trigger timing. When you want to adjust the trigger timing, you will be changing the internal offset between the periodic timer events and the trigger event. Because the absolute value of that internal offset is unknown, we will just call that the accumulated offset. Whenever the **Offset** parameter is changed, you are changing that accumulated offset. You can reset the displayed offset using **Reset Offset Display**. Changing the display does not change the value of the accumulated offset, and you can still make additional changes to accumulated offset.

To avoid ambiguity, we define that an increase in the “offset” parameter, either from the RPG or the

SCPI adjust command, serves to delay the timing of the trigger event.

SCPI Command	:TRIGger[:SEQuence]:FRAMe:OFFSet <time>
	:TRIGger[:SEQuence]:FRAMe:OFFSet?
Example	TRIG:FRAM:OFFS 1.2 ms
Dependencies	The invalid data indicator turns on when the offset is changed, until the next sweep/measurement completes.
Couplings	The same offset is used in the Gate Source selection of the period timer.
Remote Command Notes	When the SCPI command is sent the value shown on the key (and the Active Function, if this happens to be the active function) is updated with the new value. However, the actual amount sent to the hardware is the delta value, that is, the current accumulated offset value minus the previous accumulated offset value.
	The SCPI query simply returns the value currently showing on the key.
Preset	0 s
State Saved	Yes
Min	-10.000 s
Max	10.000 s
Key Path	Trig, Periodic Timer
Default Terminator	S

Offset Adjust (remote command only)

This remote command does not work at all like the related front panel keys. This command lets you advance the phase of the frame trigger by the amount you specify.

It does not change the period of the trigger waveform. If the command is sent multiple times, it advances the phase of the frame trigger an additional amount each time it is sent. Negative numbers are permitted.

SCPI Command	:TRIGger[:SEQuence]:FRAMe:ADJust <time>
Example	TRIG:FRAM:ADJ 1.2 ms
Dependencies	The invalid data indicator turns on when the offset is changed, until the next sweep/measurement completes.
Couplings	The same offset is used in the Gate Source selection of the period timer.

Remote Command Notes	The front panel interface (for example, the knob) and the TRIG:FRAM:OFFS command adjust the accumulated offset, which is shown on the active function display. However, the actual amount sent to the hardware is the delta value, that is, the current offset value minus the previous offset value. When the SCPI command is sent the value shown on the key (and the Active Function, if this happens to be the active function) is updated by increasing it (or decreasing it if the value sent is negative) by the amount specified in the SCPI command. This is a “command only” SCPI command, with no query.
Preset	0 s
State Saved	Yes
Min	-10.000 s
Max	10.000 s
Default Terminator	S

Reset Offset Display

Resets the value of the periodic trigger offset display setting to 0.0 seconds. The current displayed trigger location may include an offset value defined with the **Offset** key. Pressing this key redefines the currently displayed trigger location as the new trigger point that is 0.0 s offset. The **Offset** key can then be used to add offset relative to this new timing.

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet`
Example	TRIG:FRAM:OFFS:DISP:RES
Key Path	Trig, Periodic Timer

Sync Source

Selects a signal source for you to synchronize your periodic timer trigger to, otherwise you are triggering at some arbitrary location in the frame. Synchronization reduces the precision requirements on the setting of the period.

For convenience you may adjust the level and slope of the selected sync source in a conditional branch setup menu accessed from the Sync Source menu. Note that these settings match those in the **Trigger** and **Gate Source** menus; that is, each trigger source has only one value of level and slope, regardless of which menu it is accessed from.

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal1|EXTernal2|RFBurst|OFF`
	`:TRIGger[:SEQuence]:FRAMe:SYNC?`
Example	TRIG:FRAM:SYNC EXT2
Preset	OFF
State Saved	Yes
Key Path	Trig, Periodic Timer

Off

Turns off the sync source for your periodic trigger. With the sync source off, the timing will drift unless the signal source frequency is locked to the analyzer frequency reference.

Example	TRIG:FRAM:SYNC OFF
Key Path	Trig, Periodic Timer, Sync Source

External 1

Pressing this key, when it is not selected, selects the external input port that you will use for the periodic trigger synchronization. Pressing this key, when it is already selected, accesses the external 1 sync source setup menu.

Example	TRIG:FRAM:SYNC EXT
Couplings	Same as External 1 trigger source.
Remote Command Notes	See section Sync Source
Key Path	Trig, Periodic Timer, Sync Source

Trigger Level

Sets the value where the signal at the external 1 trigger input will synchronize with the periodic timer trigger.

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:LEVel <voltage>`
	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:LEVel?`
Example	TRIG:FRAM:EXT1:LEV 0.5 V

Couplings	This same level is used in the Ext1 trigger source in the Trigger menu, for the period timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext1 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Yes
Min	-5 V
Max	5 V
Key Path	Trig, Periodic Timer, Sync Source, External 1
Default Terminator	V

Trig Slope

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

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:EXTernal1:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:FRAMe:EXTernal1:SLOPe?`
Example	TRIG:FRAM:EXT1:SLOP NEG
Couplings	This same slope is used in the Ext1 selection for the trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Yes
Key Path	Trig, Periodic Timer, Sync Source, External 1

External 2

Pressing this key, when it is not selected, selects the external input port that you will use for the periodic frame trigger synchronization.

Pressing this key, when it is already selected, accesses the external 2 sync source setup menu.

Example	TRIG:FRAM:SYNC EXT2
Couplings	Same as External 2 trigger source.
Key Path	Trig, Periodic Timer, Sync Source

Trigger Level

Sets the value where the signal at the external 2 trigger input will synchronize with the frame timer trigger.

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:EXTernal2:LEVel` `:TRIGger[:SEQuence]:FRAMe:EXTernal2:LEVel?`
Example	TRIG:FRAM:EXT2:LEV 0.5 V
Couplings	This same level is used in the Ext2 trigger source in the Trigger menu, for the period timer sync source (in the Trigger menu and in the Gate Source menu), and also for the Ext2 selection in the Gate Source menu.
Preset	1.2 V
State Saved	Yes
Min	-5 V
Max	5 V
Key Path	Trig, Periodic Timer, Sync Source, External 2
Default Terminator	V

Trig Slope

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

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:EXTernal2:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:FRAMe:EXTernal2:SLOPe?`
Example	TRIG:FRAM:EXT2:SLOP NEG
Couplings	This same slope is used in the Ext2 trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Yes
Key Path	Trig, Periodic Timer, Sync Source, External 2

RF Burst (Wideband)

Pressing the key once selects the RF burst envelope signal to be used for the periodic timer trigger synchronization.

Press the key a second time to access the RF burst sync source setup menu.

Example	TRIG:FRAM:SYNC RFB

Couplings	Same as RF Burst trigger source.
Key Path	Trig, Periodic Timer, Sync Source

Trigger Level

Same as Trigger level under RF Burst section Trigger Level.

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:RFBurst:LEVel:ABSolute <ampl>` `:TRIGger[:SEQuence]:FRAMe:RFBurst:LEVel:ABSolute?`
Couplings	This same level is used in the RF Burst trigger source in the Trigger menu, for the period timer sync source (in the Trigger menu and in the Gate Source menu), and also for the RF Burst selection in the Gate Source menu.
Preset	-20 dBm
State Saved	Yes
Min	-100 dBm
Max	100 dBm
Key Path	Trig, Periodic Timer, Sync Source, RF Burst
Default Terminator	Absolute trig level: depends on the current selected amplitude units

Trig Slope

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

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:RFBurst:SLOPe POSitive|NEGative` `:TRIGger[:SEQuence]:FRAMe:RFBurst:SLOPe?`
Example	TRIG:FRAM:RFB:SLOP NEG
Couplings	This same slope is used in the RF Burst trigger source in the Trigger menu and for the period timer sync source (in the Trigger menu and in the Gate Source menu).
Preset	POSitive
State Saved	Yes
Key Path	Trig, Periodic Timer, Sync Source, RF Burst

Trig Delay

This setting delays the measurement timing relative to the Periodic Timer.

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:DELay <time>`
	`:TRIGger[:SEQuence]:FRAMe:DELay?`
SCPI Command	`:TRIGger[:SEQuence]:FRAMe:DELay:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:FRAMe:DELay:STATe?`
Preset	Off, 1.000 us
State Saved	Yes
Min	-150 ms
Max	+500 ms
Key Path	Trig, Periodic Timer
Default Terminator	s

Sync Holdoff

Sync Holdoff specifies the duration that the sync source signal must be kept false before the transition to true to be recognized as the sync timing. The periodic timer phase is aligned when the sync source signal becomes true, after the Holdoff time is satisfied.

A holdoff of 2 ms will work with most WiMAX signals, but there may be cases where the burst off duration is less than 1 ms and this value will need to be changed.

SCPI Command	`:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff <time>`
	`:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff?`
BAF SCPI Command	`:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff:STATe?`
Preset	On, 1.000 ms
State Saved	Yes
Min	0 ms
Max	+500 ms
Key Path	Trig, Periodic Timer
Default Terminator	s

Auto Trig

Sets the time that the analyzer will wait for the trigger conditions to be met. If they are not met after that much time, then the analyzer is triggered anyway.

SCPI Command	`:TRIGger[:SEQuence]:ATRigger <time>`
	`:TRIGger[:SEQuence]:ATRigger?`
SCPI Command	`:TRIGger[:SEQuence]:ATRigger:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:ATRigger:STATe?`
Example	TRIG:ATR:STAT ON
	TRIG:ATR 100 ms
Preset	Off, 100 ms
State Saved	Yes
Min	0 s
Max	100 s
Key Path	Trig
Default Terminator	s

Trig Holdoff

Sets the holdoff time between triggers. When the trigger condition is satisfied, the trigger occurs, the delay begins, and the holdoff time begins. New trigger conditions will be ignored until the holdoff time expires. For a free-running trigger, the holdoff value is the minimum time between triggers.

SCPI Command	`:TRIGger[:SEQuence]:HOLDoff <time>`
	`:TRIGger[:SEQuence]:HOLDoff?`
SCPI Command	`:TRIGger[:SEQuence]:HOLDoff:STATe OFF|ON|0|1`
	`:TRIGger[:SEQuence]:HOLDoff:STATe?`
BAF Preset	OFF
Example	TRIG:HOLD:STAT ON
	TRIG:HOLD 100 ms
	Supplemental Information
Preset	Off, 100 ms
State Saved	Yes
Min	0 s
Max	0.5 s

Key Path	Trig
Default Terminator	s

6 Complex Spectrum

The complex spectrum measurement provides spectrum analysis capability for the instrument. The control of the measurement was designed to be familiar to those who are accustomed to using swept spectrum analyzers.

This measurement is FFT (Fast Fourier Transform) based. The FFT-specific parameters are located in the advanced menu. Also available under basic mode spectrum measurements is an I/Q window, which shows the I and Q signal waveforms in parameters of voltage versus time. The advantage of having an I/Q view available while in the spectrum measurement is that it allows you to view complex components of the same signal without changing settings or measurements.

Key Path	**Front-panel key**

The following table shows the returned results of the FETCh|MEASure|READ commands.

`:CONFigure:SPECtrum`

`:CONFigure:SPECtrum:NDEFault`

`:INITiate:SPECtrum`

`:FETCh:SPECtrum[n]`

`:MEASure:SPECtrum[n]`

`:READ:SPECtrum[n]`

The general functionality of CONFigure, INITiate, FETCh, MEASure, and READ are described in this section. See the SENSe subsystem commands for more measurement related commands.

n	Results Returned
0	Returns unprocessed I/Q trace data, as a series of trace point values, in volts. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values.

not specified or n=1	Returns the following comma-separated scalar results: 1. FFT peak is the FFT peak amplitude. 2. FFT frequency is the FFT frequency of the peak amplitude. 3. FFT points is the Number of points in the FFT spectrum. 4. First FFT frequency is the frequency of the first FFT point of the spectrum. 5. FFT spacing is the frequency spacing between the FFT points of the spectrum. 6. Time domain points is the number of points in the time domain trace used for the FFT. The number of points doubles if the data is complex instead of real. See the time domain scalar description below. 7. First time point is the time of the first time domain point, where time zero is the trigger event. 8. Time spacing is the time spacing between the time domain points. The time spacing value doubles if the data is complex instead of real. See the time domain scaler description below. 9. Time domain returns a 1 if time domain is complex (I/Q) and complex data will be returned. It returns a 0 if the data is real. (raw ADC samples) When this value is 1 rather than 0 (complex vs. real data), the time domain points and the time spacing scalers both increase by a factor of two. 10. Scan time is the total scan time of the time domain trace used for the FFT. The total scan time = (time spacing) (time domain points 1) 11.Current average count is the current number of data measurements that have already been combined, in the averaging calculation.
2	Returns the trace data of the log-magnitude versus time. (That is, the RF envelope.)
3	Returns the I and Q trace data. It is represented by I and Q pairs (in volts) versus time.
4	Returns spectrum trace data. That is, the trace of log-magnitude versus frequency. (The trace is computed using a FFT.)
5	Returns the averaged trace data of log-magnitude versus time. (That is, the RF envelope.)
6	Not used.
7	Returns the averaged spectrum trace data. That is, the trace of the averaged log-magnitude versus frequency.
8	Not used.
9	Returns a trace containing the shape of the FFT window.
10	Returns trace data of the phase of the FFT versus frequency.
11	Returns comma-separated linear spectrum trace data in Volts RMS.
12	Returns comma-separated averaged linear spectrum trace data in Volts RMS.

Measurement Results View

Figure 1-2 Complex Spectrum Measurement Spectrum View shows an example of a Spectrum view for the Complex Spectrum Measurement. The upper half Spectrum window shows the trace of the signal and its average in the frequency domain. In the lower half, the I/Q SPECtrum window shows the traces of the I and Q of the input signal. The measured values for the mean power and peak-to-mean power are shown in the text window.

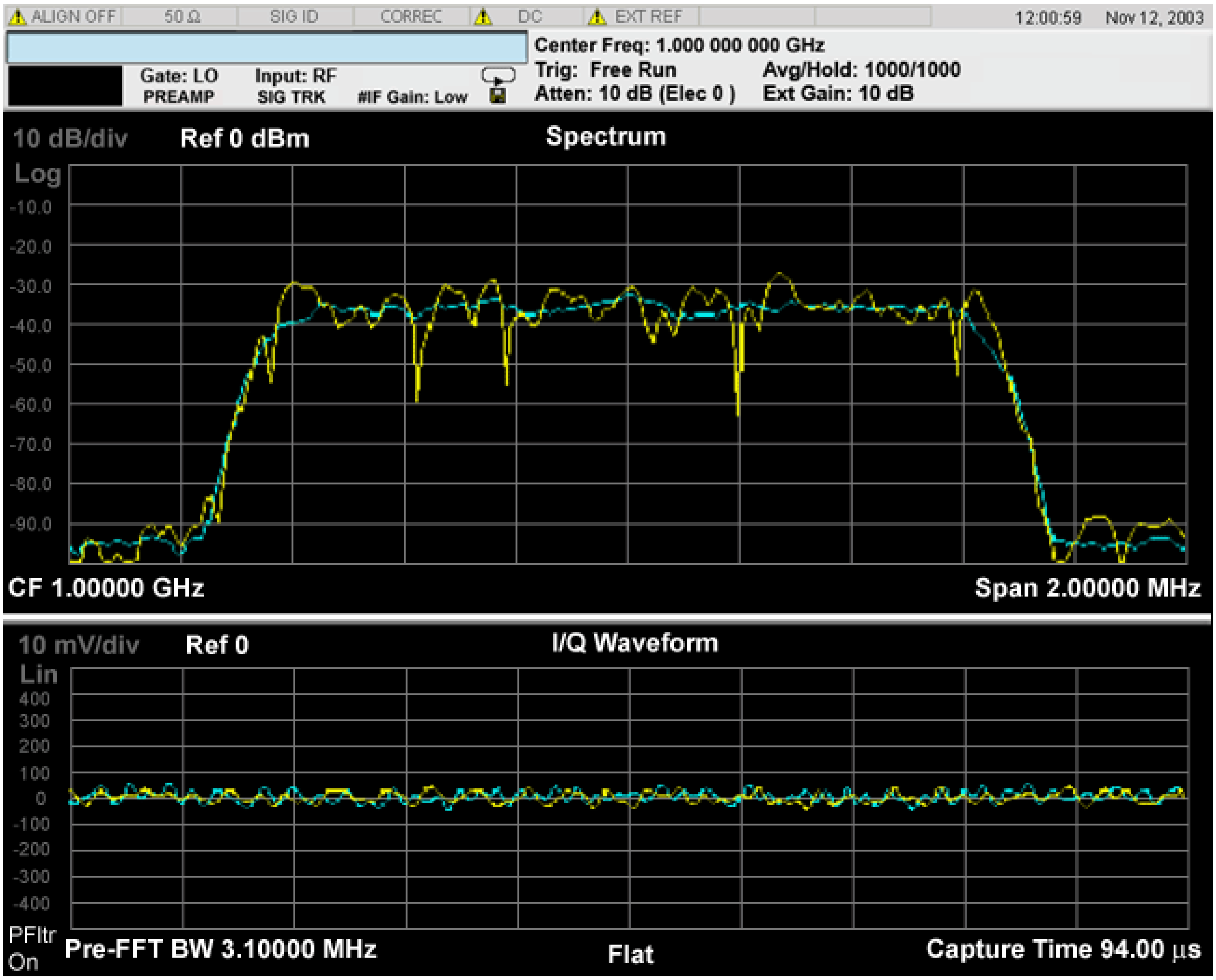


Figure 1-2 Complex Spectrum Measurement Spectrum View

Trace Results

There are two trace views: Spectrum and I/Q Spectrum.

Spectrum Window

Marker Trace	Yes
Corresponding Trace	Returns spectrum trace data. That is, the trace of log-magnitude versus frequency. (The trace is computed using a FFT.) (n=4)
Corresponding Trace	Returns the averaged trace data of log-magnitude versus time. (That is, the RF envelope.) (n=5)

I/Q SPECtrum Window

Marker Trace	Yes
Corresponding Trace	Returns the I and Q trace data. It is represented by I and Q pairs (in volts) versus time. (n=3)

SPAN X Scale

Accesses the frequency span menu when the spectrum view is active, or the horizontal time menu when the waveform view is active.

Key Path	**Front-panel key**

Span (Spectrum View)

Allows you to modify the frequency span in spectrum view for the complex spectrum measurement. This is translated to the required IF bandwidth for the FFT analysis. The analyzer's IF bandwidth is always equal or greater than this value.

Since the max IF Bandwidth is 8 MHz for narrowband mode, the Span's max IF Bandwidth will be 8 MHz.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:FREQuency:SPAN <freq>` `[:SENSe]:SPECtrum:FREQuency:SPAN?`
Example	:SPEC:FREQ:SPAN 10Hz
Dependencies/Couplings	Changing the span causes the resolution bandwidth to change automatically, and will affect data acquisition time.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	8 MHz
State Saved	Saved in instrument state.
Min	10 Hz
Max	Hardware Dependent: No Option = 8.0 MHz Option B25 = 25.0 MHz
Key Path	**SPAN X Scale**

Ref Value (Waveform View)

Sets the horizontal scale reference value in the waveform view window.

Mode	BASIC

Remote Command	:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:X[:SCALe]:RLEVel <time> :DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:X[:SCALe]:RLEVel?
Restriction and Notes	If the Auto Scaling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Auto Scaling automatically changes to Off.
Dependencies/Couplings	When you set a value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	0.000 s
State Saved	Saved in instrument state.
Min	–1.00 s
Max	10.00 s
Key Path	**SPAN X Scale**

Scale/Div (Waveform View)

Allows you to set the horizontal scale in the waveform view window by changing the time value per division.

Mode	BASIC
Remote Command	:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:X[:SCALe]:PDIVision <time> :DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:X[:SCALe]:PDIVision?
Restriction and Notes	If the Auto Scaling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Auto Scaling automatically changes to Off.
Dependencies/Couplings	When you set a value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	18.80 us
State Saved	Saved in instrument state.
Min	1.000 ns

Max	1.000 s
Key Path	**SPAN X Scale**

Ref Position (Waveform View)

Allows you to set the reference position in the waveform view window to Left, Ctr (center) or Right.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:X[:SCALe]:RPOSition LEFT|CENTer|RIGHt` `:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:X[:SCALe]:RPOSition?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	LEFT
State Saved	Saved in instrument state.
Range	Left | Ctr | Right
Key Path	**SPAN X Scale**

Auto Scaling (Waveform View)

Allows you to toggle the Auto Scaling function in the waveform view window between On and Off.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:X[:SCALe]:COUPle 0|1|OFF|ON` `:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:X[:SCALe]:COUPle`
Restriction and Notes	Upon pressing the Restart front-panel key, this function automatically determines the scale per division and reference values based on the measurement results. When you set a value to either Scale/Div or Ref Value manually, Auto Scaling automatically changes to Off.

Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**SPAN X Scale**

AMPTD Y Scale

Accesses the vertical scale parameters menu. The menu selection is dependant on the active window view.

Key Path	**Front-panel key**

Ref Value

Enables you to adjust the absolute power reference value. Ref in the upper left corner of the display, indicates the current value. To change the reference level, use the front-panel step keys, knob, or numeric keypad.

Ref Value (Spectrum window)

Enables you to adjust the absolute power reference value in the spectrum view window. Ref in the upper left corner of the display, indicates the current value. To change the reference level, use the front-panel step keys, knob, or numeric keypad.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RLEVel <ampl>` `:DISPlay:SPECtrum:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RLEVel?`
Example	:DISP:SPEC:VIEW:WIND:TRAC:Y:RLEV 100
Restriction and Notes	The default setting is 0.00 dBm. However, since the Auto Scaling default is On, this value is automatically determined by the measurement result.
Dependencies/Couplings	When Auto Scaling is turned on, this value is automatically determined by the measurement result. When this value is set, Auto Scaling is turned off. Attenuation is not coupled to Ref Value.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	0.00 dBm
State Saved	Saved in instrument state.
Min	–250 dBm
Max	250 dBm
Key Path	**AMPTD Y Scale**

Ref Value (I/Q Waveform window)

Enables you to adjust the absolute voltage reference value in the waveform view window. Ref in the upper left corner of the display, indicates the current value. To change the reference level, use the front-panel step keys, knob, or numeric keypad.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:Y[:SCALe]:RLEVel <voltage>` `:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:Y[:SCALe]:RLEVel?`
Example	:DISP:SPEC:VIEW:WIND2:TRAC:Y:RLEV 120
Restriction and Notes	The default setting is 0.0 V. However, since the Auto Scaling default is On, this value is automatically determined by the measurement result.
Dependencies/Couplings	When Auto Scaling is turned on, this value is automatically determined by the measurement result. When this value is set, Auto Scaling is turned off.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	0 V
State Saved	Saved in instrument state.
Min	–250 V
Max	250 V
Key Path	**AMPTD Y Scale**

Attenuation

Accesses the Attenuation menu to change attenuation settings. This key has a readback text that describes total attenuator value.Refer to the Spectrum Analyzer mode for more information.

Key Path	**AMPTD Y Scale**

Scale/Div

Sets the units per vertical graticule division on the display.

Scale/Div (Spectrum)

Sets the vertical scale in spectrum view by changing the amplitude value per division.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:PDIVision <rel_ampl>` `:DISPlay:SPECtrum:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:PDIVision?`
Example	:DISP:SPEC:VIEW:WIND:TRAC:Y:PDIV 10
Restriction and Notes	The default setting is 10.00 dB. However, since the Auto Scaling default is On, this value is automatically determined by the measurement result.
Dependencies/Couplings	When you set a value manually, Auto Scaling automatically changes to Off. When Auto Scaling is turned on, this value is automatically determined by the measurement result.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	10 dB
State Saved	Saved in instrument state.
Min	0.10 dB
Max	20 dB
Key Path	**AMPTD Y Scale**

Scale/Div (I/Q Waveform)

Sets the vertical scale in waveform view by changing the amplitude value per division.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:Y[:SCALe]:PDIVision <voltage>` `:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:Y[:SCALe]:PDIVision?`
Example	:DISP:SPEC:VIEW:WIND2:TRAC:Y:PDIV 10
Restriction and Notes	The default setting is 100.0 mV. However, since the Auto Scaling default is On, this value is automatically determined by the measurement result.

Dependencies/Couplings	When you set a value manually, Auto Scaling automatically changes to Off. When Auto Scaling is turned on, this value is automatically determined by the measurement result.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	100.0 mV
State Saved	Saved in instrument state.
Min	1.00 nV
Max	20.0 V
Key Path	**AMPTD Y Scale**

Internal Preamp

Accesses keys that control the internal preamps. Turning on the preamp gives a better noise figure, but a poorer TOI to noise floor dynamic range. You can optimize this setting for your particular measurement. Refer to the Spectrum Analyzer mode for more information.

Key Path	**AMPTD Y Scale**

Ref Position

Allows you to set the reference position to either Left, Ctr (center) or Right.

Ref Position (Spectrum)

Allows you to set the spectrum reference position to either Top, Ctr (center) or Bottom.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RPOSition TOP|CENTer|BOTTom` `:DISPlay:SPECtrum:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RPOSition?`
Example	:DISP:SPEC:VIEW:WIND2:TRAC:Y:RPOS CENT
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.

Preset	TOP
State Saved	Saved in instrument state.
Range	Top | Ctr | Bot
Key Path	**AMPTD Y Scale, More**

Ref Position (IQ Waveform)

Allows you to set the spectrum reference position to either Top, Ctr (center) or Bottom.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:Y[:SCALe]:RPOSition TOP|CENTer|BOTTom` `:DISPlay:SPECtrum:VIEW[1]:WINDow2:TRACe:Y[:SCALe]:RPOSition?`
Example	:DISP:SPEC:VIEW:WIND2:TRAC:Y:RPOS TOP
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	CENTer
State Saved	Saved in instrument state.
Range	Top | Ctr | Bot
Key Path	**AMPTD Y Scale, More**

Auto Scaling

Allows you to toggle the Auto Scaling function between On and Off. Upon pressing the Restart front-panel key or Restart softkey under the Meas Control menu, the Auto Scaling function automatically determines the scale per division and reference values based on the measurement results.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:VIEW[1]:WINDow[1]|2:TRACe:Y[:SCALe]:COUPle ON|OFF|1|0` `:DISPlay:SPECtrum:VIEW[1]:WINDow[1]|2:TRACe:Y[:SCALe]:COUPle?`
Example	:DISP:SPEC:VIEW:WIND2:TRAC:Y:COUP 0

Dependencies/Couplings	When you set a value to either Scale/Div or Ref Value manually, Auto Scaling automatically changes to Off. When this value is turned on, Ref Value and Scale/Div are automatically determined by the measurement result.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**AMPTD Y Scale, More**

View/Display

Accesses the Display menu that allows you to control certain functions related to the display of the analyzer. Refer to the Spectrum Analyzer mode for more information.

Display

Invokes the Display menu and allows you to control certain functions related to the display of the analyzer. Refer to the Spectrum Analyzer mode for more information.

Change Title

Writes a title across the top of the display. Press Change Title to access the Alpha Editor Menus that contain available characters and symbols. You may also use the numeric keypad to enter numbers. Press Enter or Return to complete the entry. Press ESC to cancel the entry and preserve your existing title.

The display title will remain until you press Change Title again, or you recall a trace or state, or a Factory Preset is performed. A title can also be cleared by pressing Title, Clear Title.

Pressing this key cancels any active function.

Mode	BASIC
Remote Command	`:DISPlay:SPECtrum:ANNotation:TITLe:DATA <string>`
	`:DISPlay:SPECtrum:ANNotation:TITLe:DATA?`
Example	DISP:SPEC:ANN:TITL:DATA “Agilent”
	DISP:SPEC:ANN:TITL:DATA?
Preset	Complex Spectrum
State Saved	Saved in instrument state.
Range	Uppercase, Lowercase, Numeric, Symbol
Key Path	**View/Display, Display, Title**

Trace/Detector

There is no ‘Trace/Detector functionality supported in Complex Spectrum so this front-panel key will display a blank softkey when pressed.

BW

Opens the Bandwidth menu.

Key Path	**Front-panel key**

Res BW

Allows you to set the resolution bandwidth setting. This is the resolution bandwidth of the FFT analysis. So, changing this value will change the FFT Window size, FFT length and the sweep time (measurement capture length).

If FFT Length Ctrl in the FFT Size menu under Meas Setup, Advanced is set to Manual, Res BW is grayed out and shows the resolution bandwidth determined by the FFT Window size.

Mode	BASIC

Remote Command	`[:SENSe]:SPECtrum:BANDwidth[:RESolution] <bandwidth>`
	`[:SENSe]:SPECtrum:BANDwidth[:RESolution]?`
	`[:SENSe]:SPECtrum:BANDwidth[:RESolution]:AUTO ON|OFF|1|0`
	`[:SENSe]:SPECtrum:BANDwidth[:RESolution]:AUTO?`

Example	:SENS:SPEC:BAND:RES:AUTO OFF
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode. You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	160 kHz ON
State Saved	Saved in instrument state.
Min	0.1 Hz
Max	3.0 MHz
Key Path	**BW**

Meas Setup

Opens the menu that allows you to set up the measurement parameters.

Key Path	**Front-panel key**

Avg/Hold Num

Sets the number of ‘sweeps’ that will be averaged. After the specified number of ‘sweeps’ (average counts), the averaging mode (terminal control) setting determines the averaging action.

Mode	BASIC

Remote Command	`[:SENSe]:SPECtrum:AVERage:COUNt <integer>`
	`[:SENSe]:SPECtrum:AVERage:COUNt?`
	`[:SENSe]:SPECtrum:AVERage[:STATe] ON|OFF|1|0`
	`[:SENSe]:SPECtrum:AVERage[:STATe]?`

Example	:SPEC:AVER:COUN 10 :SPEC:AVER 0
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode. You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	25 ON
State Saved	Saved in instrument state.
Min	1
Max	20001
Key Path	**Meas Setup**

Avg Mode

Press Avg Mode (Exp) to continue measurement averaging, using the specified number of averages to compute each averaged value. The average will be displayed at the end of each sweep. Avg Mode

(Repeat) will cause the measurement to reset the average counter each time the specified number of averages is reached.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:AVERage:TCONtrol EXPonential|REPeat` `[:SENSe]:SPECtrum:AVERage:TCONtrol?`
Example	SPEC:AVER:TCON REP
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	EXPonential
State Saved	Saved in instrument state.
Range	Exp | Repeat
Key Path	**Meas Setup**

Avg Type

Allows you to select the type of averaging.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:AVERage:TYPE LOG|MAXimum|MINimum|RMS|SCALar` `[:SENSe]:SPECtrum:AVERage:TYPE?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	LOG
State Saved	Saved in instrument state.
Range	Pwr Avg (RMS) | Log-Pwr Avg (Video) | Voltage Avg
Key Path	**Meas Setup**

Meas Preset

Returns all measurement local parameters to the factory default values.

Mode	BASIC
Remote Command	`:CONFigure:SPECtrum`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Meas Setup, More**

Advanced

Opens a menu of advanced settings for the complex spectrum measurement.

Key Path	**Front-panel key**

Pre-ADC BPF

Enables or disables the Pre-ADC bandpass filter.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:BANDwidth:PADC ON|OFF|1|0` `[:SENSe]:SPECtrum:BANDwidth:PADC?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	ON |OFF
Key Path	**Meas Setup, More, Advanced**

Pre-FFT Fltr

Allows the user to select the type of pre-FFT filter (FPGA post ADC, digital filter) that is used. This is an advanced control that normally does not need to be changed.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:BANDwidth:PFFT:TYPE FLAT|GAUSsian` `[:SENSe]:SPECtrum:BANDwidth:PFFT:TYPE?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	FLAT
State Saved	Saved in instrument state.
Range	Gaussian | Flat
Key Path	**Meas Setup, More, Advanced**

Pre-FFT BW

Allows you to select auto or manual control for the pre-FFT Bandwidth setting. This is an advanced control that normally does not need to be changed. This parameter is also called “IFBw” or “InfoBw”.

Mode	BASIC

Remote Command	`[:SENSe]:SPECtrum:BANDwidth:PFFT[:SIZE] <bandwidth>`
	`[:SENSe]:SPECtrum:BANDwidth:PFFT[:SIZE]?`
	`[:SENSe]:SPECtrum:BANDwidth:PFFT:AUTO ON|OFF|1|0`
	`[:SENSe]:SPECtrum:BANDwidth:PFFT:AUTO?`

Dependencies/Couplings	The bandwidth of the Pre-FFTBPF is coupled to the span by the following equations. PreFFT-BW = Span * 1.5 Since the PreFFT-BW can only set to discrete values, PreFFT-BW will not always be set by the exact value above. If the hardware cannot set to the exact value of the requested PreFFT-BW, it will use “the next wider BW” available. For instance, a PreFFT-BW requested to be set at 3.01 MHz will actually be set to 3.1 MHz in the hardware.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.

Preset	Hardware Dependent: No Option = 10.0 MHz Option B25 = 25.0 MHz ON
State Saved	Saved in instrument state.
Min	10 Hz
Max	Hardware Dependent: No Option = 10.0 MHz Option B25 = 25.0 MHz
Key Path	**Meas Setup, More, Advanced**

FFT Window

Opens a menu selection that allows you to choose one of several available FFT filtering windows.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:FFT:WINDow[:TYPE] BH4Tap|BLACkman|FLATtop|GAUSsian|HAMMing|HANNing|KB70|KB90|KB110|UNIForm` `[:SENSe]:SPECtrum:FFT:WINDow[:TYPE]?`
Remote Command Notes	This selection affects the acquisition point quantity and the FFT size, based on the resolution bandwidth selected. You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	FLATtop
State Saved	Saved in instrument state.
Range	Flat Top (High AmptdAcc) | Uniform | Hanning | Hamming | Gaussian (Alpha3.5) | Blackman | Blackman-Harris | K-B 70 dB (Kaiser-Bessel) | K-B 90 dB (Kaiser-Bessel) | K-B 110 dB (Kaiser-Bessel)
Key Path	**Meas Setup, More, Advanced**

FFT Size

Opens a menu that allows you to set FFT or window length parameters.

Key Path	**Meas Setup, Advanced**

Length Ctrl

Length Ctrl (Man) enables control of FFT window or length settings. Press Length Ctrl (Auto) to disable FFT window or length settings. This setting is directly coupled to Res BW as follows: Enabling Length Ctrl disables Res BW, while disabling Length Ctrl allows Res BW control.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:FFT:LENGth:AUTO ON|OFF|1|0` `[:SENSe]:SPECtrum:FFT:LENGth:AUTO?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	Auto I Man
Key Path	**Meas Setup, More, Advanced, FFT Size**

Min Pnts/RBW

Sets the minimum number of data points that will be used inside the resolution bandwidth. The value is ignored if length control is set to manual. This is an advanced control that normally does not need to be changed.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:FFT:RBWPoints <real>` `[:SENSe]:SPECtrum:FFT:RBWPoints?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	3.1

State Saved	Saved in instrument state.
Min	0.1
Max	100
Key Path	**Meas Setup, More, Advanced, FFT Size**

Window Length

Sets the FFT window length. This value is only used if length control is set to manual. This is an advanced control that normally does not need to be changed.

Note that the "points" is the number of points for IQ pairs. For example, if the Window Length is set to 10, it means the window length is for 10 I and 10 Q points. Not 5 I and 5 Q points.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:FFT:WINDow:LENGth <integer>`
	`[:SENSe]:SPECtrum:FFT:WINDow:LENGth?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	1694
State Saved	Saved in instrument state.
Min	8
Max	1048576
Key Path	**Meas Setup, More, Advanced, FFT Size**

FFT Length

Allows you to set the FFT length. This value is only used if length control is set to manual. The value must be greater than or equal to the window length value. Any amount greater than the window length is implemented by zero padding. This is an advanced control that normally does not need to be changed.

Note that the "points" is the number of points for IQ pairs. For example, if the Window Length is set to 10, it means the window length is for 10 I and 10 Q points. Not 5 I and 5 Q points.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:FFT:LENGth <integer>`
	`[:SENSe]:SPECtrum:FFT:LENGth?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	2048
State Saved	Saved in instrument state.

Min	566
Max	1048576
Key Path	**Meas Setup, More, Advanced, FFT Size**

ADC Dither

Opens the ADC Dither menu.

ADC Dither Auto Sets ADC Dither to Auto.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:ADC:DITHer:AUTO[:STATe] ON|OFF|1|0` `[:SENSe]:SPECtrum:ADC:DITHer:AUTO[:STATe]?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	Auto | Man
Key Path	**Meas Setup, More, Advanced, More, ADC Dither**

ADC Dither State Turns ADC Dither on or off.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:ADC:DITHer[:STATe] ON|OFF|1|0` `[:SENSe]:SPECtrum:ADC:DITHer[:STATe]?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**Meas Setup, More, Advanced, More, ADC Dither**

IF Gain

Opens a menu that allows you to manually select IF Gain settings.

IF Gain Auto Returns manually selected IF Gain settings to the auto (default) setting.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:IF:GAIN:AUTO[:STATe] ON|OFF|1|0` `[:SENSe]:SPECtrum:IF:GAIN:AUTO[:STATe]?`
Example	:SPEC:IF:GAIN:AUTO ON
Restriction and Notes	This table is for SCPI definition purpose only.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**Meas Setup, More, Advanced, More, IF Gain**

IF Gain State Allows you to optimize IF Gain for specific signals or signal levels.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM
Remote Command	`[:SENSe]:SPECtrum:IF:GAIN[:STATe] AUTOrange|LOW|HIGH` `[:SENSe]:SPECtrum:IF:GAIN[:STATe]?`
Example	SPEC:IF:GAIN HIGH
Restriction and Notes	This table is for SCPI definition purpose only.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	AUTO
State Saved	Saved in instrument state.
Range	Autorange (Slower Follows Signals) | Low (Best for Large Signals) | High (Best Noise Level)
Key Path	**Meas Setup, More, Advanced, More, IF Gain**

IF Flatness

Allows you to turn IF flatness corrections on and off. This overrides the system setting for the IF flatness correction.

Mode	BASIC
Remote Command	`[:SENSe]:SPECtrum:BANDwidth:IF:FLATness ON|OFF|1|0` `[:SENSe]:SPECtrum:BANDwidth:IF:FLATness?`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**Meas Setup, More, Advanced, More**

Trigger

Displays softkeys that allow you to select and control the trigger source for the current measurement. Refer to Measurement Functions for more information.

Trigger Source

Allows you to choose a trigger source for the current measurement. Trigger settings are mode global. Refer to “Trigger” in the Measurement Functions section.

Mode	BASIC
Remote Command	`:TRIGger:SPECtrum[:SEQuence]:SOURce EXTernal[1]|EXTernal2|IMMediate|IF|VIDeo|LINE|RFBurst|FRAMe` `:TRIGger:SPECtrum[:SEQuence]:SOURce?`
Restriction and Notes	IF is the same as VIDeo and it’s for backward compatibility purpose
Remote Command Notes	You must be in the IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	IMMediate
State Saved	Saved in instrument state.
Range	Free Run ǀ Video ǀ Line ǀ External 1 ǀ External 2 ǀ RF Burst (Wideband) ǀ Periodic Timer
Key Path	**Trigger**

Sweep/Control

Accesses the keys to control pausing/resuming the sweep or measurement. Refer to Measurement Functions for more information.

Pause/Resume

Pauses a measurement after the current data acquisition is complete. When Paused, the label on the key changes to Resume. Pressing Resume continues the paused measurement.

Key Path	Sweep/Control

Marker

The Marker front-panel key opens the marker menu.

Key Path	**Front-panel key**

Marker Type

Sets the marker control mode as described under **Normal**, **Delta** and **Off**, below. All interactions and dependencies detailed under the key description are enforced when the remote command is sent.

Mode	BASIC

Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MODE POSition|DELTa|OFF`
	
	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MODE?`

Example	:CALC:SPEC:MARK:MODE OFF
Restriction and Notes	If the selected marker is Off, pressing Marker sets it to Normal and places it at the center of the screen on the trace determined by the **Marker Trace** rules. At the same time, **Marker X Axis Value** appears on the Active Function area. Default Active Function: the active function for the selected marker's current control mode. Note that if the current control mode is Off, there is no active function and the active function is turned off. Active Function Display: the marker X axis value entered in the active function area will display the marker value to its full entered precision.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	Normal | Delta | Off
Key Path	**Marker**

Marker X Axis Value

Sets the marker X Axis value in the current marker X Axis Scale unit. It has no effect if the control mode is **Off,** but is the SCPI equivalent of entering an X value if the control mode is **Normal** or **Delta**.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X <real>` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X?`
Example	CALC:SPEC:MARK3:X?
Restriction and Notes	If no suffix is sent it will use the fundamental units for the current marker X Axis Scale. If a suffix is sent that does not match the current marker X Axis Scale unit, an error “Invalid suffix” will be generated. The query returns the marker’s absolute X Axis value if the control mode is **Normal**, or the offset from the marker’s reference marker if the control mode is **Delta**. The query is returned in the fundamental units for the current marker X Axis scale: Hz for **Frequency** and **Inverse Time**, seconds for **Period** and **Time**. If the marker is **Off** the response is not a number.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query will return a not a number (NAN).
State Saved	No
Range	Depends on X axis range of selected Trace.

Marker X Axis Position

Sets the marker X position in trace points. It has no effect if the control mode is **Off,** but is the SCPI equivalent of entering a value if the control mode is **Normal** or **Delta** - except in trace points rather than X Axis Scale units. The entered value is immediately translated into the current X Axis Scale units for setting the value of the marker.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:POSition <real>` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:POSition?`

Example	CALC:SPEC:MARK10:X:POS?
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.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query will return a not a number (NAN).
State Saved	No
Range	Depends on length of selected Trace.

Marker Y Axis Value

Gets the marker Y value. Query only.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:Y?`
Example	CALC:SPECtrum:MARK11:Y?
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	Result dependant on markers setup and signal source
State Saved	No

Relative To

Selects the marker relative to (its reference marker).

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:REFerence <integer>` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:REFerence?`

Example	CALC:SPEC:MARK6:REF 8 CALC:SPEC:MARK:REF?
Restriction and Notes	A marker cannot be relative to itself so that choice is grayed out, and if sent from SCPI generates error –221: “Settings conflict; marker cannot be relative to itself.”
Remote Command Notes	When queried a single value will be returned (the specified marker numbers relative marker).
Preset	2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1
State Saved	Saved in instrument state.
Min	1
Max	12
Key Path	**Marker, Properties**

Marker Trace

Assigns the specified marker to the designated trace.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:TRACe SPECtrum|ASPectrum|IQ` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:TRACe?`
Example	CALC:SPEC:MARK:TRACE?
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	SPECtrum
State Saved	Saved in instrument state.
Range	Spectrum | Spectrum Avg | I/Q Waveform
Key Path	**Marker**

Couple Marker

When this function is true, moving any marker causes an equal X Axis movement of every other marker which is not **Off**. Note that “equal X Axis movement” preserves the difference between each marker’s X Axis value (in the fundamental x-axis units of the trace that marker is on) and the X

Axis value of the marker being moved (in the same fundamental x-axis units).

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer:COUPle[:STATe] ON|OFF|1|0` `:CALCulate:SPECtrum:MARKer:COUPle[:STATe]?`
Example	:CALC:SPEC:MARK:COUP ON
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**Marker, More**

All Markers Off

Turns off all markers.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer:AOFF`
Example	CALC:SPEC:MARK:AOFF
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Marker, More**

Backward Compatibility SCPI Commands

Sets or queries the state of a marker. Setting a marker which is OFF to state ON or 1 puts it in Normal mode and places it at the center of the screen.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:STATe OFF|ON|0|1` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:STATe?`

Example	CALC:SPEC:MARK3:STATE ON
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On | Off

Peak Search

Pressing the Peak Search front-panel key places the selected marker on the trace point with the maximum y-axis value for that marker's trace and opens this Peak Search menu.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MAXimum`
Example	`CALC:SPEC:MARK2:MAX`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Peak Search**

Min Search

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

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MINimum`
Example	CALC:SPEC:MARK:MIN
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Peak Search**

Mkr->CF

Assigns the selected marker's frequency to the Center Frequency parameter.

See Mkr-> CF under “Marker To”.

Marker To

Accesses softkeys that can copy the current marker value into another instrument parameter (for example, Center Freq). If the currently selected marker is not on when you press this front panel key, it will be turned on at the center of the screen as a normal marker.

Key Path	**Front-panel key**

Mkr -> CF

Sets the center frequency to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12[:SET]:CENTer`
Example	CALC:SPEC:MARK4:SET:CENTER
Restriction and Notes	This key is not available (grayed out) when the selected marker is not on the spectrum trace. In delta marker mode, this function sets the center frequency to the x-axis value of the delta marker. If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the screen as a normal type marker.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Marker ->**

Mkr -> Ref Lvl

Sets the reference level to the amplitude value of the selected marker, moving the marked point to the reference level (top line of the graticule).

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12[:SET]:RLEVel`
Example	CALC:SPEC:MARK4:SET:RLEVEL

Restriction and Notes	Make the Marker Y value to the display reference value. If the currently selected marker is not on when this key is pressed, it will be turned on at the center of the screen as a normal type marker, and its amplitude applied to the reference value.
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Marker ->**

Marker Function

Opens the Marker Function menu.

Key Path	**Front-panel key**

Marker Function Type

Sets the marker control mode as described under **Normal**, **Delta** and **Off**, below. All interactions and dependencies detailed under the key description are enforced when the remote command is sent.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion NOISe|BPOWer|BDENsity|OFF` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion?`
Example	`CALC:SPEC:MARK:FUNC NOIS`
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	Marker Noise | Band/Interval Power | Band Interval Density | Marker Function Off
Key Path	**Marker Fctn**

Band Adjust

Opens a menu of keys that allow you to modify the band.

Key Path	**Marker Function**

Band/Interval Span for Frequency Domain

Sets the width of the span for the selected marker.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:SPAN <freq>` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:SPAN?`
Example	`:CALC:SPEC:MARK12:FUNC:BAND:SPAN 20 MHz`
Dependencies/Couplings	Changing the Band/Interval Span necessarily changes the Band/Interval Left and Band/Interval Right values
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	10% of Span
State Saved	Saved in instrument state.
Min	0
Max	26.5GHz
Key Path	**Marker Fctn**

Band/Interval Left for Frequency Domain

Sets the left edge frequency or time for the band of the selected marker.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:LEFT <freq>` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:LEFT?`
Example	`:CALC:SPEC:MARK12:FUNC:BAND:LEFT 20 GHz`
Dependencies/Couplings	Changing the Band/Interval Left necessarily changes the Band/Interval Span and Band/Interval Right values
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	5% of Span
State Saved	Saved in instrument state.
Min	0
Max	26.5GHz

Key Path	**Marker Fctn**

Band/Interval Right for Frequency Domain

Sets the right edge frequency or time for the band of the selected marker.

Mode	BASIC
Remote Command	`:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:RIGHt <freq>` `:CALCulate:SPECtrum:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:RIGHt?`
Example	`:CALC:SPEC:MARK12:FUNC:BAND:RIGHt 20 GHz`
Dependencies/Couplings	Changing the Band/Interval Right necessarily changes the Band/Interval Left and Band/Interval Span values
Remote Command Notes	You must be in IQ Analyzer (Basic) mode to use this command. Use INSTrument:SELect to set the mode.
Preset	5% of Span
State Saved	Saved in instrument state.
Min	0
Max	26.5GHz
Key Path	**Marker Fctn**

7 Waveform

The waveform measurement is a generic measurement for viewing the input signal waveforms in the time domain. This measurement is how the instrument performs the zero span functionality found in traditional spectrum analyzers. Also available under basic waveform measurements is an I/Q window, which shows the I and Q signal waveforms in parameters of voltage versus time to disclose the voltages which comprise the complex modulated waveform of a digital signal.

The waveform measurement can be used to perform general purpose power measurements to a high degree of accuracy as well.

Key Path	**Front-panel key**

The general functionality of CONFigure, INITiate, FETCh, MEASure, and READ are described at this section. See the SENSe subsystem commands for more measurement related commands.

The following table denotes the returned results from the FETCh|MEASure|READ commands:

`:CONFigure:WAVeform`

`:CONFigure:WAVeform:NDEFault`

`:INITiate:WAVeform`

`:FETCh:WAVeform[n]`

`:MEASure:WAVeform[n]`

`:READ:WAVeform[n]`

n	Results Returned
0	Returns unprocessed I/Q trace data, as a series of trace point values, in volts. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values.

1	Returns the following scalar results: Sample Time is a floating point number representing the time between samples when using the trace queries (n=0, 2, and so forth). Mean Power is the mean power (in dBm). This is the power across the entire trace. If averaging is on, the power is for the latest acquisition. Mean Power Averaged is the power (in dBm) for N averages, if averaging is on. This is the power across the entire trace. If averaging is on, the power is for the latest acquisition. If averaging is off, the value of the mean power averaged is the same as the value of the mean power. Number of samples is the number of data points in the captured signal. This number is useful when performing a query on the signal (i.e. when n=0,2,etc.). Peak-to-mean ratio has units of dB. This is the ratio of the maximum signal level to the mean power. Valid values are only obtained with averaging turned off. If averaging is on, the peak-to-mean ratio is calculated using the highest peak value, rather than the displayed average peak value. Maximum value is the maximum of the most recently acquired data (in dBm). Minimum value is the minimum of the most recently acquired data (in dBm).
2	Returns trace point values of the entire captured signal envelope trace data. These data points are floating point numbers representing the power of the signal (in dBm). There are N data points, where N is the number of samples. The period between the samples is defined by the sample time.

The following information describes the Waveform measurement results.

Name	Type	Description	Unit	Format
Mean Pwr	Float64	The mean power (dBm). This is either the power across the entire trace, or the power between markers if the markers are enabled.	dBm	XX.XX dBm
Pk-to-Mean	Float64	This is the ratio of the maximum signal level to the mean power.	dB	XX.XX dB
Max Pt	Float64	The maximum of the most recently acquired data.	dBm	XX.XX dBm
Min Pt	Float64	The minimum of the most recently acquired data.	dBm	XX.XX dBm

SPAN X Scale

Accesses a menu of functions that enable you to set the horizontal scale parameters.

Key Path	**Front-panel key**

Ref Value

Sets the reference value for time on the horizontal axis. When Auto Scaling is set to On, the displayed plots use a Scale/Div value determined by the analyzer, based on the measurement result.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:X[:SCALe]:RLEVel <time>` `:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:X[:SCALe]:RLEVel?`
Example	DISP:WAV:VIEW:WIND:TRAC:X:RLEV 10 ms DISP:WAV:VIEW:WIND:TRAC:X:RLEV?
Restriction and Notes	If the Auto Scaling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Auto Scaling automatically changes to Off.
Dependencies/Couplings	When you set a value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	0.00 s
State Saved	Saved in instrument state.
Min	–1.000 s
Max	10.00 s
Key Path	**SPAN X Scale**

Scale/Div

Sets the horizontal scale by changing a time value per division.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:X[:SCALe]:PDIVision <time>` `:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:X[:SCALe]:PDIVision?`
Example	DISP:WAV:VIEW:WIND:TRAC:X:PDIV 500 us DISP:WAV:VIEW:WIND:TRAC:X:PDIV?
Restriction and Notes	If the Auto Scaling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Auto Scaling automatically changes to Off.
Dependencies/Couplings	When you set a value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	200.0 µs
State Saved	Saved in instrument state.
Min	1.000 ns
Max	1.000 s
Key Path	**SPAN X Scale**

Ref Position

Sets the reference position for the X axis to either Left, Center or Right.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:X[:SCALe]:RPOSition LEFT|CENTer|RIGHt` `:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:X[:SCALe]:RPOSition?`
Example	DISP:WAV:VIEW:WIND:TRAC:X:RPOS LEFT DISP:WAV:VIEW:WIND:TRAC:X:RPOS?
Restriction and Notes	Allows you to set the reference position to either Left, Ctr (center) or Right.

Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	LEFT
State Saved	Saved in instrument state.
Range	Left | Ctr | Right
Key Path	**SPAN X Scale**

Auto Scaling

Toggles the scale coupling function between On and Off.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:X[:SCALe]:COUPle 0|1|OFF|ON` `:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:X[:SCALe]:COUPle?`
Example	DISP:WAV:VIEW:WIND:TRAC:X:COUP ON DISP:WAV:VIEW:WIND:TRAC:X:COUP?
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 Value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	1
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**SPAN X Scale**

AMPTD Y Scale

Accesses a menu of functions that enable you to set the vertical scale parameters.

Key Path	**Front-panel key**

Ref Value

Sets the absolute power reference value. However, since the Auto Scaling is defaulted to On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.

Ref Value (RF Envelope View)

Sets the Y Scale reference value (in dBm) when the RF Envelope View is active. By default, the measurement determines the reference value with Auto Scaling. Entering a reference value manually turns Auto Scaling off.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RLEVel <ampl>` `:DISPlay:WAVeform:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RLEVel?`
Example	DISP:WAV:VIEW:WIND:TRAC:Y:RLEV –50 dBm DISP:WAV:VIEW:WIND:TRAC:Y:RLEV?
Dependencies/Couplings	When the Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	10.00 dBm
State Saved	Saved in instrument state.
Range	–250.00 dBm to 250.00 dBm
Key Path	**AMPTD Y Scale**

Ref Value (I/Q Waveform View)

Sets the Y Scale reference value (in volts) when the I/Q Waveform View is active. By default, the measurement determines the reference value with Auto Scaling. Entering a reference value manually turns Auto Scaling off.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW2:WINDow[1]:TRACe:Y[:SCALe]:RLEVel <voltage>` `:DISPlay:WAVeform:VIEW2:WINDow[1]:TRACe:Y[:SCALe]:RLEVel?`
Example	DISP:WAV:VIEW2:WIND:TRAC:Y:RLEV 25 V DISP:WAV:VIEW2:WIND:TRAC:Y:RLEV?
Dependencies/Couplings	When the Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	0 V
State Saved	Saved in instrument state.
Min	–250 V
Max	250 V
Key Path	**AMPTD Y Scale**

Attenuation

Accesses a menu of functions that enable you to change the attenuation settings. This key has a readback text that describes total attenuator value

See AMPTD Y Scale, Attenuation in the “Analyzer Setup Functions” section for more information.

Key Path	**AMPTD Y Scale**

Scale/Div

Sets the units per division of vertical scale in the logarithmic display. However, since the Auto Scaling is defaulted to On, this value is automatically determined by the measurement result.

When you set a value manually, Auto Scaling automatically changes to Off.

Scale/Div (RF Envelope View)

Sets the scale per division for the RF Envelope result waveform (time domain) measurements in the graph window.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:PDIVision <rel_ampl>` `:DISPlay:WAVeform:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:PDIVision?`
Example	DISP:WAV:VIEW:WIND:TRAC:Y:PDIV 5 dB DISP:WAV:VIEW:WIND:TRAC:Y:PDIV?
Dependencies/Couplings	When the Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	10.00 dB
State Saved	Saved in instrument state.
Range	0.10 dB to 20.00 dB
Key Path	**AMPTD Y Scale**

Scale/Div (I/Q Waveform View)

Sets the scale per division for the I/ Q signal waveform graph.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW2:WINDow[1]:TRACe:Y[:SCALe]:PDIVision <voltage>` `:DISPlay:WAVeform:VIEW2:WINDow[1]:TRACe:Y[:SCALe]:PDIVision?`
Example	DISP:WAV:VIEW2:WIND:TRAC:Y:PDIV 25 mV DISP:WAV:VIEW2:WIND:TRAC:Y:PDIV?

Dependencies/Couplings	When the Auto Scaling is On, this value is automatically determined by the measurement result. When you set a value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	100.0 mV
State Saved	Saved in instrument state.
Min	1.0 nV
Max	20 V
Key Path	**AMPTD Y Scale**

Internal Preamp

Accesses a menu of functions that enable you to control the internal preamplifiers.

See AMPTD Y Scale, Internal Preamp in the “Analyzer Setup Functions” section for more information.

Key Path	**AMPTD Y Scale**

Ref Position

Positions the reference level at the top, center or bottom of the Y Scale display. Changing the reference position does not change the reference level value.

Ref Position (RF Envelope View)

Positions the reference level at the top, center or bottom of the Y Scale display. Changing the reference position does not change the reference level value.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RPOSition TOP|CENTer|BOTTom` `:DISPlay:WAVeform:VIEW[1]:WINDow[1]:TRACe:Y[:SCALe]:RPOSition?`
Example	DISP:WAV:VIEW:WIND:TRAC:Y:RPOS CENT DISP:WAV:VIEW:WIND:TRAC:Y:RPOS?

Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	TOP
State Saved	Saved in instrument state.
Range	Top | Ctr | Bot
Key Path	**AMPTD Y Scale**

Ref Position (I/Q Waveform View)

Positions the reference level at the top, center or bottom of the Y Scale display. Changing the reference position does not change the reference level value.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW2:WINDow[1]:TRACe:Y[:SCALe]:RPOSition TOP|CENTer|BOTTom` `:DISPlay:WAVeform:VIEW2:WINDow[1]:TRACe:Y[:SCALe]:RPOSition?`
Example	DISP:WAV:VIEW2:WIND:TRAC:Y:RPOS CENT DISP:WAV:VIEW2:WIND:TRAC:Y:RPOS?
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	CENT
State Saved	Saved in instrument state.
Range	Top | Ctr | Bot
Key Path	**AMPTD Y Scale**

Auto Scaling

Toggles the Auto Scaling function between On and Off. When the **Restart** front panel key is pressed, this function automatically determines the scale per division and reference values based on the measurement results.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA

Remote Command	`:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:Y[:SCALe]:COUPle 0|1|OFF|ON` `:DISPlay:WAVeform:VIEW[1]|2:WINDow[1]:TRACe:Y[:SCALe]:COUPle?`
Example	DISP:WAV:VIEW:WIND:TRAC:Y:COUP OFF DISP:WAV:VIEW:WIND:TRAC:Y:COUP?
Dependencies/Couplings	When Auto Scaling is On, upon pressing the Restart front-panel key, this function automatically switches the scale per division and reference values into the defaults. When the user sets a value to either Scale/Div or Ref Value manually, Auto Scaling automatically changes to Off.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**AMPTD Y Scale**

View/Display

Accesses a menu of functions that enable you to set up and control the display parameters for the current measurement

Key Path	**Front-panel key**

Display

Accesses a menu of functions that enable you to set the display parameters. See Display in the "Analyzer Setup Functions" section for more information.

Key Path	**View/Display**

Change Title

Accesses an Alpha Editor menu that enables you to write a title across the top of the display. This menu contains characters and symbols that may also be used with the numeric keypad. Press Enter or Return to complete the entry. Press ESC to cancel the entry and preserve your existing title.

The display title will remain until you press Change Title again, or you recall a trace or state, or a Factory Preset is performed. A title can also be cleared by pressing Title, Clear Title.

This table is for SCPI definition purpose only and SCPI command and Preset/Default value are defined on measurement basis.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:ANNotation:TITLe:DATA <string>`
	`:DISPlay:WAVeform:ANNotation:TITLe:DATA?`
Example	DISP:WAV:ANN:TITL:DATA "Agilent"
Preset	IQ Waveform
State Saved	Saved in instrument state.
Range	Uppercase, Lowercase, Numeric, Symbol
Key Path	**View/Display, Display, Title**

View

Selects the results view.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW[:SELect] RFENvelope|IQ`
	`:DISPlay:WAVeform:VIEW[:SELect]?`
Example	DISP:WAV:VIEW RFEN
	DISP:WAV:VIEW?
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	RFENvelope
State Saved	Saved in instrument state.
Range	RF Envelope | IQ Waveform
Key Path	**View/Display**

View Selection by number (SCPI only)

Displays the numeric values of the measurement results.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:DISPlay:WAVeform:VIEW:NSELect <integer>`
	`:DISPlay:WAVeform:VIEW:NSELect?`
Example	DISP:WAV:VIEW:NSEL 1
	DISP:WAV:VIEW:NSEL?
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	1
State Saved	Saved in instrument state.
Min	1
Max	2

Trace/Detector

There is no 'Trace/Detector' functionality supported in the Waveform measurement. The front-panel key will display a blank softkey when pressed.

Key Path	**Front-panel key**

BW

Accesses a menu that enables you to control the information bandwidth functions of the instrument. You can also select the filter type for the measurement.

Key Path	**Front-panel key**

Info BW

Enables you to set the information bandwidth (Info BW) of the analyzer.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`[:SENSe]:WAVeform:BANDwidth[:RESolution] <freq>` `[:SENSe]:WAVeform:BANDwidth[:RESolution]?`
Example	WAV:BAND 1 KHZ WAV:BAND?
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	100 kHz
State Saved	Saved in instrument state.
Min	10 Hz
Max	Hardware Dependent: No Option = 10 MHz Option B25 = 25 MHz
Key Path	**BW**

IBW Control

Accesses the Filter Type key

Key Path:	BW

Filter Type

Selects the type of bandwidth filter that is used. The choices are Gaussian or Flat top.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`[:SENSe]:WAVeform:BANDwidth:SHAPe GAUSsian|FLATtop` `[:SENSe]:WAVeform:BANDwidth:SHAPe?`
Example	WAV:BAND:SHAP GAUS WAV:BAND:SHAP?
Dependencies/Couplings	See the description above
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	GAUSsian
State Saved	Saved in instrument state.
Range	Gaussian|FlatTop
Key Path	**BW, RBW Control**

Meas Setup

Displays the setup softkeys that enable you to control the parameters for the current measurement.

Key Path	**Front-panel key**

Average/Hold Number

Sets the number of sweeps (average counts) that will be averaged. After the specified number of sweeps, the averaging mode (terminal control) setting determines the averaging action.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA

Remote Command	`[:SENSe]:WAVeform:AVERage:COUNt <integer>`
	`[:SENSe]:WAVeform:AVERage:COUNt?`
	`[:SENSe]:WAVeform:AVERage[:STATe] OFF|ON|0|1`
	`[:SENSe]:WAVeform:AVERage[:STATe]?`

Example	WAV:AVER:COUN 1001 WAV:AVER:COUN? WAV:AVER ON WAV:AVER?
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode. You must be in the mode that Waveform measurement is included to use this command. Use INSTrument:SELect to set the mode.
Preset	10 OFF
State Saved	Saved in instrument state.
Min	1
Max	20001
Key Path	**Meas Setup**

Avg Mode

Enables you to set the averaging mode.

When set to Exponential (Exp) the measurement averaging continues using the specified number of averages to compute each averaged value. The average will be displayed at the end of each sweep.

When set to Repeat, the measurement resets the average counter each time the specified number of averages is reached.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`[:SENSe]:WAVeform:AVERage:TCONtrol EXPonential|REPeat` `[:SENSe]:WAVeform:AVERage:TCONtrol?`
Example	WAV:AVER:TCON REP WAV:AVER:TCON?
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	EXPonential
State Saved	Saved in instrument state.
Range	Exp | Repeat
Key Path	**Meas Setup**

Avg Type

Selects the type of averaging.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`[:SENSe]:WAVeform:AVERage:TYPE LOG|MAXimum|MINimum|RMS|SCALar` `[:SENSe]:WAVeform:AVERage:TYPE?`
Example	WAV:AVER:TYPE MAX WAV:AVER:TYPE?
Restriction and Notes	The SCPI selection of MAX and MIN are kept because of BWCC reason, but they are removed from the front panel access because they are not Average.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	RMS

State Saved	Saved in instrument state.
Range	Pwr Avg (RMS) | Log-Pwr Avg (Video) | Voltage Avg
Key Path	**Meas Setup**

Meas Time

Sets how long the measurement is performed. X Scale only changes the representation of the display.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	[:SENSe]:WAVeform:SWEep:TIME <time> [:SENSe]:WAVeform:SWEep:TIME?
Example	WAV:SWE:TIME 50 ms WAV:SWE:TIME?
Restriction and Notes	Specifies and returns how long the measurement is performed. It is the time record length of the measurement waveform. The Max time may be reduced when the sample frequency is high due to the memory limitation.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	2.000000 ms
State Saved	Saved in instrument state.
Range	1.000 (s to 100.00 s
Key Path	**Meas Setup**

Meas Preset

Restores all the measurement parameters to their default values.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	:CONFigure:WAVeform
Example	CONF:WAV
Restriction and Notes	Restore default values of all parameters.

Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Meas Setup**

Advanced

Accesses a menu of “advanced” functions that are used for specific applications. These settings should not be changed for most measurements.

Key Path	**Meas Setup**

ADC Dither

Accesses the ADC Dither control menu.

Key Path	**Meas Setup, Advanced**

ADC Dither Auto Sets ADC dithering to automatically select whether dithering is needed.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`[:SENSe]:WAVeform:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1` `[:SENSe]:WAVeform:ADC:DITHer:AUTO[:STATe]?`
Example	WAV:ADC:DITH:AUTO ON WAV:ADC:DITH:AUTO?
Restriction and Notes	The dither function improves linearity for low level signals, at the expense of a higher noise floor. Behavior of this function is the same as the Spectrum Analyzer. For more information, refer to the *User’s and Programmer’s Reference*.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**Meas Setup, Advanced, ADC Dither**

ADC Dither Toggles the dither function On and Off. The dither function improves linearity for low level signals, at the expense of a higher noise floor.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`[:SENSe]:WAVeform:ADC:DITHer[:STATe] OFF|ON|0|1` `[:SENSe]:WAVeform:ADC:DITHer[:STATe]?`
Example	WAV:ADC:DITH ON WAV:ADC:DITH?
Restriction and Notes	The dither function improves linearity for low level signals, at the expense of a higher noise floor.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	Auto | Man
Key Path	**Meas Setup, Advanced, ADC Dither**

IF Gain

Sets the IF Gain function to Auto, Low Gain or High Gain. These settings affect sensitivity and IF overloads.

Key Path	**Meas Setup, Advanced**

IF Gain Auto Activates the auto rules for IF Gain. When Auto is active, the IF Gain is set to High Gain under and of the following conditions:

- The input attenuator is set to 0 dB
- the preamp is turned On and the frequency range is under 3.6 GHz

For other settings, Auto sets the IF Gain to Low Gain.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`[:SENSe]:WAVeform:IF:GAIN:AUTO[:STATe] ON|OFF|1|0` `[:SENSe]:WAVeform:IF:GAIN:AUTO[:STATe]?`
Example	WAV:IF:GAIN:AUTO ON WAV:IF:GAIN:AUTO?

Restriction and Notes	This table is for SCPI definition purpose only.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	ON
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**Meas Setup, Advanced, IF Gain**

IF Gain State Selects the range of IF gain.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`[:SENSe]:WAVeform:IF:GAIN[:STATe] AUTOrange|LOW|HIGH`
	`[:SENSe]:WAVeform:IF:GAIN[:STATe]?`
Example	WAV:IF:GAIN HIGH
	WAV:IF:GAIN?
Restriction and Notes	This table is for SCPI definition purpose only.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	AUTO
State Saved	Saved in instrument state.
Range	Autorange (Slower Follows Signals) | Low (Best for Large Signals) | High (Best Noise Level)
Key Path	**Meas Setup, Advanced, IF Gain**

Trigger

Accesses a menu of functions that enable you to select and control the trigger source for the current measurement

.See Trigger in the “Measurement Functions” section for more information.

Key Path	**Front-panel key**

Trigger

Selects a trigger source. Trigger settings are mode global. Refer to Mode functionality section for trigger settings. Refer to “Trigger” in the “Measurement Functions” section.

Mode	WCDMA, C2K, WIMAX OFDMA
Remote Command	`TRIGger:WAVeform:SOURce EXTernal[1]|EXTernal2|FRAMe|IF|VIDeo|IMMediate|LINE|RF Burst` `TRIGger:WAVeform:SOURce?`
Example	TRIG:WAV:SOUR LINE TRIG:WAV:SOUR?
Restriction and Notes	IF in SCPI selection is the same as VIDeo. IF is kept because of BWCC
Remote Command Notes	The enums of VIDeo and IF point the same trigger source (video trigger). You must be in the mode that Waveform measurement is included to use this command. Use INSTrument:SELect to set the mode.
Preset	IMMediate
State Saved	Saved in instrument state.
Range	Free Run | Video | Line | External 1 | External 2 | RF Burst (Wideband) | Periodic Timer
Key Path	**Trigger**

Sweep/Control

Accesses the Sweep menu that allows you to pause and restart the measurement.

Key Path	**Front-panel key**

Pause and Resume

Pauses a measurement after the current data acquisition is complete. When Paused, the label on the key changes to Resume. Pressing the Resume key resumes the measurement at the point it was at when paused.

See Sweep/Control in the “Analyzer Setup Functions” section for more information.

Key Path	**Sweep/Control**

Marker

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

See the “Marker Functions” section for more information

Key Path	**Front-panel key**

Select Marker

Displays the softkeys that enable you to select, set up and control the markers for the current measurement.

Key Path	**Marker**

Marker Type

Sets the marker control mode to **Normal**, **Delta**, **Fixed** or **Off**. All interactions and dependencies detailed under the key description are enforced when the remote command is sent. If the selected marker is Off, pressing Marker sets it to Normal and places it at the center of the screen on the trace determined by the **Marker Trace** rules. At the same time, **Marker X Axis Value** appears on the Active Function area.

The default active function is the active function for the currently selected marker control mode. If the current control mode is Off, there is no active function and the active function is turned off.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MODE POSition|DELTa|OFF` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MODE?`
Example	CALC:WAV:MARK:MODE OFF CALC:WAV:MARK:MODE?

Restriction and Notes	If the selected marker is Off, pressing Marker sets it to Normal and places it at the center of the screen on the trace determined by the **Marker Trace** rules. At the same time, **Marker X Axis Value** appears on the Active Function area. Default Active Function: the active function for the selected marker's current control mode. If the current control mode is Off, there is no active function and the active function is turned off. Active Function Display: the marker X axis value entered in the active function area will display the marker value to its full entered precision.
Remote Command Notes	NORMal is changed to POSition in the new SA. You must be in the mode that Waveform measurement is included to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	Normal | Delta | Off
Key Path	**Marker**

Marker X Axis Value (Remote Command only)

Sets the marker X Axis value in the current marker X Axis Scale unit. It has no effect if the control mode is **Off**, but is the SCPI equivalent of entering an X value if the control mode is **Normal** or **Delta**.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X <time>` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X?`
Example	CALC:WAV:MARK7:X 50 ms CALC:WAV:MARK3:X?

Restriction and Notes	If no suffix is sent it will use the fundamental units for the current marker X Axis Scale. If a suffix is sent that does not match the current marker X Axis Scale unit, an error “Invalid suffix” will be generated. If the specified marker is Fixed and a Marker Function is on, error –221 “Settings conflict; cannot adjust Fixed marker while Marker Function is on” is generated. The query returns the marker’s absolute X Axis value if the control mode is **Normal**, or the offset from the marker’s reference marker if the control mode is **Delta**. The query is returned in the fundamental units for the current marker X Axis scale: Hz for **Frequency** and **Inverse Time**, seconds for **Period** and **Time**. If the marker is **Off** the response is not a number.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query will return a not a number (NAN).
State Saved	No
Min	–9.9E+37
Max	9.9E+37

Marker X Axis Position (Remote Command only)

Sets the marker X position in trace points. It has no effect if the control mode is **Off,** but is the SCPI equivalent of entering a value if the control mode is **Normal** or **Delta**. The entered value is immediately translated into the current X Axis Scale units for setting the value of the marker.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:POSition <real>` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:POSition?`
Example	CALC:WAV:MARK3:X:POS 500 CALC:WAV:MARK10:X:POS?
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.

Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	After a preset, all markers are turned OFF, so Marker X Axis Value query will return a not a number (NAN).
State Saved	No
Min	–9.9E+37
Max	9.9E+37

Marker Y Axis Value (Remote Command only)

Queries the marker Y Axis value in the current marker Y Axis unit.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:Y?`
Example	CALC:WAVeform:MARK11:Y?
Restriction and Notes	When the marker is on IQ waveform, returns I and Q values. Case #1 - Trace RF: returns a single double value. >:CALC:WAV:MARK1:Y? –2.402406506109E+001 Case #2 - Trace IQ: returns an double array of two values, the first is X, and the second is Y. >:CALC:WAV:MARK1:Y? –3.006944493834E–003,+9.9870666467354E–004
Remote Command Notes	You must be in the mode that Waveform measurement is included to use this command. Use INSTrument:SELect to set the mode.
Preset	Result dependant on markers setup and signal source
State Saved	No

Properties

Accesses a menu that enables you to select the active marker, the reference marker and the trace for the current measurement.

Key Path	**Marker**

Select Marker

Displays the softkeys that enable you to select, set up and control the markers for the current measurement.

Key Path	**Marker**

Relative To

Selects the marker the selected marker will be relative to (its reference marker).

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:REFerence <integer>` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:REFerence?`
Example	CALC:WAV:MARK6:REF 8 CALC:WAVeform:MARK:REF?
Restriction and Notes	A marker cannot be relative to itself so that choice is grayed out, and if sent from SCPI generates error –221: “Settings conflict; marker cannot be relative to itself.”
Remote Command Notes	When queried a single value will be returned (the specified marker numbers relative marker). A marker cannot be relative to itself so that choice is grayed out, and if sent from SCPI generates error –221: “Settings conflict; marker cannot be relative to itself.” You must be in the mode that Waveform measurement is included to use this command. Use INSTrument:SELect to set the mode.
Preset	2|3|4|5|6|7|8|9|10|11|12|1
State Saved	Saved in instrument state.
Min	1
Max	12
Key Path	**Marker, Properties**

Marker Trace

Assigns the specified marker to the designated trace.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA

Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:TRACe RFENvelope|IQ` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:TRACe?`
Example	CALC:WAV:MARK6:TRAC RFEN CALC:WAVeform:MARK:TRACE?
Restriction and Notes	Assigns the specified marker to the designated trace.
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	RFEN
State Saved	Saved in instrument state.
Range	RF Envelope | IQ Waveform
Key Path	**Marker**

Couple Marker

Toggles the state of the markers to be coupled On or Off. When this function is true (On), moving any marker causes an equal X axis movement of every other marker which is not **Off**. "Equal X axis movement" refers to the difference between each marker's X Axis value (in the fundamental x-axis units of the trace that marker is on) and the X Axis value of the marker being moved (in the same fundamental x-axis units) are preserved.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer:COUPle[:STATe] ON|OFF|1|0` `:CALCulate:WAVeform:MARKer:COUPle[:STATe]?`
Example	CALC:WAV:MARK:COUP ON CALC:WAVeform:MARK:COUP ON
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF
State Saved	Saved in instrument state.
Range	On | Off
Key Path	**Marker**

All Markers Off

Turns off all markers.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer:AOFF`
Example	CALC:WAV:MARK:AOFF
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Marker**

Peak Search

Places the selected marker on the trace point with the maximum y-axis value for that marker's trace and accesses a menu that enables you to select to do a minimum peak search.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MAXimum`
Example	`CALC:WAV:MARK2:MAX`
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Front panel key**

Min Search

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

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MINimum`
Example	CALC:WAV:MARK:MIN
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Key Path	**Peak Search**

Marker To

There is no ‘Marker To’ functionality supported in Waveform measurements. The front-panel key will display a blank softkey when pressed.

Key Path	**Front-panel key**

Marker Function

Accesses a menu of marker functions that perform post-processing operations on markers based on the measurement specifications. Marker functions are distinct from Measurement functions, which automatically perform complex sequences of setup, data acquisition, and display operations in order to measure specified signal characteristics. Marker Functions are specified for each individual marker and may be turned on individually for each marker.

The Marker Function menu controls which marker functions are turned on and allows you to adjust the setup parameters for each function. These parameters include the following, but only one parameter can be assigned to a given marker:

- **Marker Noise**
- **Band/Interval Power**
- **Band/Interval Density**
- **Marker Function Off**

Key Path	**Front-panel key**

Select Marker

Displays the softkeys that enable you to select, set up and control the markers for the current measurement.

Key Path	**Marker**

Marker Function Type

Sets the marker control function type to, Marker Noise, Band/Interval Power, Band Interval Density, or Marker Function Off

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion BPOWer|BDENsity|OFF` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion?`
Example	`CALC:WAVeform:MARK:FUNC BPOW` CALC:WAV:MARK10:FUNC?
Remote Command Notes	You must be in the mode that Waveform measurement is included to use this command. Use INSTrument:SELect to set the mode.
Preset	OFF

State Saved	Saved in instrument state.
Range	Band/Interval Power | Band Interval Density | Marker Function Off
Key Path	**Marker Function**

Band Adjust

Accesses a menu that enables you to set the frequency span width and the left and right edge, or time values, for the band or interval of the selected marker.

Key Path	**Marker Function**

Band/Interval Span for Time Domain

Sets the width of the frequency span for the selected marker.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:SPAN <time>` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:SPAN?`
Example	CALC:WAV:MARK12:FUNC:BAND:SPAN 20 ms CALC:WAV:MARK3:FUNC:BAND:SPAN?
Dependencies/Couplings	Changing the Band/Interval Span necessarily changes the Band/Interval Left and Band/Interval Right values
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	10% of Meas Time
State Saved	Saved in instrument state.
Min	0
Max	100s
Key Path	**Marker Function**

Band/Interval Left for Time Domain

Sets the left edge frequency or time value for the band of the selected marker.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:LEFT <time>` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:LEFT?`
Example	CALC:WAVeform:MARK12:FUNC:BAND:LEFT 1 s CALC:WAV:MARK12:FUNC:BAND:LEFT?
Dependencies/Couplings	Changing the Band/Interval Left necessarily changes the Band/Interval Span and Band/Interval Right values
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	5% of Meas Time
State Saved	Saved in instrument state.
Min	0
Max	100s
Key Path	**Marker Function**

Band/Interval Right for Time Domain

Sets the right edge frequency or time value for the band of the selected marker.

Mode	BASIC, PN, WCDMA, C2K, 1XEVDO, GSM, WIMAX OFDMA
Remote Command	`:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:RIGHt <time>` `:CALCulate:WAVeform:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND:RIGHt?`
Example	CALC:WAV:MARK12:FUNC:BAND:LEFT 1 s CALC:WAV:MARK12:FUNC:BAND:RIGH?
Dependencies/Couplings	Changing the Band/Interval Left necessarily changes the Band/Interval Span and Band/Interval Right values
Remote Command Notes	You must be in the mode that includes Waveform measurements to use this command. Use INSTrument:SELect to set the mode.
Preset	5% of Meas Time

State Saved	Saved in instrument state.
Min	0
Max	100s
Key Path	**Marker Function**

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